

XORAZM ILM ZIYO



FIZIKA

VARIANTLAR TO'PLAMI

2018

Variant - 1

① $x = 2 + t$
 $y = 1 + 2t$ (A)
 $y = 1 + 2 \cdot (x - 2) =$
 $= 1 + 2x - 4 = 2x - 3$

② a_n - normal tezlanish
 a_T - tangensial tezlanish

$a_n = 0$ $a_t < 0$

$a_t = \text{const}$

$a_n = \frac{v^2}{R}$

$a_t = \frac{v - v_0}{t} < 0$

$a_t = \text{const} < 0$

③

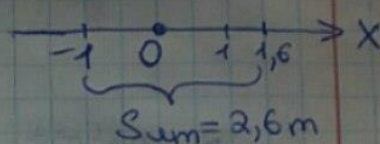
$t(s)$	0,7	0,8	0,9
$x(m)$	1,6	1	-1

$v_{\text{ort}} = \frac{S_{\text{um}}}{t_{\text{um}}} = \frac{S_1 + S_2 + S_3}{t_1 + t_2 + t_3}$

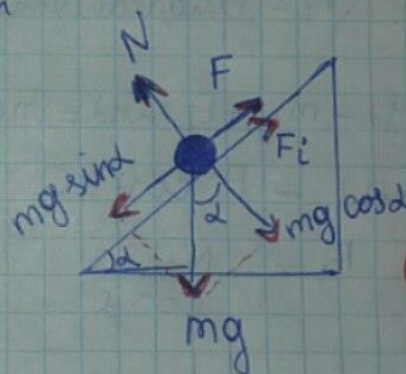
$v_{\text{ort}} = \frac{-2,6 \text{ m}}{0,2 \text{ s}} = -13 \frac{\text{m}}{\text{s}}$

(A)

$t_{\text{um}} = 0,9 \text{ s} - 0,7 \text{ s} = 0,2 \text{ s}$



④



Jismni qiziq tekislikda ushlab turishda

$F + F_i = mg \sin \alpha$

$F_i = \mu N = \mu mg \cos \alpha$

$F = mg \sin \alpha - \mu mg \cos \alpha$

$F = mg (\sin \alpha - \mu \cos \alpha)$

$F = 8 \text{ kg} \cdot 10 \text{ m/s}^2 \cdot (0,6 - 0,5 \cdot 0,8)$
 $= 16 \text{ N} > 15 \text{ N}$
 yetarli emas

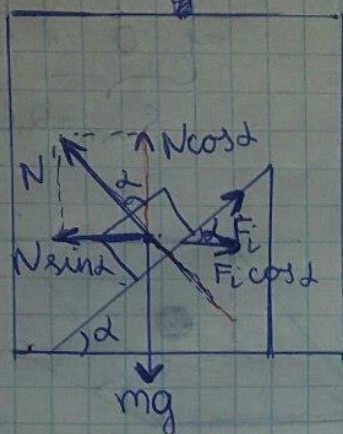
Ushlab turishda

5

Numunalar

Numunalar

3



F_i - ishqalanish kuchi

$$N \cos \alpha - mg + F_i \sin \alpha = ma$$

$$N \sin \alpha - F_i \cos \alpha = 0$$

$$F_i = \frac{N \sin \alpha}{\cos \alpha}$$

$$N \cos \alpha - mg + \frac{N \sin^2 \alpha}{\cos \alpha} = ma$$

$$\frac{N \cos^2 \alpha + N \sin^2 \alpha}{\cos \alpha} = mg + ma$$

$$\frac{N (\sin^2 \alpha + \cos^2 \alpha)}{\cos \alpha} = mg + ma$$

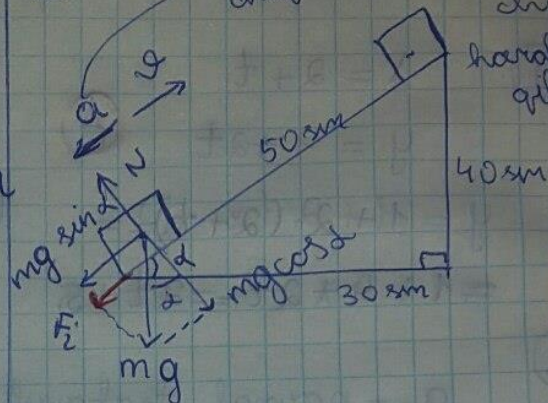
$$N = m (g + a) \cdot \cos \alpha$$

6

jism yuqoriga chiqishda sekinlashmoqda

harakat qiladi

$\uparrow a$



$$mg \sin \alpha + F_f = ma$$

$$F_f = \mu mg \cos \alpha$$

$$mg \sin \alpha + \mu mg \cos \alpha = ma$$

$$g (\sin \alpha + \mu \cos \alpha) = a$$

$$a = 10 \frac{\text{N}}{\text{kg}} \cdot \left(\frac{40}{50} + 0,3 \cdot \frac{30}{50} \right) =$$

$$= 10 \frac{\text{N}}{\text{kg}} \cdot \frac{4,9}{5} = 9,8 \frac{\text{m}}{\text{s}^2}$$

$$S = \frac{v_0^2 - v^2}{2a}$$

$$v = 0$$

$$S = \frac{v_0^2}{2a}$$

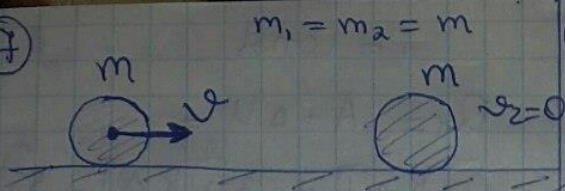
$$v_0 = \sqrt{2aS}$$

$$v_0 = \sqrt{2 \cdot 9,8 \text{ m/s}^2 \cdot 0,5 \text{ m}} =$$

$$= 3,13 \frac{\text{m}}{\text{s}} = 3,13 \frac{\text{m}}{\text{s}}$$

A

7



$$P = mv_1$$

$$\frac{P}{2} = mv'_1$$

$$\frac{mv_1}{2} = mv'_1$$

$$v'_1 = \frac{v_1}{2}$$

$$\frac{mv_1^2}{2} + \frac{mv_2^2}{2} = \frac{mv_1'^2}{2} + \frac{mv_2'^2}{2}$$

$$\frac{mv_1^2}{2} = \frac{mv_1'^2}{2} + \frac{mv_2'^2}{2}$$

$$v_1^2 = v_1'^2 + v_2'^2$$

$$v_1^2 = \left(\frac{v_1}{2}\right)^2 + v_2'^2$$

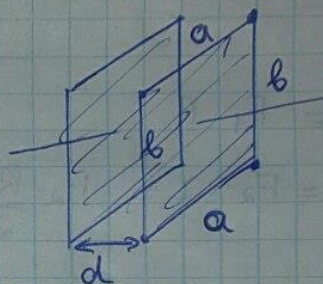
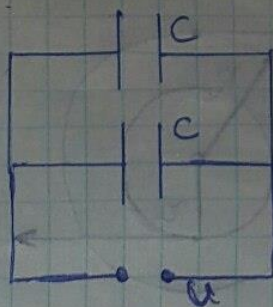
$$v_1^2 - \frac{v_1^2}{4} = v_2'^2$$

$$\frac{3v_1^2}{4} = v_2'^2$$

$$\frac{\sqrt{3}v_1}{2} = v_2'$$

$$p_2' = mv_2' = \frac{m \cdot \sqrt{3}v_1}{2} = \frac{\sqrt{3}P}{2}$$

8



$$C_1 = \frac{\epsilon \epsilon_0 S}{d} = \frac{\epsilon \epsilon_0 a \cdot b}{d}$$

$$C_2 = \frac{\epsilon \epsilon_0 \cdot 1,1a \cdot 1,1b}{1,1d} = 1,1C_1$$

$$W_1 = \frac{C_1 U^2}{2}$$

$$W_2 = \frac{C_2 U^2}{2}$$

$$W_2 = \frac{1,1C_1 U^2}{2} = 1,1 W_1$$

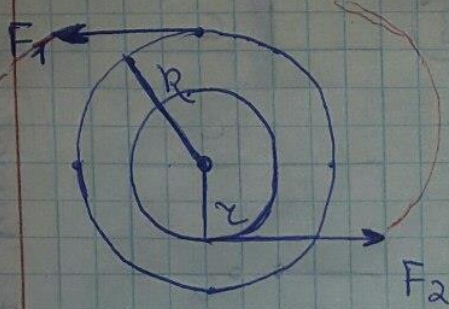
1,1 mara

A

Numaralar Summayun

9

Minimum Moment



$$M_1 = F_1 \cdot R$$

$$M_2 = F_2 \cdot r = F_2 \cdot \frac{R}{2}$$

$$M_{\text{+}} = M_1 + M_2$$

$$M_1 = F_1 \cdot R + F_2 \cdot \frac{R}{2}$$

$$M_1 = \left(F_1 + \frac{F_2}{2} \right) \cdot R$$

$$M_1 = \left(13 \text{ N} + \frac{10 \text{ N}}{2} \right) \cdot 0,2 \text{ m} = 18 \text{ N} \cdot 0,2 \text{ m} = 3,6 \text{ N} \cdot \text{m}$$

A

10

He $\rightarrow$ bir atomli

i = 3

P = const

$$Q_1 = A + \Delta U = \cancel{2} R \Delta T + \frac{3}{2} \cancel{2} R \Delta T = \frac{5}{2} \cancel{2} R \Delta T$$

V = const

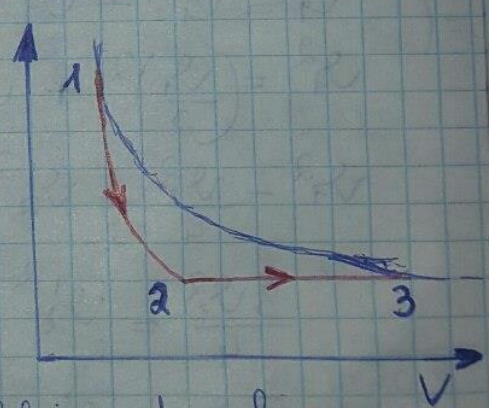
$$A = 0$$

$$Q_2 = \Delta U = \frac{i}{2} \cancel{2} R \Delta T = \frac{3}{2} \cancel{2} R \Delta T$$

$$\frac{Q_1}{Q_2} = \frac{\frac{5}{2} \cancel{2} R \Delta T}{\frac{3}{2} \cancel{2} R \Delta T} = \frac{5}{3} = 1,67$$

A

11



İkiki atomli gaz

i = 5

Q = 0 adiabatik

$$Q = A + \Delta U = 0$$

$$A_1 - \Delta U = -\frac{1}{2} \nu R \Delta T =$$

$$= -\frac{5}{2} \nu R (T_2 - T_1) =$$

$$= \frac{5}{2} \nu R (T_1 - T_2)$$

$$= \frac{5}{2} A'$$

$P = \text{const}$

$$Q = A + \Delta U$$

$$A_2 = \nu R \cdot (T_1 - T_2) = A'$$

$$A_1 + A_2 = A_2$$

$$\frac{5}{2} A' + A' = A_2$$

$$\frac{7}{2} A' = A_2$$

$$A' = \frac{2 A_2}{7} = \frac{2 \cdot 21 \text{ kJ}}{7} = 6 \text{ kJ}$$

$$A_2 = A' = 6 \text{ kJ}$$

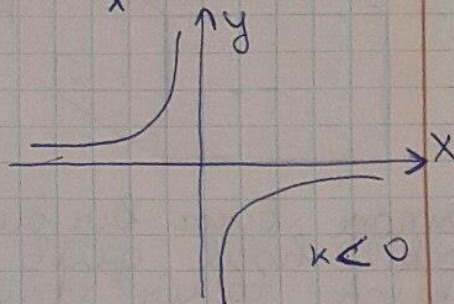
$$A_1 = \frac{5}{2} A' = \frac{5}{2} \cdot 6 \text{ kJ} = 15 \text{ kJ}$$

©

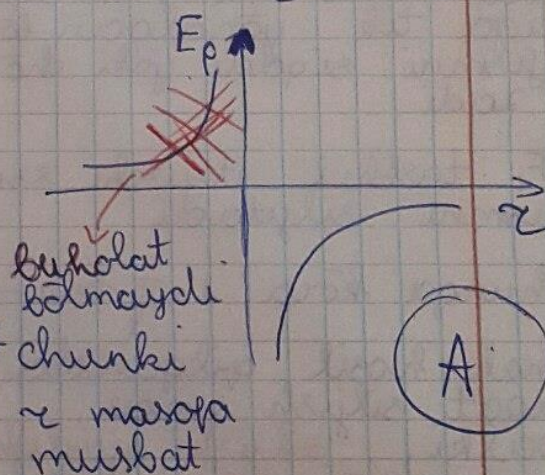
(12)

$$E_p = -\frac{GMm}{r}$$

$$y = \frac{k}{x} \quad k < 0$$



$$E_p = -\frac{GMm}{r} = \frac{k}{r}$$

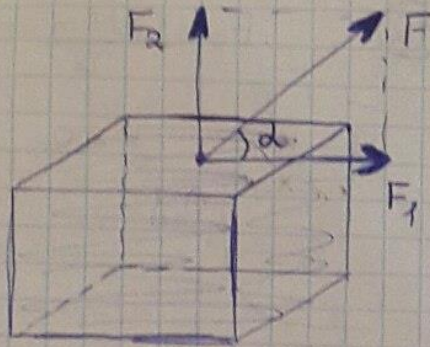


r masofa qancha
ottra, E_p poten-
sial energiya

$E_p = -\frac{GMm}{r}$ shunchalik
nolga intiladi

13)

1)



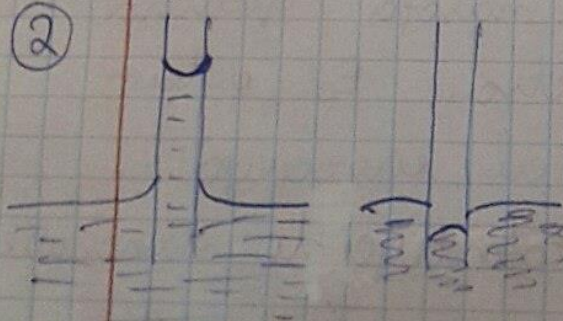
Jismga biror bir bur-
chak hosil qilib
 F kuch ta'sir etayot-
gan bo'lin

Tashkil etuvchilari-
dan biri F_2 jism sir-
tiga tik yonalgan bo'lib, shunga ko'ra oltin
jismni siqadi yoki cho-
zadi

F_1 tashkil etuvchi esa
jismni siljitadi

Shunga ko'ra $d = \frac{\pi}{4}$ bur-
chak hosil qilganda
faqat siljish emas,
 balki, siljish, siqilish
(yoki chozilish) hosil
boladi.

2)



Suyuqlikka tushiril-
gan ingichka naylar-
da suyuqlik sathi-
ning katarilishi yoki
tushish hodisalariga
kapilyar hodisalar
deyiladi.

3)

Polikristall jism isot-
rop yonalishga ega.

Isotrop bo'lsa, chiziqli
kengayish koeffitsiyenti
 $d_1 = d_2 = d_3 = d$ teng
boladi $V = 3d$ boladi

Shunga ko'ra oltin
shakli o'zgarimaydi,
haymi o'zgaradi

4)

$$d_1 = d_2 = d_3 = d$$

$$V = 3d \text{ boladi}$$

Javob:

3

4

C

14)



$$m_{pr} = 1840 m_p$$

$$v_{pr} = v_{po} = v$$

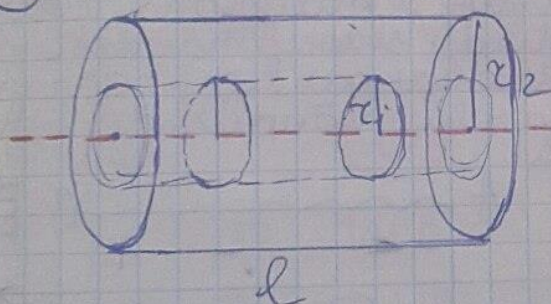
Proton va pozitron maydon orqali ta'sirlashadi, g'ayo' absolute elastik toqnuvlar kabi. Bunda energiya va impuls saqlanadi.

Pozitronning massasi ancha kichik bo'lganligi uchun protonning tezligini o'zgartirish olmaydi.

$$v' = v = 340 \text{ km/s}$$

(2)

(15)



$$\varphi_1 - \varphi = U = \frac{\tau}{2\pi\epsilon_0\epsilon} \ln \frac{r_2}{r_1}$$

$$\tau = \frac{q}{l} \quad l = \frac{q}{\tau}$$

$$C = \frac{q}{U} = \frac{q}{\frac{\tau}{2\pi\epsilon_0\epsilon} \ln \frac{r_2}{r_1}} =$$

$$= \frac{2\pi\epsilon_0\epsilon l}{\ln \frac{r_2}{r_1}}$$

$$K = \frac{1}{4\pi\epsilon_0}$$

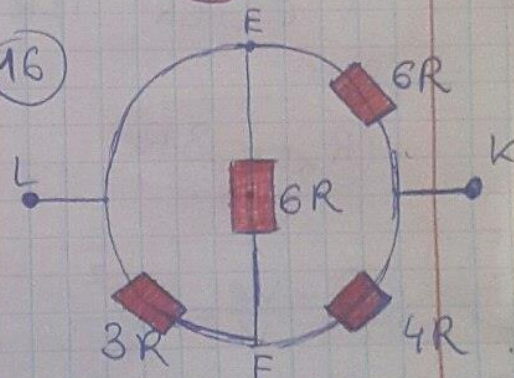
$$C = \frac{\epsilon l}{2K \ln \frac{r_2}{r_1}}$$

Shuning uchun

Silindrik kondensatorlarda energiya ichki va tashqi silindrlar orasida hosil bo'ladi.

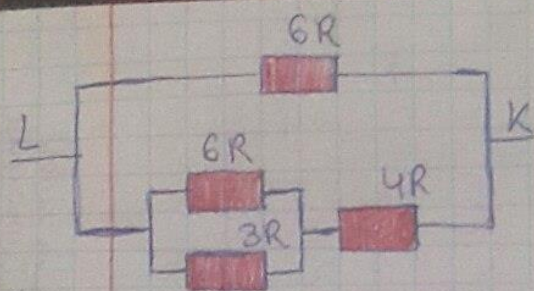
(A)

(16)



$R_{KL} = ?$

$6R$ ulangan E nuqtani soat miliga qaragana-qarshi yo'nalishda aylantirib, $3R$ ga parallel ulab qo'yamiz.



$$R_1 = \frac{6R \cdot 3R}{3R + 6R} = 2R$$

$$R_2 = 2R + 4R = 6R$$

$$R_{KL} = \frac{6R \cdot 6R}{6R + 6R} = \frac{36R}{12R} = 3R$$

$$R_{KL} = 3R$$

17

$$\bar{w} = \frac{W}{V} = \frac{q^2}{2C \cdot V}$$

$$\bar{w}_1 = \frac{q_1^2}{2 \cdot \epsilon \epsilon_0 S \cdot \frac{S}{d}} = \frac{q_1^2}{2 \epsilon \epsilon_0 S^2}$$

$$\bar{w}_2 = \frac{q_2^2}{2 \epsilon \epsilon_0 S^2}$$

$$\frac{\bar{w}_1}{\bar{w}_2} = \frac{q_1^2}{q_2^2}$$

$$q_1 = 5 \text{ nC}$$

$$q_2 = 15 \text{ nC}$$

$$\frac{\bar{w}_1}{\bar{w}_2} = \left(\frac{5}{15}\right)^2 = \frac{1}{9}$$

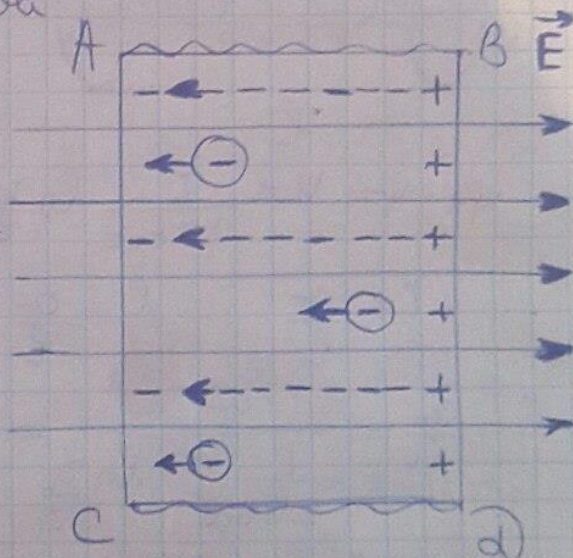
$$\bar{w}_2 = 9 \bar{w}_1$$

$$\bar{w}_2 = 9 \cdot 0,2 \text{ m} \cdot \frac{\text{J}}{\text{m}^3} = 1,8 \text{ m} \cdot \frac{\text{J}}{\text{m}^3}$$

$$\Delta \bar{w} = \bar{w}_2 - \bar{w}_1 = 1,6 \frac{\text{mJ}}{\text{m}^3}$$

A

18) Agar elektr maydon ga metall o'tkazgichni joylashtirsa, o'tkazgichdagi erkin elektronlar tashqi maydon ta'siri ostida shu maydon kuchlanganligi qarshi qarshi yo'nalishda kuchlanadi va



natijada o'tkazgichning AC sirtida

ortiqcha mahiyat
zaryad, BD sirtida
ortiqcha muqbat
zaryad paydo bola-
di. Otkazgichning
ichida qoshimcha
maydon hosil boladi.
Bu maydon asosiy
maydon kuch chiqar-
lariga qarshi qar-
shi yonalgan zaryad-
larning harakat-
lanishi otkazgich
ichida zaryadlar
hosil qilgan ichki
maydon tashqi may-
donga qadar ya'ni
umumiy kuchlangan-
lik nolga teng bo-
lish davom etadi.

Demak,

γ : nolga teng

$$(19) R = R_0(1 + \alpha T)$$

$$R(0) = 0$$

$$R \sim T$$

$$\frac{R_1}{R_2} = \frac{T_1}{T_2}$$

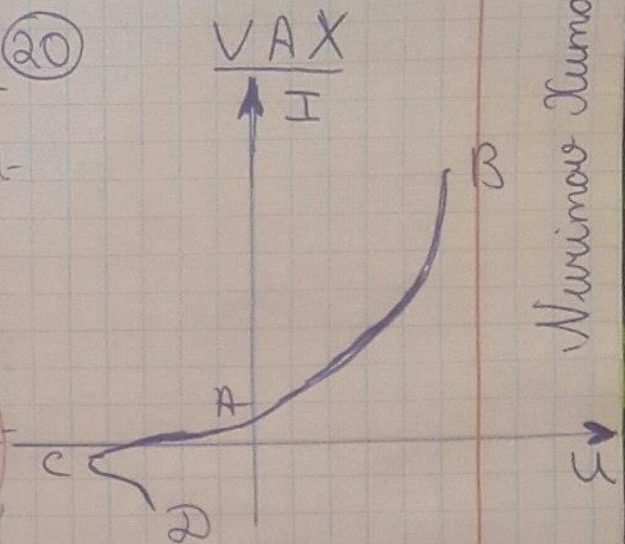
$$R_1 = \frac{U^2}{P} = \frac{(220V)^2}{100W} = 484\Omega$$

$$R_2 = R_1 \cdot \frac{T_2}{T_1} = \frac{484\Omega \cdot 2700}{3000} = 435,6$$

$$I_2 = \frac{U}{R_2} = \frac{220V}{435,6\Omega} = 0,505 A$$

(B)

(20)



VAX - volt - amper - xa-
rakteristikasi

Tokning to'g'ri ulash
qismida katta tok
otadi

Teskari yonalishda
deyarli tok o'tmaydi

Javob: AB

(A)

(21)

$$I \ll 1$$

$$I \rightarrow 0$$

$$R = \frac{U}{I}$$

$$R \rightarrow \infty$$

(B)

Chunki, Diodda - 18 V
teskari ulashga to'g'ri
keladi. Bunda tek
keskin kamayib, nolga
intiladi

(22)

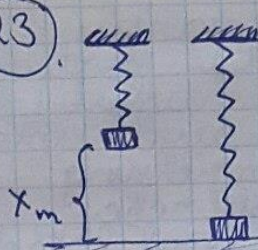


Konsentrik aylanalar
markazga yaqinlash-
gan sari zichroq joy-
lashgan bu esa magnet
induksiyasi tek yaqinida
kattaroq, undan uzoqda
kichikroq bo'lishini
bildiradi.

F: kuch chiziqlari
zich joyida

(A)

(23)



$$\frac{kx_m^2}{2} = mgx_m$$

$$x_m = \frac{2mg}{k}$$

$$A = \frac{x_m}{2}$$

$$A = \frac{2mg}{k} = \frac{mg}{k} \quad (C)$$

$$x = A \sin \omega t \Rightarrow a = \frac{mg}{k} \frac{k \sin \omega t}{m}$$

$$a = -A \omega^2 \sin \omega t \quad a = g \sin \omega t$$

$$\sin \omega t = \frac{a}{g} \quad x = \frac{A \cdot a}{g} = 0.56A$$

(24)

$$I = I_0 \cos^2 \alpha$$

$$I_1 = I_0 \cos^2 45^\circ = \frac{I_0}{2}$$

$$I_2 = I_0 \cos^2 60^\circ = \frac{I_0}{4}$$

$$\frac{I_2}{I_1} = \frac{\frac{I_0}{4}}{\frac{I_0}{2}} = \frac{1}{2} \quad (C)$$

2 marta kamayadi

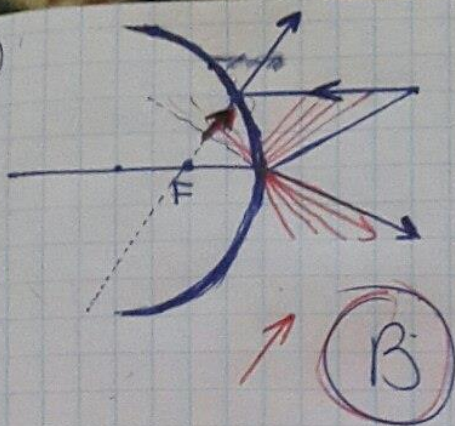
(25)

$$B = \frac{I}{\Delta S} \quad (C)$$

Ravshanlik birligi
qilib nit (nt) qabul
qilingan

$$1 \text{ nt} = \frac{1 \text{ cd}}{1 \text{ m}^2} = 1 \frac{\text{cd}}{\text{m}^2}$$

(26)



$$1 - \frac{v^2}{c^2} = \frac{1}{1,12}$$

$$v = 0,42c$$

$$P = mv = 1,1m_0 0,42c = 0,46m_0c \quad \text{C}$$

(29)

Spini $S = \frac{3}{2}$ bolgan xarxalar: D

Ω - giperon, Δ - rezonans

(27)

$$I = \sigma \cdot \pi^4$$

Absolyut qora jism uchun

Stepan - Boltzman doimiyi

$$\sigma = 5,67 \cdot 10^{-8} \frac{\text{W}}{\text{m}^2 \cdot \text{K}^4}$$

A

(28)

$$E_t = E_k + E_0$$

$$mc^2 = m_0c^2 + 0,1m_0c^2$$

$$mc^2 = 1,1m_0c^2$$

$$m = 1,1m_0$$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = 1,1m_0$$

(30)

$$A = N + Z$$

6 ta proton

6 ta neytron

6 ta elektron

Agar atom ikki katta musbat xar-yadrolansa, uning atomidagi ikki elektron chiqib ketadi.

J: 4 ta elektron qoladi

A

Variant -2

$$\textcircled{1} \quad x(t) = a \cdot t + b$$

$$y(t) = c \cdot t + d$$

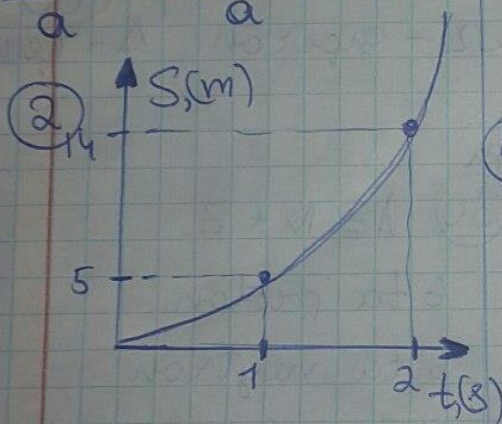
$$x = at + b \quad t = \frac{x-b}{a}$$

$$\textcircled{2} \quad y = c \cdot t + d$$

$$y = \frac{c \cdot (x-b)}{a} + d =$$

$$= \frac{c \cdot x}{a} - \frac{b \cdot c}{a} + d$$

Nurimov Durnoyun



$$S_1 = v_0 t_1 + \frac{a t_1^2}{2}$$

$$5 = v_0 \cdot 1 + \frac{a}{2} \quad | \cdot 2$$

$$S_2 = v_0 t_2 + \frac{a t_2^2}{2}$$

$$14 = v_0 \cdot 2 + \frac{a}{2} \cdot 2^2$$

$$10 = 2v_0 + a$$

$$14 = 2v_0 + 2a$$

$$4 = a$$

$$a = 4 \text{ m/s}^2$$

$\textcircled{C}$

$$\textcircled{3} \quad h = \frac{g t^2}{2} \quad g = 1,6 \frac{\text{m}}{\text{s}^2}$$

$$h = \frac{1,6 \text{ m/s}^2 \cdot (4 \text{ s})^2}{2} = 12,8 \text{ m}$$

$\textcircled{D}$

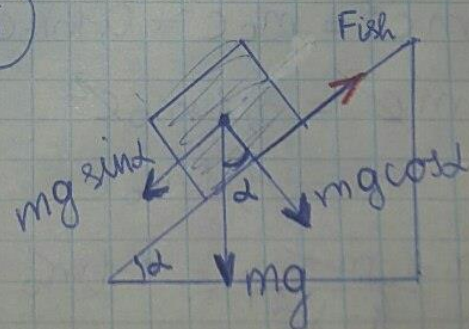
$$\textcircled{4} \quad \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_r = m \vec{a}$$

$$F_r = m a = 5 \text{ kg} \cdot 12 \text{ m/s}^2 =$$

$$= 60 \text{ N}$$

$\textcircled{B}$

$\textcircled{5}$



$$\text{tg } \alpha = \mu \quad \text{bolganda}$$

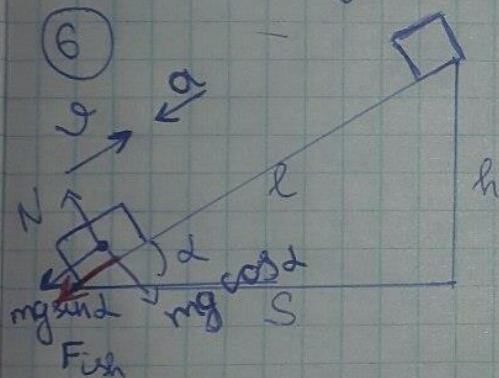
jism tinch turadi
yoki ~~o'zgarimas~~ va
tezlik bilan harakat-
lanadi.

Asosning to'liq ta'sir
etuvchi kuchu bu -
og'irlik kuchi

$$F_{\text{ish}} = mg \sin \alpha$$

$$\frac{F_{\text{ish}}}{mg} = \sin \alpha$$

$$\sin 30^\circ = \frac{F_{\text{ish}}}{mg} = \frac{1}{2}$$



jism yuqoriga hara-
katlanishda sekinla-
nyuechan harakat
botaladi.

$$F_{\text{ish}} = \mu N = \mu mg \cos \alpha$$

$$mg \sin \alpha + F_f = ma$$

$$mg \sin \alpha + \mu mg \cos \alpha = ma$$

$$g(\sin \alpha + \mu \cos \alpha) = a$$

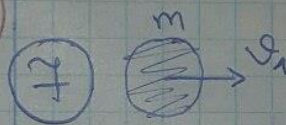
$$\sin \alpha = \frac{h}{l} = \frac{0,6 \text{ m}}{1 \text{ m}} = 0,6$$

$$\cos \alpha = \frac{\sqrt{l^2 - h^2}}{l} = 0,8$$

$$a = \frac{10 \text{ m}}{\text{s}^2} \cdot (0,6 + 0,5 \cdot 0,8) =$$

$$= 10 \text{ m/s}^2$$

$$v = \sqrt{2al} = \sqrt{2 \cdot 10 \cdot 1} = \sqrt{20} \text{ m/s}$$



$$\frac{mv_1^2}{2} + \frac{m \cdot 0^2}{2} = \frac{mv_1'^2}{2} + \frac{mv_2'^2}{2}$$

$$\frac{mv_1^2}{2} = \frac{m}{2} \cdot (v_1'^2 + v_2'^2)$$

$$v_1^2 = v_1'^2 + v_2'^2$$

$$p_1 = mv_1' \quad p_2 = mv_2'$$

$$p = mv_1$$

$$\left(\frac{p}{m}\right)^2 = \left(\frac{p_1}{m}\right)^2 + \left(\frac{p_2}{m}\right)^2$$

$$p^2 = p_1^2 + p_2^2$$

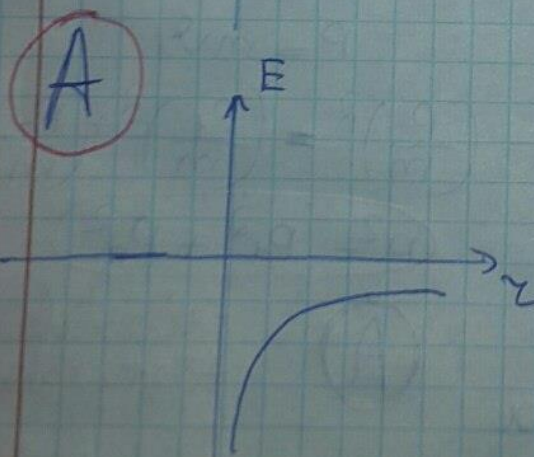
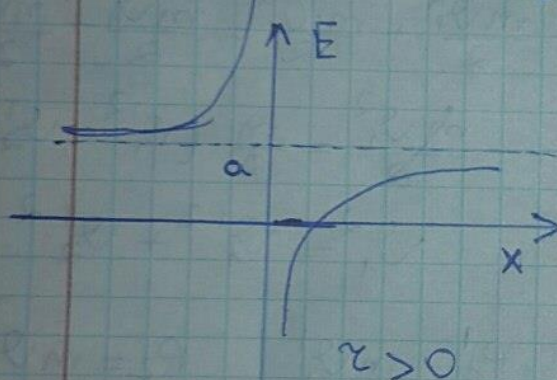


elastik
toqnashuv

⑧ $W_t = E_k + E_p$
 $E_k = \frac{mv^2}{2}$ $E_p = -\frac{GMm}{r}$

$W_t = \frac{mv^2}{2} - \frac{GMm}{r}$
 $\frac{mv^2}{2} = a$ $k = -GMm$

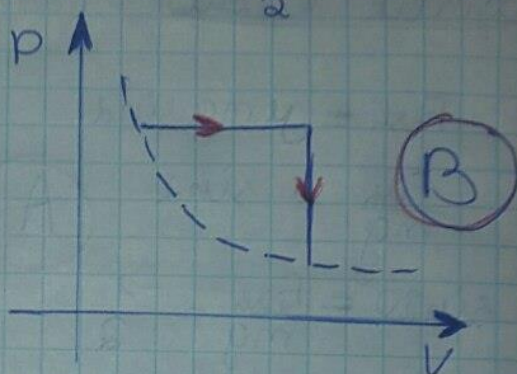
$W_t = E$ $r = x$
 $E = a + \frac{k}{x}$ $k < 0$
 $a > 0$



⑨ $\nu = 2 \text{ mol}$ $M = 200 \frac{\text{g}}{\text{mol}}$
 $Q_1 = A + \Delta U$

$Q_1 = \frac{5}{2} \nu R (T_2 - T_1)$

$Q_2 = \Delta U = \frac{3}{2} \nu R (T_1 - T_2)$



$\frac{Q_1}{Q_2} = \frac{5}{3} = 1,67 \text{ marta}$

⑩ $i = 6$ uch atomli

1) $Q = 0$ $A + \Delta U = 0$

$A = -\Delta U$

$A_1 = -\frac{i}{2} \nu R (T_2 - T_1) = \frac{i}{2} \nu R (T_1 - T_2)$

2) $P = \text{const}$

$Q = A + \Delta U$

$A_2 = \nu R (T_1 - T_2)$

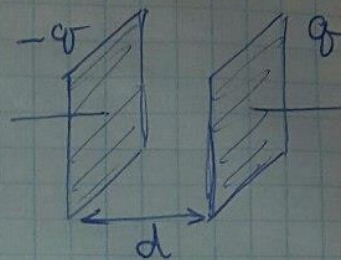
$A_1 + A_2 = A$

$$A_1 = \frac{1}{2} A_2 = 3 A_2$$

$$3 A_2 + A_2 = A$$

$$A_2 = \frac{A}{4} = \frac{20 \text{ kJ}}{4} = 5 \text{ kJ}$$

$$A_1 = 3 A_2 = 15 \text{ kJ} \quad \text{C}$$



$$C = \frac{\epsilon \epsilon_0 S}{d}$$

11) Geliy bir atomli $A = \frac{F}{\epsilon} \cdot d = \frac{\epsilon \epsilon_0 S u^2}{2d}$
 $i = 3$

$$U = \frac{3}{2} p V$$

$$\frac{U}{V} = \frac{3}{2} p$$

$$F = \frac{\epsilon^2 \epsilon_0 S u^2}{2d^2} \quad \text{C}$$

$$w = \frac{U}{V} = \frac{3}{2} p$$

$$p = \frac{2w}{3}$$

$$\text{D}$$

$$\frac{F_2}{F_1} = \frac{(2.1\epsilon)^2 \epsilon_0 S u^2}{2d^2} = 4.41$$

$$p = \frac{2 \cdot 18 \cdot 10^3}{3} = 12 \text{ kPa}$$

4,41 marta ortadi

13) $m_p = 1840 m_e$

12

$$F_1 = \frac{k q_1 q_2}{r^2}$$

$$F_2 = \frac{k \cdot q_1 \cdot q_2}{\epsilon r^2} = \frac{F_1}{\epsilon}$$

Proton va pozitron maydon orqali ta'sirlashadi, g'ayo absolyut elastik toqnashuv kabi. Bunda energiya va impuls saqlanadi.

$$A = \frac{F}{\epsilon} \cdot d = \frac{C u^2}{2}$$

$m_p \rightarrow v_1$
 $\rightarrow v_1' = -v_1$

m_p

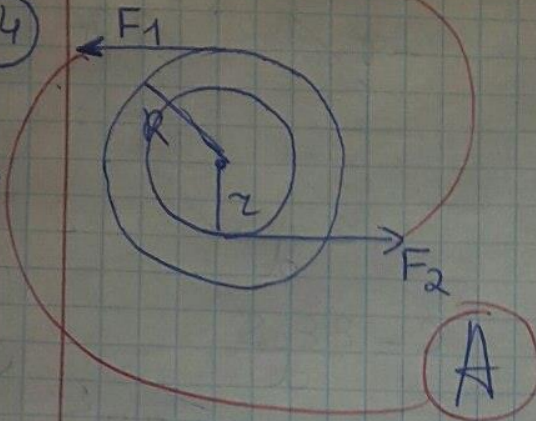
A

$$v_n = v_1 - v_1' = v_1 - (-v_1) = 2v_1$$

$$v_n = 2 \cdot 1.5v = 3v$$

Nurmo Dumayun

14



$$M_1 = F_1 \cdot R$$

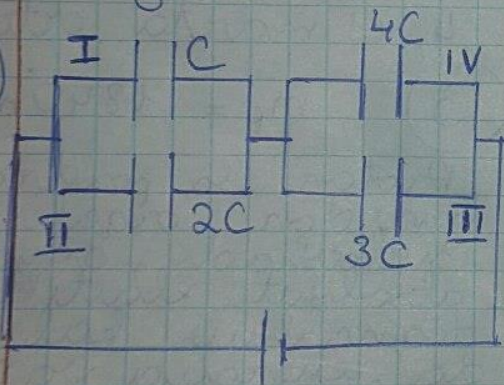
$$M_2 = F_2 \cdot r = \frac{F_2 \cdot R}{3}$$

$$M_{\pm} = M_1 + M_2$$

$$M_{\pm} = \left(F_1 + \frac{F_2}{3}\right) \cdot R = \frac{(3F_1 + F_2)}{3} \cdot R$$

$$M_{\pm} = \frac{80 \text{ N} \cdot 0,45 \text{ m}}{3} = 12 \text{ N} \cdot \text{m}$$

15



I dan II parallel
ulangan

$$U_1 = U_2$$

$$\frac{U_1}{U_2} = 1$$

A

16

$$\bar{w} = \frac{W}{V} = \frac{q^2}{2C \cdot V} = \frac{q^2}{2 \epsilon \epsilon_0 S \cdot d} = \frac{q^2}{2 \epsilon \epsilon_0 S}$$

$$w_1 = 0,2 \text{ mJ/m}^3$$

$$q_1 = 4 \text{ nC}$$

$$q_2 = 12 \text{ nC}$$

$$\frac{w_1}{w_2} = \frac{\frac{q_1^2}{2 \epsilon \epsilon_0 S}}{\frac{q_2^2}{2 \epsilon \epsilon_0 S}} = \frac{q_1^2}{q_2^2}$$

$$\frac{w_1}{w_2} = \left(\frac{4 \text{ nC}}{12 \text{ nC}}\right)^2 = \frac{1}{9}$$

$$w_2 = 9 w_1$$

$$w_2 = 1,8 \text{ mJ/m}^3$$

A

$$\Delta w = w_2 - w_1 = 1,8 - 0,2 = 1,6$$

$$\Delta w = 1,6 \text{ mJ/m}^3$$

17

Faraday

C

18) suyuqlik qatlam-lari ishqalanganda hosil bo'lgan xavf yerga o'tib ketishi uchun

A

19)

$$T_1 = T$$

$$T_2 = T + \Delta t$$

$$R_1 = R$$

$$\Delta R = ?$$

$$R(0) = 0$$

$$R \sim T$$

$$\frac{R_1}{R_2} = \frac{T_1}{T_2}$$

$$\frac{R}{R + \Delta R} = \frac{T}{T + \Delta t}$$

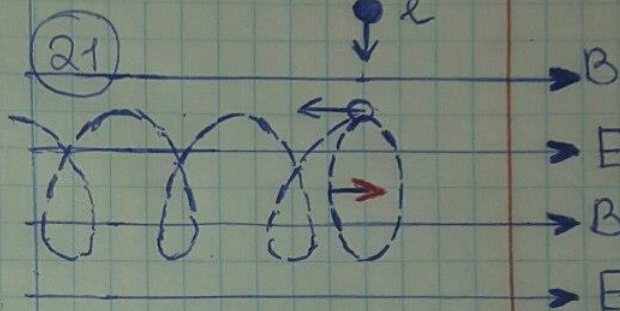
$$R \cancel{T} + R \Delta t = \cancel{R T} + \Delta R \cdot T$$

$$\Delta R = \frac{R \Delta t}{T}$$

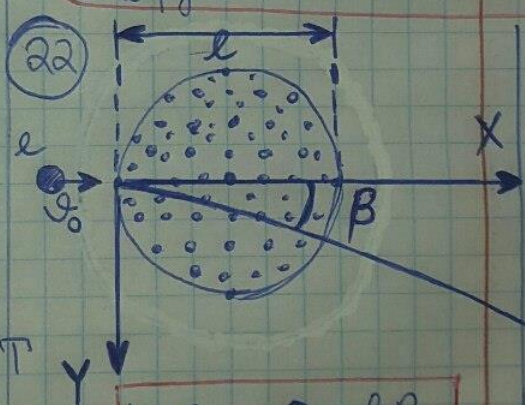
B

20) Elektr yoyi yongan daqiqada tok kuchi keskin ortadi kuchlanish esa kamayadi

A



chappa teslanuvchan

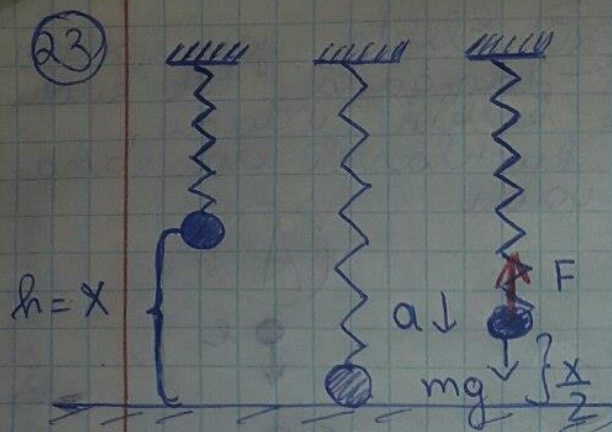


$$\tan \beta = \frac{q}{m} \cdot \frac{l B}{v_0}$$

$$l = \frac{m v_0 \tan \beta}{q B}$$

$$l = \frac{1 \cdot 10^{-16} \text{ kg} \cdot 10 \text{ m/s} \cdot \tan 3^\circ}{1.6 \cdot 10^{-19} \text{ C} \cdot 50 \cdot 10^{-3} \text{ T}} = 523$$

A



$$\frac{kx^2}{2} = mg h = mgx$$

$$\frac{kx^2}{2} = mgx$$

$$\frac{kx}{2} = mg$$

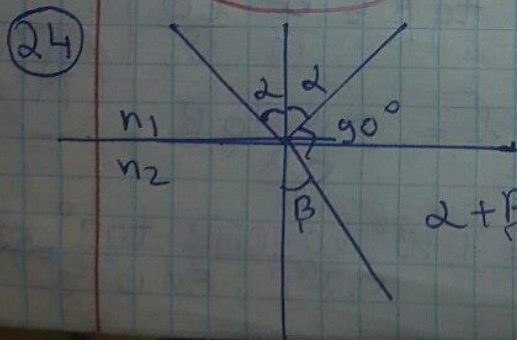
$$F = mg - ma$$

$$F = \frac{kx}{2} = mg$$

$$mg = mg - ma$$

$$ma = 0$$

$$a = 0$$



$$\alpha + \beta = 90^\circ \text{ absolyut qor jism uchun}$$

$$\frac{\sin \alpha}{\sin \beta} = \frac{n_2}{n_1} = n_{2,1}$$

$$\frac{\sin \alpha}{\sin(90^\circ - \alpha)} = n_{2,1}$$

$$n_{2,1} = \tan \alpha$$

A

25 $I = \frac{\Delta \varphi}{\Delta z}$ [kd]

Younglik kuchi kandala (kd) qabul qilingan.

D

26 $n = \frac{\lambda_0}{\lambda} \quad \lambda = \frac{\lambda_0}{n}$

$$\lambda = \frac{480 \text{ nm}}{1,6} = 300 \text{ nm}$$

$$N = \frac{d}{\lambda} = \frac{40 \cdot 10^{-6} \text{ m}}{300 \cdot 10^{-9} \text{ m}} = 133$$

$$= 133 \text{ ta}$$

B

27 $I = \sigma \cdot T^4$

temperatura 2 marta kamaysa, intensivligi 16 marta kamayadi

(2)

(28)

$$P = 0,1 m_0 c$$

$$P = 0,1 m_0 c = m v$$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$0,1 m_0 c = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \cdot v$$

$$\sqrt{1 - \frac{v^2}{c^2}} = \frac{10v}{c}$$

$$1 - \frac{v^2}{c^2} = \frac{100v^2}{c^2}$$

$$1 = \frac{101v^2}{c^2} \quad \frac{v^2}{c^2} = \frac{1}{101}$$

$$E_k = mc^2 - m_0 c^2 = \frac{m_0 \cdot c^2}{\sqrt{1 - \frac{v^2}{c^2}}} - m_0 c^2 =$$

$$= m_0 c^2 \cdot \left(\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} - 1 \right)$$

$$E_k = m_0 c^2 \cdot \left(\frac{1}{\sqrt{1 - \frac{1}{101}}} - 1 \right)$$

$$= 0,005 m_0 c^2$$

(2)

(29)

Spin kvant son - elektron ning $\hbar$ o'qi atropida gi aylanishda hissiy impuls momentini bil di ruvchi sonlar. Spin kvant son $\hbar$ birlikda

$$\hbar = \frac{h}{2\pi} \text{ olchanadi (7.1)}$$

(2)

(30)

$$A = N + Z$$

6 ta proton

6 ta neytron

6 ta elektron bor

3 karr muvbat zar yadlansa 3 ta elekt ron chiqib ketadi. Atomsda 3 ta elektron qoladi

(A)

Variant 3

$$\begin{aligned} \textcircled{1} \quad x_1 &= 3 - 2t \\ x_2 &= 21 + 15t \\ v_1 &= -2 \text{ m/s} \quad v_2 = 15 \text{ m/s} \end{aligned}$$

$$\left[\frac{v_2}{v_1} \right] = \left| \frac{15}{-2} \right| = 7.5$$

B

$$\begin{aligned} \textcircled{2} \quad S &= v_0 t + \frac{at^2}{2} \\ S_1 &= v_0 t_1 + \frac{at_1^2}{2} \\ S_2 &= v_0 t_2 + \frac{at_2^2}{2} \end{aligned}$$

$$\begin{cases} 5 = v_0 + \frac{a}{2} \\ 14 = v_0 \cdot 2 + 2a \\ 14 = 2v_0 + 2a \\ 20 = 4v_0 + 2a \\ 6 = 2v_0 \end{cases}$$

$$v_0 = \frac{3\text{m}}{3}$$

$$5 - 3 = \frac{a}{2}$$

$$a = 4 \text{ m/s}^2$$

$$S = v_0 \cdot t + \frac{at^2}{2}$$

$$S = 3 \cdot 3 + \frac{4 \cdot 3^2}{2} = 9 + 18 = 27 \text{ m}$$

B

$$\textcircled{3} \quad \omega_1 = \omega_2$$

$$\frac{v_1}{R_1} = \frac{v_2}{R_2}$$

$$\frac{v_1}{R_1} = \frac{2.5 v_1}{R_2}$$

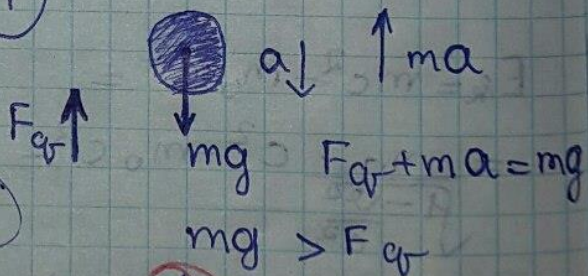
$$R_2 = 2.5 R_1$$

$$a_1 = \frac{v_1^2}{R_1}$$

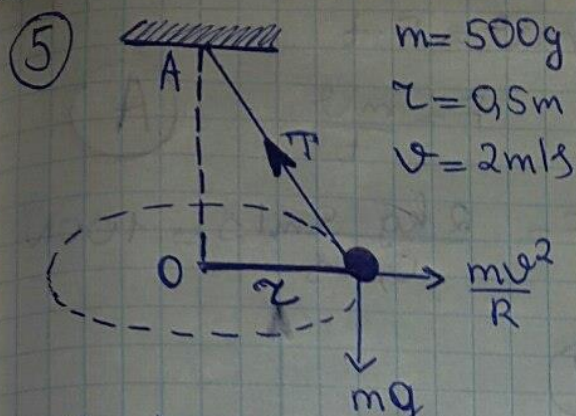
$$a_2 = \frac{v_2^2}{R_2} = \frac{(2.5 v_1)^2}{2.5 R_1} = 2.5 a_1$$

A

$$\textcircled{4}$$



A



Newtonning ikkinchi qonuni vektor ko'rinishi

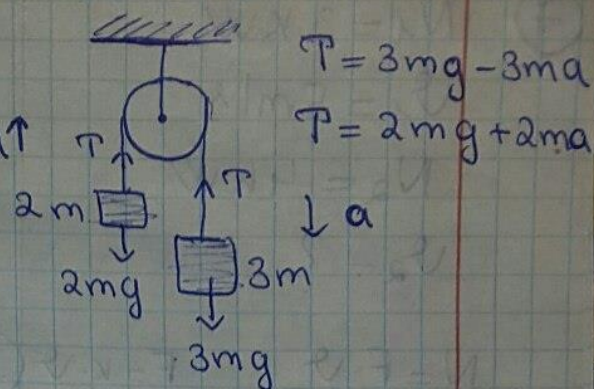
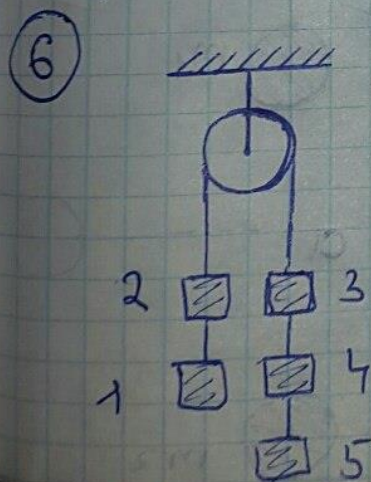
$$\sum_{i=1}^n \vec{F}_i = m \vec{a}$$

$$\sum_{i=1}^n \vec{F}_i = \vec{F}_1 + \vec{F}_2 + \dots + \vec{F}_n$$

$$\vec{T} + m \vec{g} = m \vec{a}$$

2 ta kuch

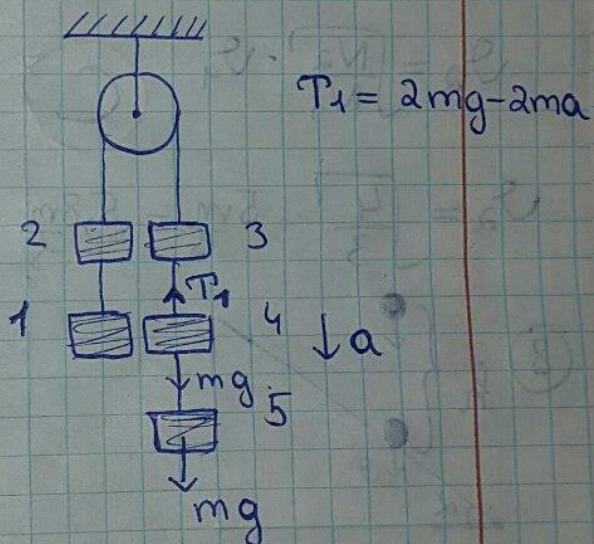
②



$$3mg - 3ma = 2mg + 2ma$$

$$mg = 5ma$$

$$a = \frac{g}{5}$$



$$T_1 = 2mg - 2m \cdot \frac{g}{5} = \frac{8mg}{5}$$

③

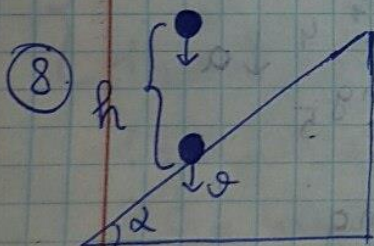
⑦ $N_1 = 3 \text{ kW}$
 $v_1 = 5 \text{ m/s}$
 $N_2 = 4 \text{ kW}$
 $v_2 = ?$

$N = F \cdot v$ $F = k \cdot v$ ⑨
 $N = k \cdot v \cdot v = k v^2$

$\begin{cases} N_1 = k v_1^2 \\ N_2 = k v_2^2 \end{cases}$ $\frac{N_2}{N_1} = \frac{v_2^2}{v_1^2}$

$v_2 = \sqrt{\frac{N_2}{N_1}} \cdot v_1$ ③

$v_2 = \sqrt{\frac{4}{3}} \cdot 5 \frac{\text{m}}{\text{s}} = 5,8 \frac{\text{m}}{\text{s}}$



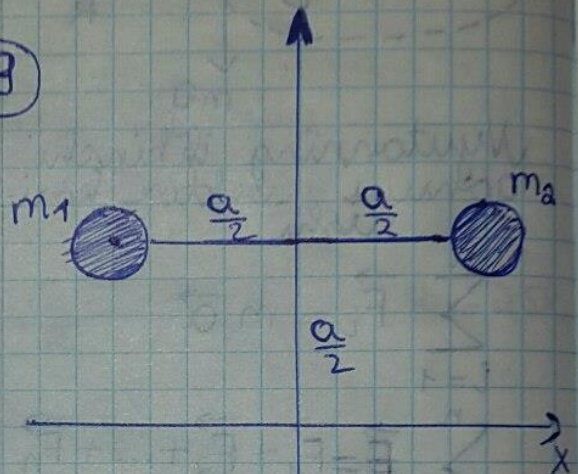
$h = \frac{v^2}{2g}$ $v = \sqrt{2gh}$

$v = \sqrt{2 \cdot 10 \text{ m/s}^2 \cdot 1,25 \text{ m}}$
 $= 5 \text{ m/s}$

$mv = F \cdot t$

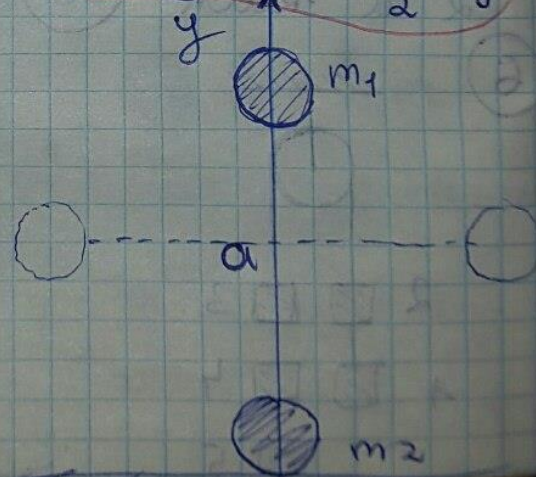
$F = \frac{mv}{t}$ ①

$F = \frac{2 \text{ kg} \cdot 5 \text{ m/s}}{0,1 \text{ s}} = 100 \text{ N}$



Shoxiqi holatda energiya

$W_F = (m_1 + m_2) \cdot \frac{a}{2} \cdot g$



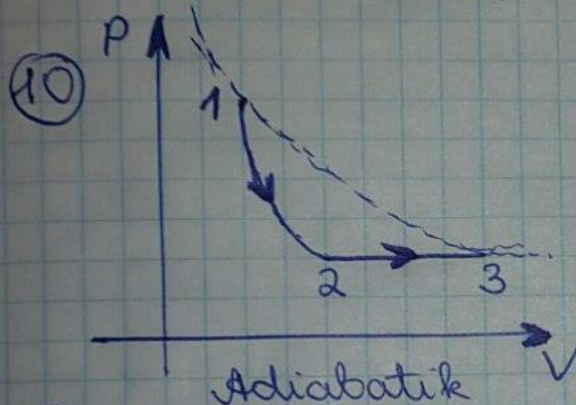
$$W_2 = m_1 a \cdot g$$

$$W_1 = W_2$$

$$(m_1 + m_2) \cdot \frac{a}{2} \cdot g = m_1 a \cdot g$$

$$m_1 + m_2 = 2m_1$$

$$m_2 = m_1$$



①

$$Q = 0$$

$$A + \Delta U = 0$$

$$A = -\Delta U = -\frac{3}{2} \gamma R \Delta T =$$

$$= -\frac{3}{2} \gamma R (T_2 - T_1)$$

$$A_1 = \frac{3}{2} \gamma R (T_1 - T_2)$$

②

Isobarik

$$Q = A + \Delta U$$

$$Q = \gamma R \Delta T + \frac{3}{2} \gamma R \Delta T$$

$$Q = \frac{5}{2} \gamma R \Delta T = \frac{5}{2} A_2$$

$$A_2 = \frac{2Q}{5}$$

$$A_2 = \frac{2 \cdot 10 \text{ kJ}}{5} = 4 \text{ kJ}$$

$$A_1 = \frac{3}{2} \gamma R (T_1 - T_2)$$

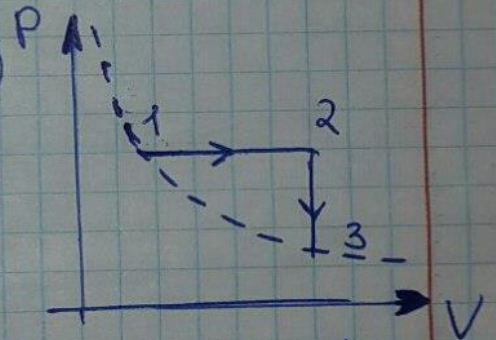
$$A_2 = \gamma R \cdot (T_1 - T_2)$$

$$A_2 = \frac{3}{2} A_1$$

C

$$A_2 = \frac{3}{2} \cdot 4 \text{ kJ} = 6 \text{ kJ}$$

⑪



$T_1 = T_3$ bu izoterma
chiziği

①

Isobarik

$$Q_p = \Delta U + A$$

$$Q_p = \frac{5}{2} \gamma R (T_2 - T_1) + \gamma R (T_2 - T_1)$$

$i = 5$ (O_2) uchun

(12) $\Delta V = 30 \text{ l}$

$(He) \Rightarrow$ bir atomli

$$Q_p = \frac{5}{2} \nu R (T_2 - T_1) + \nu R (T_2 - T_1)$$

$$= \frac{7}{2} \nu R (T_2 - T_1)$$

$$Q_1 = Q_p = \frac{7}{2} \nu R (T_2 - T_1)$$

$$\Delta U = \frac{3}{2} P \Delta V$$

$$P = \frac{2 \Delta U}{3 \Delta V}$$

$$P = \frac{2 \cdot 450 \text{ J}}{3 \cdot 30 \cdot 10^{-3}}$$

$$= 10 \text{ kPa}$$

(C)

(II) Isotexirlik jarayonda

$$Q = \Delta U = -\frac{i}{2} \nu R \Delta T$$

$i = 5$

$$\Delta T = T_3 - T_2$$

(13)

$$Q_2 = Q_v = \frac{5}{2} \nu R (T_2 - T_3)$$

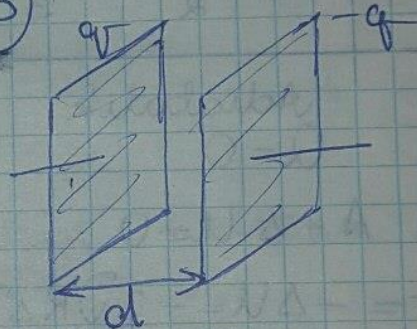
$$T_2 - T_1 = T_2 - T_3$$

$$T_1 = T_3$$

$$\frac{Q_1}{Q_2} = \frac{\frac{7}{2} \nu R (T_2 - T_1)}{\frac{5}{2} \nu R (T_2 - T_3)}$$

$$= \frac{7}{5} = 1,4$$

(B)



$$F_1 = \frac{k q_1 q_2}{r^2}$$

$$F_2 = \frac{k q_1 q_2}{\epsilon r^2} = \frac{F_1}{\epsilon}$$

$$A = \frac{F}{\epsilon} \cdot d = \frac{q^2}{2C}$$

Wurimov Xumayun

$$C = \frac{\epsilon \epsilon_0 S}{d}$$

$$\frac{F}{e} \cdot d = \frac{q^2 \cdot d}{2 \epsilon \epsilon_0 S}$$

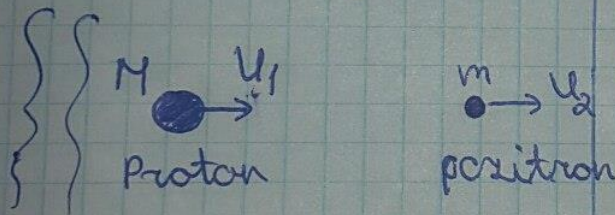
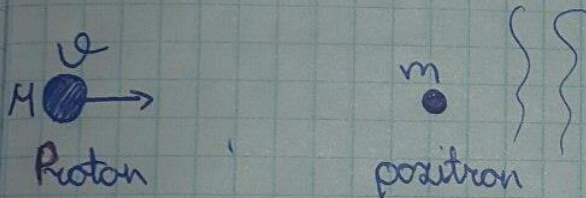
$$F = \frac{q^2}{2 \epsilon_0 S}$$

$$\epsilon = 2,1$$

F kuch ϵ ga bogliq emas

γ : o'zgarmaydi

(14)



$$M = 1840m$$

$$\begin{cases} Mv + m \cdot 0 = Mu_1 + mu_2 \\ \frac{Mv^2}{2} = \frac{Mu_1^2}{2} + \frac{mu_2^2}{2} \end{cases}$$

Wurimov

$$\begin{cases} Mv = Mu_1 + mu_2 \\ Mv^2 = Mu_1^2 + mu_2^2 \end{cases}$$

$$\Rightarrow \begin{cases} M(v - u_1) = mu_2 \\ M(v - u_1)(v + u_1) = mu_2^2 \\ v + u_1 = u_2 \end{cases}$$

$$M(v - u_1) = m(v + u_1)$$

$$(M - m) \cdot v = (M + m) u_1$$

$$u_1 = \frac{M - m}{M + m} \cdot v$$

$$u_1 = \frac{1 - \frac{m}{M}}{1 + \frac{m}{M}} v$$

$$\frac{m}{M} \rightarrow 0$$

$$u_1 = \frac{1 - 0}{1 + 0} \cdot v = v$$

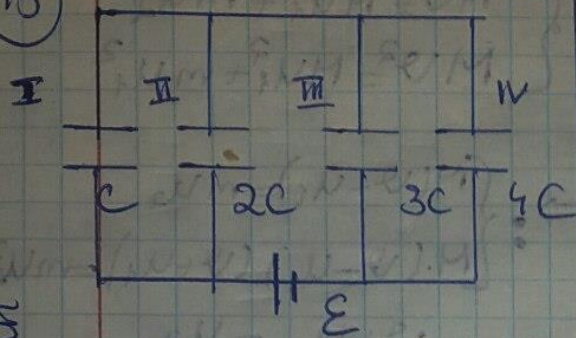
$$\gamma \quad u_1 = v$$

A

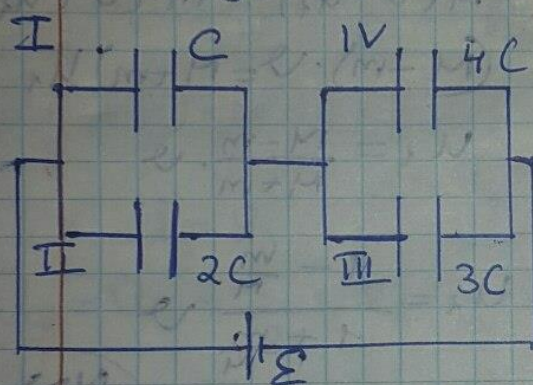
Sumayun

15

Nurimov Xumoyun



$$\frac{U_1}{U_3} = ?$$



$$C_{p1} = C + 2C = 3C$$

$$C_{p2} = 4C + 3C = 7C$$

$$C_k = \frac{C_{p1} \cdot C_{p2}}{C_{p1} + C_{p2}}$$

$$C_k = \frac{3C \cdot 7C}{7C + 3C} = 2,1C$$

$$q = E \cdot 2,1C = 2,1EC$$

$$q = q_I + q_{II}$$

$$q = U_I C + 2 U_I C = 3 U_I C$$

$$3 U_I C = 2,1EC$$

$$U_I = 0,7E$$

$$q = q_{III} + q_{IV}$$

$$q = U_{III} \cdot 3C + U_{III} \cdot 4C =$$

$$= 7 U_{III} \cdot C = 2,1EC$$

$$U_{III} = 0,3E$$

B

$$U_1 = U_I = 0,7E$$

$$U_3 = U_{III} = 0,3E$$

$$\frac{U_1}{U_3} = \frac{0,7E}{0,3E} = \frac{7}{3}$$

16 $\omega = \frac{W}{V} \quad \sigma = \frac{q}{S}$

$$\omega = \frac{q^2}{2C \cdot V} = \frac{(\sigma \cdot S)^2}{2 \cdot \frac{\epsilon \epsilon_0 S \cdot d}{d} \cdot S \cdot d}$$

$$= \frac{\sigma^2 \cdot S^2}{2 \cdot \epsilon \epsilon_0 S^2} = \frac{\sigma^2}{2 \epsilon \epsilon_0}$$

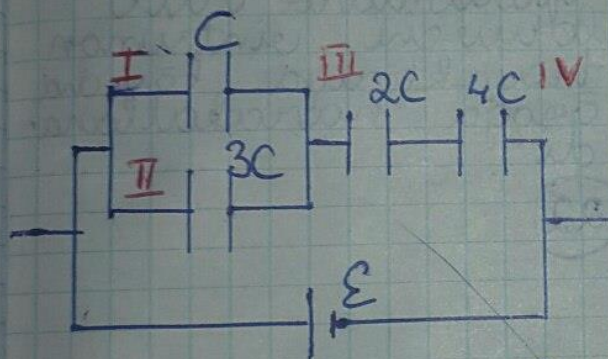
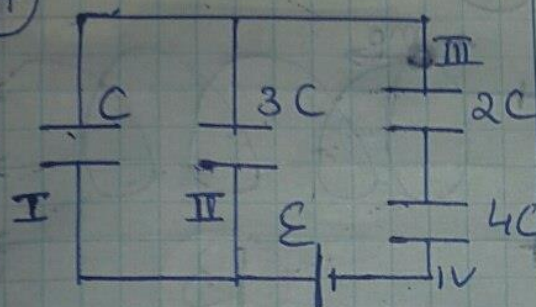
$$\omega_2 = \frac{(3\sigma)^2}{2 \epsilon_0 \cdot 2} = \frac{9}{2} \frac{\sigma^2}{2 \epsilon_0}$$

$$\omega_1 = \frac{\sigma^2}{2 \cdot 1 \epsilon_0} = \frac{\sigma^2}{2 \epsilon_0}$$

$$\omega_2 = 4.5 \omega_1 \quad \text{A}$$

4,5 marta ortadi

17



$$C_{p1} = C + 3C = 4C$$

$$\frac{1}{C_k} = \frac{1}{4C} + \frac{1}{2C} + \frac{1}{4C} = \frac{1}{C}$$

$$C_k = C$$

$$q = E \cdot C_k = EC$$

$$q = Cu + 3Cu = 4Cu$$

$$q = E \cdot C = 4Cu$$

$$E = 4u$$

$$u = \frac{E}{4}$$

$$q_I = \frac{E}{4} \cdot C$$

$$q_{II} = \frac{3E}{4} \cdot C$$

$$q_{III} = q_{IV} = EC$$

$$W = \frac{q^2}{2C}$$

$$W_I = \frac{\left(\frac{E}{4} \cdot C\right)^2}{2 \cdot C} = \frac{E^2 \cdot C}{32}$$

$$W_{II} = \frac{\left(\frac{3E}{4} \cdot C\right)^2}{2 \cdot 3C} = \frac{3E^2 C}{32}$$

$$W_{III} = \frac{(EC)^2}{2 \cdot 2C} = \frac{E^2 C}{4}$$

$$W_{IV} = \frac{(EC)^2}{2 \cdot 4C} = \frac{E^2 C}{8}$$

$$W_{III} > W_{IV} > W_{II} > W_I$$

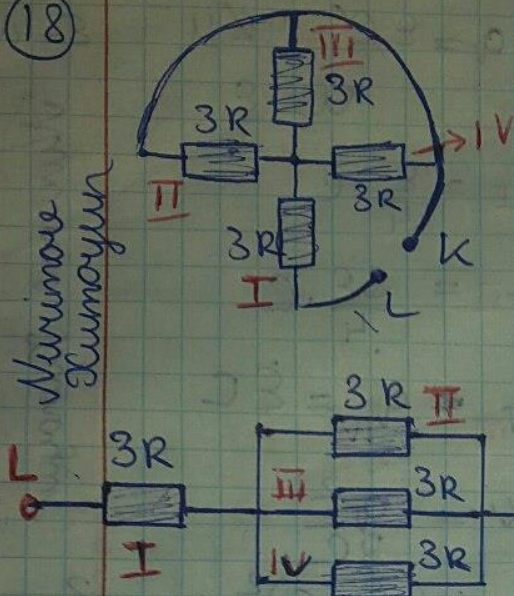
eng katta - III;

eng kichik - I;

Minimum Energiya

18

Numunalar
lumayun



$$R_p = \frac{3R}{3} = R$$

$$R_{LK} = 3R + R = 4R$$

19 $R = R_0 \cdot (1 + \alpha t)$

$$R(0) = 0$$

$$R \sim T$$

$$\frac{R_1}{R_2} = \frac{T_1}{T_2}$$

$$T_1 = 300K$$

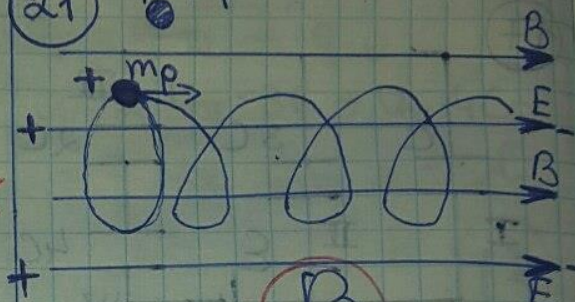
$$T_2 = 273 + 150 = 423K$$

$$R_2 = \frac{R_1 \cdot T_2}{T_1} = \frac{10 \cdot 423}{300} = 14,1$$

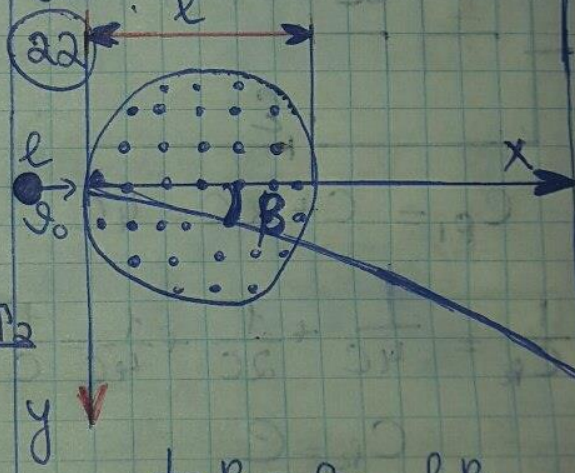
20 Elektr yoyi och-
gan daqqada
tak kamayib ketadi
fuchlanish esa ortadi.

B

21 $+ mp$



qadamlara ortib
buvuchi vintsimon
trayektoriya boyicha
qangga harakatlana-
di.



$$\tan \beta = \frac{q}{m} \cdot \frac{lB}{v_0}$$

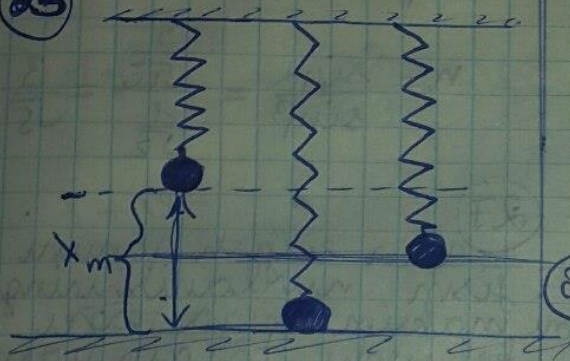
$$l = \frac{mv_0 \tan \beta}{qB}$$

$$l = \frac{9,1 \cdot 10^{-31} \text{ kg} \cdot 1 \cdot 10^6 \text{ m/s} \cdot \tan 60^\circ}{1,6 \cdot 10^{-19} \text{ C} \cdot 5 \pi}$$

$$= 0,2 \cdot 10^{-6} \text{ m} = 200 \text{ nm}$$

(C)

(23)



$$x = A \sin \omega t$$

$$v = A \omega \cos \omega t$$

$$a = -A \omega^2 \sin \omega t$$

$$E_k = \frac{mv^2}{2} = \frac{mA^2 \omega^2 \cos^2 \omega t}{2}$$

kinetik energiyani
minimal qiymati

$$\cos^2 \omega t = 0 \quad \omega t = \frac{\pi}{2}$$

$$a = -A \omega^2 \sin \omega t$$

$$a = -A \omega^2 \sin \frac{\pi}{2} = -A \omega^2$$

$$\omega^2 = \frac{k}{m}$$

$$a = \frac{A \cdot k}{m}$$

$$A = \frac{x_m}{2}$$

$$mg x_m = \frac{k x_m^2}{2}$$

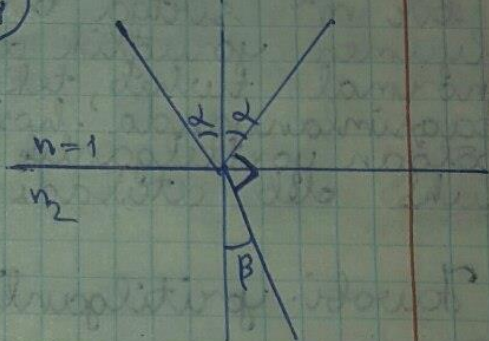
$$mg = k \cdot A = ma$$

$$mg = ma$$

$$g = a = 9,8 \frac{\text{m}}{\text{s}^2}$$

(A)

(24)



$$\frac{\sin \alpha}{\sin \beta} = \frac{n_2}{n_1} = \frac{n_2}{1} = n_2$$

$$\alpha + \beta = 90^\circ$$

$$\beta = 90^\circ - \alpha$$

$$\frac{\sin \alpha}{\sin(90^\circ - \alpha)} = n$$

$$\tan \alpha = n$$

$$\tan \alpha = n$$

α - Bruster burcha
gi

Muvimov 2

$$n = \sqrt{\epsilon \mu}$$

$$n = \sqrt{1 \cdot 3} = \sqrt{3}$$

$$\operatorname{tg} \alpha_B = \sqrt{3}$$

$$\alpha_B = 60^\circ$$

(B)

(25)

$$E = \frac{\Delta \varphi}{\Delta S}$$

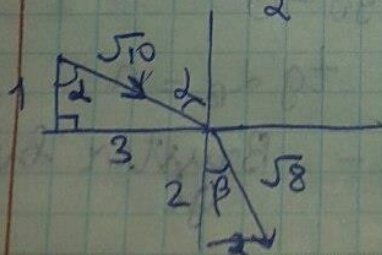
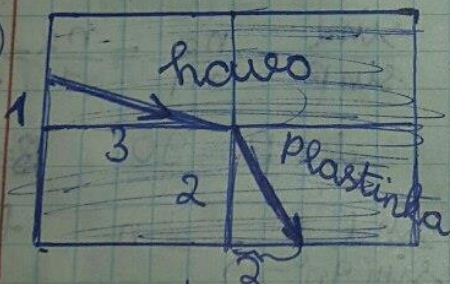
(A)

$$1 \text{ lx} = \frac{1 \text{ lm}}{1 \text{ m}^2} = 1 \frac{\text{lm}}{\text{m}^2}$$

bir m^2 sirtga bir lyumen yorug'lik oqimi normal tushib, tekis taqsimlanganda, hosil bo'lgan yoritilganlik lux deb ataladi

Javobi: yoritilganlik

(26)



$$\sin \alpha = \frac{3}{\sqrt{10}}$$

$$\sin \beta = \frac{2}{2\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$$\frac{\sin \alpha}{\sin \beta} = \frac{n_2}{n_1} = \frac{n}{1} \quad (C)$$

$$n = \frac{\sin \alpha}{\sin \beta} = \frac{\frac{3}{\sqrt{10}}}{\frac{1}{\sqrt{2}}} = \frac{3}{\sqrt{5}}$$

(27)

Vin siljish qonuni jism nurlanishining maksimumiga to'g'ri keluvchi to'lqin uzunligi, λ_m absolut temperaturaga teskari proporsionaldir.

$$\lambda_m = \frac{b}{T} \quad (C)$$

b - Vin doimiysi bo'lib, $b = 2,898 \cdot 10^{-3} \text{ m} \cdot \text{K}$

Bu yerda: λ_m - T temperaturadagi nurlanayotgan energiya maksimumiga to'g'ri keluvchi to'lqin uzunligi.

$$\lambda_{\max} = \frac{0,0029}{T}$$

$$(28) \quad P = 0,1 m_0 c = m v$$

$$0,1 m_0 c = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \cdot v$$

$$0,1 c = \frac{v}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$\sqrt{1 - \frac{v^2}{c^2}} = \frac{v}{0,1 c} = \frac{10v}{c}$$

$$1 - \frac{v^2}{c^2} = \frac{100v^2}{c^2}$$

$$1 = \frac{101v^2}{c^2}$$

$$\frac{v^2}{c^2} = \frac{1}{101}$$

$$\Delta m = m - m_0$$

$$\Delta m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} - m_0$$

$$\Delta m = m_0 \cdot \left(\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} - 1 \right)$$

$$\Delta m = m_0 \cdot \left(\frac{1}{\sqrt{1 - \frac{1}{101}}} - 1 \right)$$

$$= 0,005 m_0$$

(29) Spini 0 bo'lgan
zarralar (K-meson,
π - meson, η - meson)

Javob: 0 (B)

$$(30) \quad A = N + Z$$

6 ta proton

6 ta neytron

6 ta elektron

Agar atom ikki kar-
rda manfiy zar-
yadlarga, undagi
elektronlar soni ikkita
ga ortadi (A)

Javob: 8 ta elektron

Wurimov
Kumayun
2001

Variant - 4

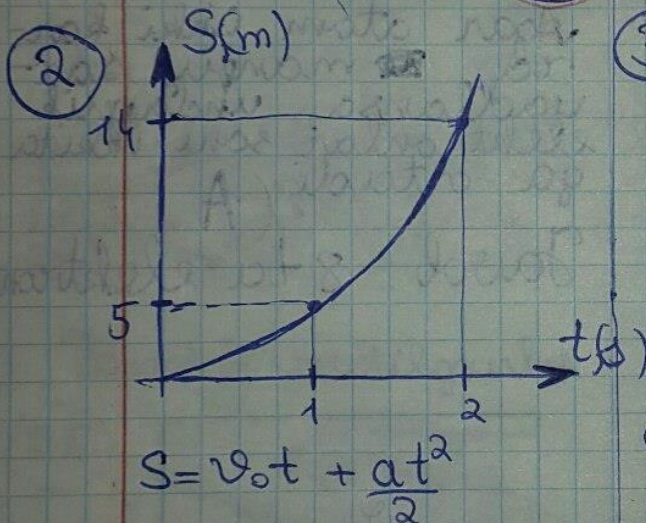
① $x = 10 - 15t$
 $y = 30 + 20t$

$v_x = -15 \frac{m}{s}$ $v_y = 20 \frac{m}{s}$

$v_n = \sqrt{v_x^2 + v_y^2}$

$v_n = \sqrt{(-15)^2 + 20^2} =$
 $= 25 \text{ m/s}$

A



$5 = v_0 \cdot 1 + \frac{a \cdot 1^2}{2} = v_0 + \frac{a}{2}$

$14 = v_0 \cdot 2 + \frac{a \cdot 2^2}{2} = 2v_0 + 2a$

$\begin{cases} 5 = v_0 + \frac{a}{2} \\ 14 = 2v_0 + 2a \end{cases}$
| 4

$20 = 4v_0 + 2a$

$14 = 2v_0 + 2a$

$6 = 2v_0$ $v_0 = 3 \text{ m/s}$

$\frac{a}{2} = 5 - 3 = 2 \frac{m}{s^2}$

$a = 4 \text{ m/s}^2$

$S_n = v_0 + \frac{a}{2} (2t - 1)$

A

$S_3 = 3 + \frac{4}{2} \cdot (2 \cdot 3 - 1) = 13 \text{ m}$

③



$\omega_1 = \omega_2 = \omega$

$\frac{v_1}{R_1} = \frac{v_2}{R_2} = \frac{v_2}{7R_1}$

$R_2 = 7R_1$

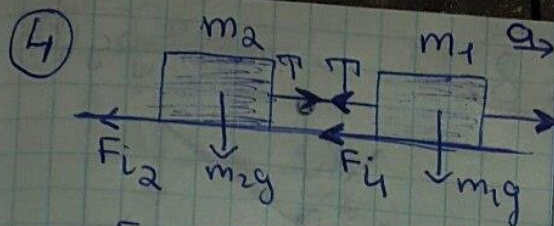
$a_2 = \frac{v_2^2}{R_2}$

$a_1 = \frac{v_1^2}{R_1}$
 $a_2 = \frac{(7v_1)^2}{7R_1} = \frac{7v_1^2}{R_1} = 7a_1$

$a_2 = 7a_1$

C

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 maxsus
 Uchquduq



$$F_{f1} + T + m_1 a = F$$

$$\mu m_1 g + T + m_1 a = F$$

$$F_{f2} + m_2 a = T$$

$$F_{f2} = \mu m_2 g$$

$$\mu m_1 g + \mu m_2 g + m_1 a + m_2 a = F$$

$$(m_1 + m_2) a = F - \mu g (m_1 + m_2)$$

$$a = \frac{F - \mu g (m_1 + m_2)}{m_2 + m_1}$$

$$a = \frac{12 \text{ N} - 0,3 \cdot 10 \text{ m/s}^2 \cdot (2 \text{ kg} + 1 \text{ kg})}{2 \text{ kg} + 1 \text{ kg}}$$

$$= \frac{12 \text{ N} - 9 \text{ N}}{3 \text{ kg}} = 1 \frac{\text{m}}{\text{s}^2}$$

$$T = (\mu g + a) \cdot m_2$$

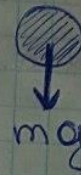
$$T = (0,3 \cdot 10 \text{ m/s}^2 + 1 \text{ m/s}^2) \cdot 1 \text{ kg}$$

$$= 4 \text{ N}$$

②

⑤

$$F_{gr} \uparrow$$



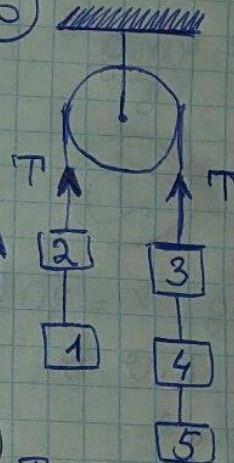
A

$$\downarrow v \quad \uparrow a$$

$$F_{gr} = mg + ma$$

$$F_{gr} > mg$$

⑥



$$m_1 = 2 \text{ m}$$

$$m_2 = 3 \text{ m}$$

$$T_1 = m_1 g + m_1 a$$

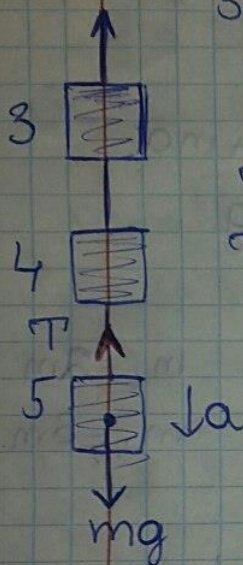
$$T = m_2 g + m_2 a$$

$$m_2 g - m_2 a = m_1 g + m_1 a$$

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$$a = \frac{m_2 - m_1 \cdot g}{m_1 + m_2}$$

$$a = \frac{3m - 2m \cdot g}{5m} = \frac{g}{5}$$



$$T_{45} = mg - ma$$

$$T_{45} = mg - \frac{mg}{5}$$

$$= \frac{4mg}{5}$$

(D)

(7) $m = 100 \text{ kg}$ $k = 20 \frac{\text{kg}}{\text{s}}$

$$N = F \cdot v = k \cdot v \cdot v$$

$$N = kv^2$$

$$v = \sqrt{\frac{N}{k}} = \sqrt{\frac{500 \text{ W}}{20 \frac{\text{kg}}{\text{s}}}} = \frac{5 \text{ m}}{\text{s}}$$

(B)

$$E_k = \frac{mv^2}{2}$$

$$E_k = \frac{100 \text{ kg} \cdot (5 \text{ m/s})^2}{2}$$

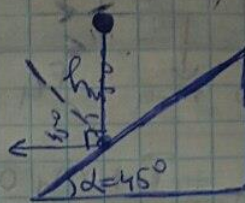
$$= 1250 \text{ J} = 1,25 \text{ kJ} =$$

$$= \frac{5}{4} \text{ kJ}$$

(8)

$$v = \sqrt{2gh}$$

(10)



$$mv_n = F \Delta t$$

$$v_n = v + 0 = v$$

$$mv = F \Delta t$$

$$F = \frac{mv}{\Delta t}$$

(A)

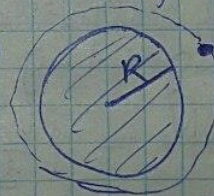
(I)

$$v = \sqrt{2gh}$$

$$v = \sqrt{2 \cdot \frac{10 \text{ m}}{\text{s}^2} \cdot 1,25 \text{ m}} = \frac{5 \text{ m}}{\text{s}}$$

$$F = \frac{2 \text{ kg} \cdot 5 \text{ m/s}}{0,1 \text{ s}} = 100 \text{ N}$$

(9)



$$F = Mg$$

$$F = 1 \cdot 10^3 \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2}$$

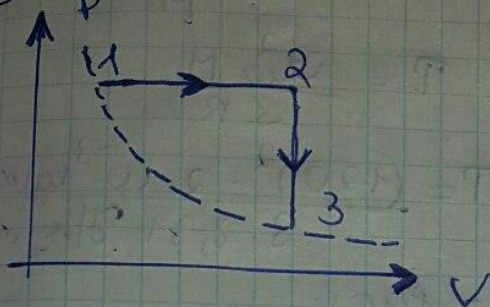
$$= 1 \cdot 10^4 \text{ N}$$

(A)

$$N = F \cdot v = 1 \cdot 10^4 \cdot 500 = 5 \text{ MW}$$

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⑩ $\nu = 1 \text{ mol CO}_2$



$T_1 = T_3$ bu izoterma chiziği.

① İzobarik $P = \text{const}$
 $Q_p = A + \Delta U$

$$Q_p = \frac{i}{2} \nu R (T_2 - T_1) + \nu R (T_2 - T_1)$$

$$= \left(\frac{i}{2} + 1\right) \nu R (T_2 - T_1)$$

$i = 6$ CO_2 uchun

$$Q_p = \left(\frac{6}{2} + 1\right) \nu R (T_2 - T_1) =$$

$$= 4 \nu R (T_2 - T_1)$$

② İzoxorik jarayonda $Q = 0$ $A + \Delta U = 0$
 $V = \text{const}$

$$Q = \Delta U = -\frac{i}{2} \nu R \Delta T$$

$$Q_v = -\frac{i}{2} \nu R (T_3 - T_2)$$

$i = 6$ CO_2 uchun

$$Q_2 = Q_v = \frac{6}{2} \nu R (T_2 - T_3)$$

$$= 3 \nu R (T_2 - T_3)$$

$$T_2 - T_1 = T_2 - T_3$$

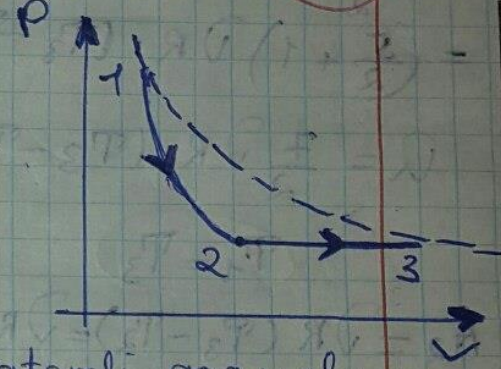
$$T_1 = T_3$$

$$\frac{Q_1}{Q_2} = \frac{4 \nu R (T_2 - T_1)}{3 \nu R (T_2 - T_1)} = \frac{4}{3}$$

$$\frac{Q_1}{Q_2} = 1,33$$

Ⓑ

⑪



2 atomli gaz uchun

$$i = 5$$

$$T_1 = T_3$$

① Adiabatik

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Uchqush

$$A = -\Delta U = -\frac{1}{2} \nu R (T_2 - T_1) \\ = \frac{1}{2} \nu R (T_1 - T_2)$$

$$A_1 = \frac{5}{2} \nu R (T_1 - T_2)$$

II Izobarik $P = \text{const}$

$$Q = A + \Delta U = \nu R (T_3 - T_2)$$

$$+ \frac{1}{2} \nu R (T_3 - T_2) = \\ = \left(\frac{5}{2} + 1\right) \nu R (T_3 - T_2)$$

$$Q = \frac{7}{2} \nu R (T_3 - T_2)$$

$$T_1 = T_3$$

$$A_2 = \nu R (T_3 - T_2) = \nu R (T_1 - T_2)$$

$$Q = \frac{7}{2} A_2 \quad A_2 = \frac{2Q}{7}$$

$$A_2 = \frac{2 \cdot 14 \text{ kJ}}{7} = 4 \text{ kJ}$$

$$A_1 = \frac{5}{2} A_2 = \frac{5}{2} \cdot 4 \text{ kJ} = 10 \text{ kJ}$$



(12) $v_{kv} = 120 \text{ m/s}$

$$v_{kv} = \sqrt{\frac{3RT}{M}}$$

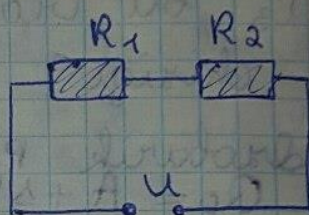
$$v_{kv}^2 = \frac{3RT}{M}$$

$$T = \frac{v_{kv}^2 \cdot M}{3R}$$

$$T = \frac{(120)^2 \cdot 2 \cdot 10^{-3} \text{ kg/mol}}{3 \cdot 8,31 \text{ J/k} \cdot \text{mol}}$$

$$= 1,15 \text{ K}$$

(13)



$$R_1 = \frac{\rho \cdot l}{S} = \frac{\rho \cdot l}{a \cdot b}$$

$$R_2 = \frac{\rho \cdot 1,1l}{1,1a \cdot 1,1b} = \frac{\rho \cdot l}{1,1b}$$

$$U_1 = \frac{I \cdot \rho \cdot l}{a \cdot b}, \quad U_2 = \frac{I \cdot \rho l}{1,1b}$$

$$E_1 = \frac{U_1}{l} = \frac{I \cdot \rho}{a \cdot b}$$

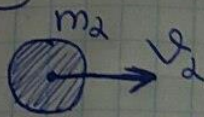
$$E_2 = \frac{U_2}{1,1l} = \frac{I \cdot \rho \cdot l}{1,1l \cdot 1,1ba} = \\ = \frac{I \cdot \rho}{1,21ba}$$

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Uchquduq

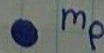
$$E_2 = \frac{E_1}{1,21}$$

14

1 mol
mol



A



$$m_d = 7360 m_p$$

Positronning massasi
ancha kichik bo'lgan-
ligi uchun d-zar-
rining tezligini
o'zgartira olmaydi

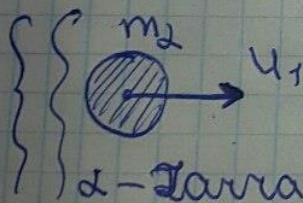
$$\text{Javob: } v_d = v = 0,8v$$

Isboti quyidagicha:



d-zarra

positron



d-zarra

Positron

$$m_d = 7360 m_p$$

$$\begin{cases} m_d v_d + m_p \cdot 0 = m_d u_1 + m_p u_2 \\ \frac{m_d v_d^2}{2} = \frac{m_d u_1^2}{2} + \frac{m_p u_2^2}{2} \end{cases}$$

$$\begin{cases} m_d v_d = m_d u_1 + m_p u_2 \\ m_d v_d^2 = m_d u_1^2 + m_p u_2^2 \end{cases}$$

B

$$\begin{cases} m_d (v_d - u_1) = m_p u_2 \\ m_d (v_d - u_1) \cdot (v_d + u_1) = m_p u_2^2 \end{cases}$$

$$v_d + u_1 = u_2$$

$$m_d v_d = m_d u_1 + m_p (v_d + u_1)$$

$$m_d v_d = m_d u_1 + m_p v_d + m_p u_1$$

$$(m_d - m_p) v_d = (m_d + m_p) u_1$$

$$u_1 = \frac{m_d - m_p}{m_d + m_p} \cdot v_d$$

$$u_1 = \frac{1 - \frac{m_p}{m_d}}{1 + \frac{m_p}{m_d}} \cdot v_d$$

$$m_d \gg m_p$$

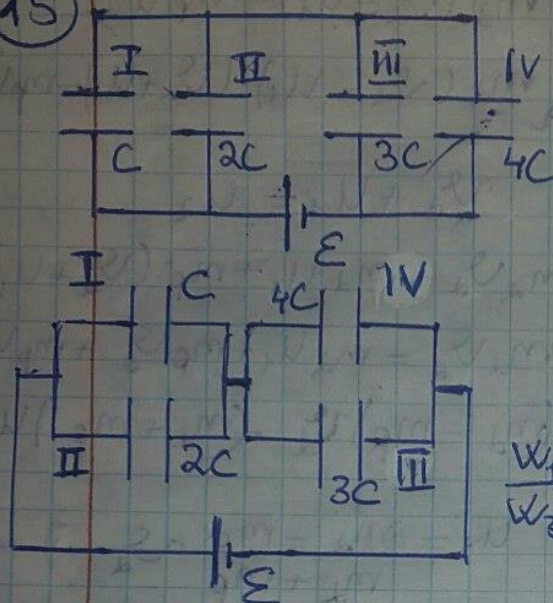
$$\frac{m_p}{m_d} \rightarrow 0$$

$$u_1 = \frac{1-0}{1+0} \cdot v_d = v_d = 0,8v$$

A

Janob Fiziklar
kanali uchun maxsus
Uchqurduq

15



$$C_{p1} = C + 2C = 3C$$

$$C_{p2} = 4C + 3C = 7C$$

$$C_k = \frac{C_{p1} \cdot C_{p2}}{C_{p2} + C_{p1}}$$

$$C_k = \frac{3C \cdot 7C}{10C} = 2,1C$$

$$q_{I,II} = q_{III,IV} = q$$

$$q = E \cdot 2,1C = 2,1EC$$

$$U_I = U_{II}$$

$$q = U_I \cdot C + U_{II} \cdot 2C$$

$$= 3U_I \cdot C = 2,1EC$$

$$U_I = 0,7E$$

$$W_1 = \frac{C U_I^2}{2} = \frac{C (0,7E)^2}{2}$$

$$U_{III} = U_{IV}$$

$$q = q_{III} + q_{IV}$$

$$q = 3C U_{III} + 4C U_{III}$$

$$= 7C U_{III} = 2,1EC$$

$$U_{III} = 0,3E$$

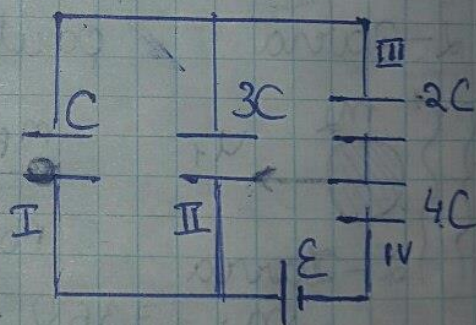
$$\frac{W_1}{W_3} = ? \quad W_3 = \frac{3C \cdot U_{III}^2}{2} = \frac{3C (0,3E)^2}{2}$$

$$\frac{W_1}{W_3} = \frac{\frac{C}{2} \cdot (0,7E)^2}{\frac{3C}{2} \cdot (0,3E)^2} =$$

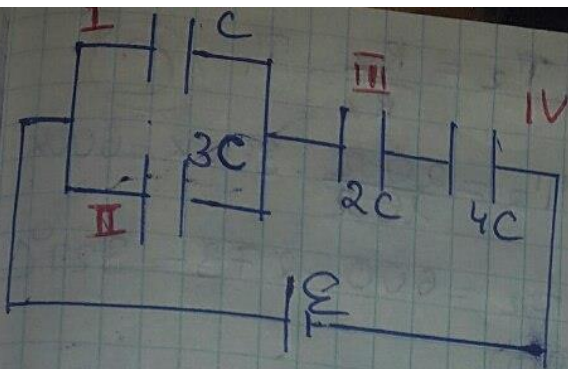
$$= \frac{49}{27}$$

13

16



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$$C_{p1} = C + 3C = 4C$$

$$\frac{1}{C_k} = \frac{1}{4C} + \frac{1}{2C} + \frac{1}{4C}$$

$$= \frac{1}{C}$$

$$C_k = C$$

$$q_{I,II} = q_{III} = q_{IV} = q$$

$$q = E \cdot C$$

$$U_{III} = \frac{q}{2C} = \frac{E \cdot C}{2C} = \frac{E}{2}$$

$$U_{IV} = \frac{q}{4C} = \frac{E \cdot C}{4C} = \frac{E}{4}$$

$$U_I = U_{II}$$

$$q = C \cdot U_I + 3C \cdot U_I$$

$$= 4C U_I = E \cdot C$$

$$U_I = U_{II} = \frac{E}{4}$$

$$U_I = U_{II} = U_{IV} = \frac{E}{4}$$

$$U_{III} = \frac{E}{2}$$

Eng katta - III

Eng kichik - I; II; IV;

(17)

$$\bar{w} = \frac{W}{V}$$

$$\bar{w} = \frac{q^2}{2C} = \frac{q^2}{2C \cdot V} =$$

$$= \frac{q^2}{2 \cdot \epsilon \epsilon_0 S \cdot d} = \frac{q^2}{2 \epsilon \epsilon_0 S^2}$$

$$\sigma = \frac{q}{S}$$

$$\bar{w} = \frac{\sigma^2}{2 \epsilon \epsilon_0}$$

$$\bar{w}_1 = \frac{\sigma^2}{2 \epsilon_0}$$

$$\bar{w}_2 = \frac{(4\sigma)^2}{2 \cdot 4 \epsilon_0}$$

$$\bar{w}_2 = \frac{16}{4} \cdot \bar{w}_1 = 4 \bar{w}_1$$

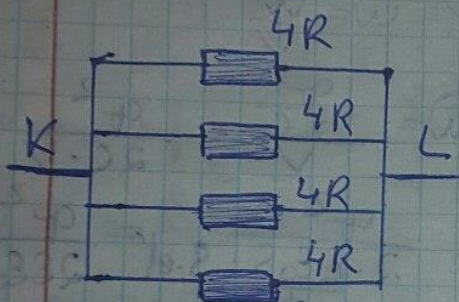
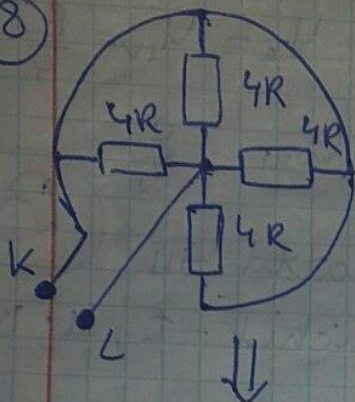
4 marta ortadi

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(B)

(A)

18



$$R_{KL} = R_p = \frac{4R}{4} = R$$

$$R_{KL} = R$$

19

$$t = 27^\circ\text{C} \Rightarrow T = 300\text{K}$$

$$R_1 = 10\ \Omega \quad R_2 = 20\ \Omega$$

$$R = R_0 \cdot (1 + \alpha t)$$

$$R(0) = 0$$

$$R \sim T$$

$$\frac{R_1}{R_2} = \frac{T_1}{T_2}$$

$$T_2 = \frac{R_2}{R_1} \cdot T_1$$

C

$$T_2 = \frac{20\ \Omega}{10\ \Omega} \cdot 300\text{K} = 600\text{K}$$

$$t_2 = 600 - 273 = 327^\circ\text{C}$$

20

Elektr toki yongan
daqiqada zaryar-
dagi tok kuch
ortadi, kuchlanish
esa kamayadi.

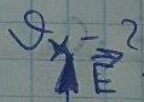
B

21

$$E = 50 \frac{\text{V}}{\text{m}} \quad B = 10\text{T}$$

$$q = m/s$$

$$t = 5\text{s}$$



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Uchqurich

$$F_1 = E q = 50 \frac{\text{V}}{\text{m}} \cdot 1,6 \cdot 10^{-19} \text{ C} \\ = 80 \cdot 10^{-19} \text{ N}$$

$$F_2 = qBV_0 = 1,6 \cdot 10^{-19} \cdot 10^7 \cdot 5 \text{ m/s} = 80 \cdot 10^{-19} \text{ N}$$

F_1 keuch yuqirga yonalgan.

F₂ kuchi esa Lorens
kuchi tufayli part.
ga yonalgan boladi

$\uparrow F_1$ $F_1 = F_2$

demak kuchlar
kompensatriya -
langan

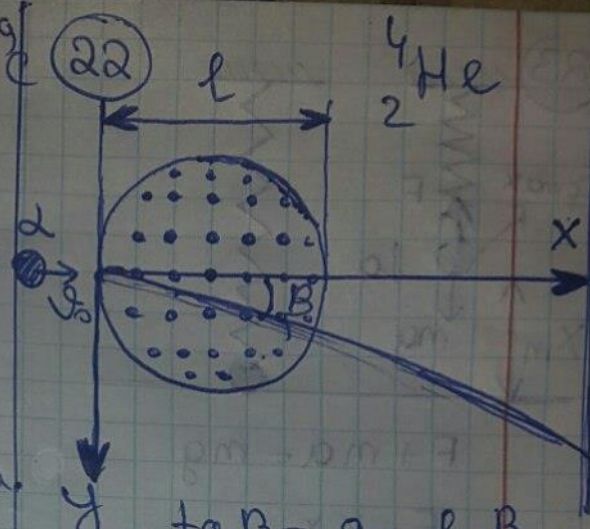
$$a=0$$

$$V = \frac{E}{B} = \frac{50 \frac{V}{m}}{10 T} = 5 \frac{m}{s}$$

İ: Teslik övgarmaydu

25 ml's ga teng
bolachi

2



$$\operatorname{tg} \beta = \frac{q}{m} \cdot \frac{e B}{v_0}$$

$$l = \frac{m g \sin \beta}{g \cos \beta}$$

$$m_2 = 4m_p$$

$$m_2 = 4 m. a. b. =$$

$$= 4 \cdot 1,67 \cdot 10^{-27} \text{ kg} =$$

$$= 6,68 \cdot 10^{-27} \text{ kg}$$

$$q_{v2} = 2 \cdot 1,6 \cdot 10^{-19} \text{ C} =$$

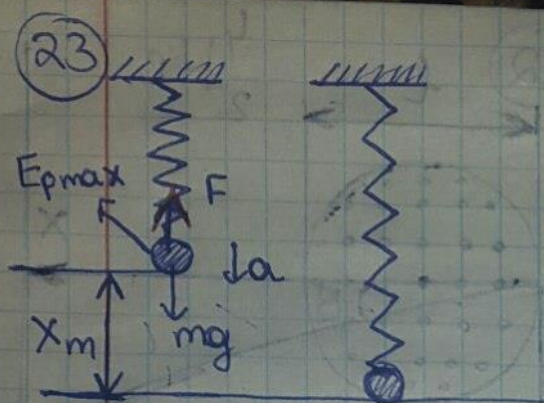
$$= 3,2 \cdot 10^{-19} \text{ C}$$

$$l = \frac{6,68 \text{ kg} \cdot 10^{-27} \cdot 15 \cdot 10^6 \text{ m/s} \cdot \tan 7^\circ}{3,2 \cdot 10^{-19} \text{ C} \cdot 2 \text{ T}}$$

$$= 2 \cdot 10^{-2} \text{ m} = 2 \text{ cm} =$$

$$= 20 \text{ mm}$$

2



$$F + ma = mg$$

$$F = kx$$

$$kx + ma = mg$$

$$x = 0$$

yuk ushlab turilgan holatda maksimal potentsial energiyaga ega bo'ladi.

$$k \cdot 0 + m a = m g$$

$$m \cdot a = m \cdot g$$

$$a = g = 9,8 \text{ m/s}^2$$

24) Yonqilikning yassi qutblanish faqat yonqilikning kristalldan o'tishida-gina emas, balki ikkita izotrop dielektrik muhitlarning chegarasidan qaytishi va sinishida ham kuzatiladi.

C

25) To'rush qattiqligi

B

26) Intensiivlik

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \Delta \varphi$$

$$\Delta \varphi = \frac{\pi}{2}$$

C

$$I_{\max} = I + \frac{I}{2} + 2\sqrt{I \cdot \frac{I}{2}} \cos \frac{\pi}{2}$$

$$= 3\frac{I}{2} + 0 = \frac{3I}{2} = 1,5I$$

27) Sin siljish qonuni

$$\lambda_m = \frac{b}{T}$$

b - Sin doimiyi

$$b = 0,0029 \text{ m} \cdot \text{K}$$

$$\lambda = \frac{0,0029 \text{ m} \cdot \text{K}}{309 \text{ K}} =$$

$$= 9,38 \mu\text{m}$$

A

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Uchquduq

28) m_0

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$
$$\sqrt{1 - \frac{v^2}{c^2}} = \frac{m_0}{m} = \frac{4}{5}$$

$$1 - \frac{v^2}{c^2} = \frac{16}{25}$$

$$1 - \frac{16}{25} = \frac{v^2}{c^2}$$

$$\sqrt{\frac{9}{25}} = \sqrt{\frac{v^2}{c^2}}$$

A

$$\frac{3}{5} = \frac{v}{c}$$

$$v = \frac{3}{5} c$$

$$p = mv = m \cdot 0,6c = 0,6mc$$

29)

Spin $S = 1$ boʻlgan
zarralar: foton,
glyn

$$S = 1$$

$$\hbar = \frac{h}{2\pi}$$

B

$$1 \cdot \frac{h}{2\pi} = \frac{h}{2\pi}$$

30)

$$A = N + Z = 20$$

Proton 10 ta

Neutron 10 ta

elektron 10 ta

A

12 ta $\rightarrow$ elektron

10 ta $\rightarrow$ proton

10 ta $\rightarrow$ neutron

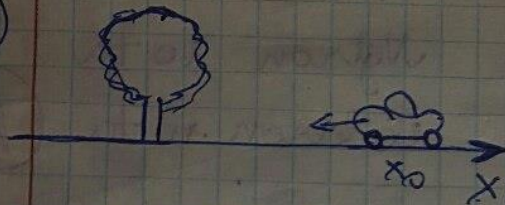
IV variant

tugadi

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Variant-5

1



$$x = x_0 + v_x t$$

$$x_0 + (-15) \cdot (-3) = 900$$

$$x_0 = 855 \text{ m}$$

C

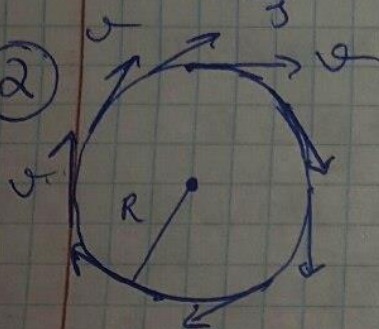
$$x = 855 + (-15)t =$$

$$= 855 - 15t = 0$$

$$855 = 15t$$

$$t = \frac{855 \text{ m}}{15 \frac{\text{m}}{\text{s}}} = 57 \text{ s}$$

2



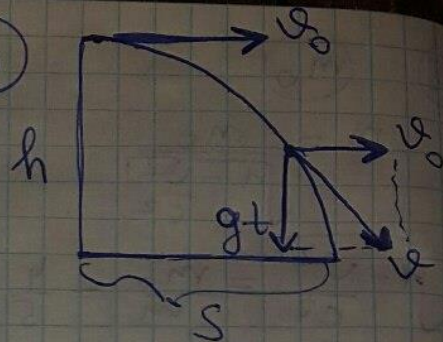
$$a_t = 0$$

2

$$a_t = \frac{v - v}{t} = \frac{0}{t} = 0$$

$$a_n = \frac{v^2}{R} = \text{const.}$$

3



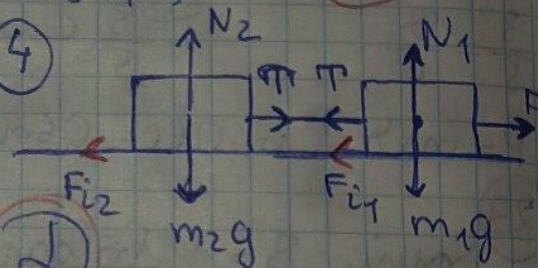
$$v = \sqrt{v_0^2 + (gt)^2}$$

$$v = \sqrt{\left(10 \frac{\text{m}}{\text{s}^2} \cdot 0.3 \text{ s}\right)^2 + \left(4 \frac{\text{m}}{\text{s}}\right)^2}$$

$$= 5 \text{ m/s}$$

2

4



2

$$F_{i1} = \mu_1 N_1 = \mu m_1 g$$

$$F_{i2} = \mu N_2 = \mu m_2 g$$

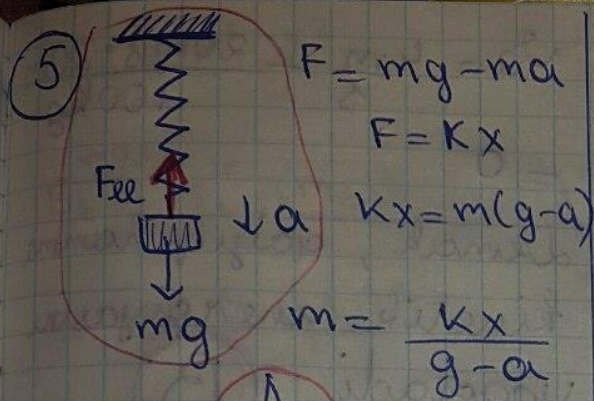
$$F_{i1} = 0.3 \cdot 2 \text{ kg} \cdot 10 \text{ m/s}^2 = 6 \text{ N}$$

$$T + F_{i1} = F \Rightarrow F_{i1} > F$$

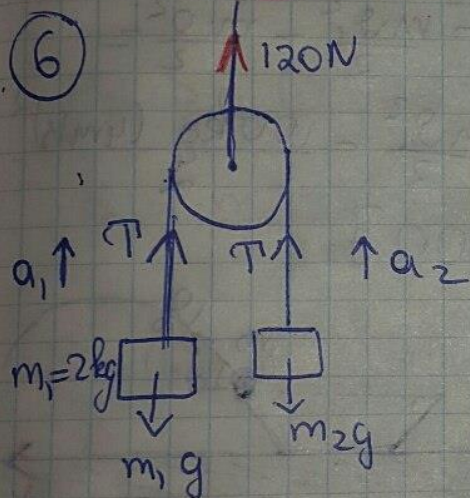
$$6 \text{ N} > 5 \text{ N}$$

$$T = 0$$

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A



$$2T = 120N$$

$$T = 60N$$

$$T = m_1g + m_1a_1$$

$$a_1 = \frac{T - m_1g}{m_1}$$

$$a_1 = \frac{60N - 2kg \cdot 10m/s^2}{2kg}$$

$$= 20m/s^2$$

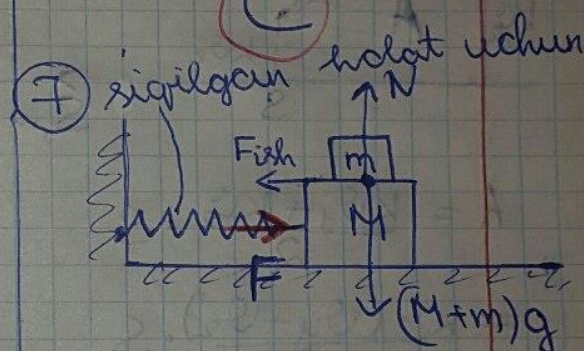
$$T = m_2g + m_2a_2$$

$$a_2 = \frac{T - m_2g}{m_2}$$

$$a_2 = \frac{60N - 1kg \cdot 10m/s^2}{1kg}$$

$$= 50m/s^2$$

C



$$F_{friction} = \mu N$$

$$N = (M + m)g$$

$$F_{friction} = \mu \cdot (M + m)g$$

$$F_{friction} = F = kx$$

$$\mu (M + m)g = kx$$

$$x_m = \frac{\mu (M + m)g}{k}$$

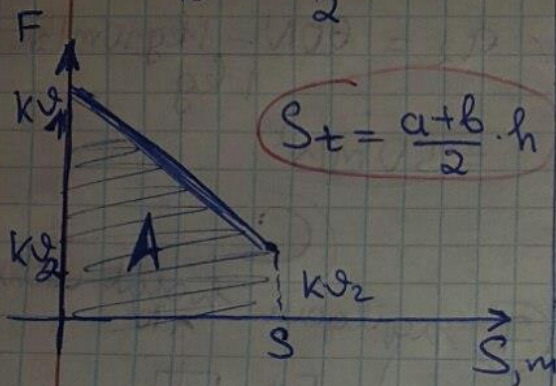
$$x_m = \frac{0.2 \cdot (4kg + 1kg) \cdot 10m/s^2}{1000N/m}$$

$$= \frac{1}{100}m = 1cm$$

A

8) Dastlabki kinetik energiyasi

$$E_k = \frac{m v_1^2}{2}$$



$$A = \frac{k v_1 + k v_2}{2} \cdot S$$

$$= k \cdot \frac{(v_1 + v_2)}{2} \cdot S$$

$$A = W = \frac{m v_1^2}{2} - \frac{m v_2^2}{2}$$

$$k \cdot \frac{(v_1 + v_2)}{2} \cdot S = \frac{m}{2} \cdot$$

$$(v_1 - v_2)(v_1 + v_2)$$

$$k \cdot S = m (v_1 - v_2)$$

$$v_1 - v_2 = \frac{k \cdot S}{m}$$

$$v_2 = v_1 - \frac{k \cdot S}{m}$$

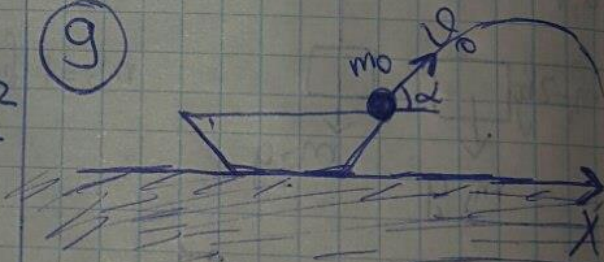
$$v_2 = 4 \frac{m}{s} - \frac{20 \text{ kg/s} \cdot 20 \text{ m}}{100 \text{ kg}} = 0$$

Demak, qiziq hamme kinetik energiyasini yoqotadi

(B)

$$E_k = \frac{m v_1^2}{2} - \frac{m v_2^2}{2} = \frac{m v_1^2}{2} = \frac{100 \text{ kg} \cdot (4 \text{ m/s})^2}{2} = 800 \text{ J}$$

9)



$$P_{x1} = m_0 v_0 \cos \alpha$$

$$P_{x2} = (m + M) v$$

$$m + M = m'$$

$$P_{x2} = P_{x1}$$

$$m_0 v_0 \cos \alpha = m' v$$

$$v = \frac{m_0 v_0 \cos \alpha}{m'}$$

$$E_k = \frac{m_1 v^2}{2}$$

$$E_k^{\max} = \frac{m_1}{2} \cdot \frac{(m_0 v_0 \cos \alpha)^2}{m_1^2}$$

$$= \frac{(m_0 v_0 \cos \alpha)^2}{2 m_1}$$

$$A = F_q \cdot S = E_k^{\max}$$

$$F_q \cdot S = \frac{(m_0 v_0 \cos \alpha)^2}{2 m_1}$$

$$S = \frac{m_0^2 v_0^2 \cos^2 \alpha}{2 m_1 \cdot F_q}$$

$$S = \frac{(40 \cdot 10^{-3})^2 \cdot 400^2 \cdot \left(\frac{\sqrt{3}}{2}\right)^2}{2 \cdot 80 \cdot 4}$$

$$= \frac{1600 \cdot 10^{-6} \cdot 16 \cdot 10^4 \cdot \frac{3}{4}}{8 \cdot 80}$$

$$= \frac{3}{10} = 0,3 \text{ m}$$

A

① $n_2 = 3 n_1$ $T_2 = 2 T_1$

$$P = n k T$$

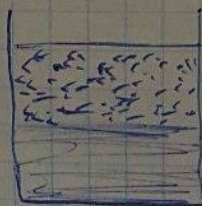
$$P_1 = n_1 k T_1 \quad P_2 = n_2 k T_2$$

$$\frac{P_2}{P_1} = \frac{n_2 k T_2}{n_1 k T_1} = \frac{3 n_1 \cdot 2 T_1}{n_1 \cdot T_1} = 6$$

$$\frac{P_2}{P_1} = 6$$

②

11



$$P = n k T$$

$$T_2 = 2 T_1$$

A

$$P_1 = n k T_1$$

$$P_2 = n k T_2$$

$$P_2 = n k \cdot 2 T_1 = 2 P_1$$

2 martadan ko'proq

Toviqning bugining holatini ideal gazning holat (Mendeleev - Kleryon tenglamasi taqriban ifodalaydi.

12 $v_{kv}^2 = \frac{3 R T}{M}$ $T = \frac{M v_{kv}^2}{3 R}$

$$T = \frac{4 \cdot 10^{-3} \cdot (500)^2}{3 \cdot 8,31} = 40,1 \text{ K}$$

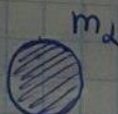
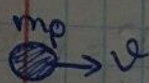
C

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kanakisi uchun
Uchquduq

14

$$m_d = 4m_p$$

$$v \ll c$$



$$m_p v + m_d v_{d1} = (m_p + m_d) u$$

$$m_p v = (m_p + m_d) u$$

$$u = \frac{m_p v}{m_p + m_d}$$

$$u = \frac{m_p v}{m_p + 4m_p} = \frac{m_p v}{5m_p}$$

$$= \frac{v}{5}$$

$$E_k = \frac{(m_p + m_d) u^2}{2}$$

$$E = \frac{m_p v^2}{2}$$

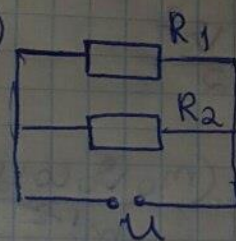
$$E_k = \frac{(m_p + 4m_p) \left(\frac{v}{5}\right)^2}{2}$$

$$= \frac{5m_p \cdot \frac{v^2}{25}}{2} = \frac{m_p v^2}{2 \cdot 5}$$

$$E_k = \frac{E}{5}$$

A

13



$$R_1 = \frac{\rho l_1}{S_1}$$

$$R_2 = \frac{\rho l_2}{S_2}$$

$$R_1 = \frac{\rho l_1}{S_1} = \frac{\rho \cdot c}{a \cdot b}$$

$$R_2 = \frac{\rho l_2}{S_2} = \frac{\rho \cdot 1,1c}{1,1a \cdot 1,1b} = \frac{R_1}{1,1}$$

$$E_1 = \frac{U}{d_1} = \frac{U}{c}$$

$$E_2 = \frac{U}{d_2} = \frac{U}{1,1c} = \frac{E_1}{1,1}$$

$$\frac{E_1}{E_2} = 1,1$$

D

15

$$R = 9 \text{ km}$$

$$E = 18 \text{ kV/m}$$

$$E = \frac{k q r}{R^2}$$

$$q r = \frac{E R^2}{k}$$

$$q r = \frac{18 \cdot 10^3 \cdot (9 \cdot 10^{-3})^2}{9 \cdot 10^9}$$

$$= 16,2 \cdot 10^{-9} \text{ C} = 16,2 \text{ nC}$$

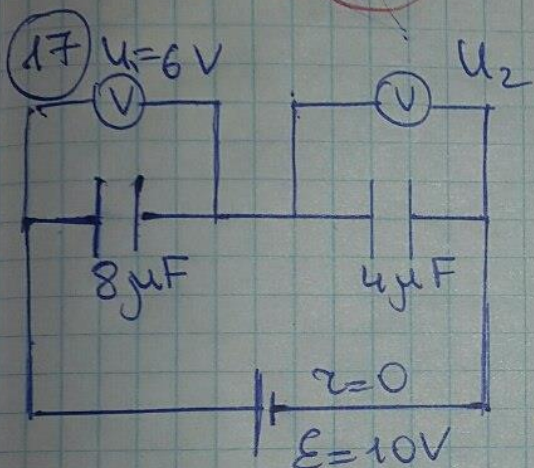
A

Муримов Хумай

$$(16) \quad W = \frac{CU^2}{2}$$

Kondensatorning energiyasi uning qo'llamalarida o'zidagi fazoda to'planadi

A



$$C_k = \frac{C_1 \cdot C_2}{C_1 + C_2}$$

$$C_k = \frac{8 \mu F \cdot 4 \mu F}{12 \mu F} = \frac{8}{3} \mu F$$

$$U_1 + U_2 = E$$

$$U_2 = E - U_1$$

$$U_2 = 10V - 6V = 4V$$

$$Q_1 = C_1 U_1 = 8 \cdot 10^{-6} F \cdot 6V = 48 \mu C$$

$$Q_2 = C_2 U_2 = 4 \cdot 10^{-6} F \cdot 4V = 16 \mu C$$

C

$$J: 48 \mu C, 16 \mu C$$

$$(18) \quad R = R_0 \cdot (1 + \alpha t)$$

$$R(0) = 0$$

$$R \sim T \quad \frac{R_1}{R_2} = \frac{T_1}{T_2}$$

$$\frac{R_1}{R_2} = \frac{T}{T_1} \quad U = \text{const}$$

$$I = \frac{U}{R_1} \quad I_1 = \frac{U}{R_2}$$

$$\frac{I}{I_1} = \frac{\frac{U}{R_1}}{\frac{U}{R_2}} = \frac{R_2}{R_1}$$

$$I_1 = I \cdot \frac{R_1}{R_2} = \frac{I \cdot T}{T_1}$$

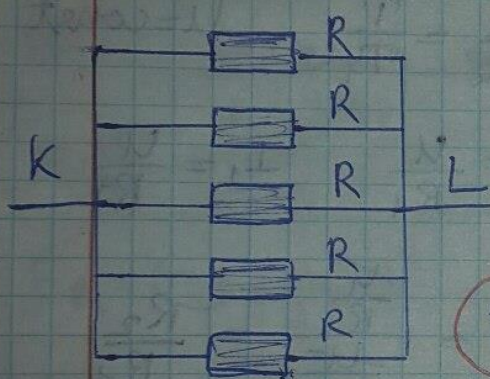
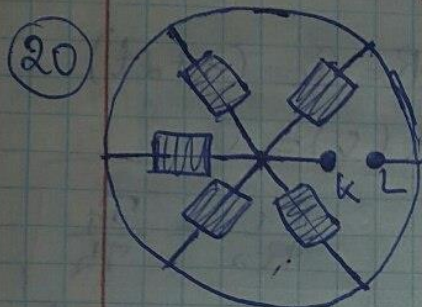
$$I_1 = \frac{I \cdot T}{T_1}$$

C

Tanob Fiziklar kanali uchun maxsus Uchqurduq

19) Elektr yuqori o'chgan daqiqada zanjirdagi tok kuchi kamayadi, kuchlanish esa o'tadi

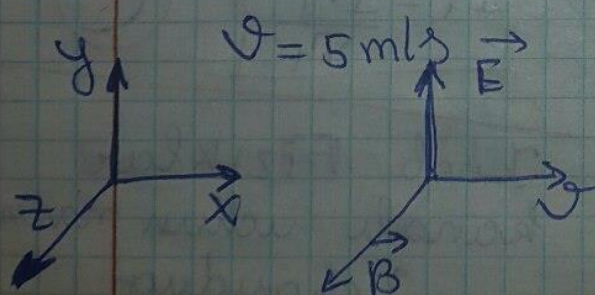
A



$$R_{KL} = R_p = \frac{R}{5}$$

A

21) $E = 50 \frac{V}{m}$ $B = 10 T$



$$Eq$$

$$Eq = FL$$

$$FL$$

→ Lorens kuchi

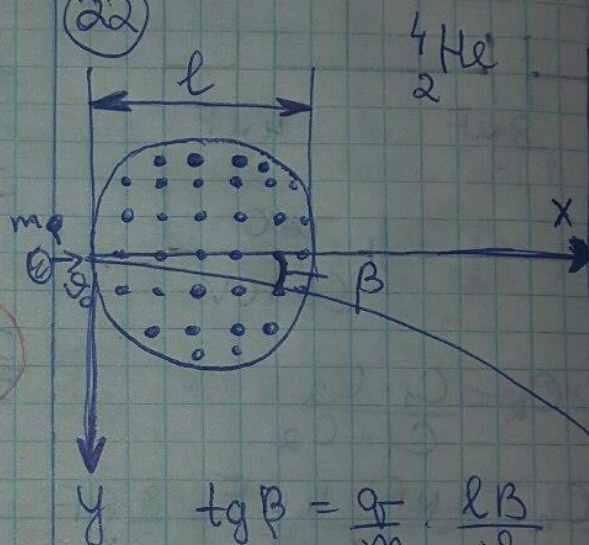
$$E \cdot q = q B v$$

$$v = \frac{E}{B}$$

2)

tog'ri chiziq

22)



$$\tan \beta = \frac{q}{m} \cdot \frac{l B}{v_0}$$

$$l = \frac{m v_0 \tan \beta}{q B}$$

$$m_p = 1,67 \cdot 10^{-27} \text{ kg}$$

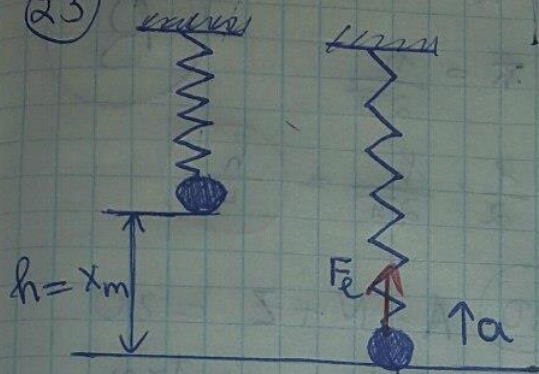
$$q_p = 1,6 \cdot 10^{-19} \text{ C}$$

$$l = \frac{1,67 \cdot 10^{-27} \cdot 8000 \cdot \tan 18^\circ}{1,6 \cdot 10^{-19} \cdot 4 T}$$

$$= 6,5 \text{ m}$$

(B)

(23)



$$mgh = \frac{kx_m^2}{2}$$

$$h = x_m$$

$$mgx_m = \frac{kx_m^2}{2}$$

$$2mg = kx_m$$

Prujina maksimal chozilganda yukning balandligi $h=0$ bo'lgandan keyin, yuk a tezlanish bilan yuqoriga harakatlanib boshlaydi.

$$F_e = mg + ma = kx_m$$

$$kx_m = 2mg$$

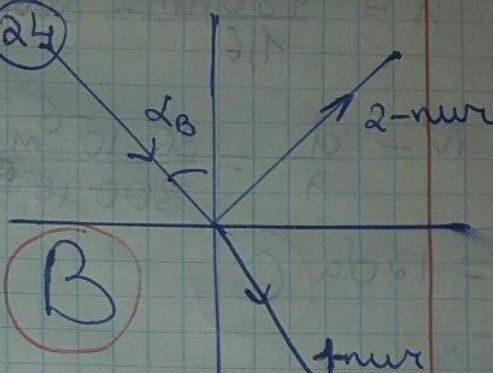
$$mg + ma = 2mg$$

(2)

$$ma = mg$$

$$a = g = 9,8 \text{ m/s}^2$$

(24)



(B)

α_B - Iushish burchagi. Brjuster burchagiga teng bo'lsa, 2-nur to'la qutblanadi. Aks holda qisman.

1-nur hech qachon (ixtiyoriy) burchakda ham to'la qutblanmaydi.

(25)

$$\varphi = LI$$

$$[\varphi] = 1 \text{ Wb}$$

veber

magnit oqimi

(A)

(26) $n = \frac{\lambda_0}{\lambda}$

$\lambda = \frac{480 \text{ nm}}{1,6} = 300 \text{ nm}$

$N = \frac{d}{\lambda} = \frac{36 \cdot 10^{-6} \text{ m}}{300 \cdot 10^{-9} \text{ m}} = 120$ **C**

(27) 1 va 2 to'g'ri

C

(28) 1) $L = L_0 \cdot \sqrt{1 - \frac{v^2}{c^2}}$ o'zga radi

2) $t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ o'zga radi

3) $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ o'zga radi

J: 4 va 5

A

(29) Protonning spini

$\frac{1}{2}$ ga teng

$\hbar = \frac{h}{2\pi}$

$\frac{1}{2} \cdot \frac{h}{2\pi} = \frac{h}{4\pi}$

B

(30) $A = N + Z = 20$

10 ta neytron

A 10 ta proton

10 ta elektron

Agar atom **+2e** zaryadga ega bo'lsa 2 ta elektron chiqib ketadi

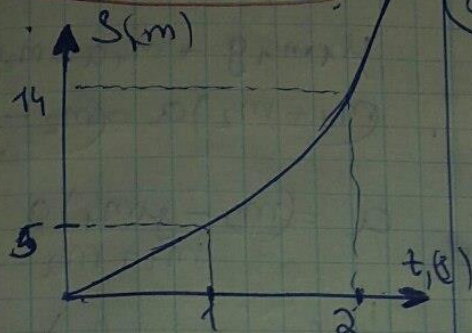
elektron 8 ta
proton 10 ta
Neytron 10 ta

Tanob Fiziklar
kanali uchun
maxsus

Ulchovulug

Variant 6

①



$$S = v_0 t + \frac{a t^2}{2}$$

$$14 = v_0 \cdot 2 + \frac{a \cdot 2^2}{2} = 2v_0 + 2a \quad (3)$$

$$5 = v_0 \cdot 1 + \frac{a \cdot 1^2}{2} = v_0 + \frac{a}{2}$$

$$\begin{cases} 14 = 2v_0 + 2a \\ 5 = v_0 + \frac{a}{2} \end{cases} \quad | \cdot 4$$

$$\begin{cases} 14 = 2v_0 + 2a \\ 20 = 4v_0 + 2a \end{cases} \quad (2)$$

$$\begin{cases} 14 = 2v_0 + 2a \\ 20 = 4v_0 + 2a \end{cases}$$

$$6 = 2v_0 \quad v_0 = 3 \text{ m/s}$$

$$5 = 3 + \frac{a}{2} \quad a = 4 \text{ m/s}^2$$

$$S_{\text{sum}} = 3 \cdot 3 + \frac{4 \cdot 3^2}{2} = 27 \text{ m}$$

$$v_{\text{ort}} = \frac{S_{\text{sum}}}{t_{\text{sum}}} = \frac{27 \text{ m}}{3 \text{ s}} = 9 \frac{\text{m}}{\text{s}}$$

② $t = -3 \text{ s} \quad x = -900 \text{ m}$

$$v = 15 \text{ m/s}$$

$$x = x_0 + v_x t \quad A$$

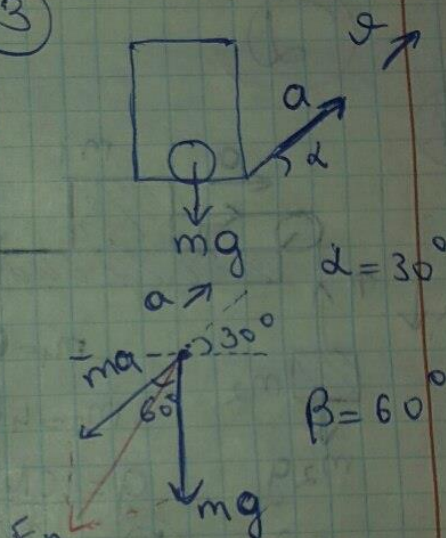
$$-900 = x_0 + 15(-3)$$

$$x_0 = -855$$

$$x = -855 + 15t = 0$$

$$855 = 15t \quad t = 57 \text{ s}$$

③



$$F_n = \sqrt{(ma)^2 + (mg)^2 + 2ma \cdot mg \cos \beta}$$

$$F_n = m \cdot \sqrt{a^2 + g^2 + 2ag \cos \beta}$$

$$F_n = 2 \text{ kg} \cdot \sqrt{(6 \text{ m/s}^2)^2 + (10 \text{ m/s}^2)^2 + 2 \cdot 6 \cdot 10 \cdot \cos 60^\circ} = 28 \text{ N}$$

$$n = \frac{F_n}{mg} \Rightarrow \text{yuklanishi}$$

$$n = \frac{28 \text{ N}}{2 \text{ kg} \cdot 10 \text{ m/s}^2} = 1,4$$

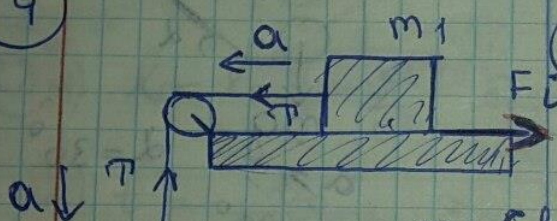
$$F_T = ma \Rightarrow \text{teng ta'sir etuvchi kuch}$$

$$\vec{F}_1 + \vec{F}_2 + \dots + \vec{F}_n = m\vec{a} = \vec{F}_T$$

$$F_T = 2 \text{ kg} \cdot 6 \text{ m/s}^2 = 12 \text{ N}$$

2

4



$$m_1 = 6 \text{ kg}$$

$$m_2 = 4 \text{ kg}$$

$$g = 10 \frac{\text{N}}{\text{kg}}$$

$$\mu = 0,3$$

B

$$T = m_2 g - m_2 a$$

$$T = m_1 a + F_f$$

$$F_f = \mu m_1 g$$

$$T = \mu m_1 g + m_1 a$$

$$\mu m_1 g + m_1 a = m_2 g - m_2 a$$

$$(m_1 + m_2) a = (m_2 - \mu m_1) g$$

$$a = \frac{(m_2 - \mu m_1) g}{m_1 + m_2}$$

$$a = \frac{(4 \text{ kg} - 0,3 \cdot 6 \text{ kg}) \cdot 10 \text{ m/s}^2}{6 \text{ kg} + 4 \text{ kg}}$$

$$= \frac{2,2 \text{ kg} \cdot 10 \text{ m/s}^2}{10 \text{ kg}} = 2,2 \frac{\text{m}}{\text{s}^2}$$

5



$$F_{f1} = \mu m_1 g$$

$$F_{f1} = 0,3 \cdot 2 \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2} = 6 \text{ N}$$

$$F_{f2} = \mu m_2 g$$

$$F_{f2} = 0,3 \cdot 1 \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2} = 3 \text{ N}$$

$$F_{f1} + F_{f2} > F$$

Demak jismlar
sujimaydi

$$T + F_{i1} = F$$

$$T = F - F_{i1} = 8\text{N} - 6\text{N} = 2\text{N}$$

(B)

$$(6) \quad v = \sqrt{2ah}$$

$$h = \frac{v^2}{2a} = \frac{v^2}{2 \cdot 15g} = \frac{v^2}{30g}$$

$$h = \frac{(8 \cdot 10^3 \text{ m/s})^2}{30 \cdot 10 \text{ m/s}^2} = \frac{64 \cdot 10^6 \text{ m}^2/\text{s}^2}{300 \frac{\text{m}}{\text{s}^2}} = 213 \text{ km}$$

(A)

$$(7) \quad F = kv \quad P = F \cdot v$$

$$P = F \cdot v = k \cdot v \cdot v = kv^2$$

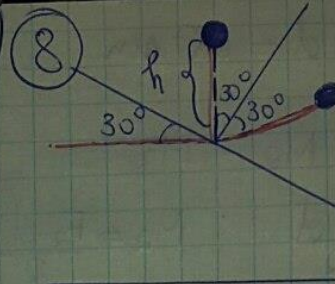
$$k = \frac{P}{v^2} \quad 4P = kv_2^2$$

$$4P = \frac{P}{v^2} \cdot v_2^2$$

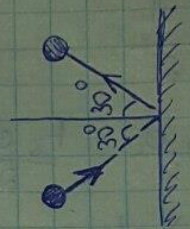
$$\sqrt{4v^2} = \sqrt{v_2^2}$$

$$v_2 = 2v$$

(C)



$\alpha = 30^\circ$



$$v = \sqrt{2gh}$$

$$v = \sqrt{2 \cdot 10 \frac{\text{m}}{\text{s}^2} \cdot 1,25 \text{ m}} = 5 \text{ m/s}$$

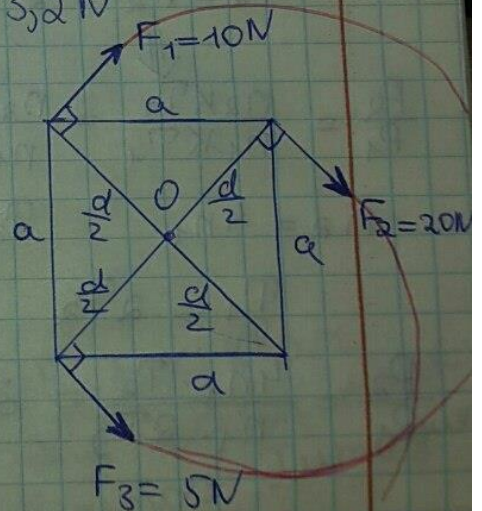
$$2mv \cos \alpha = F \cdot t$$

$$F = \frac{2mv \cos \alpha}{t}$$

$$F = \frac{2 \cdot 2 \text{ kg} \cdot 5 \text{ m/s} \cdot \cos 30^\circ}{0,1 \text{ s}}$$

$$= 173,2 \text{ N}$$

(9)



$$d_1 = d_2 = d = 20 \text{ cm}$$

$$M = M_1 + M_2 - M_3$$

$$M_1 = \frac{F_1 \cdot d}{2} \quad M_2 = \frac{F_2 \cdot d}{2}$$

$$M_3 = \frac{F_3 \cdot d}{2}$$

$$M = \frac{F_1 \cdot d}{2} + \frac{F_2 \cdot d}{2} - \frac{F_3 \cdot d}{2} = \frac{(F_1 + F_2 - F_3) \cdot d}{2}$$

$$M = \frac{(10 \text{ N} + 20 \text{ N} - 5 \text{ N}) \cdot 20 \text{ cm}}{2} = 250 \text{ N} \cdot \text{cm}$$

$$(10) \quad P_1 = n_1 k T_1$$

$$P_2 = n_2 k T_2$$

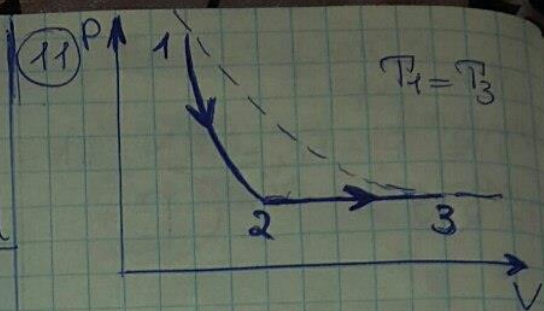
$$\frac{P_2}{P_1} = \frac{n_2 k T_2}{n_1 k T_1} = \frac{n_2 \cdot T_2}{n_1 \cdot T_1}$$

$$n_2 = 4n_1$$

$$T_2 = \frac{T_1}{2}$$

$$T_1 = 2T_2$$

$$\frac{P_2}{P_1} = \frac{4n_1 \cdot T_2}{n_1 \cdot 2T_2} = 2$$



(I) Adiabatic

$$Q = A + \Delta U = 0$$

$$A_1 = -\Delta U = -\frac{3}{2} \nu R \Delta T =$$

$$= -\frac{3}{2} \nu R (T_2 - T_1) =$$

$$= \frac{3}{2} \nu R (T_1 - T_2)$$

(II) Isochoric

$$Q = A + \Delta U$$

$$A_2 = \nu R (T_3 - T_2)$$

$$T_3 = T_1$$

$$A_2 = \nu R (T_1 - T_2)$$

$$\Delta U = \frac{3}{2} \nu R \Delta T = \frac{3}{2} \nu R (T_1 - T_2)$$

(C)

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Nurimov Xumoyun

$$Q = A + \frac{3}{2} A_2 = \frac{5}{2} A_2$$

$$E = \frac{k q_1 q_2}{R^2}$$

(B)

$$A_1 = \frac{3}{2} \cdot R (T_1 - T_2) = \frac{3}{2} A_2$$

$$E = \frac{9 \cdot 10^9 \cdot 82 \cdot 10^{-3}}{(6,4 \cdot 10^6)^2} = 18 \frac{\mu V}{m}$$

$$A_1 + A_2 = A$$

$$A_2 + \frac{3}{2} A_2 = A$$

$$\frac{5}{2} A_2 = A$$

(D)

$m_p v$

m_d

$$Q = \frac{5}{2} A_2 = A = 21 \text{ KJ}$$

$$E = \frac{m_p v^2}{2}$$

(12)

(C)

Quyosh plazmadan tarkib topgan, ya'ni kuchli ionlashgan holatda bo'ladi

$$m_p v + m_d \cdot 0 = m_p u + m_d u$$

$$m_p v = (m_p + m_d) u$$

$$u = \frac{m_p v}{m_p + m_d}$$

(13) $S_1 = 10 \text{ sm}^2$ bitta

$$S = 4\pi R^2$$

$$S = 4\pi R^2$$

$$N = \frac{S}{S_1} = \frac{4\pi R^2}{S_1}$$

$$u = \frac{m_p v}{m_p + 4m_p} = \frac{m_p v}{5m_p} = \frac{v}{5}$$

$$E_k = \frac{(m_p + m_d) u^2}{2} =$$

$$= \frac{5m_p \cdot \left(\frac{v}{5}\right)^2}{2} = \frac{8m_p \cdot v^2}{2 \cdot 25}$$

$$= \frac{E}{5}$$

$$E_t = E = E_k + E_p$$

$$N = \frac{4 \cdot 3,14 \cdot (6,4 \cdot 10^6 \text{ m})^2}{10 \cdot 10^{-4} \text{ m}^2} =$$

$$= 51,4 \cdot 10^{16} \text{ ta elektron}$$

$$q = Ne = 51,4 \cdot 10^{16} \cdot 1,6 \cdot 10^{-19} \text{ C}$$

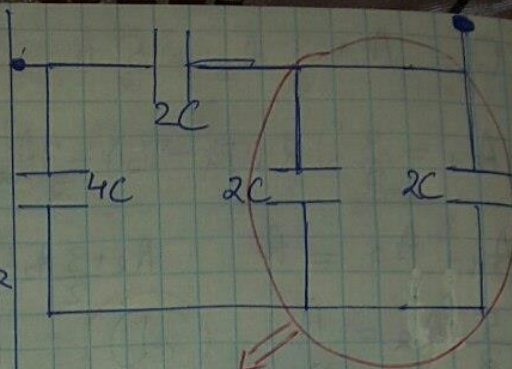
$$= 82 \cdot 10^{-3} \text{ C}$$

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Nurimov Xumoyun

$$E = \frac{E}{5} + E_p$$

$$E_p = \frac{4E}{5}$$

(C)



$$(15) \quad W_1 = \frac{k \cdot q_1 \cdot 2q_1}{r} = \frac{2kq_1^2}{r}$$

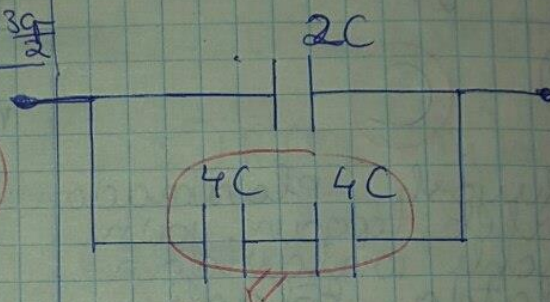
$$q_1' = q_2' = \frac{q_1 + 2q_1}{2} = \frac{3q_1}{2}$$

$$C_{p1} = 2C + 2C = 4C$$

$$W_2 = \frac{k \cdot q_1' \cdot q_2'}{r} = \frac{k \cdot \frac{3q_1}{2} \cdot \frac{3q_1}{2}}{r}$$

$$= \frac{9}{4} \frac{kq_1^2}{r}$$

(C)

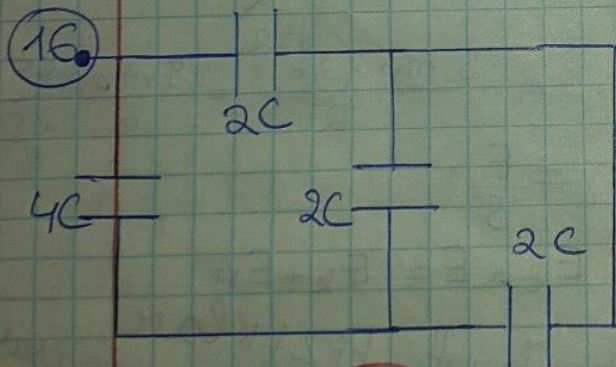


$$\frac{W_2}{W_1} = \frac{\frac{9}{4} \frac{kq_1^2}{r}}{\frac{2kq_1^2}{r}} = \frac{9}{8}$$

$$C_R = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

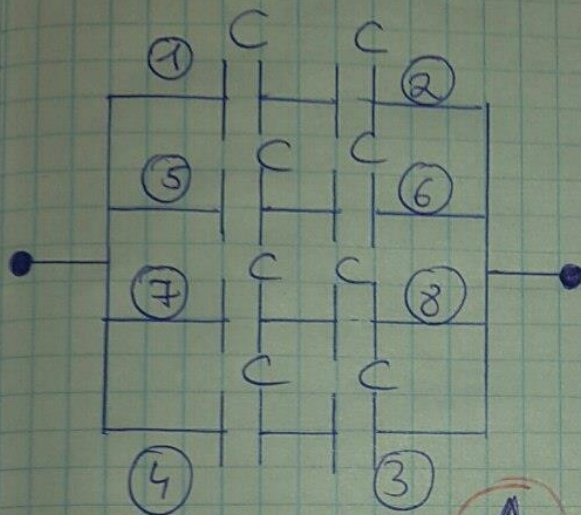
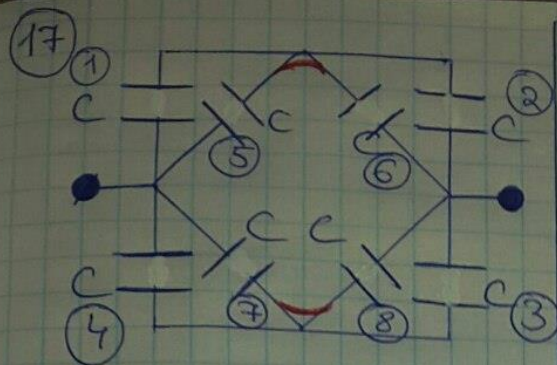
$\frac{9}{8}$ marta o'tadi

$$C_{um} = 2C + C_R = 2C + 2C = 4C$$



(A)

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Nurimov Rumay



$$C_R = \frac{C \cdot C}{C + C} = \frac{C}{2}$$

$$C_p = 4C_R = 4 \cdot \frac{C}{2} = 2C$$

18) $S = 1,1 \cdot 10^{-6} \text{ m}^2$

$$I = 500 \text{ mA}$$

$$\rho = 1,1 \cdot 10^{-4} \Omega \cdot \text{m} = 1,1 \cdot 10^{-6} \Omega \cdot \text{m}$$

$$R = \frac{\rho \cdot l}{S} = \frac{1,1 \cdot 10^{-6} \Omega \cdot \text{m} \cdot 3 \text{ m}}{1,1 \cdot 10^{-6} \text{ m}^2} = 3 \Omega$$

$$U = IR = 500 \cdot 10^{-3} \text{ A} \cdot 3 \Omega = 1,5 \text{ V}$$

D

19) Diod P-n stish asosida ishlaydigan qurilmadir. Diod tokni faqat bir tomonlama otkarsadi.

A

20) Sorens kuchu radiatsion belbogi magnit mayda hosil boladi

C

21) 2

chunki kondensator-dan tok otmaydi, lampa yonmaydi

B

22 Butun fazodagi g'altak haqida

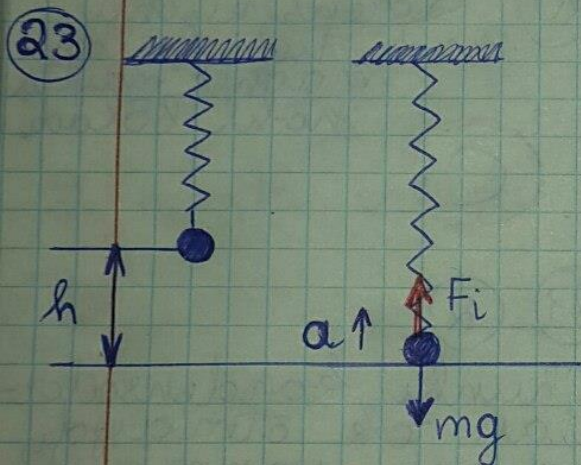
Fazoda g'altak qanchadan hajmini egalab turgan bo'lsa, o'sha hajmida deyarli kerak.

Energiya zichligi

$$\bar{w} = \frac{W}{V} \text{ da}$$

ham bir o'tacha hajm uchun g'altak hajmini olamiz

A



$$mgh = \frac{kx_m^2}{2}$$

$$x_m = h \quad mgh = \frac{k h^2}{2}$$

$$2mg = k \cdot h = k \cdot x_m$$

$$F_i = mg + ma = kx_m$$

$$mg + ma = 2mg$$

A $ma = mg$

$$a = g = 9,8 \text{ m/s}^2$$

24

1; 4



B

Tabiiy yorug'lik shisha va suv chegarasiga tushganda, bir qismi qaytadi, bir qismi esa sirib ikkinchi muhitda harakatlanadi. Bu nurlarning yo'liga turmali plastina qo'yib, ularning qisman qutblanishiga ishonch qilish mumkin.

25 B

Geometrik optika

(26) In tensiulik

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \varphi$$

$$\Delta \varphi = \frac{\pi}{2}$$

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \frac{\pi}{2}$$

$$= I_1 + I_2$$

$$I_n = I + 2I = 3I$$

(27) 3,4

A

(28) $t_0 = 12 - 10 = 2$ yil
kosmik kemada

$t \rightarrow$ yerda otgan vaqt

$$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$t = \frac{2 \text{ yil}}{\sqrt{1 - \frac{21^2 c^2}{25 c^2}}} = \frac{2 \text{ yil}}{\frac{2}{5}} =$$

$$= 5 \text{ yil}$$

$$20 \text{ yosh} + 5 = 25 \text{ yosh}$$

A

(29) Proton va antiproton
spini biri o'yl $\frac{1}{2}$
ga teng.

$$\frac{\frac{1}{2}}{\frac{1}{2}} = 1$$

A

(30) $2h\nu = m_e c^2$

$$\nu = \frac{m_e c^2}{2h}$$

$$p = \frac{h}{\lambda} = \frac{h}{\frac{c}{\nu}} = \frac{h\nu}{c}$$

$$p = \frac{h}{c} \cdot \frac{m_e c^2}{2h} = \frac{m_e c}{2}$$

$$p = \frac{9,1 \cdot 10^{-31} \text{ kg} \cdot 3 \cdot 10^8 \text{ m/s}}{2} =$$

$$= 1,365 \cdot 10^{-22} \text{ kg m/s}$$

A

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kanali uchun
Wurimov Jumayun

Variant 7

① $v_0 = 20 \text{ m/s}$

$S = 50 \text{ m}$

$S = v_0 t - \frac{at^2}{2}$

$a = \frac{v_0 - v}{t}$

$v = 0$

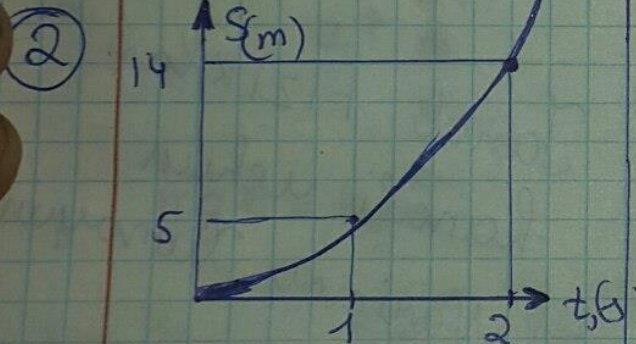
$a = \frac{v_0}{t}$

$S = v_0 t - \frac{v_0}{t} \cdot \frac{t^2}{2} = v_0 t - \frac{v_0 t}{2}$

$= \frac{v_0 t}{2}$

$t = \frac{2S}{v_0} = \frac{2 \cdot 50 \text{ m}}{20 \text{ m/s}} =$

$= 5 \text{ s}$



A

$S = v_0 t + \frac{at^2}{2}$

$5 = v_0 \cdot 1 + \frac{a}{2} \cdot 1 = v_0 + \frac{a}{2}$

$14 = v_0 \cdot 2 + \frac{a}{2} \cdot 2^2 = 2v_0 + 2a$

$$\begin{cases} 5 = v_0 + \frac{a}{2} \\ 14 = 2v_0 + 2a \end{cases} \quad | \cdot 2$$

$10 = 2v_0 + a$

$14 = 2v_0 + 2a$

$4 = a \quad a = 4 \text{ m/s}^2$

$5 = v_0 + \frac{4}{2} = v_0 + 2$

$v_0 = 3 \text{ m/s}$

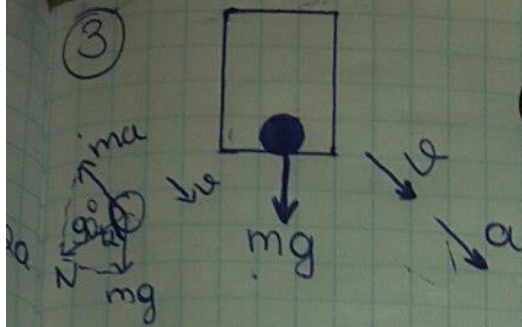
$S_3 = v_0 + \frac{a}{2} \cdot (2 \cdot 3 - 1) =$

$= 3 + \frac{4}{2} \cdot 5 = 13 \text{ m}$

$v_{\text{ort}} = \frac{S_3}{t_3} = \frac{13 \text{ m}}{1 \text{ s}} = 13 \frac{\text{m}}{\text{s}}$

D

③



Ⓑ

$$N = \sqrt{(ma)^2 + (mg)^2 + 2ma \cdot mg \cdot \cos(90^\circ + \alpha)}$$

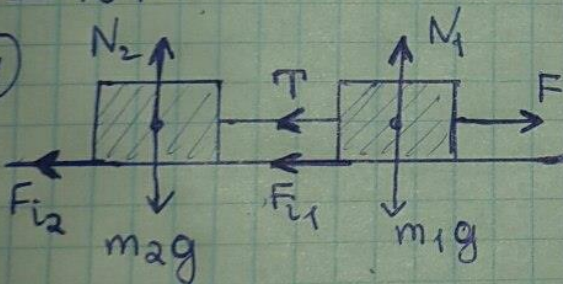
$$= m \cdot \sqrt{a^2 + g^2 - 2a \cdot g \cdot \sin \alpha}$$

$$N = 2 \cdot \sqrt{5^2 + 10^2 - 2 \cdot 5 \cdot 10 \cdot \frac{1}{2}}$$

$$= 2 \cdot \sqrt{75} = 10\sqrt{3} \text{ N}$$

$$F = ma = 2 \text{ kg} \cdot \frac{5 \text{ m}}{s^2} = 10 \text{ N}$$

④



$$F_{12} = \mu m_1 g$$

$$F_{12} = 0,3 \cdot 2 \text{ kg} \cdot 10 \frac{\text{m}}{s^2} = 6 \text{ N}$$

$$= 6 \text{ N}$$

$$F_{12} = \mu m_2 g$$

$$F_{12} = 0,3 \cdot 1 \text{ kg} \cdot 10 \frac{\text{m}}{s^2} = 3 \text{ N}$$

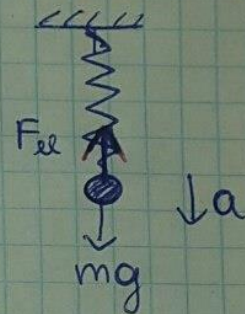
$$F_{11} + F_{12} = 9 \text{ N} = F$$

$$T + F_{11} = F$$

$$T = F - F_{11}$$

$$T = 9 \text{ N} - 6 \text{ N} = 3 \text{ N}$$

⑤



$$F_e = mg - ma = kx$$

$$m(g - a) = kx$$

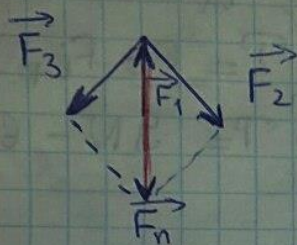
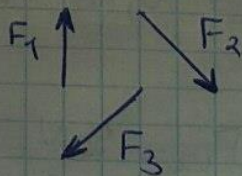
$$m = \frac{kx}{g - a}$$

$$m = \frac{100 \frac{\text{N}}{\text{m}} \cdot 6 \cdot 10^{-2} \text{ m}}{10 \frac{\text{m}}{s^2} - 4 \frac{\text{m}}{s^2}} =$$

$$= \frac{6 \text{ N}}{6 \frac{\text{m}}{s^2}} = 1 \text{ kg}$$

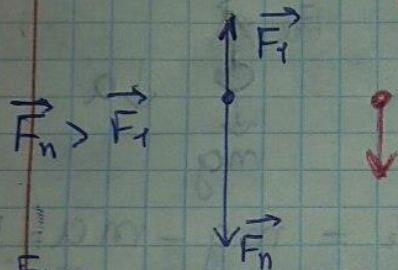
Ⓒ

⑥



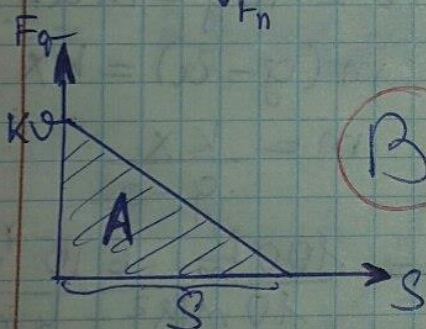
$$\vec{F}_n = \vec{F}_3 + \vec{F}_2$$

(A)



$$\vec{F}_n > \vec{F}_1$$

⑦



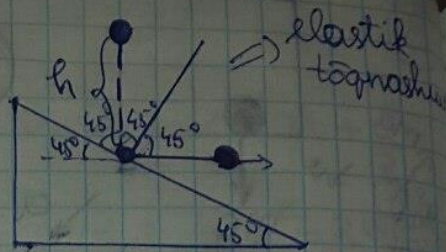
(B)

$$A = \frac{kx \cdot s}{2} = \frac{m \cdot x}{2}$$

$$k \cdot s = p$$

$$p = 20 \frac{\text{kg}}{\text{s}} \cdot 15 \text{ m} = 300 \text{ kg} \cdot \frac{\text{m}}{\text{s}}$$

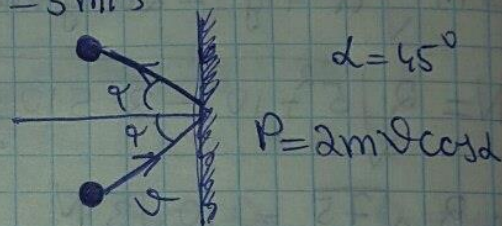
⑧



$$h = 1,25 \text{ m}$$

$$v = \sqrt{2gh} = \sqrt{2 \cdot 10 \frac{\text{m}}{\text{s}^2} \cdot 1,25 \text{ m}} =$$

$$= 5 \text{ m/s}$$



$$\alpha = 45^\circ$$

$$P = 2mv \cos \alpha$$

$$P = 2mv \cos \alpha = F \cdot t$$

$$F = \frac{2mv \cos \alpha}{t}$$

$$F = \frac{2 \cdot 2 \text{ kg} \cdot 5 \text{ m/s} \cdot \cos 45^\circ}{0,1 \text{ s}}$$

$$= 200 \cdot \frac{\sqrt{2}}{2} \text{ N} = 141 \text{ N}$$

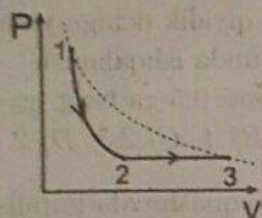
(A)

⑨ $m_1 = 4 \text{ g}$ $m_2 = 6 \text{ g}$

$$m_3 = 10 \text{ g}$$

9. Ikki mol neon inert gazi ($M=20$ g/mol) isitkichdan Q_1 issiqlik olib, izobarik kengaymoqda, so'ngra sovutkichga Q_2 issiqlik berib, izoxorik ravishda dastlabki temperaturagacha sovutilmoqda. Q_1/Q_2 nisbat topilsin.
A) 0,66. B) 1,67. C) 1. D) 1,33.

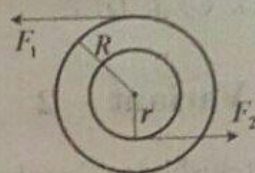
10. Uch atomli gaz dastlab adiabatik, so'ngra izobarik kengaydi. Ideal gazning boshlang'ich temperaturasi oxirgi temperaturasiga teng. Gaz to'liq kengayishda 20 kJ ish bajargan. Adiabatik kengayishda va izobarik kengayishda qancha ish bajarilgan (kJ)?



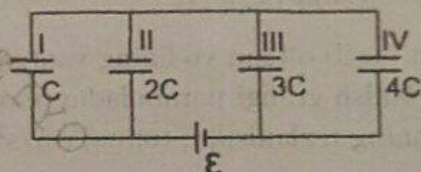
- A) 12,6; 8,4. B) 12,8; 8,7. C) 15; 5.
D) 12,4; 8,6.
11. Geliy gazining ichki energiya zichligi 18 kJ/m³. Uning bosimi nimaga teng (kPa)?
A) 24. B) 36. C) 18. D) 12.
12. Doimiy tok manbaiga ulangan yassi havo kondensatorining plastinkalari orasiga dielektrik singdiruvchanligi $\epsilon=2,1$ bo'lgan modda qoplamalarga tekizmasdan kirtildi. Bunda plastinkalar orasidagi ta'sir kuchi qanday o'zgardi?
A) 1,4 marta kamaydi.
B) 2,1 marta kamaydi.
C) 4,41 marta ortdi.
D) 2,1 marta ortdi.
13. Proton uzoqdan $1,5v$ ($v \ll c$) tezlik bilan dastlab tinch turgan pozitron

tomon harakatlanmoqda. Proton bilan ta'sirlashgandan so'ng pozitronning natijaviy tezligi qanday bo'lishini baholang. Protonning massasi pozitronnikidan 1840 marta ortiq.
A) $3v$. B) $2v$. C) $1,5v$. D) $v/2$.

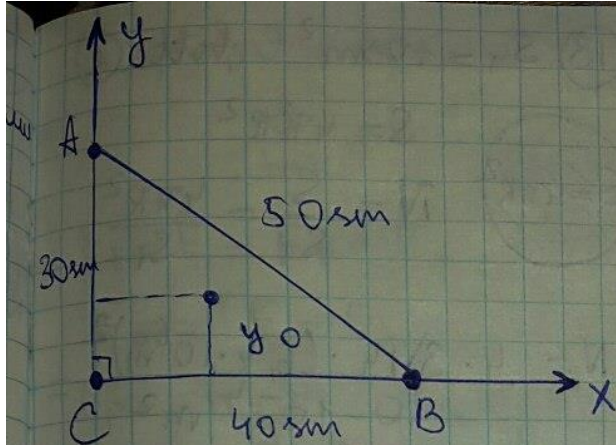
14. Radiuslari R va r bo'lgan ikki disk rasmda ko'rsatilgandek bir-biriga kavsharlangan. Jismlar sistemasini kuch momenti modulini toping (N·m). $R=3r=45$ cm, $F_1=24$ N, $F_2=8$ N.



- A) 12. B) 9,6. C) 13. D) 15.
15. Quyidagi rasmda kondensatorlardagi kuchlanishlarni nisbatini U_1/U_2 toping.



- A) 1. B) $7/3$. C) $3/7$. D) 2.
16. Yassi kondensatorga 4 nC zaryad berilganda uning qoplamalari orasidagi muhitda hosil bo'lgan elektr maydon energiya zichligi $0,2$ mJ/m³ ga teng bo'ldi. Agar kondensator zaryadi 8 nC ga oshirilsa, elektr maydon energiya zichligi qanchaga o'zgaradi (mJ/m³)?
A) 1,6. B) 1,8. C) 2,2. D) 2,4.
17. Zaryad saqlanish qonunini kim kiritgan?
A) Om. B) Amper.
C) Faradey. D) Volta.



$$x_0 = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3}{m_1 + m_2 + m_3}$$

$$y_0 = \frac{m_1 y_1 + m_2 y_2 + m_3 y_3}{m_1 + m_2 + m_3}$$

$$y_0 = \frac{4g \cdot 30 + 6g \cdot 0 + 10g \cdot 0}{4g + 6g + 10g}$$

$$= \frac{120 \text{ cm} \cdot g}{20g} = 6 \text{ cm}$$

A

Wurimaru Tumayun
Janob Fiziklar
kanali uchun
maxsus

⑩ $C = c m$ $\nu = \frac{m}{M}$

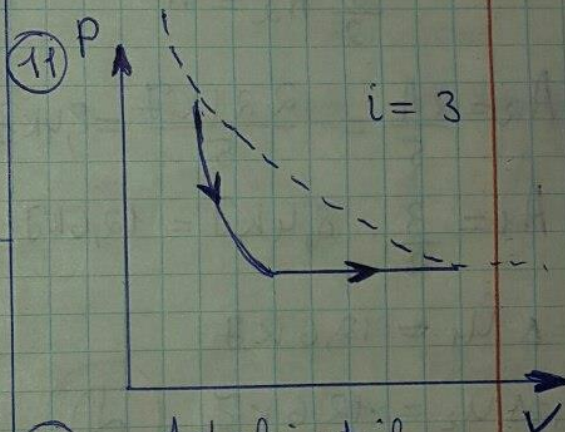
$$m = \nu M \Rightarrow C = c \nu M$$

$$\nu = 1 \text{ mol} \quad C_m = c \cdot M$$

$$C_m = \frac{380 \text{ J}}{\text{kg} \cdot \text{K}} \cdot 63,5 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}$$

$$= 24,13 \frac{\text{J}}{\text{K} \cdot \text{mol}} \cdot \frac{8,31}{8,31} =$$

$$= 2,9 \text{ R}$$



① Adiabatic

$$T_1 = T_3$$

$$Q = A + \Delta U = 0$$

$$A_1 = -\Delta U = -\frac{3}{2} \nu R (T_2 - T_1)$$

$$= \frac{3}{2} \nu R (T_1 - T_2)$$

② Izobarik

$$Q = A + \Delta U$$

$$A_2 = \sigma R \Delta T = \sigma R (T_3 - T_2) \quad (13) \quad S_1 = 10 \text{ m}^2 \quad \text{bitta } e$$

$$\Delta U_2 = \frac{3}{2} \sigma R (T_3 - T_2)$$

$$A_2 = \sigma R (T_1 - T_2)$$

$$A_1 = \frac{3}{2} \sigma R (T_1 - T_2) = \frac{3}{2} A_2$$

$$A_1 + A_2 = A$$

$$\frac{3}{2} A_2 + A_2 = A$$

$$\frac{5}{2} A_2 = A$$

$$A_2 = \frac{2A}{5} = \frac{2 \cdot 21 \text{ kJ}}{5} = 8,4 \text{ kJ}$$

$$A_1 = \frac{3}{2} \cdot 8,4 \text{ kJ} = 12,6 \text{ kJ}$$

$$A_1 = \Delta U_1 = 12,6 \text{ kJ}$$

$$A_1 = \Delta U_2 = 12,6 \text{ kJ} \quad (D)$$

$$\Delta U = \Delta U_2 - \Delta U_1 = 0$$

(12) (D)

Fazaviy o'tish modda
ni agregat holat
o'garib xarakteristika
holat o'garishi

$$S = 4\pi R^2$$

$$S = 4\pi R^2$$

$$N = \frac{S}{S_1} = \frac{4\pi R^2}{S_1}$$

$$N = \frac{4 \cdot 3,14 \cdot (6,4 \cdot 10^6 \text{ m})^2}{10 \cdot 10^{-4} \text{ m}^2} =$$

$$= 51,4 \cdot 10^{16} \text{ ta elektron}$$

$$q = Ne$$

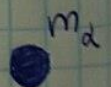
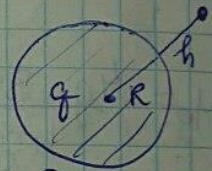
$$q = 51,4 \cdot 10^{16} \cdot 1,6 \cdot 10^{-19} \text{ C}$$

$$= 82 \cdot 10^{-3} \text{ C}$$

$$E = \frac{kq}{(R+h)^2}$$

$$E = \frac{9 \cdot 10^9 \cdot 82 \cdot 10^{-3} \text{ C}}{(6,4 \cdot 10^6 \text{ m} + 6,4 \cdot 10^6 \text{ m})^2} =$$

$$= 4,5 \mu \frac{\text{V}}{\text{m}} \quad (D)$$



(14)

$$E = \frac{m_p v^2}{2}$$

$$m_d = 4m_p$$

$$m_p v + m_d \cdot 0 = m_p \cdot 0,9v + m_d u$$

$$0,1 m_p v = m_d u$$

$$0,1 m_p \vartheta = 4 m_p \cdot u$$

$$\frac{\vartheta}{40} = u$$

(C)

$$E_t = E = E_p + E_k$$

$$E_p = E - E_k$$

$$E_p = \frac{m_p \vartheta^2}{2} - \left(\frac{m_p (0,9 \vartheta)^2}{2} + \frac{4 m_p \left(\frac{\vartheta}{40} \right)^2}{2} \right) =$$

$$= \frac{m_p \vartheta^2}{2} - \frac{0,81 m_p \vartheta^2}{2} - \frac{m_p \vartheta^2}{800} =$$

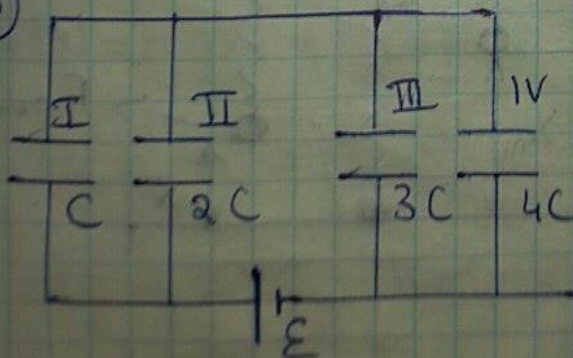
$$= \frac{0,19 m_p \vartheta^2}{2} - \frac{m_p \vartheta^2}{800} =$$

$$= \frac{19 m_p \vartheta^2}{2000} - \frac{m_p \vartheta^2}{800} =$$

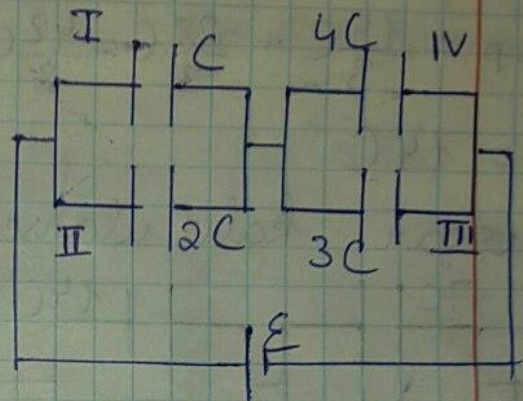
$$= \frac{75 m_p \vartheta^2}{800} = \frac{75}{400} E =$$

$$= 0,1875 E \approx 0,19 E$$

(15)



$$U_3 / U_4 = ?$$

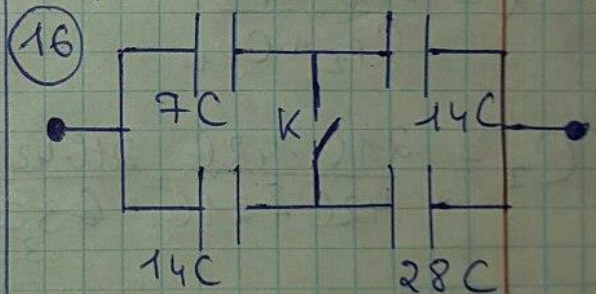


(16) U_{IV} va U_{III} Parallel ulangan

$$U_{IV} = U_{III} \text{ ga teng}$$

$$\frac{U_{III}}{U_{IV}} = \frac{U_{III}}{U_{III}} = 1$$

(A)



$$C_{R1} = \frac{7C \cdot 14C}{14C + 7C} = \frac{7C \cdot 14C}{21C}$$

$$= \frac{14}{3} C$$

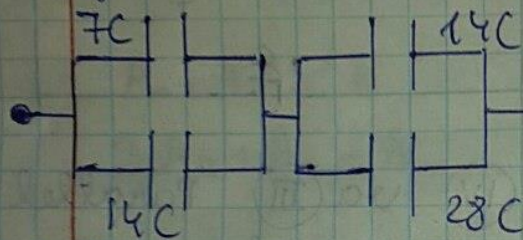
$$C_{R2} = \frac{14C \cdot 28C}{28C + 14C} = \frac{28}{3} C$$

$$C_p = C_{k1} + C_{k2}$$

$$C_p = \frac{14C}{3} + \frac{28C}{3} = \frac{42C}{3}$$

$$= 14C$$

Agar kalit ulansa



$$C_{p1} = 7C + 14C = 21C$$

$$C_{p2} = 14C + 28C = 42C$$

$$C_2 = \frac{C_{p1} \cdot C_{p2}}{C_{p2} + C_{p1}}$$

$$C_2 = \frac{21C \cdot 42C}{42C + 21C} = \frac{21 \cdot 42C}{63} \quad (18)$$

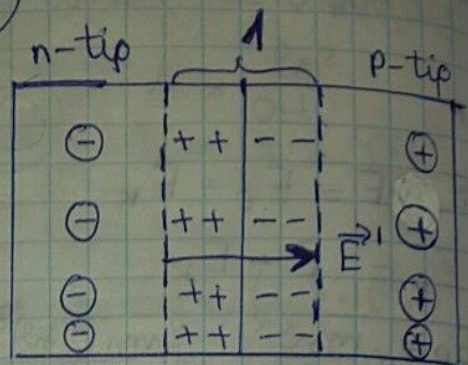
$$= 14C$$

$$C_1 = C_2 = 14C$$

Umumiy siqim o'zgar-maydi

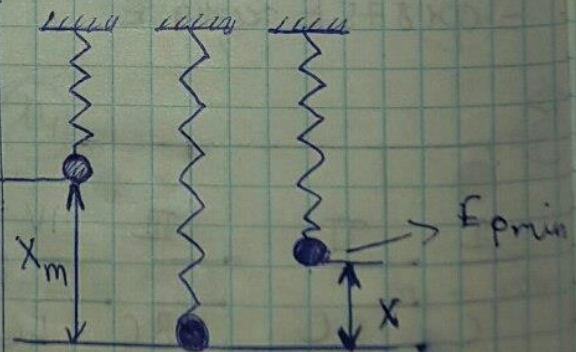
A

17



Normal temperatura-da 4 qatlamlar elektronlarning $n \rightarrow p$ yonalishida, teshiklarning $p \rightarrow n$ yonalishida o'tishlarga juda qo'shilik ko'rsatadi. Shuning uchun 1 qatlam **berkityuchi qatlam** deb ataladi

A



$$\frac{kx_m^2}{2} = mgx_m$$

$$kx_m = 2mg$$

$$E_p = E_{p1} + E_{p2} \rightarrow \text{Bujinaning potential energiyasi}$$

↓
yukning
potential energiyasi

$$E_{p1} = mgx$$

$$E_{p2} = \frac{k(x_m - x)^2}{2}$$

$$E_p = mgx + \frac{k(x_m - x)^2}{2} =$$

$$= mgx + \frac{kx_m^2}{2} - kx_mx + \frac{kx^2}{2}$$

$E_p \rightarrow \min$ bōlgani uchun E_p hosila olamiz (x bōyicha)

$$E_p'(x) = (mgx)' + \left(\frac{kx_m^2}{2}\right)' -$$

$$- (kx_mx)' + \left(\frac{kx^2}{2}\right)' =$$

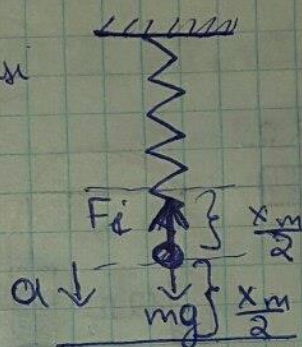
$$= mg + kx_m - kx_m + kx = 0$$

$$mg = -kx$$

$$kx_m = 2kx$$

$$x = \frac{x_m}{2} \text{ bōlganda}$$

$E_{p \min}$ bōladi



$$F_i = \frac{kx_m}{2}$$

$$F_i = mg - ma = \frac{kx_m}{2}$$

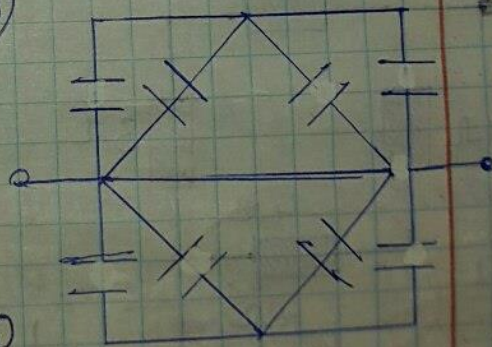
$$kx_m = 2mg$$

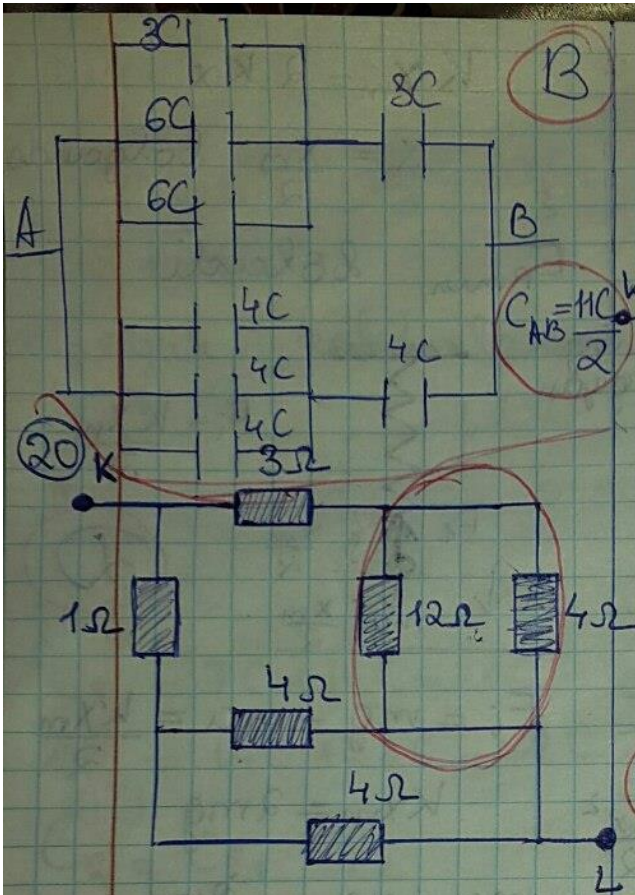
$$mg - ma = \frac{2mg}{2} = mg$$

$$mg - ma = mg$$

$$a = 0$$

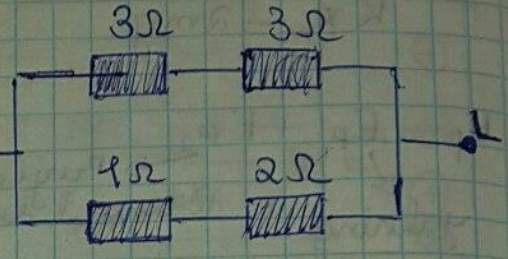
(19)





(B)

$$R_p = \frac{4\Omega \cdot 4\Omega}{4\Omega + 4\Omega} = \frac{16\Omega^2}{8\Omega} = 2\Omega$$



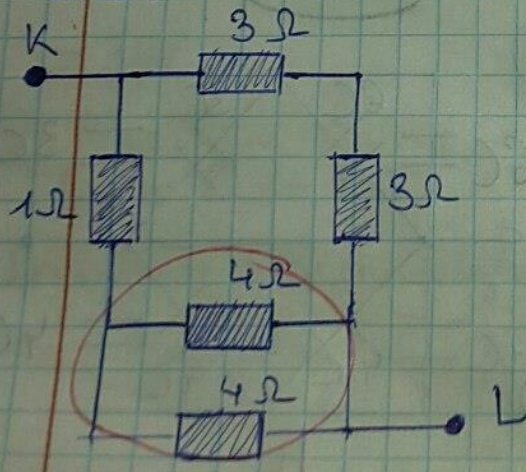
$$R_{R_1} = 3\Omega + 3\Omega = 6\Omega$$

$$R_{R_2} = 1\Omega + 2\Omega = 3\Omega$$

$$R_{RL} = \frac{6\Omega \cdot 3\Omega}{6\Omega + 3\Omega} = 2\Omega$$

(A)

$$R_R = \frac{12\Omega \cdot 4\Omega}{4\Omega + 12\Omega} = \frac{12\Omega \cdot 4\Omega}{16\Omega} = 3\Omega$$



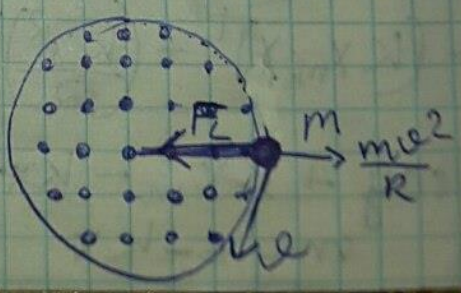
(21) (A)

metallarda, vakuumli diod va vakuumli triodda

(22) magnit maydon

(C)

(23)



22

$$F_L = \frac{mv^2}{R} = qB \sin 90^\circ \quad (25) \quad \lambda = \frac{\lambda_0}{n}$$

$$\frac{mv}{R} = qB$$

$$R = \frac{mv}{qB}$$

$$r_1 = \frac{m_p v}{q_p B}$$

$$r_2 = \frac{m_\alpha v}{q_\alpha B}$$

Proton ${}^1_1\text{H}$ Alfa zarra ${}^4_2\text{He}$

$$q_\alpha = 2q_p$$

$$m_\alpha = 4m_p$$

$$r_1 = \frac{m_p v}{q_p B}$$

$$r_2 = \frac{4m_p v}{2q_p B}$$

$$r_2 = 2r_1$$

$$\frac{1}{2} = \frac{r_1}{r_2}$$

(A)

(24)

(1)

simob

(3)

oltin

(B)

$$\lambda = \frac{\lambda_0}{n}$$

$$h = \frac{h_0}{n} = \frac{2,66\text{ m}}{1,33} = 2\text{ m}$$

(A)

(26)

$$I_n = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \alpha$$

$$\alpha = 90^\circ$$

$$I_n = I_1 + I_2$$

$$I_n = I + \frac{I}{3} = \frac{4I}{3} = 1,33I$$

(B)

(27)

1) Jism harorati
ning doimiyligi
uning quyilish
muvozanatlanganligi
dan darak beradi

(3)

manfiy zaryadlar
gan metall sharcha
fotoeffekt tuzaydi zar
yadini yopqatadi

(B)

(28)

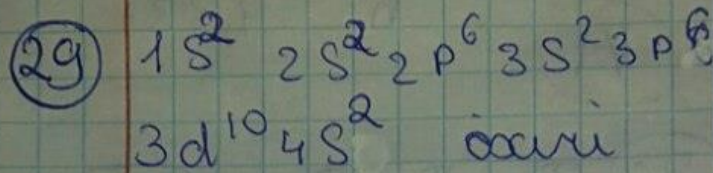
$$m_0 = 1\text{ kg}$$

massa o'zgarmaydi

$$v_n = \frac{v_1 - v_2}{1 - \frac{v_1 v_2}{c^2}} = \frac{0,5c - 0,5c}{1 - \frac{0,5c \cdot 0,5c}{c^2}} = 0$$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{m_0}{\sqrt{1 - \frac{0^2}{c^2}}} = m_0$$

①



4 qobiq s qobiqchani x
 taldirib tugaydi

Ⓒ

③ 0)
$$W = -\frac{me^4}{8\epsilon_0^2 h^2} \cdot \frac{1}{n^2}$$

Stationar holat energiyasi

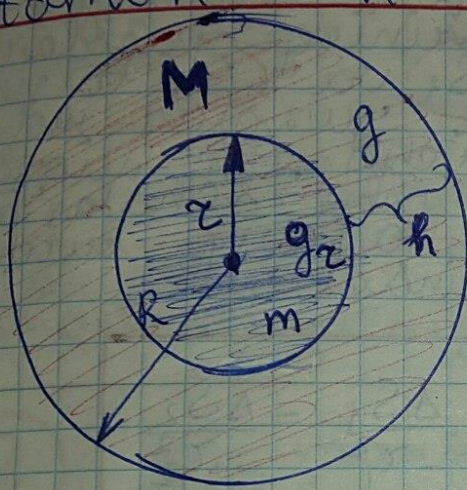
$n=1$ da $W_1 = -13,55 \text{ eV}$
 to'la $\approx 13,6 \text{ eV}$

Elektronning n-orbita-
 dagi to'la energiyasi

$$W_n = \frac{W_1}{n^2}$$

$$W_n = \frac{13,6 \text{ eV}}{2^2} = 3,4 \text{ eV}$$

Ⓐ



g h quyidagicha
bôladi.

$$M = \rho \cdot \frac{4}{3} \pi R^3$$

$$m = \rho \cdot \frac{4}{3} \pi r^3$$

$$\frac{M}{m} = \left(\frac{R}{r}\right)^3 \quad \frac{m}{M} = \left(\frac{r}{R}\right)^3$$

$$g_r = \frac{Gm}{r^2}$$

$$g = \frac{GM}{R^2}$$

$$\frac{g_r \cdot r^2}{m} = \frac{g \cdot R^2}{M}$$

$$\frac{g_r \cdot r^2}{g \cdot R^2} = \frac{m}{M} = \frac{r^3}{R^3} \Rightarrow \frac{g_r}{g} = \frac{r}{R}$$

$$g_r = g \cdot \left(\frac{R-h}{R}\right) = g \cdot \left(1 - \frac{h}{R}\right)$$



$$dF = dP \cdot 4\pi r^2$$

$$dF = \frac{G m dm}{r^2}$$

$$m = \rho \cdot \frac{4}{3} \pi r^3$$

$$dm = 4\pi r^2 dr \cdot \rho$$

$$dP \cdot 4\pi r^2 = \frac{G m dm}{r^2}$$

$$dP \cdot 4\pi r^2 = G m \cdot \frac{4\pi r^2 dr \rho}{r^2}$$

$$dP = G \cdot \rho \cdot \frac{4}{3} \pi r^3 \frac{dr}{r^2} \cdot \rho = \frac{4}{3} \pi G \rho^2 r dr$$

$$dP = \frac{4}{3} \pi G \rho^2 r dr$$

$$\begin{aligned} P &= \int_r^R dP = \int_r^R \frac{4}{3} \pi G \rho^2 r dr = \\ &= \frac{4}{3} \pi G \rho^2 \cdot \int_r^R r dr = \frac{4}{3} \pi G \rho^2 \left(\frac{r^2}{2} \Big|_r^R \right) = \\ &= \frac{4}{3} \pi G \rho^2 \left(\frac{R^2}{2} - \frac{r^2}{2} \right) = \frac{2}{3} \pi G \rho^2 (R^2 - r^2) \end{aligned}$$

$$M = \rho \cdot \frac{4}{3} \pi R^3 \quad \Rightarrow \quad \rho = \frac{3M}{4\pi R^3}$$

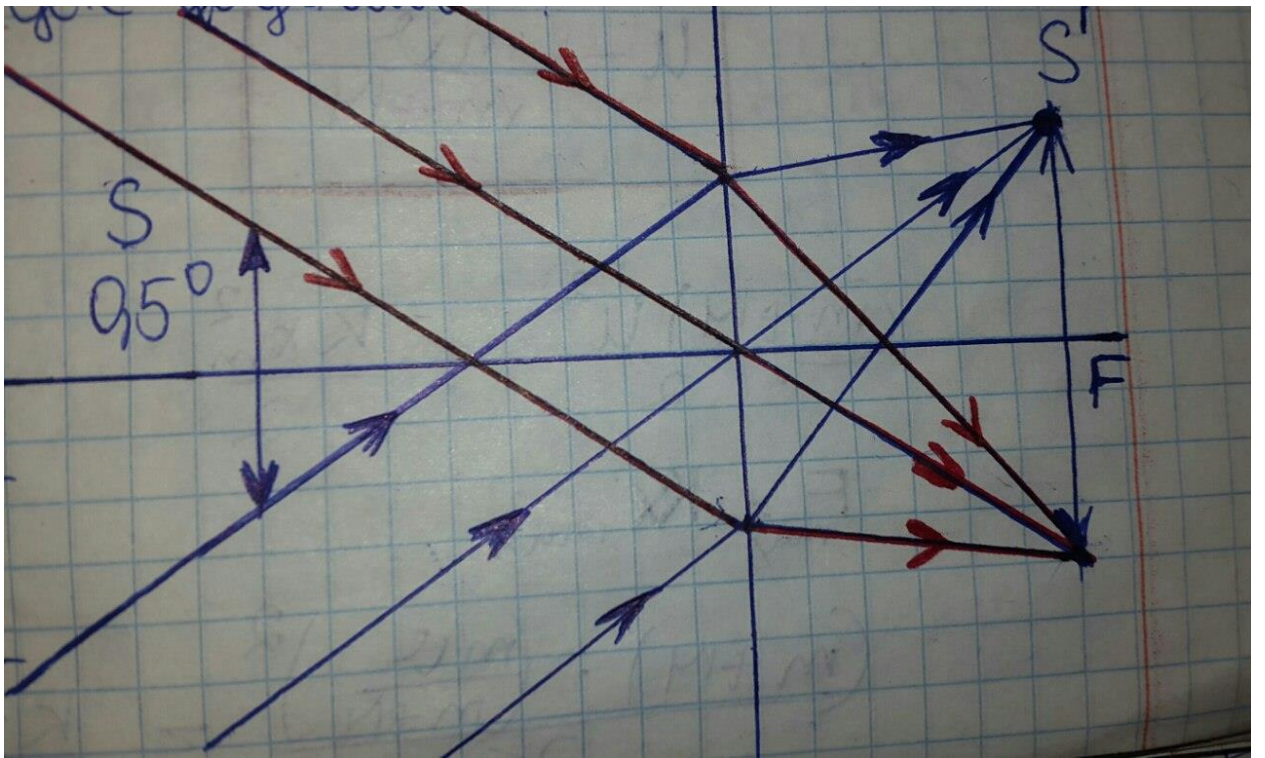
$$P = \frac{2}{3} \pi G \cdot \frac{3M^2}{16\pi^2 R^6} \cdot (R^2 - r^2)$$

$$P = \frac{3GM^2}{8\pi R^4} \cdot \left(1 - \frac{r^2}{R^2} \right)$$

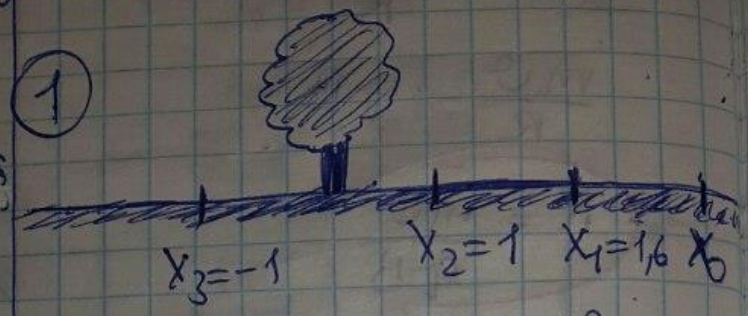
$$P_0 = \frac{3GM^2}{8\pi R^4} = \frac{3 \cdot 6,67 \cdot 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2} \cdot (6 \cdot 10^{24} \text{ kg})^2}{8 \cdot 3,14 \cdot (6400 \cdot 10^3 \text{ m})^4} = 1,72 \cdot 10^6 \text{ Pa}$$

$$P = P_0 \cdot \left(1 - \frac{r^2}{R^2} \right)$$

Yer esa sirtida, ya'ni $r=R$ bo'lganda $P=0$ ga teng.



Variant 8



$$x = x_0 + v_0 t + \frac{a t^2}{2}$$

$$1 = 1.6 + v_0 \cdot 0.1 + \frac{a \cdot 0.1^2}{2}$$

$$-1 = 1.6 + v_0 \cdot 0.2 + \frac{a \cdot 0.2^2}{2}$$

$$\begin{cases} -0.6 = 0.1 \cdot v_0 + \frac{a \cdot 0.1^2}{2} \\ -2.6 = 0.2 v_0 + \frac{a \cdot 0.2^2}{2} \end{cases}$$

$$\begin{cases} -1.2 = 0.2 v_0 + 0.02 a \\ -2.6 = 0.2 v_0 + 0.02 a \end{cases}$$

$$\begin{cases} -1.2 = 0.2 v_0 + a \cdot 0.1^2 \\ -2.6 = 0.2 v_0 + 0.02 a \end{cases}$$

$$\begin{cases} -1.2 = 0.2 v_0 + 0.01 a \\ -2.6 = 0.2 v_0 + 0.02 a \end{cases}$$

$$-2.6 - (-1.2) = 0.01 a$$

$$-2.6 + 1.2 = 0.01 a$$

$$-1.4 = 0.01 a$$

$$a = -140 \text{ m/s}^2$$

A

$$(2) \quad s = v_0 t - \frac{at^2}{2}$$

$$\begin{cases} 6 = v_0 \cdot 1 - \frac{a}{2} \cdot 1 = v_0 - \frac{a}{2} \\ 8 = v_0 \cdot 2 - \frac{a}{2} \cdot 2^2 = 2v_0 - 2a \end{cases}$$

$$24 = 4v_0 - 2a$$

$$8 = 2v_0 - 2a$$

$$24 - 8 = 4v_0 - 2a - 2v_0 + 2a$$

$$16 = 2v_0$$

$$v_0 = 8 \text{ m/s}$$

(2)

(3)



$$N = mg = 80 \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2} = 800 \text{ N}$$

$$F = ma \Rightarrow \text{teng ta'sir etuvchi kuch}$$

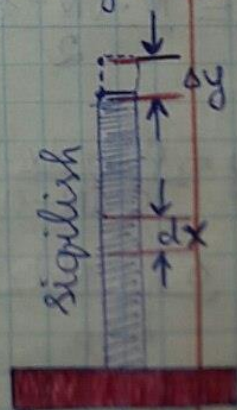
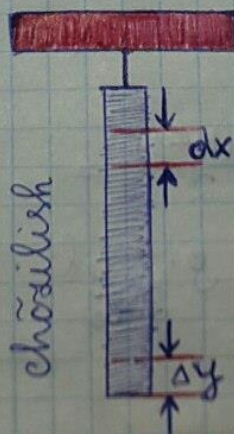
$$F = 80 \text{ kg} \cdot \sqrt{21} \text{ m/s}^2 = 80\sqrt{21} \text{ N}$$

(2)

(4) Biz quyuqni elementlar dx qismlar ga bōlib chiqamiz.

Bunda elementlar sonini $N = \frac{l}{dx}$ deyviz

$N \gg 1$. Har bir element ni $K = k_0 \cdot (N-1)$ bikirlikli prujinalar tutashtirib turadi deb faraz qilamiz va bunda prujinalar soni $(N-1)$ ta bōladi. Bu yerda k_0 butun quyuqning bikirliqi. Har bir prujinaning chōzilishini topib, ularni qoshib chiqamiz va bu butun quyuqning chōzilishiga teng. Albatta bu yerda $N-1$ ta k bikirlikli prujina ketma-ket ularganda, umumiy bikirlik k_0 ga teng bōlishi hisobga olindi. Har bir prujinaning chōzilishini hisoblaymiz:



$$\left\{ \begin{aligned} dy_1 &= \frac{dmg}{k} = \frac{\rho S g dx}{k_0(N-1)} \end{aligned} \right.$$

$$dy_2 = \frac{2dmg}{k} = \frac{2\rho S g dx}{k_0(N-1)}$$

$$dy_3 = \frac{3dmg}{k} = \frac{3\rho S g dx}{k_0(N-1)}$$

.....

$$dy_{N-1} = \frac{(N-1)dmg}{k} = \frac{(N-1)\rho S g dx}{k_0(N-1)}$$

Yuqoridagilarni qo'shamiz

$$\Delta y = \sum_{i=1}^{N-1} dy_i = \frac{\rho S g dx}{k_0(N-1)} (1+2+3+\dots+N-1)$$

$$\Delta y = \frac{\rho \cdot S \cdot g \cdot dx}{k_0 \cdot (N-1)} \sum_{i=1}^{N-1} i$$

$$\sum_{i=1}^{N-1} i = 1+2+3+\dots+N-1 =$$

$$= \frac{N \cdot (N-1)}{2}$$

$$\Delta y = \frac{\rho \cdot S \cdot g \cdot dx}{k_0 \cdot (N-1)} \frac{N \cdot (N-1)}{2} =$$

$$= \frac{\rho S g N dx}{2k_0} = \frac{\rho \cdot S \cdot g \cdot l}{2k_0}$$

$$\Delta y = \frac{\rho \cdot S \cdot g \cdot l}{2k_0}$$

$$k_0 = \frac{ES}{l}$$

$$\Delta y = \frac{\rho \cdot S \cdot g \cdot l}{2 \frac{ES}{l}} = \frac{\rho g l^2}{2E}$$

Δy chözilishda ham, sig'ilishda ham bir xil

Umumiy chözilish va sig'ilishlar yig'indisi bu xarakteristikalar farqiga teng

$$\Delta y_{um} = \frac{\rho g l^2}{2E} + \frac{\rho g l^2}{2E}$$

$$\Delta y_{um} = \frac{\rho g l^2}{E}$$

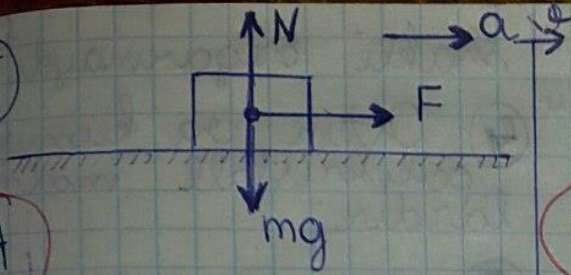
$$\Delta y_{um} = \frac{7900 \frac{\text{kg}}{\text{m}^3} \cdot 10 \frac{\text{N}}{\text{kg}} (20 \text{ m})^2}{200 \cdot 10^9 \text{ Pa}}$$

$$= \frac{790 \cdot 400}{2 \cdot 10^6} = 158 \cdot 10^{-6}$$

$$= 158 \mu\text{m}$$

A

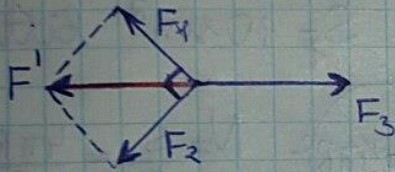
5



A

$$F = ma = 120 \text{ N}$$

6



$$F' = \sqrt{F_1^2 + F_2^2} = 4 \text{ N}$$

$$F_3 = 4 \text{ N}$$

$$F_n = F_3 - F' = 4 \text{ N} - 4 \text{ N} = 0$$

$$a = \frac{F_n}{m} = 0$$

B

7

$$N = F \cdot v \quad F = kv$$

$$N = kv \cdot v = kv^2$$

$$N \left(1 - \frac{64\%}{100\%}\right) = kv_2^2$$

$$\sqrt{kv^2 \cdot 0,36} = \sqrt{kv_2^2}$$

$$0,6v = v_2$$

$$v_2 = v \cdot \left(1 - \frac{40\%}{100\%}\right)$$

40% ga kamaygan

B

8

$$h_2 = \frac{2\sigma}{\rho(g+a)z}$$

$$h_1 = \frac{2\sigma}{\rho g z}$$

$$h_1 > h_2$$

demak kamayadi

A

9

$$P = P_1 - P_2$$

$$P = \frac{\rho v^2}{2}$$

$$P_1 - P_2 = \frac{\rho v^2}{2}$$

$$2 \cdot (P_1 - P_2) = \rho v^2$$

$$\frac{2(P_1 - P_2)}{\rho} = v^2$$

$$v = \sqrt{\frac{2(P_1 - P_2)}{\rho}}$$

A

10) Birinchi gaz uchun

$$i_i - i_a = 0$$

$$i_i = 3 \quad i_a = 3$$

$$i_1 = 6 \quad \text{uch atomli yoki undan ko'proq}$$

Ikkinchi gaz uchun

$$i_i + i_a = 6$$

$$i_i = 3 \quad i_a = 3$$

$$i_2 = 6 \Rightarrow \text{uch atomli yoki undan ko'proq}$$

$$U_1 = \frac{i_1}{2} \nu R \Delta T$$

$$U_2 = \frac{i_2}{2} \nu R \Delta T$$

$$\frac{U_1}{U_2} = \frac{i_1}{i_2} = \frac{6}{6} = 1$$

11) 1) $\rho \sim T$

temperatura o'tishi bilan to'yingan bug' zichligi ortadi

3) Polikristall moddalar issiqlikdan kengayganda ularning

shakli o'zgarmaydi

4) Oltin va kumush polikristall moddalardir;

5) gaz va suyuqliklar isotrop moddalar D

12) $S_1 = 10 \text{ sm}^2$ kitta E

$$S = 4\pi R^2 \quad N = \frac{S}{S_1} = \frac{4\pi R^2}{S_1}$$

$$N = \frac{4 \cdot 3,14 \cdot (6,4 \cdot 10^{-6} \text{ m})^2}{10 \cdot 10^{-4} \text{ m}^2} = \frac{12,56 \cdot 40,96 \cdot 10^{-12} \text{ m}^2}{10 \cdot 10^{-4} \text{ m}^2} = 51,4 \cdot 10^{16} \text{ ta elektron}$$

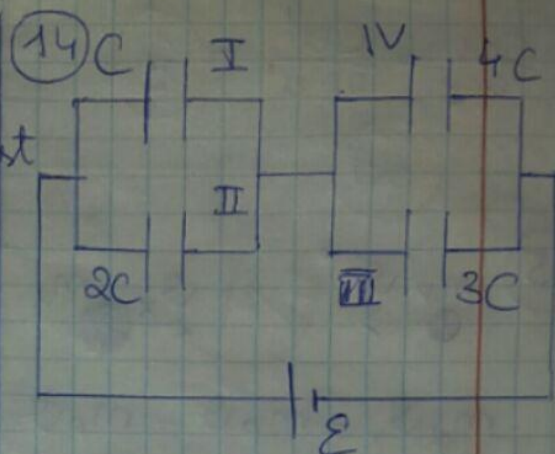
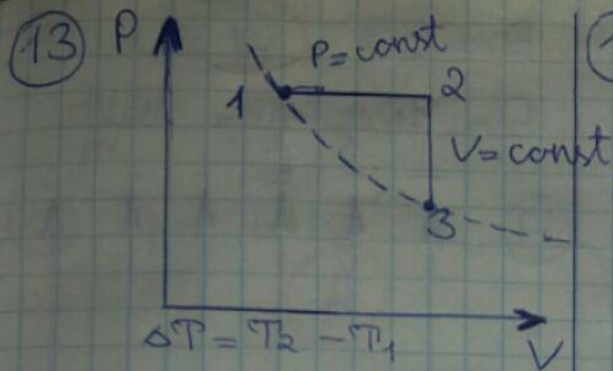
$$q = Ne = 51,4 \cdot 10^{16} \cdot 1,6 \cdot 10^{-19} \text{ C} = 82,3 \cdot 10^{-3} \text{ C}$$

$$\varphi = \frac{kq}{R}$$

$$\varphi = \frac{9 \cdot 10^9 \cdot 82 \cdot 10^{-3} \text{ C}}{6,4 \cdot 10^{-6} \text{ m}} =$$

$$= 115 \text{ V}$$

A



① $P = \text{const}$ $i = 3$

② $Q = A + \Delta U$

$A = \int P dV$

$\Delta U = \frac{3}{2} \int P dV$

$Q = \int P dV + \frac{3}{2} \int P dV =$
 $= \frac{5}{2} A$

$Q = \frac{5}{2} A$ $A = \frac{2Q}{5}$

③ $V = \text{const}$ $A_2 = 0$

$Q = \Delta U = -\frac{3}{2} \int P dV = \frac{3}{2} A$

$\Delta U_2 = -\frac{3}{2} \cdot \frac{2Q}{5} = -\frac{3Q}{5}$

$\Delta U_2 = -\frac{3}{5} \cdot 10 J = -6 J$

②

$\frac{q_1}{q_2} = ?$

$C_1 = C + 2C = 3C$

$C_2 = 4C + 3C = 7C$

$C_R = \frac{C_1 \cdot C_2}{C_1 + C_2}$

$C_R = \frac{3C \cdot 7C}{3C + 7C} = \frac{21C^2}{10C} = \frac{21C}{10}$

$q_{I,II} = \frac{\varepsilon \cdot 21C}{10}$

$q_{I,II} = \frac{\varepsilon \cdot 21C}{10} = q_1 + q_2$

$\frac{\varepsilon \cdot 21C}{10} = U'_1 + 2C \cdot U'_2$

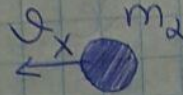
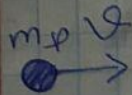
$\frac{\varepsilon \cdot 21C}{10} = 3C U'_1$

$U'_1 = \frac{\varepsilon}{10} + \varepsilon$

$$\frac{q_1}{q_2} = \frac{ctt'}{2ett'} = \frac{1}{2}$$

(2)

(15)



$$m_2 v_x - m_p v = m_p v$$

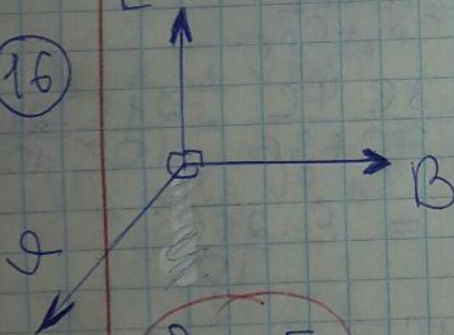
$$m_2 v_x = 2m_p v$$

$$m_2 = 4m_p$$

$$4m_p v_x = 2m_p v$$

$$v_x = \frac{v}{2} = 40 \frac{\text{km}}{\text{s}}$$

(16)



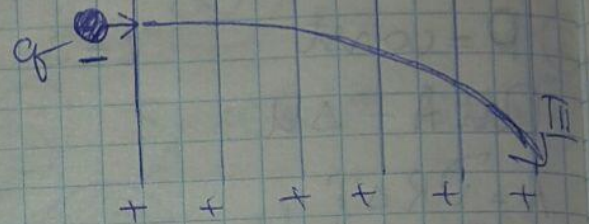
$$v = \frac{E}{B}$$

Elektromagnit to'lov
tarqalish tezligini
 $\vec{E}$ va $\vec{B}$ orqali
topish

$$E = Bv \quad (2)$$

$$E = 15 \frac{\text{m}}{\text{s}} \cdot 1 \text{T} = 15 \frac{\text{V}}{\text{m}}$$

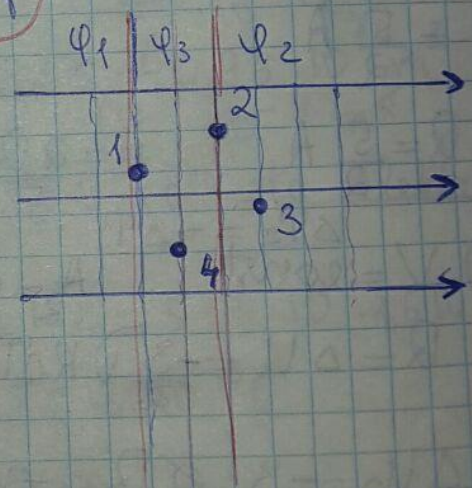
(17)



Manfiy zaryad
musbatga tortiladi
manfiydan itariladi

(A)

(18)

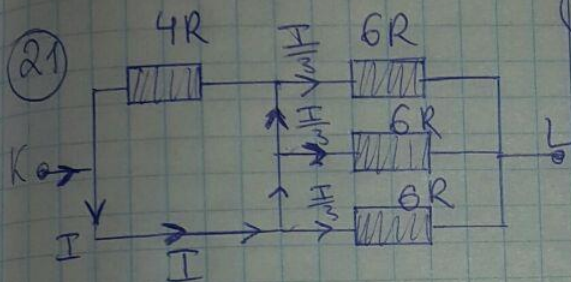


$$\phi_3 = \frac{\phi_2 - \phi_1}{2}$$

$$\phi_3 = \frac{6 \text{V} - 0 \text{V}}{2} = 3 \text{V}$$

(19) (P-n) **A**
diod , fotoelement

(20) $q = 1,6 \cdot 10^{-19} \text{ C}$
A



$$R_{KL} = \frac{6R}{3} = 2R$$

(22) $T_1 = 2\pi \frac{m_p}{q_p B}$

$$T_2 = 2\pi \frac{m_d}{q_d B}$$

$$\frac{T_1}{T_2} = \frac{2\pi \frac{m_p}{q_p B}}{2\pi \frac{m_d}{q_d B}} = \frac{m_p q_d}{m_d q_p}$$

Proton $\frac{1}{1}H$
alfa zarra $\frac{4}{2}He$

$$q_d = 2q_p \quad m_d = 4m_p$$

$$\frac{T_1}{T_2} = \frac{m_p \cdot 2q_p}{4m_p \cdot q_p} = \frac{1}{2}$$

A

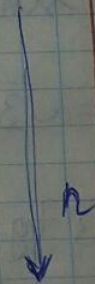
(23) $a = A \omega^2 \quad \omega = \sqrt{\frac{a}{A}}$
 $\omega = \sqrt{\frac{180 \text{ m/s}^2}{0,05 \text{ m}}} = 60 \frac{\text{rad}}{\text{s}}$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{60} = \frac{\pi}{30}$$

$$\lambda = v \cdot T \quad v = \frac{\lambda}{T} \quad \text{B}$$

$$v = \frac{8\pi}{\frac{\pi}{30}} = 240 \frac{\text{m}}{\text{s}}$$

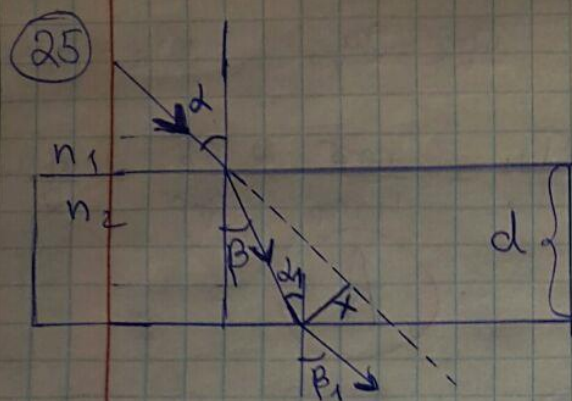
(24) qizil
zarqaldaq
sariq
yashil
havrang
kok
binagsha



$$n_{qiz} < n_{zarq} < n_{sariq} < n_{binag}$$

$$sindo = \frac{1}{n}$$

B



$$X = \frac{d \sin(\alpha - \beta)}{\cos \beta}$$

$$\frac{\sin \alpha}{\sin \beta} = \frac{n_2}{n_1} = \sqrt{3}$$

$$\sin 60^\circ = \sqrt{3} \sin \beta$$

$$\frac{\sqrt{3}}{2} = \sqrt{3} \sin \beta$$

$$\sin \beta = \frac{1}{2} \quad \beta = 30^\circ$$

$$X = \frac{\sqrt{3} \sin(60^\circ - 30^\circ)}{\cos 30^\circ} =$$

$$= \sqrt{3} \tan 30^\circ = \sqrt{3} \cdot \frac{1}{\sqrt{3}} = 1 \text{ m}$$

A

26

$$\varphi = \frac{W}{t} \Rightarrow \text{Yarqulik qismi}$$

$$I = \frac{W}{S \cdot t} = \frac{\varphi}{S}$$

$$\varphi = I \cdot S = I \cdot \pi R^2 =$$

$$= I \cdot \pi \left(\frac{d}{2}\right)^2 = \frac{I \pi d^2}{4}$$

$$\varphi = \frac{100 \frac{\text{W}}{10^{-4} \text{ m}^2} \cdot 3,14 \cdot (8 \cdot 10^{-3})^2}{4}$$

$$\approx 50 \text{ lm}$$

2

27

1 va 3 xato

2 va 4 to'g'ri

$$D = -\frac{1}{F} = -(n-1) \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$$

n ga to'g'riq holda o'zgaradi

B

(28)

$$E_t = E_0 + E_k$$

$$E_t = m_{\text{rel}} c^2 = 13mc^2$$

$$m_{\text{rel}} = 13m$$

$$m_{\text{rel}} = \frac{m}{\sqrt{1 - \frac{v^2}{c^2}}} = 13m$$

$$\frac{1}{13} = \sqrt{1 - \frac{v^2}{c^2}}$$

$$\frac{1}{169} = 1 - \frac{v^2}{c^2}$$

$$\frac{v^2}{c^2} = 1 - \frac{1}{169} = \frac{168}{169}$$

$$v^2 = \frac{168c^2}{169}$$

$$v = \frac{\sqrt{168}c}{13}$$

$$p = m \cdot v$$

$$p = 13m \cdot \frac{\sqrt{168} \cdot c}{13}$$

$$= \sqrt{168} \cdot m \cdot c$$

(29)

$$p = m \cdot v = \frac{h}{\lambda}$$

$$\lambda = \frac{h}{m \cdot v}$$

$$\lambda = \frac{6,62 \cdot 10^{-34} \text{ J} \cdot \text{s}}{9,1 \cdot 10^{-31} \text{ kg} \cdot 10 \text{ m/s}} = 7,27 \cdot 10^{-4} \text{ m} = 727 \text{ nm}$$

A

(30)

Stationare holat energiyasi

$$W = -\frac{m e^4}{8 \epsilon_0^2 \cdot h^2} \cdot \frac{1}{n^2}$$

$$n=1 \text{ da } W_1 = -13,6 \text{ eV}$$

$$W_n = \frac{W_1}{n^2}$$

$$W_3 = \frac{W_1}{3^2}$$

$$W_3 = \frac{-13,6 \text{ eV}}{9} = -1,51 \text{ eV}$$

$$\Delta W = W_3 - W_1 =$$

$$= -1,51 \text{ eV} - (-13,6 \text{ eV})$$

$$= 12,1 \text{ eV}$$

D

Nurimov Tumoyun

Tanab Fiziklar
kanali uchun
massus

Variant 9

1

$$\vartheta = \frac{2\pi R}{T} \cos \alpha$$



$$\alpha = 30^\circ$$

$$L = 2\pi R$$

$$\vartheta = \frac{L}{T} \cos \alpha$$

$$\vartheta = \frac{(40 \cdot 10^3 \cdot 10^3 \text{ m})}{86,400 \text{ s}} \cdot \frac{\sqrt{3}}{2}$$

$$= 401 \text{ m/s}$$

A

2

t(s)	10	11	12
x(m)	1,6	1	-1

$$t_1 = 1 \text{ s}$$

$$t_2 = 2 \text{ s}$$



$$\vartheta_0$$

$$x_2 = x_1 + \vartheta_0 t_1 + \frac{a t_1^2}{2}$$

$$x_3 = x_1 + \vartheta_0 t_2 + \frac{a t_2^2}{2}$$

$$\begin{cases} 1,6 + \vartheta_0 \cdot 1 + \frac{a}{2} \cdot 1 = 1 \\ 1,6 + \vartheta_0 \cdot 2 + \frac{a}{2} \cdot 2 = -1 \end{cases}$$

$$\begin{cases} \vartheta_0 + \frac{a}{2} = -0,6 \\ 2\vartheta_0 + 2a = -2,6 \end{cases} \quad | \cdot 2$$

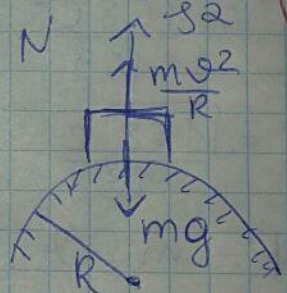
$$\begin{cases} 2\vartheta_0 + a = -1,2 \\ 2\vartheta_0 + 2a = -2,6 \end{cases}$$

$$a = -1,4 \text{ m/s}^2 =$$

$$= -140 \frac{\text{cm}}{\text{s}^2}$$

A

3



$$N = mg - \frac{m\vartheta^2}{R} = m(g - \frac{\vartheta^2}{R})$$

$$N = 9 \cdot 10^3 \text{ kg} \cdot \left(10 \frac{\text{m}}{\text{s}^2} - \frac{(10 \text{ m/s})^2}{90 \text{ m}} \right)$$

$$= 9 \cdot 10^3 \text{ kg} \cdot \left(10 \frac{\text{m}}{\text{s}^2} - 1,1 \frac{\text{m}}{\text{s}^2} \right)$$

$$= 80 \text{ kN}$$

$$F = ma = \frac{m\vartheta^2}{R} \Rightarrow \text{tension et cetera}$$

$$F = \frac{9 \cdot 10^3 \text{ kg} \cdot (10 \text{ m/s})^2}{90 \text{ m}}$$

$$= 10 \text{ kN}$$

(C)

$$F_g = m \cdot (g - a)$$

$$F_g = 3 \text{ kg} \cdot \left(\frac{10 \text{ m}}{s^2} - \frac{6 \text{ m}}{s^2} \right)$$

$$= 12 \text{ N}$$

(B)

(4)

$$k = \frac{ES}{l_0}$$

$$E = \frac{k \cdot l_0}{S} = \frac{500 \frac{\text{N}}{\text{m}} \cdot 5 \text{ m}}{2 \cdot 10^{-9} \text{ m}^2}$$

$$= 1250 \cdot 10^4 \text{ Pa} = 125 \text{ MPa}$$

(C)

(7)

$$F = k \cdot \vartheta$$

$$N_1 = F \cdot \vartheta = k \vartheta^2$$

$$N_2 = k \cdot \left(\vartheta \cdot \left(1 - \frac{20\%}{100\%} \right) \right)^2$$

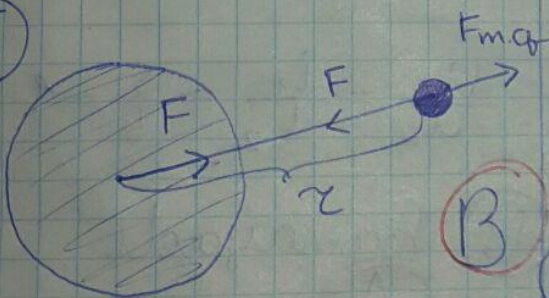
$$= k \cdot \vartheta^2 \cdot 0,8^2 = 0,64 k \vartheta^2$$

$$N_2 = N_1 \cdot \left(1 - \frac{36\%}{100\%} \right)$$

36% ga kamaygan

(C)

(5)



(B)

$$F = F_{mg} = F_{mi} = 100 \text{ kN}$$

(8)

$$\sigma = \frac{F}{L}$$

$$[\sigma] = \frac{1 \text{ N}}{\text{m}}$$

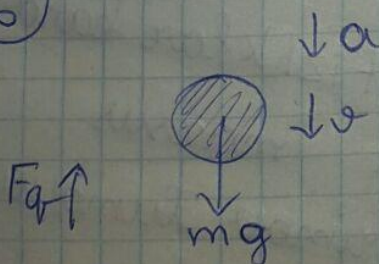
$$k = \frac{F}{\Delta L}$$

(C)

$$[k] = \frac{1 \text{ N}}{\text{m}}$$

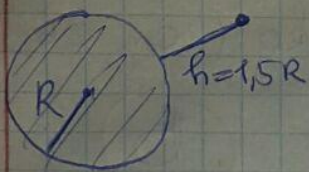
bikrlik

(6)



$$F_a = mg - ma$$

9



$$E_t = E_k + E_p$$

$$E_k = \frac{mv^2}{2}$$

$$E_p = -\frac{GMm}{(R+h)}$$

$$E_t = \frac{mv^2}{2} - \frac{GMm}{R+h} = E_k - \frac{GMm}{(R+h)}$$

$$= E_k - \frac{GMm}{R+1.5R} =$$

$$= E_k - 0.4mgR = -\frac{GMm}{R}$$

$$E_k - 0.4mgR = -mgR$$

$$E_k = -0.6mgR$$

kinetik energiya
musbat kattalik

$$E_k = 0.6mgR$$

C

10

$$i_i - i_a = 1$$

$$i_i = 3$$

$$i_a = 2$$

$$i_1 = 5$$

ikki atomli
gaz

$$(2) \quad i_i + i_a = 5$$

$$i_2 = 5$$

ikki atomli
gaz

$$U_1 = \frac{i_1}{2} \nu R \Delta T$$

$$U_2 = \frac{i_2}{2} \nu R \Delta T$$

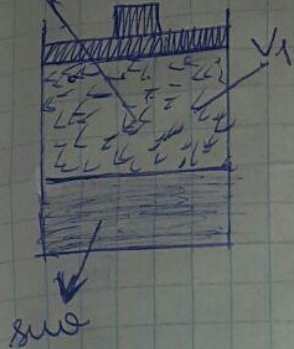
$$\frac{U_1}{U_2} = \frac{i_1}{i_2} = \frac{5}{5} = 1$$

11) kamayadi

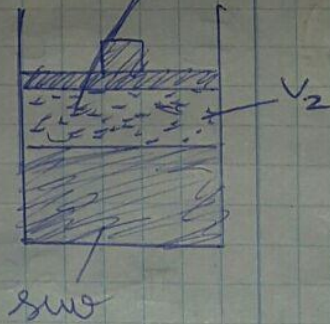
A

Tanob Fiziklar kanali
uchun maxsus
Muximov Tumayev

12) to'g'inmagan bug



to'g'inmagan bug



$$n_1 kT \cdot M = \rho_1 R T$$

$$n_2 kT \cdot M = \rho_2 R T$$

$$\frac{n_1}{n_2} = \frac{\rho_1}{\rho_2}$$

$$n_1 \cdot \rho_2 = \rho_1 \cdot n_2$$

$$n_2 > n_1$$

$$\rho_1 < \rho_2$$

1) $P = n kT$
 $T = \text{const}$

$$P_1 = n_1 kT$$

$$P_2 = n_2 kT$$

$$PV = \text{const}$$

$$P_1 V_1 = P_2 V_2$$

$$n_1 kT V_1 = n_2 kT V_2$$

$$n_1 V_1 = n_2 V_2$$

$$V_1 > V_2$$

$$n_1 < n_2$$

konzentratsiya ortadi

2) $PV = \frac{m}{M} RT$

$$P \cdot M = \rho R T$$

zichligi ortadi

5) $P = n kT$

$$P \sim n$$

A

13) $\varphi_1 = \frac{k g}{x_1}$

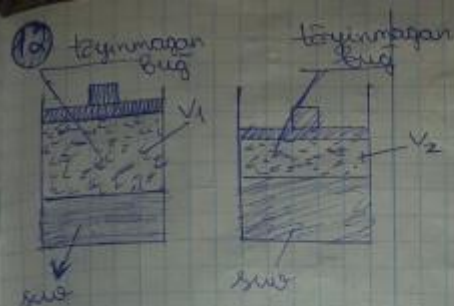
$$\varphi_2 = \frac{k g}{x_2}$$

$$\varphi_2 + \Delta \varphi = \varphi_1$$

$$\frac{k g}{x_2} + \Delta \varphi = \frac{k g}{x_1}$$

$$\varphi_2 - \Delta \varphi = \frac{k g}{x}$$

$$\frac{k g}{x_2} - \left(\frac{k g}{x_1} - \frac{k g}{x_2} \right) = \frac{k g}{x}$$



$$n_1 k T \cdot M = \rho_1 R T$$

$$n_2 k T \cdot M = \rho_2 R T$$

$$\frac{n_1}{n_2} = \frac{\rho_1}{\rho_2}$$

$$n_1 \rho_2 = \rho_1 n_2$$

$$n_2 > n_1$$

$$\rho_1 < \rho_2$$

zichligi ortadi

$$(5) \quad P = n k T$$

$$P \sim n$$

A

$$(1) \quad P = n k T$$

$$T = \text{const}$$

$$P_1 = n_1 k T$$

$$P_2 = n_2 k T$$

$$P V = \text{const}$$

$$P_1 V_1 = P_2 V_2$$

$$n_1 k T V_1 = n_2 k T V_2$$

$$n_1 V_1 = n_2 V_2$$

$$V_1 > V_2$$

$$n_1 < n_2$$

koncentrasiya ortadi

$$(2) \quad P V = \frac{m}{M} R T$$

$$P \cdot M = \rho R T$$

$$(13) \quad \psi_1 = \frac{k q}{x_1}$$

$$\psi_2 = \frac{k q}{x_2}$$

$$\psi_2 + \Delta \psi = \psi_1$$

$$\frac{k q}{x_2} + \Delta \psi = \frac{k q}{x_1}$$

$$\psi_2 - \Delta \psi = \frac{k q}{x}$$

$$\frac{k q}{x_2} - \left(\frac{k q}{x_1} - \frac{k q}{x_2} \right) = \frac{k q}{x}$$

$$\frac{Kq}{X_2} + \frac{Kq}{X_2} = \frac{Kq}{X_1} = \frac{Kq}{X}$$

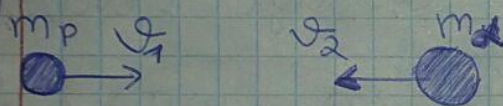
$$\frac{2}{X_2} - \frac{1}{X_1} = \frac{1}{X}$$

$$\frac{2}{2\text{cm}} - \frac{1}{1\text{cm}} = \frac{1}{X}$$

$$0 = \frac{1}{X}$$

$$X \rightarrow \infty$$

14



$$m_2 v_2 - m_p v_1 = m_p v_1$$

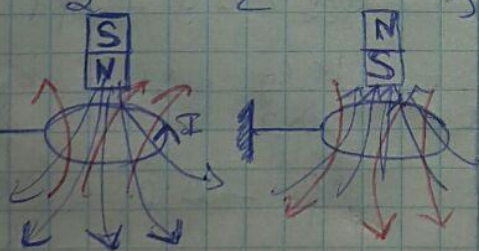
$$m_2 v_2 = 2 m_p v_1$$

$$4 m_p v_2 = 2 m_p v_1$$

$$2 v_2 = v_1$$

$$v_2 = \frac{v_1}{2} = \frac{100 \text{ km/s}}{2} = 50 \text{ km/s}$$

15

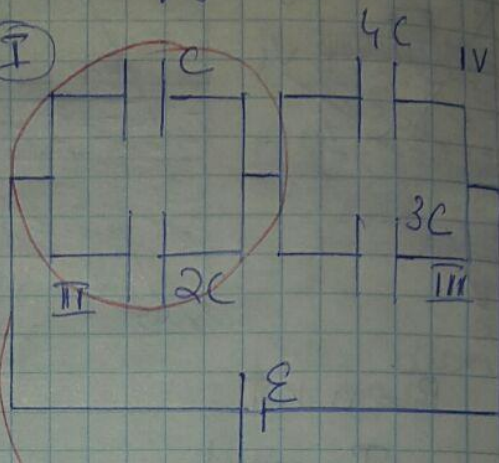


Magnitni tushish vaqti katta

16

$$\frac{q_2}{q_3} = ?$$

I



$$U_I = U_{II} = U_1$$

$$q = U_1 \cdot C + U_1 \cdot 2C$$

$$= 3 U_1 C$$

$$q_{II} = U_1 \cdot 2C$$

$$q_{II} = \frac{q}{3C} \cdot 2C = \frac{2q}{3}$$

$$U_{IV} = U_{III} = U_2$$

$$q = U_2 \cdot 4C + U_2 \cdot 3C$$

$$= 7 U_2 C$$

$$q_{III} = 3 U_2 C = 3 \cdot \frac{q}{7C} \cdot C$$

$$= \frac{3q}{7}$$

$$\frac{kq_1}{x_2} + \frac{kq_2}{x_2} = \frac{kq_1}{x_1} = \frac{kq_2}{x}$$

$$\frac{2}{x_2} - \frac{1}{x_1} = \frac{1}{x}$$

$$\frac{2}{2\text{cm}} - \frac{1}{1\text{cm}} = \frac{1}{x}$$

$$0 = \frac{1}{x}$$

$$x \rightarrow \infty$$

(16)

$$\frac{q_1}{q_2} = ?$$



$$U_I = U_{II} = U_{IV}$$

$$q = U_1 C + U_1 2C = 3U_1 C$$

$$q_{II} = U_1 2C$$

$$q_{III} = \frac{q}{3C} 2C = \frac{2q}{3}$$

$$U_{IV} = U_{III} = U_2$$

$$q = U_2 4C + U_2 3C = 7U_2 C$$

$$q_{IV} = 3U_2 C = 3 \frac{q}{7C} = \frac{3q}{7}$$

(14)

$$m_p v_1 = m_2 v_2 - m_p v_1 = m_p v_1$$

$$m_2 v_2 = 2m_p v_1$$

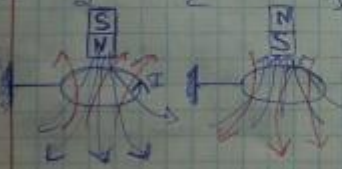
(C)

$$4m_p v_2 = 2m_p v_1$$

$$2v_2 = v_1$$

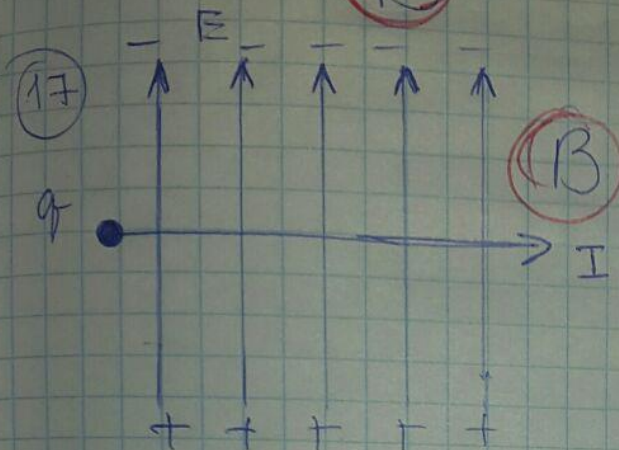
$$v_2 = \frac{v_1}{2} = \frac{100 \text{ km/s}}{2} = 50 \text{ km/s}$$

(15)



Magnitni tushish vaqti katta

$$\frac{q_{II}}{q_{III}} = \frac{\frac{2q}{3}}{\frac{3q}{7}} = \frac{14}{9}$$

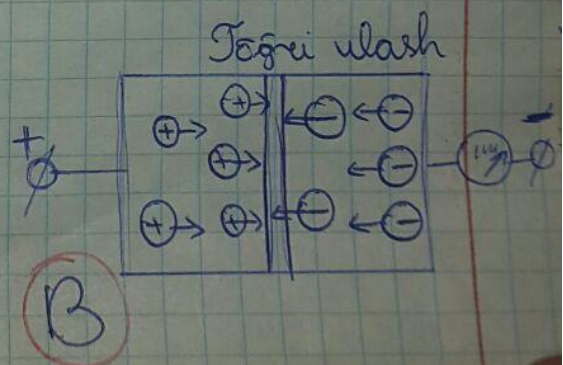
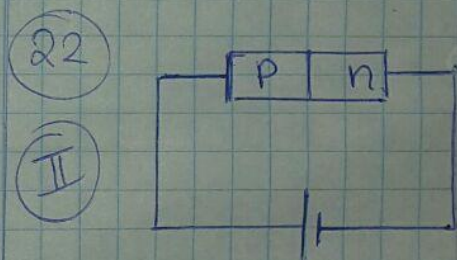
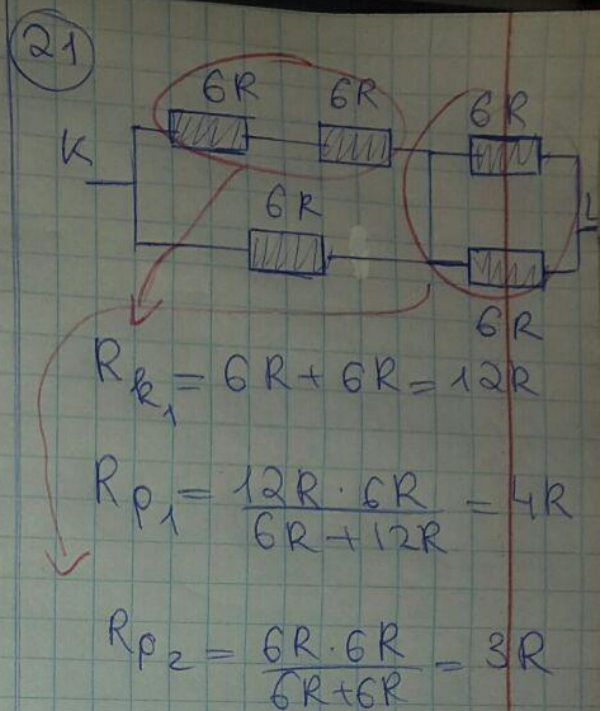


(18) Elektr maydon
tôg'risidagi tasavvur $R_{KL} = 4R + 3R = 7R$
larini fizikaga birin-
chi marta ingliz
fiziki M. Faraday
kiritgan

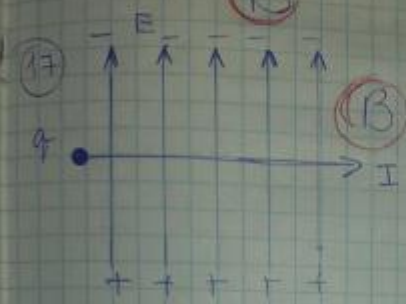
(19) $e = 1,6 \cdot 10^{-19} \text{C}$

(20) $\mu \gg 1$
ferromagnetiklar
uchun

(1) (2)



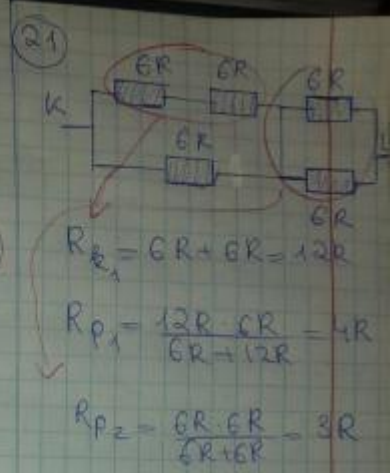
$$\frac{q \cdot E}{q \cdot E} = \frac{2q \cdot E}{3q \cdot E} = \frac{14}{9}$$



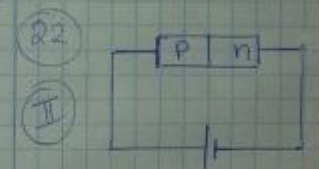
18) Elektrik maydon to'g'risidagi to'g'riylikni birinchi marta ingliz fizigi M. Faraday kiritgan

19) $e = 1.6 \cdot 10^{-19} \text{C}$

20) $\mu \gg 1$
 ↓
 Ferromagnetiklar uchun
 1) 2)



$R_{KL} = 4R + 3R = 7R$



23) $A = 110 \text{ mm}$
 $a = 1331 \text{ m/s}^2$

$$a = A \omega^2$$

$$\omega = \sqrt{\frac{a}{A}}$$

$$T = \frac{2\pi}{\omega} = 2\pi \cdot \sqrt{\frac{A}{a}}$$

$$T = 2\pi \cdot \sqrt{\frac{0.11 \text{ m}}{1331 \text{ m/s}^2}}$$

$$= \frac{2\pi}{110} \text{ s}$$

$$\lambda = v \cdot T$$

$$v = \frac{\lambda}{T}$$

$$v = \frac{\frac{8\pi}{110} \text{ m}}{\frac{2\pi}{110} \text{ s}} = 440 \frac{\text{m}}{\text{s}}$$

24) Laser nurlanishi, $f = x + d = 30 + 20 = 50 \text{ cm}$
 birinchidan, vaqt
 bōyicha va fazoviy
 ko'rsatkich; ikkinchidan,
 qat'iy monoxromatik;
 uchinchidan, quvvati
 katta. ~~tartinchidan~~
 dasturiy o'tkir yonalish
 li (ingichka) bo'ladi

2

25) to'g'ri, kattalashgan
 tashviri yig'inechi
 linsada hosil bo'ladi

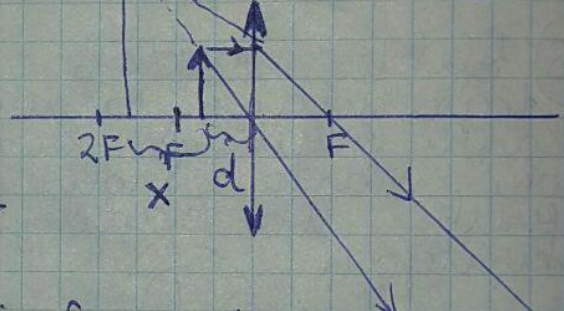
$$0 < d < F \text{ oraliqda}$$

tashvir mazmun

$$\frac{1}{F} = \frac{1}{d} - \frac{1}{f} \text{ bo'ladi}$$

$$D = \frac{1}{F} = \frac{1}{d} - \frac{1}{f}$$

$$D = \frac{1}{F} \left[\frac{1}{m} \right]$$



$$D = \frac{1}{0.2 \text{ m}} - \frac{1}{0.5 \text{ m}} = 5 - 2$$

$$= 3 \text{ dptr}$$

A

26) $I = \frac{\Delta \Phi}{\Delta \Omega}$

$$[I] = 1 \text{ cd} = \frac{1 \text{ lm}}{\text{sr}}$$

23) $A = 110 \text{ mm}$
 $a = 1331 \text{ m/s}^2$
 $a = A \omega^2$

$$\omega = \sqrt{\frac{a}{A}}$$

$$T = \frac{2\pi}{\omega} = 2\pi \sqrt{\frac{A}{a}}$$

$$T = 2\pi \sqrt{\frac{0.11 \text{ m}}{1331 \text{ m/s}^2}}$$

$$= \frac{2\pi}{110} \text{ s}$$

$$\lambda = 2\pi \quad \nu = \frac{\lambda}{T}$$

$$\nu = \frac{8.4 \text{ m}}{\frac{2\pi}{110} \text{ s}} = 440 \text{ s}$$

25) to'g'ri, kattalashgan
 tarvix yig'uvchi
 linzada hosil boladi

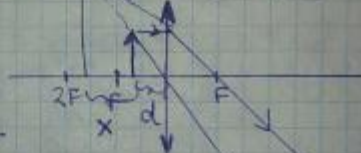
$0 < d < F$ oraliqda

tarvix moxhul

$$\frac{1}{F} = \frac{1}{d} - \frac{1}{f} \text{ boladi}$$

$$D = \frac{1}{F} = \frac{1}{d} - \frac{1}{f}$$

$$D = \frac{1}{F} \left[\frac{1}{m} \right]$$



24) Laser nurlanishi, $f = x + d = 30 + 20 = 50 \text{ m}$
 birinchi darajali, vaqt
 bo'yicha va fazoviy
 ko'rsatkich; ikkinchi darajali
 qo'lliy monoxromatik,
 uchunchi darajali, quvvatli
 katta. ~~to'rtinchi darajali~~
 dasturiy o'tkir yonalish
 li (ingichka) boladi

$$D = \frac{1}{0.2 \text{ m}} - \frac{1}{0.5 \text{ m}} = 5 - 2$$

$$= 3 \text{ dpt}$$

A

26) $I = \frac{\Delta \phi}{\Delta t}$

$$[I] = 1 \text{ cal} = \frac{1 \cdot \text{lm}}{\text{sr}}$$

$\Delta \Omega$ - to'la burchak

$$\Delta \Omega = 4\pi \text{ sr}$$

(B)

$$I = \frac{124\pi \text{ lm}}{4\pi \text{ sr}} = 31 \text{ cd}$$

(27)

Kvant mexanikasida elektronlar bulut shaklida tarqalgan

(28)

(B)

Protonning yashash vaqti 10^{32} yildan kam emas.

(2)

∞

(29) 1 - nurlar

(2) β - nurlar

(3) γ - nurlar

(3) (2) va (1)

(A)

(30)

$$W = -\frac{me^4}{8\epsilon_0^2 h^2} \cdot \frac{1}{n^2}$$

$n=1$ da

$$W_1 = -13,55 \text{ eV}$$

$$W_n = \frac{W_1}{n^2}$$

$$W_3 = \frac{W_1}{3^2} = \frac{W_1}{9}$$

$$W_3 = \frac{-13,55 \text{ eV}}{9} = -1,5 \text{ eV}$$

$$W_3 > W_1$$

atom katta energiyali holatdan kichik

energiyali holatga

o'tsa, nurlanish sodir bo'ladi.

nurlanmaydi

(C)

Janab Fiziklar kanali uchun maxsus

Murimae Tumayun

ΔL - to'la burchak

$$\Delta L = 4\pi \hbar$$

(B)

$$I = \frac{124 \hbar}{4\pi} \frac{\text{nm}}{\text{sr}} = 31 \text{ cd}$$

(27)

Kvant mexanikasida elektronlar bulut shaklida joylashadi

(28)

(B)

Protonning yashash vaqti 10^{32} yildan kam emas

(2)

∞

(29) 1 - nurlar

(2) β - nurlar

(3) γ - nurlar

(3) 2 va 1

(A)

(30)

$$W = -\frac{m e^4}{8 \epsilon_0^2 \hbar^2} \frac{1}{n^2}$$

$n=1$ da

$$W_1 = -13.52 \text{ eV}$$

$$W_n = \frac{W_1}{n^2}$$

$$W_9 = \frac{W_1}{3^2} = \frac{W_1}{9}$$

$$W_3 = \frac{-13.52 \text{ eV}}{9} = -1.5 \text{ eV}$$

$$W_3 > W_1$$

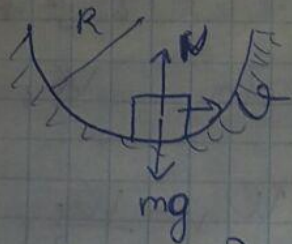
atom katta energiya holatidan kichik energiyali holatga o'tsa, nurlanish sodir bo'ladi.

nurlanmaydi (C)

Janab Fiziklar kanali uchun maxsus
Muximov Tumayev

Variant-10

1



$$N = mg + \frac{mv^2}{R} = m \cdot \left(g + \frac{v^2}{R} \right)$$

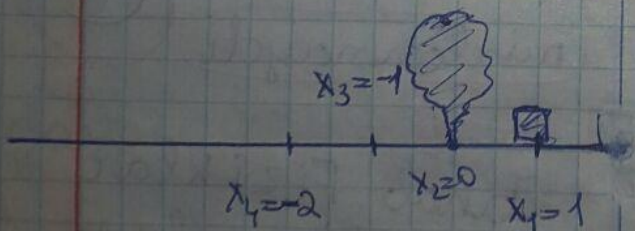
$$N = 9 \cdot 10^3 \text{ kg} \cdot \left(\frac{10 \text{ m}}{32} + \frac{100 \text{ m/s}^2}{90 \text{ m}} \right) = 100 \text{ kN}$$

$$F = ma = \frac{mv^2}{R}$$

$$F = \frac{9 \cdot 10^3 \text{ kg} \cdot (10 \text{ m/s})^2}{90 \text{ m}} = 10 \text{ kN}$$

2

t(s)	0	1	2	3
x(m)	1	0	-1	-2



$$x = x_0 + v_x t + \frac{at^2}{2}$$

$$0 = 1 + v_x \cdot 1 + \frac{a \cdot 1^2}{2}$$

$$-1 = 1 + v_x \cdot 2 + \frac{a \cdot 2^2}{2}$$

$$-2 = 1 + v_x \cdot 3 + \frac{a \cdot 3^2}{2}$$

$$\begin{cases} -1 = v_x + \frac{a}{2} \\ -2 = 2v_x + 2a \end{cases} \quad | 2$$

$$\begin{cases} -1 = v_x + \frac{a}{2} \\ -2 = 2v_x + 2a \end{cases}$$

$$\begin{cases} -2 = 2v_x + a \\ -2 = 2v_x + 2a \end{cases}$$

$$\begin{cases} -2 = 2v_x + a \\ -2 = 2v_x + 2a \end{cases}$$

$$a = 0$$

$$v_x = -1 \text{ m/s}$$

$$-3 = 3v_x + \frac{a \cdot 3^2}{2} \Rightarrow 0$$

3

$$s = v_0 t - \frac{at^2}{2}$$

$$\begin{cases} 6 = v_0 \cdot 1 - \frac{a \cdot 1}{2} \\ 8 = v_0 \cdot 2 - \frac{a \cdot 2^2}{2} \end{cases}$$

$$\begin{cases} 6 = v_0 - \frac{a}{2} \\ 8 = 2v_0 - 2a \end{cases} \quad | 2$$

$$\begin{cases} 6 = v_0 - \frac{a}{2} \\ 8 = 2v_0 - 2a \end{cases}$$

$$\begin{cases} 6 = v_0 - \frac{a}{2} \\ 8 = 2v_0 - 2a \end{cases}$$

Variant-10

1



$$N = mg + \frac{mv^2}{R} = m(g + \frac{v^2}{R})$$

$$N = 9 \cdot 10^3 \text{ kg} \left(\frac{10 \text{ m}}{3 \text{ s}} + \frac{100 \frac{\text{m}^2}{\text{s}^2}}{90 \text{ m}} \right) = 100 \text{ kN}$$

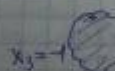
$$F = ma = \frac{mv^2}{R}$$

$$F = 9 \cdot 10^3 \text{ kg} \cdot \frac{(10 \text{ m/s})^2}{90 \text{ m}} = 10 \text{ kN}$$

2

2

t(s)	0	1	2	3
x(m)	1	0	-1	-2



$$x = x_0 + v_0 t + \frac{at^2}{2}$$

$$\begin{cases} 0 = 1 + v_0 \cdot 1 + \frac{a \cdot 1^2}{2} \\ -1 = 1 + v_0 \cdot 2 + \frac{a \cdot 2^2}{2} \\ -2 = 1 + v_0 \cdot 3 + \frac{a \cdot 3^2}{2} \end{cases}$$

$$\begin{cases} -1 = v_0 + \frac{a}{2} \quad | \cdot 2 \\ -2 = 2v_0 + 2a \end{cases}$$

$$\begin{cases} -2 = 2v_0 + a \\ -2 = 2v_0 + 2a \end{cases}$$

$$a = 0$$

$$v_0 = -1 \text{ m/s}$$

C

$$-3 = 3v_0 + \frac{3a}{2} \Rightarrow 0$$

3

$$s = v_0 t + \frac{at^2}{2}$$

$$\begin{cases} 6 = v_0 \cdot 1 - \frac{a}{2} \cdot 1 \\ 8 = v_0 \cdot 2 - \frac{a}{2} \cdot 2^2 \end{cases}$$

$$\begin{cases} 6 = v_0 - \frac{a}{2} \quad | \cdot 2 \\ 8 = 2v_0 - 2a \end{cases}$$

$$\begin{cases} 12 = 2v_0 - a \\ 8 = 2v_0 - 2a \\ 4 = 2v_0 - a - 2v_0 + 2a \\ 4 = a \end{cases} \quad a = \frac{4m}{s^2}$$

(C)

(4)



$$v_I = 7,9 \frac{km}{s} \Rightarrow \text{aylana}$$

$$v_I < v < v_{II}$$

$$7,9 \frac{km}{s} < v \leq 11,2 \frac{km}{s}$$

Ellips

$$9,2 < v < 16,7 \\ v_{II} < v < v_{III}$$

Parabola

$$v_{III} \leq v$$

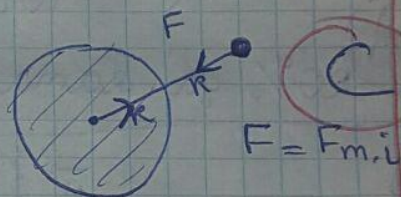
$$16,7 \leq v$$

Giperbola

(B)

$$16,7 \frac{km}{s} < 20 \frac{km}{s}$$

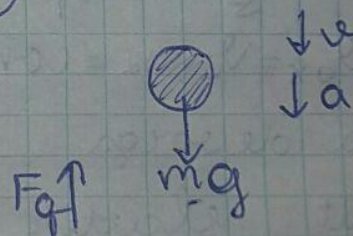
(5)



$$F = \frac{GMm}{(R+R)^2} = 200kN$$

$$F_{m,i} = 200kN$$

(6)



$$F_g = mg - ma$$

$$a = \frac{mg - F_g}{m}$$

$$a = \frac{3kg \cdot 10 \frac{m}{s^2} - 24N}{3kg} = \frac{2m}{s^2}$$

(B)

$$\begin{cases} 12 = 2v_0 - a \\ 8 = 2v_0 - 2a \end{cases}$$

$$4 = 2v_0 - a - 2v_0 + 2a$$

$$4 = a \quad a = \frac{4m}{s^2}$$

(C)

(4)



$$v_I = 7,9 \frac{km}{s} \Rightarrow \text{aylana}$$

$$v_I < v < v_{II}$$

$$7,9 \frac{km}{s} < v < 11,2 \frac{km}{s}$$

Ellips

$$9,12 \leq v \leq 16,7$$

$$v_{II} < v < v_{III}$$

Parabola

$$v_{III} \leq v$$

$$16,7 \leq v$$

giperbola

(B)

$$16,7 \frac{km}{s} < 20 \frac{km}{s}$$

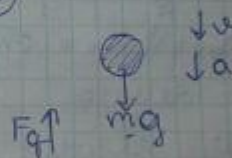
(5)



$$F = \frac{G M m}{(R+R)^2} = 200 \text{ kN}$$

$$F_{m.i} = 200 \text{ kN}$$

(6)



$$F_q = mg - ma$$

$$a = \frac{mg - F_q}{m}$$

$$a = \frac{3 \text{ kg} \cdot 10 \frac{m}{s^2} - 24 \text{ N}}{3 \text{ kg}} = 2 \frac{m}{s^2}$$

(B)

$$⑦ \quad F = k v$$

$$N = F \cdot v = k v \cdot v = k v^2$$

$$N_1 = k v_1^2$$

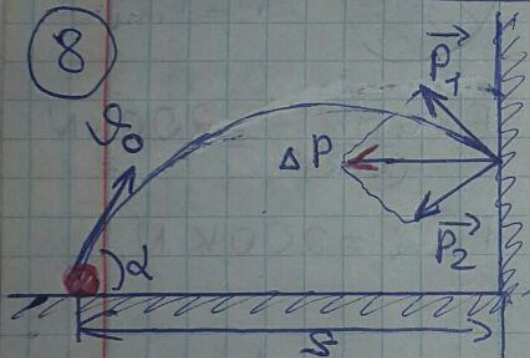
$$N_1 \cdot \left(1 - \frac{36\%}{100\%}\right) = k v_2^2$$

$$k v_1^2 \cdot 0,64 = k v_2^2$$

$$0,8 v_1 = v_2$$

$$v_2 = v_1 \cdot \left(1 - \frac{20\%}{100\%}\right)$$

⑧ 20% ga kamaygan



$$v_x = v_{0x} = v_0 \cos \alpha = \text{const}$$

Sharcha devorga
absolyut elastik
urulgani uchun
devorga urulishda-
gi impuls o'zgarishi

quyidagiga teng;

$$\Delta P = \vec{P}_2 - \vec{P}_1 = 2 m v_x = 2 m v_0 \cos \alpha$$

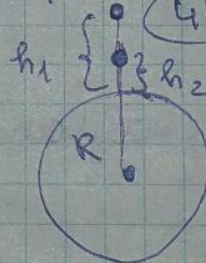
$$v_0 = \frac{\Delta P}{2 m \cos \alpha}$$

$$v_0 = \frac{2,6 \text{ kg} \cdot \text{m/s}}{2 \cdot 0,3 \text{ kg} \cdot 0,87} \approx 5 \text{ m/s} \quad \textcircled{C}$$

$$⑨ \quad E_t = -\frac{G M m}{(5R+R)} = -\frac{G M m}{6R}$$

$$E_t = E_k + E_p$$

$$E_p = -\frac{G M m}{(4R+R)} = -\frac{G M m}{5R}$$



$$-\frac{G M m}{6R} = E_k - \frac{G M m}{5R}$$

$$E_k = \frac{6}{5} \frac{G M m}{5R} - \frac{5}{6} \frac{G M m}{6R}$$

7 $F = k \vartheta$

$N = F \cdot \vartheta = k \vartheta \cdot \vartheta = k \vartheta^2$

$N_1 = k \vartheta_1^2$

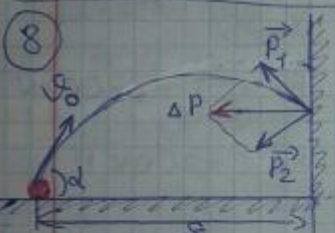
$N_1 \cdot (1 - \frac{36\%}{100\%}) = k \vartheta_2^2$

$k \vartheta_1^2 \cdot 0,64 = k \vartheta_2^2$

$0,8 \vartheta_1 = \vartheta_2$

$\vartheta_2 = \vartheta_1 \cdot (1 - \frac{20\%}{100\%}) \approx 5 \text{ m/s}$ C

A 20% ga kamaygan



$\vartheta_x = \vartheta_{0x} = \vartheta_0 \cos \alpha = \text{const}$

Sharcha devorga
absolyut elastik
urulgani uchun
devorga urulishda
gi impuls o'zgarishi

quyidagiga teng:

$\Delta P = \vec{P}_2 - \vec{P}_1 = 2m\vartheta_x =$
 $= 2m\vartheta_0 \cos \alpha$

$\vartheta_0 = \frac{\Delta P}{2m \cos \alpha}$

$\vartheta_0 = \frac{2,6 \text{ kg} \cdot \text{m/s}}{2 \cdot 0,3 \text{ kg} \cdot 0,87} =$

9 $E_t = -\frac{GMm}{(5R+R)} = -\frac{GMm}{6R}$

$E_t = E_k + E_p$

$E_p = -\frac{GMm}{(4R+R)} = -\frac{GMm}{5R}$



$-\frac{GMm}{6R} = E_k - \frac{GMm}{5R}$

$E_k = \frac{GMm}{5R} - \frac{GMm}{6R}$

$$E_k = \frac{mgR}{30}$$

(2)

(10) (I) Birinchi gaz uchun

$$i_i - i_a = 1$$

$$i_i = 3 \quad i_a = 2$$

$$i_{II} = 5 \Rightarrow \text{ikki atomli gaz}$$

(II) Ikkinchi gaz uchun

$$i_i - i_a = 0$$

$$i_i = 3 \quad i_a = 3$$

$$i_{II} = 6 \quad \text{uch atomli yoki undan ko'p}$$

$$U_1 = \frac{i_I}{2} \triangleright R \Delta T$$

$$U_2 = \frac{i_{II}}{2} \triangleright R \Delta T$$

$$\frac{U_2}{U_1} = \frac{i_{II}}{i_I} = \frac{6}{5} = 1,2$$

(C)

(11)

(A)

(12)

nisbiy namlik

$$\varphi = \frac{P_a}{P_t} \cdot 100\%$$

$$P_a = nKT \quad \text{dan}$$

T qancha o'tsa, P_a ham o'tadi

$$\varphi_1 = \frac{P_{a1}}{P_{T1}} \cdot 100\%$$

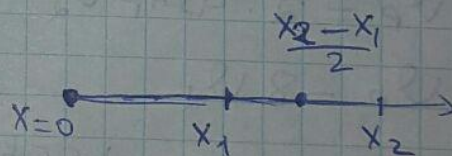
$$\varphi_2 = \frac{P_{a2}}{P_{T2}} \cdot 100\%$$

nisbiy namlik o'tadi

(13)

$$\varphi_1 = \frac{kq}{x_1}$$

$$\varphi_2 = \frac{kq}{x_2}$$



$$X_0 = X_1 + \frac{x_2 - x_1}{2} = \frac{x_1 + x_2}{2}$$

$$\varphi_0 = \frac{kq}{X_0} = \frac{2kq}{x_1 + x_2}$$

$$x_1 + x_2 = \frac{2kq}{\varphi_0}$$

$$E_k = \frac{mgR}{30}$$

(2)

(10) I Brunchi gaz uchun

$$i_i = i_a = 1$$

$$i_i = 3 \quad i_a = 2$$

$$i_{II} = 5 \Rightarrow \text{ikkita atomli gaz}$$

(II) ikkinchi gaz uchun

$$i_i = i_a = 0$$

$$i_i = 3 \quad i_a = 3$$

$$i_{II} = 6 \quad \text{uch atomli yoki undan ko'p}$$

$$U_1 = \frac{i_I}{2} R \Delta T$$

$$U_2 = \frac{i_{II}}{2} R \Delta T$$

$$\frac{U_2}{U_1} = \frac{i_{II}}{i_I} = \frac{6}{5} = 1,2$$

(C)

(11) (A)

(12) nisbiy namlik

$$\varphi = \frac{P_a}{P_t} \cdot 100\%$$

$P_a = n k T$ dan
 T qancha o'ssa, P_a ham o'stadi

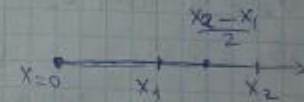
$$\varphi_1 = \frac{P_{a1}}{P_{t1}} \cdot 100\%$$

$$\varphi_2 = \frac{P_{a2}}{P_{t2}} \cdot 100\%$$

nisbiy namlik o'tadi

(C)

(13)
$$\varphi_1 = \frac{k q}{x_1} \quad \varphi_2 = \frac{k q}{x_2}$$



$$x_0 = x_1 + \frac{x_2 - x_1}{2} = \frac{x_1 + x_2}{2}$$

$$\varphi_0 = \frac{k q}{x_0} = \frac{2 k q}{x_1 + x_2}$$

$$x_1 + x_2 = \frac{2 k q}{\varphi_0}$$

$$x_1 = \frac{kq}{\varphi_1} \quad x_2 = \frac{kq}{\varphi_2}$$

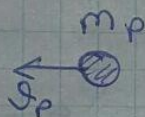
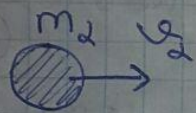
$$\frac{kq}{\varphi_1} + \frac{kq}{\varphi_2} = \frac{2kq}{\varphi_0}$$

$$\frac{\varphi_2 + \varphi_1}{\varphi_1 \cdot \varphi_2} = \frac{2}{\varphi_0}$$

$$\varphi_0 = \frac{2\varphi_1\varphi_2}{\varphi_2 + \varphi_1}$$

A

14



$$m_p v_p - m_d v_d = m_d v_d$$

$$m_p v_p = 2 m_d v_d$$

$$m_d = 4 m_p$$

$$m_p v_p = 2 \cdot 4 m_p v_d$$

$$v_p = 8 v_d$$

$$v_p = 8 \cdot 50 \frac{\text{km}}{\text{s}} = 400 \frac{\text{km}}{\text{s}}$$

$$15) q'_1 = q'_2 = \frac{q + 3q}{2} =$$

$$= 2q$$

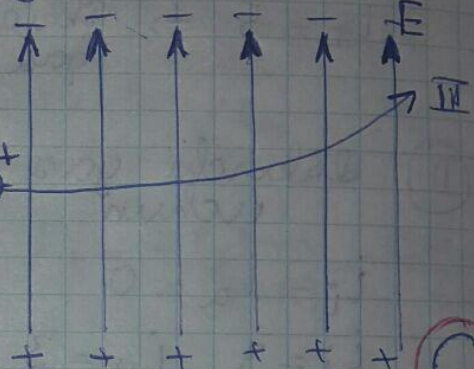
$$W_1 = \frac{kq \cdot 3q}{r} = \frac{3kq^2}{r}$$

$$W_2 = \frac{kq'_1 q'_2}{r} = \frac{k \cdot 2q \cdot 2q}{r}$$

$$= \frac{4kq^2}{r} = \frac{4W_1}{3} \quad \text{B}$$

$\frac{4}{3}$ mara ortadi

16



C

+q + dan itariladi

+q - ga tortiladi

$$17) \bar{w} = \frac{P}{V} \quad P - \text{quvvat}$$

$$\bar{w} = \frac{I^2 R}{V} = \frac{I^2 \cdot \frac{\rho l}{S}}{S \cdot l} = \frac{I^2 \rho}{S^2}$$

$$I = nevS$$

$$\bar{w} = \frac{(nevS)^2 \cdot \rho}{S^2} =$$

$$= \frac{n^2 e^2 v^2 g^2}{g^2} \cdot g =$$

$$= n^2 e^2 v^2 g$$

$$\omega = n^2 e^2 v^2 g$$

$$v^2 = \frac{\omega}{n^2 e^2 g}$$

(2)

$$v = \frac{1}{n e} \sqrt{\frac{\omega}{g}}$$

(18) $F_1 = 20 \text{ mm} = 2 \text{ sm}$

$$F_2 = 30 \text{ mm} = 3 \text{ sm}$$

$$\delta = l - (F_1 + F_2)$$

$$l = 15 \text{ sm}$$

$$\delta = 15 \text{ sm} - (2 \text{ sm} + 3 \text{ sm})$$

$$= 10 \text{ sm}$$

Chiziqli kattalashtirish

$$K = \frac{\delta \cdot d_0}{F_1 \cdot F_2}$$

$$K = \frac{10 \text{ sm} \cdot 25 \text{ sm}}{2 \text{ sm} \cdot 3 \text{ sm}} =$$

$$= \frac{125}{3}$$

Optimal kattalashtirish

$$K = \frac{\delta}{F_1} \cdot \left(\frac{d_0}{F_2} + 1 \right)$$

$$K = \frac{10 \text{ sm}}{2 \text{ sm}} \cdot \left(\frac{25 \text{ sm}}{3 \text{ sm}} + 1 \right)$$

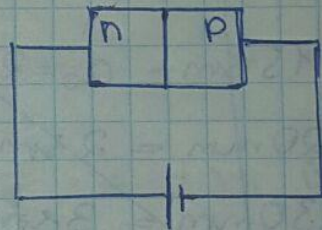
$$= 5 \cdot \frac{28}{3} = \frac{140}{3}$$

A

(19) $q = 1,6 \cdot 10^{-19} \text{ C}$

A

(20)



P-n ötish qatlamida
teskari ötish

(21) Har bir ferro-
magnetik uchun
aniq T_c tempera-
tura. (Xususi huquq)
maujud bo'lib, bu
temperatura da spın-
tan magnitlanish
sahasi buziladi va

$$= n^2 e^2 \frac{q^2 s^2}{s^2} \cdot g =$$

$$= n^2 e^2 g^2 g$$

$$\omega = n^2 e^2 g^2 g$$

$$g^2 = \frac{\omega}{n^2 e^2 g} \quad (2)$$

$$g = \frac{1}{n e} \sqrt{\frac{\omega}{g}}$$

$$(18) \quad F_1 = 20 \text{ mm} = 2 \text{ sm}$$

$$F_2 = 30 \text{ mm} = 3 \text{ sm}$$

$$\tilde{\sigma} = l - (F_1 + F_2)$$

$$l = 15 \text{ sm}$$

$$\tilde{\sigma} = 15 \text{ sm} - (2 \text{ sm} + 3 \text{ sm})$$

$$= 10 \text{ sm}$$

Chiziqli kattalashtirish

$$K = \frac{\tilde{\sigma} \cdot d_0}{F_1 \cdot F_2}$$

$$K = \frac{10 \text{ sm} \cdot 25 \text{ sm}}{2 \text{ sm} \cdot 3 \text{ sm}} =$$

$$= \frac{125}{3}$$

Optimal kattalashtirish

$$K = \frac{\tilde{\sigma}}{F_1} \cdot \left(\frac{d_0}{F_2} + 1 \right)$$

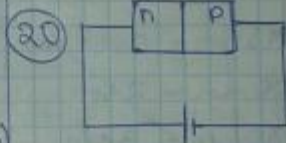
$$K = \frac{10 \text{ sm}}{2 \text{ sm}} \cdot \left(\frac{25 \text{ sm}}{3 \text{ sm}} + 1 \right) =$$

$$= 5 \cdot \frac{28}{3} = \frac{140}{3}$$

A

$$(19) \quad q = 1,6 \cdot 10^{-19} \text{ C}$$

A



P-n o'tish qatlami
teskari o'tish

(21) Har bir ferro-
magnetik uchun
ana T_c tempera-
tura (feyni nuqtasi)
mavjud bo'lib, bu
temperaturada sam-
tan magnitlanish
sohasi bo'siladi va

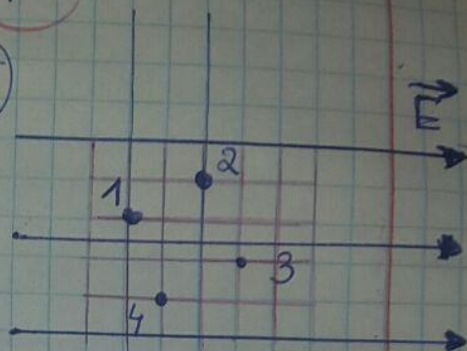
modda ferromagnetiklik
xassisini yiqilib
paramagnet moddaga
aylanadi

(A)

(25)

Ferromagnet $\mu \gg 1$
Paramagnet $\mu > 1$

(C)



(22) Magnitni tushish
vaqti katta
chunki lens qo'ldan
ga asosan

(B)

$\mu \gg 1$

$\varphi_{3,1} - ?$

(2)

$$\varphi_2 - \varphi_1 = 6V$$

$$\varphi' = \frac{\varphi_2 - \varphi_1}{2} = \frac{6V}{2} = 3V$$

$$\varphi_3 - \varphi_1 = 3\varphi' = 9V$$

(23) Dispersiya hodisa
siga kora.

$$\nu = 1,4 THz$$

$$\lambda = \frac{c}{\nu}$$

(B)

$$390nm \leq \lambda \leq 800nm$$

oraligda boladi

(24) $\tilde{\sigma}_2$ - $\tilde{\sigma}_2$ ni fokuslovchi
nur lazer deyiladi

(26)

$$I = \frac{\Delta \varphi}{\Delta \Omega}$$

$$\Delta \Omega = \frac{\Delta S}{r^2} = \frac{4\pi r^2}{r^2}$$

$$= 2\pi sr$$

$$I = \frac{220\pi \text{ lm}}{2\pi sr} =$$

$$= 110 \text{ cd}$$

(C)

modda ferromagnitlik
xossasini yoqalib
paramagnit moddaga
aylanadi

A

25

Ferromagnit $\mu \gg 1$
Paramagnit $\mu > 1$

C



22 Magnitni tushish
vaqti katta
chunki lens qo'ldan
qa asosan

B

$\mu \gg 1$

$\varphi_{3,1} = ?$

D

$$\varphi_2 - \varphi_1 = 6V$$

$$\varphi' = \frac{\varphi_2 - \varphi_1}{2} = \frac{6V}{2} = 3V$$

$$\varphi_3 - \varphi_1 = 3\varphi' = 9V$$

23 Dispersiya hodisa
siga kora.

$$\nu = 1,4 THz$$

$$\lambda = \frac{c}{\nu}$$

B

26

$$I = \frac{\Delta \varphi}{\Delta R}$$

$$\Delta R = \frac{\Delta S}{2L} = \frac{4\pi r^2}{2L}$$

$$= 2\pi rL$$

$$390nm \leq \lambda \leq 800nm$$

oraligda boladi

$$I = \frac{220\pi \text{ km}}{2\pi \text{ sr}} =$$

$$= 110 \text{ cd}$$

C

24 $\tilde{\sigma}_2$ - o'zini pokulovchi
nura lazer deyiladi

$$(27) I = \frac{W}{s \cdot t}$$

qisqan sari nurlanish
intensivligi ortadi

(B)

(28) Elektron barqaror
zarra, uning yashash
vaqti kamida 10^{22}
yilga teng ekanligi
aniqlangan

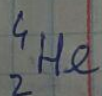
Bu ancha kichik vaqt
 ∞ dera boladi

(D)

(29)

$$W_1 = 27 \text{ MeV}$$

$$W_2 = 4,7 \text{ eV}$$



$$A = 4$$

(B)

$$W_{B1} = \frac{W_1}{A} = \frac{27 \text{ MeV}}{4}$$

$${}^1_0\text{n} \quad W_{B2} = \frac{W_2}{2} = \frac{4,7 \text{ eV}}{2}$$

$$\frac{W_{B1}}{W_{B2}} = \frac{\frac{27 \text{ MeV}}{4}}{\frac{4,7}{2}} \approx 3 \text{ M} = 3 \cdot 10^6 \text{ marta}$$

$$(30) W = -\frac{me^4}{8\epsilon_0^2 h^2} \cdot \frac{1}{n^2}$$

$$n=1 \text{ da}$$

$$W_1 = -13,55 \text{ eV}$$

$$W_n = \frac{W_1}{n^2}$$

$$W_2 = \frac{-13,55 \text{ eV}}{2^2} = \frac{-6,775 \text{ eV}}{2} = -3,3875 \text{ eV}$$

$$W_3 = \frac{W_1}{3^2} = \frac{-13,55 \text{ eV}}{9} = -1,5 \text{ eV}$$

(C)

$$W^I = W_3 - W_2 = -1,5 \text{ eV} + 3,3875 \text{ eV} = 1,9 \text{ eV}$$

Nurimov Tumoyun
Janob Fiziklar
kanali uchun
maxsus

$$(27) I = \frac{W}{S \cdot t}$$

qiziqan sari nurlanish
intensivligi o'tadi

(B)

(28) Elektron bargazor
zarra, uning yashash
vaqti kamida 10^{-22}
yilga teng ekanligi
aniqlangan

Bu ancha kichik vaqt
 ∞ deya biladi

(D)

$$(29) W_1 = 27 \text{ MeV}$$

$$W_2 = 4,7 \text{ eV}$$



$$A = 4$$

(B)

$$W_{B1} = \frac{W_1}{A} = \frac{27 \text{ MeV}}{4}$$

$${}^1_1\text{H}_2 \quad W_{B2} = \frac{W_2}{2} = \frac{4,7 \text{ eV}}{2}$$

$$\frac{W_{B1}}{W_{B2}} = \frac{\frac{27 \text{ MeV}}{4}}{\frac{4,7}{2}} \approx 3 \text{ M} =$$

$$= 3 \cdot 10^6 \text{ marta}$$

$$(30) W = -\frac{m e^4}{8 \epsilon_0^2 h^2} \cdot \frac{1}{n^2}$$

$$n=1 \text{ da}$$

$$W_1 = -13,5 \text{ eV}$$

$$W_n = \frac{W_1}{n^2}$$

$$W_2 = \frac{-13,5 \text{ eV}}{2^2} = \frac{-13,5 \text{ eV}}{4} = -3,375 \text{ eV}$$

$$W_3 = \frac{W_1}{3^2} = \frac{-13,5 \text{ eV}}{9} =$$

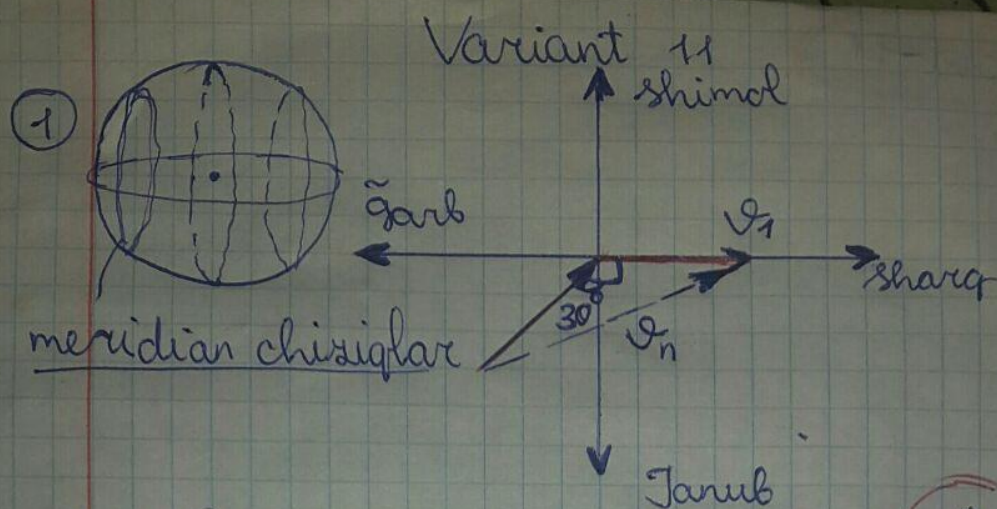
$$= -1,5 \text{ eV}$$

(C)

$$W' = W_3 - W_2 = -1,5 \text{ eV} +$$

$$+ 3,375 \text{ eV} = 1,875 \text{ eV}$$

Maximova Lumayun
Jahod Fiziklar
kanali uchun
maxsus



$$\alpha = 30^\circ$$

$$\beta = 30^\circ + 90^\circ = 120^\circ$$

$$v_n = \sqrt{v_1^2 + v_2^2 + 2v_1v_2 \cos \beta}$$

$$v_1 = v_2 = v$$

$$v_n = \sqrt{v^2 + v^2 + 2v^2 \cdot \left(-\frac{1}{2}\right)} = v = 20 \frac{\text{km}}{\text{h}}$$

$$\textcircled{2} \quad s = v_0 t - \frac{at^2}{2}$$

$$\begin{cases} 5 = v_0 \cdot 1 - \frac{a}{2} \cdot 1 \end{cases}$$

$$\begin{cases} 8 = v_0 \cdot 2 - \frac{a}{2} \cdot 2^2 \end{cases}$$

$$\begin{cases} 2 \cdot 5 = v_0 \cdot 2 - a \end{cases}$$

$$\begin{cases} 8 = 2v_0 - 2a \end{cases}$$

$$2 = \cancel{2v_0} - a - \cancel{2v_0} + 2a$$

$$2 = a \quad a = 2 \text{ m/s}^2$$

$$5 = v_0 \cdot 1 - \frac{2}{2}$$

$$v_0 = 6 \text{ m/s}$$

$$s = v_0 t - \frac{at^2}{2} = 6t - \frac{2t^2}{2} = 6t - t^2$$

$$s = 6 \cdot 3 - 3^2 = 18 - 9 = 9 \text{ m}$$

$$v_{\text{ort}} = \frac{s}{t} = \frac{9 \text{ m}}{3} = 3 \frac{\text{m}}{\text{s}}$$

$\textcircled{2}$



A

$$\alpha = 30^\circ$$

$$\beta = 30^\circ + 90^\circ = 120^\circ$$

$$v_n = \sqrt{v_1^2 + v_2^2 + 2v_1v_2 \cos \beta}$$

$$v_1 = v_2 = v$$

$$v_n = \sqrt{v^2 + v^2 + 2v^2 \left(-\frac{1}{2}\right)} = v = 20 \frac{\text{km}}{\text{h}}$$

$$\textcircled{2} \quad s = v_0 t - \frac{at^2}{2}$$

$$\begin{cases} 5 = v_0 \cdot 1 - \frac{a}{2} \cdot 1 \\ 8 = v_0 \cdot 2 - \frac{a}{2} \cdot 2^2 \end{cases} \Rightarrow \begin{cases} 5 = v_0 - \frac{a}{2} \\ 8 = 2v_0 - 2a \end{cases}$$

$$\begin{cases} 5 = v_0 - \frac{a}{2} \\ 8 = v_0 \cdot 2 - \frac{a}{2} \cdot 2^2 \end{cases} \Rightarrow \begin{cases} 5 = v_0 - \frac{a}{2} \\ 2 = 2v_0 - a - 2v_0 + 2a \end{cases}$$

$$2 = a \quad a = 2 \text{ m/s}^2$$

$$5 = v_0 \cdot 1 - \frac{2}{2} \quad v_0 = 6 \text{ m/s}$$

$$s = v_0 t - \frac{at^2}{2} = 6t - \frac{2t^2}{2} = 6t - t^2$$

$$s = 6 \cdot 3 - 3^2 = 18 - 9 = 9 \text{ m}$$

$$v_{\text{ort}} = \frac{s}{t} = \frac{9 \text{ m}}{3} = 3 \frac{\text{m}}{\text{s}}$$

D

③ $\alpha = 60^\circ$

$$\begin{cases} T \cos \alpha = mg \\ T \sin \alpha = \frac{mv^2}{R} \end{cases} \Rightarrow \tan \alpha = \frac{v^2}{gR}$$

$$\sin \alpha = \frac{R}{l} \quad R = l \sin \alpha$$

$$\tan \alpha = \frac{v^2}{gl \sin \alpha} \quad v^2 = gl \tan \alpha \cdot \sin \alpha$$

$$v^2 = 10 \frac{m}{s^2} \cdot 0,6 m \cdot \tan 60^\circ \cdot \sin 60^\circ = 9 m^2/s^2$$

$$v = 3 m/s$$

$$N = mg \cos \alpha + \frac{mv^2}{R} = m \cdot (g \cos \alpha + \frac{v^2}{R})$$

$$N = 1 kg \left(10 \frac{m}{s^2} \cdot \frac{1}{2} + \frac{(3 m/s)^2}{0,6 m} \right) = 20 N$$

$$F = ma = \frac{mv^2}{R} = \frac{1 kg \cdot (3 m/s)^2}{0,6 m \cdot \sin 60^\circ} = 10 \sqrt{3} N$$

B

④

giperbola $v = 10 km/s$

$$v_T < v \leq v_H$$

$$7,9 \frac{km}{s} < v \leq 11,2 \frac{km}{s}$$

ellips

A

③ $\alpha = 60^\circ$

$$\begin{cases} T \cos \alpha = mg \\ T \sin \alpha = \frac{mv^2}{R} \end{cases} \Rightarrow \tan \alpha = \frac{v^2}{gR}$$

$$\sin \alpha = \frac{R}{l} \quad R = l \sin \alpha$$

$$\tan \alpha = \frac{v^2}{gl \sin \alpha} \quad v^2 = g l \tan \alpha \sin \alpha$$

$$v^2 = 10 \frac{\text{m}}{\text{s}^2} \cdot 0,6 \text{ m} \cdot \tan 60^\circ \cdot \sin 60^\circ = 9 \text{ m}^2/\text{s}^2$$

$$v = 3 \text{ m/s}$$

$$N = mg \cos \alpha + \frac{mv^2}{r} = m \cdot \left(g \cos \alpha + \frac{v^2}{r} \right)$$

$$N = 1 \text{ kg} \left(10 \frac{\text{m}}{\text{s}^2} \cdot \frac{1}{2} + \frac{(3 \text{ m/s})^2}{0,6 \text{ m}} \right) = 20 \text{ N}$$

$$F = m \cdot a = \frac{mv^2}{R} = \frac{1 \text{ kg} \cdot (3 \text{ m/s})^2}{0,6 \text{ m} \cdot \sin 60^\circ} = 10,3 \text{ N}$$

B

④

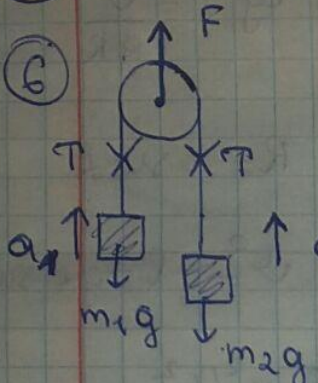
giperbola $v = 10 \text{ km/s}$

$$v_{\text{I}} < v \leq v_{\text{II}}$$

$$7,9 \frac{\text{km}}{\text{s}} < v \leq 11,2 \frac{\text{km}}{\text{s}}$$

A

⑤ $F = ma = 2,5 \text{ kg} \cdot 1,2 \text{ m/s}^2 = 3 \text{ N}$ (2)

⑥  $F = 2T \Rightarrow T = \frac{F}{2} = \frac{72 \text{ N}}{2} = 36 \text{ N}$

$T = m_2 g + m_2 a_2 \Rightarrow a_2 = \frac{T - m_2 g}{m_2}$

$a_2 = \frac{36 \text{ N} - 3 \text{ kg} \cdot 10 \text{ m/s}^2}{3 \text{ kg}} = 2 \text{ m/s}^2$

$T = m_1 g + m_1 a_1 \Rightarrow a_1 = \frac{T - m_1 g}{m_1}$

$a_1 = \frac{36 \text{ N} - 2 \text{ kg} \cdot 10 \text{ m/s}^2}{2 \text{ kg}} = 8 \text{ m/s}^2$

Har ikkala jism yerga nisbatan yugoriya tezlanish bilan harakatlanadi.

⑦ $F = k\vartheta$ $N = F \cdot \vartheta = k\vartheta \cdot \vartheta = k\vartheta^2$

$N_1 = k\vartheta_1^2$

$N_2 = k\vartheta_2^2$

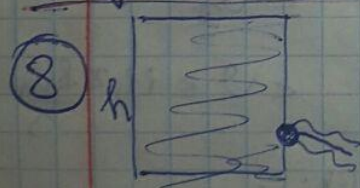
$N_3 = k\vartheta_3^2$

$N = N_1 + N_2 + N_3$

$k\vartheta^2 = k\vartheta_1^2 + k\vartheta_2^2 + k\vartheta_3^2$

$\vartheta^2 = \vartheta_1^2 + \vartheta_2^2 + \vartheta_3^2$ (E)

$\vartheta = \sqrt{(1 \text{ m/s})^2 + (2 \text{ m/s})^2 + (3 \text{ m/s})^2} = \sqrt{14} \text{ m/s}$



$mgh = \frac{mv^2}{2}$

$v^2 = 2gh$

$v = \sqrt{2gh}$ (C)

⑨ $E_t = E_k + E_p$

⑤ $F = ma = 2,5 \text{ kg} \cdot 1,2 \text{ m/s}^2 = 3 \text{ N}$ (d)

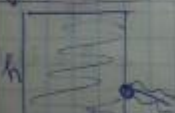
⑥  $F = 2T \Rightarrow T = \frac{F}{2} = \frac{72 \text{ N}}{2} = 36 \text{ N}$
 $T = m_2 g + m_2 a_2 \Rightarrow a_2 = \frac{T - m_2 g}{m_2}$
 $a_2 = \frac{36 \text{ N} - 3 \text{ kg} \cdot 10 \text{ m/s}^2}{3 \text{ kg}} = 2 \text{ m/s}^2$
 $T = m_1 g + m_1 a_1 \Rightarrow a_1 = \frac{T - m_1 g}{m_1}$

(B) $a_1 = \frac{36 \text{ N} - 2 \text{ kg} \cdot 10 \text{ m/s}^2}{2 \text{ kg}} = 8 \text{ m/s}^2$

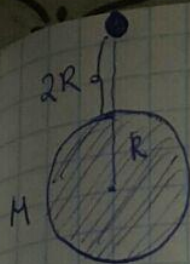
Kar ikkala jim yerga niktatn yuguriga teslanish bilan harakatlanaadi.

⑦ $F = k\vartheta$ $N = F \cdot \vartheta = k\vartheta \cdot \vartheta = k\vartheta^2$
 $N_1 = k\vartheta_1^2$ $N_2 = k\vartheta_2^2$ $N_3 = k\vartheta_3^2$
 $N = N_1 + N_2 + N_3$ $k\vartheta^2 = k\vartheta_1^2 + k\vartheta_2^2 + k\vartheta_3^2$
 $\vartheta^2 = \vartheta_1^2 + \vartheta_2^2 + \vartheta_3^2$ (E)

$\vartheta = \sqrt{(1 \text{ m/s})^2 + (2 \text{ m/s})^2 + (3 \text{ m/s})^2} = \sqrt{14} \text{ m/s}$

⑧  $mgh = \frac{mv^2}{2}$ $v^2 = 2gh$
 $v = \sqrt{2gh}$ (C)

⑨ $E_t = E_k + E_p$



$$E_p = -\frac{GMm}{(R+h)} = -\frac{GMm}{(R+2R)} = -\frac{GMm}{3R}$$

$$E_k = \frac{mv^2}{2}$$

$$v^2 = \frac{GM}{R+h} = \frac{GM}{R+2R} = \frac{GM}{3R}$$

$$E_k = \frac{m}{2} \cdot \frac{GM}{3R} = \frac{GMm}{6R}$$

(D)

$$E_t = \frac{GMm}{6R} - \frac{GMm}{3R} = -\frac{GMm}{6R} = -\frac{mgR}{6}$$

(10) $i_i - i_a = 0$
 $i = 6$

$i_i = 3$ $i_a = 3$

(A)

$V = \text{const}$ $A = 0$

$$Q = \Delta U = \frac{i}{2} \int_{RT} = C_v$$

$$\frac{6}{2} \cdot 1 \cdot R = C_v$$

$$C_v = 3R = 3 \cdot 8,31 = 25 \frac{\text{J}}{\text{K mol}}$$

(11) kamayadi

(A)

(12) Anizotroplik - jismning fizik xossalari uning ichki yo'nalishiga bog'liqligi, ya'ni har xil yo'nalishlarda fizik xossalari turlicha bo'ladi

(A)

(13) $W_1 = k \cdot \frac{2q \cdot (-q)}{r_1} = -\frac{2kq^2}{r_1}$

$$W_2 = -\frac{2kq^2}{r_2}$$

$$r_1 < r_2$$

$$W_1 < W_2$$

(B)

ortadi

JANOB FIZIKLARKanali



$$E_p = -\frac{GMm}{(R+R)} = -\frac{GMm}{(R+2R)} = -\frac{GMm}{3R}$$

$$E_k = \frac{mv^2}{2} \quad v^2 = \frac{GM}{R+R} = \frac{GM}{R+2R} = \frac{GM}{3R}$$

$$E_k = \frac{m}{2} \cdot \frac{GM}{3R} = \frac{GMm}{6R} \quad \textcircled{D}$$

$$E_t = \frac{GMm}{6R} - \frac{GMm}{3R} = -\frac{GMm}{6R} = -\frac{mgR}{6}$$

$$\textcircled{10} \quad i_i - i_a = 0 \quad i_i = 3 \quad i_a = 3$$

$$i = 6 \quad \textcircled{A}$$

$$V = \text{const} \quad A = 0$$

$$Q = \Delta U = \int_1^2 \vec{D} \cdot d\vec{r} = C \ln$$

$$\frac{G}{2} \cdot 1 \cdot R = C_v$$

$$C_v = 3R = 3 \cdot 8,31 = 25 \frac{\text{J}}{\text{mol} \cdot \text{K}}$$

11) kamayadi

Ⓐ

12) Anizotropik - jismning fizik xossalari uning ichki yonalishiga bog'liqligi ya'ni har xil yonalishlarda fizik xossalari turlicha bo'ladi

Ⓐ

$$\textcircled{13} \quad W_1 = k \cdot \frac{q_1 \cdot (-q_2)}{r_1} = -\frac{2kq^2}{r_1}$$

$$W_2 = -\frac{2kq^2}{r_2}$$

$$r_1 < r_2$$

$$W_1 < W_2$$

Ⓑ

o'tadi

JANOB FIZIKLARkanali

14) $m_p \rightarrow v$

m_d

$E = \frac{m_p v^2}{2}$

$m_p v + m_d \cdot 0 = m_d v_d + m_p \cdot 0$

$m_p v = m_d v_d \Rightarrow m_p v = 4 m_p v_d \quad \text{C} \quad v_d = \frac{v}{4}$

$E_k = \frac{m_d v_d^2}{2} = \frac{4 m_p \cdot \left(\frac{v}{4}\right)^2}{2} = \frac{4 m_p \frac{v^2}{16}}{2} = \frac{E}{4}$

15) q_1 q_2

$\varphi_1 = \frac{k q_1}{r_1}$

$\varphi_2 = \frac{k q_2}{r_2}$

$\varphi_1' = \varphi_2' \Rightarrow \frac{k q_1'}{r_1} = \frac{k q_2'}{r_2} \Rightarrow q_1' \cdot r_2 = q_2' \cdot r_1$

$q_1 + q_2 = q_1' + q_2' \Rightarrow q + q = q_1' + q_2'$

$2q = q_1' + q_1' \cdot \frac{r_2}{r_1} = q_1' \cdot \left(1 + \frac{r_2}{r_1}\right) \Rightarrow q_1' = \frac{2q}{\left(1 + \frac{r_2}{r_1}\right)}$

$q_1' = \frac{2q}{\left(1 + \frac{4 \text{ cm}}{2 \text{ cm}}\right)} = \frac{2q}{3} \Rightarrow 2q = \frac{2q}{3} + q_2'$

$q_2' = 2q - \frac{2q}{3} = \frac{4q}{3}$

$W_{p1} = \frac{k q \cdot q}{r} = \frac{k q^2}{r}$

$W_{p2} = \frac{k \cdot \frac{2q}{3} \cdot \frac{4q}{3}}{2}$

$W_{p2} = \frac{8}{9} \frac{k q^2}{r} = \frac{8}{9} W_{p1}$

B

$\frac{q}{8}$ marta kamayadi.

14) $m_p \rightarrow v$ m_d $E = \frac{m_p v^2}{2}$

$$m_p v + m_d \cdot 0 = m_d v_d + m_p \cdot 0$$

$$m_p v = m_d v_d \Rightarrow v_p v = 4 v_p v_d \quad \text{C} \quad v_d = \frac{v}{4}$$

$$E_d = \frac{m_d v_d^2}{2} = \frac{4 m_p \cdot \left(\frac{v}{4}\right)^2}{2} = \frac{4 m_p \frac{v^2}{16}}{2} = \frac{E}{4}$$

15) q_1 q_2 $\varphi_1 = \frac{k q_1}{r_1}$ $\varphi_2 = \frac{k q_2}{r_2}$

$$\varphi_1' = \varphi_2' \Rightarrow \frac{k q_1'}{r_1} = \frac{k q_2'}{r_2} \Rightarrow q_1' \cdot r_2 = q_2' \cdot r_1$$

$$q_1 + q_2 = q_1' + q_2' \Rightarrow q + q = q_1' + q_2'$$

$$2q = q_1' + q_1' \frac{r_2}{r_1} = q_1' \left(1 + \frac{r_2}{r_1}\right) \Rightarrow q_1' = \frac{2q}{1 + \frac{r_2}{r_1}}$$

$$q_1' = \frac{2q}{1 + \frac{4\text{cm}}{2\text{cm}}} = \frac{2q}{3} \Rightarrow 2q = \frac{2q}{3} + q_2'$$

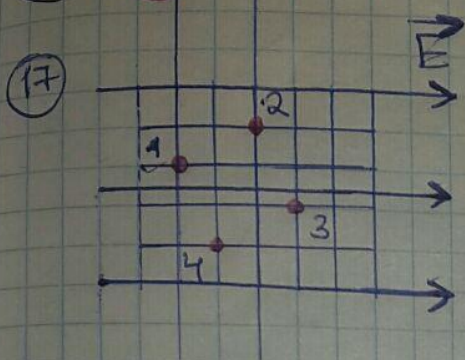
$$q_2' = 2q - \frac{2q}{3} = \frac{4q}{3}$$

$$W_{p1} = \frac{k q \cdot q}{r} = \frac{k q^2}{r} \quad W_{p2} = \frac{k \frac{2q}{3} \cdot \frac{4q}{3}}{2}$$

$$W_{p2} = \frac{8}{9} \frac{k q^2}{r} = \frac{8}{9} W_{p1} \quad \text{B}$$

$\frac{8}{9}$ marta kamayadi.

16) A elektrostatika bo'limida



$$\varphi_2 - \varphi_1 = 6 \text{ V}$$

$$\varphi' = \frac{\varphi_2 - \varphi_1}{2} = \frac{6 \text{ V}}{2} = 3 \text{ V}$$

$$\varphi_3 - \varphi_4 = 2\varphi' = 2 \cdot 3 \text{ V} = 6 \text{ V}$$

D

18) Qarshilikka teskari kattalik

$$\Lambda = \frac{1}{R}$$

dielektriklar qarshiligi katta,
otkazuvchanligi kichik

A

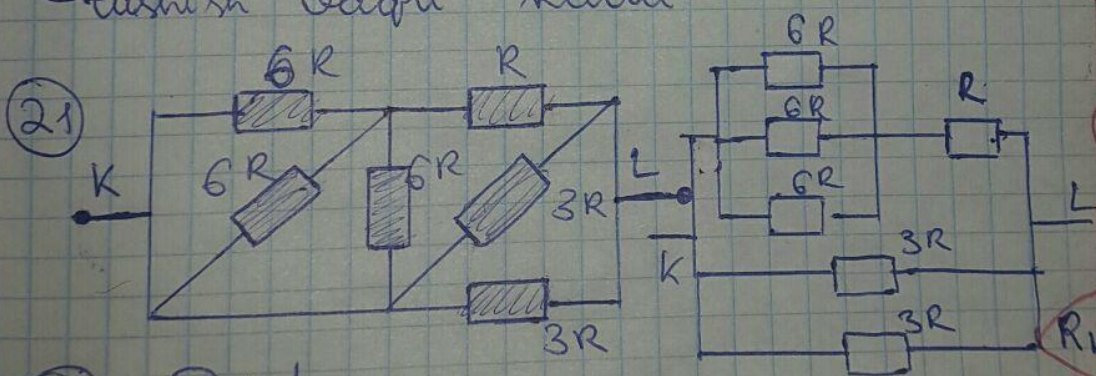
19) $\mu = 1 + \chi$

$$\beta = \mu B_0 = B_0(1 + \chi)$$

D

20) Lens qoidalariga asosan magnitni tushish vaqti katta

B



B

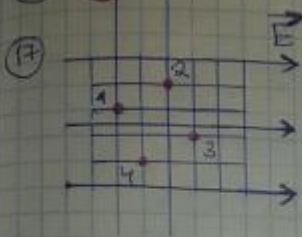
$$R_{KL} = R$$

22) Diodalga

VAX - volt Amperi xarakteristikasi

C

16) A elektrostatika bo'limida



$$\varphi_2 - \varphi_1 = 6V$$

$$\varphi' = \frac{\varphi_2 - \varphi_1}{2} = \frac{6V}{2} = 3V$$

$$\varphi_3 - \varphi_4 = 2\varphi' = 2 \cdot 3V = 6V$$

D

18) Qarshilikka teskari kattalik

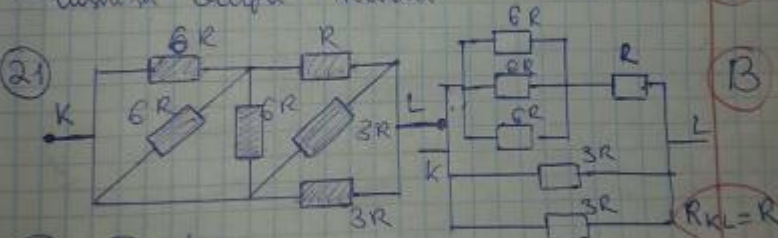
$$\Lambda = \frac{1}{R} \quad \text{dielektriklar qarshiligi katta, o'tkazimchanligi kichik}$$

A

19) $\mu = 1 + \chi$ $\beta = \mu B_0 = B_0(1 + \chi)$

D

20) Lens qoidasiga asosan magnitni tushish vaqti katta B



22) Diodga VAX - Volt Amper xarakteristikasi

C

$$\textcircled{23} \quad \frac{\varepsilon}{u_1} = \frac{n_1}{n_2} \quad \frac{\varepsilon}{u_2} = \frac{n_2}{n_1} \quad u_1 = 8V \quad u_2 = 2V$$

$$\frac{\varepsilon}{u_1} \cdot \frac{\varepsilon}{u_2} = \frac{n_1}{n_2} \cdot \frac{n_2}{n_1} \quad \varepsilon^2 = u_1 \cdot u_2 \quad \varepsilon = \sqrt{u_1 \cdot u_2} \quad \textcircled{D}$$

$$\varepsilon = \sqrt{8V \cdot 2V} = 4V$$

$\textcircled{24}$ Lazer nurlari qutblangan nurlar hisoblanadi $\textcircled{C}$

$$\textcircled{25} \quad K = \frac{F_{ob}}{F_{ok}} \quad F_{ob} + F_{ok} = l$$

$$F_{ob} = l - F_{ok} = 210 \text{ sm} - 10 \text{ sm} = 200 \text{ sm}$$

$$K = \frac{200 \text{ sm}}{10 \text{ sm}} = 20 \text{ marta} \quad \textcircled{A}$$

$$\textcircled{26} \quad \Delta \Omega = \frac{S}{r^2} = \frac{\pi r^2}{r^2} = \pi \text{ sr}$$

$$\textcircled{C} \quad I = \frac{\Delta \Phi}{\Delta \Omega} = \frac{110 \pi \text{ lm}}{\pi \text{ sr}} = 110 \text{ cd}$$

$$\textcircled{27} \quad I = \frac{W}{S \cdot t} \quad W \text{ kamaygani uchun, kamayadi} \quad \textcircled{A}$$

$\textcircled{28}$ Yashash vaqti cheksiz bo'lgan zarralar stabil zarralar deb ataladi $\textcircled{A}$

$\textcircled{29}$ Pozitron elektronning antizarrasi $\textcircled{A}$
 $\textcircled{+1e}$ $\textcircled{-1e}$ Zaryadi bilan

$\textcircled{30}$ $\textcircled{A}$ Proton $1,6 \cdot 10^{-19} \text{ C}$
 Antiproton $-1,6 \cdot 10^{-19} \text{ C}$

23) $\frac{E}{U_1} = \frac{n_1}{n_2}$ $\frac{E}{U_2} = \frac{n_2}{n_1}$ $U_1 = 8V$ $U_2 = 2V$
 $\frac{E}{U_1} \cdot \frac{E}{U_2} = \frac{n_1}{n_2} \cdot \frac{n_2}{n_1}$ $E^2 = U_1 U_2$ $E = \sqrt{U_1 U_2}$ $E = \sqrt{8V \cdot 2V} = 4V$ (D)

24) Sog'ir nurlari qutblangan nurlar hisoblanadi (C)

25) $K = \frac{F_{ob}}{F_{ok}}$ $F_{ob} + F_{ok} = l$
 $F_{ob} = l - F_{ok} = 210 \mu m - 10 \mu m = 200 \mu m$
 $K = \frac{200 \mu m}{10 \mu m} = 20$ marta (A)

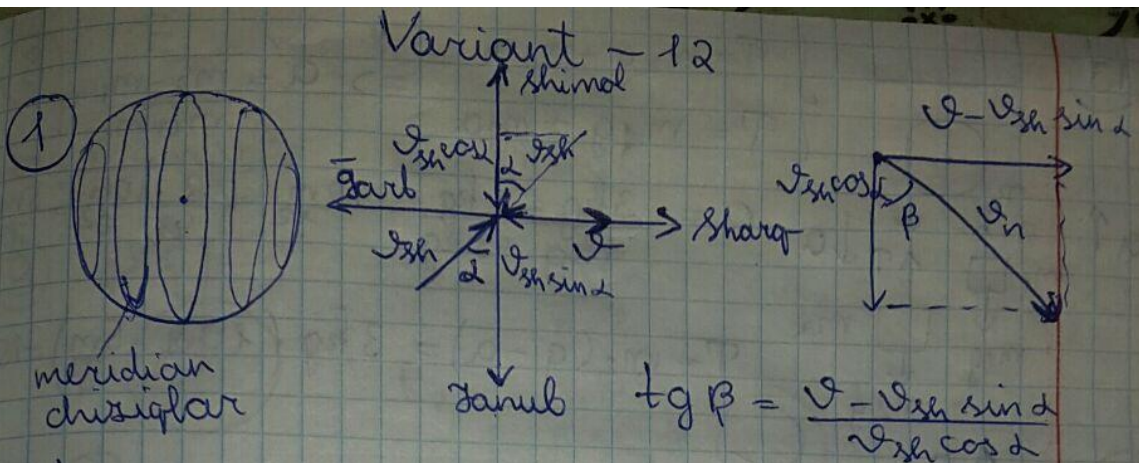
26) $\Delta R = \frac{S}{r^2} = \frac{4\pi r^2}{r^2} = \pi$ sr
 $I = \frac{P}{\Delta R} = \frac{110\pi \text{ lm}}{\pi \text{ sr}} = 110 \text{ cd}$ (C)

27) $I = \frac{W}{S \cdot t}$ W kamaygan uchun kamayadi (A)

28) Yushash vaqti chekris bo'lgan zarralar stabil zarralar deb ataladi (A)

29) Pozitron elektronning antizovasi (+e) (-e) zaryadi bilan (A)

30) A Proton $1,6 \cdot 10^{-19} \text{ C}$
 Antiproton $-1,6 \cdot 10^{-19} \text{ C}$



$$\text{tg } \beta = \frac{20 - 20 \cdot \sin 30^\circ}{20 \cdot \frac{\sqrt{3}}{2}} = \frac{10}{10\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$\beta = 30^\circ$$

(B)

$$(2) \quad v = \frac{2\pi R}{T} \cos \alpha = \frac{L}{T} \cos \alpha = \frac{40 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \cos 60^\circ =$$

$$= \frac{40 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \frac{1}{2} = 232 \text{ m/s}$$

(B)

$$(3) \quad x = 2t + t^2 \Rightarrow x' = v = 2 + 2t$$

$$v(1) = 2 + 2 \cdot 1 = 4 \text{ m/s} \quad v' = a = 2 \text{ m/s}^2$$

$$F = ma = 2 \text{ kg} \cdot 2 \text{ m/s}^2 = 4 \text{ N}$$

$$x = 2t + t^2 = 2 \cdot 1 + 1 = 3 \text{ m}$$

(A)

J: $4 \frac{\text{m}}{\text{s}}; 3 \text{ m}; \frac{2 \text{ m}}{\text{s}^2}; 4 \text{ N};$

$$(4) \quad v_{II} < v < v_{III} \quad \text{Parabola}$$

$$11,2 \frac{\text{km}}{\text{s}} < v < 16,7 \frac{\text{km}}{\text{s}}$$

$$11,2 < 11,3 < 16,7$$

(C)

Variant - 12

1.  meridian chizma

Diagram showing velocity vectors $\vec{v}$ and $\vec{v}_{sh}$ with angles α and β . The resultant velocity $\vec{v}$ is at an angle β to the horizontal. The horizontal component is $v_{sh} \cos \alpha$ and the vertical component is $v - v_{sh} \sin \alpha$.

$\tan \beta = \frac{v - v_{sh} \sin \alpha}{v_{sh} \cos \alpha}$

$\tan \beta = \frac{20 - 20 \cdot \sin 30^\circ}{20 \cdot \frac{\sqrt{3}}{2}} = \frac{10}{10\sqrt{3}} = \frac{1}{\sqrt{3}}$

$\beta = 30^\circ$ (B)

2. $v = \frac{2\pi R \cos \alpha}{T} = \frac{L \cos \alpha}{T} = \frac{40 \cdot 10^6 \text{ m} \cdot \cos 60^\circ}{86400 \text{ s}}$

$= \frac{40 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \frac{1}{2} = 232 \text{ m/s}$ (B)

3. $x = 2t + t^2 \Rightarrow x' = v = 2 + 2t$

$v(1) = 2 + 2 \cdot 1 = 4 \text{ m/s}$ $v' = a = 2 \text{ m/s}^2$

$F = ma = 2 \text{ kg} \cdot 2 \text{ m/s}^2 = 4 \text{ N}$

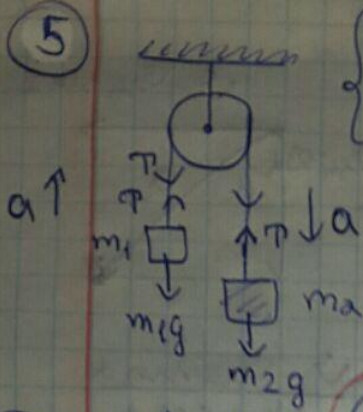
$x = 2t + t^2 = 2 \cdot 1 + 1 = 3 \text{ m}$ (A)

2: $4 \frac{\text{m}}{\text{s}}$; 3 m ; $2 \frac{\text{m}}{\text{s}^2}$; 4 N

4. $v_{II} < v < v_{III}$ Parabola

$16,2 \frac{\text{km}}{\text{s}} < v < 16,7 \frac{\text{km}}{\text{s}}$ $11,2 < 11,3 < 16,7$ (C)

5



$$\begin{cases} T = m_2 g - m_2 a \\ T = m_1 g + m_1 a \end{cases} \Rightarrow a = \frac{m_2 - m_1}{m_1 + m_2} g$$

$$a = \frac{3 \text{ kg} - 1 \text{ kg}}{1 \text{ kg} + 3 \text{ kg}} \cdot 10 \frac{\text{m}}{\text{s}^2} = \frac{2}{4} \cdot 10 \frac{\text{m}}{\text{s}^2} = \frac{5 \text{ m}}{\text{s}^2}$$

$$T = m_2 (g - a) = 3 \text{ kg} \left(10 \frac{\text{m}}{\text{s}^2} - 5 \frac{\text{m}}{\text{s}^2} \right) = 15 \text{ N}$$

6

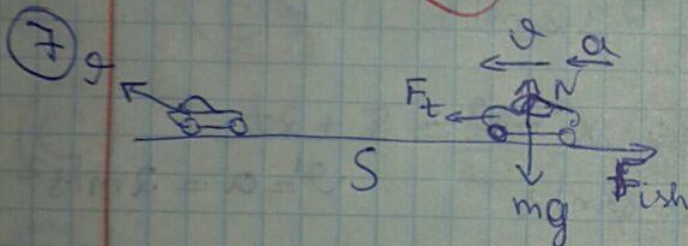


$$F = 2T \Rightarrow T = \frac{F}{2} = \frac{96 \text{ N}}{2} = 48 \text{ N}$$

$$T = m_1 g + m_1 a_1$$

$$a_1 = \frac{T - m_1 g}{m_1} = \frac{48 \text{ N} - 3 \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2}}{3 \text{ kg}} = \frac{6 \text{ m}}{\text{s}^2}$$

7



$$F_t = F_{fr} + ma$$

$$F_{fr} = \mu N = \mu mg$$

$$\mu = k \quad F_{fr} = kmg$$

$$F_t = kmg + ma = m(kg + a)$$

$$S = \frac{v^2}{2a} \quad a = \frac{v^2}{2S} = \frac{(25 \text{ m/s})^2}{2 \cdot 100 \text{ m}} = \frac{25}{8} \frac{\text{m}}{\text{s}^2}$$

$$F_t = \left(0,02 \cdot 10 \frac{\text{m}}{\text{s}^2} + \frac{25}{8} \frac{\text{m}}{\text{s}^2} \right) \cdot 1000 \text{ kg} = 3325 \text{ N}$$

$$N = F_t \cdot v = 3325 \text{ W} \cdot 25 \frac{\text{m}}{\text{s}} = 83 \text{ kW}$$

B

5

$$\begin{cases} T = m_2 g - m_2 a \\ T = m_1 g + m_1 a \end{cases} \Rightarrow a = \frac{m_2 - m_1}{m_1 + m_2} g$$

$$a = \frac{3 \text{ kg} - 1 \text{ kg}}{1 \text{ kg} + 3 \text{ kg}} \cdot 10 \frac{\text{m}}{\text{s}^2} = \frac{2}{4} \cdot 10 \frac{\text{m}}{\text{s}^2} = 5 \frac{\text{m}}{\text{s}^2}$$

$$T = m_2 (g - a) = 3 \text{ kg} \left(10 \frac{\text{m}}{\text{s}^2} - 5 \frac{\text{m}}{\text{s}^2} \right) = 15 \text{ N}$$

6

$$F = 2T \Rightarrow T = \frac{F}{2} = \frac{96 \text{ N}}{2} = 48 \text{ N}$$

$$T = m_1 g + m_1 a_1$$

$$a_1 = \frac{T - m_1 g}{m_1} = \frac{48 \text{ N} - 3 \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2}}{3 \text{ kg}} = \frac{18 \text{ N}}{3 \text{ kg}} = 6 \frac{\text{m}}{\text{s}^2}$$

7

$$F_t = F_{fr} + m a$$

$$F_{fr} = \mu N = \mu m g$$

$$\mu = k \quad F_{fr} = k m g$$

$$F_t = k m g + m a = m (k g + a)$$

$$S = \frac{v^2}{2a} \quad a = \frac{v^2}{2S} = \frac{(25 \text{ m/s})^2}{2 \cdot 100 \text{ m}} = \frac{25}{8} \frac{\text{m}}{\text{s}^2}$$

$$F_t = \left(0.02 \cdot 10 \frac{\text{m}}{\text{s}^2} + \frac{25}{8} \frac{\text{m}}{\text{s}^2} \right) \cdot 1000 \text{ kg} = 3325 \text{ N}$$

$$N = F_t \cdot 0.25 = 3325 \text{ W} \cdot 0.25 \frac{\text{m}}{\text{s}} = 83 \text{ kJ} \quad \text{B}$$

$$(8) E_t = mgh = mgh + \frac{mv^2}{2}$$

$$\frac{mgh}{2} = \frac{mv^2}{2}$$

$$v^2 = gh$$

$$v = \sqrt{gh}$$

(B)



$$E_p = -\frac{GMm}{R+h}$$

$$g = \frac{GM}{R^2}$$

(C)

$$E_p = -\frac{GMm}{R+0.1R} = -\frac{GMm}{1.1R} = -\frac{mgR}{1.1}$$

$$(10) (I) V = \text{const}$$

$$Q = \Delta U$$

$$A = 0$$

$$Q = \Delta U = \frac{i}{2} \frac{m}{M} R \Delta T$$

$$i = 3$$

bir atomli uchun

$$Q = \frac{3}{2} \frac{m}{M} R \Delta T = C_v \Delta T$$

$$\Rightarrow \frac{3}{2} \frac{m}{M} R = C_v$$

$$C_v = \frac{3}{2} \frac{R}{M}$$

$i = 5$ ikki atomli uchun

$$Q = \frac{5}{2} \frac{m}{M} R \Delta T = C_v \Delta T$$

$$\Rightarrow$$

$$\frac{5}{2} \frac{m}{M} R = C_v$$

$$C_v = \frac{5}{2} \frac{R}{M}$$

$$(II) P = \text{const}$$

$$Q = A + \Delta U$$

$i = 3$ bir atomli

$$Q = \frac{m}{M} R \Delta T + \frac{3}{2} \frac{m}{M} R \Delta T = \frac{5}{2} \frac{m}{M} R \Delta T = C_p \Delta T$$

$$C_p = \frac{5}{2} \frac{R}{M}$$

$$i = 6$$

uch atomli gaz uchun

$$Q = \frac{m}{M} R \Delta T + \frac{6}{2} \frac{m}{M} R \Delta T = 4 \frac{m}{M} R \Delta T = C_p \Delta T$$

$$C_p = 4 \frac{R}{M}$$

(C)

$$(8) E_t = mgh = mgh + \frac{mv^2}{2}$$

$$\frac{mgh}{2} = \frac{mv^2}{2} \quad v^2 = gh \quad v = \sqrt{gh} \quad (B)$$

(9)  $E_p = -\frac{GMm}{R+r}$ $g = \frac{GM}{R^2}$ (C)

$$E_p = -\frac{GMm}{R+0.1R} = -\frac{GMm}{1.1R} = -\frac{mgR}{1.1R}$$

(10) (I) $V = \text{const}$ $Q = \Delta U$ $A = 0$

$$Q = \Delta U = \frac{i}{2} \frac{m}{M} R \Delta T \quad i = 3 \quad \text{biri atomli uchun}$$

$$Q = \frac{3}{2} \frac{m}{M} R \Delta T = C_v \Delta T \Rightarrow \frac{3}{2} \frac{m}{M} R = C_v$$

$$C_v = \frac{3}{2} \frac{R}{M}$$

$i = 5$ ikki atomli uchun

$$Q = \frac{5}{2} \frac{m}{M} R \Delta T = C_v \Delta T \Rightarrow \frac{5}{2} \frac{m}{M} R = C_v$$

$$C_v = \frac{5}{2} \frac{R}{M}$$

(II) $P = \text{const}$ $Q = A + \Delta U$ $i = 3$ biri atomli

$$Q = \frac{m}{M} R \Delta T + \frac{3}{2} \frac{m}{M} R \Delta T = \frac{5}{2} \frac{m}{M} R \Delta T = C_p \Delta T$$

$$C_p = \frac{5}{2} \frac{R}{M}$$

$i = 6$ uch atomli gaz uchun

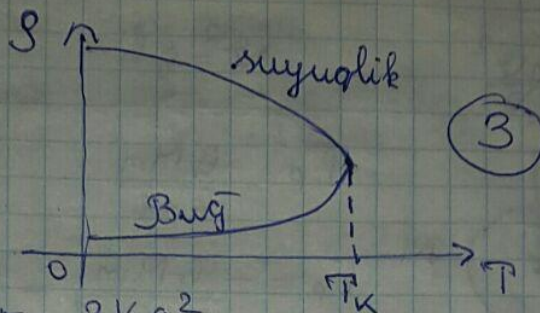
$$Q = \frac{m}{M} R \Delta T + \frac{6}{2} \frac{m}{M} R \Delta T = \frac{7}{2} \frac{m}{M} R \Delta T = C_p \Delta T$$

$$C_p = \frac{7}{2} \frac{R}{M} \quad (C)$$

11) A) ortadi

12) 1,3,4 B)

1) $\rho \sim T$



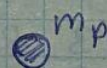
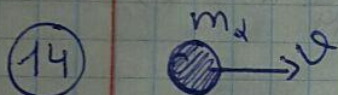
13) $W_{p1} = \frac{kq \cdot 3q}{r} = \frac{3kq^2}{r}$

$W_{p2} = \frac{3kq^2}{r_2}$

$r_2 > r$

$W_{p2} < W_{p1}$
kamayadi

C



$\Rightarrow E = \frac{m_d v^2}{2}$

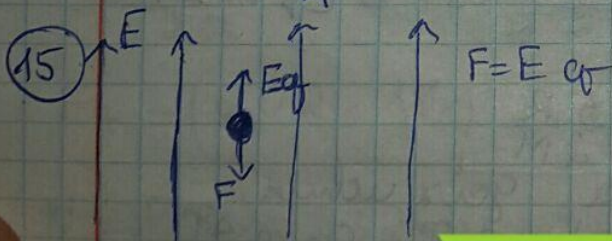
$m_d v + m_p \cdot 0 = (m_d + m_p) u$

$\Rightarrow u = \frac{m_d v}{m_d + m_p}$

$u = \frac{4m_p v}{4m_p + m_p} = \frac{4m_p v}{5m_p} = 0,8 v$

$E_k = \frac{(m_d + m_p) u^2}{2} = \frac{(4m_p + m_p) \cdot (0,8v)^2}{2} = 1,6 m_p v^2$

$E_k = 1,6 \frac{m_d}{4} v^2 = 0,8 \frac{m_d v^2}{2} = 0,8 E$ C



maydonni hosil
qiluvchi zaryadlar
toplamiga

11) A) ordadi

12) 1,34 B)

1) $g \sim T$



13) $W_{p1} = \frac{kq \cdot 3q}{r} = \frac{3kq^2}{r}$

$W_{p2} = \frac{3kq^2}{r_2}$

$r_2 > r$

C

$W_{p2} < W_{p1}$
kamayadi

14)

m_p

C

$E = \frac{m_d v^2}{2}$

$m_d v + m_p \cdot 0 = (m_d + m_p) u$

C

$u = \frac{m_d v}{m_d + m_p}$

$u = \frac{4m_p v}{4m_p + m_p} = \frac{4m_p v}{5m_p} = 0,8v$

$E_k = \frac{(m_d + m_p) u^2}{2} = \frac{(4m_p + m_p) \cdot (0,8v)^2}{2} = 1,6 m_p v^2$

$E_k = 1,6 \frac{m_d}{4} v^2 = 0,8 \frac{m_d v^2}{2} = 0,8 E$ C



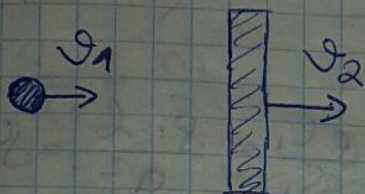
maydonni hosil
qiluvchi zaryadlar
toplamiga

16) $\vec{J} = \chi \vec{H}$

$\vec{J} = \sum_{\Delta V} \frac{\vec{p}_m}{\Delta V}$

$\Rightarrow$ $\frac{[J]}{[H]} = \frac{[p_m]}{[V]} = \frac{A \cdot m^2}{m^3} = \frac{A}{m}$
 A magnetlanish vektori

17



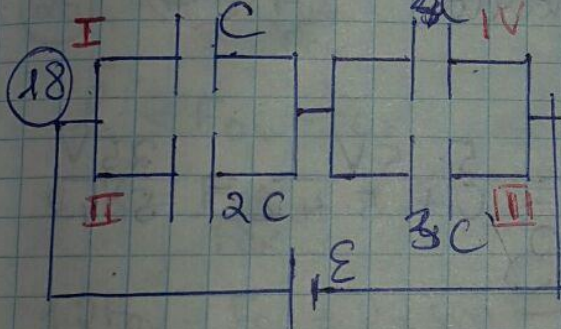
Tismning harakatdagi devorga nisbatan tezligi

$v_{n1} = v_1 - v_2$

Qo'zg'almas sharchaning

sanoq sistemasiga nisbatan to'qnashuvdan keyingi tezligi

$v_n = v_{n1} - v_2 = v_1 - v_2 - v_2 = v_1 - 2v_2$



$\frac{q_1}{q_4} = ?$

$q_{I,II} = q_{III,IV} = q$

$C_{P1} = C + 2C = 3C$

$C_{P2} = 3C + 4C = 7C$

$C_R = \frac{C_{P1} \cdot C_{P2}}{C_{P2} + C_{P1}} = \frac{3C \cdot 7C}{7C + 3C} = \frac{21C^2}{10C} = 2,1C$

$q = E \cdot C_R = 2,1EC$

$q = U_{I,II} \cdot C_{P1}$

$U_{I,II} = \frac{q}{C_{P1}} = \frac{2,1EC}{3C} = 0,7E$

$q = U_{III,IV} \cdot C_{P2}$

$U_{III,IV} = \frac{q}{C_{P2}} = \frac{2,1EC}{7C} = 0,3E$

16) $\vec{J} = \chi \vec{H}$

$\vec{J} = \sum \frac{\vec{p}_m}{\Delta V}$

$\Rightarrow$ **A** $\frac{[\vec{J}]}{[\vec{H}]} = \frac{[p_m]}{[V]} = \frac{A \cdot m^2}{m^3} = \frac{A}{m}$
magnitlanish vektor

17)



Fismining harakatidagi deyarli nisbatan tezligi

$\vec{v}_n = \vec{v}_1 - \vec{v}_2$

Qo'zg'almas sharchaning yanaq, sistemasiga nisbatan to'qnashuvdan keyingi tezligi

$\vec{v}_n = \vec{v}_{n1} - \vec{v}_2 = \vec{v}_1 - \vec{v}_2 - \vec{v}_2 = \vec{v}_1 - 2\vec{v}_2$



$\frac{q_1}{q_4} = ?$

$q_{I,II} = q_{III,IV} = q$

$C_{P1} = C + 2C = 3C$

$C_{P2} = 3C + 4C = 7C$

$C_A = \frac{C_{P1} \cdot C_{P2}}{C_{P2} + C_{P1}} = \frac{3C \cdot 7C}{7C + 3C} = \frac{21C^2}{10C} = 2,1C$

$q = E \cdot C_A = 2,1EC$

$q = U_{I,II} \cdot C_{P1}$

$U_{I,II} = \frac{q}{C_{P1}} = \frac{2,1EC}{3C} = 0,7E$

$q = U_{III,IV} \cdot C_{P2}$

$U_{III,IV} = \frac{q}{C_{P2}} = \frac{2,1EC}{7C} = 0,3E$

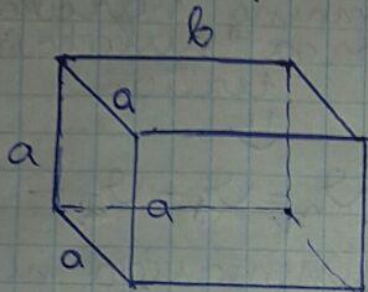
$$q_1 = U_{I,II} \cdot C = 0,7 \text{ E} \cdot C$$

$$q_4 = U_{III,IV} \cdot C = 0,3 \text{ E} \cdot 4C = 1,2 \text{ E} \cdot C$$

$$\frac{q_1}{q_4} = \frac{0,7 \text{ E} \cdot C}{1,2 \text{ E} \cdot C} = \frac{7}{12}$$

(B)

(19)



$$b = 2a$$

$$R_1 = \frac{\rho l_1}{S_1} = \frac{\rho \cdot b}{a^2} = \frac{\rho \cdot 2a}{a^2} = \frac{2\rho}{a}$$

$$R_2 = \frac{\rho l_2}{S} = \frac{\rho \cdot a}{a \cdot b} = \frac{\rho \cdot a}{a \cdot 2a} = \frac{\rho}{2a}$$

$$\frac{R_1}{R_2} = \frac{\frac{2\rho}{a}}{\frac{\rho}{2a}} = 4 \text{ marta}$$

(B)

(20)

$$I = \frac{\mathcal{E}_{um}}{R + r_{um}} = \frac{n \cdot \mathcal{E}}{R + n \cdot r} = \frac{5 \cdot 5V}{0 + 5 \cdot 4\Omega} = \frac{25V}{5 \cdot 4\Omega} = 1,25 \text{ A}$$

(B)

(21)

Tranzistor elektr signallarini kuchaytiruvchi kuchaytirgich sifatida radio texnika va boshqa sohalarda keng qollanadi.

(C)

(22)



(I)

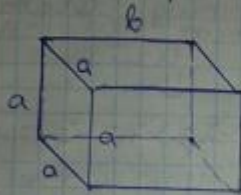
$$R_1 = \frac{R \cdot R}{R + R} = \frac{R}{2}$$

$$q_1 = U_{I,II} \cdot C = 0,7 \text{ E} \cdot C$$

$$q_4 = U_{III,IV} \cdot C = 0,3 \text{ E} \cdot 4C = 1,2 \text{ E} \cdot C$$

$$\frac{q_1}{q_4} = \frac{0,7 \text{ E} \cdot C}{1,2 \text{ E} \cdot C} = \frac{7}{12} \quad \text{B}$$

19



$$b = 2a$$

$$R_1 = \frac{\rho \cdot l_1}{S_1} = \frac{\rho \cdot b}{a^2} = \frac{\rho \cdot 2a}{a^2} = \frac{2\rho}{a}$$

$$R_2 = \frac{\rho \cdot l_2}{S} = \frac{\rho \cdot a}{a \cdot b} = \frac{\rho \cdot a}{a \cdot 2a} = \frac{\rho}{2a}$$

$$\frac{R_1}{R_2} = \frac{\frac{2\rho}{a}}{\frac{\rho}{2a}} = 4 \text{ marta} \quad \text{B}$$

20

$$I = \frac{\mathcal{E}_{um}}{R + r_{um}} = \frac{n \cdot \mathcal{E}}{R + nr} = \frac{5 \cdot 5V}{0 + 5 \cdot 4\Omega} = \frac{25V}{20\Omega} = 1,25 \text{ A} \quad \text{B}$$

21

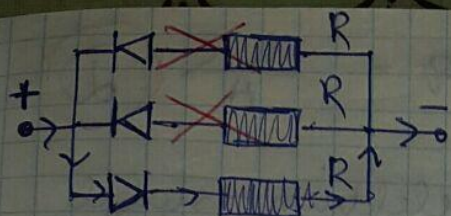
Transistor elektr signallarini kuchaytirishda radio texnika va boshqa sohalarda keng qo'llanadi. C

22



I

$$R_1 = \frac{R \cdot R}{R + R} = \frac{R}{2}$$



$$R_2 = R$$

B

$$\frac{R_2}{R_1} = \frac{R}{\frac{R}{2}} = 2 \text{ marita o'tadi}$$

$$(23) \quad \frac{\mathcal{E}}{U_1} = \frac{n_1}{n_2}$$

$$\frac{\mathcal{E}}{U_2} = \frac{n_2}{n_1}$$

$$U_1 = 17,5 \text{ V}$$

$$U_2 = 2 \text{ V}$$

$$\frac{\mathcal{E}}{U_1} \cdot \frac{\mathcal{E}}{U_2} = \frac{n_1}{n_2} \cdot \frac{n_2}{n_1} = 1$$

$$\mathcal{E}^2 = U_1 \cdot U_2$$

C

$$\mathcal{E} = \sqrt{U_1 \cdot U_2} = \sqrt{17,5 \text{ V} \cdot 2 \text{ V}} = \sqrt{35 \text{ V}^2} \approx 6 \text{ V}$$

(24) koherent

C

Galiley trubasi

$$(25) \quad K = \frac{F_{ob}}{F_{ok}}$$

$$F_{ok} + l = F_{ob}$$

$$l = F_{ob} - F_{ok}$$

$$F_{ob} - F_{ok} = 22 \text{ sm}$$

A

$$K = \frac{F_{ob}}{F_{ok}} = 12$$

$$F_{ob} = 12 F_{ok}$$

$$12 F_{ok} - F_{ok} = 22 \text{ sm}$$

$$11 F_{ok} = 22 \text{ sm}$$

$$F_{ok} = 2 \text{ sm}$$

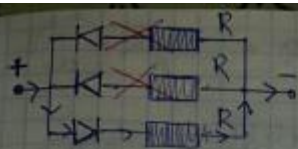
$$F_{ob} = 12 \cdot 2 \text{ sm} = 24 \text{ sm}$$

$$(26) \quad I = \frac{\Delta \varphi}{\Delta \Omega}$$

$$\Delta \Omega = \frac{S}{r^2} = \frac{0,75 \cdot 4\pi r^2}{r^2} = 3\pi$$

$$I = \frac{120\pi \text{ lm}}{3\pi \text{ sr}} = 40 \text{ cd}$$

D



$$R_2 = R$$

(B)

$$\frac{R_2}{R_1} = \frac{R}{\frac{R}{2}} = 2 \text{ marra o'tade}$$

$$(23) \quad \frac{\varepsilon}{U_1} = \frac{n_1}{n_2} \quad \frac{\varepsilon}{U_2} = \frac{n_2}{n_1} \quad U_1 = 17,5 \text{ V} \quad U_2 = 2 \text{ V}$$

$$\frac{\varepsilon}{U_1} \cdot \frac{\varepsilon}{U_2} = \frac{n_1}{n_2} \cdot \frac{n_2}{n_1} = 1 \quad \varepsilon^2 = U_1 \cdot U_2 \quad (C)$$

$$\varepsilon = \sqrt{U_1 \cdot U_2} = \sqrt{17,5 \text{ V} \cdot 2 \text{ V}} = \sqrt{35 \text{ V}^2} = 6 \text{ V}$$

(24) koherent

(C)

Galiley trubasi

$$(25) \quad K = \frac{F_{ob}}{F_{ox}}$$

$$F_{ox} + l = F_{ob}$$

$$l = F_{ob} - F_{ox}$$

$$F_{ob} - F_{ox} = 22 \text{ sm} \quad (A)$$

$$K = \frac{F_{ob}}{F_{ox}} = 12$$

$$F_{ob} = 12 F_{ox}$$

$$12 F_{ox} - F_{ox} = 22 \text{ sm}$$

$$11 F_{ox} = 22 \text{ sm}$$

$$F_{ox} = 2 \text{ sm}$$

$$F_{ob} = 12 \cdot 2 \text{ sm} = 24 \text{ sm}$$

$$(26) \quad I = \frac{\Delta \varphi}{\Delta \Omega}$$

$$\Delta \Omega = \frac{S}{r^2} = \frac{0,75 \cdot 4\pi r^2}{r^2} = 3\pi$$

$$I = \frac{120\pi \text{ lm}}{3\pi \text{ sr}} = 40 \text{ cd} \quad (D)$$

(27) $A_{ch} = h\nu = \frac{h \cdot c}{\lambda}$

$\lambda_{q} = \frac{h \cdot c}{A}$ (2)

(28) Foton - stabil
Proton - stabil

elektron - stabil
neytrino - stabil

(A)

(29) Neytrino antineytrinodan zarfadi yōq bōlganligi uchin spinlarining qaradama - qarshi yōnalganliklari bilan farq qiladi.

(30) Elektronning n - orbitadagi tōla energiyasi

$W_n = \frac{W_1}{n^2}$

$W_n = \frac{-me^4}{8\epsilon_0^2 h^2} \cdot \frac{1}{n^2} \cdot n=1 \text{ da}$

$W_1 = -13,55 \text{ eV}$

(B)

$W_3 = \frac{W_1}{9} = \frac{-13,55 \text{ eV}}{9} = -1,5 \text{ eV}$

Elektron 3 - kvant sathdan 1 - kvant sathga o'tganda nurlanadi, lekin yutilmaydi

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(27) $A_{ch} = h\nu = \frac{h \cdot c}{\lambda}$ $\lambda q = \frac{h \cdot c}{A}$ (2)

(28) Foton - stabil elektron - stabil
 Proton - stabil neytrino - stabil
 A

(29) Neytrino antineytrinodan zaryadi
 yiq bo'lganligi uchun spinlarining
 qarama-qarshi yonalganliklari bilan
 farq qiladi.

(30) Elektronning n -orbitadagi to'la
 energiyasi

$W_n = \frac{W_1}{n^2}$ $W_n = \frac{-me^4}{8\epsilon_0^2 h^2} \cdot \frac{1}{n^2}$ $n=1$ da

$W_1 = -13,55 \text{ eV}$

$W_3 = \frac{W_1}{9} = \frac{-13,55 \text{ eV}}{9} = -1,5 \text{ eV}$ B

Elektron 3-kyant sathidan 1-kyant
 sathga o'tganda nurlanadi, lekin
 yutilmaydi

JANOB FIZIKLARkanali

13-variant

① $v = \frac{2\pi R}{T} \cos \alpha = \frac{L}{T} \cos \alpha = \frac{40 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \cos 0^\circ =$
 $= 463 \text{ m/s}$ C

② $F_1 = k \cdot v$ $F_2 = k \cdot 2v = 2kv$
 $\frac{F_1}{F_2} = \frac{k \cdot v}{2kv} = \frac{1}{2}$ A

③

$t(s)$	0,3	0,4	0,5
$x(m)$	0	-1	1

$$x = x_0 + v_0 t + \frac{at^2}{2}$$

$$\begin{cases} -1 = 0 + v_0 \cdot 0,1 + \frac{a \cdot 0,1^2}{2} \\ 1 = -1 + v_0 \cdot 0,1 + \frac{a \cdot 0,1^2}{2} \end{cases}$$

$$v_{02} = v_0 + at$$

$$\Rightarrow v_{02} = v_0 + 0,1a$$

$$\begin{cases} -1 = v_0 \cdot 0,1 + \frac{0,01a}{2} \\ 2 = v_{02} \cdot 0,1 + \frac{0,01a}{2} \end{cases}$$

$$-1 = v_0 \cdot 0,1 + \frac{0,01a}{2}$$

$$\Rightarrow 2 = (v_0 + 0,1a) \cdot 0,1 + \frac{0,01a}{2}$$

$$\begin{cases} -1 = v_0 \cdot 0,1 + \frac{0,01a}{2} \\ 2 = v_0 \cdot 0,1 + \frac{0,03a}{2} \end{cases}$$

$$\Rightarrow 3 = \frac{0,02a}{2}$$

2

$$3 = 0,01a$$

$$a = 300 \frac{\text{m}}{\text{s}^2}$$

13-variant

① $v = \frac{2\pi R}{T} \cos \alpha = \frac{L}{T} \cos \alpha = \frac{40 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \cos 0^\circ = 463 \text{ m/s}$ C

② $F_1 = k \cdot v$ $F_2 = k \cdot 2v = 2kv$
 $\frac{F_1}{F_2} = \frac{k \cdot v}{2kv} = \frac{1}{2}$ A

③

$t(s)$	0,3	0,1	0,5
$x(m)$	0	-1	1

$$x = x_0 + v_0 t + \frac{a t^2}{2}$$

$$\begin{cases} -1 = 0 + v_0 \cdot 0,1 + \frac{a \cdot 0,1^2}{2} \\ 1 = -1 + v_0 \cdot 0,1 + \frac{a \cdot 0,1^2}{2} \end{cases} \Rightarrow v_0 = v_0 + a \cdot 0,1$$

$$\begin{cases} -1 = v_0 \cdot 0,1 + \frac{0,01a}{2} \\ 2 = v_0 \cdot 0,1 + \frac{0,01a}{2} \end{cases} \Rightarrow \begin{cases} -1 = v_0 \cdot 0,1 + \frac{0,01a}{2} \\ 2 = (v_0 + 0,1a) \cdot 0,1 + \frac{0,01a}{2} \end{cases}$$

$$\begin{cases} -1 = v_0 \cdot 0,1 + \frac{0,01a}{2} \\ 2 = v_0 \cdot 0,1 + \frac{0,03a}{2} \end{cases} \Rightarrow \begin{cases} -1 = v_0 \cdot 0,1 + \frac{0,01a}{2} \\ 3 = \frac{0,02a}{2} \end{cases}$$

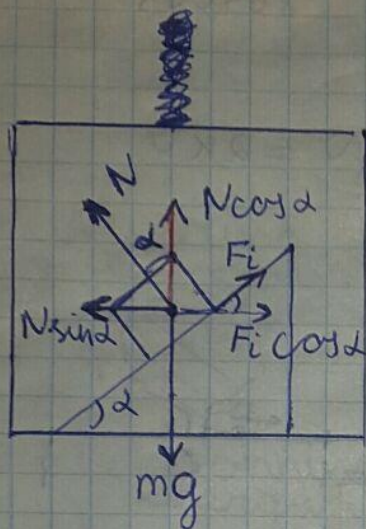
$3 = 0,01a$ $a = 300 \frac{\text{m}}{\text{s}^2}$ D

④

Diqqat! ochirib ham qaytib tushmaydi

B

⑤



F_i - ishqalanish kuchi
 $N \cos \alpha - mg + F_i \sin \alpha = ma$

$$N \sin \alpha - F_i \cos \alpha = 0$$

$$F_i = \frac{N \sin \alpha}{\cos \alpha}$$

$$N \cos \alpha - mg + \frac{N \sin^2 \alpha}{\cos \alpha} = ma$$

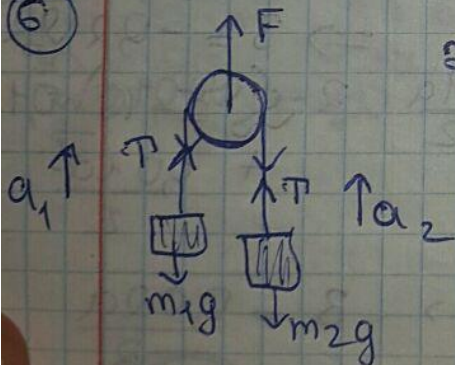
$$\frac{N \cos^2 \alpha + N \sin^2 \alpha}{\cos \alpha} = mg + ma$$

$$\frac{N (\cos^2 \alpha + \sin^2 \alpha)}{\cos \alpha} = m(g + a) \Rightarrow N = m(g + a) \cos \alpha$$

$$N = 6 \text{ kg} \cdot \left(\frac{10 \text{ m}}{\text{s}^2} + \frac{3 \text{ m}}{\text{s}^2} \right) \cdot \frac{\sqrt{2}}{2} = 54,6 \text{ N}$$

A

⑥



$$2T = F \Rightarrow T = \frac{F}{2} = \frac{96 \text{ N}}{2} = 48 \text{ N}$$

$$T = m_2 g + m_2 a_2$$

$$a_2 = \frac{T - m_2 g}{m_2}$$

$$a_2 = \frac{48 \text{ N} - 4 \text{ kg} \cdot 10 \text{ m/s}^2}{4 \text{ kg}} = \frac{8 \text{ N}}{4 \text{ kg}} = 2 \text{ m/s}^2$$

B

4

Diqqat! shu bilan ham
kordinatlar yengil qaytib tushmaydi

B

5



F_i - ishqalanish kuchi
 $N \cos \alpha - mg + F_i \sin \alpha = ma$

$$N \sin \alpha - F_i \cos \alpha = 0$$

$$F_i = \frac{N \sin \alpha}{\cos \alpha}$$

$$N \cos \alpha - mg + \frac{N \sin^2 \alpha}{\cos \alpha} = ma$$

$$\frac{N \cos^2 \alpha + N \sin^2 \alpha}{\cos \alpha} = mg + ma$$

$$\frac{N (\cos^2 \alpha + \sin^2 \alpha)}{\cos \alpha} = m(g + a) \Rightarrow N = m(g + a) \cos \alpha$$

$$N = 6 \text{ kg} \cdot \left(10 \frac{\text{m}}{\text{s}^2} + 3 \frac{\text{m}}{\text{s}^2} \right) \cdot \frac{\sqrt{2}}{2} = 54,6 \text{ N} \quad \text{A}$$

6



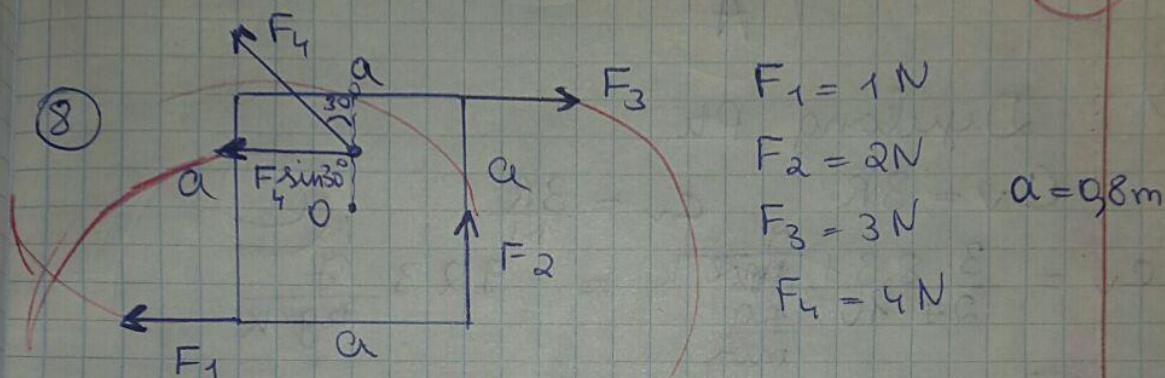
$$2T = F \Rightarrow T = \frac{F}{2} = \frac{96 \text{ N}}{2} = 48 \text{ N}$$

$$T = m_2 g + m_2 a_2$$

$$a_2 = \frac{T - m_2 g}{m_2} \quad \text{B}$$

$$a_2 = \frac{48 \text{ N} - 4 \text{ kg} \cdot 10 \text{ m/s}^2}{4 \text{ kg}} = 2 \frac{\text{m}}{\text{s}^2}$$

7)  $mgh = \frac{mv^2}{2}$
 $v^2 = 2gh$ $v = \sqrt{2gh}$
 $V = S \cdot l = S \cdot v \cdot t = S \sqrt{2gh} \cdot t$ C



$$M = F_1 \cdot \frac{a}{2} + F_3 \cdot \frac{a}{2} - F_2 \cdot \frac{a}{2} - \frac{F_4 \sin 30^\circ}{2}$$

$$= \frac{F_1 \cdot a}{2} + \frac{F_3 \cdot a}{2} - \frac{F_2 \cdot a}{2} - \frac{F_4 \cdot a}{8}$$
 C

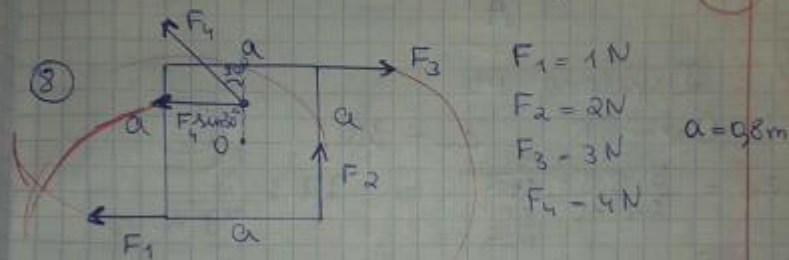
$$M = \frac{1\text{ N} \cdot 0,8}{2} + \frac{3\text{ N} \cdot 0,8}{2} - \frac{2\text{ N} \cdot 0,8}{2} - \frac{4\text{ N} \cdot 0,8}{8} =$$

$$= 0,4\text{ N}\cdot\text{m} + 1,2\text{ N}\cdot\text{m} - 0,8\text{ N}\cdot\text{m} - 0,4\text{ N}\cdot\text{m} = 0,4\text{ N}\cdot\text{m}$$

9) Sirt taranglik faqat ^{suyuqlik} va bug ^{bu} chegarasidagina mavjud bo'lmay, ikkita aralashmaydigan ^{suyuqlik} yoki qattiq jism chegarisida ham hosil bo'ladi. A

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⑦  $mgh = \frac{mv^2}{2}$
 $v^2 = 2gh$ $v = \sqrt{2gh}$
 $V = S \cdot l = S \cdot v \cdot t = S \sqrt{2gh} \cdot t$ C



$$M = F_1 \cdot \frac{a}{2} + F_3 \cdot \frac{a}{2} - F_2 \cdot \frac{a}{2} - F_4 \cdot \frac{a \sin 30^\circ}{4}$$

$$= \frac{F_1 \cdot a}{2} + \frac{F_3 \cdot a}{2} - \frac{F_2 \cdot a}{2} - \frac{F_4 \cdot a}{8}$$
 C

$$M = \frac{1\text{ N} \cdot 0.8}{2} + \frac{3\text{ N} \cdot 0.8}{2} - \frac{2\text{ N} \cdot 0.8}{2} - \frac{4\text{ N} \cdot 0.8}{8} =$$

$$= 0.4\text{ Nm} + 1.2\text{ Nm} - 0.8\text{ Nm} - 0.4\text{ Nm} = 0.4\text{ Nm}$$

⑨ Sirt taranglik pasat ^{suvoqli} va bug ^{mayxud} chegarasidagina ^{bilmay} chekarasidagina mayxud bilmay, ^{ayratilmaydigan} ayratilmaydigan suyoqlik yoki qattiq ^{homon} jisim chegarasida homon hosil bo'ladi A

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10) $Q = A + \Delta U$

I) $v = \text{const}$ $Q = \Delta U$ $A = 0$

$Q = \frac{i=3}{2} \nu R \Delta T = C_V \Delta T \Rightarrow C_V = \frac{3}{2} \cdot 1 \cdot R = \frac{3R}{2}$

A

11)

Diyulung pti

$C_V = 3R$

$c_v = \frac{3R}{M}$

C

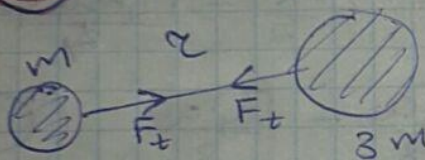
$c_v = \frac{3 \cdot 8,31 \frac{\text{J}}{\text{mol} \cdot \text{K}}}{27 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}} = 923 \frac{\text{J}}{\text{kg} \cdot \text{K}}$

12)

A

2; 3; 5

13)



$E_{p1} = -\frac{G m \cdot 3m}{r} = -\frac{3Gm^2}{r}$

$E_{p2} = -\frac{G m \cdot 3m}{r_2} = -\frac{3Gm^2}{r_2}$

B

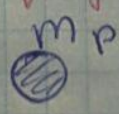
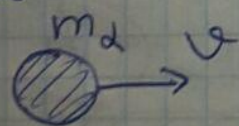
$r_2 > r$

$E_{p2} > E_{p1}$

Correctly

Gravitatsion ta'sirlashuv doimo tortishuv xarakteriga ega bo'lgani uchun ta'sirlashuv potensial energiyasi **doimo manfiy** qiymatga ega

14)



$m_2 = 4m_p$

$m_2 v + m_p \cdot 0 = m_2 v_x + m_p \cdot 0,2v$

$m_2 v = m_2 v_x + m_p \cdot 0,2v$

10) $Q = A + \Delta U$

1) $V = \text{const}$ $Q = \Delta U$ $A = 0$

$Q = \frac{3}{2} \nu R \Delta T = C_V \Delta T \rightarrow C_V = \frac{3}{2} \cdot 1 \cdot R = \frac{3}{2} R$

A

11)

Diyulong Pt

$C_V = 3R$

$c_v = \frac{3R}{M}$

$c_v = \frac{3 \cdot 8,31 \frac{\text{J}}{\text{mol} \cdot \text{K}}}{27 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}} = 923 \frac{\text{J}}{\text{kg} \cdot \text{K}}$

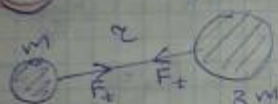
C

12)

A

2; 3; 5

13)



$E_{p1} = -\frac{G m \cdot 3m}{r} = -\frac{3Gm^2}{r}$

$E_{p2} = -\frac{G m \cdot 3m}{r_2} = -\frac{3Gm^2}{r_2}$

B

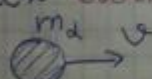
$r_2 > r$

$E_{p2} > E_{p1}$

ortadi

Gravitatsion ta'sirlashuv doimo
to'g'ri xarakterga ega bo'lgan
uchin ta'sirlashuv potensial ener-
giyasi doimo manfiy qiymatga ega

14)



$m_2 = 4m_1$

$m_1 v + m_2 \cdot 0 = m_1 v_x + m_2 \cdot 0,2v$

$m_1 v = m_1 v_x + m_2 \cdot 0,2v$

$$4m_p v = 4m_p v_x + m_p \cdot 0,2v \Rightarrow 4v = 4v_x + 0,2v$$

$$v_x = \frac{4v - 0,2v}{4} = \frac{3,8v}{4} = \frac{1,9v}{2}$$

$$E_t = E = \frac{m_d v^2}{2} = \frac{4m_p v^2}{2} : E_t = E_k + E_p$$

$$E_k = \frac{m_d v_x^2}{2} + \frac{m_p (0,2v)^2}{2} = \frac{4m_p \cdot \left(\frac{1,9v}{2}\right)^2}{2} + \frac{m_p \cdot 0,04v^2}{2}$$

$$= 2m_p \cdot \frac{3,61v^2}{4} + 0,02m_p v^2 = 1,825m_p v^2$$

$$E_t = 2m_p v^2 = 1,825m_p v^2 + E_p$$

$$0,175m_p v^2 = E_p$$

$$E_p = \frac{0,175 \cdot 2m_p v^2}{2} = \frac{0,175 E}{2} \approx 0,088 E$$

15



m_d v_d m_p v_p

$$E = \frac{m_d v_d^2}{2} = \frac{m_p v_p^2}{2}$$

$$2v_d = v_p$$

$$v_d = \frac{v_p}{2}$$

$m_d = 4m_p$
 $v_p = v$
 $4m_p v_d^2 = m_p v^2$

A

16

$$I = \frac{q}{t} = \frac{Ne}{t} \Rightarrow n = \frac{N}{V} \Rightarrow N = nV$$

$$I = \frac{nVe}{t} = \frac{nSle}{t} = nesv$$

B

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$$4m_p v = 4m_p v_x + m_p \cdot 0,2v \Rightarrow 4v = 4v_x + 0,2v$$

$$v_x = \frac{4v - 0,2v}{4} = \frac{3,8v}{4} = \frac{1,9v}{2}$$

$$E = \frac{m_d v^2}{2} = \frac{4m_p v^2}{2} \quad E_t = E_a + E_p$$

$$E_a = \frac{m_d v_x^2}{2} + \frac{m_p (0,2v)^2}{2} = \frac{4m_p \left(\frac{1,9v}{2}\right)^2}{2} + \frac{m_p 0,04v^2}{2}$$

$$= 2m_p \cdot \frac{3,61v^2}{4} + 0,02m_p v^2 = 1,825m_p v^2$$

$$E_t = 2m_p v^2 = 1,825m_p v^2 + E_p \quad \text{A}$$

$$0,175m_p v^2 = E_p$$

$$E_p = \frac{0,175 \cdot 2m_p v^2}{2} = \frac{0,175 E}{2} = 0,088 E$$

15



$$E = \frac{m_d v_d^2}{2} = \frac{m_p v_p^2}{2}$$

$$2v_x = v \quad \boxed{v_x = \frac{v}{2}} \quad \text{A}$$

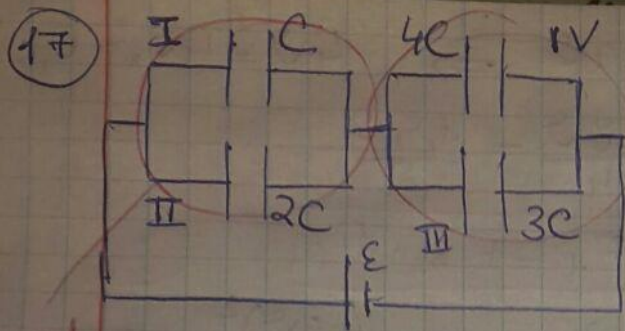
$m_d = 4m_p$
 $v_p = v$
 $4m_p v_d^2 = m_p v^2$

16

$$I = \frac{q}{t} = \frac{Ne}{t} \Rightarrow n = \frac{N}{V} \Rightarrow N = nV$$

$$I = \frac{nV e}{t} = \frac{n S l e}{t} = n e s v \quad \text{B}$$

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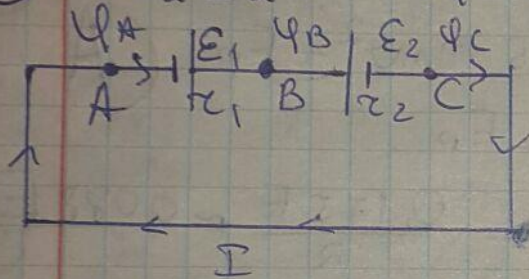
$$q_1 + q_2 = q'$$

$$q_3 + q_4 = q'$$

$$\frac{q_1 + q_2}{q_3 + q_4} = \frac{q'}{q'} = 1$$

A

18. $E_2 = 2V$ $r_1 = 0,25\Omega$ $r_2 = 0,5\Omega$ $I = 1A$



$$E_1 > E_2$$

$$\varphi_B - \varphi_A = E_1 - I r_1$$

$$\varphi_B - \varphi_C = E_2 + I r_2$$

$$\varphi_A = \varphi_C$$

$$\begin{cases} \varphi_B - \varphi_C = E_1 - I r_1 \\ \varphi_B - \varphi_C = E_2 + I r_2 \end{cases} \Rightarrow \varphi_B - \varphi_C = 2V + 1A \cdot 0,5\Omega = 10V$$

B

19. γ ximot kargichi triad yoki tranzistor deyiladi

A

20. $W = U q = \frac{m_e v^2}{2}$

$$U e = \frac{m_e v^2}{2} \Rightarrow U = \frac{m_e v^2}{2e}$$

$$v = \frac{s}{t} = \frac{38 \cdot 10^{-3} m}{4 \cdot 10^{-9} s} = \frac{19}{2} \cdot 10^7 m/s$$

2

$$U = \frac{9,1 \cdot 10^{-31} kg \cdot \left(\frac{19}{2} \cdot 10^7 m/s\right)^2}{2 \cdot 1,6 \cdot 10^{-19} C} = 25664V$$



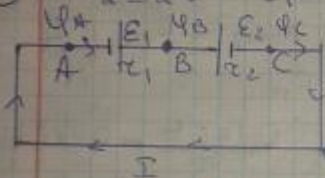
$$q_1 + q_2 = q'$$

$$q_3 + q_4 = q'$$

$$\frac{q_1 + q_2}{q_3 + q_4} = \frac{q'}{q'} = 1$$

A

18 $E_2 = 2V$ $r_1 = 0,25\Omega$ $r_2 = 0,5\Omega$ $I = 1A$



$$E_1 > E_2$$

$$\varphi_B - \varphi_A = E_1 - I r_1$$

$$\varphi_B - \varphi_C = E_2 + I r_2$$

$$\varphi_A = \varphi_C$$

$$\begin{cases} \varphi_B - \varphi_C = E_1 - I r_1 \\ \varphi_B - \varphi_C = E_2 + I r_2 \end{cases} \Rightarrow \varphi_B - \varphi_C = 2V + 1A \cdot 0,5\Omega = 2,5V$$

B

19 Yarıiletkenler triod yarı transistör deyiladi

A

20 $W = U q = m_e \frac{v^2}{2}$ $Ue = \frac{m_e v^2}{2} \Rightarrow U = \frac{m_e v^2}{2e}$

$$v = \frac{h}{m \lambda} = \frac{6,626 \cdot 10^{-34} J \cdot s}{9,1 \cdot 10^{-31} kg \cdot 1,6 \cdot 10^{-10} m} = 4,58 \cdot 10^6 m/s$$

D

$$U = \frac{9,1 \cdot 10^{-31} kg \cdot (4,58 \cdot 10^6 m/s)^2}{2 \cdot 1,6 \cdot 10^{-19} C} = 25664V$$

$$(21) \quad \vec{J} = \sum \frac{\vec{P}_m}{\Delta V}$$

$$[\vec{J}] = \frac{[\vec{P}_m]}{[V]} = \frac{A \cdot m^2}{m^3} = \frac{A}{m}$$

$$\vec{H} = \frac{\vec{B}}{\mu_0} - \vec{J}$$

$$\vec{J} = \chi \vec{H}$$

$$\vec{H} = \frac{\vec{B}}{\mu_0} - \chi \vec{H}$$

$$\Rightarrow \vec{H} (1 + \chi) = \frac{\vec{B}}{\mu_0}$$

$$\boxed{B = \mu_0 \vec{H} (1 + \chi)} \quad \textcircled{B}$$

$$(22) \quad x = A \sin \omega t$$

$$x' = v = A \omega \cos \omega t$$

$$\cos \omega t = 1 \Rightarrow v_{\max}$$

$$v_{\max} = A \cdot \omega$$

$$\textcircled{A}$$

$$(23) \quad T = 2\pi \sqrt{LC} \Rightarrow \text{Tompson formulasi}$$

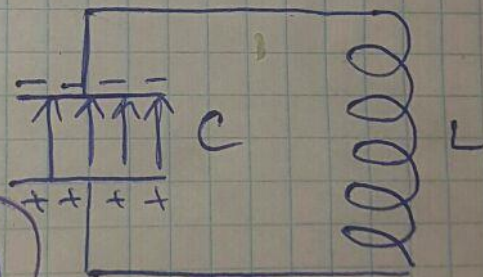
$$T = 2 \cdot 3 \cdot \sqrt{50H \cdot 200 \cdot 10^6 F} = 0,6s = 600ms$$

$$t = \frac{T}{2}$$

$$t = \frac{600ms}{2} =$$

$$= 300ms$$

$$\textcircled{A}$$



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21) $\vec{J} = \sum \frac{\vec{P}_m}{\Delta V}$ $[\vec{J}] = \frac{[P_m]}{[V]} = \frac{A \cdot m^2}{m^3} = \frac{A}{m}$

$\vec{H} = \frac{\vec{B}}{\mu_0} - \vec{J}$ $\vec{J} = \chi \vec{H}$

$\vec{H} = \frac{\vec{B}}{\mu_0} - \chi \vec{H} \Rightarrow \vec{H} (1 + \chi) = \frac{\vec{B}}{\mu_0}$

$\vec{B} = \mu_0 \vec{H} (1 + \chi)$ $\vec{B}$

22) $x = A \sin \omega t$

$x' = v = A \omega \cos \omega t$

$\cos \omega t = 1 \Rightarrow v_{\max}$

$v_{\max} = A \cdot \omega$

A

23) $T = 2\pi \sqrt{LC} \Rightarrow$ Tompson formulasi

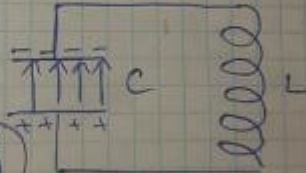
$T = 2 \cdot 3 \sqrt{50H \cdot 200 \cdot 10^{-6}F} = 0,6s = 600ms$

$t = \frac{T}{2}$

$t = \frac{600ms}{2} =$

$= 300ms$

A



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(24) Malus qonuniga kōra polarizator-
dan o'tgan nur intensivligi

$$I = I_0 \cos^2 \alpha$$

$$\alpha = 0^\circ \Rightarrow I = I_0 = 5 \cdot 10^{16} \frac{\text{W}}{\text{m}^2}$$

$$\alpha = 90^\circ \Rightarrow I = 0$$

$$0 \leq I \leq I_0$$

I: 1) 0 2) $2,5 \cdot 10^{16}$ 3) $5 \cdot 10^{16}$

(B)

(25) Diffraksiya panjara ham barcha
spektral asboblari kabi ayrata olish
qobiliyatiga ega. Bu xarakteristika
asboblarning ikkita eng yaqin λ va $\lambda + \Delta\lambda$
tōlqin uzunlikli spektral chiziqlarini
ayrata olish qobiliyati bilan aniqla-
nadi.

$$\frac{\lambda}{\Delta\lambda} = k \cdot N$$

$$\frac{\lambda}{\Delta\lambda} = 3 \cdot 300 = 900$$

(A)

(26) $I = \frac{\Delta\phi}{\Delta\Omega}$ $\Delta\phi = \frac{W}{t} = P$ $I = \frac{P}{\Delta\Omega}$

$$I = \frac{314}{\frac{\pi}{4} \text{ sr}} = \frac{314 \cdot 4}{3,14} = 400 \text{ cd}$$

(C)

(27) $h\nu = A_{ch} + E_k \Rightarrow h\nu = A_{ch} + \frac{mv^2}{2}$

(C)

(28) fotonlar sinigiga: fotonlar va gamma kvanti
kuradi

(2)

(29) magnit momenti

(C)

(30)

yutiladi

(A)

- 24) Malus qonuniga ko'ra polarizatsiya
dan o'tgan nur intensivligi

$$I = I_0 \cos^2 \alpha$$

$$\alpha = 0^\circ \Rightarrow I = I_0 = 5 \cdot 10^{16} \frac{\text{W}}{\text{m}^2}$$

$$\alpha = 90^\circ \Rightarrow I = 0$$

$$0 \leq I \leq I_0$$

J: 1) 0 2) $2,5 \cdot 10^{16}$ 3) $5 \cdot 10^{16}$

(B)

- 25) Difraktsion qanpara ham barcha
spekttral asboblari kabi ayrista olish
qobiliyatiga ega. Bu xarakteristika
ayrista olishning ikkita eng yuqori va
past $\lambda + \Delta\lambda$ to'lqin uzunlikli spektral shirlar
ayrista olish qobiliyati bilan aniqla-
nadi.

$$\frac{\lambda}{\Delta\lambda} = K \cdot N$$

$$\frac{\lambda}{\Delta\lambda} = 3 \cdot 300 = 900$$

(A)

26) $I = \frac{\Delta P}{\Delta t}$ $\Delta P = \frac{W}{t} = P$ $I = \frac{P}{\Delta t}$

$$I = \frac{314}{\frac{\pi}{4} \text{ s}} = \frac{314 \cdot 4}{3,14} = 400 \text{ cd}$$

(C)

27) $h\nu = A_{ch} + E_k \Rightarrow h\nu = A_{ch} + \frac{mv^2}{2}$

(C)

28) fotonlar sinfiga: fotonlar va gamma nurlari

(2)

29) magnet momenti (C) 30) yutiladi (A)

Variant 14

$$\textcircled{1} \quad \begin{aligned} S_1 &= 1 - 0 = 1 \text{ m} & t_1 &= 1 \text{ s} \\ S_2 &= 2 \text{ m} - 0 = 2 \text{ m} & t_2 &= 8 - 5 = 3 \text{ s} \end{aligned}$$

$$S_3 = 3 \text{ m} - 0 = 3 \text{ m} \quad t_3 = 6 \text{ s}$$

$$S = v_0 t + \frac{at^2}{2}$$

$$\begin{cases} 1 = v_0 \cdot 1 + \frac{a}{2} \cdot 1^2 \\ 2 = v_0 \cdot 3 + \frac{a}{2} \cdot 3^2 \\ 3 = v_0 \cdot 6 + \frac{a}{2} \cdot 6^2 \end{cases} \quad \left| \begin{matrix} \times 3 \\ - \\ \times 1 \end{matrix} \right. \Rightarrow \begin{cases} 3 = 3v_0 + \frac{3a}{2} \\ 2 = 3v_0 + \frac{9a}{2} \\ 3 = 3v_0 + \frac{18a}{2} \end{cases}$$

$$\Rightarrow \begin{aligned} 1 &= -3a \\ a &= -\frac{1}{3} \frac{\text{m}}{\text{s}^2} \end{aligned}$$

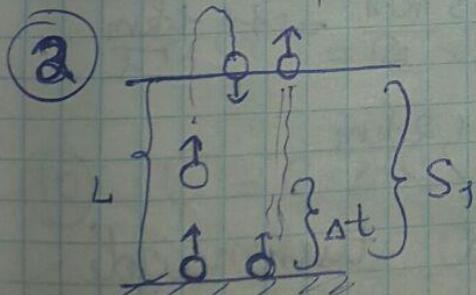
$$v_0 = 1 - \frac{a}{2} = 1 - \frac{(-\frac{1}{3})}{2} = 1 + \frac{1}{6} = \frac{7}{6} \frac{\text{m}}{\text{s}}$$

$$3 = v_0 \cdot 6 + \frac{a}{2} \cdot 6^2 \Rightarrow 3 = \frac{7}{6} \cdot 6 + \left(-\frac{1}{3}\right) \cdot \frac{1}{2} \cdot 36$$

A

$$3 = 7 - 6 = 1 \Rightarrow \text{Bu xato}$$

Demak, terlanish o'zgaruvchan bo'larkan



$$L = S_1$$

$$\frac{L}{S_1} = 1$$

C

Variant 14

$$\begin{aligned} \textcircled{1} \quad S_1 &= 1 - 0 = 1 \text{ m} & t_1 &= 1 \text{ s} \\ S_2 &= 2 \text{ m} - 0 = 2 \text{ m} & t_2 &= 8 - 5 = 3 \text{ s} \\ S_3 &= 3 \text{ m} - 0 = 3 \text{ m} & t_3 &= 6 \text{ s} \end{aligned}$$

$$S = v_0 t + \frac{a t^2}{2} \quad \begin{cases} 1 = v_0 \cdot 1 + \frac{a}{2} \cdot 1 \\ 2 = v_0 \cdot 3 + \frac{a}{2} \cdot 3^2 \\ 3 = v_0 \cdot 6 + \frac{a}{2} \cdot 6^2 \end{cases}$$

$$\begin{cases} 1 = v_0 + \frac{a}{2} \\ 2 = 3v_0 + \frac{9a}{2} \end{cases} \quad \begin{matrix} | 3 \\ \Rightarrow \end{matrix} \quad \begin{cases} 3 = 3v_0 + \frac{9a}{2} \\ 2 = 3v_0 + \frac{9a}{2} \end{cases} \Rightarrow \begin{matrix} 1 = -3a \\ a = -\frac{1}{3} \frac{\text{m}}{\text{s}^2} \end{matrix}$$

$$v_0 = 1 - \frac{a}{2} = 1 - \frac{(-\frac{1}{3})}{2} = 1 + \frac{1}{6} = \frac{7}{6} \frac{\text{m}}{\text{s}}$$

$$3 = v_0 \cdot 6 + \frac{a}{2} \cdot 6^2 \Rightarrow 3 = \frac{7}{6} \cdot 6 + \frac{(-\frac{1}{3})}{2} \cdot 36$$

$$\textcircled{A} \quad 3 = 7 - 6 = 1 \Rightarrow \text{bu xato}$$

Demak, teslanish o'zgaruvchan bo'larkan



$$L = S_1$$

$$\frac{L}{S_1} = 1$$

$$\textcircled{C}$$

3

$$F = k \cdot q^2$$

$$F_1 = k \cdot q^2$$

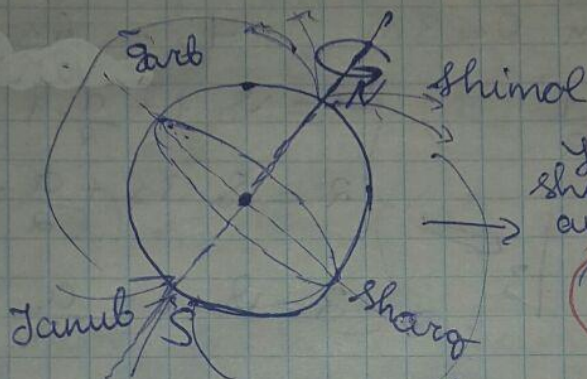
$$F_2 = k \cdot (2q)^2 = 4kq^2$$

$$\frac{F_1}{F_2} = \frac{F_1}{4F_1} = \frac{1}{4}$$

$$F_2 = 4F_1$$

2

4



yer g'arb'dan
sharqqa tomon
aylanadi

2

$$v_g = \frac{2\pi R}{T} = \frac{2 \cdot 3,14 \cdot 6,4 \cdot 10^6 \text{ m}}{86400 \text{ s}} = \frac{40140800 \text{ m}}{86400 \text{ s}} = 465 \frac{\text{m}}{\text{s}} = 0,465 \frac{\text{km}}{\text{s}}$$

$$v = v_g + v' = 12,7 \frac{\text{km}}{\text{s}} + 0,465 \frac{\text{km}}{\text{s}} \approx 13,2 \frac{\text{km}}{\text{s}}$$

$v > v_{II}$ bo'lganligi uchun $\Rightarrow$ kema quyosh sist-
masini tark etmaydi

13 - variant 4 savol isboti

Kosmik kema sharqqa tomon yonalgan
 $v' = 11,6 \frac{\text{km}}{\text{s}}$ tezlik bilan

$$v = v' - v_g = 11,6 \frac{\text{km}}{\text{s}} - 0,465 \frac{\text{km}}{\text{s}} = 11,1 \frac{\text{km}}{\text{s}}$$

$$v < v_{II} \quad 11,1 \frac{\text{km}}{\text{s}} < 11,2 \frac{\text{km}}{\text{s}}$$

Kosmik kema yerga tushmaydi

③ $F = kQ^2$ $F_1 = kQ^2$ $F_2 = k(QQ)^2 = 4kQ^2$

$\frac{F_1}{F_2} = \frac{F_1}{4F_1} = \frac{1}{4}$ $F_2 = 4F_1$ (2)



$v_g = \frac{2\pi R}{T} = \frac{2 \cdot 3,14 \cdot 6,4 \cdot 10^6 \text{ m}}{86400 \text{ s}} = \frac{40212480 \text{ m}}{86400 \text{ s}} = 465 \frac{\text{m}}{\text{s}} = 0,465 \frac{\text{km}}{\text{s}}$

$v = v_g + v' = 12,7 \frac{\text{km}}{\text{s}} + 0,465 \frac{\text{km}}{\text{s}} \approx 13,2 \frac{\text{km}}{\text{s}}$

$v > v_{II}$ ko'lganligi uchun $\Rightarrow$ kema quyosh sistemasi tarkibida qolmaydi

13 - variant 4 savol islati

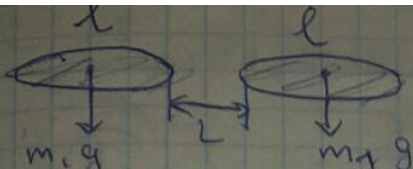
Kosmik kema sharqqa tomon yonalgan
 $v' = 11,6 \frac{\text{km}}{\text{s}}$ tezlik bilan

$v = v' - v_g = 11,6 \frac{\text{km}}{\text{s}} - 0,465 \frac{\text{km}}{\text{s}} = 11,1 \frac{\text{km}}{\text{s}}$

$v < v_{II}$ $11,1 \frac{\text{km}}{\text{s}} < 11,2 \frac{\text{km}}{\text{s}}$

Kosmik kema yerga tushmaydi

5

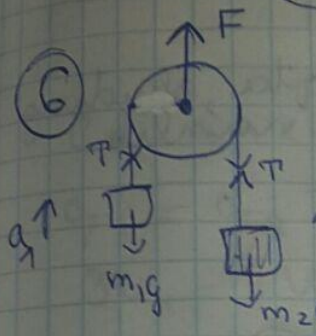


$$F = G \frac{m_1 m_2}{\left(\frac{L}{2} + L + \frac{L}{2}\right)^2} = \frac{G m^2}{(L+L)^2}$$

A

$$F = \frac{6,67 \cdot 10^{-11} \cdot 160 \text{ kg} \cdot 160 \text{ kg}}{(4 \text{ m} + 6 \text{ m})^2} = 17,1 \text{ nN}$$

6



$a_0 = ?$

$$2T = F \quad T = \frac{F}{2} = \frac{96 \text{ N}}{2} = 48 \text{ N}$$

$$\begin{cases} T = m_1 g + m_1 a_1 = m_1 g + m_1 (a + a_0) \\ T = m_2 g + m_2 a_2 = m_2 g + m_2 (a - a_0) \end{cases}$$

$$\begin{cases} a + a_0 = 6 \\ a - a_0 = 2 \end{cases} \Rightarrow a_0 = \frac{2 \text{ m}}{\text{s}^2}$$

D

7

N · m

$$M = F \cdot l \quad [M] = 1 \text{ N} \cdot \text{m}$$

$\text{N} \cdot \text{m} = \text{J}$ **A**

8

$$P = P_0 + \rho g h$$

$$P - P_0 = \rho g h$$

$$\rho g h = P' \Rightarrow h = \frac{P'}{\rho g} = \frac{2,8 \cdot 10^6 \text{ Pa}}{1030 \frac{\text{kg}}{\text{m}^3} \cdot 9,8 \frac{\text{m}}{\text{s}^2}} = 277 \text{ m}$$

B

9

$$PV = \text{const}$$

$$P_1 V_1 = P_2 V_2$$

$$P_1 \cdot \frac{4}{3} \pi r_1^3 = P_2 \cdot \frac{4}{3} \pi r_2^3$$

$$P_1 \cdot r_1^3 = P_2 \cdot r_2^3$$

B

$r_2 > r_1 \quad P_1 > P_2$
eng kichik

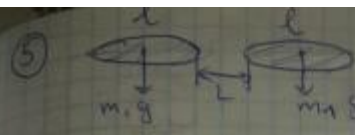
10

$$Q = C \Delta T$$

$$\Delta T = T_2 - T_1 = 0 \text{ K}$$

$$C = \frac{Q}{\Delta T} = \frac{Q}{0} \Rightarrow \text{aniqmaslik}$$

∞ **2**

⑤  $F = G \frac{m_1 m_2}{\left(\frac{L}{2} + L + \frac{L}{2}\right)^2} = \frac{G m_1 m_2}{(L+L)^2}$ **A**

$F = \frac{6,67 \cdot 10^{-11} \cdot 160 \text{ kg} \cdot 160 \text{ kg}}{(4 \text{ m} + 6 \text{ m})^2} = 17,1 \text{ nN}$

⑥  $2T = F$ $T = \frac{F}{2} = \frac{96 \text{ N}}{2} = 48 \text{ N}$
 $T = m_1 g + m_1 a_1 = m_1 g + m_1 (a + a_0)$
 $T = m_2 g + m_2 a_2 = m_2 g + m_2 (a - a_0)$
 $\begin{cases} a + a_0 = 6 \\ a - a_0 = 2 \end{cases} \Rightarrow a_0 = \frac{2 \text{ m}}{\text{s}^2}$ **D**

⑦ **Nm** $M = F \cdot l$ $[M] = 1 \text{ Nm}$ **A**
 $N \cdot m = J$

⑧ $P = P_0 + \rho g h$ **B** $P - P_0 = \rho g h$
 $P - P_0 = P'$ $P' = \rho g h \Rightarrow h = \frac{P'}{\rho g} = \frac{2,8 \cdot 10^6}{1030 \frac{\text{kg}}{\text{m}^3} \cdot 9,8 \frac{\text{m}}{\text{s}^2}} = 27 \text{ m}$

⑨ $PV = \text{const}$ $T = \text{const}$ $P_1 V_1 = P_2 V_2$
 $P_1 \cdot \frac{4}{3} \pi r_1^3 = P_2 \cdot \frac{4}{3} \pi r_2^3$
 $P_1 r_1^3 = P_2 r_2^3$ **B** $r_2 > r_1$ $P_1 > P_2$
 eng kichik

⑩ $Q = C \Delta T$ $\Delta T = T_2 - T_1 = 0 \text{ K}$
 $C = \frac{Q}{\Delta T} = \frac{Q}{0} \rightarrow \text{aniqmaslik}$ **2**
 ∞

11) DyuLong Pt qanuniga kora

$$C_v = 3R$$

$$C_v = \frac{3R}{M}$$

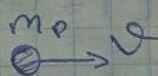
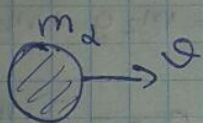
(2)

$$C_v = \frac{3 \cdot 8,31 \frac{\text{J}}{\text{K} \cdot \text{mol}}}{56 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}} = 445 \frac{\text{J}}{\text{kg} \cdot \text{K}}$$

12) Suv bugi to'yinadigan nuqta, shuning nuqtasi deyiladi. Nisbiy namlik $\varphi = 100\%$ bo'ladi.

(A)

13)

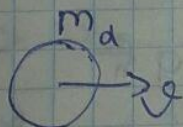


$$P = m_d v + m_p v = (m_d + m_p) v$$

$$P = (4m_p + m_p) v = 5m_p v$$

(A)

14)



$$m_d v + m_p \cdot 0 = m_d \cdot 0,95v + m_p v_2$$

$$0,05 m_d v = m_p v_2 \Rightarrow 0,05 \cdot 4m_p \cdot v = m_p v_2$$

$$v_2 = 0,2 v$$

$$E_k = \frac{m_d (0,95v)^2}{2} + \frac{m_p (0,2v)^2}{2}$$

$$E_k = \frac{4m_p \cdot 0,9025v^2}{2} + \frac{0,04m_p v^2}{2} = 1,825m_p v^2$$

$$E_t = E = E_k + E_p \quad E = \frac{m_d v^2}{2} = \frac{4m_p v^2}{2} = 2m_p v^2$$

$$E_k = 1,825 \cdot \frac{E}{2} = 0,9125 E$$

$$E_p = E - 0,9125 E = 0,0875 E$$

(A)

11) Duzilong Pti qanuniga kora

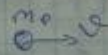
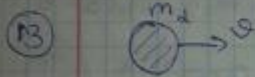
$$C_v = 3R$$

$$C_v = \frac{3R}{M}$$

(2)

$$C_v = \frac{3 \cdot 8,31 \frac{\text{J}}{\text{K mol}}}{56 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}} = 445 \frac{\text{J}}{\text{kg K}}$$

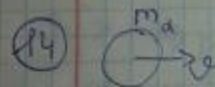
12) Suu bugi toqimadigan nuqta, shuning nuqtasi deyiladi. $\eta = 100\%$ boladi. A



$$P = m_d v + m_p v = (m_d + m_p) v$$

A

$$P = (4m_p + m_p) v = 5m_p v$$



$$m_d v + m_p \cdot 0 = m_d \cdot 0,95v + m_p v_2$$

$$0,05 m_d v = m_p v_2 \Rightarrow 0,05 \cdot 4m_p \cdot v = m_p v_2$$

$$v_2 = 0,2 v \quad E_k = \frac{m_d (0,95v)^2}{2} + \frac{m_p (0,2v)^2}{2}$$

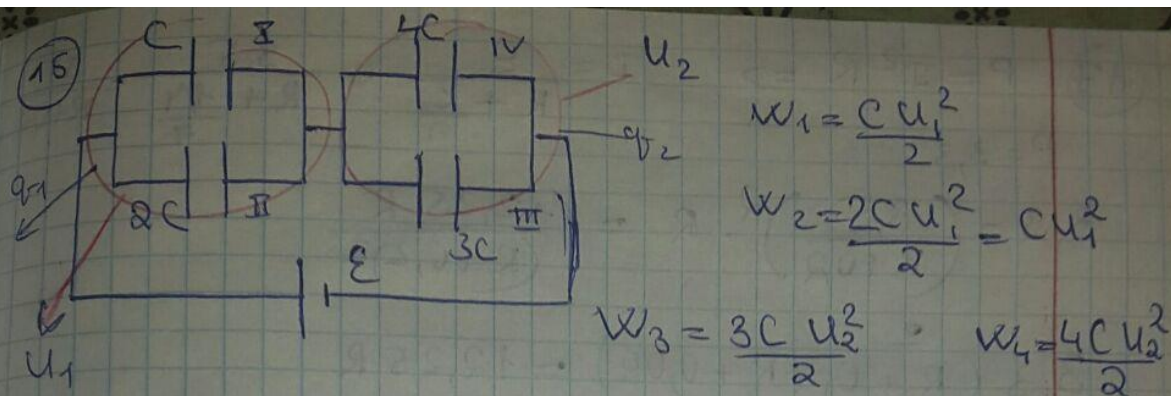
$$E_k = \frac{4m_p}{2} \cdot 0,9025v^2 + \frac{0,04m_p v^2}{2} = 1,825 m_p v^2$$

$$E_t = E = E_k + E_p \quad E = \frac{m_d v^2}{2} = \frac{4m_p v^2}{2} = 2m_p v^2$$

$$E_k = 1,825 \cdot \frac{E}{2} = 0,9125 E$$

$$E_p = E - 0,9125 E = 0,0875 E$$

A



$$C_{P1} = C + 2C = 3C \quad \Rightarrow \quad C_{P2} = 4C + 3C = 7C$$

$$q_1 = q_2$$

$$C_{P1} \cdot U_1 = C_{P2} U_2 \Rightarrow 3C \cdot U_1 = 7C U_2$$

$$3U_1 = 7U_2$$

$$U_1 + U_2 = \varepsilon$$

$$U_1 + \frac{3U_1}{7} = \varepsilon \Rightarrow \frac{10}{7} U_1 = \varepsilon \Rightarrow U_1 = \frac{7\varepsilon}{10}$$

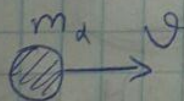
$$U_2 = \varepsilon - U_1 = \varepsilon - \frac{7\varepsilon}{10} = \frac{3\varepsilon}{10}$$

$$W_1 + W_2 = \frac{C U_1^2}{2} + C U_1^2 = \frac{3C U_1^2}{2} = \frac{3C}{2} \left(\frac{7\varepsilon}{10} \right)^2$$

$$W_3 + W_4 = \frac{3C U_2^2}{2} + \frac{4C U_2^2}{2} = \frac{7C U_2^2}{2} = \frac{7C}{2} \left(\frac{3\varepsilon}{10} \right)^2$$

$$\frac{W_1 + W_2}{W_3 + W_4} = \frac{\frac{3C}{2} \cdot \frac{49\varepsilon^2}{100}}{\frac{7C}{2} \cdot \frac{9\varepsilon^2}{100}} = \frac{3}{7} \cdot \frac{49}{9} = \frac{7}{3} \quad \text{B}$$

16



$$\frac{m_1 v^2}{2} = \frac{m_p v_p^2}{2}$$

$$4m_p v^2 = m_p v_p^2$$

$$2v = v_p$$

A

15

$W_1 = \frac{C U_1^2}{2}$
 $W_2 = \frac{2C U_1^2}{2} = C U_1^2$
 $W_3 = \frac{3C U_2^2}{2}$ $W_4 = \frac{4C U_2^2}{2}$

$C_{p1} = C + 2C = 3C \Rightarrow C_{p2} = 4C + 3C = 7C$
 $q_1 = q_2$ $C_{p1} \cdot U_1 = C_{p2} U_2 \Rightarrow 3C \cdot U_1 = 7C U_2$
 $3U_1 = 7U_2$ $U_1 + U_2 = \varepsilon$
 $U_1 + \frac{3U_1}{7} = \varepsilon \Rightarrow \frac{10}{7} U_1 = \varepsilon \Rightarrow U_1 = \frac{7\varepsilon}{10}$
 $U_2 = \varepsilon - U_1 = \varepsilon - \frac{7\varepsilon}{10} = \frac{3\varepsilon}{10}$
 $W_1 + W_2 = \frac{C U_1^2}{2} + C U_1^2 = \frac{3C U_1^2}{2} = \frac{3C}{2} \left(\frac{7\varepsilon}{10}\right)^2$
 $W_3 + W_4 = \frac{3C U_2^2}{2} + \frac{4C U_2^2}{2} = \frac{7C U_2^2}{2} = \frac{7C}{2} \left(\frac{3\varepsilon}{10}\right)^2$
 $\frac{W_1 + W_2}{W_3 + W_4} = \frac{\frac{3C}{2} \cdot \frac{49\varepsilon^2}{100}}{\frac{7C}{2} \cdot \frac{9\varepsilon^2}{100}} = \frac{3}{7} \cdot \frac{49}{9} = \frac{7}{3}$ **B**

16

$\frac{m_1 v^2}{2} = \frac{m_2 v_2^2}{2}$ $4m_1 v^2 = m_2 v_2^2$
 $2v = v_2$ **A**

17) $P = I^2 R \Rightarrow I = \frac{\mathcal{E}}{R + \frac{r}{n}} = \frac{3,5}{R + \frac{1,4}{7}} = \frac{3,5}{R + 0,2}$
 $P = 3,3$

$$3,3 = \left(\frac{3,5}{R + 0,2} \right)^2 \cdot R = \frac{12,25 R}{(R + 0,2)^2}$$

$$3,3 \cdot (R + 0,4 R + 0,04) = 12,25 R$$

$$3,3 R^2 - 10,93 R + 0,132 = 0$$

$$R = 3,3$$

$$I = \frac{3,5}{3,3 + 0,2} = \frac{3,5}{3,5} = 1 \text{ A}$$

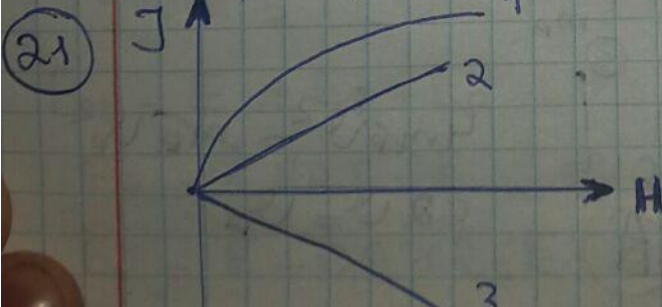
18) $I = ne v S$

$$E = \frac{U}{l} = \frac{I \cdot R}{l} = \frac{ne v S \cdot \frac{\rho l}{S}}{l} = ne v \cdot \rho$$

$$v = \frac{E}{ne \rho}$$

19) Ko'plab tranzistorlar yig'indisidan iborat kichik olchamdagi asbob integral sxema deb ataladi (C)

20) Diadning - asosiy vazifasi o'zgaruvchan tokni to'g'irlash (C)



$$\vec{J} = \chi \cdot \vec{H} \Rightarrow y = kx$$

Paramagnit uchun $\chi > 0$ (B)

(2)

$$(17) P = I^2 R \Rightarrow I = \frac{E}{R + \frac{r}{n}} = \frac{3,5}{R + \frac{1,4}{7}} = \frac{3,5}{R + 0,2}$$

$$P = 3,3$$

$$3,3 = \left(\frac{3,5}{R + 0,2} \right)^2 \cdot R = \frac{12,25 R}{(R + 0,2)^2}$$

$$3,3 (R + 0,4 R + 0,04) = 12,25 R$$

$$3,3 R^2 - 10,93 R + 0,132 = 0$$

$$R = 3,3$$

(A)

$$I = \frac{3,5}{3,3 + 0,2} = \frac{3,5}{3,5} = 1 \text{ A}$$

$$(18) I = ne \nu S$$

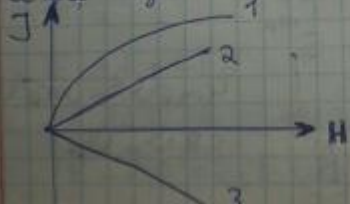
$$E = \frac{U}{L} = \frac{I R}{L} = \frac{ne \nu S \cdot \frac{\rho L}{S}}{L} = ne \nu \rho$$

$$\nu = \frac{E}{ne \rho}$$

(A)

(19) Ko'plab tranzistorlar yigindisidan iborat kichik o'lchamdagi aytib integral sxema deb ataladi (C)

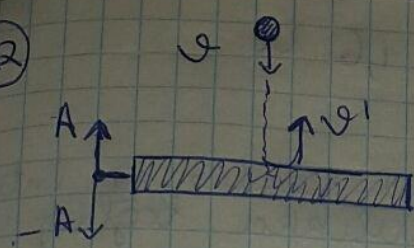
(20) Diodning asosiy vazifasi o'zgaruvchan tokni to'g'irlash (C)

(21)  $J = \chi \cdot H \Rightarrow y = kx$
Paramagnet uchun $\chi > 0$ (B)

(2)

3/5

22

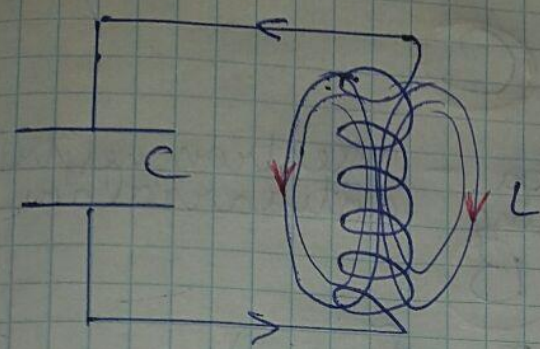


$$v + A\omega = v' - A\omega$$

$$v' = v + 2A\omega$$

C

23



$$t = \frac{3}{4}T \quad W_m \rightarrow \max$$

$$T = 2\pi\sqrt{LC}$$

$$T = 2 \cdot 3 \cdot \sqrt{30H \cdot 120 \cdot 10^{-6}F}$$

$$= 6 \cdot 60 \cdot 10^{-3} = 360ms$$

$$t_2 = \frac{3}{4}T = \frac{3}{4} \cdot 360ms = 270ms$$

$$t = \frac{T}{4} \quad W_m \rightarrow \max$$

A

$$t_1 = \frac{360ms}{4} = 90ms$$

$$\Delta t = t_2 - t_1 = 180ms$$

24

$$I_0 = 6 \cdot 10^{17} \frac{W}{m^2}$$

$$I = I_0 \cos \alpha$$

$$\alpha = 90^\circ \Rightarrow I = 0$$

$$\alpha = 0^\circ \Rightarrow I = I_0$$

$$[0; 6 \cdot 10^{17}]$$

D

25

$$\frac{\lambda}{\Delta \lambda} = k \cdot N = 2 \cdot 400 = 800$$

A

26

$$d = 50nm$$

$$\Delta \varphi = 0,314 \text{ rad}$$

$$E = \frac{\Delta \varphi}{\Delta S} \Rightarrow \Delta S = \pi r^2 = \frac{\pi d^2}{4} \Rightarrow E = \frac{4\Delta \varphi}{\pi d^2}$$

22



$\vec{v} + A\vec{\omega} = \vec{v}' - A\vec{\omega}$
 $\vec{v}' = \vec{v} + 2A\vec{\omega}$
 C

23



$t = \frac{3}{4}T \quad W_m \rightarrow \max$
 $T = 2\pi\sqrt{LC}$
 $T = 2 \cdot 3 \cdot \sqrt{30H \cdot 120 \cdot 10^{-6}F}$
 $= 6 \cdot 60 \cdot 10^{-3} = 360ms$
 $t_2 = \frac{3}{4}T = \frac{3}{4} \cdot 360ms = 270ms$
 $t = \frac{T}{4} \quad W_m \rightarrow \max$
 $t_1 = \frac{360ms}{4} = 90ms$
 $\Delta t = t_2 - t_1 = 180ms$
 A

24

$I_0 = 6 \cdot 10^{17} \frac{W}{m^2}$
 $I = I_0 \cos \alpha$
 $\alpha = 90^\circ \Rightarrow I = 0$
 $\alpha = 0^\circ \Rightarrow I = I_0$
 $[0; 6 \cdot 10^{17}]$
 D

25

$\frac{\lambda}{\Delta \lambda} = k \cdot N = 2 \cdot 400 = 800$
 A

26

$d = 50nm$
 $\Delta \varphi = 0,314 \text{ km}$
 $E = \frac{\Delta \varphi}{\Delta S} \Rightarrow \Delta S = \pi r^2 = \frac{\pi d^2}{4} \Rightarrow E = \frac{4\Delta \varphi}{\pi d^2}$

$$E = \frac{4 \Delta \varphi}{\pi d^2} = \frac{4 \cdot 0,314 \text{ km}}{\pi \cdot \left(\frac{1}{2} \text{ m}\right)^2} = 1,6 \text{ lx}$$

(27)

$$h\nu = A_{ch} + \frac{m v^2}{2}$$

o'zgarmaydi

ν tezlik, τ inter-siulikka bog'liq emal

(C)

(28)

Leptonlar zingira - elektron, neytrino, myon va ularning antizarralari

(B)

(29)

$$\sigma = 1,44 \tau$$

$$\tau = \frac{\sigma}{1,44}$$

σ - radioaktiv atomning o'tacha yashash vaqti

$$\tau = \frac{72,9 \text{ sutka}}{1,44} = 50,6 \text{ sutka}$$

(C)

(30)

Kichik energiyali holatdan katta energiyali holatga o'tsa, yutilish sodir bo'ladi

$$W = \frac{-m e^4}{8 \epsilon_0^2 h^2} \cdot \frac{1}{n^2}$$

(C)

$$n = 1 \text{ da } W_1 = -13,55 \text{ eV}$$

$$W_n = \frac{W_1}{n^2}$$

$$W_2 = \frac{W_1}{2^2} = \frac{-13,55 \text{ eV}}{4} = -3,3875$$

$$W_2 - W_1 = -3,3875 \text{ eV} + 13,55 \text{ eV} = 10,2 \text{ eV}$$

$$E = \frac{4\pi\phi}{\pi d^2} = \frac{4 \cdot 0.314 \text{ km}}{\pi \left(\frac{1}{2} \text{ m}\right)^2} = 1,6 \text{ lx}$$

(27) $h\nu = A_0 + \frac{m\nu^2}{2}$ ν tezlik, ν intan
suzlikka bogliq.
O'zgarmaydi (C)

(28) Septanlar zingira - elektron neytrino
myon va ularning antipartiklari
(B)

(29) $\sigma = 1,44^\circ$ $T = \frac{\sigma}{1,44}$
 σ - radioaktiv atomning o'tacha yashash
vaqti

$T = \frac{72,9 \text{ sutka}}{1,44} = 50,6 \text{ sutka}$ (C)

(30) Kichik energiyali holatdan katta
energiyali holatga o'tsa, yutilish sodir
boladi

$$W = \frac{-me^4}{8\epsilon_0^2 h^2} \cdot \frac{1}{n^2}$$
 (C)

$n = 1$ da $W_1 = -13,55 \text{ eV}$

$W_n = \frac{W_1}{n^2}$ $W_2 = \frac{W_1}{2^2} = \frac{-13,55 \text{ eV}}{4} = -3,387$

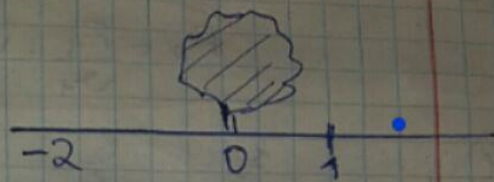
$W_2 - W_1 = -3,387 \text{ eV} + 13,55 \text{ eV} = 10,16 \text{ eV}$

Variant 15.

①

$t(s)$	1	1,1	1,2
$X(m)$	0	-2	1

$$x = x_0 + v_0 t + \frac{a t^2}{2}$$



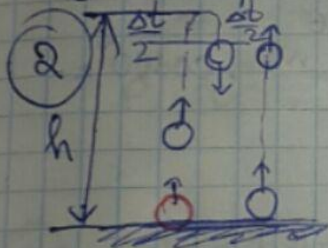
$$\begin{cases} -2 = 0 + v_0 \cdot 0,1 + \frac{a \cdot 0,1^2}{2} = v_0 \cdot 0,1 + \frac{0,01a}{2} & | \cdot 2 \\ 1 = 0 + v_0 \cdot 0,2 + \frac{0,02a}{2} = v_0 \cdot 0,2 + 0,02a \end{cases}$$

$$\begin{cases} -4 = 0,2 v_0 + 0,01a \\ 1 = 0,2 v_0 + 0,02a \end{cases}$$

$$-4 = 0,2 v_0 + 0,01a$$

$$1 = 0,2 v_0 + 0,02a$$

$$\Rightarrow 5 = 0,01a \quad a = 500 \frac{m}{s^2}$$



$$\Delta t = 1s$$

$$\frac{\Delta t}{2} = 0,5s$$

$$v_0 = g t$$

$$t = \frac{v_0}{g} = \frac{30 m/s}{10 m/s^2} = 3s$$

$$S'_1 = h = \frac{v_0^2}{2g} = \frac{(30 m/s)^2}{2 \cdot 10 m/s^2} = \frac{900}{20} = 45m$$

$$S'_2 = \frac{g \left(\frac{\Delta t}{2}\right)^2}{2} = \frac{10 m/s^2 \cdot (0,5s)^2}{2} = 1,25m$$

$$S_1 = S'_1 + S'_2 = 45m + 1,25m = 46,25m$$

$$t_1 = t - \frac{\Delta t}{2} = 3s - 0,5s = 2,5s$$

$$S_2 = v_0 t_1 - \frac{g t_1^2}{2} = 30 \frac{m}{s} \cdot 2,5s - \frac{10 m/s^2 \cdot 2,5^2}{2} = 43,75m$$

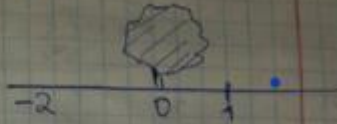
$$\frac{S_1}{S_2} = \frac{46,25m}{43,75m} = 1,05$$

A

Variant 15

①

t(s)	1	1,1	1,2
X(m)	0	-2	1



$$x = x_0 + v_0 t + \frac{a t^2}{2}$$

$$\begin{cases} -2 = 0 + v_0 \cdot 0,1 + \frac{a \cdot 0,1^2}{2} = v_0 \cdot 0,1 + \frac{0,01a}{2} & | \cdot 2 \\ 1 = 0 + v_0 \cdot 0,2 + \frac{a \cdot 0,2^2}{2} = v_0 \cdot 0,2 + 0,02a \end{cases}$$

$$\begin{cases} -4 = 0,2 v_0 + 0,01a \\ 1 = 0,2 v_0 + 0,02a \end{cases} \Rightarrow 5 = 0,01a \quad a = 500 \frac{m}{s^2}$$

$$\begin{cases} -4 = 0,2 v_0 + 0,01a \\ 1 = 0,2 v_0 + 0,02a \end{cases} \Rightarrow 5 = 0,01a \quad a = 500 \frac{m}{s^2}$$



$$\Delta t = 1s$$

$$\frac{\Delta t}{2} = 0,5s$$

$$v_0 = g t$$

$$t = \frac{v_0}{g} = \frac{30 \frac{m}{s}}{10 \frac{m}{s^2}} = 3s$$

$$S_1' = h = \frac{v_0^2}{2g} = \frac{(30 \frac{m}{s})^2}{2 \cdot 10 \frac{m}{s^2}} = \frac{900}{20} = 45m$$

$$S_2' = \frac{g \left(\frac{\Delta t}{2}\right)^2}{2} = \frac{10 \frac{m}{s^2} \cdot (0,5s)^2}{2} = 1,25m$$

$$S_1 = S_1' + S_2' = 45m + 1,25m = 46,25m$$

$$t_1 = t - \frac{\Delta t}{2} = 3s - 0,5s = 2,5s$$

$$S_2 = v_0 t_1 - \frac{g t_1^2}{2} = 30 \frac{m}{s} \cdot 2,5s - \frac{10 \frac{m}{s^2} \cdot 2,5^2}{2} = 43,75m$$

$$\frac{S_1}{S_2} = \frac{46,25m}{43,75m} = 1,05$$

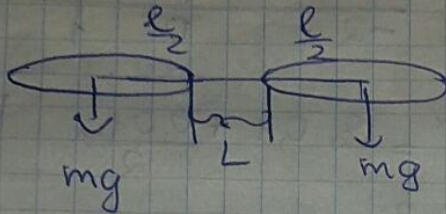
A

③ $F_1 = k \vartheta_1$ $F_2 = k \vartheta_2 = \frac{F_1}{\vartheta_1} \cdot \vartheta_2$

$F_2 = \frac{F_1}{\vartheta_1} \cdot \vartheta_2$

②

④



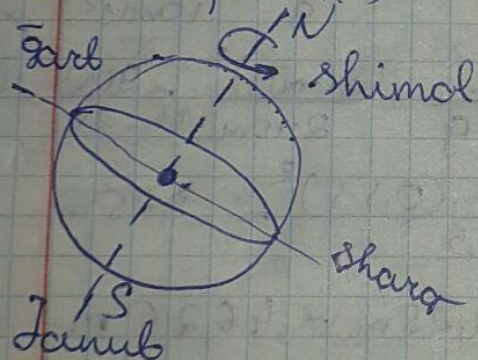
$F = \frac{G m \cdot m}{\left(\frac{R}{2} + L + \frac{R}{2}\right)^2} = \frac{G m^2}{(L+R)^2}$

$F = \frac{6,67 \cdot 10^{-11} \cdot 100^2}{(4+6)^2} = \frac{6,67 \cdot 10^{-11} \cdot 100^2}{100} = 6,67 \text{ nN}$

②

⑤

$\vartheta_1 = \frac{2\pi R}{T} \cos \alpha = \frac{2 \cdot 3,14 \cdot 6,4 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \cos 60^\circ = 232,6 \text{ m/s} = 0,233 \frac{\text{km}}{\text{s}}$



yer g'arbdan sharqqa aylanadi

$\vartheta_A = \vartheta_2 + \vartheta_1 = 7,6 \frac{\text{km}}{\text{s}} + 0,233 \frac{\text{km}}{\text{s}} = 7,833 \frac{\text{km}}{\text{s}}$

$\vartheta_n < \vartheta_A$

$7,3 \frac{\text{km}}{\text{s}} < 7,9 \frac{\text{km}}{\text{s}}$

yerqa qutib turhadi

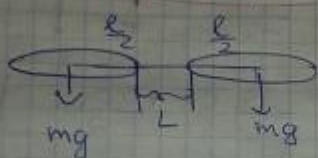
A

③ $F_1 = k \cdot \vartheta_1$ $F_2 = k \cdot \vartheta_2 = \frac{F_1}{\vartheta_1} \cdot \vartheta_2$

$F_2 = \frac{F_1}{\vartheta_1} \cdot \vartheta_2$

②

④

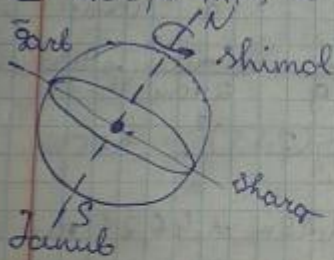


$F = G \cdot m \cdot m$
 $\left(\frac{R}{2} + L + \frac{R}{2}\right)^2 = \frac{G m^2}{(L+R)^2}$

$F = \frac{6,67 \cdot 10^{-11} \cdot 100^2}{(4+6)^2} = \frac{6,67 \cdot 10^{-11} \cdot 100^2}{100} = 6,67 \text{ nN}$

②

⑤ $\vartheta_1 = 2\pi R \cos \alpha = \frac{2 \cdot 3,14 \cdot 6,4 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \cos 60^\circ = 232,6 \text{ m/s} = 0,233 \frac{\text{km}}{\text{s}}$



yer sharqdan sharqqa harakat qiladi.

$\vartheta_A = \vartheta_2 - \vartheta_1 = 7,6 \frac{\text{km}}{\text{s}} - 0,2336 \frac{\text{km}}{\text{s}} = 7,36 \frac{\text{km}}{\text{s}}$

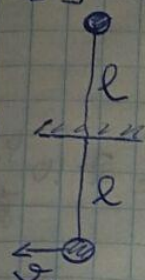
$\vartheta_n < \vartheta_1$ $7,36 \frac{\text{km}}{\text{s}} < 7,9 \frac{\text{km}}{\text{s}}$

yerqa qaratib tushadi

①

⑥ $F_{\text{ish}} = F_m \cdot g$ $\mu m g = \frac{mv^2}{r}$
 $v = \sqrt{\mu g R} = \sqrt{0,3 \cdot 10 \text{ m/s}^2 \cdot 400 \text{ m}} = 34,6 \text{ m/s}$ (D)

⑦ $[A] = 1 \text{ J} = 1 \text{ N} \cdot \text{m}$ kuch momenti
(A)

⑧  $E_t = \frac{mv_0^2}{2} = mg \cdot 2l$ (A)
 $\sqrt{v_0^2} = \sqrt{4gl}$ $v_0 = 2\sqrt{gl}$

⑨ $PV = \text{const}$ $P_1 V_1 = P_2 V_2$
 $T = \text{const}$ $P_1 \cdot \frac{4}{3} \pi r_1^3 = P_2 \cdot \frac{4}{3} \pi r_2^3$
 $P_1 \cdot r_1^3 = P_2 \cdot r_2^3$ $r_1 > r_2$ $P_1 < P_2$
eng katta (A)

⑩ Kritik haroratda (D)

⑪ $W_{p1} = \frac{k q_1 q_2}{r^2} = \frac{k q^2}{r^2}$

$\varphi_1' = \varphi_2'$ $\frac{k q_1'}{R_1} = \frac{k q_2'}{R_2} \Rightarrow q_1' \cdot R_2 = q_2' \cdot R_1$

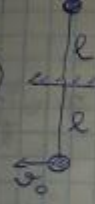
$q_1' \cdot 6 \text{ sm} = q_2' \cdot 4 \text{ sm} \Rightarrow 1,5 q_1' = q_2'$

$q_1 + q_2 = q_1' + q_2'$ $2q = q_1' + 1,5 q_1' = 2,5 q_1'$

$q_1' = \frac{2q}{2,5} = 0,8q$ $q_2' = 1,5 q_1' = \frac{1,5 \cdot 2q}{2,5} = 1,2q$

6) $F_{cm} = F_{mq}$ $\mu m g = \frac{m v^2}{r}$ $v = \sqrt{g r}$ $v = \sqrt{0,3 \cdot 10^3 \text{ m/s}^2 \cdot 400 \text{ m}} = 34,6 \text{ m/s}$ $\textcircled{2}$

7) $[A] = I = 1 \text{ N} \cdot \text{m}$ $\textcircled{A}$ *kuch momenti*

8)  $E_t = \frac{m v_0^2}{2} = m g \cdot 2l$ $\textcircled{A}$
 $v_0^2 = 4 g l$ $v_0 = 2 \sqrt{g l}$

9) $PV = \text{const}$ $T = \text{const}$ $P_1 V_1 = P_2 V_2$
 $P_1 \cdot \frac{4}{3} \pi r_1^3 = P_2 \cdot \frac{4}{3} \pi r_2^3$
 $P_1 \cdot r_1^3 = P_2 \cdot r_2^3$ $r_1 > r_2$ $P_1 < P_2$ $\textcircled{A}$
eng katta

10) *Kritik haroratda* $\textcircled{2}$

11) $W_{p1} = \frac{k q_1 q_2}{r^2} = \frac{k q^2}{r^2}$
 $q_1' = q_2'$ $\frac{k q_1'}{R_1} = \frac{k q_2'}{R_2} \Rightarrow q_1' \cdot R_2 = q_2' \cdot R_1$
 $q_1' \cdot 6 \text{ sm} = q_2' \cdot 4 \text{ sm} \Rightarrow 1,5 q_1' = q_2'$
 $q_1 + q_2 = q_1' + q_2'$ $2q = q_1' + 1,5 q_1' = 2,5 q_1'$
 $q_1' = \frac{2q}{2,5} = 0,8q$ $q_2' = 1,5 q_1' = \frac{1,5 \cdot 2q}{2,5} = 1,2q$

$W_{p2} = \frac{k q_1' \cdot q_2'}{r^2} = \frac{k \cdot 0,8q \cdot 1,2q}{r^2} = \frac{0,96 k q^2}{r^2}$

$\frac{W_{p1}}{W_{p2}} = \frac{\frac{k q^2}{r^2}}{\frac{0,96 k q^2}{r^2}} = \frac{25}{24}$ *marra kamayadi* $\textcircled{B}$

12) $Q_1 = C m (\pi_2 - \pi_1)$
 $C = \frac{Q}{m \cdot (\pi_2 - \pi_1)} = \frac{2 \cdot 10^6 \text{ J}}{1 \text{ kg} \cdot (100 - 0) \text{ K}} = 2 \cdot 10^4 \frac{\text{J}}{\text{kg} \cdot \text{K}}$
 $= 20 \frac{\text{kJ}}{\text{kg} \cdot \text{K}}$ $\textcircled{A}$

$Q_2 = \tau m_8 = \tau m$ $\tau = \frac{Q}{m}$
 $\tau = \frac{3 \cdot 10^6 \text{ J}}{1 \text{ kg}} = 3 \cdot 10^6 \frac{\text{J}}{\text{kg}} = 3 \text{ MJ/kg}$

$$W_{P2} = \frac{k q_1^1 \cdot q_2^1}{r^2} = \frac{k \cdot 0,8q \cdot 1,2q}{r^2} = \frac{0,96 k q^2}{r^2}$$

$$\frac{W_{P1}}{W_{P2}} = \frac{\frac{k q^2}{r^2}}{\frac{0,96 k q^2}{r^2}} = \frac{25}{24} \text{ maka } \textcircled{B} \text{ kemayalah}$$

$$\textcircled{12} \quad Q_1 = C m (\pi_2 - \pi_1)$$

$$C = \frac{Q}{m \cdot (\pi_2 - \pi_1)} = \frac{2 \cdot 10^6 \text{ J}}{1 \text{ kg} \cdot (100 - 0) \text{ K}} = 2 \cdot 10^4 \frac{\text{J}}{\text{kg} \cdot \text{K}}$$

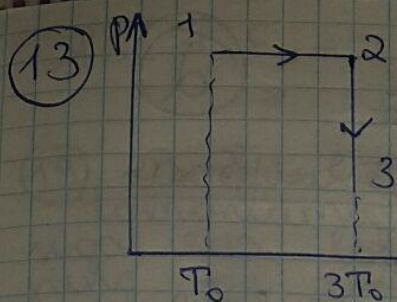
$$= 20 \frac{\text{kJ}}{\text{kg} \cdot \text{K}}$$

$$Q_2 = \tau m_2 = \tau m$$

$$\tau = \frac{Q}{m}$$

$$\tau = \frac{3 \cdot 10^6 \text{ J}}{1 \text{ kg}} = 3 \cdot 10^6 \frac{\text{J}}{\text{kg}} = 3 \text{ MJ} \frac{\text{J}}{\text{kg}}$$

$\textcircled{A}$



$$T_0 = 30 \text{ K}$$

$$P = \text{const} \quad Q = A + \Delta U$$

$$A_1 = \nu R (3T_0 - T_0) = 2\nu R T_0$$

$$\Delta U = \frac{3}{2} \nu R (3T_0 - T_0) = 3\nu R T_0$$

$$Q_1 = 2\nu R T_0 + 3\nu R T_0 = 5\nu R T_0$$

$$T = \text{const}$$

$$Q_2 = A_2 = 700 \text{ J}$$

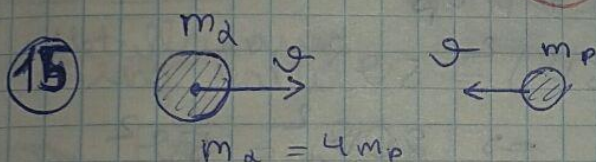
$$Q_1 + Q_2$$

$$A_1 + A_2$$

$$\frac{A_1 + A_2}{Q_1 + Q_2} = \frac{2\nu R T_0 + A_2}{5\nu R T_0 + Q_2} = \frac{2 \cdot 2 \cdot 8,31 \cdot 30 + 700}{5 \cdot 2 \cdot 8,31 \cdot 30 + 700}$$

$$= 0,53$$

C



$$\begin{cases} m_d v - m_p v = m_p v_1 + m_d v_2 \\ \frac{m_p v^2}{2} + \frac{m_d v^2}{2} = \frac{m_p v_1^2}{2} + \frac{m_d v_2^2}{2} \end{cases}$$

$$\begin{cases} 4m_p v - m_p v = m_p v_1 + 4m_p v_2 \\ m_p v^2 + 4m_p v^2 = m_p v_1^2 + 4m_p v_2^2 \end{cases}$$

$$\begin{cases} 3v = v_1 + 4v_2 & \Rightarrow v_1 = 3v - 4v_2 \\ 5v^2 = 4v_2^2 + v_1^2 & 5v^2 = 4v_2^2 + (3v - 4v_2)^2 \end{cases}$$

$$5v^2 = 4v_2^2 + 9v^2 - 24vv_2 + 16v_2^2$$

$$20v_2^2 - 24vv_2 + 4v^2 = 0$$

$$5v_2^2 - 6vv_2 + v^2 = 0$$

$$v_2 = v$$

$$v_1 = 3v - 4 \cdot \frac{v}{5} = 2,2v$$

$$v_2 = \frac{v}{5}$$

D



$$T_0 = 30 \text{ K}$$

$$P = \text{const} \quad Q = A + \Delta U$$

$$A_1 = \nu R (3T_0 - T_0) = 2\nu R T_0$$

$$\Delta U = \frac{3}{2} \nu R (3T_0 - T_0) = 3\nu R T_0$$

$$Q_1 = 2\nu R T_0 + 3\nu R T_0 = 5\nu R T_0$$

$$T = \text{const} \quad Q_2 = A_2 = 700 \text{ J}$$

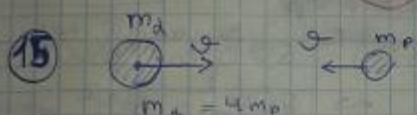
$$Q_1 + Q_2$$

$$A_1 + A_2$$

$$\frac{A_1 + A_2}{Q_1 + Q_2} = \frac{2\nu R T_0 + A_2}{5\nu R T_0 + Q_2} = \frac{2 \cdot 2 \cdot 8,31 \cdot 30 + 700}{5 \cdot 2 \cdot 8,31 \cdot 30 + 700}$$

$$= 0,53$$

C



$$\begin{cases} m_1 v - m_2 v = m_1 v_1 + m_2 v_2 \\ \frac{m_1 v^2}{2} + \frac{m_2 v^2}{2} = \frac{m_1 v_1^2}{2} + \frac{m_2 v_2^2}{2} \end{cases}$$

$$\begin{cases} 4m_2 v - m_2 v = m_1 v_1 + 4m_2 v_2 \\ m_2 v^2 + 4m_2 v^2 = 4m_2 v_1^2 + m_2 v_2^2 \end{cases}$$

$$\begin{cases} 3v = v_1 + 4v_2 & \Rightarrow v_1 = 3v - 4v_2 \\ 5v^2 = 4v_1^2 + v_2^2 & 5v^2 = 4(3v - 4v_2)^2 + v_2^2 \end{cases}$$

$$5v^2 = 4v_2^2 + 9v^2 - 24vv_2 + 16v_2^2 + v_2^2$$

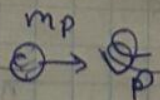
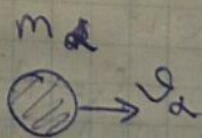
$$20v_2^2 - 24vv_2 + 4v^2 = 0$$

$$5v_2^2 - 6vv_2 + v^2 = 0 \quad v_2 = \frac{v}{5}$$

$$v_1 = 3v - 4 \cdot \frac{v}{5} = 2,2v$$

2

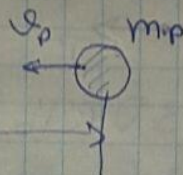
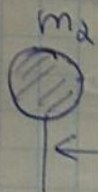
(14)



(2)

$$P = m_a v_a + m_p v_p = 4m_p \cdot v + m_p \cdot 0,5v = 4,5m_p v$$

(16)



2-höl

$$m_a v_a + m_p v_2 = 0$$

$$4m_p v_a = -m_p v_2$$

$$4v_a = -v_2$$

$$\left\{ \begin{array}{l} \frac{m_p v_p^2}{2} = \frac{k q_1 q_2}{d^2} \\ \frac{m_a v_a^2}{2} + \frac{m_p v_2^2}{2} = \frac{k q_1 q_2}{d^2} = \frac{m_p v_p^2}{2} \end{array} \right.$$

$$4m_p v_a^2 + m_p v_2^2 = m_p v_p^2$$

$$4v_a^2 + v_2^2 = v_p^2 = (5v)^2 = 5v^2$$

$$4v_a^2 + (-4v_a)^2 = 5v^2 \Rightarrow 20v_a^2 = 5v^2$$

$$v_a = 0,5v$$

$$v_2 = -4v_a = -4 \cdot 0,5v = -2v$$

(17)

$$j = \frac{I}{S}$$

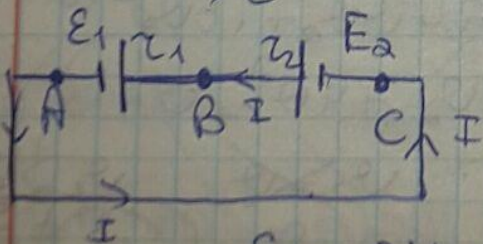
$$E = \frac{U}{d} = \frac{I \cdot R}{d} = \frac{j \cdot S \cdot R}{d} = \frac{j \cdot S \cdot R}{l}$$

$$E = \frac{j \cdot S \cdot \rho \cdot l}{l} = j \cdot \rho$$

(2)

$$\rho = \frac{E}{j}$$

(18)

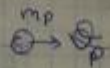
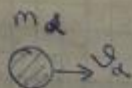


$$E_2 - E_1 = I r_2 + I r_1$$

$$E_2 = E_1 + I \cdot (r_1 + r_2)$$

$$E_2 = 2V + 16A (0,5\Omega + 0,25\Omega) = 14V$$

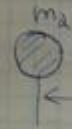
14



(d)

$$P = m_a v_a + m_p v_p = 4m_p \cdot v + m_p \cdot 0,5v = 4,5m_p v$$

16



2-böl
 $m_a v_a + m_p v_p = 0$
 $4m_p v_a = -m_p v_p$
 $4v_a = -v_p$

$$\left\{ \begin{array}{l} \frac{m_p v_p^2}{2} = \frac{k q_1 q_2}{d^2} \\ \frac{m_a v_a^2}{2} + \frac{m_p v_p^2}{2} = \frac{k q_1 q_2}{d^2} = \frac{m_p v_p^2}{2} \end{array} \right.$$

$$4m_p v_a^2 + m_p v_p^2 = m_p v_p^2$$

$$4v_a^2 + v_p^2 = v_p^2 = (5v_a)^2 = 5v_a^2$$

$$4v_a^2 + (-4v_a)^2 = 5v_a^2 \Rightarrow 20v_a^2 = 5v_a^2$$

$$v_a = 0,5v$$

$$v_p = -4v_a = -4 \cdot 0,5v = -2v$$

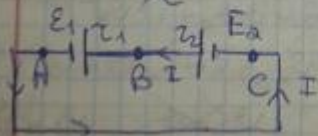
17

$$j = \frac{I}{S}$$

$$E = \frac{U}{d} = \frac{I R}{d} = \frac{j \cdot S \cdot R}{d} = \frac{j \cdot S \cdot R}{l}$$

$$E = \frac{j \cdot 8 \cdot 9 \cdot l}{l} = j \cdot 8 \Rightarrow j = \frac{E}{8}$$

18



$$E_2 - E_1 = I r_2 + I r_1$$

$$E_2 = E_1 + I (r_1 + r_2)$$

$$E_2 = 2V + 1,5A (0,5\Omega + 0,25\Omega) = 1,4V$$

$$\varphi_{BC} = \mathcal{E}_2 - I r_2 = 14V - 16A \cdot 0,5\Omega = 6V$$

(D)

(19) Berkiruvchi qatlam ventilli (bir tomonlama) o'tkazuvchanlik xossasiga ega bo'ladi. Berkiruvchi qatlamning bu xossaligidan yarimotkargichli lampalar - diod va transistor (triodlarda) foydalaniladi.

(A)

(20) O'tkazuvchanlik qarshilikka teskari kattalik

$$\Lambda = \frac{1}{R}$$

Metallarning eng katta

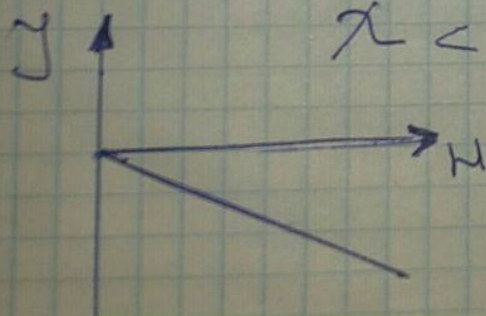
Qarshilik
metall $R = R_0(1 + \alpha t)$
elektrolit $R = R_0(1 - \alpha t)$
elektr o'tkazuvchanligi

(A)

(21) $\vec{J} = \chi \vec{H}$ $\Rightarrow y = kx$ $(k < 0)$

Diamagnitlar uchun magnit qabul qilmovchanlik χ manfiy qiymatga ega

$$\chi < 0$$



$$\varphi_{BC} = \mathcal{E}_2 - I r_2 = 14V - 16A \cdot 0,5\Omega = 6V$$

(D)

(19) Berkiruvchi qatlam ventili (bir tomonlama) o'tkazuvchanlik xossasiga ega bo'ladi. Berkiruvchi qatlamning bu xossaligidan yarimotkazgichlilar, lampalar, diod va tranzistorlar (vudlarda) foydalaniladi.

(A)

(20) O'tkazuvchanlik qارشilikka teskari kattalik

$$\lambda = \frac{1}{R}$$

Metallarning ing katta

Qارشilik
metall $R = R_0(1 + \alpha t)$
elektrolit $R = R_0(1 - \alpha t)$
elektrik o'tkazuvchanligi

(A)

$$\vec{J} = \chi \vec{H} \rightarrow y = kx \quad (k < 0)$$

Diamagnitlar uchun magnit qabul qارشilik χ manfiy qiymatga ega
 $\chi < 0$



JANOB FIZIKLARkanali

22) $x = A \sin \omega t$

$x' = v = A \cdot \omega \cos \omega t$

$\cos \omega t = 1$

$v = A \cdot \omega \Rightarrow a = \frac{v^2}{A} = v \cdot \omega$

$v = A \cdot \frac{a}{v} \Rightarrow v^2 = a \cdot A$

$v = \sqrt{A \cdot a}$

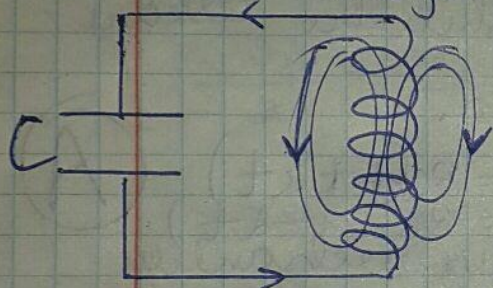
(B)

23)

$C = 125 \mu F$

$L = 20 H$

$\pi = 3$



$t_1 = \frac{T}{4}$

max

~~W~~ max

$t_2 = \frac{3T}{4}$

$W_m \rightarrow \max$

$\Delta t = \frac{3T}{4} - \frac{T}{4} = \frac{2T}{4} = 0,5T$

$T = 2\pi \sqrt{LC}$

$\Delta t = 2\pi \cdot \sqrt{LC} \cdot 0,5 = \pi \cdot \sqrt{LC}$

$\Delta t = 3 \cdot \sqrt{20 H \cdot 125 \cdot 10^{-6} F} = 3 \cdot 50 \cdot 10^{-3} = 150 ms$

(2)

24)

Beir yongilik yili $= 9,46 \cdot 10^{12} km =$

$\approx 9,5 \cdot 10^{15} m$

(C)

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22) $x = A \sin \omega t$
 $x' = v = A \cdot \omega \cos \omega t$ $\cos \omega t = 1$
 $v = A \cdot \omega \Rightarrow a = \frac{v^2}{A} = v \cdot \omega$
 $v = A \cdot \frac{a}{v} \Rightarrow v^2 = a \cdot A$
 $v = \sqrt{A \cdot a}$ (B)

23) $C = 125 \mu F$ $L = 20 H$ $n = 3$

 $t_1 = \frac{T}{4}$ $\text{max} \rightarrow W_{\text{max}}$
 $t_2 = \frac{3T}{4}$ $W_m \rightarrow \text{max}$
 $\Delta t = \frac{3T}{4} - \frac{T}{4} = \frac{2T}{4} = 0,5T$
 $T = 2\pi \sqrt{LC}$
 $\Delta t = 2\pi \cdot \sqrt{LC} \cdot 0,5 = \pi \cdot \sqrt{LC}$ (d)
 $\Delta t = 3 \cdot \sqrt{20 H \cdot 125 \cdot 10^{-6} F} = 3 \cdot 50 \cdot 10^{-3} =$
 $= 150 \text{ ms}$

24) Bir yoruglik yili $= 9,46 \cdot 10^{12} \text{ km} =$
 $\approx 9,5 \cdot 10^{15} \text{ m}$ (C)

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25



26



$$\Delta \Omega = \frac{S}{R^2}$$

$$0 \leq \Delta \Omega \leq 4\pi$$

$$S = 4\pi R^2$$

$$I = \frac{\Delta \Phi}{\Delta \Omega}$$

$$\Delta \Phi = I \cdot 4\pi = 4\pi I$$

C

$$E = \frac{\Delta \Phi}{\Delta S} = \frac{4\pi I}{4\pi R^2} = \frac{I}{R^2} = \frac{20 \text{ cd}}{(0.1 \text{ m})^2} = 2000 \text{ lx}$$

27

$$I = N h \nu$$

ν ortsa ham

N

õzgarmaydi

28

Proton va Neytron kuzadi

Baryonlar siniga

29

C

30

A

25



A

qisiluvchi tizilish eng katta

26



$$\Delta R = \frac{S}{R^2}$$

$$0 \leq \Delta R \leq 4\pi$$

$$S = 4\pi R^2$$

$$I = \frac{\Delta \Phi}{\Delta R}$$

$$\Delta \Phi = I \cdot 4\pi = 4\pi I$$

C

$$E = \frac{\Delta \Phi}{\Delta S} = \frac{4\pi I}{4\pi R^2} = \frac{I}{R^2} = \frac{20 \text{ cd}}{(0.1 \text{ m})^2} = 2000 \text{ lx}$$

27

$$I = N h \nu$$

ν o'rtacha ham, N o'zgaruvchan

C

28

Proton va Neutron Barionlar sinfiga kiradi

29

C

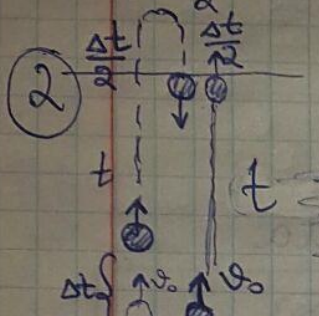
30

A

Variant 16

① $h = \frac{gt^2}{2}$ $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 500m}{10m/s^2}} = 10s$ (A)

$S = \frac{g}{2}(2t-1) = \frac{10m/s^2}{2} \cdot (2 \cdot 10 - 1)s^2 = \frac{5m}{s^2} \cdot 19s^2 = 95m$

②  $t_k = \frac{v_0}{g} = \frac{30m/s}{10m/s^2} = 3s$

$t_k = \frac{\Delta t}{2} + t = \frac{1s}{2} + t = 3s$

$t = 2,5s = \frac{5}{2}s$

$S_1 = h_1 + h_2 = \frac{v_0^2}{2g} + g \frac{(\frac{\Delta t}{2})^2}{2} = \frac{v_0^2}{2g} + \frac{g \Delta t^2}{8}$

$S_1 = \frac{(30m/s)^2}{2 \cdot 10m/s^2} + \frac{10m/s^2 (1s)^2}{8} = \frac{900}{20} + \frac{10}{8} =$

$= 45 + 1,25 = 46,25m$

$S_2 = h_2 = v_0 \cdot t - \frac{gt^2}{2} = \frac{30m}{s} \cdot \frac{5}{2}s - \frac{10m/s^2 (\frac{5}{2}s)^2}{2}$

$= 75m - 5 \frac{m}{s^2} \cdot \frac{25}{4}s^2 = \frac{300m - 125m}{4} =$

$= 43,75m$

$\Delta S = S_1 - S_2 = 46,25m - 43,75m = 2,5m$ (d)

③  $A = \frac{k \cdot v_0 \cdot S}{2} = \frac{m v_0^2}{2}$

$k \cdot S = m v_0$

$S = \frac{m v_0}{k} = \frac{4kg \cdot 10m/s}{2kg/s} = 20m$ (C)

Variant 16

1) $h = \frac{gt^2}{2}$ $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \cdot 500m}{10m/s^2}} = 10s$ (A)

$S = \frac{g}{2}(2t-1) = \frac{10m/s^2}{2} \cdot (2 \cdot 10 - 1)s^2 = \frac{5m}{s^2} \cdot 19s^2 = 95m$

2) $t_k = \frac{v_0}{g} = \frac{30m/s}{10m/s^2} = 3s$

$t_k = \frac{\Delta t}{2} + t = \frac{1s}{2} + t = 3s$

$t = 2,5s = \frac{5}{2}s$

$S_1 = h_1 + h_2 = \frac{v_0^2}{2g} + g \frac{(\frac{\Delta t}{2})^2}{2} = \frac{v_0^2}{2g} + \frac{g \Delta t^2}{8}$

$S_1 = \frac{(30m/s)^2}{2 \cdot 10m/s^2} + \frac{10m/s^2 (1s)^2}{8} = \frac{900}{20} + \frac{10}{8} =$

$= 45 + 1,25 = 46,25m$

$S_2 = h_2 = v_0 \cdot t - \frac{gt^2}{2} = \frac{30m}{s} \cdot \frac{5}{2}s - \frac{10m/s^2 (\frac{5}{2})^2}{2}$

$= 75m - \frac{5m}{s^2} \cdot \frac{25}{4} = \frac{300m - 125m}{4} =$

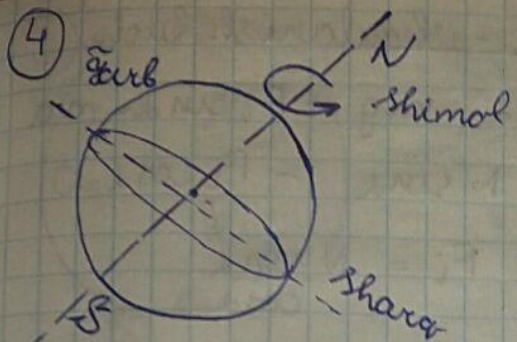
$= 43,75m$

$\Delta S = S_1 - S_2 = 46,25m - 43,75m = 2,5m$ (d)

3) $A = \frac{k v_0^2 S}{2} = \frac{m v_0^2}{2}$ (c)

$k \cdot S = m v_0^2$

$S = \frac{m v_0^2}{k} = \frac{4kg \cdot 10m/s}{2kg/s} = 20m$



yer, g'arbdan sharqqa
tomon aylanadi

$$v_n = v_1 + v_2$$

$$v_1 = 6,6 \text{ km/s}$$

$$v_2 = \frac{2\pi R}{T} \cos \alpha$$

$$v_2 = \frac{2 \cdot 3,14 \cdot 6,4 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cdot \cos 60^\circ = 232,6 \text{ m/s} = 0,233 \frac{\text{km}}{\text{s}}$$

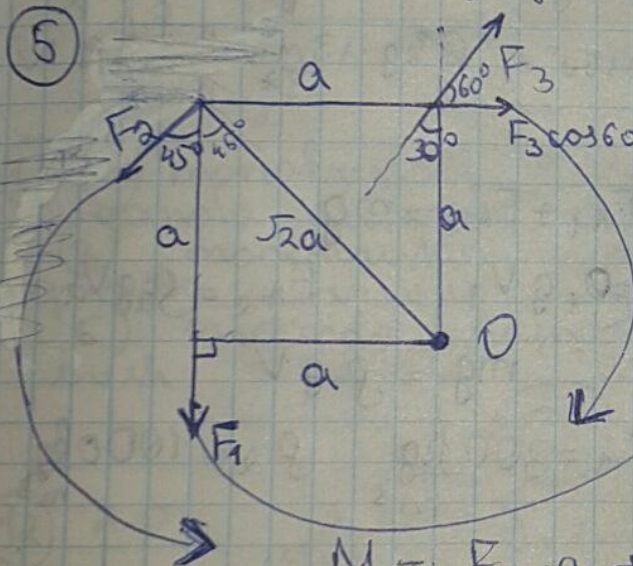
$$v_n = 6,6 \frac{\text{km}}{\text{s}} + 0,233 \frac{\text{km}}{\text{s}} = 6,833 \frac{\text{km}}{\text{s}}$$

$$v_n < v_I$$

$$6,833 \frac{\text{km}}{\text{s}} < 7,9 \frac{\text{km}}{\text{s}}$$

Kosmik kema yerga tushib ketadi

Ⓐ



$$M = M_1 + M_2 - M_3$$

$$M_1 = F_1 \cdot a$$

$$M_2 = F_2 \cdot \sqrt{2}a$$

$$M_3 = F_3 \cos 60^\circ \cdot a = \frac{F_3 \cdot a}{2}$$

$$M = F_1 \cdot a + F_2 \cdot \sqrt{2}a - \frac{F_3 \cdot a}{2}$$

$$M = \left(F_1 + \sqrt{2}F_2 - \frac{F_3}{2} \right) \cdot a$$

Ⓑ

$$M = \left(1 \text{ N} + \sqrt{2} \cdot \sqrt{2} \text{ N} - \frac{2 \text{ N}}{2} \right) \cdot 0,8 \text{ m} = 2 \text{ N} \cdot 0,8 \text{ m} = 1,6 \text{ N} \cdot \text{m}$$



yer. g'auldan sharqqa
tomon aylanadi

$$v_n = v_1 + v_2$$

$$v_1 = 6,6 \text{ km/s}$$

$$v_2 = \frac{2\pi R}{T} \cos \alpha$$

$$v_2 = \frac{2 \cdot 3,14 \cdot 6,4 \cdot 10^6 \text{ m}}{86400 \text{ s}} \cos 60^\circ = 232,6 \text{ m/s} = 0,233 \frac{\text{km}}{\text{s}}$$

$$v_n = 6,6 \frac{\text{km}}{\text{s}} + 0,233 \frac{\text{km}}{\text{s}} = 6,833 \frac{\text{km}}{\text{s}}$$

$$v_n < v_{\text{I}} \quad 6,833 \frac{\text{km}}{\text{s}} < 7,9 \frac{\text{km}}{\text{s}}$$

Kosmik kema yerga tushib ketadi

(A)



$$M = M_1 + M_2 - M_3$$

$$M_1 = F_1 \cdot a$$

$$M_2 = F_2 \cdot \sqrt{2}a$$

$$M_3 = F_3 \cos 60^\circ a$$

$$= F_3 \cdot \frac{a}{2}$$

$$M = F_1 \cdot a + F_2 \cdot \sqrt{2}a - \frac{F_3 \cdot a}{2}$$

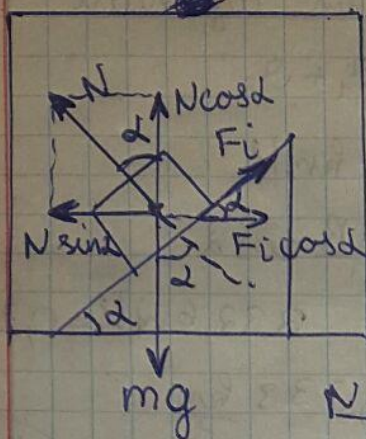
$$M = \left(F_1 + \sqrt{2}F_2 - \frac{F_3}{2} \right) \cdot a$$

(2)

$$M = \left(10 + \sqrt{2} \cdot \sqrt{2}N - \frac{2N}{2} \right) \cdot 0,8 \text{ m} =$$

$$= 2N \cdot 0,8 \text{ m} = 1,6 N \cdot \text{m}$$

6



F_i - ishqalanish kuchi

$$\begin{cases} N \cos \alpha - mg + F_i \sin \alpha = ma \\ N \sin \alpha - F_i \cos \alpha = 0 \end{cases}$$

$$F_i = \frac{N \sin \alpha}{\cos \alpha}$$

$$N \cos \alpha - mg + \frac{N \sin^2 \alpha}{\cos \alpha} = ma$$

$$\frac{N \cos^2 \alpha + N \sin^2 \alpha}{\cos \alpha} = mg + ma$$

$$N \frac{(\sin^2 \alpha + \cos^2 \alpha)}{\cos \alpha} = mg + ma$$

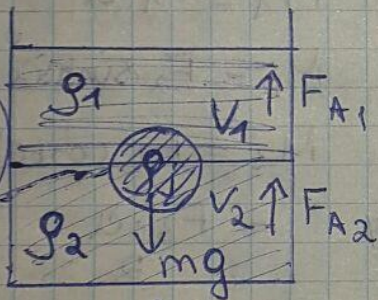
$$N = m(g + a) \cos \alpha$$

C

$$N = 6 \text{ kg} \cdot \left(\frac{10 \text{ m}}{\text{s}^2} + \frac{3 \text{ m}}{\text{s}^2} \right) \cdot \cos 60^\circ = 6 \text{ kg} \cdot \frac{13 \text{ m}}{\text{s}^2} \cdot \frac{1}{2} = 39 \text{ N}$$

7

D



$$F_{A1} + F_{A2} = mg$$

$$F_{A1} = \rho_1 g V_1$$

$$F_{A2} = \rho_2 g V_2$$

$$mg = \rho g V$$

$$\rho_1 = 300 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_2 = 1000 \frac{\text{kg}}{\text{m}^3}$$

$$\rho = 400 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_1 g V_1 + \rho_2 g V_2 = \rho g V \Rightarrow \rho_1 V_1 + \rho_2 V_2 = \rho V$$

$$V_1 + V_2 = V \Rightarrow \rho_1 (V - V_2) + \rho_2 V_2 = \rho V$$

$$\rho_1 V - \rho_1 V_2 + \rho_2 V_2 = \rho V \Rightarrow (\rho_2 - \rho_1) V_2 = (\rho - \rho_1) V$$

$$\frac{V_2}{V} = \frac{\rho - \rho_1}{\rho_2 - \rho_1} = \frac{400 - 300}{1000 - 300} = \frac{100}{700} = \frac{1}{7} = 0,14$$

6



F_i - ishqalanish kuchu

$$\begin{cases} N \cos \alpha - mg + F_i \sin \alpha = ma \\ N \sin \alpha - F_i \cos \alpha = 0 \end{cases}$$

$$F_i = \frac{N \sin \alpha}{\cos \alpha}$$

$$N \cos \alpha - mg + \frac{N \sin^2 \alpha}{\cos \alpha} = ma$$

$$\frac{N \cos^2 \alpha + N \sin^2 \alpha}{\cos \alpha} = mg + ma$$

$$\frac{N(\sin^2 \alpha + \cos^2 \alpha)}{\cos \alpha} = mg + ma$$

$$N = m(g + a) \cos \alpha$$

C

$$N = 6 \text{ kg} \left(\frac{10 \text{ m}}{\text{s}^2} + \frac{3 \text{ m}}{\text{s}^2} \right) \cdot \cos 60^\circ = 6 \text{ kg} \cdot 13 \frac{\text{m}}{\text{s}^2} \cdot \frac{1}{2} = 39 \text{ N}$$

7

D



$$F_{A1} + F_{A2} = mg$$

$$F_{A1} = \rho_1 g V_1$$

$$F_{A2} = \rho_2 g V_2$$

$$mg = \rho g V$$

$$\rho_1 = 300 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_2 = 1000 \frac{\text{kg}}{\text{m}^3}$$

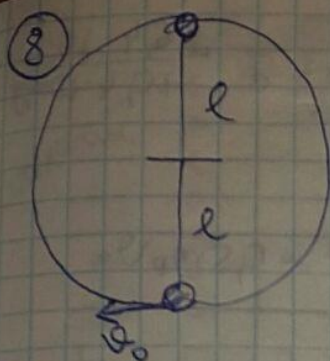
$$\rho = 400 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_1 g V_1 + \rho_2 g V_2 = \rho g V \Rightarrow \rho_1 V_1 + \rho_2 V_2 = \rho V$$

$$V_1 + V_2 = V \Rightarrow \rho_1 (V - V_2) + \rho_2 V_2 = \rho V$$

$$\rho_1 V - \rho_1 V_2 + \rho_2 V_2 = \rho V \Rightarrow (\rho_2 - \rho_1) V_2 = (\rho - \rho_1) V$$

$$\frac{V_2}{V} = \frac{\rho - \rho_1}{\rho_2 - \rho_1} = \frac{400 - 300}{1000 - 300} = \frac{100}{700} = \frac{1}{7} = 0,14$$



$$\frac{mv_0^2}{2} = mgh \quad h = 2l$$

$$mv_0^2 = 2mg \cdot 2l = 4mgl$$

$$v_0 = 2\sqrt{gl} \quad \text{A}$$

9) shax shaklida A

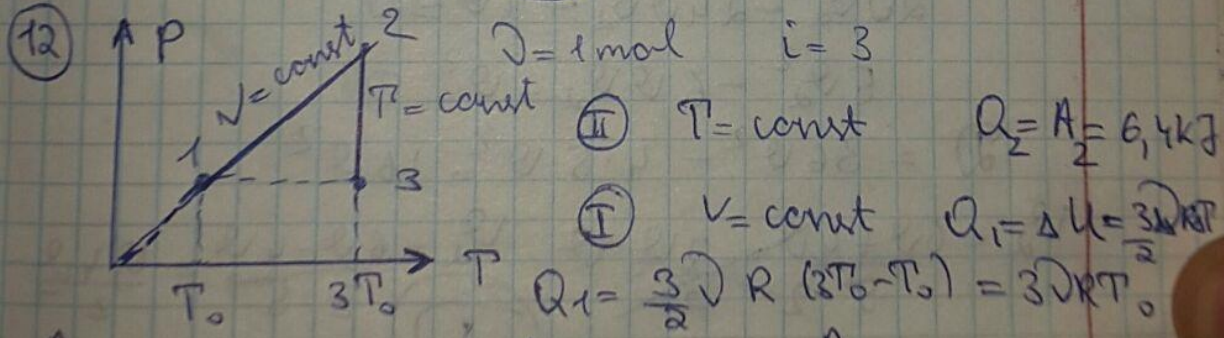
10) $P = \frac{1}{3} \rho v_{kv}^2$ $P_2 = \frac{1}{3} \cdot \frac{\rho}{1,2} v_{kv2}^2 = 1,2 P$

$\frac{1}{3} \cdot \frac{\rho}{1,2} v_{kv2}^2 = 1,2 \cdot \frac{1}{3} \rho v_{kv}^2$ A $v_{kv2}^2 = 1,2^2 v_{kv}^2$

$v_{kv2} = 1,2 v_{kv} = 1,2 \cdot 500 \text{ m/s} = 600 \text{ m/s}$

11) 1) monokristall moddalar issiqlikdan kengay-
ganda ularning shakli o'zgaradi
3) monokristall moddalar issiqlikdan kengay-
ganda ularning shakli o'zgarmaydi
5) eriganda haymi ortadigan moddalarning
erish harorati tashqi bosimga bog'liq

C



$$\frac{A_{\text{um}}}{Q_{\text{um}}} = \frac{A_1 + A_2}{Q_1 + Q_2} = \frac{Q_1 + A_2}{3 \nu R T_0 + Q_2} = \frac{A_2}{3 \nu R T_0 + Q_2}$$

⑧  $\frac{mv_0^2}{2} = mgl$ $h = 2l$
 $mv_0^2 = 2mg \cdot 2l = 4mgl$
 $v_0 = 2\sqrt{gl}$ (A)

⑨ shax shaklida (A)

⑩ $P = \frac{1}{3} \rho v_{kv}^2$ $P_2 = \frac{1}{3} \cdot \frac{\rho}{1,2} v_{kv2}^2 = 1,2 P$
 $\frac{1}{3} \cdot \frac{\rho}{1,2} v_{kv2}^2 = 1,2 \cdot \frac{1}{3} \rho v_{kv}^2$ (A) $v_{kv2}^2 = 1,2^2 v_{kv}^2$
 $v_{kv2} = 1,2 v_{kv} = 1,2 \cdot 500 \text{ m/s} = 600 \text{ m/s}$

⑪ ① monokristall moddalar issiqlikdan kengay-
 ganda ularning shakli o'zgaradi
 ② monokristall moddalar issiqlikdan kengay-
 ganda ularning shakli o'zgarmaydi
 ③ eriganda hayri o'tadigan moddalarning
 erish harorati tashqi haroratga bog'liq
 (C)

⑫  $\nu = 1 \text{ mol}$ $i = 3$
 (II) $T = \text{const}$ $Q_2 = A_2 = 6,4 \text{ kJ}$
 (I) $V = \text{const}$ $Q_1 = \Delta U = \frac{3}{2} \nu R \Delta T$
 $Q_1 = \frac{3}{2} \nu R (3T_0 - T_0) = 3\nu R T_0$
 $\frac{A_{\text{um}}}{Q_{\text{um}}} = \frac{A_1 + A_2}{Q_1 + Q_2} = \frac{Q_1 + A_2}{3\nu R T_0 + Q_2} = \frac{A_2}{3\nu R T_0 + Q_2}$

$$\frac{A_{\text{um}}}{Q_{\text{um}}} = \frac{6,4 \cdot 10^3 \text{ J}}{3 \cdot 1 \cdot 2,31 \cdot 160 \text{ K} + 6,4 \cdot 10^3 \text{ J}} = \frac{6,4 \cdot 10^3}{19,4 \cdot 10^3} = 0,33$$

13) $P = m_a v - m_p \cdot 0,5 v = 4 m_p v - 0,5 m_p v = 3,5 m_p v$ (A)

14)  $m_a = 4 m_p$

$$\begin{cases} m_a v - m_p v = m_a v_a + m_p v_p \\ \frac{m_a v^2}{2} + \frac{m_p v^2}{2} = \frac{m_a v_a^2}{2} + \frac{m_p v_p^2}{2} \end{cases}$$

$$\begin{cases} 4 m_p v - m_p v = 4 m_p v_a + m_p v_p \\ \frac{4 m_p v^2}{2} + \frac{m_p v^2}{2} = \frac{4 m_p v_a^2}{2} + \frac{m_p v_p^2}{2} \end{cases}$$

$$\begin{cases} 3v = 4v_a + v_p \\ 5v^2 = 4v_a^2 + v_p^2 \end{cases} \Rightarrow \begin{cases} v_p = 3v - 4v_a \\ 5v^2 = 4v_a^2 + (3v - 4v_a)^2 \end{cases}$$

$$5v^2 = 4v_a^2 + 9v^2 - 24vv_a + 16v_a^2$$

$$20v_a^2 - 24vv_a + 4v^2 = 0$$

$$5v_a^2 - 6vv_a + v^2 = 0$$

$$\Delta = 36v^2 - 4 \cdot 5 \cdot v^2 = 16v^2$$

$$v_a = \frac{6v \pm 4v}{5 \cdot 2} = \frac{2v}{2} = v \quad \text{or} \quad v_a = \frac{6v - 4v}{2 \cdot 5} = \frac{2v}{5} = 0,4v$$

(2) $= 0,2v$

$$\frac{A_{\text{sum}}}{Q_{\text{sum}}} = \frac{6,4 \cdot 10^3 \text{ J}}{3 \cdot 1 \cdot 2,31 \cdot 160 \text{ K} + 6,4 \cdot 10^3 \text{ J}} = \frac{6,4 \cdot 10^3 \text{ J}}{10,4 \cdot 10^3 \text{ J}} = 0,62 \quad \textcircled{C}$$

$$\textcircled{13} \quad P = m_d v - m_p \cdot 0,5 v = 4 m_p v - 0,5 m_p v = 3,5 m_p v \quad \textcircled{A}$$

$$\textcircled{14} \quad \begin{array}{c} m_d \rightarrow v \\ \leftarrow m_p \end{array} \quad m_d = 4 m_p$$

$$\begin{cases} m_d v - m_p v = m_d v_d + m_p v_p \\ \frac{m_d v^2}{2} + \frac{m_p v^2}{2} = \frac{m_d v_d^2}{2} + \frac{m_p v_p^2}{2} \end{cases}$$

$$\begin{cases} 4 m_p v - m_p v = 4 m_p v_d + m_p v_p \\ \frac{4 m_p v^2}{2} + \frac{m_p v^2}{2} = \frac{4 m_p v_d^2}{2} + \frac{m_p v_p^2}{2} \end{cases}$$

$$\begin{cases} 3v = 4v_d + v_p & v_p = 3v - 4v_d \\ 5v^2 = 4v_d^2 + v_p^2 & 5v^2 = 4v_d^2 + (3v - 4v_d)^2 \end{cases}$$

$$5v^2 = 4v_d^2 + 9v^2 - 24vv_d + 16v_d^2$$

$$20v_d^2 - 24vv_d + 4v^2 = 0$$

$$5v_d^2 - 6vv_d + v^2 = 0$$

$$\Delta = 36v^2 - 4 \cdot 5 \cdot v^2 = 16v^2$$

$$v_d = \frac{6v \pm 4v}{2 \cdot 5} = \frac{6v - 4v}{2 \cdot 5} = \frac{2v}{5} = 0,2v \quad \textcircled{D}$$

15

oxiricha

tashqari

tashqari

$E_+ - E_- = 0$ $E_+ E_-$ $E_+ - E_- = 0$

$E = E_+ + E_- = \frac{\sigma}{\epsilon_0} \Rightarrow \sigma = \frac{q}{S} \quad E = \frac{q}{\epsilon_0 S}$

$E = \frac{0,2}{8,85 \cdot 10^{-12} \text{ C}^2 \cdot \text{N} \cdot \text{m}^{-2}} \cdot 25 \cdot 10^{-4} \text{ m}^2 = \frac{2 \cdot 10^6 \text{ N}}{25 \text{ C}} = 80 \frac{\text{KV}}{\text{m}}$

16

$j = \frac{I}{S} = \frac{\frac{U}{R}}{S} = \frac{U}{R \cdot S} = \frac{E \cdot R}{\frac{\rho \cdot R}{S} \cdot S} = \frac{E}{\rho}$

$E = j \cdot \rho$

(2)

(B)

15

oxiricha

tashqari

tashqari

$E_+ - E_- = 0$ $E_+ E_-$ $E_+ - E_- = 0$

$E = E_+ + E_- = \frac{\sigma}{\epsilon_0} \Rightarrow \sigma = \frac{q}{S} \quad E = \frac{q}{\epsilon_0 S}$

$E = \frac{0,2}{8,85 \cdot 10^{-12} \text{ C}^2 \cdot \text{N} \cdot \text{m}^{-2}} \cdot 25 \cdot 10^{-4} \text{ m}^2 = \frac{2 \cdot 10^6 \text{ N}}{25 \text{ C}} = 80 \frac{\text{KV}}{\text{m}}$

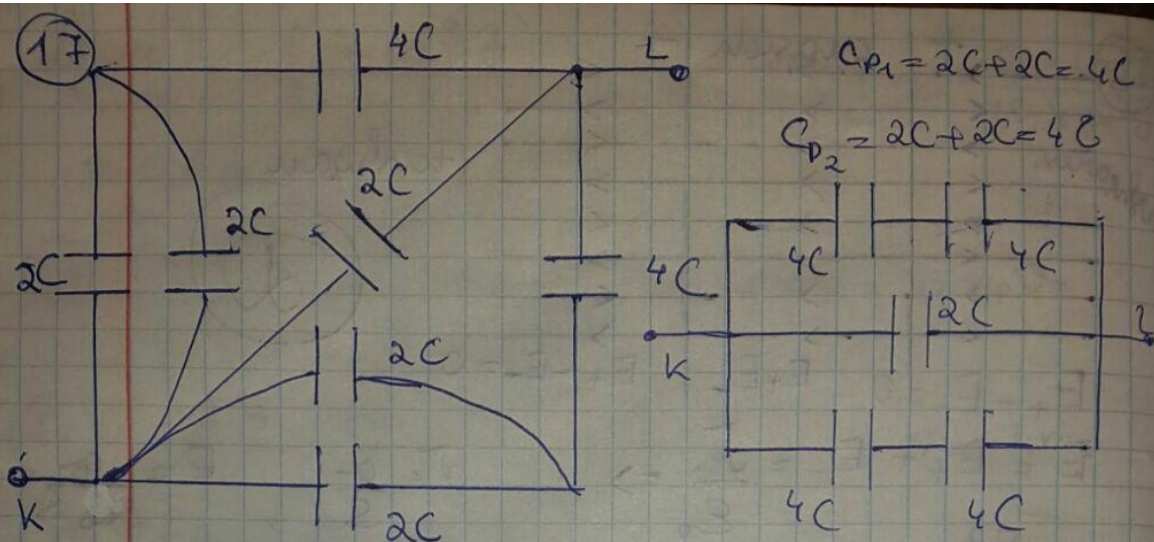
16

$j = \frac{I}{S} = \frac{\frac{U}{R}}{S} = \frac{U}{R \cdot S} = \frac{E \cdot R}{\frac{\rho \cdot R}{S} \cdot S} = \frac{E}{\rho}$

$E = j \cdot \rho$

(2)

(B)

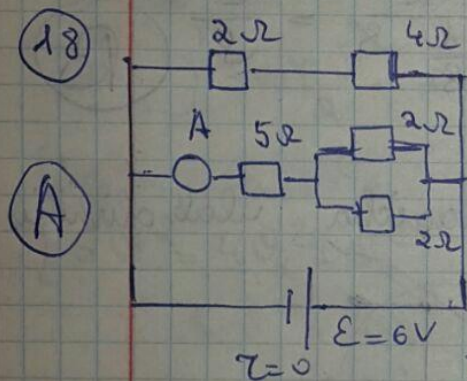


$$C_{k1} = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

$$C_{k2} = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

(A)

$$C_{kl} = C_{k1} + 2C + C_{k2} = 2C + 2C + 2C = 6C$$



$$R_{k1} = 2\Omega + 4\Omega = 6\Omega$$

$$R_{k2} = 5\Omega + \frac{2\Omega \cdot 2\Omega}{2\Omega + 2\Omega} = 6\Omega$$

$$R_p = \frac{R_{k1} \cdot R_{k2}}{R_{k2} + R_{k1}} = \frac{6\Omega \cdot 6\Omega}{6\Omega + 6\Omega} = 3\Omega$$

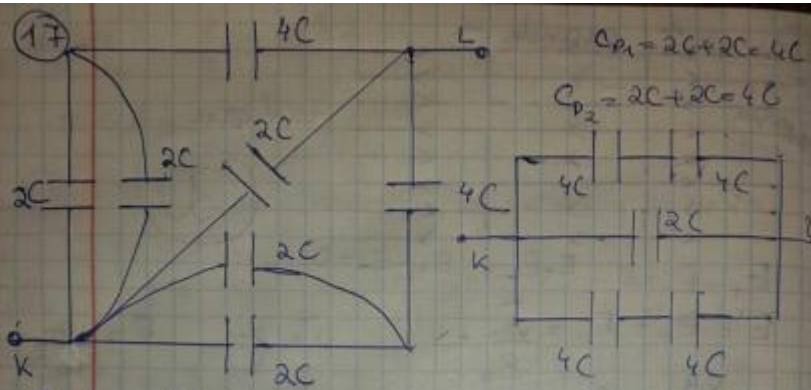
$$I = \frac{6V}{3\Omega} = 2A$$

$$I = \frac{\varepsilon}{R_p + r} \quad r = 0 \quad I = \frac{\varepsilon}{R_p}$$

$$I_A = \frac{\varepsilon}{R_{k2}} = \frac{6V}{6\Omega} = 1A$$

19) Akkumulyator olishi mumkin, balkan eng ko'pta elektr miqdori zaryad sig'imi deb ataladi.

(C)

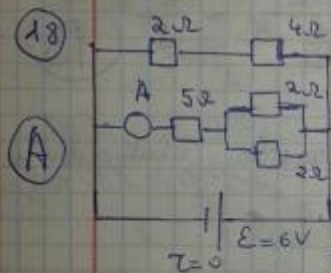


$$C_{k1} = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

$$C_{k2} = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

(A)

$$C_{kl} = C_{k1} + 2C + C_{k2} = 2C + 2C + 2C = 6C$$



$$R_{k1} = 2\Omega + 4\Omega = 6\Omega$$

$$R_{k2} = 5\Omega + \frac{2\Omega \cdot 2\Omega}{2\Omega + 2\Omega} = 6\Omega$$

$$R_p = \frac{R_{k1} \cdot R_{k2}}{R_{k1} + R_{k2}} = \frac{6\Omega \cdot 6\Omega}{6\Omega + 6\Omega} = 3\Omega$$

$$I = \frac{E}{R_p + r} = \frac{6V}{3\Omega + 0} = 2A$$

$$I_n = \frac{E}{R_{k2}} = \frac{6V}{6\Omega} = 1A$$

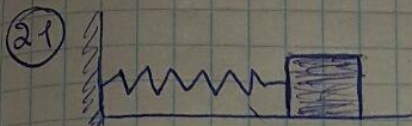
19) Akkumulyator olishi mumkin, balki eng katta elektr miqdori zaryad sig'imi deb ataladi.

(C)

20) $\vec{J} = \chi \cdot \vec{H}$

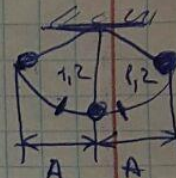
Paramagnit uchun $\chi > 0$
Diamagnit uchun $\chi < 0$

(B)



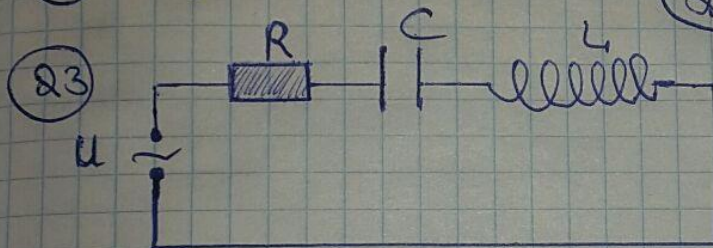
$x = A \sin \omega t$

(B)



$S = 3A + (2,2 - 1,2) = 3 \cdot 2,2 + 1 = 7,6 \text{ sm}$

22) $I_t = 4 \text{ mA} = 0,004 \text{ A}$ (D)



$R = 10 \Omega$
 $C = 8 \text{ mF}$
 $L = 80 \text{ H}$
 $\omega = 1,25 \text{ rad/s}$

$\cos \varphi = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}}$

$X_L = \omega L$

$X_C = \frac{1}{\omega C}$

$X_L = 1,25 \frac{\text{rad}}{\text{s}} \cdot 80 \text{ H} = 100 \Omega$

$X_C = \frac{1}{1,25 \frac{\text{rad}}{\text{s}} \cdot 8 \cdot 10^{-3}} = 100 \Omega$

$\cos \varphi = \frac{R}{\sqrt{R^2 + (100 \Omega - 100 \Omega)^2}} = \frac{R}{R} = 1$

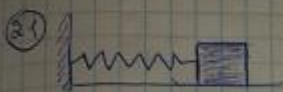
(C)

24) 1. Astronomik birlik (a. b.) - Quyoshdan Yergacha bo'lgan o'rtacha masofa = 149,6 million kilometrga teng. Bu birlikdan, asosan Quyosh sistemasidagi osmon jismlarigacha (planetalar, kometalari, Oy va boshqalar) bo'lgan masofalarni ifodalashda foydalaniladi.

20) $\vec{J} = \chi \cdot \vec{H}$

paramagnet uchun $\chi > 0$
diamagnet uchun $\chi < 0$

(B)



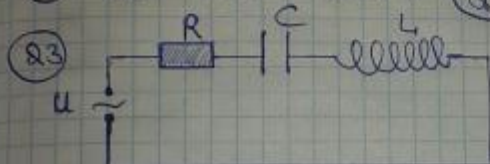
$x = A \sin \omega t$

(B)



$S = 3A + (2,2 - 1,2) = 3 \cdot 2,2 + 1 = 7,6 \text{ m}$

22) $I_t = 4 \text{ mA} = 0,004 \text{ A}$ (D)



$R = 10 \Omega$
 $C = 8 \text{ mF}$
 $L = 80 \text{ H}$
 $\omega = 1,25 \text{ rad/s}$

$\cos \varphi = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}}$

$X_L = \omega L$

$X_C = \frac{1}{\omega C}$

$X_L = 1,25 \frac{\text{rad}}{\text{s}} \cdot 80 \text{ H} = 100 \Omega$

$X_C = \frac{1}{1,25 \frac{\text{rad}}{\text{s}} \cdot 8 \cdot 10^{-3}} = 100 \Omega$

$\cos \varphi = \frac{R}{\sqrt{R^2 + (100 \Omega - 100 \Omega)^2}} = \frac{R}{R} = 1$ (C)

24) 1. Astronomik birlik (a.b.) - Quyoshdan Yergacha bo'lgan o'rtacha masofa = 149,6 million kilometrga teng. Bu birlikdan, asosan Quyosh sistemasiidagi boshqa jismlarigacha (planetalar, kometalar, Oy va boshqalar) bo'lgan masofalarni ifodalashda foydalaniladi.

Variant 17

① $S = \frac{g}{2} (2t-1)$

$\frac{10 \text{ m/s}^2}{2} \cdot (2t-1) = 75 \text{ m}$

$5 \cdot (2t-1) = 75$

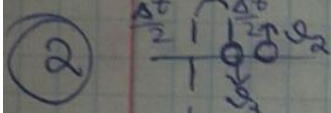
$2t-1 = 15$

$2t = 16$

$t = 8 \text{ s}$

(C)

$S = \frac{gt^2}{2} = \frac{10 \text{ m/s}^2 \cdot (8 \text{ s})^2}{2} = \frac{10 \text{ m}}{\text{s}^2} \cdot 32 \text{ s}^2 = 320 \text{ m}$

② 

$v_1 = g \Delta t = 10 \frac{\text{m}}{\text{s}^2} \cdot \frac{15}{2} = \frac{5 \text{ m}}{\text{s}}$

$v_2 = v_0 - g t_1$

$t = \frac{v_0}{g} = \frac{30 \text{ m/s}}{10 \text{ m/s}^2} = 3 \text{ s}$

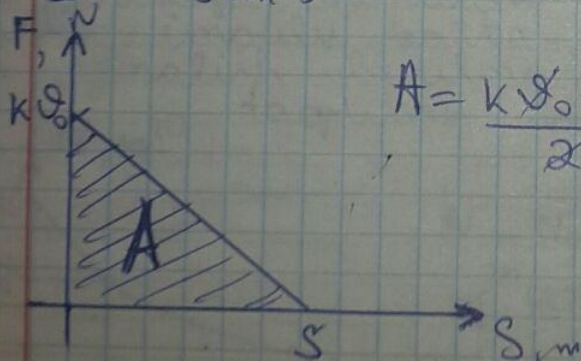
$t_1 = t - \frac{\Delta t}{2} = 3 \text{ s} - \frac{1 \text{ s}}{2} = 2,5 \text{ s}$

$v_2 = 30 \frac{\text{m}}{\text{s}} - 10 \frac{\text{m}}{\text{s}^2} \cdot 2,5 \text{ s} = 5 \frac{\text{m}}{\text{s}}$

$\frac{v_1}{v_2} = \frac{5 \text{ m/s}}{5 \text{ m/s}} = 1$

(A)

③



$A = \frac{kx_0 \cdot S}{2} = \frac{m v_0^2}{2}$

(B)

$k \cdot S = m v_0$

$S = \frac{m v_0}{k} = \frac{100 \cdot 4}{8} = 50 \text{ m}$

Variant 14

① $S = \frac{g}{2}(2t-1)$ $\frac{10 \text{ m/s}^2}{2} \cdot (2t-1) = 75 \text{ m}$

$5 \cdot (2t-1) = 75$ $2t-1 = 15$ $2t = 16 \text{ s}$

$t = 8 \text{ s}$

(C)

$S = \frac{gt^2}{2} = \frac{10 \text{ m/s}^2 \cdot (8 \text{ s})^2}{2} = \frac{10 \text{ m}}{\text{s}^2} \cdot 32 \text{ s}^2 = 320 \text{ m}$



$v_1 = g \frac{at}{2} = \frac{10 \text{ m}}{\text{s}^2} \cdot \frac{1 \text{ s}}{2} = \frac{5 \text{ m}}{\text{s}}$

$v_2 = v_0 - g t_1$

$t = \frac{v_0}{g} = \frac{30 \text{ m/s}}{10 \text{ m/s}^2} = 3 \text{ s}$

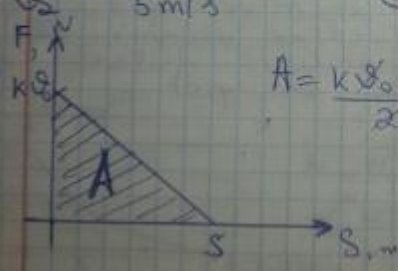
$t_1 = t - \frac{at}{2} = 3 \text{ s} - \frac{1 \text{ s}}{2} = 2,5 \text{ s}$

$v_2 = 30 \frac{\text{m}}{\text{s}} - 10 \frac{\text{m}}{\text{s}^2} \cdot 2,5 \text{ s} = 5 \frac{\text{m}}{\text{s}}$

$\frac{v_1}{v_2} = \frac{5 \text{ m/s}}{5 \text{ m/s}} = 1$

(A)

⑧



$A = \frac{kx_0 \cdot S}{2} = \frac{m g x_0}{2}$

$k \cdot S = m g$

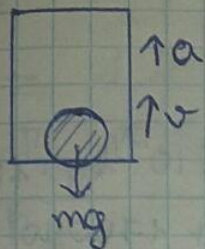
(B)

$S = \frac{m g}{k} = \frac{100 \text{ kg} \cdot 9,8 \text{ m/s}^2}{8} = 1225 \text{ m}$

④ $F = mg + ma = P + ma$

$a = \frac{F - P}{m} = \frac{6\text{ N} - 5\text{ N}}{0,5\text{ kg}} = 2\text{ m/s}^2$

$m = \frac{P}{g} = \frac{5\text{ N}}{10\frac{\text{N}}{\text{kg}}} = 0,5\text{ kg}$

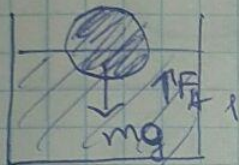


②

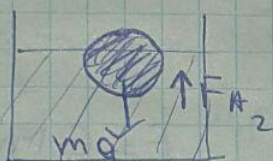
⑤

$F_A = \rho g V_b = mg$

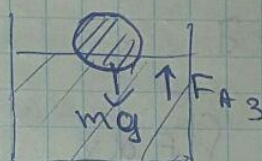
$F_{A1} = F_{A2} = F_3$



$\rho_{\text{sub}} > \rho_{\text{liq}}$



$\rho_{\text{sub}} > \rho_{\text{liq}}$



$\rho_{\text{sub}} > \rho_{\text{liq}}$

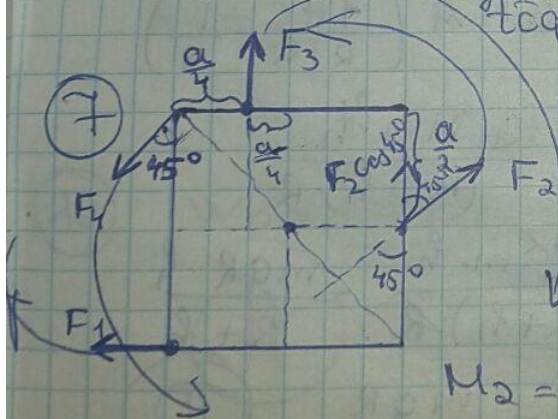
②

⑥

$$\begin{cases} m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2' \\ \frac{m_1 v_1^2}{2} + \frac{m_2 v_2^2}{2} = \frac{m_1 v_1'^2}{2} + \frac{m_2 v_2'^2}{2} \end{cases}$$

sharlarning elastik markaziy toqnashuvida

⑦



$M_1 = F_1 \cdot \frac{a}{2} + F_3 \cdot \frac{a}{4}$

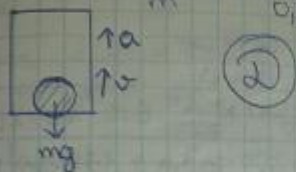
$M_2 = F_2 \cos 45^\circ \cdot \frac{a}{2} + F_4 \cdot \frac{\sqrt{2}a}{2}$

$M_1 = 1\text{ N} \cdot \frac{0,4\text{ m}}{2} + 2\text{ N} \cdot \frac{0,4\text{ m}}{4} = 0,4\text{ N}\cdot\text{m}$

$M_2 = 2\sqrt{2}\text{ N} \cdot \frac{\sqrt{2}}{2} \cdot \frac{0,4\text{ m}}{2} + \sqrt{2} \cdot \frac{\sqrt{2}}{2} \cdot 0,4\text{ m}$
 $= 0,4\text{ N}\cdot\text{m} + 0,4\text{ N}\cdot\text{m} = 0,8\text{ N}\cdot\text{m}$

④ $F = mg + ma - P + ma$ $m = \frac{P}{g} = \frac{5N}{10 \frac{m}{s^2}} = 0,5 kg$

$$a = \frac{F - P}{m} = \frac{6N - 5N}{0,5 kg} = 2 m/s^2$$



⑤ $F_A = \rho g V_0 = mg$ $F_{A1} = F_{A2} = F_3$

$\rho_{liquid} > \rho_{sphere}$

$\rho_{liquid} = \rho_{sphere}$

$\rho_{liquid} < \rho_{sphere}$

(2)

⑥
$$\begin{cases} m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2' \\ \frac{m_1 v_1^2}{2} + \frac{m_2 v_2^2}{2} = \frac{m_1 v_1'^2}{2} + \frac{m_2 v_2'^2}{2} \end{cases}$$

Shocklarning elastik markaziy toq-nashuvda

⑦

$$M_1 = F_1 \cdot \frac{a}{2} + F_3 \cdot \frac{a}{4}$$

$$M_2 = F_2 \cos 45^\circ \cdot \frac{a}{2} + F_4 \cdot \frac{\sqrt{2}a}{2}$$

$$M_1 = 1N \cdot \frac{0,4m}{2} + 2N \cdot \frac{0,4m}{4} = 0,4m$$

$$M_2 = 2\sqrt{2}N \cdot \frac{\sqrt{2}}{2} \cdot \frac{0,4m}{2} + \sqrt{2} \cdot \frac{\sqrt{2}}{2} \cdot 0,4m$$

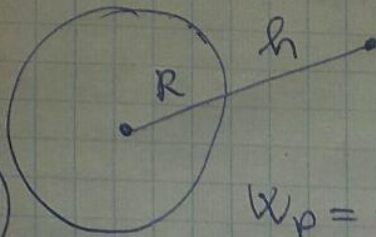
$$= 0,4 N \cdot m + 0,4 N \cdot m = 0,8 N \cdot m$$

$$M = M_2 - M_1 = 0,8 \text{ N} \cdot \text{m} - 0,4 \text{ N} \cdot \text{m} = 0,4 \text{ N} \cdot \text{m}$$

8

B

A



$$W_p = - \frac{G M m}{(R+h)}$$

$$W_p = - \frac{6,67 \cdot 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2} \cdot 6 \cdot 10^{24} \text{ kg} \cdot 1 \cdot 10^3 \text{ kg}}{6300 \cdot 10^3 \text{ m} + 1700 \cdot 10^3 \text{ m}}$$

$$= - \frac{6,67 \cdot 10^{-11} \cdot 6 \cdot 10^{24} \cdot 1 \cdot 10^3}{8000 \cdot 10^3} = -5 \cdot 10^{10} \text{ J}$$

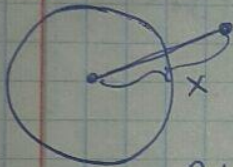
$$= -50 \text{ GJ}$$

JANOB FIZIKLARKanali

9

$$A = \int F dx$$

$$F = \frac{G M m}{x^2}$$



$$A = \int_R^{R+h} \frac{G M m}{x^2} dx =$$

$$= G M m \int_R^{R+h} \frac{1}{x^2} dx = G M m \int_R^{R+h} x^{-2} dx =$$

$$= \left[-\frac{G M m}{x} \right]_R^{R+h} = -G M m \left(\frac{1}{R+h} - \frac{1}{R} \right)$$

$$= -G M m \cdot \left(\frac{R - R - h}{(R+h) \cdot R} \right) = \frac{G M m \cdot h}{(R+h) \cdot R}$$

$$g = \frac{G M}{R^2} \Rightarrow A = \frac{g R^2 \cdot m \cdot h}{(R+h) \cdot R} = \frac{m g R \cdot h}{R+h}$$

$$A = \frac{m g R \cdot \frac{R}{n}}{R + \frac{R}{n}} = \frac{m g R^2}{(n+1) \cdot R} = \frac{m g R}{n+1}$$

2

$$M = M_2 - M_1 = 0,8 \text{ N} \cdot \text{m} - 0,4 \text{ N} \cdot \text{m} = 0,4 \text{ N} \cdot \text{m}$$

8

B

A



$$W_p = - \frac{G M m}{(R+h)}$$

$$W_p = - \frac{6,67 \cdot 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2} \cdot 6 \cdot 10^{24} \text{ kg} \cdot 10^3 \text{ kg}}{6300 \cdot 10^3 \text{ m} + 1700 \cdot 10^3 \text{ m}}$$

$$= - \frac{6,67 \cdot 10^{-11} \cdot 6 \cdot 10^{24} \cdot 10^3}{8000 \cdot 10^3} = - 5 \cdot 10^{10} \text{ J}$$

$$= - 50 \text{ GJ}$$

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9

$$A = \int F dx$$

$$F = \frac{G M m}{x^2}$$



$$A = \int_R^{R+h} \frac{G M m}{x^2} dx =$$

$$= G M m \int_R^{R+h} \frac{1}{x^2} dx = G M m \int_R^{R+h} x^{-2} dx =$$

$$= \frac{G M m}{-x} \Big|_R^{R+h} = - G M m \left(\frac{1}{R+h} - \frac{1}{R} \right)$$

$$= - G M m \cdot \left(\frac{R - R - h}{(R+h) \cdot R} \right) = \frac{G M m h}{(R+h) \cdot R}$$

$$g = \frac{G M}{R^2} \Rightarrow A = \frac{g R^2 m \cdot h}{(R+h) \cdot R} = \frac{m g R \cdot h}{R+h}$$

$$A = \frac{m g R \cdot \frac{R}{n}}{R + \frac{R}{n}} = \frac{m g R^2}{(n+1) \cdot R} = \frac{m g R}{n+1}$$

D

10) $p = \text{const}$ $\frac{V}{T} = \text{const}$

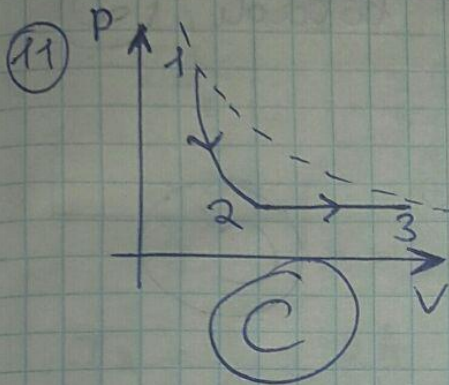
$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$T_2 = \frac{V_2}{V_1} \cdot T_1 = \frac{1.2 \cdot (1+20\%) \cdot 273K}{1.00\%}$$

$$= 1.2 \cdot 273K$$

A

$$\Delta t = T_2 - T_1 = 1.2 \cdot 273K - 273K = 0.2 \cdot 273K = 54.6^\circ C$$



$$T_1 = T_3$$

i=3 bir atomlu

I Adiabatik

$$Q = A + \Delta U = 0$$

$$A_1 = -\Delta U = -\frac{3}{2} R (T_2 - T_1) = \frac{3}{2} R (T_1 - T_2)$$

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II Izobarik

$$Q = A + \Delta U$$

$$A_1 = \frac{3}{2} A_2 \Rightarrow$$

$$A_2 = R (T_3 - T_2) = R (T_1 - T_2)$$

$$A_1 + A_2 = A$$

$$A_1 + \frac{2A_1}{3} = A \Rightarrow$$

$$\frac{5A_1}{3} = A \Rightarrow A_1 = \frac{3A}{5}$$

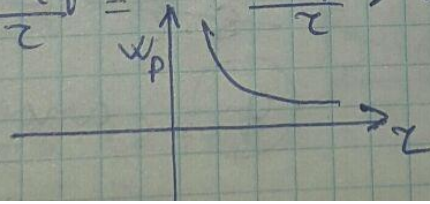
$$A_1 = \frac{3 \cdot A}{5} = 0.6 A$$

12)

$$W_p = \frac{kq \cdot 2q}{r} = \frac{2kq^2}{r} > 0$$

$$W_p = \frac{k}{r} > 0$$

A



1

⑩ $P = \text{const}$ $\frac{V}{T} = \text{const}$
 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $T_2 = \frac{V_2}{V_1} \cdot T_1 = \frac{V_1(1+20\%)}{V_1} \cdot 273K$
 $= 1,2 \cdot 273K$ (A)

$\Delta t = T_2 - T_1 = 1,2 \cdot 273K - 273K = 0,2 \cdot 273K = 54,6K$

⑪ P $T_1 = T_3$ (I=3) bir döngü



(I) Adiyabatik

$Q = A + \Delta U = 0$

$A_1 - \Delta U = -\frac{3}{2} \mathcal{R} (T_2 - T_1)$
 $= \frac{3}{2} \mathcal{R} (T_1 - T_2)$

(II) İzobarik

$Q = A + \Delta U$

$A_1 = \frac{3}{2} A_2$

$\Rightarrow A_1 + A_2 = A$

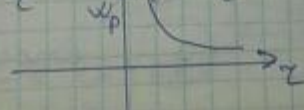
$A_2 = \mathcal{R} (T_3 - T_2) = \mathcal{R} (T_1 - T_2)$

$A_1 + \frac{2A_1}{3} = A \Rightarrow \frac{5A_1}{3} = A \Rightarrow A_1 = \frac{3A}{5}$

$A_1 = \frac{3 \cdot A}{5} = 0,6 A$

⑫ $w_p = \frac{kq_1 \cdot 2q}{z} = \frac{2kq^2}{z} > 0$

(A)



$w_p = \frac{k}{z} > 0$

(-)

13

B

14

mp $\vec{v}$ $\vec{v}$ mp
 $mp \vec{v} - mp \vec{v} = 2mpu$

A

$u=0$

$2mpu=0$

15

$\varphi_K - \varphi_L = 0$ bo'lganligi uchun umumiy sig'im $C=0$ bo'ladi

D

16



C

$E = E_+ + E_- = \frac{\sigma}{2\epsilon_0} + \frac{\sigma}{2\epsilon_0} = \frac{\sigma}{\epsilon_0}$ $\sigma = \frac{q}{S}$

$E = \frac{q}{\epsilon_0 S}$

$E = \frac{\sigma}{\epsilon_0} = \frac{1.77 \cdot 10^{-12} \frac{C}{m^2}}{8.85 \cdot 10^{-12} \frac{C^2}{N \cdot m^2}} = 200 \frac{V}{m}$

$U = E \cdot d = 200 \frac{V}{m} \cdot 5 \cdot 10^{-2} m = 10 V$

17

$j = \frac{I}{S}$

$I = j \cdot S$

B

$\omega = \frac{P}{V} = \frac{IU}{V} = \frac{j \cdot S \cdot E \cdot l}{S \cdot l} = j \cdot E$

18

$q = CU$
 $q = It$

q

amper $\cdot$ soat

C

13

13

14

$$m_p v - m_p v = 2 m_p u$$

$$m_p v - m_p v = 2 m_p u$$

$$2 m_p u = 0$$

15

$\varphi_K - \varphi_L = 0$ bolganligi uchun umumiy ziqim $C = 0$ bo'ladi (2)

16



$$E_+ - E_- = 0 \quad E_+ + E_- \quad E_+ - E_- = 0$$

$$E = E_+ + E_- = \frac{\sigma}{2\epsilon_0} + \frac{\sigma}{2\epsilon_0} = \frac{\sigma}{\epsilon_0} \quad \sigma = \frac{q}{S}$$

$$E = \frac{q}{\epsilon_0 S} \quad E = \frac{\sigma}{\epsilon_0} = \frac{1.77 \cdot 10^{-10} \frac{C}{m^2}}{8.85 \cdot 10^{-12} \frac{C^2}{N \cdot m^2}} = 200 \frac{V}{m}$$

$$U = E d = 200 \frac{V}{m} \cdot 5 \cdot 10^{-8} m = 10 V$$

17

$$j = \frac{I}{S}$$

$$I = j \cdot S$$

(B)

$$\omega = \frac{P}{V} = \frac{IU}{V} = \frac{j \cdot S \cdot E \cdot l}{S \cdot l} = j \cdot E$$

18

$$q = C U$$

$$q = I t$$

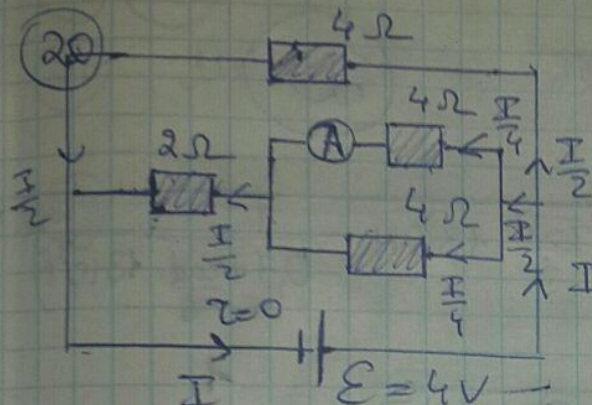
(q)

amper $\leftarrow$ scat

(C)

19) $\lambda = \frac{1}{R} \Rightarrow$ ötkəsüçənlik

$R = R_0 \cdot (1 + \alpha t) \Rightarrow$ t oxta, qarşılıq oxta
Ötkəsüçənlik kamayadi



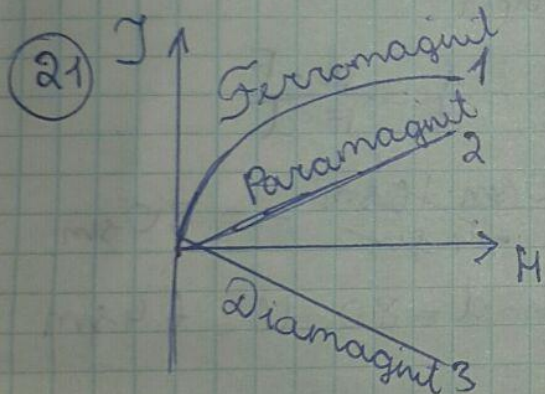
$$R_{p1} = \frac{4\Omega \cdot 4\Omega}{4\Omega + 4\Omega} = \frac{16\Omega^2}{8\Omega} = 2\Omega$$

$$R_R = R_{p1} + R_3 = 2\Omega + 2\Omega = 4\Omega$$

$$R_{um} = \frac{4\Omega \cdot 4\Omega}{4\Omega + 4\Omega} = 2\Omega$$

$$I = \frac{\varepsilon}{R_{um} + r} = \frac{\varepsilon}{R_{um}} = \frac{4V}{2\Omega} = 2A$$

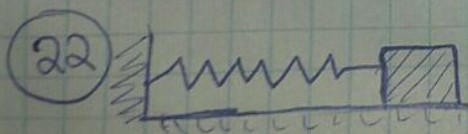
$$I_A = \frac{I}{4} = \frac{2A}{4} = 0,5A$$



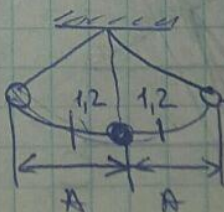
A

Ferromagnetiklər

JANOB FIZIKLARkanali



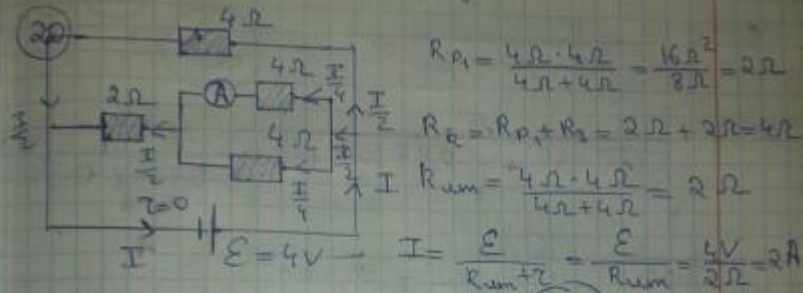
$$2A + 1,2 = 2 \cdot 2,2 + 1,2 = 4,4 + 1,2 = 5,6 \text{ sm}$$



C

19) $\lambda = \frac{1}{R} \rightarrow$ ötkəsurcharlik

$R = R_0 (1 + \alpha \Delta t) \rightarrow$ α odna, qarshilik otada
ötkəsurcharlik kamayadi

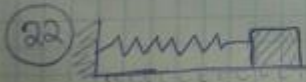


$I_1 = \frac{I}{4} = \frac{2A}{4} = 0,5A$



A) Ferromagnetiklar

JANOB FIZIKLARkanali



$2A + 1,2 = 2 \cdot 2,2 + 1,2 =$
 $= 4,4 + 1,2 = 5,6 \text{ m}$

C)

23) Qavat koefitsiyenti deb $\cos \varphi$ ga aytiladi

$$\cos \varphi = \frac{R}{Z} = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}}$$

$$X_L = \omega L$$

$$X_C = \frac{1}{\omega C}$$

$$\cos \varphi = \frac{R}{\sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}}$$

(2)

$$\cos \varphi = \frac{10 \Omega}{\sqrt{(10 \Omega)^2 + \left(0,77 \frac{\text{rad}}{\text{s}} \cdot 130 \text{H} - \frac{1}{0,77 \frac{\text{rad}}{\text{s}} \cdot 13 \cdot 10^{-3} \text{F}}\right)^2}}$$

$$= \frac{10 \Omega}{\sqrt{100 \Omega^2 + (100 \Omega^2 - 99,9 \Omega^2)^2}} = 1$$

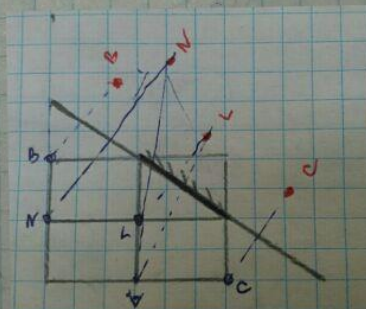
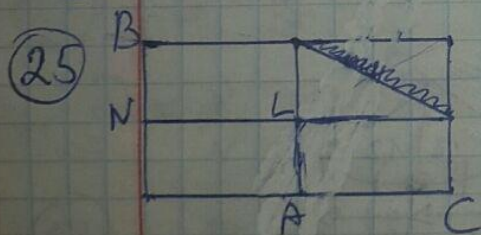
24) $\frac{1}{d} = \frac{1}{F} \quad F = \frac{1}{d} = \frac{1}{5 \text{ detr}} = 0,2 \text{m} = 20 \text{sm.}$

$$\frac{1}{F} = \frac{1}{d} + \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{1}{F} - \frac{1}{d} = \frac{d - F}{F \cdot d}$$

$$f = \frac{F \cdot d}{d - F} = \frac{20 \text{sm} \cdot 16 \text{sm}}{16 \text{sm} - 20 \text{sm}} = \frac{20 \text{sm} \cdot 16 \text{sm}}{-4 \text{sm}} = -80 \text{sm.}$$

B) $0 < d < F$

$$L = f - d = 80 - 16 = 64 \text{sm}$$



23) Quesat koefitsiyenti deb cos φ ga aytiladi

$$\cos \varphi = \frac{R}{Z} = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}}$$

$$X_L = \omega L$$

$$X_C = \frac{1}{\omega C}$$

$$\cos \varphi = \frac{R}{\sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}}$$

(D)

$$\cos \varphi = \frac{10.2}{\sqrt{(10.2)^2 + \left(0.77 \frac{\text{rad}}{\text{s}} \cdot 130 \text{H} - \frac{1}{0.77 \frac{\text{rad}}{\text{s}} \cdot 13 \cdot 10^{-6}}\right)^2}}$$

$$= \frac{10.2}{\sqrt{100.2^2 + (100.12^2 - 99.92^2)^2}} = 1$$

24) $\frac{1}{d} = \frac{1}{F}$ $F = \frac{1}{d} = \frac{1}{5 \text{ detn}} = 0.2 \text{ m} = 20 \text{ cm}$

$$\frac{1}{F} = \frac{1}{d} + \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{1}{F} - \frac{1}{d} = \frac{d - F}{F \cdot d}$$

$$f = \frac{F \cdot d}{d - F} = \frac{20 \text{ cm} \cdot 16 \text{ cm}}{16 \text{ cm} - 20 \text{ cm}} = \frac{20 \text{ cm} \cdot 16 \text{ cm}}{-4 \text{ cm}} = -80 \text{ cm}$$

B) $0 < d < F$ $L = f - d = 80 - 16 = 64 \text{ cm}$



(26) $\varphi = \frac{W}{t} = P = 1 \text{ kW} = 1000 \text{ W}$

$I = \frac{\Delta P}{\Delta \Omega} = \frac{1000 \text{ W}}{\pi \cdot 10^{-4} \text{ sr}} = 3 \text{ G} \frac{\text{W}}{\text{sr}}$

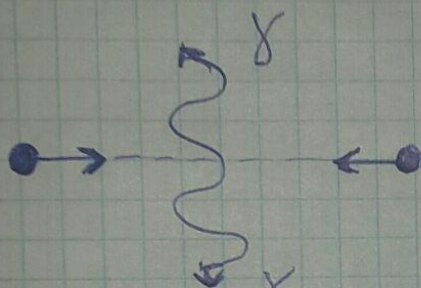
(A)

(27) (B)

(28) Mezonlar va barionlar adronlarga mansub

(C)

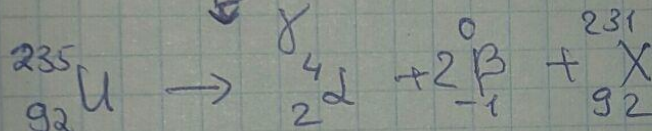
(29)



$e^- + e^+ \rightarrow 2\gamma$
elektron va pozitron

(A)

(30)



(A)

JANOB FIZIKLARkanali

26) $\varphi = \frac{W}{t} = P = 1 \text{ kW} = 1000 \text{ W}$

$I = \frac{\Delta P}{\Delta t} = \frac{1000 \text{ W}}{\pi \cdot 10^{-7} \text{ s}} = 3 \text{ G} \frac{\text{W}}{\text{s}}$

(A)

27) (B)

28) Mezonlar va barionlar adronlarga
manub

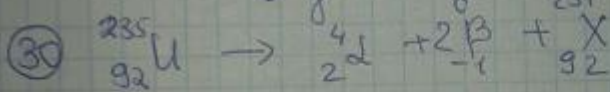
(C)

29)



$e^- + e^+ \rightarrow 2\gamma$
elektron va pozitron

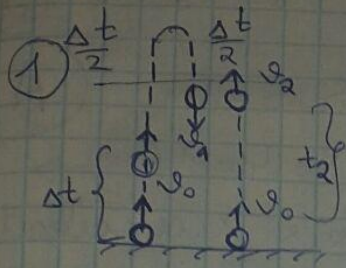
(A)



(A)

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Variant 18



$$v_1 = g \frac{\Delta t}{2} = 10 \frac{\text{m}}{\text{s}^2} \cdot \frac{2 \text{ s}}{2} = 10 \frac{\text{m}}{\text{s}}$$

$$t = \frac{v_0}{g} = \frac{30 \text{ m/s}}{10 \text{ m/s}^2} = 3 \text{ s}$$

$$t_2 = t - \frac{\Delta t}{2} = 3 \text{ s} - \frac{2 \text{ s}}{2} = 2 \text{ s}$$

$$v_2 = v_0 - g t_2 = 30 \frac{\text{m}}{\text{s}} - 10 \frac{\text{m}}{\text{s}^2} \cdot 2 \text{ s} = 10 \frac{\text{m}}{\text{s}}$$

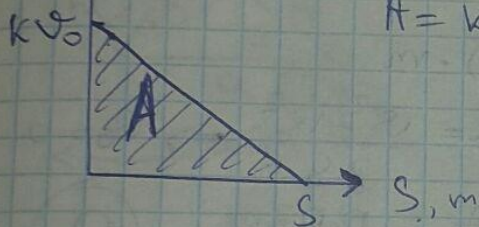
$$v_1' = -v_1 = -10 \text{ m/s}$$

$$v_2' = v_2 = 10 \text{ m/s}$$

⇒ yuqoriga yonalgan
projektiya

(A)

② F, N



$$A = \frac{k v_0 \cdot S}{2} = \frac{m v_0^2}{2}$$

$$k \cdot S = m v_0$$

(C)

$$\Rightarrow m = \frac{k \cdot S}{v_0}$$

$$m = \frac{8 \text{ kg/s} \cdot 50 \text{ m}}{4 \text{ m/s}} = 100 \text{ kg}$$

③

t, s	0	1	2	3	4
x, m	6	7	8	9	10

$$x = x_0 + v_0 t + \frac{a t^2}{2}$$

$$\begin{cases} 7 = 6 + v_0 \cdot 1 + \frac{a \cdot 1}{2} \\ 8 = 6 + v_0 \cdot 2 + \frac{a \cdot 2^2}{2} \end{cases} \Rightarrow$$

$$\begin{cases} 1 = v_0 + \frac{a}{2} \\ 2 = 2v_0 + 2a \end{cases} \quad | :2$$

$$\begin{cases} 2 = 2v_0 + a \\ 2 = 2v_0 + 2a \end{cases}$$

$$\Rightarrow$$

$$\boxed{a = 0}$$

tezlanish nolga
 teng

$v_0 = 1 \text{ m/s}$

Variant 18



$$v_1 = g \frac{\Delta t}{2} = 10 \frac{\text{m}}{\text{s}^2} \cdot \frac{2 \text{ s}}{2} = 10 \frac{\text{m}}{\text{s}}$$

$$t = \frac{v_0}{g} = \frac{30 \text{ m/s}}{10 \text{ m/s}^2} = 3 \text{ s}$$

$$t_2 = t - \frac{\Delta t}{2} = 3 \text{ s} - \frac{2 \text{ s}}{2} = 2 \text{ s}$$

$$v_2 = v_0 - g t_2 = 30 \frac{\text{m}}{\text{s}} - 10 \frac{\text{m}}{\text{s}^2} \cdot 2 \text{ s} = 10 \frac{\text{m}}{\text{s}}$$

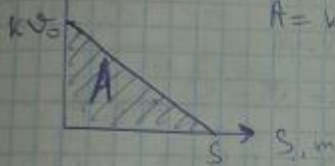
$$v_1' = -v_1 = -10 \text{ m/s}$$

$$v_2' = v_2 = 10 \text{ m/s}$$

(A)

→ yuqoriga yonalgan
rivojlanish

(2) F, N



$$A = k \frac{v_0}{2} S = \frac{m v_0^2}{2}$$

$$k S = m v_0 \Rightarrow m = \frac{k \cdot S}{v_0}$$

$$m = \frac{8 \text{ kg/s} \cdot 50 \text{ m}}{4 \text{ m/s}} = 100 \text{ kg}$$

(C)

t, s	0	1	2	3	4
x, m	6	7	8	9	10

$$x = x_0 + v_0 t + \frac{a t^2}{2}$$

$$\begin{cases} 7 = 6 + v_0 \cdot 1 + \frac{a \cdot 1^2}{2} \\ 8 = 6 + v_0 \cdot 2 + \frac{a \cdot 2^2}{2} \end{cases} \Rightarrow \begin{cases} 1 = v_0 + \frac{a}{2} \\ 2 = 2v_0 + 2a \end{cases} \quad | 2$$

$$\begin{cases} 2 = 2v_0 + a \\ 2 = 2v_0 + 2a \end{cases} \Rightarrow \boxed{a = 0} \quad \text{tezlanish nolga teng}$$

$v_0 = 1 \text{ m/s}$

$$x = x_0 + v_0 t + \frac{at^2}{2}$$

$$a=0 \Rightarrow x = x_0 + v_0 t$$

$$x_1 = 6 + v_0 \cdot 0 = 6 \text{ m}$$

$$x_4 = 6 + v_0 \cdot 3 = 9 \text{ m}$$

(A)

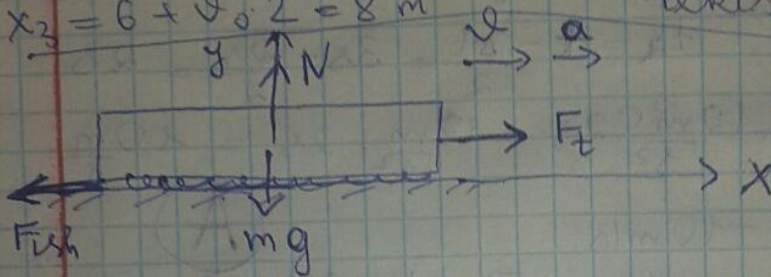
$$x_2 = 6 + v_0 \cdot 1 = 7 \text{ m}$$

$$x_5 = 6 + v_0 \cdot 4 = 10 \text{ m}$$

$$x_3 = 6 + v_0 \cdot 2 = 8 \text{ m}$$

tekis hareket

(4)



$$x: F_t - F_{\text{friction}} = ma \Rightarrow F_t = F_{\text{friction}} + ma$$

$$y: N - mg = 0 \quad N = mg \Rightarrow F_{\text{friction}} = \mu mg$$

$$F_t = \mu mg + ma = (\mu g + a) \cdot m$$

$$m = 50 \text{ t} \quad \mu = 0,05$$

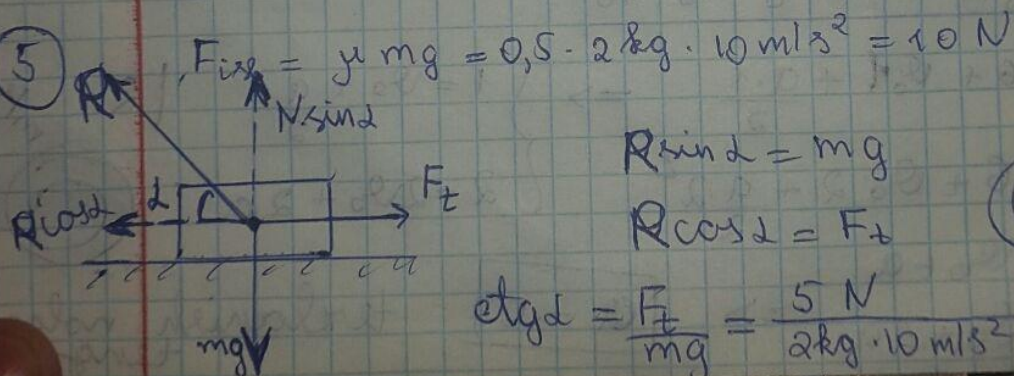
$$a = \frac{v^2 - v_0^2}{2s} \Rightarrow v_0 = 0$$

$$a = \frac{2s}{t^2} = \frac{2 \cdot 25 \text{ m}}{(50 \text{ s})^2} = \frac{1}{50} \frac{\text{m}}{\text{s}^2} = 0,02 \frac{\text{m}}{\text{s}^2}$$

(B)

$$F_t = \left(0,05 \cdot 10 \frac{\text{m}}{\text{s}^2} + 0,02 \frac{\text{m}}{\text{s}^2} \right) \cdot 50 \cdot 10^3 \text{ kg} = 26 \text{ kN}$$

(5)



$$R \sin \alpha = mg$$

$$R \cos \alpha = F_t$$

(C)

$$\tan \alpha = \frac{F_t}{mg} = \frac{5 \text{ N}}{2 \text{ kg} \cdot 10 \text{ m/s}^2} = 0,25$$

$$x = x_0 + v_0 t + \frac{at^2}{2}$$

$$a = 0 \Rightarrow x = x_0 + v_0 t$$

$$x_1 = 6 + 0 \cdot 0 = 6 \text{ m}$$

$$x_4 = 6 + 0 \cdot 3 = 9 \text{ m}$$

$$x_2 = 6 + 0 \cdot 1 = 7 \text{ m}$$

$$x_5 = 6 + 0 \cdot 4 = 10 \text{ m}$$

$$x_3 = 6 + 0 \cdot 2 = 8 \text{ m}$$

$$v \rightarrow a$$

teknik kinematika

4



$$x: F_t - F_{gk} = ma \Rightarrow F_t = F_{gk} + ma$$

$$y: N - mg = 0 \quad N = mg \Rightarrow F_{gk} = \mu mg$$

$$F_t = \mu mg + ma = (\mu g + a) \cdot m$$

$$m = 50 \text{ kg} \quad \mu = 0,05 \quad a = \frac{v^2 - v_0^2}{2s} \Rightarrow v_0 = 0$$

$$a = \frac{25}{\frac{1}{2}} = \frac{2 \cdot 25 \text{ m}}{(50 \text{ s})^2} = \frac{1}{50} \frac{\text{m}}{\text{s}^2} = 0,02 \frac{\text{m}}{\text{s}^2}$$

(B)

$$F_t = (0,05 \cdot 10 \frac{\text{m}}{\text{s}^2} + 0,02 \frac{\text{m}}{\text{s}^2}) \cdot 50 \cdot 10^3 \text{ kg} = 26 \text{ kN}$$

5

$$F_{gk} = \mu mg = 0,5 \cdot 2 \text{ kg} \cdot 10 \text{ m/s}^2 = 10 \text{ N}$$

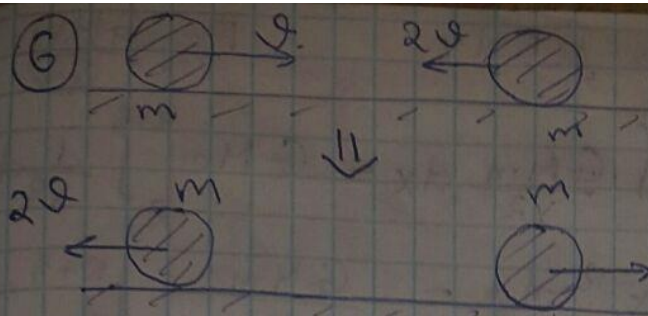


$$R \sin \alpha = mg$$

$$R \cos \alpha = F_t$$

(C)

$$\tan \alpha = \frac{F_t}{mg} = \frac{5 \text{ N}}{2 \text{ kg} \cdot 10 \text{ m/s}^2} = 0,25$$



$\gamma: 2v, v$

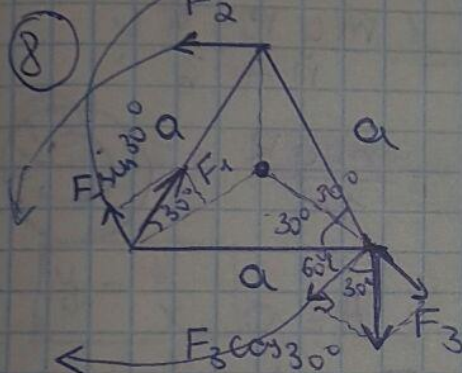
(B)

mutloq elastik toqnashuv

(7) $G = \gamma$

$$W_p = - \frac{G M m}{R + h} = - \gamma \frac{G M}{R + h}$$

(C)



$$F_1 = 2\sqrt{3} \text{ N}$$

$$F_2 = \sqrt{3} \text{ N}$$

$$F_3 = 2 \text{ N}$$



$$3x = h = \frac{\sqrt{3}a}{2}$$

$$x = \frac{\sqrt{3}a}{6}$$

$$2x = \frac{2 \cdot \sqrt{3}a}{6} = \frac{a}{\sqrt{3}}$$

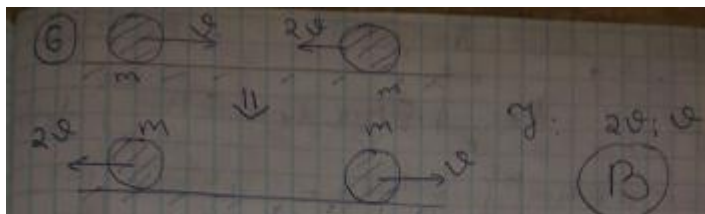
$$M = M_1 + M_3 - M_2 = F_1 \sin 30^\circ \cdot \frac{a}{\sqrt{3}} + F_3 \cos 30^\circ \cdot \frac{a}{\sqrt{3}} -$$

$$- F_2 \cdot \frac{a}{\sqrt{3}} = (F_1 \sin 30^\circ + F_3 \cos 30^\circ - F_2) \frac{a}{\sqrt{3}}$$

$$M = \left(2\sqrt{3} \text{ N} \cdot \frac{1}{2} + 2 \text{ N} \cdot \frac{\sqrt{3}}{2} - \sqrt{3} \text{ N} \right) \cdot \frac{1 \text{ m}}{\sqrt{3}} =$$

$$= \sqrt{3} \text{ N} \cdot \frac{1 \text{ m}}{\sqrt{3}} = 1 \text{ N} \cdot \text{m}$$

(D)



mutloq elastik toqarish

⑦ $G = \gamma$

$W_p \Rightarrow \frac{G M m}{R+h} = -\gamma \frac{G M}{R+h}$ (C)



$F_1 = 2\sqrt{3} \text{ N}$ $F_2 = \sqrt{3} \text{ N}$
 $F_3 = 2 \text{ N}$



$3x = h = \frac{\sqrt{3}a}{2}$

$x = \frac{\sqrt{3}a}{6}$

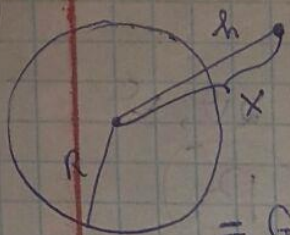
$2x = 2 \cdot \frac{\sqrt{3}a}{6} = \frac{a}{\sqrt{3}}$

$N = M_1 + M_3 - M_2 = F_1 \sin 30^\circ \cdot \frac{a}{\sqrt{3}} + F_3 \cos 30^\circ \cdot \frac{a}{\sqrt{3}} - F_2 \cdot \frac{a}{\sqrt{3}} = (F_1 \sin 30^\circ + F_3 \cos 30^\circ - F_2) \frac{a}{\sqrt{3}}$

$M = \left(2\sqrt{3} \text{ N} \cdot \frac{1}{2} + 2 \text{ N} \cdot \frac{\sqrt{3}}{2} - \sqrt{3} \text{ N} \right) \frac{1 \text{ m}}{\sqrt{3}} =$

$= \sqrt{3} \text{ N} \cdot \frac{1 \text{ m}}{\sqrt{3}} = 1 \text{ N} \cdot \text{m}$ (D)

9



$$A = \int F dx$$

$$F = \frac{GMm}{x^2}$$

$$A = \int_R^{R+h} \frac{GMm}{x^2} dx = GMm \int_R^{R+h} \frac{1}{x^2} dx$$

$$= GMm \int_R^{R+h} x^{-2} dx = \frac{GMm}{-x} \Big|_R^{R+h} =$$

$$= -GMm \left(\frac{1}{R+h} - \frac{1}{R} \right) = -GMm \cdot \frac{(R - R - h)}{(R+h) \cdot R} =$$

$$= \frac{GMm \cdot h}{(R+h) \cdot R}$$

$$\Rightarrow A = \frac{GMm \cdot h}{(R+h) \cdot R}$$

$$g = \frac{GM}{R^2} \Rightarrow A = \frac{gR^2 \cdot m \cdot h}{(R+h) \cdot R} = \frac{mgR \cdot h}{R+h}$$

$$A = \frac{mgR \cdot \frac{R}{10}}{R + \frac{R}{10}} = \frac{mgR^2}{11R^2} = \frac{mgR}{11}$$

(C)

10

$$L = 6$$

$$V = \text{const}$$

$$A = 0$$

$$Q = \Delta U = \frac{i}{2} \nu R \Delta T = \frac{i}{2} \cdot 1 \cdot R \Delta T = \frac{i}{2} R \Delta T = C \Delta T$$

$$C = \frac{i}{2} R = \frac{6}{2} R = 3R$$

(B)

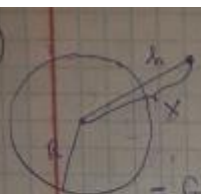
11

1) ota sovuqan suyuqliklarda kris-tallanish markazlari mavjud emas

5) nisbiy namlikning eng yuqori chegarasi 100% ga teng

(C)

9



$$A = \int F dx$$

$$F = \frac{GMm}{x^2}$$

$$A = \int_R^{R+h} \frac{GMm}{x^2} dx = GMm \int_R^{R+h} \frac{1}{x^2} dx$$

$$= GMm \int_R^{R+h} x^{-2} dx = \frac{GMm}{-x} \Big|_R^{R+h} =$$

$$= -GMm \left(\frac{1}{R+h} - \frac{1}{R} \right) = -GMm \cdot \frac{(R-R-h)}{(R+h) \cdot R} =$$

$$= \frac{GMm \cdot h}{(R+h) \cdot R} \Rightarrow A = \frac{GMm \cdot h}{(R+h) \cdot R}$$

$$g = \frac{GM}{R^2} \Rightarrow A = \frac{gR^2 \cdot m \cdot h}{(R+h) \cdot R} = \frac{mgR \cdot h}{R+h}$$

$$A = \frac{mgR \cdot \frac{R}{10}}{R + \frac{R}{10}} = \frac{mgR^2}{11R^2} = \frac{mgR}{11} \quad (C)$$

10

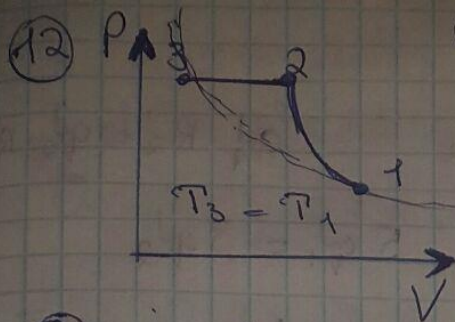
$$E = \epsilon \quad V = \text{const} \quad A = 0$$

$$Q = \Delta H = \frac{i}{2} \Delta R \Delta T = \frac{i}{2} \cdot 1 \cdot R \Delta T = \frac{i}{2} R \Delta T = C \Delta T$$

$$C = \frac{i}{2} R = \frac{6}{2} R = 3R \quad (B)$$

11

1) ota sovuqah susugliklarda krus-
talanish markazlari mavjud emas
5) nishiy namlikning ling yuqori chegarasi
100% ga teng (C)



I adiabatik siqilish

$$Q = \Delta H + \Delta U = 0$$

$$A_1 = -\Delta U = -\frac{3}{2} \nu R (T_2 - T_1)$$

$$= \frac{3}{2} \nu R (T_1 - T_2)$$

II izobarik siqilish

$$Q = \Delta H + \Delta U$$

$$A_2 = \nu R (T_2 - T_3) = -\nu R (T_1 - T_2) = A$$

$$\nu R (T_1 - T_2) = -A$$

$$A_1 = -\frac{3}{2} A = -1,5 A$$

13

$$E_p = \frac{k \cdot 2q \cdot (-q)}{r} = \frac{-2kq^2}{r}$$

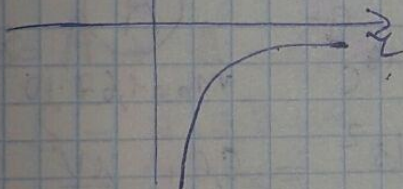
$$y = \frac{k}{x}$$

E_p

$$y = E_p$$

$$k = -2kq^2 < 0$$

$$x = r$$



2

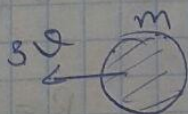
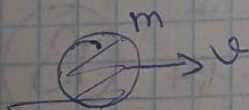
B

14

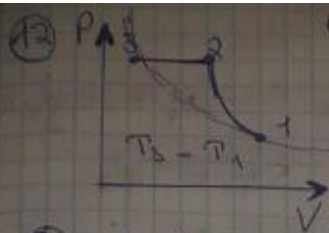
$$m \cdot 3v - m \cdot v = (m + m)u$$

$$2mv = 2mu$$

$$v = u$$



2



① adiabatik sigilish

$$Q = A + \Delta U = 0$$

$$A_1 - \Delta U = -\frac{3}{2} \nu R (T_2 - T_1) \\ = \frac{3}{2} \nu R (T_1 - T_2)$$

② izobarik sigilish

$$Q = A + \Delta U$$

$$A_2 = \nu R (T_2 - T_3) = -\nu R (T_1 - T_2) = A$$

$$\nu R (T_1 - T_2) = -A$$

$$A_1 = -\frac{3}{2} A = -1,5 A$$

③

⑬ $E_p = \frac{k \cdot 2qr \cdot (-q)}{r} = \frac{-2kqr^2}{r}$

$$y = \frac{k}{x}$$

$$y = E_p$$

$$k = -2kqr^2 < 0$$

$$x = r$$



②

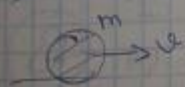
③

⑭ $m \cdot 3v - m \cdot v = (m+m)u$

$$2mv = 2mu$$

$$v = u$$

②



$$(15) \quad W_1 = k \frac{q_1 \cdot q_2}{r} = \frac{k q_1^2}{r}$$

$$\varphi_1 = \varphi_2 \Rightarrow \frac{k q_1}{R_1} = \frac{k q_2}{R_2} \quad q_1 \cdot R_2 = q_2 \cdot R_1$$

$$q_1 \cdot 5 \text{ cm} = q_2 \cdot 3 \text{ cm} \Rightarrow 5 q_1 = 3 q_2$$

$$q_1 + q_2 = q_1 + q_2 \Rightarrow q + \bar{q} = q_1 + \frac{5 q_1}{3}$$

$$2q = \frac{8 q_1}{3} \Rightarrow q = \frac{4 q_1}{3} \quad q_1 = \frac{3 q}{4}$$

$$q_2 = \frac{5 q_1}{3} = \frac{5}{3} \cdot \frac{3 q}{4} = \frac{5}{4} q$$

$$W_2 = \frac{k q_1 q_2}{r} = \frac{k \cdot \frac{3 q}{4} \cdot \frac{5}{4} q}{r} = \frac{15}{16} \frac{k q^2}{r}$$

$$\frac{W_1}{W_2} = \frac{\frac{k q^2}{r}}{\frac{15}{16} \frac{k q^2}{r}} = \frac{16}{15} \quad \text{marita kamayadi}$$

(13)

$$(16) \quad F = Eq = ma$$

$$E = \frac{ma}{q}$$

(A)

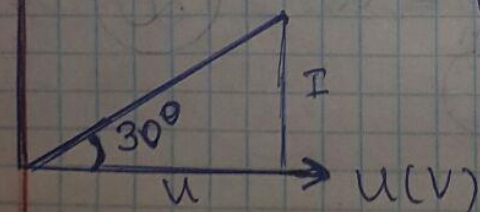
$$a = 6,4 \cdot 10^{11} \text{ m/s}^2$$

$$q = 1,6 \cdot 10^{-19} \text{ C}$$

$$m_p = 1,67 \cdot 10^{-27} \text{ kg}$$

$$E = \frac{1,67 \cdot 10^{-27} \text{ kg} \cdot 6,4 \cdot 10^{11} \text{ m/s}^2}{1,6 \cdot 10^{-19} \text{ C}} = 6,64 \cdot \frac{\text{KV}}{\text{m}}$$

$$(17) \quad I(A)$$



$$R = \text{ctg} 30^\circ = \frac{U}{I}$$

$$R = \sqrt{3} = 1,7$$

(B)

15) $W_f = k \frac{q_1 \cdot q_2}{r} = \frac{k q^2}{2}$

$\varphi_1 = \varphi_2 \Rightarrow \frac{k q_1}{R_1} = \frac{k q_2}{R_2} \quad q_1 R_2 = q_2 R_1$

$q_1 \cdot 5 \text{ cm} = q_2 \cdot 3 \text{ cm} \Rightarrow 5 q_1 = 3 q_2$

$q_1 + q_2 = q_1 + q_2 \Rightarrow q + \bar{q} = q_1 + \frac{5 q_1}{3}$

$2q = \frac{8 q_1}{3} \Rightarrow q = \frac{4 q_1}{3} \quad q_1 = \frac{3 q}{4}$

$q_2 = \frac{5 q_1}{3} = \frac{5}{3} \cdot \frac{3 q}{4} = \frac{5}{4} q$

$W_2 = \frac{k q_1 q_2}{r} = \frac{k \cdot \frac{3 q}{4} \cdot \frac{5}{4} q}{r} = \frac{15}{16} \frac{k q^2}{r}$

$\frac{W_1}{W_2} = \frac{\frac{k q^2}{r}}{\frac{15}{16} \frac{k q^2}{r}} = \frac{16}{15}$ mara kamayadi

(13)

16) $F = Eq = ma \quad E = \frac{ma}{q}$

$a = 6.4 \cdot 10^{11} \text{ m/s}^2 \quad q = 1.6 \cdot 10^{-19} \text{ C} \quad m_e = 9.1 \cdot 10^{-31} \text{ kg}$

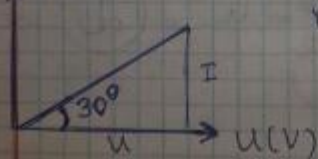
$E = \frac{1.6 \cdot 10^{-19} \cdot 6.4 \cdot 10^{11}}{1.6 \cdot 10^{-19}} = 6.4 \cdot 10^{11} \text{ V/m}$

17) $I(A)$

$R = \tan 30^\circ = \frac{U}{I}$

$R = \frac{1}{\sqrt{3}} = 0.577$

(13)



18) $R = 10 \Omega$ $I = 5t$

$$dQ = I^2 R dt = (5t)^2 R dt = 25R t^2 dt$$

$$Q = \int_0^2 25R t^2 dt = 25R \cdot \left(\frac{t^3}{3} \Big|_0^2 \right) = 25 \cdot 10 \Omega \cdot \frac{8}{3} = 667 \text{ J} \quad \textcircled{D}$$

19) $1 \text{ A} \cdot \text{h}$

$1 \text{ h} = 3600 \text{ s}$

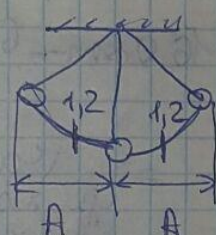
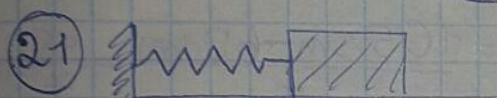
$1 \text{ A} \cdot 3600 \text{ s} = 3600 \text{ C}$ $q = I \cdot t$

3600 C

$\textcircled{B}$

20) Plasma holat $\rightarrow$ kuchli ionlashgan holat

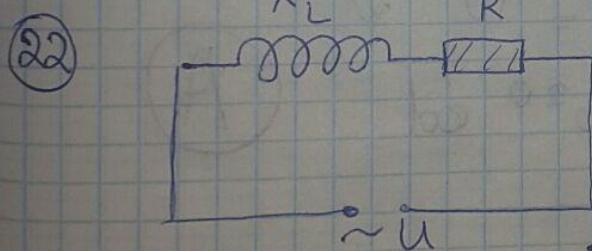
$\textcircled{C}$



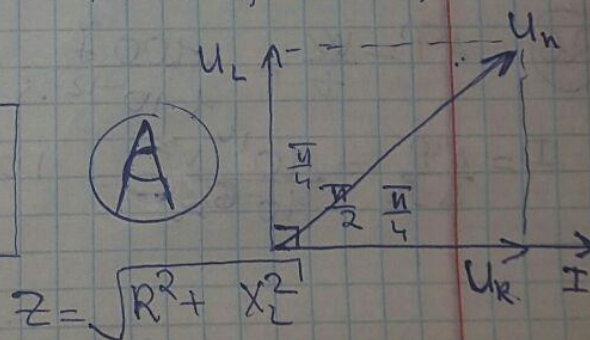
$\textcircled{C}$

$$S = A + A - 1,2 = 2A - 1,2$$

$$S = 2 \cdot 2,2 \text{ sm} - 1,2 \text{ sm} = 4,4 \text{ sm} - 1,2 \text{ sm} = 3,2 \text{ sm}$$



$\textcircled{A}$



18) $R = 10 \Omega$ $I = 5t$

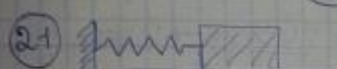
$dQ = I^2 R dt = (5t)^2 R dt = 25R t^2 dt$

$Q = \int_0^2 25R t^2 dt = 25R \left(\frac{t^3}{3} \Big|_0^2 \right) =$
 $= 25 \cdot 10 \Omega \cdot \frac{8}{3} = 667 \text{ J}$ (D)

19) 1 A · h 1 h = 3600 s

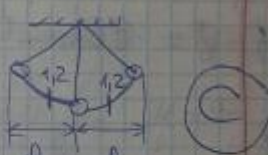
$1 \text{ A} \cdot 3600 \text{ s} = 1 \text{ A} \cdot 3600 \text{ s} \quad q = I t$
3600 C (B)

20) Plasma holat → kuchli ionlashgan holat
 (C)

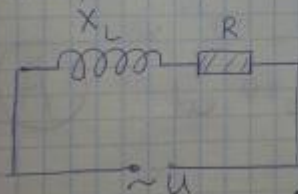


$S = A + A - 1,2 = 2A - 1,2$

$S = 2 \cdot 2,2 \text{ sm} - 1,2 \text{ sm} = 4,4 \text{ sm} - 1,2 \text{ sm} = 3,2 \text{ sm}$



22)

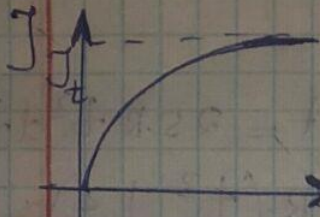


(A)

$Z = \sqrt{R^2 + X_L^2}$



(23)



Rasmdan görünür ki, maydan kuchianganlığı ortib burishi bilan magnit lanih vektoru dastlab tes o'rib biradi, song o'rish N sekinlashadi, va nihayet, o'rish toxtaydi, to'yinish yuz beradi.

(A)

magnit to'yinishini

(24)

$$D = \frac{1}{F} = 5 \text{ dpt}$$

$$\frac{1}{F} = \frac{1}{d} - \frac{1}{f}$$

$$-5 = \frac{1}{0,15\text{m}} - \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{100}{15} + 5 = \frac{175}{15}$$

$$f = \frac{15\text{m}}{175} = \frac{15 \cdot 100\text{sm}}{175} = \frac{60}{7}\text{sm}$$

(A)

Batig linsada, buyumdan tasviri gachamacha

$$L = d - f = 15\text{sm} - \frac{60}{7}\text{sm} = \frac{105\text{sm} - 60\text{sm}}{7} = \frac{45}{7}\text{sm}$$

(25)

$$\varphi = \frac{W}{t}$$

$\Rightarrow$ vaqt birliqi ichida biror yuzaga tushayotgan yorug'lik energiyasi

(A)

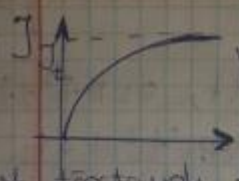
(26)

$$A^{\text{op}} = \frac{W}{t} = \frac{100\text{J}}{1 \cdot 10^{-12}\text{s}} = 10^{14}\text{W}$$

$$I = \frac{A^{\text{op}}}{\Delta R} = \frac{10^{14}\text{W}}{10^{-6}\text{W}} = 10^{20}\text{od}$$

(A)

JANOB FIZIKLARKanali

23)  Rasmdan ko'rinadiki, maydon kuchlanilgich o'rtib boshib bilan magnit larish vektor dastlab osib boradi, song o'sib H sekinlashadi, va nihayti o'sib toxtaydi, tayinish yuz beradi.

(A) magnit tayinishu

24) $2 = \frac{1}{F} = 5 \text{ dpt}$ $\frac{1}{F} = \frac{1}{d} - \frac{1}{f}$

$$-5 = \frac{1}{0,15\text{m}} - \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{100}{15} + 5 = \frac{175}{15}$$

$$f = \frac{15\text{m}}{175} = \frac{15 \cdot 100\text{sm}}{175} = \frac{60}{7}\text{sm}$$

(A)

Batig linsada, buyumdan taxvimgachamaga

$$L = d - f = 15\text{sm} - \frac{60}{7}\text{sm} = \frac{105\text{sm} - 60\text{sm}}{7} = \frac{45}{7}\text{sm}$$

25) $\Phi = \frac{W}{t} \Rightarrow$ vaqt birligi ichida biror yuzaga tushayotgan yoruglik energiyasi

(A)

26) $\Delta\Phi = \frac{W}{t} = \frac{100\text{J}}{1 \cdot 10^{-12}\text{s}} = 10^{14}\text{W}$

$$I = \frac{\Delta\Phi}{\Delta n} = \frac{10^{14}\text{W}}{10^{20}} = 10^{-6}\text{ed}$$

(A)

27) $I = \sigma \cdot T^4 \Rightarrow$ Absolyut qora jim uchun

(1) (2) (3) (4) (A)

28) To'rtta zarracha - γ -foton, π^0 -mezon, K_1^0 -mezon va K_2^0 -mezanning antizarrachasi mavjud emas (D)

29) $W_1 = -13,6 \text{ eV}$ $W_4 = -0,85 \text{ eV}$

$\Delta W = W_4 - W_1 = -0,85 \text{ eV} - (-13,6 \text{ eV}) = 12,75 \text{ eV}$

30) $\hbar = \frac{h}{2\pi}$ $h = 2\pi \hbar$ (D)

JANOB FIZIKLARkanali

27) $I = j \cdot T^4 \Rightarrow$ Absolyut qora jism uchun
 1 2 3 4 A

28) Törtta zarracha - γ -foton, π^0 -mezon, K_1^0 -mezon va K_2^0 -mezanning antizarralari mavjud emas D

29) $W_1 = -13,6 \text{ eV}$ $W_4 = -0,85 \text{ eV}$
 $\Delta W = W_4 - W_1 = -0,85 \text{ eV} - (-13,6 \text{ eV}) = 12,75 \text{ eV}$

30) $\hbar = \frac{h}{2\pi}$ $h = 2\pi \hbar$ D

JANOB FIZIKLARKanali

① $X = x_0 + v_0 t + \frac{a t^2}{2}$

$$\begin{cases} 13 = 11 + v_0 \cdot 2 + \frac{a \cdot 2^2}{2} \\ 17 = 11 + v_0 \cdot 4 + \frac{a \cdot 4^2}{2} \end{cases}$$

$$\begin{cases} 2 = 2v_0 + 2a \quad | :2 \\ 6 = 4v_0 + 8a \end{cases}$$

$$4 = 4v_0 + 4a$$

$$6 = 4v_0 + 8a$$

$$\Rightarrow 2 = 4a$$

$$a = 0,5 \frac{m}{s^2}$$

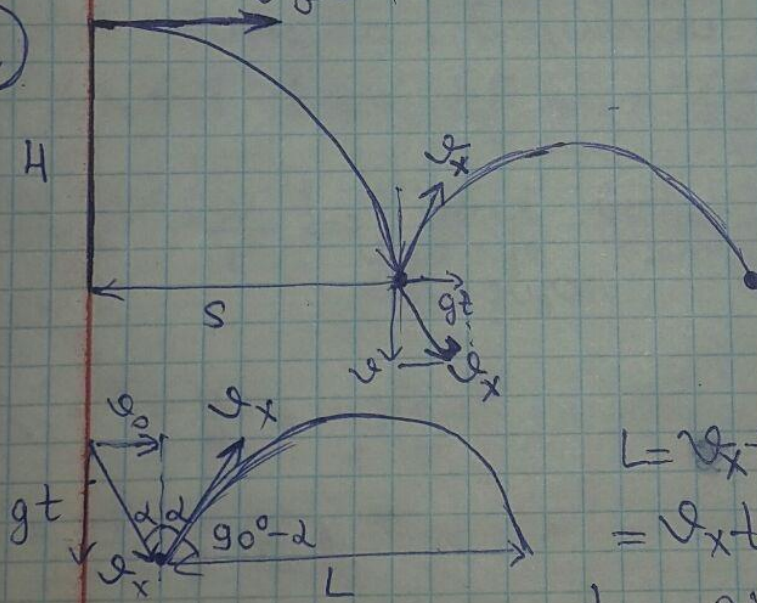
$$v_0 = 0,5 \text{ m/s}$$

terjadi terlanjutan bergerak

A

$$X = 11 + 0,5 \cdot 6 + \frac{0,5 \cdot 6^2}{2} = 11 + 3 + 9 = 23 \text{ m}$$

②



$$t = \sqrt{\frac{2H}{g}}$$

$$L = v_x t_0 \cos(90^\circ - \alpha) =$$

$$= v_x t_0 \sin \alpha$$

$$t_0 = \frac{2 v_x \sin(90^\circ - \alpha)}{g}$$

$$t_0 = \frac{2 v_x \cos \alpha}{g}$$

Variant - 19

① $x = x_0 + v_0 t + \frac{a t^2}{2}$

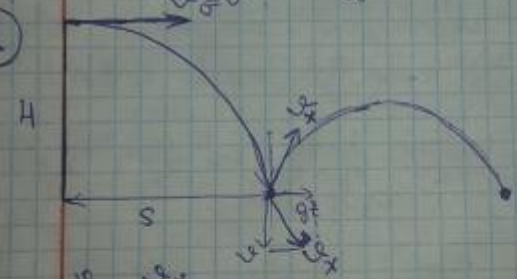
$$\begin{cases} 13 = 11 + v_0 \cdot 2 + \frac{a \cdot 2^2}{2} \\ 17 = 11 + v_0 \cdot 4 + \frac{a \cdot 4^2}{2} \end{cases} \quad \begin{cases} 2 = 2v_0 + 2a \quad | :2 \\ 6 = 4v_0 + 8a \end{cases}$$

$$\begin{cases} 2 = 4v_0 + 4a \\ 6 = 4v_0 + 8a \end{cases} \Rightarrow 2 = 4a \quad \begin{matrix} a = 0,5 \frac{m}{s^2} \\ v_0 = 0,5 \frac{m}{s} \end{matrix}$$

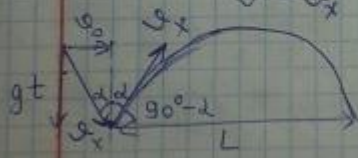
teknik pertukaran barisan

$$x = 11 + 0,5 \cdot 6 + \frac{0,5 \cdot 6^2}{2} = 11 + 3 + 9 = 23 \text{ m}$$

②



$$t = \sqrt{\frac{2H}{g}}$$



$$\begin{aligned} L &= v_x t_0 \cos(90^\circ - \alpha) = \\ &= v_x t_0 \sin \alpha \\ t_0 &= \frac{2 v_x \sin(90^\circ - \alpha)}{g} \end{aligned}$$

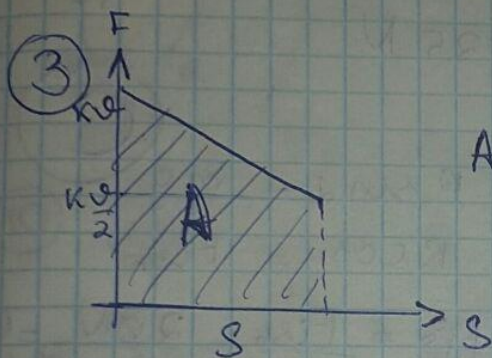
$$t_0 = \frac{2 v_x \cos \alpha}{g}$$

$$L = v_x \cdot \frac{2v_x \cos \alpha \cdot \sin \alpha}{g} = \frac{2v_x^2 \sin \alpha \cos \alpha}{g}$$

$$v_x \sin \alpha = v$$

$$v_x \cos \alpha = gt \Rightarrow L = 2 \cdot \frac{v \cdot gt}{g} = 2vt$$

$$L = 2v \cdot \sqrt{\frac{2H}{g}} \quad (C)$$



$$A = \frac{kv}{2} \cdot s = \frac{mv^2}{2} - \frac{m(\frac{v}{2})^2}{2}$$

$$\frac{3kv}{4} \cdot s = \frac{m}{2} (v^2 - \frac{v^2}{4})$$

$$\frac{3kv \cdot s}{4} = \frac{m}{2} \cdot \frac{3v^2}{4} \Rightarrow 2k \cdot s = m \cdot v$$

$$s = \frac{mv}{2k} = \frac{4 \text{ kg} \cdot 10 \text{ m/s}}{2 \cdot \frac{\text{kg}}{\text{s}} \cdot 2} = \frac{20 \text{ m}}{2} = 10 \text{ m} \quad (B)$$



$$V = V_1 + V_2$$

$$F_{A1} + F_{A2} = mg$$

$$F_{A1} = \rho_s g V_1$$

$$F_{A2} = \rho_s g V_2$$

$$m = \rho_0 V = \rho_0 (V_1 + V_2)$$

$$\rho_s g V_1 + \rho_s g V_2 = mg = \rho_0 g V$$

$$\rho_s V_1 + \rho (V - V_1) = \rho_0 V$$

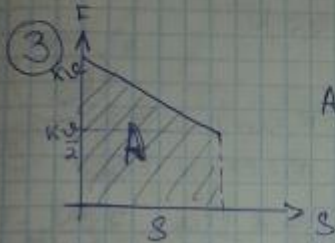
$$\rho_s V_1 + \rho V - \rho V_1 = \rho_0 V$$

$$L = v_x \cdot \frac{2v_x \cos \alpha \cdot \sin \alpha}{g} = \frac{2v_x^2 \sin \alpha \cos \alpha}{g}$$

$$v_x \sin \alpha = v$$

$$v_x \cos \alpha = gt \Rightarrow L = \frac{2 \cdot v \cdot gt}{g} = 2vt$$

$$L = 2v \sqrt{\frac{2H}{g}} \quad (C)$$



$$A = \frac{kv + \frac{kv}{2}}{2} \cdot s = \frac{mv^2}{2} - \frac{m(\frac{v}{2})^2}{2}$$

$$\frac{3kv}{4} \cdot s = \frac{m}{2} (v^2 - \frac{v^2}{4})$$

$$\frac{3kv}{4} s = \frac{m}{2} \cdot \frac{3v^2}{4} \Rightarrow 2ks = mv$$

$$s = \frac{mv}{2k} = \frac{4 \text{ kg} \cdot 10 \text{ m/s}}{2 \cdot \text{kg} \cdot 2} = \frac{20 \text{ m}}{2} = 10 \text{ m} \quad (B)$$



$$V = V_1 + V_2$$

$$F_{A1} + F_{A2} = mg$$

$$F_{A1} = \rho_s g V_1$$

$$F_{A2} = \rho_s g V_2$$

$$m = \rho_0 V = \rho_0 (V_1 + V_2)$$

$$\rho_s g V_1 + \rho_s g V_2 = mg = \rho_0 g V$$

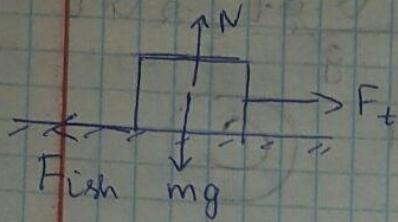
$$\rho_s V_1 + \rho (V - V_1) = \rho_0 V$$

$$\rho_s V_1 + \rho V - \rho V_1 = \rho_0 V$$

$$(p_3 - p) V_1 = (p_0 - p) \cdot V$$

$$\frac{V_1}{V} = \frac{800 - 700}{1000 - 700} = \frac{100}{300} = \frac{1}{3} \quad \text{(B)}$$

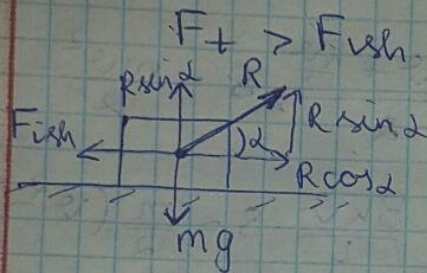
5



$$F_{fr} = \mu mg$$

$$F_{fr} = 0,5 \cdot 4 \text{ kg} \cdot \frac{10 \text{ m}}{\text{s}^2} = 20 \text{ N}$$

$$F_t = 25 \text{ N}$$



$$R \sin \alpha = mg$$

$$R \cos \alpha = F_{fr}$$

$$\text{ctg } \alpha = \frac{F_{fr}}{mg} = \frac{20 \text{ N}}{4 \text{ kg} \cdot 10 \text{ m/s}^2} = 0,5$$

6

$$P = 3m v$$

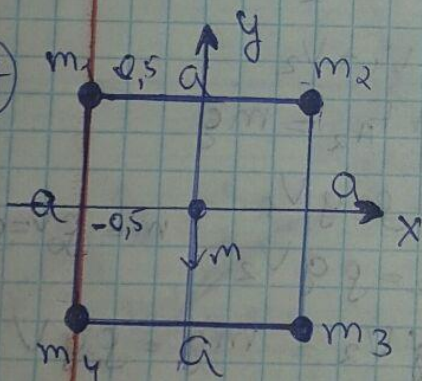
$$P_1 = P_2$$

$$P_1 = m v_1$$

$$P_2 = 2m v_2$$

(A)

7



$$a = 1 \text{ m}$$

$$m = 2 \text{ kg}$$

$$m_1 = 8 \text{ kg}$$

$$m_2 = m_3 = m_4 = 0 \text{ kg}$$

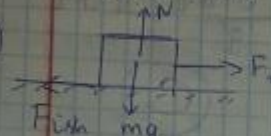
$$X = \frac{x_1 m_1 + x_2 m_2 + x_3 m_3 + \dots}{m_1 + m_2 + m_3 + \dots}$$

$$X = \frac{m \cdot x_1 + m_1 \cdot x_2}{m + m_1}$$

$$X = \frac{m \cdot 0 + m_1 \cdot (-0,5)}{m + m_1} = \frac{8 \text{ kg} \cdot (-0,5 \text{ m})}{8 \text{ kg} + 2 \text{ kg}} = \frac{-4}{10} = -0,4 \text{ m} = -40 \text{ cm}$$

(A)

$(p_1 - p) V_1 = (p_0 - p) \cdot V$
 $\frac{V_1}{V} = \frac{800 - 700}{1000 - 700} = \frac{100}{300} = \frac{1}{3} \quad \text{(B)}$

5 
 $F_{fr} = \mu mg$
 $F_{fr} = 0,5 \cdot 4 \text{ kg} \cdot \frac{10 \text{ m}}{\text{s}^2} = 20 \text{ N}$
 $F_+ = 25 \text{ N}$


 $F_+ > F_{fr}$
 $R_{\sin \alpha} = mg$
 $R_{\cos \alpha} = F_{fr}$
 $\text{ctg} \alpha = \frac{F_{fr}}{mg} = \frac{20 \text{ N}}{4 \text{ kg} \cdot 10 \text{ m/s}^2} = 0,5$

6 $P = 3m v$
 $p_1 = p_2$
 $p_1 = m v_1$
 $p_2 = 2m v_2$

7 
 $a = 1 \text{ m}$
 $m = 2 \text{ kg}$
 $m_1 = 8 \text{ kg}$
 $m_2 = m_3 = m_4 = 0 \text{ kg}$
 $X = \frac{x_1 m_1 + x_2 m_2 + x_3 m_3}{m_1 + m_2 + m_3}$
 $X = \frac{m \cdot x_1 + m_1 x_2}{m + m_1}$
 $X = \frac{m \cdot 0 + m_1 (0,5)}{m + m_1} = \frac{8 \text{ kg} \cdot (1 - 0,5)}{8 \text{ kg} + 2 \text{ kg}} = \frac{4}{10} = 0,4 \text{ m}$

8 $h = \frac{2\sigma}{\rho(g+a) \cdot r} = \frac{2 \cdot 73 \cdot 10^{-3} \text{ N/m}}{\frac{1000 \text{ kg}}{\text{m}^3} \cdot \left(10 \frac{\text{m}}{\text{s}^2} + \frac{4 \text{ m}}{\text{s}^2}\right) \cdot 2 \cdot 10^{-3} \text{ m}}$
 $= \frac{2 \cdot 73 \cdot 10^{-3}}{14 \cdot 2} = 5,2 \text{ mm} \quad \text{(A)}$

9 
 $E_k = \frac{m v^2}{2} = \frac{G M m}{R}$
 $E_k = \frac{G M m}{R} \Rightarrow g = \frac{G M}{R^2}$
 $E_k = m g R$

10 $\frac{v_{kv}^2}{M} = \frac{3 R T}{M} \Rightarrow T = \frac{v_{kv}^2 \cdot M}{3 R}$

$T = \frac{(200 \text{ m/s})^2 \cdot 28 \cdot 10^{-3} \text{ kg/mol}}{3 \cdot 8,31 \frac{\text{J}}{\text{K} \cdot \text{mol}}} = \frac{4 \cdot 10^4 \cdot 28 \cdot 10^{-3}}{3 \cdot 8,31} = 45 \text{ K}$

$$\textcircled{8} \quad h = \frac{2\sigma}{\rho(g/a) \cdot r} = \frac{2 \cdot 73 \cdot 10^{-3} \text{ N/m}}{1000 \frac{\text{kg}}{\text{m}^3} \cdot \left(10 \frac{\text{m}}{\text{s}^2} + 4 \frac{\text{m}}{\text{s}^2}\right) \cdot 2 \cdot 10^{-3} \text{ m}}$$

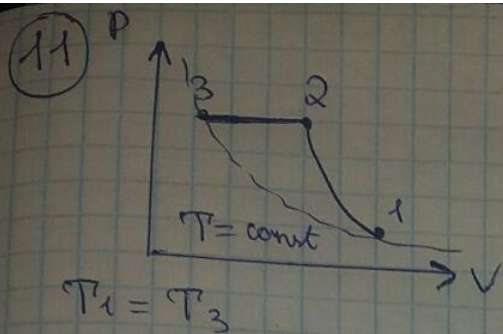
$$= \frac{2 \cdot 73 \cdot 10^{-3}}{14 \cdot 2} = 5,2 \text{ mm} \quad \textcircled{A}$$

$\textcircled{9}$

 $E_k = \frac{m v^2}{2} = \frac{G M m}{R}$
 $E_k = \frac{G M m}{R} \Rightarrow g = \frac{G M}{R^2}$
 $E_k = m g R \quad \textcircled{A}$

$\textcircled{10} \quad v_{kv}^2 = \frac{3RT}{M} \Rightarrow T = \frac{v_{kv}^2 \cdot M}{3R} \quad \textcircled{A}$

$$T = \frac{(200 \text{ m/s})^2 \cdot 28 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}}{3 \cdot 8,31 \frac{\text{J}}{\text{K mol}}} = \frac{4 \cdot 10^4 \cdot 28 \cdot 10^{-3}}{3 \cdot 8,31} = 45 \text{ K}$$



Isobarik

$$A_2 = \nu R (T_3 - T_2) = \nu R (T_1 - T_2)$$

$$A_1 = \frac{3}{2} A_2 \Rightarrow A_2 = \frac{2 A_1}{3}$$

$$A_1 + A_2 = A$$

$$A_1 + \frac{2 A_1}{3} = A$$

$$\frac{5 A_1}{3} = A$$

$$A_1 = \frac{3 A}{5} = 0.6 A$$

$$\Rightarrow \text{signlich} \Rightarrow A_1' = -0.6 A$$

I Adiabatik

$$Q = A + \Delta U = 0$$

$$A_1 = -\Delta U = -\frac{3}{2} \nu R (T_2 - T_1) = \frac{3}{2} \nu R (T_1 - T_2)$$

C

12 $q_1 = +5e$

$$q_2 = 5e - (-2e) = 5e + 2e = 7e$$

C

13 $p = \sqrt{(m_p v_p)^2 + (m_2 v_2)^2}$

$$p = \sqrt{(m_p 3v)^2 + (4m_p v)^2} = \sqrt{25 m_p^2 v^2} = 5 m_p v$$

$$p = 5 m_p v$$

A

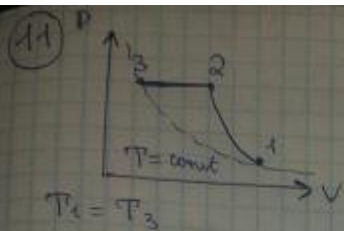
14 $m_a \rightarrow v$

$m_p \rightarrow 3v$

A

$$m_2 = 4m_p$$

$$m_a v + m_p \cdot 3v = (m_2 + m_p) u \Rightarrow u = \frac{4m_p v + 3m_p v}{4m_p + m_p} = \frac{7v}{5}$$



I Adiabatisch

$$Q = \Delta H + \Delta U = 0$$

$$A_1 = -\Delta U = -\frac{3}{2} \mathcal{R} (T_2 - T_1) \\ = \frac{3}{2} \mathcal{R} (T_1 - T_2)$$

$$T_1 = T_3$$

Isobarisch

$$A_2 = \mathcal{R} (T_3 - T_2) = \mathcal{R} (T_1 - T_2)$$

$$A_1 = \frac{3}{2} A_2 \Rightarrow A_2 = \frac{2}{3} A_1$$

$$A_1 + A_2 = A \quad A_1 + \frac{2}{3} A_1 = A \quad \frac{5}{3} A_1 = A$$

$$A_1 = \frac{3A}{5} = 0,6A \Rightarrow \text{negativ} \Rightarrow A_1' = -0,6A$$

12 $q_1 = +5e$

$$q_2 = 5e - (-2e) = 5e + 2e = 7e$$

13 $P = \sqrt{(m_p v_p)^2 + (m_a v_a)^2}$

$$P = \sqrt{(m_p 3v)^2 + (4m_p v)^2} = \sqrt{25 m_p^2 v^2} = 5 m_p v$$

$$P = 5 m_p v$$

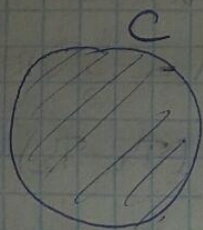
14 $m_a \rightarrow v$

$m_p \rightarrow 3v$

$m_a = 4m_p$

$$m_a v + m_p \cdot 3v = (m_a + m_p) u \Rightarrow u = \frac{4m_p v + 3m_p v}{4m_p + m_p} = \frac{7m_p v}{5}$$

(15)



$$C = 4\pi\epsilon_0 R$$

$$W_1 = \frac{q_1^2}{2C} = \frac{q_1^2}{2 \cdot 4\pi\epsilon_0 R} = \frac{q_1^2}{8\pi\epsilon_0 R}$$

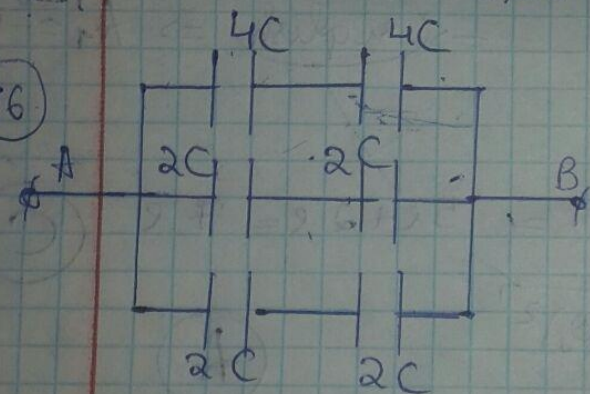
$$W_2 = \frac{q_2^2}{2C} = \frac{q_2^2}{2 \cdot 4\pi\epsilon_0 R} = \frac{q_2^2}{8\pi\epsilon_0 R}$$

(A)

$$\Delta W = A = W_1 + W_2 = \frac{q_1^2}{8\pi\epsilon_0 R} + \frac{q_2^2}{8\pi\epsilon_0 R} = \frac{q_1^2 + q_2^2}{8\pi\epsilon_0 R}$$

$$\Delta W = A = \frac{(2 \cdot 10^{-6} \text{ C})^2 + (1 \cdot 10^{-6} \text{ C})^2}{8 \cdot \pi \cdot 8,85 \cdot 10^{-12} \frac{\text{C}^2}{\text{N} \cdot \text{m}^2} \cdot 9 \cdot 10^{-2} \text{ m}} = 0,25 \text{ J}$$

(16)



$$C_{k1} = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

$$C_{k2} = \frac{2C \cdot 2C}{2C + 2C} = C$$

$$C_{k3} = \frac{2C \cdot 2C}{2C + 2C} = C$$

$$C_p = C_{k1} + C_{k2} + C_{k3} = 2C + C + C = 4C$$

(B)

(17)

$$j = 2 \frac{\text{A}}{\text{m}^2}$$

$$E = 6 \mu\text{V/m}$$

$$j = \frac{I}{S} = \frac{\frac{U}{R}}{S} = \frac{U}{R \cdot S} = \frac{U}{\rho \frac{l}{S} \cdot S} = \frac{U}{\rho \cdot l} = \frac{E \cdot l}{\rho \cdot l} = \frac{E}{\rho}$$

$$\rho = \frac{E}{j} = \frac{6 \cdot 10^{-6} \frac{\text{V}}{\text{m}}}{2 \frac{\text{A}}{\text{m}^2}} = 3 \cdot 10^{-6} = 3 \mu\Omega \cdot \text{m}$$

(2)

15



$$C = 4\pi\epsilon_0 R$$

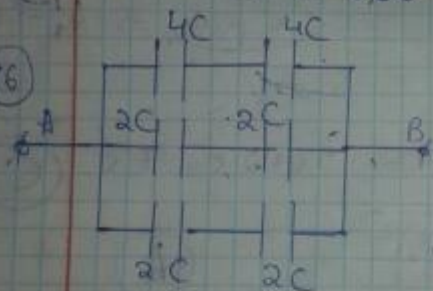
$$W_1 = \frac{q_1^2}{2C} = \frac{q_1^2}{2 \cdot 4\pi\epsilon_0 R} = \frac{q_1^2}{8\pi\epsilon_0 R}$$

$$W_2 = \frac{q_2^2}{2C} = \frac{q_2^2}{2 \cdot 4\pi\epsilon_0 R} = \frac{q_2^2}{8\pi\epsilon_0 R} \quad \text{A}$$

$$\Delta W = A = W_1 + W_2 = \frac{q_1^2}{8\pi\epsilon_0 R} + \frac{q_2^2}{8\pi\epsilon_0 R} = \frac{q_1^2 + q_2^2}{8\pi\epsilon_0 R}$$

$$\Delta W = A = \frac{(2 \cdot 10^{-6} \text{ C})^2 + (1 \cdot 10^{-6} \text{ C})^2}{8 \cdot \pi \cdot 8,85 \cdot 10^{-12} \frac{\text{C}^2}{\text{N} \cdot \text{m}^2} \cdot 9 \cdot 10^{-2} \text{ m}} = 0,25 \text{ J}$$

16



$$C_{K1} = \frac{4C \cdot 4C}{4C + 4C} = 2C$$

$$C_{K2} = \frac{2C \cdot 2C}{2C + 2C} = C$$

$$C_{K3} = \frac{2C \cdot 2C}{2C + 2C} = C$$

$$C_p = C_{K1} + C_{K2} + C_{K3} = 2C + C + C = 4C \quad \text{B}$$

17

$$j = 2 \frac{\text{A}}{\text{m}^2} \quad E = 6 \frac{\mu\text{V}}{\text{m}}$$

$$j = \frac{I}{S} = \frac{\frac{U}{R}}{S} = \frac{U}{R \cdot S} = \frac{U}{\rho \cdot \frac{L}{S} \cdot S} = \frac{U \cdot S}{\rho \cdot L} = \frac{E \cdot L}{\rho \cdot L} = \frac{E}{\rho}$$

$$\rho = \frac{E}{j} = \frac{6 \cdot 10^{-6} \frac{\text{V}}{\text{m}}}{2 \frac{\text{A}}{\text{m}^2}} = 3 \cdot 10^{-6} \frac{\text{V} \cdot \text{m}}{\text{A}} = 3 \mu\Omega \cdot \text{m} \quad \text{D}$$

18) $R = 12 \Omega$ $I = 6t$ $t = 5s$

$$dQ = I^2 R dt = (6t)^2 R dt = 36t^2 R dt$$

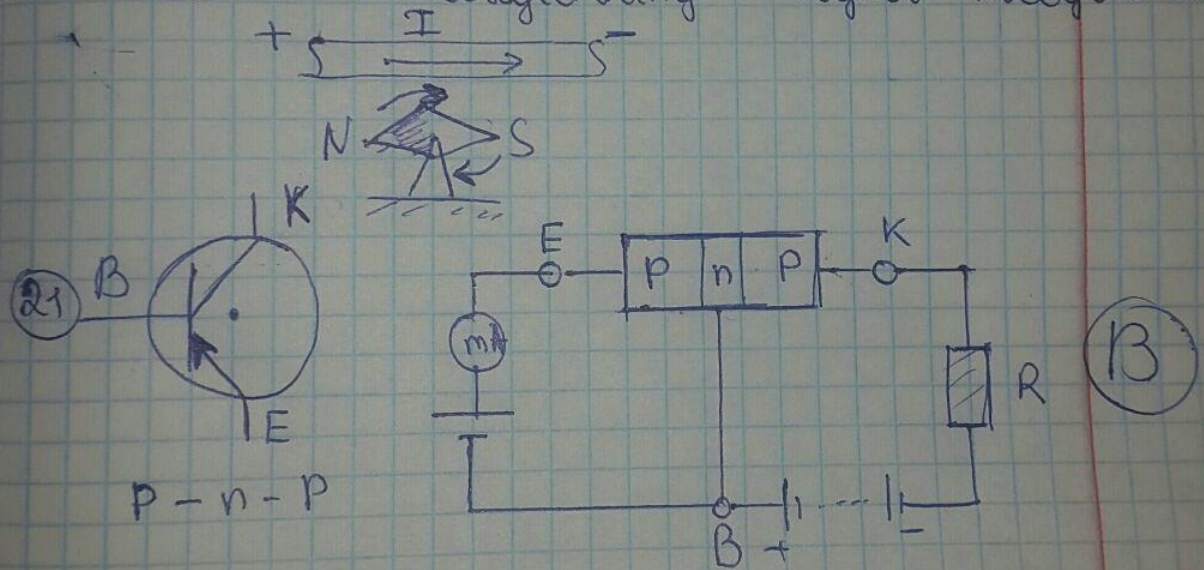
$$\int_0^5 Q = \int_0^5 36R t^2 dt$$

$$Q = 36R \int_0^5 t^2 dt$$

$$Q = 36R \left(\frac{t^3}{3} \Big|_0^5 \right) = 36 \cdot 12 \cdot \frac{125}{3} = 18000 J$$

19) Akseptor kiritishmali yarimotkargichlar yoki p-tip yarimotkargichlar ham deb yuritiladi

20) Bio - Savar - Laplas qonuni
Tokli otkargichning magnit maydonini

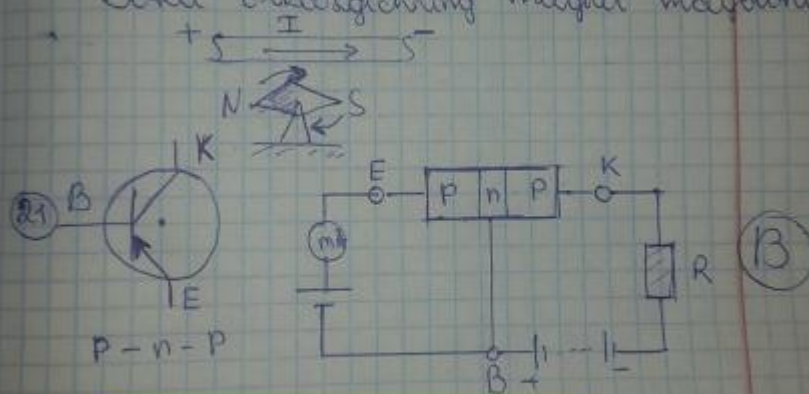


18) $R = 12 \Omega$ $I = 6t$ $t = 5s$
 $dQ = I^2 R dt = (6t)^2 R dt = 36t^2 R dt$
 $\int_0^5 Q = \int_0^5 36R t^2 dt$ $Q = 36R \int_0^5 t^2 dt$

$Q = 36R \left(\frac{t^3}{3} \Big|_0^5 \right) = 36 \cdot 12 \cdot \frac{125}{3} = 18000 J$ (B)

19) Akseptor kiritilmali yarimətkəricilərdən p-tip yarım ətkəricilərə ham dəb yuritilədi (B)

20) Bio - Savar - Laplas qanunu
 Təbii ətkəşmənin maqnit maydonunu



$$(22) \quad Z = \sqrt{R^2 + (X_L - X_C)^2} \quad X_L = X_C$$

$$Z = R$$

$$I_0 = \frac{U_0}{R}$$

$$U_0 = I_0 \cdot R$$

$$U_0 = 13 \text{ A} \cdot 20 \Omega = 260 \text{ V} \rightarrow \text{tok rezonansida} \\ \text{aktiv qarshilikda}$$

$$U_{OL,r} = U_{OC} = I_{OL} \cdot X_L = I_{OL} \cdot \omega L$$

$$\omega L = \frac{1}{\omega C} \quad \omega^2 = \frac{1}{LC} \Rightarrow \omega = \frac{1}{\sqrt{LC}}$$

$$U_{OL,r} = U_{OC} = I_{OL} \cdot \frac{1}{\sqrt{LC}} \cdot L = I_{OL} \cdot \sqrt{\frac{L}{C}}$$

$$U_{OC} = U_{OC} = 13 \text{ A} \cdot \sqrt{\frac{180 \text{ H}}{13 \cdot 10^{-3} \text{ F}}} = 1300 \text{ V}$$

(B)

$$(23) \quad \cos \varphi \Rightarrow \text{Quvvat koeffitsiyenti}$$

$$\cos \varphi = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}}$$

$$X_C = 0$$

(A)

$$\cos \varphi = \frac{R}{\sqrt{R^2 + X_L^2}} = \frac{40 \Omega}{\sqrt{(40 \Omega)^2 + (30 \Omega)^2}} = 0,8$$

$$(24) \quad v = \frac{c}{n} = \frac{3 \cdot 10^8 \text{ m/s}}{1,5} = 2 \cdot 10^8 \frac{\text{m}}{\text{s}}$$

$$S = v \cdot t = 2 \cdot 10^8 \text{ m/s} \cdot 0,1 \text{ s} = 2 \cdot 10^7 \text{ m}$$

(C)

$$(25) \quad E = \frac{\Delta \varphi}{\Delta S} \Rightarrow \text{tekis yoritilgan sirtning} \\ \text{birlik yuzasiga, tik} \\ \text{tushayotgan yorug'lik qoni}$$

$$(22) \quad Z = \sqrt{R^2 + (X_L - X_C)^2} \quad X_L = X_C$$

$$Z = R \quad I_0 = \frac{U_0}{R} \quad U_0 = I_0 \cdot R$$

$$U_0 = 13 \text{ A} \cdot 20 \Omega = 260 \text{ V} \rightarrow \text{tak rezonansida}$$

$$U_{0L} = U_{0C} = I_{0L} \cdot X_L = I_{0L} \cdot \omega L$$

$$\omega L = \frac{1}{\omega C} \quad \omega^2 = \frac{1}{LC} \Rightarrow \omega = \frac{1}{\sqrt{LC}}$$

$$U_{0L} = U_{0C} = I_{0L} \cdot \frac{1}{\sqrt{LC}} \cdot L = I_{0L} \cdot \sqrt{\frac{L}{C}}$$

$$U_{0C} = U_{0L} = 13 \text{ A} \cdot \sqrt{\frac{150 \text{ H}}{13 \cdot 10^{-3} \text{ F}}} = 1300 \text{ V}$$

(B)

$$(23) \quad \cos \varphi \rightarrow \text{Quvvat koeffitsiyenti}$$

$$\cos \varphi = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}} \quad X_C = 0$$

(A)

$$\cos \varphi = \frac{R}{\sqrt{R^2 + X_L^2}} = \frac{40 \Omega}{\sqrt{(40 \Omega)^2 + (60 \Omega)^2}} = 0.8$$

$$(24) \quad v = \frac{c}{n} = \frac{3 \cdot 10^8 \text{ m/s}}{1.5} = 2 \cdot 10^8 \frac{\text{m}}{\text{s}}$$

$$S = v \cdot t = 2 \cdot 10^8 \text{ m/s} \cdot 0.1 \text{ s} = 2 \cdot 10^7 \text{ m}$$

(C)

$$(25) \quad E = \frac{\Delta \varphi}{\Delta S} \Rightarrow \text{tekis yoritilgan shtung} \\ \text{birlik shtalgan tek} \\ \text{tushayotgan yonug'lik qismi}$$

26) $W = 8 \text{ J}$

$t = 902 \text{ ns}$

$I = \frac{W}{S \cdot t} = \frac{q}{s}$

$I \rightarrow$ intensitetlik

(C)

$I = \frac{8 \text{ J}}{0,5 \cdot 10^{-4} \text{ m}^2 \cdot 0,02 \cdot 10^{-9} \text{ s}} = \frac{8 \cdot 10^{16}}{10} = 8 \cdot 10^{15} \frac{\text{W}}{\text{m}^2}$

27) 1, 2, 4, 5

(B)

28) To'rtta zarra - γ -foton, π^0 -meson, K_1^0 -meson va K_2^0 -mesonning antizarrasi mavjud emas. Bu zarra-lar absolyut neutral zarralar deb ataladi

(A)

29) $A_2 = \frac{\Delta N}{\Delta t} = \frac{960}{0,4 \cdot 60} = \frac{16}{0,4} = 40 \frac{\text{atom}}{\text{s}}$

$A_1 = 80 \text{ atom/s}$

$\frac{A_1}{A_2} = \frac{80 \text{ atom/s}}{40 \text{ atom/s}} = 2$

(A)

30) $W_t = N \cdot (W_e + W_p)$

(C)

$W_t = 204 \cdot (940 \text{ MeV} + 8 \text{ MeV}) = 193 \text{ GeV}$

JANOB FIZIKLARkanali

$$I = \frac{W}{S \cdot t} = \frac{Q}{S} \quad I \rightarrow \text{intensiv}$$

$$I = \frac{8 \text{ J}}{0,5 \cdot 10^{-5} \text{ m}^2 \cdot 0,07 \cdot 10^{-9} \text{ s}} = \frac{8 \cdot 10^{16}}{10} = 8 \cdot 10^{15} \frac{\text{W}}{\text{m}^2}$$

27 1, 2, 4, 5 (B)

23) Főttá száraz - 8 - foton, π^0 - mezon,
 K^1 - mezon $ed. K^2$ - mezonning
 antiparalel irányú szomszédos
 lán abszolút neutrál száraz del
 ataladi

(29) $A_2 = \frac{\Delta N}{\Delta t} = \frac{960}{0.060} = \frac{16}{0.4} = 40 \frac{\text{atom}}{\text{s}}$

$$A_1 = 80 \text{ atom/s}$$

$$\frac{A_1}{A_2} = \frac{80 \text{ atom/s}}{40 \text{ atom/s}} = 2$$

$$(30) \quad W_t = N \cdot (W_{t-1} + W_0)$$

$$W_t = 204 \cdot (940 \text{ MeV} + 8 \text{ MeV}) = 193 \text{ GeV}$$

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Variant-20

① $t_1 = 7,3\text{ s} - 6\text{ s} = 1,3\text{ s}$

$v = v_0 - at_1 = 12\text{ m/s} - a \cdot 1,3$

(A)

$a = \frac{v_0 - v}{t_1} \Rightarrow$ *Weg*
Änderung

$a = \frac{12 - 0}{6} = 2 \frac{\text{m}}{\text{s}^2}$

$v = 12\text{ m/s} - 2 \frac{\text{m}}{\text{s}^2} \cdot 1,3\text{ s} = 9,4\text{ m/s}$

② $h = \frac{v^2}{2g} = \frac{(2\text{ m/s})^2}{2 \cdot 1,67\text{ m/s}^2} = \frac{4\text{ m}^2/\text{s}^2}{2 \cdot 1,67\text{ m/s}^2} = 1,2\text{ m}$

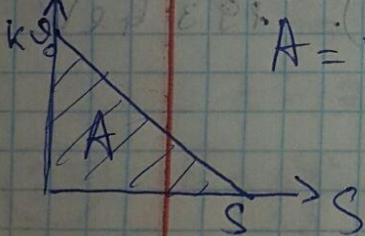
(B)

③ F

$m_1 = m_2$

$v_{01} = v_{02}$

$\frac{k_1}{k_2} = 2 \quad \frac{S_2}{S_1} = ?$



$A = \frac{k \cdot v_0 \cdot S}{2} = \frac{m v_0^2}{2}$

$k \cdot S = m v_0^2$

$S = \frac{m v_0^2}{k}$

$\frac{S_2}{S_1} = \frac{\frac{m v_0^2}{k_2}}{\frac{m v_0^2}{k_1}} = \frac{k_1}{k_2} = 2$

(A)

Variant-20

① $t_1 = 7,3\text{ s} - 6\text{ s} = 1,3\text{ s}$

$v = v_0 - at_1 = 12\text{ m/s} - a \cdot 1,3$

(A)

$a = \frac{v_0 - v}{t_1} \Rightarrow$ *Weg*
Änderung

$a = \frac{12 - 0}{6} = 2 \frac{\text{m}}{\text{s}^2}$

$v = 12\text{ m/s} - 2 \frac{\text{m}}{\text{s}^2} \cdot 1,3\text{ s} = 9,4\text{ m/s}$

② $h = \frac{v^2}{2g} = \frac{(2\text{ m/s})^2}{2 \cdot 1,67\text{ m/s}^2} = \frac{4\text{ m}^2/\text{s}^2}{2 \cdot 1,67\text{ m/s}^2} = 1,2\text{ m}$

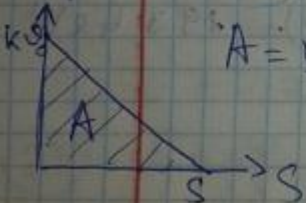
(B)

③ F

$m_1 = m_2$

$v_{01} = v_{02}$

$\frac{k_1}{k_2} = 2 \quad \frac{S_2}{S_1} = ?$



$A = \frac{k \cdot v_0 \cdot S}{2} = \frac{m v_0^2}{2}$

$k \cdot S = m v_0^2$

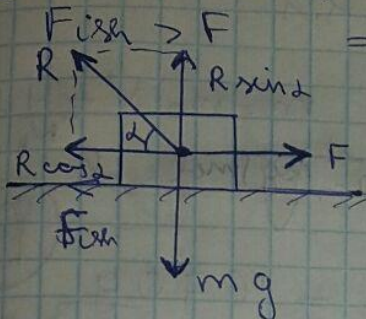
$S = \frac{m v_0^2}{k}$

$\frac{S_2}{S_1} = \frac{\frac{m v_0^2}{k_2}}{\frac{m v_0^2}{k_1}} = \frac{k_1}{k_2} = 2$

(A)

④ $P = 5 \text{ N}$ (A)

⑤ $F_{\text{fr}} = \mu mg = 4 \text{ kg} \cdot 0,5 \cdot 10 \text{ m/s}^2 = 20 \text{ N}$



$\Rightarrow 20 \text{ N} > 8 \text{ N}$

$R \sin \alpha = mg$

$R \cos \alpha = F$

$\text{ctg } \alpha = \frac{F}{mg} = \frac{8 \text{ N}}{40 \text{ N}} = 0,2$

⑥ $P_1 = P_2$

$E_{k1} = \frac{m v_1^2}{2}$

$m \cdot v_1 = 2m \cdot v_2$

$v_1 = 2v_2$

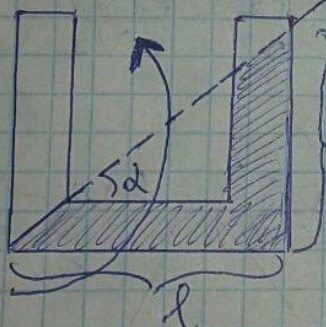
$E_{k2} = \frac{2m \left(\frac{v_1}{2}\right)^2}{2}$

$= \frac{m v_1^2}{2 \cdot 2} = \frac{E_{k1}}{2}$

$E_{k2} = \frac{E_{k1}}{2}$

$2E_2 = E_1$

⑦



$g \perp a$

$P = \rho \sqrt{g^2 + a^2} \cdot h$

$P = 1000 \frac{\text{kg}}{\text{m}^3} \cdot \sqrt{\left(\frac{10 \text{ m}}{\text{s}^2}\right)^2 + \left(\frac{3 \text{ m}}{\text{s}^2}\right)^2} \cdot 0,1 \text{ m}$

$= 100 \cdot \sqrt{10,9} = \sqrt{1,09} \text{ kPa}$

⑧ $h = \frac{2\sigma}{\rho(g-a)r}$

$= \frac{2 \cdot 73 \cdot 10^{-3} \text{ N/m}}{1000 \frac{\text{kg}}{\text{m}^3} \cdot \left(\frac{10 \text{ m}}{\text{s}^2} - \frac{2 \text{ m}}{\text{s}^2}\right) \cdot 2 \cdot 10^{-3} \text{ m}}$

$= 9,125 \text{ mm}$

④ $P = 5 \text{ N}$ (A)

⑤ $F_{\text{fr}} = \mu mg = 4 \text{ kg} \cdot 0,5 \cdot 10 \text{ m/s}^2 = 20 \text{ N}$

$F_{\text{fr}} > F \Rightarrow 20 \text{ N} > 8 \text{ N}$

$R \sin \alpha = mg$ (C)

$R \cos \alpha = F$

$\text{ctg} \alpha = \frac{F}{mg} = \frac{8 \text{ N}}{40 \text{ N}} = 0,2$

⑥ $P_1 = P_2$

$E_{k1} = \frac{m v_1^2}{2}$

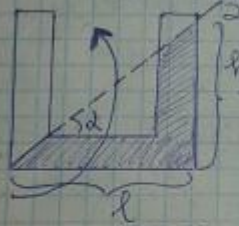
$v_1 \cdot v_1 = 2 v_1 \cdot v_2 \quad v_1 = 2 v_2$

$E_{k2} = \frac{2m \left(\frac{v_1}{2}\right)^2}{2} = \frac{m v_1^2}{2} = \frac{E_{k1}}{2}$

$E_{k2} = \frac{E_{k1}}{2}$

$2 E_2 = E_1$ (B)

⑦



$g \perp a$

$P = \rho \sqrt{g^2 + a^2} \cdot h$

$P = 1000 \frac{\text{kg}}{\text{m}^3} \cdot \sqrt{\left(\frac{10 \text{ m}}{\text{s}^2}\right)^2 + \left(\frac{3 \text{ m}}{\text{s}^2}\right)^2} \cdot 0,1 \text{ m}$

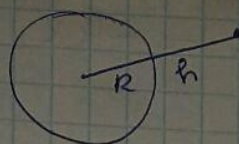
$= 100 \cdot \sqrt{109} = \sqrt{1,09} \cdot 10^4 \text{ Pa}$ (D)

⑧

$h = \frac{a \cdot d}{\rho(g-a) \cdot r} = \frac{2 \cdot 73 \cdot 10^{-3} \text{ N}}{1000 \frac{\text{kg}}{\text{m}^3} \cdot \left(\frac{10 \text{ m}}{\text{s}^2} - \frac{2 \text{ m}}{\text{s}^2}\right) \cdot 2 \cdot 10^{-3} \text{ m}}$ (B)

$= 9,125 \text{ mm}$

$$(9) \quad E_k = \frac{G m M}{R+h}$$



$$g = \frac{GM}{R^2}$$

$$E_k = \frac{mgR^2}{R+h} = \frac{mgR^2}{R+0,1R} = \frac{mgR}{1,1}$$

(2)

$$(10) \quad M = m_0 N_A \Rightarrow m_0 = \frac{M}{N_A} \Rightarrow m = m_0 N = \frac{M}{N_A} \cdot N$$

$$\rho = \frac{\frac{M}{N_A} \cdot N}{V} = \frac{M}{V} \cdot \frac{N}{N_A} = \frac{M}{V} \cdot \sqrt{\frac{V}{V}} = \frac{M}{V}$$

$$\rho = \frac{38 \cdot 10^{-3} \frac{\text{kg}}{\text{mol}}}{22,4 \cdot 10^{-3} \frac{\text{m}^3}{\text{mol}}} = 1670 \frac{\text{g}}{\text{m}^3}$$

(13)

$$(11) \quad dA = p dV \quad p = \frac{dA}{dV}$$

$$pV = \sqrt{RT}$$

$$\frac{dA}{dV} \cdot V = \sqrt{RT}$$

$$\int dA = \int \frac{\sqrt{RT}}{V} dV$$

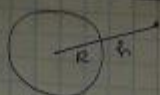
$$A = \int_{V_1}^{V_2} \frac{\sqrt{RT}}{V} dV = \sqrt{RT} \int_{V_1}^{V_2} V^{-1} dV =$$

$$= \sqrt{RT} \left(\ln V \right) \Big|_{V_1}^{V_2} = \sqrt{RT} \cdot (\ln V_2 - \ln V_1) =$$

$$= \sqrt{RT} \ln \frac{V_2}{V_1} = \frac{N}{N_A} RT \ln \frac{V_2}{V_1}$$

$$A = \frac{8 \cdot 10^{22}}{6,02 \cdot 10^{23}} \cdot 8,31 \cdot 300 \cdot \ln \frac{0,272}{0,1} = 24,84 \text{ J}$$

$$9) F_h = \frac{G m M}{R+h}$$



$$g = \frac{G M}{R^2}$$

$$F_g = \frac{m g R^2}{R+h} = \frac{m g R^2}{R+0.1R} = \frac{m g R}{1.1}$$

(2)

$$10) M = m_0 N_A \Rightarrow m_0 = \frac{M}{N_A} \Rightarrow m = m_0 N = \frac{M}{N_A} N$$

$$\rho = \frac{\frac{M}{N_A} N}{V} = \frac{M}{V} \cdot \frac{N}{N_A} = \frac{M}{V} \cdot \frac{1}{\frac{N_A}{N}} = \frac{M}{V}$$

$$\rho = \frac{38 \cdot 10^{-3} \text{ kg/mol}}{22,4 \cdot 10^{-3} \frac{\text{m}^3}{\text{mol}}} = 1,70 \frac{\text{kg}}{\text{m}^3}$$

(B)

$$11) dA = p dV \quad p = \frac{dA}{dV}$$

$$pV = \mathcal{N}RT \quad \frac{dA}{dV} \cdot V = \mathcal{N}RT$$

$$\int dA = \int \frac{\mathcal{N}RT}{V} dV$$

$$A = \int_{V_1}^{V_2} \frac{\mathcal{N}RT}{V} dV = \mathcal{N}RT \int_{V_1}^{V_2} V^{-1} dV =$$

$$= \mathcal{N}RT \left(\ln V \right) \Big|_{V_1}^{V_2} = \mathcal{N}RT (\ln V_2 - \ln V_1) =$$

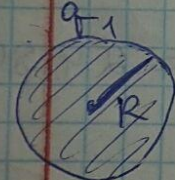
$$= \mathcal{N}RT \ln \frac{V_2}{V_1} = \frac{N}{N_A} RT \ln \frac{V_2}{V_1}$$

$$A = \frac{8 \cdot 10^{22}}{6,02 \cdot 10^{23}} \cdot 8,31 \cdot 300 \cdot \ln \frac{9272}{0,1} = 24,84 \text{ J}$$

12) $-6e - (-2e) = -4e$ (A)

13) $P_1 = m_p v$ $P_2 = m_d v_2 = 4m_p \cdot \frac{v}{4} = m_p v$
 $P_1 = P_2 = P = m_p v$
 $P_n = \sqrt{P^2 + P^2 + 2P \cdot P \cos 60^\circ} = \sqrt{3} P = \sqrt{3} m_p v$ (B)

14) 
 $m_d v + m_p v = (m_d + m_p) u \Rightarrow u = \frac{(m_d + m_p) v}{(m_d + m_p)}$
 $u = \frac{(4m_p + m_p) v}{4m_p + m_p} = \frac{5m_p v}{5m_p} = v$ (C)

15)  $C = 4\pi \epsilon_0 R$
 $W_1 = \frac{q_1^2}{2C} = \frac{q_1^2}{2 \cdot 4\pi \epsilon_0 R} = \frac{q_1^2}{8\pi \epsilon_0 R}$
 $q_1 = 2 \mu C$ $q_2 = 2 \mu C + 2 \mu C = 4 \mu C$

12) $-6e - (-2e) = -4e$ (A)

13) $P_1 = m_p v$ $P_2 = m_d v_2 = 4m_p \cdot \frac{v}{4} = m_p v$
 $P_1 = P_2 = P = m_p v$
 $P_n = \sqrt{P^2 + P^2 + 2P \cdot P \cos 60^\circ} = \sqrt{3} P = \sqrt{3} m_p v$ (B)

14) 
 $m_d v + m_p v = (m_d + m_p) u \Rightarrow u = \frac{(m_d + m_p) v}{(m_d + m_p)}$
 $u = \frac{(4m_p + m_p) v}{4m_p + m_p} = \frac{5m_p v}{5m_p} = v$ (C)

15)  $C = 4\pi \epsilon_0 R$
 $W_1 = \frac{q_1^2}{2C} = \frac{q_1^2}{2 \cdot 4\pi \epsilon_0 R} = \frac{q_1^2}{8\pi \epsilon_0 R}$
 $q_1 = 2 \mu C$ $q_2 = 2 \mu C + 2 \mu C = 4 \mu C$

$$W_2 = \frac{(q_1 + q)^2}{2C}$$

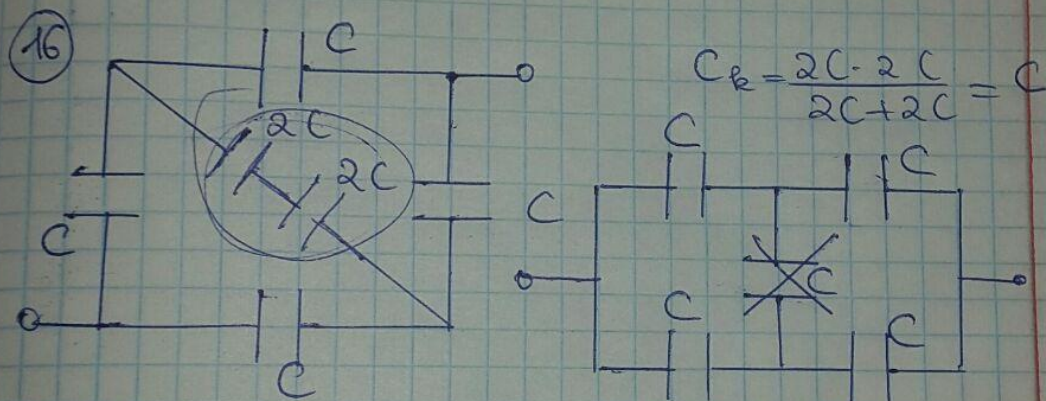
$$A = W_2 - W_1 = \frac{(q_1 + q)^2}{2C} - \frac{q_1^2}{2C} = \frac{q_1^2 + 2q_1q + q^2}{2C} - \frac{q_1^2}{2C}$$

$$= \frac{2q_1q + q^2}{2 \cdot 4\pi\epsilon_0 R} = \frac{q \cdot (2q_1 + q)}{8\pi\epsilon_0 R}$$

$$A = \frac{2 \cdot 10^{-6} C \cdot (2 \cdot 2 \cdot 10^{-6} C + 2 \cdot 10^{-6} C)}{8 \cdot 3,14 \cdot 8,85 \cdot 10^{-12} \frac{C^2}{N \cdot m^2} \cdot 9 \cdot 10^{-2} m}$$

$$= \frac{12 \cdot 10^{-12}}{8 \cdot 3,14 \cdot 8,85 \cdot 10^{-12} \cdot 9 \cdot 10^{-2}} = 0,6 \text{ J}$$

(A)

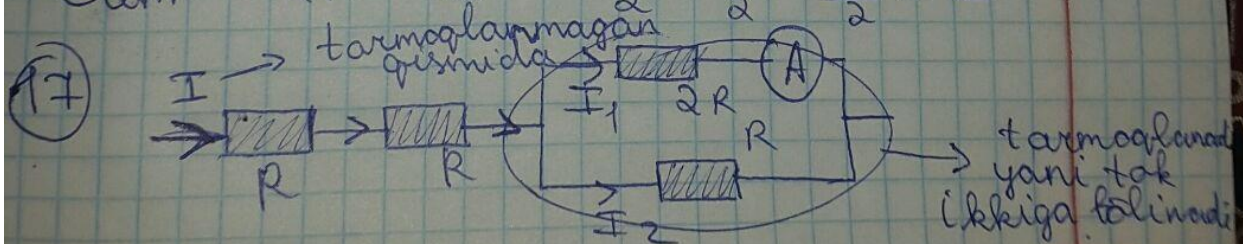


$$C_{k1} = \frac{C \cdot C}{C + C} = \frac{C}{2}$$

$$C_{k2} = \frac{C \cdot C}{C + C} = \frac{C}{2}$$

$$C_{\text{sum}} = C_{k1} + C_{k2} = \frac{C}{2} + \frac{C}{2} = \frac{2C}{2} = C$$

(C)



$$W_2 = \frac{(q_1 + q_2)^2}{2C}$$

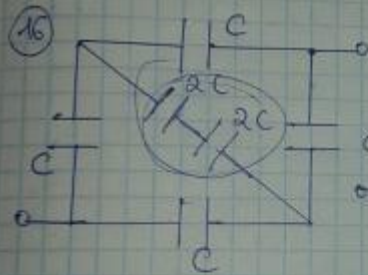
$$A = W_2 - W_1 = \frac{(q_1 + q_2)^2}{2C} - \frac{q_1^2}{2C} = \frac{q_1^2 + 2q_1q_2 + q_2^2}{2C} - \frac{q_1^2}{2C}$$

$$= \frac{2q_1q_2 + q_2^2}{2 \cdot 4\pi\epsilon_0 R} = \frac{q_1(2q_1 + q_2)}{8\pi\epsilon_0 R}$$

$$A = \frac{2 \cdot 10^{-6} C \cdot (2 \cdot 2 \cdot 10^{-6} C + 2 \cdot 10^{-6} C)}{8 \cdot 3,14 \cdot 8,85 \cdot 10^{-12} \frac{C^2}{N \cdot m^2} \cdot 9 \cdot 10^{-2} m}$$

$$= \frac{12 \cdot 10^{-12}}{8 \cdot 3,14 \cdot 8,85 \cdot 10^{-12} \cdot 9 \cdot 10^{-2}} = 0,6 \text{ J}$$

(A)



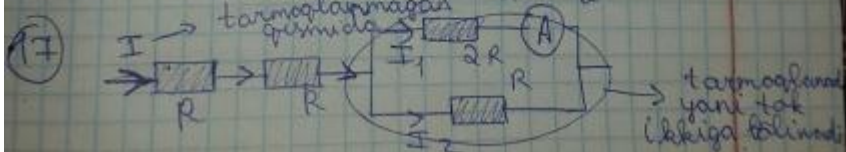
$$C_k = \frac{2C \cdot 2C}{2C + 2C} = C$$

$$C_{k1} = \frac{C \cdot C}{C + C} = \frac{C}{2}$$

$$C_{k2} = \frac{C \cdot C}{C + C} = \frac{C}{2}$$

$$C_{\text{cum}} = C_{k1} + C_{k2} = \frac{C}{2} + \frac{C}{2} = \frac{2C}{2} = C$$

(C)



$$I = 6 \text{ A}$$

$$I = I_1 + I_2$$

$$R_{R1} = R + R = 2R$$

$$R_{P1} = \frac{2R \cdot R}{R + 2R} = \frac{2R}{3}$$

2R dagi kuchlanish U_1

R dagi kuchlanish U_2

$$U_1 = U_2$$

$$I_1 \cdot 2R = I_2 \cdot R \Rightarrow 2I_1 = I_2$$

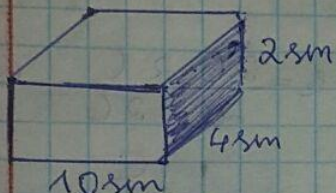
$$I_1 + 2I_1 = I$$

$$3I_1 = I$$

$$\textcircled{C} I_1 = \frac{I}{3}$$

$$I_A = I_1 = \frac{I}{3} = \frac{6 \text{ A}}{3} = 2 \text{ A}$$

18



$$R = \frac{\rho \cdot l}{S}$$

$$R = \frac{1,68 \cdot 10^{-8} \Omega \cdot \text{m} \cdot 0,1 \text{ m}}{2 \cdot 4 \cdot 10^{-6} \text{ m}^2} = 2,1 \cdot 10^{-6} \Omega$$

Ⓢ

19

$$\frac{mv^2}{2} = e \cdot E \cdot \lambda$$

Ⓢ

λ - erkin yugurish yoli

20

Donor kirishmali yarimotkazgichlar yana n - tip yarimotkazgichlar ham deb yuritiladi.

Ⓐ

21

tash birinchi tushadi. Magnit keyin tushadi. Bu lens qochirish orqali tushuntiriladi.

Ⓐ

$$I = 6 \text{ A} \quad T = I_1 + I_2$$

$$R_{\text{eq}} = R + R = 2R \quad R_{\text{eq}} = \frac{2R \cdot R}{R + 2R} = \frac{2R}{3}$$

$2R$ daqi kuchlanish U_1

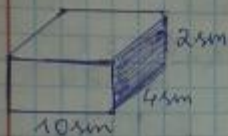
R daqi kuchlanish U_2

$$U_1 = U_2 \quad I_1 \cdot 2R = I_2 \cdot R \Rightarrow 2I_1 = I_2$$

$$I_1 + 2I_1 = I \quad 3I_1 = I \quad \textcircled{C} \quad I_1 = \frac{I}{3}$$

$$I_A = I_1 = \frac{I}{3} = \frac{6 \text{ A}}{3} = 2 \text{ A}$$

18



$$R = \frac{\rho \cdot l}{S}$$

$$R = \frac{1,68 \cdot 10^{-8} \Omega \cdot \text{m} \cdot 20 \text{ m}}{2,4 \cdot 10^{-4} \text{ m}^2} = 2,1 \cdot 10^{-6} \Omega \quad \textcircled{C}$$

19

$$\frac{mv^2}{2} = e \cdot E \cdot \lambda$$

Ⓒ

λ - erkin yugurish yoli

20

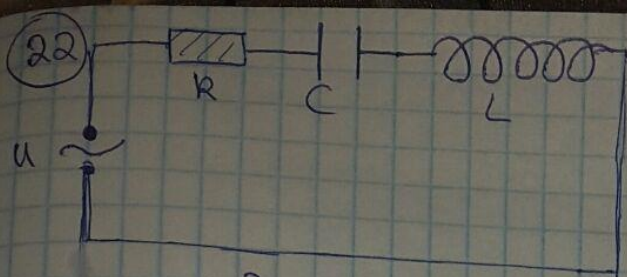
Donor kirishmal yarimotkazgichlar yoki n-tip yarimotkazgichlar ham deb yuritiladi

Ⓐ

21

tash birinchi tushadi
Magnet kayin tushadi. Bu lens qada
si orqali tushuntiriladi

Ⓐ



$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$X_L = X_C$$

$$\omega L = \frac{1}{\omega C}$$

$$X_L - X_C = 0 \Rightarrow Z = R$$

$$\omega^2 = \frac{1}{LC}$$

$$I_{0,r} = \frac{U_0}{R} = \frac{40V}{20\Omega} = 2A$$

(C)

23) $\cos \varphi$ - quvvat koefitsiyenti $\cos \varphi = \frac{R}{Z}$

$$\cos \varphi = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}} \Rightarrow$$

$$R = 0 \quad X_L = 70\Omega$$

$$X_C = 50\Omega$$

$$\cos \varphi = \frac{0}{\sqrt{0 + (X_L - X_C)^2}} = 0$$

(A)

24) $L = 20 \text{ cm}$

$$v = \frac{c}{n} = \frac{3 \cdot 10^8 \text{ m/s}}{1,5} = 2 \cdot 10^8 \text{ m/s}$$

$$S = v \cdot t = 2 \cdot 10^8 \frac{\text{m}}{\text{s}} \cdot 0,5 \cdot 10^{-3} \text{ s} = 10 \cdot 10^4 \text{ m}$$

$$N = \frac{S}{2L} = \frac{10 \cdot 10^4 \text{ m}}{2 \cdot 0,2 \text{ m}}$$

$$= 25 \cdot 10^4 = 2,5 \cdot 10^5$$

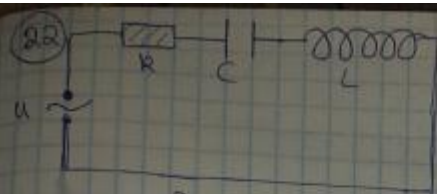
(B)

25) $I = \frac{\Delta \varphi}{\Delta \Omega}$

$$[I] = 1 \text{ cd}$$

Birlik fazoviy
yotgan yonuglik

Burchakda tarqala-
qimi



$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$X_L = X_C$$

$$\omega L = \frac{1}{\omega C}$$

$$\omega^2 = \frac{1}{LC}$$

$$X_L - X_C = 0 \Rightarrow Z = R$$

$$I_{0,p} = \frac{U_0}{R} = \frac{40V}{20\Omega} = 2A$$

(C)

23) $\cos \varphi$ - quvvat koeffitsiyenti $\cos \varphi = \frac{R}{Z}$

$$\cos \varphi = \frac{R}{\sqrt{R^2 + (X_L - X_C)^2}} \Rightarrow R = 0 \quad X_L = 40\Omega$$

$$X_C = 50\Omega$$

$$\cos \varphi = \frac{0}{\sqrt{0 + (X_L - X_C)^2}} = 0$$

(A)

24) $L = 20\text{m}$

$$v = \frac{c}{n} = \frac{3 \cdot 10^8 \text{ m/s}}{1,5} = 2 \cdot 10^8 \text{ m/s}$$

$$S = v \cdot t = 2 \cdot 10^8 \frac{\text{m}}{\text{s}} \cdot 0,5 \cdot 10^{-3} \text{ s} = 10 \cdot 10^4 \text{ m}$$

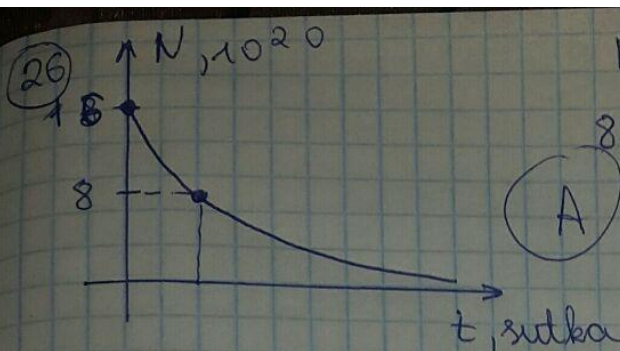
$$N = \frac{S}{2L} = \frac{10 \cdot 10^4 \text{ m}}{2 \cdot 0,2 \text{ m}} = 25 \cdot 10^4 = 2,5 \cdot 10^5$$

(B)

25) $I = \frac{\Delta \varphi}{\Delta t} \quad [I] = 1 \text{ cd}$

Birlik yotqan yoruglik

Burchakda tarqala-qimi



$$N = N_0 \cdot 2^{-\frac{t}{T}}$$

$$8 \cdot 10^{20} = 16 \cdot 10^{20} \cdot 2^{-\frac{t}{T}}$$

$$2^{-1} = 2^{-\frac{t}{T}}$$

$$T = t = 2 \text{ sutka}$$

$$N = 16 \cdot 10^{20} \cdot 2^{-\frac{8}{2}} = 1 \cdot 10^{20}$$

(A)

(27) spinlari (D)

(28) $W = P \cdot c$

$$P = \frac{W}{c}$$

$$m \cdot c = 2P = \frac{2W}{c} \Rightarrow v = \frac{2W}{m \cdot c}$$

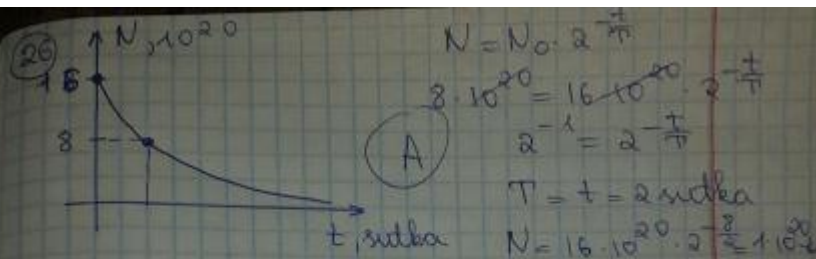
$$v = \frac{2 \cdot 15 \text{ J}}{1,6 \cdot 10^{-6} \text{ kg} \cdot 3 \cdot 10^8 \text{ m/s}} = 0,06 \text{ m/s}$$

(C)

(29) Bosh kvant soni - n atomning statSIONAR holat energiyasini xarakterlaydi va $n = 1, 2, 3, \dots$ butun sonlarni qabul qiladi (C)

(30) $W_8 = N W_{b1} = 204 \cdot 8 \text{ MeV} = 1632 \text{ MeV}$
 $= 1,63 \text{ GeV}$ (C)

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27) spinlari (D)

28) $W = P \cdot c$ $P = \frac{W}{c}$

$$m \cdot c^2 = 2P = \frac{2W}{c} \Rightarrow v = \frac{2W}{m \cdot c} \quad (C)$$

$$v = \frac{2 \cdot 15 \text{ J}}{1,6 \cdot 10^{-6} \text{ kg} \cdot 3 \cdot 10^8 \text{ m/s}} = 0,06 \text{ m/s}$$

29) Bosh kvant soni - n atomning statSIONAR holat energiyasini xarakterlaydi, va $n = 1, 2, 3, \dots$ butun sonlarni qabul qiladi (C)

30) $W_8 = N W_{81} = 204 \cdot 8 \text{ MeV} = 1632 \text{ MeV}$
 $= 1,632 \text{ GeV} \quad (C)$

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