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Umumiy kimyo

2-Qism

*Anorganik kimyo
*Organik kimyo
*Ma'lumotnomalar

KIRISH

“Kadrlar tayyorlash milliy dasturi” tizimida ta’limda uzluksizlikni ta’minlash bo’g’ini yoshlarni qiziqishi va iqtidorini e’tiborga olib, kasbga yo’naltirish hisoblanadi. Shundan kelib chiqib tabiiy va tibbiyot yo’nalishida Akademik litseylar o’quvchilari uchun ko’plab qo’llanma va darsliklar chop etilgan. Ularda asosan oliy oq’uv yurtlariga kirish uchun nazariy ma’lumotlar va amaliy mashg’ulotlar berilgan.

Qo’lingizdagi qo’llanma esa Akademik litseylarning tabiiy yo’nalishi 3 yillik o’quv rejasi asosida tuzilgan bo’lib, unda umumiy, anorganik va organik kimyodan nazariy ma’lumotlar, masalalarning yechimlari keltirilgan. Uni tayyorlashda mavzuni yoritish uchun iloji boricha qisqa va to’liqroq ma’lumot berishga harakat qilindi.

Hozirda kirish imtihonlarida test topshiriqlarini yechish usullari bo’yicha juda ko’p qo’llanmalar mavjudligiga qaramasdan, ularning ko’pchiligida masalalar yechish turli xil proportsiyalar tuzishga asoslanadi. Bu esa o’quvchida bir tomonlama, ya’ni faqat masalani yechimini topishdan boshqa maqsad qoldirmasligiga olib kelishi mumkin. Shuning uchun biz qo’llanmada iloji boricha test topshiriqlarini yechishda kimyoviy formulalardan foydalanishga, kattaliklarni to’g’ri keltirishga harakat qildik. Qo’llanmada barcha kattaliklar Xalqaro birliklar sistemasi (SI) va belgilashlariga mos tushadi.

Ushbu qo’llanmani Kimyodan mavzulashtirilgan testlar to’plami bilan birgalikda foydalanish maqsadga muvofiq. Chunki unda mustaqil yechish uchun masalalar keltirilmagan.

Qo’llanmadan Akademik litsey o’quvchilari, kirish imtihonlariga tayyorlanuvchi abituriyentlar va repetitorlar foydalanishlari mumkin.

Qo’’lanmani ko’rib chiqib o’z fikrlarini bildirganligi uchun mualliflar SamQXI qoshidagi 1 son Akademik litseyi kimyo fani o’qituvchisi G’ofurov A. ga, anorganik kimyo kafedrasi dotsenti, kimyo fanlari nomzodi, dotsent Lutfullayev E.L. larga chuqur minnatdorlik bildiradi.

Mualliflar ushbu qo’llanma bo’yicha barcha fikr va mulohazlarni quyidagi manzilda mamnuniyat bilan qabul qiladi. Samarqand shahri, 140104, Universitet xiyoboni ko’chasi 15, Samarqand davlat universiteti, Kimyo bo’limi, Anorganik kimyo kafedrasi, 408 xona.

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2-Qism

ANORGANIK KIMYO REAKSIYALARDA

ANORGANIK KIMYO REAKSIYALARDA
Mavzu: Vodorod – H_2

Olinishi:

Laboratoriyada:

1. Suyultirilgan kislotalarga metallar ta'siridan:

$$Zn+2HCl=ZnCl_2+H_2\uparrow$$

2. Amfoter metallarga ishqor ta'sir ettirib:

$$Al+NaOH+3H_2O=Na[Al(OH)_4]+1,5H_2\uparrow$$

Sanoatda:

1. Metanni konversiyalab:

$$CH_4+H_2O=CO+3H_2 \quad (t=800°C, kat)$$

2. Suv bug'ini cho'g'langan koksga ta'sir ettirib:

$$C+H_2O=CO+H_2 \qquad CO+H_2O=CO_2+H_2$$

3. Cho'g'langan temirga suv bug'i ta'siridan:

$$3Fe+4H_2O=Fe_3O_4+4H_2\uparrow$$

4. Suvni elektroliz qilib:

$$2H_2O=2H_2+O_2$$

Kimyoviy xossalari:

1. Kislorodda yorqin havorang alanga berib yonadi:

$$2H_2+O_2=2H_2O$$

2. Galogenlar, N_2 va S bilan oson ta'sirlashadi:

$$H_2+Cl_2=2HCl \quad N_2+3H_2=2NH_3 \quad H_2+S=H_2S$$

3. Ko'pchilik metal oksidlarini qaytaradi(vodorodotermiya):

$$CuO+H_2=Cu+H_2O \qquad WO_3+3H_2=W+3H_2O$$

4. Ishqoriy va ishqoriy yer metallari bilan gidridlar hosil qiladi:

$$Ca+H_2=CaH_2 \quad 2Na+H_2=2NaH$$

5. Molekulyar vodorod VIIIB guruh metallariga yaxshi yutiladi. Masalan, 1 hajm Pd 700 hajm vodorodni yutadi.

Mavzu: Gidridlar – EH_x

1. Tuzsimon gidridlar – ishqoriy va ishqoriy-yer metallarining gidridlari: LiH, NaH, KH, CsH, RbH, CaH_2, SrH_2 va BaH_2.
   Ular suv bilan ta'sirlashib vodorodni hosil qiladi:

$$CaH_2+2HOH=Ca(OH)_2+2H_2\uparrow$$

2. Kovalent gidridlar – IVA, VA, VIA va VIIA guruh elementlarining gidridlaridir. CH_4, SiH_4, NH_3, PH_3, H_2O, H_2S, HF, HCl, HBr, HJ, AsH_3, BeH_2 va BH_3.
3. Metal gidridlar – IB-VIIIB guruh elemntlarining gidridlaridir. Masalan, Pd-H_2.
4. Kompleks gidridlar – tuzsimon va kovalent gidridlaridan hosil bo'ladi.

$$NaH+BH_3=Na[BH_4]$$

Mavzu: Suv – H_2O

Kimyoviy xossalari:

1. Suv 1000°C dan yuqorida parchalanadi:

$$2H_2O\rightarrow 2H_2+O_2$$

2. Galogenlar bilan ta'sirlashadi:

$$H_2O+F_2=2HF+O \qquad H_2O+Cl_2=HCl+HClO$$

3. Cho'g'langan ko'mir bilan ta'sirlashadi:

$$C+H_2O=CO+H_2$$

4. Ishqoriy va ishqoriy-yer metallari bilan ta'sirlashadi:

$$2Na+2H_2O=2NaOH+H_2\uparrow$$

5. Asosli va kislotali oksidlar bilan ta'sirlashadi:

$$CaO+H_2O=Ca(OH)_2 \quad SO_3+H_2O=H_2SO_4$$

Mavzu: Ftor – F_2

Minerallari:

CaF_2 – flyuorit(plavik shpat) $Na_3[AlF_6]$ – kriolit $3Ca_3(PO_4)_2\cdot CaF_2$ – ftorappatit

Olinishi:

1. KF ning HF dagi suyuqlanmasini elektroliz qilib olinadi:

$$2KF=2K+F_2\uparrow$$

Kimyoviy xossalari:

1. Ftor juda aktiv metalmas. U faqatgina bevosita kislorod va azot bilan ta'irlashmaydi.

Mavzu: Vodorod ftorid – HF

Olinishi:

Flyuoritga kons.H_2SO_4 ta'siridan olinadi:

$$CaF_2+H_2SO_4=CaSO_4+2HF$$

Kimyoviy xossalari:

1. Plavik kislota shishani yemiradi:

$$SiO_2+4HF=SiF_4+2H_2O \qquad 2HF+SiF_4=H_2[SiF_6]$$

2. AgF suvda yaxshi eriydi.

Mavzu: Xlor – Cl_2

Minerallari:

KCl – silvin $KCl\cdot MgCl_2\cdot 6H_2O$ – karnallit $KCl\cdot MgSO_4\cdot 3H_2O$ – kainit

Olinishi:

Laboratoriyada:

1. Xlorid kislotaga oksidlovchilar ta'sir ettirib olinadi:

$$2KMnO_4+16HCl=2KCl+2MnCl_2+5Cl_2\uparrow+8H_2O$$
$$MnO_2+4HCl=MnCl_2+Cl_2\uparrow+2H_2O$$

Sanoatda:

1. Osh tuzi eritmasini elektroliz qilib olinadi:

$$2NaCl+2H_2O=2NaOH+Cl_2\uparrow+H_2\uparrow$$

Kimyoviy xossalari:

1. Xlor juda kuchli oksidlovchi. U vodorod va metallar bilan kuchli ta'sirlashadi:

$$H_2+Cl_2=2HCl \qquad 2Fe+3Cl_2=2FeCl_3 \qquad 2Sb+3Cl_2=2SbCl_3$$

2. U metalmaslar bilan ham ta'sirlashadi:

$$2P+3Cl_2=2PCl_3$$

3. Xlor suvda erib kislotalar aralashmasini hosil qiladi:

$$Cl_2+H_2O=HCl+HClO$$

4. Xlor sovuq ishqor eritmalari bilan xlorid va gipoxloritlar aralashmasini hosil qiladi:

$$Cl_2+2NaOH=NaCl+NaClO+H_2O$$ (Laborak suvi)

5. Xlor qaynoq ishqor eritmalari bilan xlorid va xloratlar aralashmasini hosil qiladi:

$$3Cl_2+6NaOH=5NaCl+NaClO_3+3H_2O$$

6. Xlor brom va yodni birikmalaridan siqib chiqaradi:

$$Cl_2+2NaBr=2NaCl+Br_2 \qquad Cl_2+2NaJ=2NaCl+J_2$$

Mavzu: Vodorod xlorid – HCl

Olinishi:

1. Sintez usuli bilan olinadi:

$$H_2+Cl_2=2HCl$$

2. Osh tuziga kons.H_2SO_4 ta'sir ettirib olinadi:

$$2NaCl+H_2SO_4=2HCl+Na_2SO_4 \qquad NaCl+H_2SO_4=NaHSO_4+HCl$$

Kimyoviy xossalari:

1. Xlorid kislota kuchli kislota hisoblanadi:

$$Fe+2HCl=FeCl_2+H_2\uparrow$$

2. 3 hajm kons.HCl va 1 hajm kons.HNO_3 aralashmasiga "zar suvi" yoki "podsho arog'i" deyiladi. Unda Au va Pt eriydi:

$$Au+3HCl+HNO_3=AuCl_3+NO\uparrow+2H_2O$$

3. Kuchlanishlar qatorida H_2 dan o'ngda turgan metallar HCl da erimaydi.

Mavzu: Xorning kislorodli birikmlari

Kislorodli kislotalari: $HClO$, $HClO_2$, $HClO_3$, $HClO_4$

Kimyoviy xossalari:

1. Gipoxlorit kislota juda kuchsiz kislota. Parchalanganda atomar kislorod ajralib chiqqanligi uchun juda kuchli oksidlovchi:

$$HClO=HCl+O$$

2. Gipoxloritlarni olish uchun xlor sovuq ishqor eritmasida eritiladi:
$$2KOH+Cl_2=KCl+KClO+H_2O$$ (Javell suvi)
3. Ohak eritmasiga xlor yuborilsa xlorli ohak hosil bo'ladi:
$$Ca(OH)_2+Cl_2=CaOCl_2+H_2O$$
4. Xlorli ohak havoda va kislotalar ta'siridan parchalanadi:
$$2CaClOCl+CO_2=CaCO_3+CaCl_2+Cl_2\uparrow \qquad CaClOCl+2HCl=CaCl_2+Cl_2\uparrow+H_2O$$
5. ClO_2 ishqorlarda erib disproporsilanadi:
$$2ClO_2+2KOH=KClO_2+KClO_3+H_2O$$
6. Xlorat kislota quyidagicha hosil qilinadi:
$$Ba(ClO_3)_2+H_2SO_4=BaSO_4+2HClO_3$$
7. Bertolle tuzi katalizatorsiz 400°C da parchalanganda xlorid va perxloratlar hosil bo'ladi:
$$4KClO_3\rightarrow 3KClO_4+KCl$$
8. Bertolle tuzi MnO_2 ishtirokida xlorid va kislorodni hosil qiladi:
$$2KClO_3\rightarrow 2KCl+3O_2\uparrow$$
9. Perxlorat kislota – $HClO_4$ eng kuchli kislorodli kislota hisoblanib, u perxloratlarga kons.H_2SO_4 ta'siridan olinadi:
$$KClO_4+H_2SO_4=KHSO_4+HClO_4$$
10. Perxloratlar oksidlovchilik xossasini namoyon qilmaydi.

Mavzu: Brom va yod – Br_2/J_2

Olinishi:

1. Bromidlarni/yodidlarni xlor bilan siqib chiqarib olinadi:
$$2KBr+Cl_2=2KCl+Br_2$$
$$2KJ+Cl_2=2KCl+J_2$$
2. HBr sintez yoki PBr_3 gidrolizidan olinadi:
$$PBr_3+3H_2O=H_3PO_3+3HBr$$

Kimyoviy xossalari:

1. Brom vodorod bilan qizdirilganda reaksiyaga kirishadi:
$$H_2+Br_2=2HBr$$
2. Brom kuchli oksidlovchi hisoblanadi:
$$SO_2+Br_2+2H_2O=2HJ+H_2SO_4$$
3. Yod ishqorda erib yodid va yodatlar aralashmasini hosil qiladi:
$$J_2+6NaOH=5NaJ+NaJO_3+3H_2O$$

Mavzu: Kislorod – O_2

Olinishi:

1. Parchalash reaksiyalari yordamida olinadi:
$$2KClO_3=2KCl+3O_2\uparrow$$
$$2KNO_3=2KNO_2+O_2\uparrow$$
$$2KMnO_4=K_2MnO_4+MnO_2+O_2\uparrow$$ (juda toza O_2)
$$2H_2O_2=2H_2O+O_2\uparrow$$
$$2BaO_2=2BaO+O_2\uparrow$$
$$2HgO=2Hg+O_2\uparrow$$
2. Ishqoriy metallar peroksidlarini CO_2 bilan ta'siridan:
$$2Na_2O_2+CO_2=2Na_2CO_3+O_2\uparrow$$ (akvalangda O_2 ni regeneratsiya qilish)
3. Sanoatda havoni fraksiyalab, yoki suvni elektroliz qilib:
$$2H_2O=2H_2+O_2$$

Kimyoviy xossalari:

1. Moddalar O_2 da yonganda oksidlar hosil bo'ladi:
$$S+O_2=SO_2 \qquad 4Li+O_2=2Li_2O \qquad 2Cu+O_2=2CuO \qquad 2H_2S+3O_2=2SO_2+2H_2O$$
2. Barcha organik moddalar O_2 da yonadi:
$$CH_4+2O_2=CO_2+2H_2O \qquad C_6H_{12}O_6+6O_2=6CO_2+6H_2O$$
3. Fosfor O_2 da yonganda 2 xil oksid hosil bo'ladi:

$4P+3O_2=2P_2O_3$ (O_2 kam) $4P+5O_2=2P_2O_5$ (O_2 mo'l)

Mavzu: Ozon – O_3

Olinishi:

1. Ozonatorda olinadi:

$$2O_3=3O_2$$

Kimyoviy xossalari:

1. Ozon juda kuchli oksidlovchi:

$$2Ag+O_3=Ag_2O+O_2\uparrow$$
$$3PbS+4O_3=3PbSO_4$$
$$3H_2S+4O_3=3H_2SO_4$$

Sifat reaksiya:

1. KJ eritmasi orqali o'tkazilganda binafsha rangli yod cho'kmasi hosil bo'ladi:

$$2KJ+O_3+H_2O=2KOH+J_2+O_2\uparrow$$

Mavzu: Vodorod peroksid – H_2O_2

Olinishi:

1. BaO_2 ga H_2SO_4 ta'siridan:

$$BaO_2+H_2SO_4=H_2O_2+BaSO_4$$

Kimyoviy xossalari:

1. MnO_2 katalizatori ishtirokida oson parchalanadi:

$$2H_2O_2=2H_2O+O_2\uparrow$$

2. H_2O_2 kuchsiz kislota xossasiga ega. Ishqorlar bilan peroksidlar hosil qiladi:

$$H_2O_2+Ba(OH)_2=BaO_2+2H_2O$$

3. H_2O_2 kuchli oksidlovchi hisoblanadi:

$$2KJ+H_2O_2=J_2+2KOH$$
$$PbS+4H_2O_2=PbSO_4+4H_2O$$

4. H_2O_2 kuchli oksidlovchilar bilan oksidlanadi:

$$2KMnO_4+3H_2SO_4+5H_2O_2=K_2SO_4+MnSO_4+5O_2\uparrow+8H_2O$$

Mavzu: Oltingugurt – S

Minerallari:

FeS – temir sulfid; FeS_2 – pirit; ZnS – rux aldamasi; $CaSO_4\cdot2H_2O$ – gips; $CaSO_4$ – angidrit; $BaSO_4$ – barit; $Na_2SO_4\cdot10H_2O$ – Glauber tuzi; $MgSO_4\cdot7H_2O$ – taxir tuz.

Olinishi:

1. Sanoatda quyidagicha olinadi:

$2H_2S+3O_2=2SO_2+2H_2O$ $2H_2S+SO_2=3S+2H_2O$

Kimyoviy xossalari:

1. Oltingugurt kislorodda yonib SO_2 ni hosil qiladi:

$$S+O_2=SO_2$$

2. Oltingugurt metallar va vodorod bilan qizdirilgan ta'sirlashadi:

$$S+H_2=H_2S$$
$$Fe+S=FeS$$

3. S qizdirilganda xlor bilan reaksiyaga kirishadi:

$$2S+Cl_2=S_2Cl_2$$

4. S qaynoq ishqorda disproporsialanadi:

$$3S+6NaOH=2Na_2S+Na_2SO_3+3H_2O$$

5. S kons.H_2SO_4 bilan reaksiyaga kirishib SO_2 ni hosil qiladi:

$$2H_2SO_4+S=2SO_2\uparrow+2H_2O$$

Mavzu: Vodorod sulfid – H_2S

Olinishi:

1. FeS ni HCl bilan ta'siridan:

$$FeS+2HCl=FeCl_2+H_2S\uparrow$$

2. Sintez usul bilan:

$$H_2+S=H_2S$$

Kimyoviy xossalari:

1. U to'la yonganda ko'kish alanga berib yonadi:

$$2H_2S+3O_2=2H_2O+2SO_2$$

2. U chala yonganda S hosil bo'ladi:

$$2H_2S+O_2=2S+2H_2O$$

Mavzu: Oltingugurt(IV)oksid - SO_2

Olinishi:

1. S yoki H_2S ning yonishidan:

$$S+O_2=SO_2 \qquad 2H_2S+3O_2=2H_2O+2SO_2$$

2. Sulfid va piritni yoqib olinadi:

$$2ZnS+3O_2=2ZnO+2SO_2\uparrow$$
$$4FeS_2+11O_2=2Fe_2O_3+8SO_2\uparrow$$

3. Misning konsentrlangan sulfat kislota bilan ta'siridan:

$$Cu+2H_2SO_4=CuSO_4+SO_2\uparrow+2H_2O$$

Kimyoviy xossalari:

1. U kislotalar ishtirokida yonib SO_3 ni hosil qiladi:

$$2SO_2+O_2=2SO_3$$

2. U suvda erib kuchsiz kislota – sulfit kislotani hosil qiladi:

$$SO_2+H_2O=H_2SO_3$$

Mavzu: Oltingugurt (VI) oksid – SO_3

Olinishi:

1. SO_2 ning oksidlanishidan hosil bo'ladi:

$$2SO_2+O_2=2SO_3 \quad \text{kat } (Pt,V_2O_5)$$

Kimyoviy xossalari:

1. U suv bilan sulfat kislotani hosil qiladi. Bu reaksiya kuchli ekzotermik:

$$SO_3+H_2O=H_2SO_4$$

2. Sulfat kislotada erib oleumni hosil qiladi. Uning asosiy tarkibi pirosulfat kislota hisoblanadi:

$$H_2SO_4+SO_3=H_2S_2O_7$$
$$H_2SO_4+nSO_3=H_2SO_4\cdot nSO_3 \quad \text{(oleum)}$$

Mavzu: Sulfat kislota – H_2SO_4

Olinishi:

1. Nitroza
2. Kontakt. Bu 2 usul bir-biri bilan faqat SO_2 ning oksidlanish jarayonida farq qiladi:

1-bosqich. Sulfid rudalari yoqiladi:

$$4FeS_2+11O_2=2Fe_2O_3+8SO_2\uparrow$$

2-bosqich. Nitroza usulida SO_2 NO katalizatorida oksidlanadi:

$$2SO_2+O_2=2SO_3$$

Kontakt usulida SO_2 V_2O_5 katalizatorida oksidlanadi:

$$2SO_2+O_2=2SO_3$$

3-bosqich. SO_3 kons. sulfat kislotaga yuttiriladi:

$$SO_3+H_2SO_4=H_2S_2O_7$$

Oleum suvga yuttiriladi:

$$H_2S_2O_7+H_2O=2H_2SO_4$$

Kimyoviy xossalari:

1. Sulfat kislota kuchli ikki asosli kislota hisoblanadi:

$$H_2SO_4\leftrightarrow H^+ + HSO_4^- \qquad HSO_4^-\leftrightarrow H^+ + SO_4^{2-}$$

2. U ko'pchilik kislotalarni tuzlaridan siqib chiqaradi:

$$CaF_2+H_2SO_4=CaSO_4+2HF$$

3. Suyultirilgan H_2SO_4 ko'pchilik nodirmas metallar bilan ta'sirlashib vodorod ajralib chiqadi:

$$Fe+H_2SO_{4(s)}=FeSO_4+H_2\uparrow$$

4. Konsentrlangan sulfat kislotadan hech qanday metal vodorodni siqib chiqara olmaydi. Chunki u kuchli oksidlovchi.

$$Cu+2H_2SO_{4(k)}=CuSO_4+SO_2\uparrow+2H_2O$$
$$2Ag+2H_2SO_{4(k)}=Ag_2SO_4+SO_2\uparrow+2H_2O$$

$$3Zn+4H_2SO_{4(k)}=3ZnSO_4+S+4H_2O$$

5. Konsentrlangan sulfat kislota ko'pchilik organik moddalardan suvni tortib oladi:

$$C_{12}H_{22}O_{11}+H_2SO_4=12C+H_2SO_4\cdot H_2O$$
$$HCOOH+H_2SO_4=CO\uparrow+H_2SO_4\cdot H_2O$$

6. U hatto ko'mirni ham oksidlashi mumkin:

$$C+2H_2SO_4=CO_2+2SO_2+2H_2O$$

7. Turli qaytaruvchilar kons.H_2SO_4 ta'sirida oksidlanadi:

$$2HBr+H_2SO_4=Br_2+SO_2\uparrow+2H_2O$$
$$3H_2S+H_2SO_4=4S+4H_2O$$

Mavzu: Tiosulfat kislota – $H_2S_2O_3$

Olinishi:

1. Tiosulfatlar sulfitlarga oltingugurt qo'shib qizdirib olinadi:

$$Na_2SO_3+S=Na_2S_2O_3 \qquad Na_2S_2O_3+2HCl=H_2S_2O_3+2NaCl$$

Kimyoviy xossalari:

1. Tiosulfatlar sulfat kislota ta'siridan eritma loyqalanadi(S hosil bo'lish hisobiga):

$$Na_2S_2O_3+H_2SO_4=Na_2SO_4+S+SO_2\uparrow+H_2O$$

Mavzu: Selenat kislota – H_2SeO_4

Kimyoviy xossalari:

1. Selenat kislota juda kucli oksidlovchi. Unda hatto oltin eriydi:

$$2Au+6H_2SeO_4=Au_2(SeO_4)_3+3SeO_2\uparrow+6H_2O$$

Mavzu: Azot – N_2

Olinishi:

Laboratoriyada.

1. NH_4NO_2 ni parchalab olinadi:

$$NH_4NO_2=N_2\uparrow+2H_2O$$

2. $(NH_4)_2Cr_2O_7$ ni parchalab olinadi:

$$(NH_4)_2Cr_2O_7=N_2\uparrow+Cr_2O_3+4H_2O$$

Sanoatda.

Havoni fraksion kondensatlab va distillab olinadi. Bunda birinchi bo'lib azot haydaladi.

Kimyoviy xossalari:

Azot molekulasi barqarorligi uchun u juda ham inert.

$$N_2\rightarrow 2N - 940\ kJ/mol$$

U passivligi jihatidan inert gazlardan keyin ikkinchi o'rinda turadi:

1. U faqat Li bilan xona sharoitida reaksiyaga kirishadi:

$$6Li+N_2=2Li_3N$$

2. U qolgan aktiv metallar bilan temperatura ta'sirida reaksiyaga kiirshib nitridlar hosil qiladi:

$$3Mg+N_2=Mg_3N_2$$

3. U vodorod va metalmaslar bilan ham yuqori temperaturada reaksiyaga kirishadi:

$$N_2+3H_2=2NH_3 \quad N_2+O_2=2NO$$

Mavzu: Ammiak – NH_3

Olinishi:

1. Laboratoriyada ammoniy tuzlariga kuchli asoslar ta'sir ettirib olinadi:

$$2NH_4Cl+Ca(OH)_2\rightarrow CaCl_2+2NH_3\uparrow+2H_2O$$

2. Nitridlarning parchalanishidan:

$$Mg_3N_2+6H_2O=3Mg(OH)_2+2NH_3\uparrow$$

3. Sanoatda sintez usuli bilan olinadi:

$$N_2+3H_2=2NH_3$$

Kimyoviy xossalari:

1. Suvdagi eritmasi asos xossasiga ega:

$$NH_3+H_2O\leftrightarrow NH_4OH$$

2. Ammiak katalizatorsiz yonganda N_2 hosil bo'ladi:

$$4NH_3+3O_2=2N_2+6H_2O$$

3. U katalizator ishtirokida yonganda NO ni hosil qiladi:

$$4NH_3+5O_2=4NO+6H_2O$$

4. Ammiakning suvli eritmasi xlor ishtirokida oksidlanadi:

$$8NH_3+Cl_2=N_2+6NH_4Cl$$

5. CuO ta'sirida oksidlanadi:

$$2NH_3+3CuO=3Cu+N_2\uparrow+3H_2O$$

6. Aktiv metallar bilan amidlar hosil bo'ladi:

$$2NH_3+2Na=2NaNH_2+H_2\uparrow$$

7. Kislotalar ta'sirida ammoniy tuzlarini hosil qiladi:

$$NH_3+HCl=NH_4Cl \qquad NH_3+HNO_3=NH_4NO_3$$
$$NH_3+H_2SO_4=NH_4HSO_4 \qquad 2NH_3+H_2SO_4=(NH_4)SO_4$$

8. NH_3 *d*-metallar tuzlari bilan ammiakatlar hosil qiladi:

$$AgCl+2NH_3\rightarrow[Ag(NH_3)_2]Cl \text{ eritma}$$

Mavzu: Gidrazin – N_2H_4

Olinishi:

1. NH_3 ni NaOCl bilan oksidlab olinadi:

$$2NH_3+NaOCl\rightarrow N_2H_4+NaCl+H_2O$$

Kimyoviy xossalari:

1. U kislorod va xlor ta'sirida oksidlanadi:

$$N_2H_4+O_2=N_2+2H_2O \qquad N_2H_4+2Cl_2=N_2+4HCl$$

Mavzu: Gidroksilamin – NH_2OH

Olinishi:

1. HNO_3 ning katod qaytarilishidan hosil bo'ladi.

$$HNO_3+6H=NH_2OH+2H_2O$$

Mavzu: Azot (II) oksidi – NO

Olinishi:

1. Labaratoriyada misga suyultirilgan HNO_3 ta'siridan olinadi:

$$3Cu+HNO_{3(s)}=3Cu(NO_3)_2+2NO\uparrow+4H_2O$$

2. Sanoatda NH_3 ni katalitik oksidlanishidan hosil bo'ladi:

$$4NH_3+5O_2=4NO+6H_2O$$

Kimyoviy xossalari:

1. U havoda qo'ng'ir rangli gaz hosil qiladi:

$$2NO+O_2=2NO_2$$

Mavzu: Nitrit kislota – HNO_2

Kimyoviy xossalari:

1. Nitrit kislota kuchli oksidlovchilar ta'siridan oksidlanib nitratlarga o'tadi:

$$5HNO_2+2KMnO_4+3H_2SO_4=K_2SO_4+2MnSO_4+5HNO_3+3H_2O$$

Mavzu: Azot(III)oksid – N_2O_3

Olinishi:

1. NO va NO_2 ning ekvimolyar aralashmasini sovutib olinadi:

$$NO+NO_2=N_2O_3$$

Mavzu: Azot(IV)oksid – NO_2

Olinishi:

1. Cu ni kons.HNO_3 da eritib olinadi:

$$Cu+4HNO_3=Cu(NO_3)_2+2NO_2\uparrow+2H_2O$$

Kimyoviy xossalari:

1. Suvda erib kislotalar aralashmasini hosil qiladi:

$$2NO_2+H_2O=HNO_3+HNO_2$$

2. Agar u issiq suvda erisa faqat bitta kislota hosil qiladi;

$$3NO_2+H_2O=2HNO_3+NO$$

3. Ishqorlarda erib tuzlar aralashmasini hosil qiladi.

$$2NO_2+2KOH=KNO_2+KNO_3+H_2O$$

4. U kislorod ishtirokida suvda erib nitrat kislotani hosil qiladi:

$$4NO_2+O_2+2H_2O=4HNO_3$$

Mavzu: Azot(IV)oksidi dimeri - N_2O_4

Olinishi:

1. NO_2 ning sovushidan hosil bo'ladi. Bunda qo'ng'ir rang yo'qoladi:

$$2NO_2=N_2O_4$$

Mavzu: Azot(V)oksid – N_2O_5

Olinishi:

1. Nitrat kislotani degidratlab olinadi:

$$2HNO_3+P_2O_5=2HPO_3+N_2O_5$$

Kimyoviy xossalari:

1. U suvda erib nitrat kislotani hosil qiladi:

$$N_2O_5+H_2O=2HNO_3$$

Mavzu: Nitrat kislota – HNO_3

Olinishi:

1. Laboratoriyada quruq nitratlarga kons.H_2SO_4 qo'shib qizdirib olinadi:

$$NaNO_3+H_2SO_4=HNO_3+NaHSO_4$$

2. Sanoatda Ostvald usulida olinadi (1915):

$$4NH_3+5O_2=4NO+6H_2O \quad (kat.\ Pt, Pd)$$

U keyin katalitik oksidlanadi:

$$2NO+O_2=2NO_2$$

Hosil bo'lgan NO_2 va O_2 suvga yuttiriladi:

$$4NO_2+O_2+2H_2O=4HNO_3$$

Kimyoviy xossalari:

Nitrat kislota kuchli oksidlovchi kislota

$HNO_3=H^++NO_3^-$

1. Nitrat kislota deyarli barcha metallar (Au, Pt, Os, Ir, Nb, Ta va W dan tashqari) va metalmaslar bilan ta'sirlashadi;

$$3As+5HNO_3+2H_2O=3H_3AsO_4+5NO\uparrow$$
$$S+6HNO_3=H_2SO_4+6NO_2\uparrow+2H_2O$$

2. Standart elektrod potensial qatorida vodoroddan keyin turgan metallar kons.HNO_3 da erib NO_2 ni hosil qiladi:

$$Cu+4HNO_3=Cu(NO_3)_2+2NO_2\uparrow+2H_2O$$

Agar suyultirilgan nitrat kislota ishlatilsa NO hosil bo'ladi:

$$3Cu+8HNO_3=3Cu(NO_3)_2+2NO\uparrow+4H_2O$$

3. Zn – Pb qatorida metallar NO ni hosil qiladi:

$$3Fe+8HNO_3=3Fe(NO_3)_3+2NO\uparrow+4H_2O$$

Juda suyultirilganda k-ta bilan NH_4^+ hosil bo'ladi;

$$4Fe+NO_3^-+10H^+=4Fe^{3+}+NH_4^++3H_2O$$

Kons HNO_3 ta'sirida Fe, Al, Cr passivlashadi:

4. Li – Mg qatoridagi metallar kons. HNO_3 bilan N_2O hosil qiladi:

$$4Mg+10HNO_3=4Mg(NO_3)_2+N_2O\uparrow+5H_2O$$

Juda suyultirilgan HNO_3 bilan NH_4NO_3 ni hosil qiladi

$$4Mg+10HNO_3=4Mg(NO_3)_2+NH_4NO_3+3H_2O$$

Faqat Co erkin azorgacha qaytariladi:

$$5Co+12HNO_3=5Co(NO_3)_2+N_2\uparrow+6H_2O$$

5. 1 mol kons. HNO_3 va 3 mol kons. HCl aralashmasi juda kuchli oksidlovchi hisoblanadi. U "zar suvi" yoki "podsho arog'i" deyiladi. U hatto Au va Pt ni oksidlaydi;

$$3Pt+4HNO_3+12HCl=3PtCl_4+4NO\uparrow+8H_2O$$

6. Nitrat kislota yorug'lik ta'sirida parchalanib qo'ng'ir rangli gaz ajratadi:

$$4HNO_3\rightarrow 2H_2O+4NO_2+O_2$$

Mavzu: Fosfor – P

Olinishi:

Kalsiy fosfatni qum ishtirokida ko'mir bilan qizdirib olinadi:

$$Ca_3(PO_4)_2+3SiO_2+5C=3CaSiO_3+2P+5CO\uparrow$$

Kimyoviy xossalari:

1. Uishqoriy va ishqoriy yer metallari bilan ta'sirlashib fosfidlar hosil qiladi:

$$3Ca+2P=Ca_3P_2$$

2. Fosfor metalmaslar bilan ta'sirlashib qaytaruvchilik xossasini namoyon qiladi:

$$4P+3O_2=2P_2O_3 \qquad 4P+5O_2=2P_2O_5$$
$$2P+3Cl_2=2PCl_3 \qquad 2P+5Cl_2=2PCl_5$$
$$2P+3S=P_2S_3 \qquad 2P+5S=P_2S_5$$

3. U kons. HNO_3 bilan ta'sirlashadi:

$$P+5HNO_3=H_3PO_4+5NO_2\uparrow+H_2O$$

Mavzu: Fosfin – PH_3

Olinishi:

1. Kalsiy fosfidni gidroliz qilib olinadi:

$$Ca_3P_2+6H_2O=3Ca(OH)_2+2PH_3\uparrow$$

Kimyoviy xossalari:

1. U NH_3 ga qaraganda kuchsiz asos xossasini namoyon qiladi:

$$PH_3+HCl=PH_4Cl$$ (fosfoniy xlorid)

2. U havoda fosfat kislotagacha oksidlanadi:

$$PH_3+2O_2=H_3PO_4$$

Mavzu: Fosfor (III) xlorid – PCl_3

U gidrolizga uchraydi:

$$PCl_3+3H_2O=H_3PO_3+3HCl$$

Mavzu: Fosfor (V) xlorid – PCl_5

U gidrolizga uchraydi:

$$PCl_5+4H_2O=H_3PO_4+5HCl$$

Mavzu: Fosfor (III) oksidi – P_2O_3

Olinishi:

1. Fosfor kislorod yetishmagan muhitda oksidlanib olinadi:

$$4P+3O_2=2P_2O_3$$

Kimyoviy xossalari:

1. U havoda qizdirilganda oksidlanadi:

$$P_2O_3+O_2=P_2O_5$$

2. U suvda fosfit kislotani hosil qiladi:

$$P_2O_3+3H_2O=2H_3PO_3$$

Mavzu: Fosfit kislota – H_3PO_3

Kimyoviy xossalari:

1. U ishqorlar bilan 2 xil tuzlarni hosil qiladi:

$$P_2O_3+2NaOH+H_2O=2NaH_2PO_3$$ (natriy gidrofosfit)
$$P_2O_3+4NaOH=2Na_2HPO_3+H_2O$$ (natriy fosfit)
$$H_3PO_3+NaOH=NaH_2PO_3+H_2O$$
$$H_3PO_3+2NaOH=Na_2HPO_3+2H_2O$$

2. Fosfit kislota qizdirilganda disproprsilanadi:

$$4H_3PO_3=PH_3\uparrow+3H_3PO_4$$

3. Fosfit kislota oksidlovchilar ta'sirida oksidlanadi:

$$H_3PO_3+Cl_2+H_2O=H_3PO_4+2HCl$$

Mavzu: Fosfor(V)oksid - P_2O_5

Olinishi:

1. Fosforni mo'l kislorodda yoqib olinadi;

$$4P+5O_2=2P_2O_5$$

Kimyoviy xossalari:

1. P_2O_5 soviq suvda eriganda metafosfat kislota hosil bo'ladi:

$$P_2O_5+H_2O=2HPO_3$$

2. P_2O_5 issiq suvda eriganda ortofosfat kislota hosil bo'ladi:

$$P_2O_5+3H_2O=2H_3PO_4$$

3. Bu 2 mol suv bilan ta'sirlashsa difosfat (pirofosfat) kislota hosilbo'ladi;

$$P_2O_5+2H_2O=H_4P_2O_7$$

Mavzu: Ortofosfat kislota - H_3PO_4

Olinishi:

1. Laboratoryada fosfat kislota fosforni 32% li nitrat kislotada eritib olinadi:

$$3P+5HNO_3+2H_2O=3H_3PO_4+5NO\uparrow$$

2. Sanoatda fosfat kislota ekstraksiyon va termik usulda olinadi:

a) Ekstraksiyon usulda maydalangan fosforit sulfat kislotada eritiladi:

$$Ca_3(PO_4)_2+3H_2SO_4=3CaSO_4+2H_3PO_4$$

b) Termik usulda fosforitdan fosfor olinadi. Olingan fosfor kislorodda oksidlantirilib P_2O_5 olinadi. P_2O_5 suvda eritilib fosfat kislota olinadi:

$$Ca_3(PO_4)_2+5C+3SiO_2=3CaSiO_3+5CO\uparrow+2P$$

$$4P+5O_2=2P_2O_5$$

$$P_2O_5+3H_2O=2H_3PO_4$$

Termik usulda olingan fosfat kislota ekstraksiya usulida olingan kislotaga qaraganda tozaligi va yuqori konsentratsiyali bo'lishi bilan ajralib turadi.

3. Kelajakda fosfat kislota chiqindisiz texnologiya asosida olinishi mumkin:

$$P_4+16H_2O=4H_3PO_4+10H_2\uparrow \quad (t=700°C \quad kat=Cu)$$

Kimyoviy xossalari:

1. U uch xil tuzlarni hosil qiladi:

$$NaOH+H_3PO_4=NaH_2PO_4+H_2O \quad \text{digidrofosfat}$$

$$2NaOH+H_3PO_4=Na_2HPO_4+2H_2O \quad \text{gidrofosfat}$$

$$3NaOH+H_3PO_4=Na_3PO_4+3H_2O \quad \text{fosfat}$$

2. U 200°C da qizdirilganda pirofasfat kislota hosil bo'ladi:

$$2H_3PO_4=H_4P_2O_7+H_2O$$

Mavzu: Fosforli o'g'itlar

Fosforli o'g'itlarga quyidagilar kiradi:

1. Fosforit yoki appatit – $Ca_3(PO_4)_2$ (16-35% P_2O_5)
2. Oddiy superfosfat :

$$Ca_3(PO_4)_2+2H_2SO_4=Ca(H_2PO_4)_2+2CaSO_4 \ (20\%\ P_2O_5)$$

3. Qo'sh superfosfat:

$$Ca_3(PO_4)_2+4H_3PO_4=3Ca(H_2PO_4)_2 \ (40\text{-}50\%\ P_2O_5)$$

4. Pretsipitat:

$$2CaCO_3+2H_3PO_4=2CaHPO_4\cdot 2H_2O+2CO_2\uparrow \ (30\text{-}35\%\ P_2O_5)$$

Mavzu: Azot saqlovchi o'g'itlar

1. Ammofos- $NH_4H_2PO_4$
2. Diammofos- $(NH_4)_2HPO_4$
3. Karbamid- $CO(NH_2)_2$

Karbamid yuqori bosimda ammiakni karbonat angidrid bilan reaksiyasidan hosil bo'ladi:

$$CO_2+2NH_3=CO(NH_2)_2+H_2O$$

Mavzu: Uglerod

Kimyoviy xossalari:

1. Uglerod kislorod yetishmagan muhitda CO ni hosil qiladi.

$$2C+O_2=2CO$$

2. Uglerod kislorodda to'la yonib CO_2 ni hosil qiladi:

$$C+O_2=CO_2$$

3. U ko'pchilik metallmaslar bilan ta'sirlashadi:

$$C+H_2O=CO+H_2 \qquad C+S=CS_2 \qquad C+2F_2=CF_4$$

Mavzu: Uglerod(II)oksid – CO

Olinishi:

Laboratoriyada chumoli kislotaga konsentrlangan sulfat kislota ta'siridan olinadi:

$$HCOOH=CO\uparrow+H_2O$$

1. Sanoatda quyidagi usullar bilan olinadi:

$$CO_2+C=2CO+(N_2)\ \text{Generator gazi}\ \ 2C+O_2+4N_2=2CO+4N_2$$

2. Shuningdek suv gazi ko'rinishida olinadi:

$$C+H_2O=CO+H_2$$

Kimyoviy xossalari:

1. U havoda ko'kish alanga berib yonadi:

$$2CO+O_2=2CO_2$$

2. U juda ko'p metallarning oksidlarini erkin metallargacha qaytaradi(karbotermiya):

$$NiO+CO=CO_2+Ni$$

$$Fe_3O_4+4CO=3Fe+4CO_2$$

3. CO ba'zi d- metallar bilan birikib karbonillar $\{Me(CO)_x\}$ hosil qiladi:

$$Ni+4CO=Ni(CO)_4 \quad Fe+5CO=Fe(CO)_5$$

4. CO ishqorlar bilan ta'sirlashib formiatlar hosil qiladi.

$$CO+NaOH=HCOONa$$

5. CO xlor va oltingugurt bilan ta'sirlashadi;

$$CO+Cl_2=COCl_2 \qquad CO+S=COS$$

6. U ZnO kat. ishtirokida yuqori bosim va 300°C da vodorod bilan birikib metanolni hosil qiladi:

$$CO+2H_2=CH_3OH$$

Mavzu: Uglerod(IV)oksid – CO_2

Olinishi:

Laboratoriyada $CaCO_3$ ga HCl ta'siridan Kipp apparatida olinadi:

$$CaCO_3+2HCl=CaCl_2+CO_2\uparrow+H_2O$$

1. Sanoatda ohaktosh kuydirilgandda hosil bo'ladi:

$$CaCO_3=CaO+CO_2\uparrow$$

2. Barcha organik moddalar va ko'mir yonganda ham CO_2 hosil bo'ladi:

$$CH_4+2O_2=CO_2+2H_2O \qquad C+O_2=CO_2 \qquad C_6H_{12}O_6+6O_2=6CO_2+6H_2O$$

Kimyoviy xossalari:

1. Uglerod bilan qaytarilganda CO hosil bo'ladi:

$$CO_2+C=2CO$$

2. Suvda erib kuchsiz kislota karbonat kislotani hosil qiladi:

$$CO_2+H_2O=H_2CO_3$$

3. CO_2 yonishga yordam bermasa ham aktiv metallar unda yonadi:

$$2Mg+CO_2=2MgO+C$$

4. Ishqorlarda erib karbonatlarni hosil qiladi:

$$CO_2+NaOH=NaHCO_3$$

$$CO_2=2NaOH=Na_2CO_3+H_2O$$

Sifat reaksiya:

CO_2 ajralib chiqayotganligi $Ca(OH)_2$ yoki $Ba(OH)_2$ orqali shu gazni o'tkazib aniqlanadi. Bunda eritma loyqalanadi:

$$CO_2+Ca(OH)_2=CaCO_3\downarrow+H_2O$$

Mavzu: Uglerod disulfid – CS_2

Ko'mirni oltingugurt bilan qizdirib olinadi:

$$C+2S=CS_2$$

U tez alangalanuvchan modda:

$$CS_2+3O_2=CO_2+2SO_2$$

Mavzu: Galogenidlari – $CГ_4$

$$CH_4+4Cl_2=CCl_4+4HCl \qquad CS_2+2Cl_2=CCl_4+2S$$

Mavzu: Uglerodning azotli birikmalari

1. Disian – C_2N_2

$$Hg(CN)_2\rightarrow Hg+C_2N_2$$

2. Vodorod sianid – HCN

Olinishi:

1. Sianidlarga kislota ta'siridan olinadi:

$$2KCN+H_2SO_4=2HCN=K_2SO_4$$

Boshqa birikmlari:

Sianat kislota – H-O-C≡N Izosianat kislota – H-N=C=O

Tiosianat kislota – H-S-C≡N (Rodanidlar) Izotiosianat kislota – H-N=C=S

Mavzu: Karbidlar

1. Atsetilenidlar – ishqoriy/ishqoriy-yer metallarining karbidlari.

Li_2C_2, Na_2C_2, MgC_2, CaC_2, SrC_2, BaC_2

Ular gidrolizidan atsetilen hosil bo'ladi:

$$CaC_2+2HOH=Ca(OH)_2+C_2H_2\uparrow$$

2. Metanidlar – Al_4C_3 va Be_2C

Ular gidrolizidan metan hosil bo'ladi:

$$Al_4C_3+12HOH=4Al(OH)_3+3CH_4\uparrow$$

3. Olmossimon karbidlar – B_3C va SiC. Charxtoshlarda ishlatiladi:

4. Fe_3C – sementit.

Mavzu: Karbonat kislota – H_2CO_3

Olinishi:

1. CO_2 ni suvga yuttirib olinadi;

$$CO_2+H_2O=H_2CO_3$$

Kimyoviy xossalari:

1. Karbonat kislota kuchsiz ikki asosli kislota

Mavzu: Karbonatlar

Kimyoviy xossalari:

1. Li_2CO_3 dan boshqa ishqoriy metallarning karbonatlari parchalanmasdan suyuqlanadi. Qolganlari qizdirilganda parchalanadi:

$$CaCO_3\rightarrow CaO+CO_2\uparrow \qquad Cu(OH)_2\cdot CuCO_3\rightarrow 2CuO+CO_2\uparrow+H_2O$$

2. Gidrokarbonatlar qizdirilganda osonroq parchalanadi:

$$Ca(HCO_3)_2\rightarrow CaCO_3+CO_2\uparrow+H_2O \qquad 2NaHCO_3\rightarrow Na_2CO_3\uparrow+CO_2+H_2O$$

Mavzu: Soda ishlab chiqarish

Na_2CO_3 – soda, kalsinirlangan soda; $NaHCO_3$ – ichimlik soda

$Na_2CO_3\cdot 10H_2O$ – kristall soda

Olinishi:

1. Leblan usuli:

$$Na_2SO_4+2C=Na_2S+2CO_2\uparrow$$

$$Na_2S+CaCO_3=Na_2CO_3+CaS \text{ (toza emas)}$$

2. Solvey usuli (Ammiakli usul)

$$NaCl+NH_3+CO_2+H_2O=NaHCO_3+NH_4Cl$$

$$2NaHCO_3\rightarrow Na_2CO_3+CO_2\uparrow+H_2O \text{ (toza)}$$

3. Elektrolitik usul:

$$NaOH+CO_2=NaHCO_3$$

Mavzu: Kremniy - Si

Olinishi:

1. SiF_4 ni K bilan qaytarib olinadi:

$$SiF_4+4K=Si+4KF$$

2. SiO_2 ni Mg yoki Al bilan qaytarib olinadi:

$$SiO_2+2Mg=2MgO+Si \qquad 3SiO_2+4Al=3Si+2Al_2O_3$$

3. Juda toza kremniy $SiCl_4$ ni vodorod bilan qaytarib olinadi:

$$SiCl_4+2H_2=Si+4HCl$$

Kimyoviy xossalari:

1. Yuqori temperaturada kislorodda yonadi:

$$Si+O_2=SiO_2$$

2. Faqat ftor bilan odatdagi sharoitda ta'sirlashadi:

$$Si+2F_2=SiF_4$$

3. Issiq ishqorlarda eriydi:

$$Si+2NaOH+H_2O=Na_2SiO_3+2H_2\uparrow$$

4. SiO_2 ishqorlarda erib silikatlarni hosil qiladi:

$$SiO_2+2NaOH=Na_2SiO_3+H_2O$$

5. Uni faqat ftorid kislota eritadi:

$$SiO_2+4HF=SiF_4+2H_2O$$

Mavzu: Silan – SiH_4

Olinishi:

1. Magniy silitsidga xlorid kislota ta'siridan olinadi:

$$Mg_2Si+4HCl=2MgCl_2+SiH_4\uparrow$$

Kimyoviy xossalari:

1. Silan havoda o'z-o'zidan alangalanadi:

$$SiH_4+2O_2=SiO_2+2H_2O$$

2. U suv bilan quyidagicha ta'sirlashadi:

$$SiH_4+2H_2O=SiO_2+4H_2$$

Mavzu: Kremniyning galogenli birikmalari – $SiГ_4$

Olinishi:

$$SiO_2+4HF=SiF_4+2H_2O$$
$$SiO_2+2Cl_2+2C=SiCl_4+2CO$$

Mavzu: Shisha

Olinishi:

$$Na_2CO_3+CaCO_3+6SiO_2=Na_2O\cdot CaO\cdot 6SiO_2+2CO_2\uparrow$$

$K_2O\cdot CaO\cdot 6SiO_2$ – Eruvchan shisha

Mavzu: Metallarning olinish usullari

Metallarning olinishi 3 ga bo'linadi:

1. Pirometallurgiya – yuqori temperaturada biror qaytaruvchi bilan qaytarish. Qaytaruvchiga ko'ra yana farqlanadi:
   a) Vodorodotermiya – H_2 bilan qaytarish:
   $$WO_3+3H_2=W+3H_2O \qquad MoO_3+3H_2O=Mo+3H_2O$$
   b) Karbotermiya – C va CO bilan qaytarish:
   $SnO_2+2C=Sn+2CO$ $ZnO+CO=Zn+CO_2$ (bu usulda Fe, Pb, Sn, Cu, Zn, Ni, Cd va Mn olinadi)
   c) Alyumotermiya – Al bilan qaytarish:
   $$3Mn_3O_4+8Al=9Mn+4Al_2O_3$$

Pirometallurgiyada agar metal sulfid holida bo'lsa, avval yoqilib oksid holiga keltiriladi:

$$2Zn+3O_2=2ZnO+2SO_2$$

2. Gidrometallurgiya – avval metal eruvchan holga keltirilib eritmaga o'tkaziladi, so'ngra biror aktivroq metal bilan qaytariladi:

$$4Au+8NaCN+2H_2O+O_2=4Na[Au(CN)_2]+4NaOH$$
$$Zn+2Na[Au(CN)_2]=Na_2[An(CN)_4]+2Au$$
$$Fe+CuSO_4=Cu+FeSO_4$$

3. Elektrometallurgiya – elektroliz usulida olish:

$$CuSO_4+H_2O=Cu+H_2SO_4+0{,}5O_2\uparrow$$

Ishqoriy metallar, ishqoriy-yer metallar, Mg va Al suyuqlanma elektrolizi yordamida olinadi:

$$2NaCl=2Na+Cl_2\uparrow \qquad 2Al_2O_3=4Al+3O_2\uparrow$$

Mavzu: Ishqoriy metallar

Kimyoviy xossalari:

1. Kislorodda yonib faqat Li oksid hosil qilsa, qolganlari peroksid va nadperoksidlar hosil qiladi:

$$4Li+O_2=2Li_2O \qquad 2Na+O_2=Na_2O_2 \qquad K+O_2=KO_2$$

2. Suv bilan shiddatli ta'sirlashadi:

$$2K+2HOH=2KOH+H_2\uparrow$$

Mavzu: Litiy – Li

Olinishi:

LiCl va KCl suyuqlanmasini elektroliz qilib olinadi:

$$2LiCl=2Li+Cl_2\uparrow$$

Kimyoviy xossalari:

1. Kislorodda yonib oksid hosil qiladi:

$$4Li+O_2=2Li_2O$$

2. Suv bilan odatdagi sharoitda ta'sirlashib H_2 ni siqib chiqaradi:

$$2Li+2H_2O=2LiOH+H_2\uparrow$$

3. Li azot bilan xona temperaturasida ta'sirlashasi:

$$6Li+N_2=2Li_3N$$

4. Li barcha galogenlar, S va H_2 bilan ta'sirlashadi:

$$2Li+Cl_2=2LiCl \quad 2Li+H_2=2LiH$$

5. Li magniyga diagonal o'xshash element. Uning karbonati, fosfat va fosfiti kam eriydi. Li_2CO_3 qizdirilganda parchalanadi:

$$Li_2CO_3\rightarrow Li_2O+CO_2\uparrow$$

Mavzu: Natriy – Na

Minerallari:

NaCl – tosh tuz $NaCl\cdot KCl$ – silvinit $Na_2SO_4\cdot 10H_2O$ – Glauber tuzi

$Na_3[AlF_6]$ – Kriolit $NaNO_3$ – Chili selitrasi $Na_2B_4O_7\cdot 10H_2O$ – bura

Olinishi:

1. NaOH yoki NaCl suyuqlanmasini elektroliz qilib olinadi:

$$2NaOH=2Na+2H_2O+O_2\uparrow \qquad 2NaCl=2Na+Cl_2\uparrow$$

Kimyoviy xossalari:

1. Kislorod bilan ta'sirlashib peroksid hosil qiladi:

$$2Na+O_2=Na_2O_2$$

2. Suv bilan shiddatli ta'sirlashib vodorodni siqib chiqaradi:

$$2Na+2HOH=2NaOH+H_2\uparrow$$

3. Galogenlar, S va H_2 bilan ta'sirlashadi:

$$2Na+Cl_2=2NaCl \quad 2Na+S=Na_2S \qquad 2Na+H_2=2NaH$$

Mavzu: Kaliy – K

Minerallari:

KCl – silvin $KCl\cdot MgCl_2\cdot 6H_2O$ – karnallit $KCl\cdot MgSO_4\cdot 3H_2O$ – kainit

Olinishi:

1. KOH suyuqlanmasini elektroliz qilib olinadi:

$$2KOH=2K+2H_2O+O_2\uparrow$$

Kimyoviy xossalari:

1. Kislorodda yonib asosan superoksidni hosil qiladi:

$$K+O_2=KO_2$$

2. Suv bian yonish orqali ta'sirlashadi. Galogenlar bilan portlaydi:

$$2K+Br_2=2KBr$$

Mavzu: Berilliy – Be

Olinishi:

1. BeF_2 ni vakuumda Ca bilan qizdirib olinadi:

$$BeF_2+Ca=CaF_2+Be$$

Kimyoviy xossalari:

1. Kislorodda qizdirilganda yonadi:

$$2Be+O_2=2BeO$$

2. Suyultirlgan kislotalarda eriydi:

$$Be+H_2SO_4=BeSO_4+H_2\uparrow$$

3. Ishqorlar bilan berillatlar hosil qiladi:

$$Be+2NaOH=Na_2BeO_2+H_2\uparrow$$

4. Berilliy karbid metanid hisoblanadi;

$$Be_2C+4H_2O=2Be(OH)_2+CH_4\uparrow$$

5. $Be(OH)_2$ amfoterlik xossasini namoyon qiladi;

$$Be(OH)_2+H_2SO_4=BeSO_4+2H_2O$$

$$Be(OH)_2+2NaOH=Na_2[Be(OH)_4]$$

Mavzu: Magniy – Mg

Minerallari:

$MgCO_3$ – magnezit $CaCO_3 \cdot MgCO_3$ – dolomit $KCl \cdot MgCl_2 \cdot 6H_2O$ – karnallit

Olinishi:

1. $MgCl_2$ suyuqlanmasini elektroliz qilib olinadi:

$$MgCl_2=Mg+Cl_2\uparrow$$

Kimyoviy xossalari:

1. Havoda Mg sirti oksid parda bilan qoplanadi;

$$2Mg+O_2=2MgO$$

2. Sovuq suv bilan sekin, issiq suv bilan tez ta'sirlashib, H_2 ni siqib chiqaradi:

$$Mg+2HOH=Mh(OH)_2+H_2\uparrow$$

3. $Mg(OH)_2$ oq kukun, suvda kam eriydi. Ammoniy tuzlari $Mg(OH)_2$ cho'kmsi tushishiga xalaqit beradi:

$$MgSO_4+2NaOH=Mg(OH)_2+Na_2SO_4$$

Mavzu: Kalsiy – Ca

Minerallari:

$CaCO_3$ – bor, ohaktosh, marmar, kalsit $CaCO_3 \cdot MgCO_3$ – dolomit $CaSO_4 \cdot 2H_2O$ – gips CaF_2 – flyuorit, plavik shpat $Ca_3(PO_4)_2$ – fosforit

Olinishi:

1. $CaCl_2$ suyuqlanmasini elektroliz qilib olinadi:

$$CaCl_2=Ca+Cl_2\uparrow$$

Kimyoviy xossalari:

1. Kislorodda yonib oksid hosil qiladi:

$$2Ca+O_2=2CaO$$

2. Suv bilan shiddatli ta'sirlashib ohakli suvni hosil qiladi:

$$Ca+2H_2O=Ca(OH)_2+H_2\uparrow$$

3. Azot ta'sirida nitrid hosil qiladi:

$$3Ca+N_2=Ca_3N_2$$

Mavzu: Kalsiy birikmalari

Olinishi:

1. CaO ohaktoshni parchalab olinadi:

$$CaCO_3\rightarrow CaO+CO_2\uparrow$$

Kimyoviy xossalari:

1. CaO – so'ndirilmagan ohak. U suvda erib $Ca(OH)_2$ – so'ndirilgan ohakni hsoil qiladi:

$$CaO+H_2O=Ca(OH)_2$$

2. $Ca(OH)_2$ CO_2 ta'sirida loyqalanadi:

$$Ca(OH)_2+CO_2=CaCO_3+H_2O$$

3. $CaCO_3$ suspenziyasi orqali CO_2 o'tkazilsa eritma holiga o'tadi va tiniqlashadi:

$$CaCO_3+CO_2+H_2O=Ca(HCO_3)_2$$

4. CaC_2 atsetilenid hisoblanadi:

$$CaC_2+2HOH=Ca(OH)_2+C_2H_2\uparrow$$

Mavzu: Suvning qattiqligi va uni yo'qotish usullari

Vaqtinchalik qattiqlikni yo'qotish:

1. Qaynatib yo'qotiladi:

$$Ca(HCO_3)_2\rightarrow CaCO_3+CO_2\uparrow+H_2O$$

2. Ohak qo'shib yo'qotiladi:

$$Ca(HCO_3)_2+Ca(OH)_2=2CaCO_3+2H_2O$$

Doimiy qattiqlikni yo'qotish:

1. Soda yoki natriy fosfat qo'shib:

$$3CaSO_4+2Na_3PO_4=Ca_3(PO_4)_2+3Na_2SO_4$$

$$MgSO_4+Na_2CO_3=MgCO_3+Na_2SO_4$$

2. Kationit yoki anionitdan foydalaniladi.

Mavzu: Bor – B

Olinishi:

$$B_2O_3+3Mg=2B+3MgO$$

Kimyoviy xossalari:

1. Bor suyultilgan kislotalarda erimaydi. U konsentrlangan nitrat kislotada eriydi:

$$B+3HNO_3=B(OH)_3+3NO_2$$

2. Diboran B_2H_6 gidrolizdan vodorod ajraladi:

$$B_2H_6+6H_2O=2B(OH)_3+6H_2\uparrow$$

3. BF_3 gidrolizidan tetraftorborat kislota, qolganlaridan galogenovodorodlar hosil bo'ladi:

$$4BF_3+3H_2O=B(OH)_3+3H[BF_4]$$
$$BCl_3+3H_2O=B(OH)_3+3HCl$$

Mavzu: Alyuminiy – Al

Minerallari:

$Na_3[AlF_6]$ – kriolit Al_2O_3 – korund $Al_2O_3\cdot 2H_2O$ – boksit

Olinishi:

1. Al_2O_3 ning kriolitdagi suyuqlanmasini elektroliz qilib olinadi:

$$2Al_2O_3=4Al+3O_2\uparrow$$

Kimyoviy xossalari:

1. Al havoda yupqa oksid parda bilan qoplanadi:

$$4Al+3O_2=2Al_2O_3$$

2. Suyultirilgan kislotalarda eriydi:

$$2Al+6HCl=2AlCl_3+3H_2\uparrow$$

3. Ishqorlarda oson eriydi:

$$2Al+2NaOH+6H_2O=2Na[Al(OH)_4]+3H_2\uparrow$$

4. Kons. HNO_3 da erimaydi;
5. $Al(OH)_3$ tuzlariga ishqor ta'sir ettirib olinadi:

$$Al_2(SO_4)_3+6NaOH=2Al(OH)_3+3Na_2SO_4$$

6. $Al(OH)_3$ amfoter;

$$Al(OH)_3+3HCl=AlCl_3+3H_2O$$
$$Al(OH)_3+NaOH=Na[Al(OH)_4]$$

7. Granula holidagi Al metallarni payvandlashda ishlatiladi(termit reaksiyasi):

$$3Fe_3O_4+8Al=4Al_2O_3+9Fe$$

Mavzu: Germaniy – Ge

Kimyoviy xossalari:

1. Ge kislorodda yonganda (IV) oksid hosil qiladi:

$$Ge+O_2=GeO_2$$

Mavzu: Qalay – Sn

Olinishi:

1. SnO_2 ni 1000°C ko'mir bilan qaytarib olinadi:

$$SnO_2+2C=Sn+2CO\uparrow$$

Kimyoviy xossalari:

1. Sn kislorodda yonganda (IV) oksid hosil qiladi:

$$Sn+O_2=SnO_2$$

2. Suyultirilgan kislotalarda erib Sn(II) birikmalarini hsoil qiladi:

$$Sn+2HCl=SnCl_2+H_2\uparrow$$

3. Kons. sulfat kislotada erib Sn(IV) birikmalarini hsoil qiladi:

$$Sn+4H_2SO_4=Sn(SO_4)_2+2SO_2\uparrow+4H_2O$$

Mavzu: Qo'rg'oshin – Pb

Olinishi:

1. Asosan pirometallurgiya usulida olinadi:

$$2PbS+3O_2=2PbO+2SO_2$$
$$PbO+CO=Pb+CO_2$$

Kimyoviy xossalari:

1. Havoda oksidlanganda PbO_2 ni hosil qiladi:

$$Pb+O_2=PbO_2$$

2. Nitrat kislotada oson eriydi:

$$3Pb+8HNO_3=3Pb(NO_3)_2+2NO\uparrow+4H_2O$$

3. Suyultirilgan kislotalarda, masalan sirka kislotada yaxshi eriydi:

$$Pb+2CH_3COOH=(CH_3COO)_2Pb+H_2\uparrow$$

Mavzu: Surma va vismut – Sb va Bi

Olinishi:

1. Pirometallurguya usuli bilan olinadi:

$$Sb_2S_3+3Fe=2Sb+3FeS \qquad Bi_2O_3+3C=2Bi+3CO$$

Kimyoviy xossalari:

1. Sb va Bi kislorodda yonadi:

$$4Sb+3O_2=2Sb_2O_3 \qquad 4Bi+3O_2=2Bi_2O_3$$

2. Sb va Bi elektrod potensiallar qatorida H_2 dan o'ngda joylashganligi uchun suyultirilgan kislotalarda erimaydi.
3. Sb va Bi kons. nitrat va kons.sulfat kislotalarda eriydi:

$$2Sb+6H_2SO_4=Sb_2(SO_4)_3+3SO_2\uparrow+6H_2O$$
$$Bi+4HNO_3=Bi(NO_3)_3+NO\uparrow+2H_2O$$

4. Sb va Bi ning galogenidlari gidrolizga uchraydi:

$$SbCl_3+H_2O=SbOCl+2HCl \qquad BiCl_3+H_2O=BiOCl+2HCl$$

Mavzu: Temir – Fe

Minerallari:

Fe_3O_4 – magnetit, magnitli temirtosh Fe_2O_3 – gematit, qizil temirtosh
$FeCO_3$ – siderit FeS_2 – pirit FeS – temir kolchedani

Olinishi:

1. Asosan pirometallurgiya usulida olinadi:

$$Fe_2O_3+2Al=2Fe+Al_2O_3 \qquad Fe_2O_3+3H_2=2Fe+3H_2O$$

2. Juda toza temir karbonillardan olinadi:

$$Fe(CO)_5\rightarrow Fe+5CO$$

Kimyoviy xossalari:

1. Temir havoda oksidlanadi:

$$3Fe+2O_2=Fe_3O_4$$

2. Temir yuoqri temperaturada suv bug'lari bilan ta'sirlashadi:

$$3Fe+4H_2O=Fe_3O_4+4H_2$$

3. Xlor va S bilan reaksiyaga kirishadi:

$$2Fe+3Cl_2=2FeCl_3 \qquad Fe+S=FeS$$

4. Suyultirilgan kislotalarda erib Fe(II) birikmalarini hosil qiladi:

$$Fe+2HCl=FeCl_2+H_2\uparrow \qquad Fe+H_2SO_4=FeSO_4+H_2\uparrow$$

5. Temirning oksidlari quyidagi reaksiyalar asosida olinadi:

$$2Fe(OH)_3\rightarrow Fe_2O_3+3H_2O \qquad Fe(OH)_2\rightarrow FeO+H_2O$$

6. Gidrokdilari tegishli tuzlariga ishqor ta'sir ettirib olinadi:

$$FeCl_2+2NaOH=Fe(OH)_2+2NaCl \qquad FeCl_3+3NaOH=Fe(OH)_3+3NaCl$$

7. $Fe(OH)_2$ oson oksidlanib Fe(III) birikmalariga o'tadi:

$$4Fe(OH)_2+2H_2O+O_2=4Fe(OH)_3$$

8. Temirning sulfatlari quyidagicha olinadi:

$$Fe+H_2SO_{4(s)}=FeSO_4+H_2\uparrow \qquad Fe_2O_3+3H_2SO_4=Fe_2(SO_4)_3+3H_2O$$

9. Temirning (+VI) birikmlari temir birikmalarini ishqoriy muhitda oksidlanishidan hosil bo'ladi:

$$Fe_2O_3+3KNO_3+4KOH=2K_2FeO_4+3KNO_2+2H_2O$$
$$2Fe(OH)_3+10KOH+3Br_2=2K_2FeO_4+6KBr+8H_2O$$

10. Sariq qon tuzi va qizil qon tuzi quyidagi reaksiyalar asosida olinadi:

$$Fe(CN)_2+4KCN=K_4[Fe(CN)_6] \qquad 2K_4[Fe(CN)_6]+Br_2=2K_3[Fe(CN)_6]+2KBr$$

11. Sariq qon tuzi va qizil qon tuzi Fe^{3+} va Fe^{2+} ionlarini aniqlashda ishlatiladi:

$$4FeCl_3+3K_4[Fe(CN)_6]=Fe_4[Fe(CN)_6]_3+12KCl$$ (Berlin lazuri)
$$3FeCl_2+2K_3[Fe(CN)_6]=Fe_3[Fe(CN)_6]_2+6KCl$$ (Turnbul ko'ki)

Mavzu: Xrom – Cr

Minerallari:

$Cr_2O_3 \cdot FeO$ – xromit, xromli temirtosh $PbCrO_4$ – krokoit

Olinishi:

1. Alyumotermiya usulida olinadi:

$$Cr_2O_3+2Al=2Cr+Al_2O_3$$

Kimyoviy xossalari:

1. Oksidlanganda Cr_2O_3 hosil bo'ladi:

$$4Cr+3O_2=2Cr_2O_3$$

2. Suyultirilgan kislotarlarda erib Cr(II) birikmalarini hosil qiladi:

$$Cr+2HCl=CrCl_2+H_2\uparrow$$

3. Sovuq kons.HNO_3 da erimaydi. Chunki passivlashadi.
4. Cr_2O_3 ammoniy bixromat parchalanganda hosil bo'ladi:

$$(NH_4)_2Cr_2O_7 \rightarrow N_2\uparrow+Cr_2O_3+4H_2O$$

5. $Cr(OH)_3$ xrom(III) tuzlariga ishqor ta'sir ettirib olinadi:

$$Cr_2(SO_4)_3+6NH_4OH=2Cr(OH)_3+3(NH_4)_2SO_4$$

6. $Cr(OH)_3$ amfoter hisoblanadi:

$$Cr(OH)_3+3HCl=CrCl_3+3H_2O$$

$$Cr(OH)_3+3NaOH=Na_3[Cr(OH)_6]$$

7. Xrom(II) birikmalari beqaror. CrO $Cr(OH)_2$ parchalanganda hosil bo'ladi:

$$CrCl_2+2KOH=Cr(OH)_2+2KCl \qquad Cr(OH)_2 \rightarrow CrO+H_2O$$

8. Xrom(VI) oksid kaliy bixromat eritmasiga kons.H_2SO_4 ta'siridan yorqin qizil ignasimon kristall holida cho'kadi:

$$K_2Cr_2O_7+H_2SO_4=K_2SO_4+2CrO_3+H_2O$$

9. H_2CrO_4 – xromat kislota. O'rtacha kuchdagi ikki asosli kislota.
10. $H_2Cr_2O_7$ – bixromat kislota. Kuchli ikki asosli kislota.
11. Xromatlar ishqoriy va neytral muhitda barqaror. Kislotali muhitda bixromatlarga o'tadi:

$$2CrO_4^{2-}+2H^+ \leftrightarrow Cr_2O_7^{2-}+H_2O \quad 2K_2CrO_4+H_2SO_4=K_2Cr_2O_7+K_2SO_4+H_2O$$

$$K_2Cr_2O_7+2KOH=2K_2CrO_4+H_2O$$

12. Xromatlar kuchli oksidlovchilar hisoblanadi. Kislotali muhitda Cr(III) birikmalariga qaytariladi:

$$K_2Cr_2O_7+14HCl=2KCl+2CrCl_3+3Cl_2\uparrow+7H_2O$$

Mavzu: Molibden – Mo

Olinishi:

1. Alyumotermiya yoki vodorodotermiya usulida olinadi:

$$MoO_3+2Al=Mo+Al_2O_3 \qquad MoO_3+3H_2=Mo+3H_2O$$

Kimyoviy xossalari:

1. Yuqori temperaturada kislorod bilan ta'sirlashadi:

$$2Mo+3O_2=2MoO_3$$

Mavzu: Volfram – W

Olinishi:

1. Vodorodotermiya usulida olinadi:

$$MoO_3+3H_2=Mo+3H_2O$$

Kimyoviy xossalari:

1. Juda yuqori temperaturada kislorod bilan ta'sirlashadi:

$$2W+3O_2=2WO_3$$

2. Deyarli hech qaysi kislotada erimaydi.

Mavzu: Marganets – Mn

Minerallari:

MnO_2 – pirolyuzit Mn_3O_4 – gausmanit MnS – marganets aldamasi

Olinishi:

1. Alyumotermiya usulida olinadi:

$$3Mn_3O_4+8Al=9Mn=4Al_2O_3$$

Kimyoviy xossalari:

1. Havoda yonganda Mn_3O_4 hosil bo'ladi:

$$3Mn+2O_2=Mn_3O_4$$

2. Suyultirilgan kislotalarda erib Mn(II) birikmalarini hosil qiladi:

$$Mn+2HCl=MnCl_2+H_2\uparrow$$

3. Suyultirilgan nitrat kislotada eriydi:

$$3Mn+8HNO_3=3Mn(NO_3)_2+2NO\uparrow+4H_2O$$

4. Mn(II) birikmlari asos xossaga ega. $Mn(OH)_2$ suvda yaxshi erimasa ham kuchli asos hisoblanadi:

$$MnCl_2+2NaOH=Mn(OH)_2+2NaCl$$

5. MnO_2 oksidlovchilik xossasini namoyon qiladi:

$$MnO_2+4HCl=MnCl_2+Cl_2\uparrow+2H_2O$$

6. MnO_2 amfoterlik xossasini namoyon qiladi:

$$MnO_2+Ca(OH)_2=CaMnO_3+H_2O$$

7. Mn(VI) birikmalari quyi birikmlarini oksidlanishidan hosil bo'ladi:

$$MnCl_2+2KNO_3+2Na_2CO_3=Na_2MnO_4+2KNO_2+2CO_2\uparrow+2NaCl$$

8. Mn(VII) birikmalari uning quyi birikmalarining oksidlanishidan hosil bo'ladi:

$$2K_2MnO_4+Cl_2=2KMnO_4+2KCl$$

9. $KMnO_4$ kuchli oksidlovchi hisoblanadi. Kislotali muhitda Mn^{2+}(*rangsiz*), neytral muhitda MnO_2(*qo'ng'ir cho'kma*) va kislotali muhitda MnO_4^{2-}(*to'q yashil*) gacha qaytariladi:

$$KMnO_4(pH<7)Mn^{2+} \qquad KMnO_4(pH=7)MnO_2 \qquad KMnO_4(pH>7)K_2MnO_4$$

10. $KMnO_4$ qizdirilganda parchalanadi:

$$2KMnO_4\rightarrow K_2MnO_4+MnO_2+O_2\uparrow$$

Mavzu: Texnetsiy va Reniy – Tc va Re

Kimyoviy xossalari:

1. Kislorodda yonganda +7 birikmlarini hsoil qiladi:

$$4Tc+7O_2=2Tc_2O_7$$

2. Reniy elektrod potensiallar qatorida H_2 dan o'ngda turadi. Shuning uchun suyultirilgan kislotalarda erimaydi:

$$3Re+7HNO_3=3HReO_4+7NO\uparrow+2H_2O$$

3. $HReO_4$ kuchli kislota.

Mavzu: Rux – Zn

Olinishi:

1. Ikki xil usulda: quruq va eritmada olinadi:

Quruq:

$$2ZnS+3O_2=2ZnO+2SO_2 \qquad ZnO+CO=Zn+CO_2$$

Eritmada:

$ZnO+H_2SO_4=ZnSO_4+H_2O$ keyin elektroliz qilinadi.

Kimyoviy xossalari:

1. Kislorodda oksidlanadi:

$$2Zn+O_2=2ZnO$$

2. Suyultirilgan kislotalarda tez eriydi:

$$Zn+2HCl=ZnCl_2+H_2\uparrow \qquad Zn+H_2SO_4=ZnSO_4+H_2\uparrow$$

3. Rux amfoter bo'lganligi uchun ishqorlarda eriydi:

$$Zn+2NaOH+2H_2O=Na_2[Zn(OH)_4]+H_2\uparrow$$

4. Konsentrlangan sulfat kislotada eriganda cho'kma va gazlar aralshmasi hosil bo'ladi:

$$8Zn+11H_2SO_4=8ZnSO_4+H_2S\uparrow+S+SO_2\uparrow+10H_2O$$

Mavzu: Simob – Hg

Olinishi:

1. Kinovarni yoqib olinadi:

$$HgS+O_2=Hg+SO_2$$

Mavzu: Mis – Cu

Minerallari:

$CuFeS_2$ – xalkopirit Cu_2S – xalkozin, mis yaltirog'I $CuCO_3\cdot Cu(OH)_2$ – malaxit

Olinishi:

1. Sulfid rudalarini yoqib olinadi:

$$Cu_2S+O_2=2Cu+SO_2$$

2. Mis tuzlarini eritmada Fe yoki Zn bilan qaytarib olinadi:

$$CuSO_4+Zn=Cu+ZnSO_4$$

3. Toza mis eritma elekrtolizidan (rafinirlash) yo'li bilan olinadi:

$$Cu_{q(Anod)}+CuSO_4+H_2O=Cu_{t(Katodda)}+CuSO_4+H_2O$$

Kimyoviy xossalari:

1. Havoda qizdirilganda qorayib CuO ni hosil qiladi:

$$2Cu+O_2=2CuO$$

2. Standart elektrod potensiallar qatorida H_2 dan o'ngda turganligi uchun suyultirilgan kislotalarda erimaydi.
3. Har qanday konsentratsiyali nitrat kislotada eriydi:

$$3Cu+8HNO_{3(s)}=3Cu(NO_3)_2+2NO\uparrow+4H_2O$$
$$Cu+4HNO_{3(k)}=Cu(NO_3)_2+2NO_2\uparrow+2H_2O$$

4. $Cu(OH)_2$ ko'k paxtasimon chokma holida cho'kadi:

$$Cu(NO_3)_2+2KOH=Cu(OH)_2+2KNO_3$$

Mavzu: Kumush – Ag

Olinishi:

1. Sulfid rudalaridan siyanidli usul yordamida olinadi:

$$4Ag+8KCN+2H_2O+O_2=4K[Ag(CN)_2]+4KOH$$
$$2K[Ag(CN)_2]+Zn=2Ag+K_2[Zn(CN)_4]$$

Kimyoviy xossalari:

1. Ag nodir metal hisoblanadi. H_2S bilan kislorod ishtirokida ta'sirlashadi:

$$4Ag+2H_2S+O_2=2Ag_2S+2H_2O$$

2. Har qanday konsentratsiyali HNO_3 da eriydi:

$$Ag+2HNO_{3(k)}=AgNO_3+NO_2\uparrow+H_2O$$

Mavzu: Oltin – Au

Olinishi:

1. Siyanidli usul yordamida olinadi:

$$4Au+8KCN+2H_2O+O_2=4K[Au(CN)_2]+4KOH$$
$$2K[Au(CN)_2]+Zn=2Au+K_2[Zn(CN)_4]$$

Kimyoviy xossalari:

1. Oltin eng nodir metal hisoblanadi. U havo, kislota va ishqorlar ta'siriga chidamli. Zar suvida eriydi:

$$Au+HNO_3+3HCl=AuCl_3+NO\uparrow+2H_2O$$
$$Au+HNO_3+4HCl=H[AuCl_4]+NO\uparrow+2H_2O$$

Mavzu: Titan – Ti

Olinishi:

1. Titan quyidagicha olinadi:

$$TiO_2+2C+2Cl_2=TiCl_4+2CO \qquad TiCl_4+2Mg=Ti+2MgCl_2$$

Kimyoviy xossalari:

1. Titan suv va mineral kislotalar ta'siriga chidamli. Yuqori temperaturada kislorod bilan ta'sirlashadi:

$$Ti+O_2=TiO_2$$

2. Yuqori temperaturada azot bilan nitrid hosil qiladi:

$$2Ti+N_2=2TiN$$

3. Granula holida HNO_3 da eriydi:

$$3Ti+4HNO_3+H_2O=3H_2TiO_3+4NO\uparrow$$

4. Granula holida issiq sulfat kislotada eriydi:

$$Ti+3H_2SO_4=TiSO_4+Ti(SO_4)_2+3H_2\uparrow$$

5. Kons.H_2SO_4 bilan qizdirilganda reaksiyaga kirishadi:

$$2Ti+6H_2SO_4=Ti_2(SO_4)_3+3SO_2\uparrow+6H_2O$$

3-Qism

ORGANIK KIMYO

* Nazariy ma'lumot

*Ma'lumotlar

ORGANIK KIMYO

I BOB. ORGANIK BIRIKMALAR TUZILISHI NAZARIYASI VA ORGANIK REAKSIYALARNING TURLARI.

Mavzu: Organik kimyo faniga kirish.

"Organik kimyo" fani termini 1808 yil shved olimi Bersellius tomonidan fanga kiritilgan.

XVIII asr o'rtalarida juda kam organik moddalar o'rganilgan. Masalan, sirka chumoli, benzoy va qahrabo kislotalar, Sheele tabiiy moddalardan vino, sut, limon, olma kislotalarni va glitserinni ajratib olgan.

Dastlabki organik sintezlar quyidagilar:

1824 yil Vyoler ditsiandan oksalat kislotani sintez qildi, 1828 yil ammoniy sianatdan mochevinani sintez qildi.

1845 yil Kolbe sirka kislotani, Bertlo chumoli kislotani, etil spirt, C_2H_2, benzol, metan va yog'ni sintez qildi.

Ta'rif: *"Organik kimyo – uglerod brikmalarining kimyosidir".*

1861 yil rus olimi A.M. Butlerov "organik birikmalar tuzilishi nazariyasini" e'lon qiladi. Uning asosiy hollari quyidagilar:

1. Organik birikmalarda uglerod atomlari o'zaro ma'lum tartibga ko'ra birikadi.
2. Moddaning kimyoviy xossasi uning miqdoriy va sifat tarkibiga bog'liq.
3. Agar bitta molekula bir xil miqdordagi va bir xil molekulyar massaga ega bo'lgani bilan, tuzilishi har xil bo'lsa, u holda *izomeriya* hodisasi kuzatiladi.
4. Moddaning kimyoviy xossasi modda molekulasi tarkibidagi atomlar guruhi o'zaro ta'siriga bog'liq.

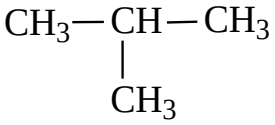
Ta'rif: *Tarkibi va molekulyar massasi bir xil, tuzulishi va xossalari har xil bo'lgan moddalar izomerlar deyiladi.*

$CH_3 – CH_2 – OH$ C_2H_6O $CH_3 – O – CH_3$

etanol – spirt dimetil efir – oddiy efir

Izomeryaning bir qancha turlari bor:

1) *Uglerod skeleti bo'yicha izomeriya*:

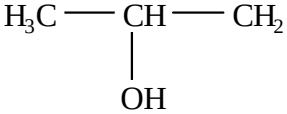


$CH_3 – CH_2 – CH_2 – CH_3$

n-butan (tarmoqlanmagan) izobutan (tarmoqlangan)

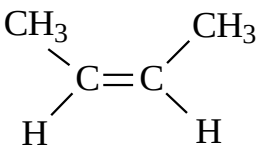
2) *Holat izomeriya, funksional guruh holatiga ko'ra izomeriya:*

$CH_3 – CH_2 – CH_2 – OH$

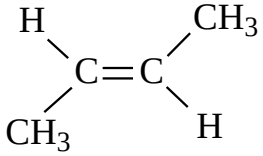


propanol -1 propanol -2

3) *Geometrik izomeriya (sis-, trans - izomeriya),* qo'shbog' tutgan organik birikmalarda kuzatiladi:



sis – buten – 2



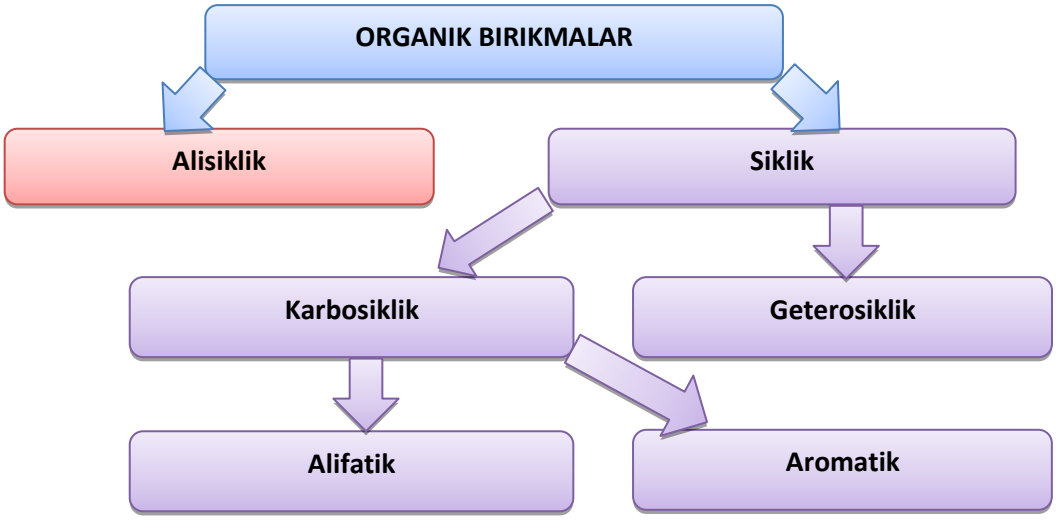
trans – buten – 2

4) *Optik izomeriya* – ular qutblangan yorug'lik nuruni o'ng yoki chap tomoniga buradi. Agar o'ngga bursa – D, chapga bursa – L izomer deyiladi.

Mavzu: Organik birirkmalarning klassifikatsiyasi.

Organik birikmalar turlicha klassifikatsiyalanadi.

1. Alisiklik – siklik bo'lmagan birikmalar.
2. Siklik birikmalarga bo'linadi (ilovaga qarang).



Mavzu: Organik reakiyalarning turlari.

Reaksiyalarni klassifikatsiyalashda kimyoviy o'zgarish va ayni molekuladagi bog' uzilishi hisobga olinadi.

Kimyoviy o'zgarishlarga ko'ra reaksiyalar quyidagicha bo'linadi:

1) Birikish
2) Ajralish
3) O'rin olish.

Birikish reaksiyalarida asosan to'yinmagan ya'ni karrali bog'ga ega molekulalar ishtirok etadi va qo'shbog' yoki uchbog' uziladi. Bunday reaksiyalar ***A*** (*Addition*) harfi bilan belgilanadi.

Bunday reaksiyalarning bir qancha turlari bor:

a) *Gidrogenlanish* – ya'ni Ni, Pt yoki Pd katalizatori ishtirokida vodorod birikish reaksiyasi:

$$CH_2{=}CH_2 + H_2 \rightarrow CH_3{-}CH_3$$

b) *Gidratlanish* – suv molekulalarining birikishi. Masalan, etilen gidratlanganda etanol hosil bo'ladi:

$$CH_2{=}CH_2 + H_2O \rightarrow CH_3{-}CH_2{-}OH$$

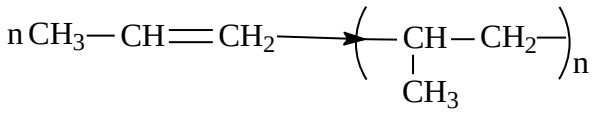
c) *Galogenovodorod* birikish reaksiyalari – HF, HCl, HBr va HJ birikishi:

$$CH_2{=}CH{-}CH_3 + HCl \longrightarrow CH_3{-}\underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}}{-}CH_3$$

d) *Galogenlanish* – F_2, Cl_2, Br_2 va J_2 birikishi:

$$CH_2{=}CH_2 + Cl_2 \longrightarrow \underset{\displaystyle Cl}{\overset{\displaystyle |}{CH_2}}{-}\underset{\displaystyle Cl}{\overset{\displaystyle |}{CH_2}}$$

e) *Polimerlanish* reaksiyasi – ya'ni kichik molekulyar massali to'yinmagan molekulalardan yuqori molekulyar birikmalar (YuMB) hosil bo'lish reaksiyalari:



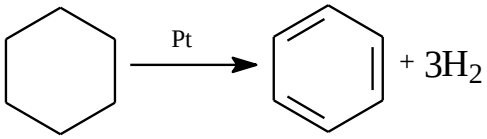
propilen polipropilen

f) *Siklobirikish* reaksiyasi – masalan, Dills-Alder reaksiyasi.

Ajralish reaksiyalarida atom yoki atomlar guruhi ajralib chiqadi va karrali bog'lar hosil bo'ladi. Bunday reaksiyalar ***E*** (*Elimination*) harfi bilan belgilanadi.

Ajralash reaksiyalarining bir qancha turlari bor:

a) *Degidrogenlanish* – ya'ni vodorod ajralish reaksiyasi:



b) *Degidratlanish* – ya'ni suv ajralib chiqish reaksiyasi:

$$CH_3 - CH_2 - OH \xrightarrow[t°C]{t > 170°C} CH_2 = CH_2 + H_2O$$

c) *Degidrogalogenlanish* – ya'ni galogenovodorod ajralish reaksiyasi:

$$CH_2Br–CHBr–CH_3 \xrightarrow{KOH,\ spirt} CH{\equiv}C–CH_3 + 2HBr$$

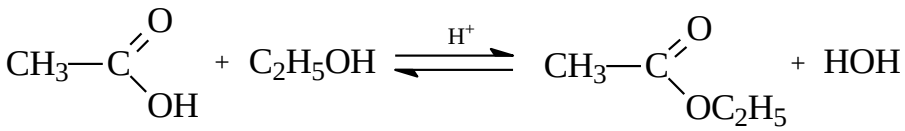
O'rin olish reaksiyalarida molekuladagi atom yoki atomlar guruhi boshqasiga almashinadi. Bunday reaksiyalar ***S*** (*Substitution*) harfi bilan belgilanadi.

O'rin olish reaksiyalari organik kimyoda muhim o'rin tutadi.

a) *Galogen almashinish* reaksiyasi, ya'ni vodorodning galogenga almashinishi:

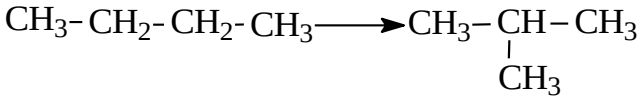
$$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$$

b) *Kondensatsiya* reaksiyasi – quyi molekulyar birikma ajralishi bilan amalga oshadigan reaksiyalar. Masalan, eterifikatsiya reaksiyasi:



c) *Polikondensatsiya* reaksiyasi – polimerlanishdan farq qilib, quyi molekulyar birikmlar ta'siridan polimer hosil bo'lishi bilan birga past molekulyar massali modda qo'shimcha sifatida hosil bo'ladi. Masalan, fenolformaldegid smolasi, kapron va h.k.lar.

Yuqoridagi 3 ta reaksiyadan tashqari qayta guruhlansih va izomerlanish reaksiya ham uchraydi.



Bog'ning uzilishi va qayta hosil bo'lishiga ko'ra reaksiyalar 2 ga bo'linadi:

1) *Gomogen* uzilish (erkin radikal mexanizmi):

$$A : B \leftrightarrow A^{\bullet} + B^{\bullet}$$

2) *Geterogen* uzilish (ion mexanizm)

$$A : B \leftrightarrow [A :]^{-} + [B]^{+}$$

II BOB. UGLEVODORODLAR.

Mavzu: Uglevodorodlar.

Ta'rif: *Tarkibida faqat uglerod va vodorod atomlari tutgan organik moddalarga uglevodorodlar deyiladi.*

Uglevodorodlar 2 ga bo'linadi

1. To'yingan uglevodorodlar – a) alkanlar b) sikloalkanlar
2. To'yinmagan uglevodorodlar – a) alkenlar b) alkinlar c) alkadiyenlar d) poliyenlar e) arenlar.

Mavzu: Alkanlar

Ta'rif: *Tarkibida faqat σ – bog'lar tutgan uglevodorodlarga alkanlar deyiladi.*

Ularning umumiy formulasi C_nH_{2n+2}.

Gibridlanishi – sp^3.

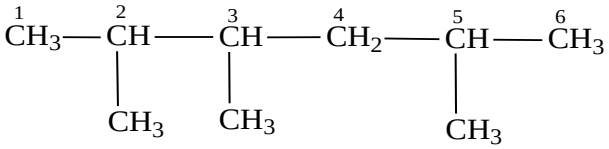
Ta'rif: *Uglerod soni ortishi bilan bir yoki bir necha – CH_2 guruhiga farq qiladigan va xossalari o'xshash moddalarga gomologlar deyiladi.*

Alkanlarning gomologik qatori

Formulasi	Nomi	Agregat holati	Formulasi	Nomi	Agregat holati
CH_4	metan	Gaz	C_8H_{18}	oktan	Suyuq
C_2H_6	etan		C_9H_{20}	nonan	
C_3H_8	propan		$C_{10}H_{22}$	dekan	
C_4H_{10}	butan		$C_{15}H_{32}$	pentadekan	
C_5H_{12}	pentan	Suyuq	$C_{20}H_{42}$	eykozan	Qattiq
C_6H_{14}	geksan		$C_{100}H_{202}$	gektan	
C_7H_{16}	geptan				

Izomeriyasi va nomenklaturasi: alkanlarni IUPAC bo'yicha nomlashda quyidagiga e'tibor beriladi:

1) Eng uzun uglerod zanjiri tanlanadi.
2) Tarmoqqa yaqin tomondan raqamlanadi va radikal nomi ko'rsatiladi.
3) Dastlab kichik radikal, keyin kattarog'i aytiladi.



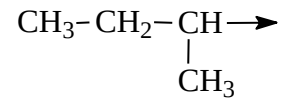
2,3,5-trimetilgeksan

Radikallar bu alkandan vodorod yo'qolganda qolgan qoldiq hisoblanadi va C_nH_{2n+1} formulaga muvofiq keladi.

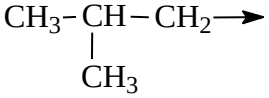
$CH_3 \rightarrow$ metil

$CH_3\text{-}CH_2 \rightarrow$ etil

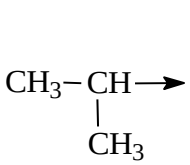
$CH_3 - CH_2 - CH_2 \rightarrow$ propil



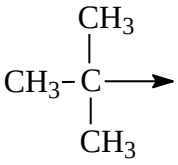
ikkilamchi butil



izobutil



izopropil



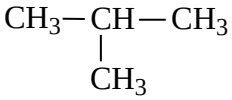
uchlamchi butil

$CH_3 – CH_2 – CH_2 – CH_2 \rightarrow$ butil

Tarmoqlanmagan zanjirga ega alkanlar *normal alkanlar*, tarmoqlanganlari *izo – alkanlar* deyiladi.

Alkanlarda izomeriya – tuzulishi izomeriasi (zanjir) hisoblanadi. Izomeriya butandan boshlanadi.

$CH_3 – CH_2 – CH_2 – CH_3$



n-butan

2 – metil propan (izobutan)

Uglerod soni ortishi bilan izomerlar soni ortadi. Masalan pentanda 3 ta, geptanda 9 ta, oktanda – 18, dekanda – 75.

Tabiatda uchrashi:

Alkanlarning asosiy manbai – tabiiy gaz va neft hisoblanadi.

Olinishi:

1) Uglerodni gidrogenlab (H_2 qo'shib):

$$C+2H_2=CH_4$$

2) CO_2 va CO ni katalitik gidrogenlab olinadi:

$$CO_2+4H_2 \xrightarrow{400°C,\ Ni} CH_4+2H_2O$$

Laboratoriyada

1) Al_4C_3 ni gidrolizlab:

$$Al_4C_3+12H_2O=4Al(OH)_3+3CH_4$$

2) Vyurs reaksiyasi, ya'ni galogenalkenlarga Na ta'siridan olinadi.

$$2R – Br + 2Na \rightarrow R – R+2NaBr$$

$$CH_3Br+2Na+CH_3Br \rightarrow \underset{\text{etan}}{CH_3 – CH_3} +2NaBr$$

brommetan

$$3CH_3Cl+6Na+3CH_3\text{-}CH_2\text{-}Cl \rightarrow \underset{\text{etan}}{C_2H_6} + \underset{\text{propan}}{C_3H_8} + \underset{\text{butan}}{C_4H_{10}}+6NaCl$$

3) Karbon kislota tuzlarini ishqor qo'shilib qizdirib olinadi.

$$CH_3 – COONa + NaOH \xrightarrow{t°C} CH_4 + Na_2CO_3$$

$$R – COONa+NaOH \xrightarrow{t°C} R – H + Na_2CO_3$$

4) To'yinmagan uglevodorodlarni gidrogenlab olinadi.

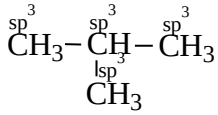
$$\underset{\text{eten}}{CH_2=CH_2}+H_2 \xrightarrow{Ni} \underset{\text{etan}}{C_2H_6}$$

Fizikaviy xossalari:

Alkanlarda uglerod soni ortishi bilan suyuqlanish va qaynash temperaturasi ortadi. Tarmoqlanmagan alkanlar tarmoqlangan alkanlarga qaraganda yuqori suyuqlanish va qaynash temperaturasiga ega. Alkanlar suvda erimaydi.

Molekula tuzulishi:

Alkanlarda uglerod atomlari faqat sp^3 gibridlangan holda bo'ladi.



1) sp^3 – 4x4=16 ta 2) s – 10 ta valent burchagi 109°28’ ga teng.

Kimyoviy xossalari:

Alkanlar “parafin” lar ham deyiladi va ancha inert hisoblanadi. Alkanlarda barcha uglerod atomlari vodorod atomlari vododrod atomi bilan to’yinganligi uchun birikish reaksiyalariga kirishmaydi.

1) Alkanlar galogenlar bilan oson ta’sirlashadi:

$$CH_4+Cl_2 \xrightarrow{h\nu} CH_3Cl+HCl$$

2) Reaksiya zanjir mexanizmi asosida boradi va buni Semyonov ochgan.

$$CH_4+Cl_2 \xrightarrow[-HCl]{hv} \underset{\text{metan}}{CH_3Cl} \xrightarrow[-HCl]{+Cl_2} \underset{\text{xlormetan}}{CH_2Cl_2} \xrightarrow[-HCl]{+Cl_2} \underset{\text{dixlormetan}}{CHCl_3} \xrightarrow[-HCl]{+Cl_2} \underset{\text{tetraxlormetan}}{CCl_4}$$

trixlormetan xloroform

3) Alkanlar nitrat kislota bilan reaksiyaga kirishadi:

$$R–H + HNO_3 \xrightarrow{t°C} R–NO_2+HOH$$

$$CH_4 + HNO_3 \xrightarrow{t°C} \underset{\text{nitrometan}}{CH_3–NO_2} + HOH$$

bu reaksiyaga Konovalov reaksiyasi deyiladi.

4) Alkanlar kislorod ta’sirida oson yonadi. Bunda karbonat angidrid va suv hosil bo’ladi:

$$CH_4 + 2O_2 = CO_2 + 2H_2O$$

$$C_nH_{2n+2} + 1{,}5n+0{,}5O_2 = nCO_2 + n+1H_2O$$

5) Alkanlar yuqori temperaturada degidrogenlanadi (H_2 molekulasi ajralib chiqib karrali bog’lar hosil bo’ladi):

$$CH_3–CH_3 \xrightarrow{t°C} CH_2=CH_2 + H_2$$

$$2CH_4 \xrightarrow{1500°C} CH{\equiv}CH + 3H_2$$

6) Alkanlar $AlCl_3$ yoki $AlBr_3$ ishtirokida qizdirilganda izomerlanadi. Bunda zanjir tarmoqlanadi:

$$\text{n-Alkan} \xrightarrow{AlCl_3} \text{Izoalkan}$$

$$\underset{\text{n-butan}}{CH_3-CH_2-CH_2-CH_3} \longrightarrow \underset{\text{izobutan}}{CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3}$$

Ishlatilishi:

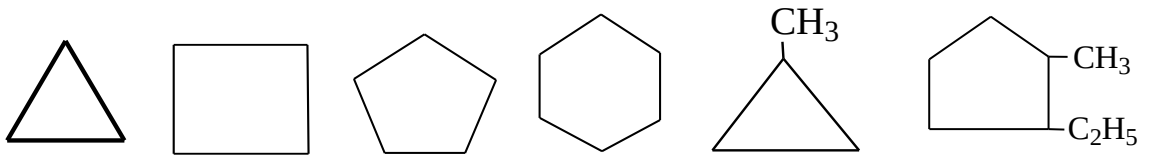
Alkanlar eng asosiysi yoqilg’ilardan biri hisoblanadi. Masalan, CH_4 tabiiy gazning 90-95% gacha qismini tashkil qiladi. Geksan va xloroform qutbsiz erituvchi sifatida, CCl_4 o’t o’chirishda ishlatiladi.

Mavzu: Sikloalkanlar.

Ta’rif: *Uglerod atomlari o’zaro faqat σ-bo’lgan bilan bog’langan, yopiq xalqali uglevodorodlarga sikloalkanlar deyiladi.*

Ularning umumiy formulasi: C_nH_{2n}. Gibridlanishi – sp^3

Nomlanishi: Sikloalkanlarni nomlashda zanjirdagi uglerod soniga “*siklo*” – so’zi qo’shiladi.



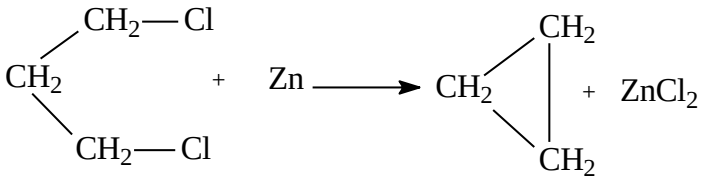
siklopropan siklobutan siklopentan siklogeksan metilsikopropan 1-metil-2- etilsiklopentan

Tabiatda uchrashi:

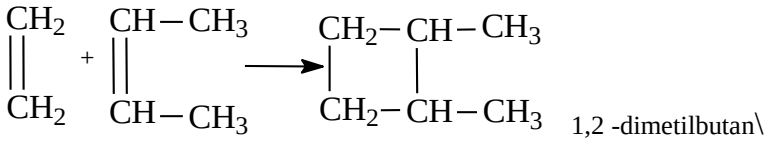
Sikloalkanlar va ularning hosilalari neft va o'simliklar tarkibida uchraydi. Rus olimi V.V.Markovnikov neftdan C_5H_{10} va C_6H_{12} larni ajratib oldi va bu sinfni kashf qiladi.

Olinishi:

1) Ajratilgan digalogenli hosilalarga Zn ta'siridan olinadi.

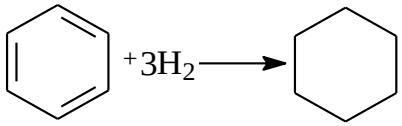


2) Alkenlarni dimerlab olinadi:



1,2 -dimetilbutan\

3) Benzolni gidrogenlab olinadi:



benzol siklogeksan

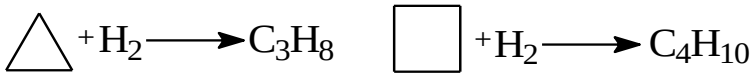
Fizikaviy xossalari:

C_3H_6, C_4H_8 va C_5H_{10} rangsiz gazlar, C_6H_{12} suyuqlik hisoblanadi.

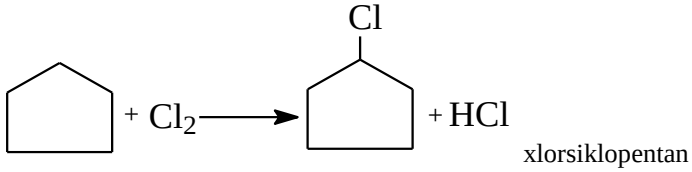
Kimyoviy xossalari:

Sikloalkanlarning dastlabki vakillari bo'lgan siklopropan va siklobutan birikish reaksiyalariga oson kirishadi. Bunda zanjir ochiladi. (Bayer nazariyasi)

1) Sikloalkanlar gidrogenlanganda alkanlar hosil bo'ladi.

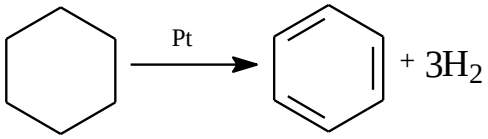


2) Siklopentan va siklogeksan ko'proq to'yinganlik xossasini nomoyon qiladi. Shuning uchun o'rin olish reaksiyalariga oson kirishadi:



xlorsiklopentan

3) Siklogeksan 300°C da Pt katalizatorida benzolni hosil qiladi:



benzol

4) Sikloalkanlar yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_6H_{12} + 9O_2 = 6CO_2 + 6H_2O$$
$$C_nH_{2n} + 1{,}5nO_2 = nCO_2 + nH_2O$$

Ishlatilishi:

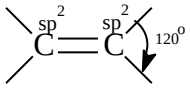
Siklopropan meditsinada og'riqni qoldirish uchun, siklobutan va siklopentan organik sintezda, siklogeksan qutbsiz erituvchi sifatida ishlatiladi. $C_6H_6Cl_6$ – geksaxlorsiklogeksan qishloq xo'jaligida insektitsid sifatida ishlatiladi. Siklopropan narkoz sifatida ishlatiladi.

Mavzu: Alkenlar.

Ta'rif: *Tarkibida bitta qo'shbog' tutgan to'yinmagan uglevodorodlarga alkenlar deyiladi.*

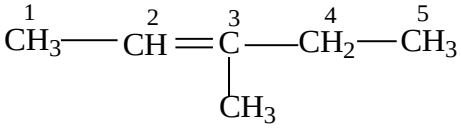
Ularning umumiy formulasi: C_nH_{2n}

Gibridlanishi



Nomlanishi:

Alkenlarni nomlash uchun tarkibida qo'shbog' tutgan eng uzun uglevodorod zanjiri tanlanib, qo'shbog' yaqin tomondan raqamlanadi va uglevodorod nomiga *–en* qo'shimchasi qo'shiladi.

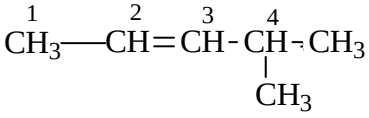


3 – metilpenten - 2

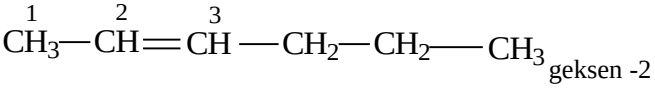
Izomeriyasi:

Alkenlar uchun zanjir izomeriyasi, qo'shbog'ning holat izomeriyasi, shuningdek geometrik izomeriya o'rinli.

1) Zanjir izomeriya

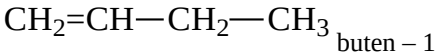


4 – metilpenten -2

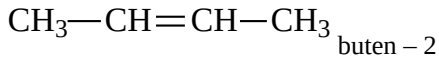


geksen -2

2) Qo'shbog'ning holat izomeriyasi

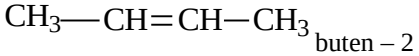


buten – 1

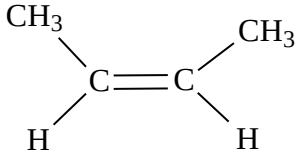


buten – 2

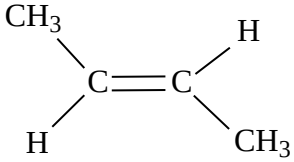
3) Geometrik izomeriyada qo'shbog'da turli o'rinbosarlar joylashganda qo'shbog' 1 – o'rinda joylashganda yuzaga keladi.



buten – 2



sis – buten – 2



trans – buten – 2

Olinishi:

1) Alkanlarni degidrogenlab olinadi:

$$CH_3 - CH_2 - CH_2 - CH_3 \xrightarrow[450°C]{Cr_2O_3} CH_3 - CH = CH - CH_3 + H_2$$

2) Spirtlarni degidratlab olinadi:

$$CH_3 - CH_2 - OH \xrightarrow[t°C]{t > 170°C} CH_2 = CH_2 + H_2O$$

3) Galogenalkanlarga ishqorning spirtdagi eritmasi ta'sir ettirib olinadi:

$$NaOH + CH_3 - CH_2 - CH_2 - Cl \xrightarrow{t°C} CH_3 - CH = CH_2 + NaCl + H_2O$$

$$CH_3 - CH_2 - CH - CH_3 + NaOH \xrightarrow{spirt} CH_3 - CH = CH - CH_3 + NaCl + H_2O$$

4) Diyenlar va alkinlarni Ni yoki Pd katalizatori ishtirokida gidrogenlab olinadi:

$$CH_2 = CH - CH = CH_2 + H_2 \xrightarrow{Ni} CH_3 - CH = CH - CH_3$$

5) Vitsinal digalogenli uglevodorodlarga Zn ta'siridan olinadi:

$$CH_2Br - CH_2Br + Zn \rightarrow CH_2 = CH_2 + ZnBr_2$$

Fizikaviy xossalari:

$C_2H_4 - C_4H_8$ – gaz, undan yuqori vakillari suyuqliklardir. Etilen va propilen kuchsiz hidga ega.

Molekulada tuzulishi:

$CH_3^{sp^3}—CH^{sp^2}=CH_2^{sp^2}$

1) sp^3 – 4ta
2) sp^2 – 2x3=6ta
3) s – 6ta
4) p – 2ta

Kimyoviy xossalari:

Alkenlarda bitta qo'shbog' bo'lganligi uchun ular to'yinmaganlik xossasini namoyon qiladi va birikish reaksiyalariga oson kirishadi.

1) Alkenlar Ni katalizatori ishtirokida gidrogenlanadi.

$$\underset{\text{alken}}{CH_3 - CH = CH_2} + H_2 \xrightarrow{Ni} \underset{\text{alkan}}{CH_3 - CH_2 - CH_3}$$

2) Alkenlar vodorod galogenlar bilan ta'sirlashadi. Bunda Markovnikov qoidasiga binoan reaksiya sodir bo'ladi.

Ta'rif: *Vodorod ko'p gidrogenlangan uglerodga, galogen kam gidrogenlangan uglerodga birikadi.*

$$CH_3 - \overset{\delta+}{CH} = \overset{\delta-}{CH_2} + H - \overset{\delta-}{Cl} \longrightarrow CH_3 - \underset{\displaystyle Cl}{\underset{|}{CH}} - CH_3$$

3) Alkenlar galogenlanish reaksiyalariga oson kirishadi. Xlor bromli suvni rangsizlantiradi:

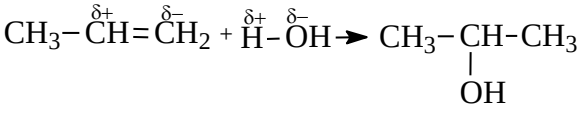
$$CH_3—CH=CH—CH_3 + Cl_2 \longrightarrow \underset{\displaystyle Cl}{\underset{|}{CH_3 - CH}} - \underset{\displaystyle Cl}{\underset{|}{CH}} - CH_3$$

2,3-dixlorbutan

4) Alkenlarga vodorod galogenidlar H_2O_2 ishtirokida biriksa, bunda Markovnikov qoidasiga teskari birikish kuzatiladi. Bu radikal mexanizmi asosida amalga oshadi.

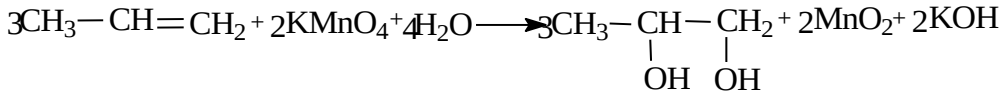
$$CH_3 - \overset{\delta+}{CH} = \overset{\delta-}{CH_2} + \overset{\delta+}{H} - \overset{\delta-}{Cl} \xrightarrow{H_2O_2} \underset{\text{1-xlorpropan}}{CH_3 - CH_2 - CH_2Cl}$$

5) Alkenlar H_2SO_4 ishtirokida suv bilan birikib spirtlarni hosil qiladi.



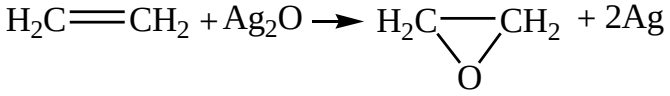
propanol-2

6) Alkenlar $KMnO_4$ eritmasi bilan oksidlanganda ikki atomli spirtlar hosil bo'ladi. Bunda eritma rangsizlanadi(Vagner reaksiyasi):



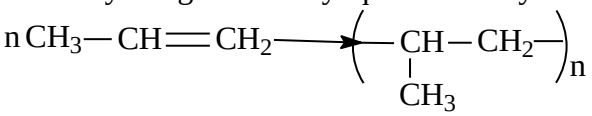
propandiol – 1,2

7) Alkenlar Ag tuzlari ishtirokida oksidlanganda organik oksidlar hosil bo'ladi:



etilenoksid

8) Alkenlar polimerlanish reaksiyalariga kirishib yuqori molekulyar birikmalarni hosil qiladi:



polipropilen

Ishlatilishi:

Etilen etanol olishda, polietilen, polivinelxlorid, etilenglikol olishda; propilen polipropilen olishda, fenol va atseton olishda, glitserin olishda ishlatiladi. Buten kauchik ishlab chiqarishda ishlatiladi.

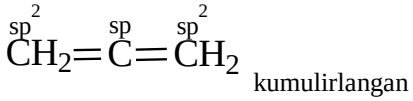
Mavzu: Alkadiyenlar. Diyen uglevodorodlari.

Ta'rif: *Tarkibida 2 ta qo'shbog' bo'lgan ochiq zanjirli uglevodorodlar sinfiga alkadiyenlar deyiladi.*

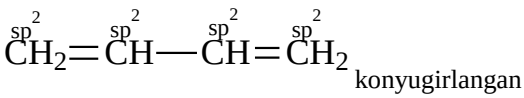
Ularning umumiy formulasi: C_nH_{2n-2}; Gibridlanishi – sp^2

Shuningdek ular alkinlarga izomer hisoblanadi.

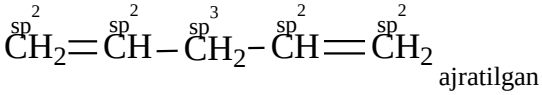
Alkadiyenlar molekulasida ikkita qo'shbog' ajratilmagan yoki ajratilgan bo'lishi.



kumulirlangan



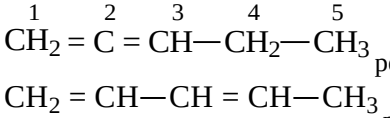
konyugirlangan



ajratilgan

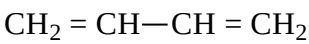
Nomlanishi va izomeriyasi:

Alkadiyenlar nomlash uchun 2 ta qo'shbog' tutgan eng uzun uglevodorod zanjiri tanlanib qo'shbog' raqami ko'rsatiladi va asosiy uglevodorod nomiga *-diyen* qo'shimchasi qo'shiladi.

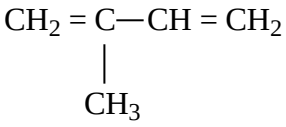


pentadiyen – 1,2

pentadiyen – 1,3



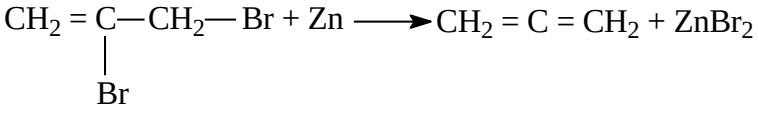
butadiyen-1,3, divinil



2-metilbutadiyen-1,3, izopren

Olinishi:

1) Alkadiyenlarni digalogenalkenlarga Zn ta'siridan olish mumkin:



2) Butadiyen – 1,3 etil spirtni Al_2O_3+ZnO katalizatorida qizdirib olinadi. Buni 1927 yil S.V. Lebedev taklif qilgan:

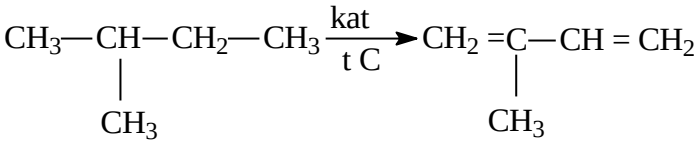
$$2CH_3 - CH_2 - OH \xrightarrow{kat} CH_2 = CH - CH = CH_2 + 2H_2O + H_2$$

3) Buten yoki butenni digedrogenlab olinadi:

$$CH_3 - CH_2 - CH_2 - CH_3 \xrightarrow[650°C]{Cr_2O_3} CH_2 = CH - CH = CH_2 + 2H_2$$

$$CH_3 - CH = CH - CH_3 \xrightarrow[650°C]{Cr_2O_3} CH_2 = CH - CH = CH_2 + H_2$$

4) Izopren izopentenni yoki 2 – metil butenni degidrogenlab olinadi.

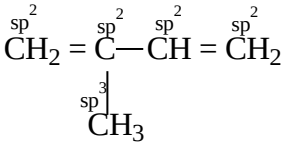


2 – metilbutadiyen – 1,3

Fizikaviy xossalari:

Alkadiyenlarning dastlabki vakillari gaz yoki suyuqliklardir.

Molekula tuzulishi:



1) sp^3 – 4ta
2) sp^2 – 4,3 = 12ta
3) s – 8ta
4) p – 4ta

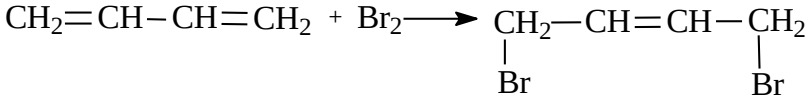
Kimyoviy xossalari:

Alkadiyenlarda 2 ta qo'shbog' bo'lganligi uchun ular to'yinmaganlik xossasini namoyon qiladi va birikish reaksiyalariga oson kirishadi.

1) Alkadiyenlar gidrogenlanganda alken yoki alkanlar hosil bo'ladi:

$$C_4H_6 + H_2 \xrightarrow{Ni} C_4H_8 + H_2 \xrightarrow{Ni} C_4H_{10}$$

2) Alkadiyenlar bromlanganda 1,4 birikish amalga oshadi va qo'shbog' o'rtaga ko'chadi.

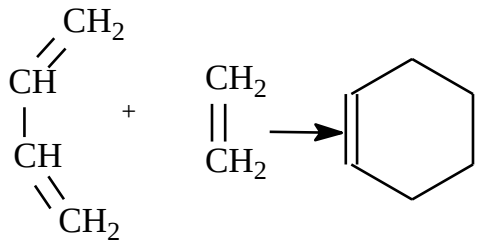


3) Galogenvodorodlar ham 1,4 birikadi:

$$CH_2 = CH - CH = CH_2 + H - Cl \rightarrow CH_3 - CH = CH - CH_2Cl$$

1–xlorbuten–2

4) Alkenlar bilan birikib sikloalkanlar hosil qiladi. Bunga Dills–Alder reaksiyasi deyiladi:



siklogeksen

5) Alkadiyenlar yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_4H_6 + 5{,}5O_2 \rightarrow 4CO_2 + 3H_2O$$

$$C_nH_{2n-2} + 1{,}5n - 0{,}5O_2 \rightarrow nCO_2 + n - 1H_2O$$

6) Alkadiyenlar polimerlanish reaksiyasiga kirishib yuqori molekulyar birikmalarni hosil qiladi:

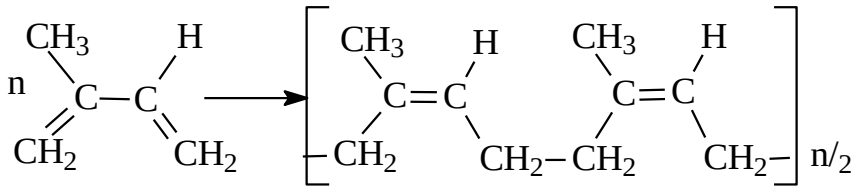
$$nCH_2=CH-CH=CH_2 \rightarrow (-CH_2-CH=CH-CH_2-)_n$$

divinil — divinil kauchuk

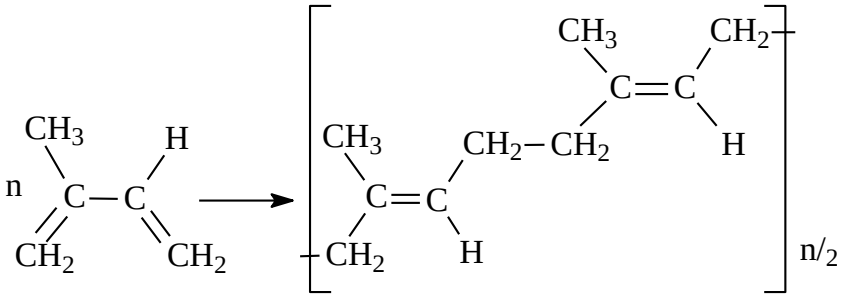
<u>Ishlatilishi:</u>

Ularning polimerlari kauchuk sifatida ishlatiladi. Kauchukning bir necha turlari bor.

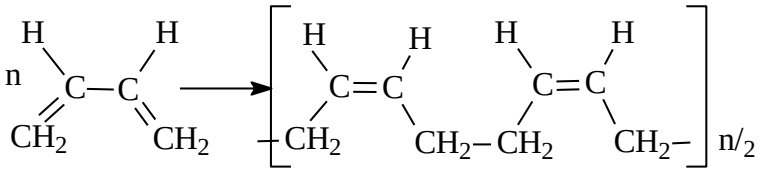
1) Tabiiy kauchuk, ya'ni sis – izopren kauchuk:



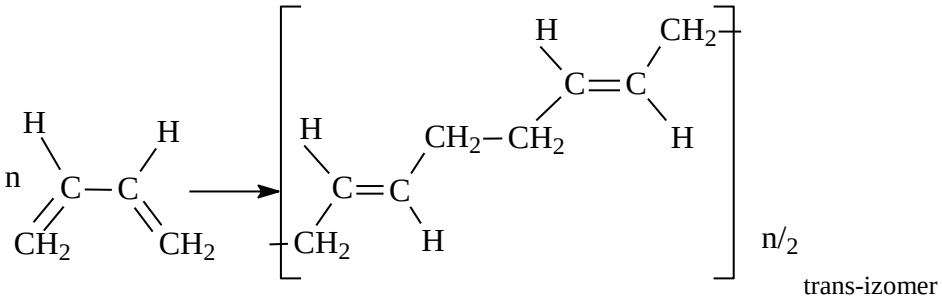
2) Trans-izopren kauchuk yoki guttapercha:



3) Divinil kauchuk – butadiyen-1,3 kauchuk:

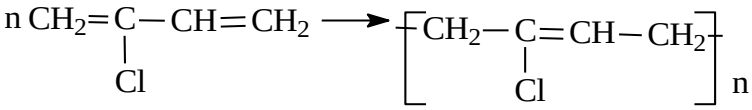


sis-izomer

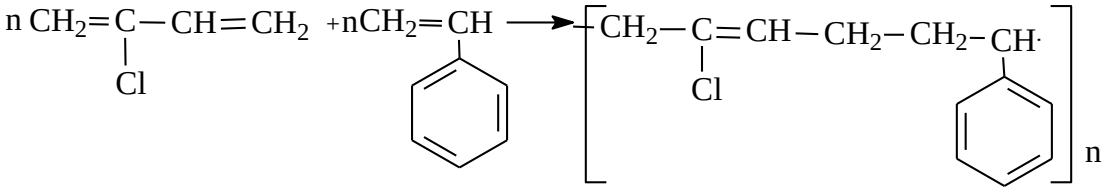


trans-izomer

4) Xloropren kauchuk:



5) Butadiyen stirol kauchuk:



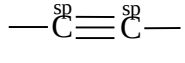
Tabiiy kauchuk asosan sis-izoprendan tuzulgan. U Braziliyadagi Geveya daraxtidan olinadi. Tabiiy kauchukning molekulyar massasi 200000 dan 400000 gacha bo'ladi.

Kauchukning xossalarini yaxshilash uchun unga ishlov beriladi, ya'ni vulkanlanadi. Bunda oltingugurt qo'shib qizdiriladi. Agar 50% dan kam S qo'shilsa rezina, 50% dan ko'p S qo'shilsa ebonit hosil bo'ladi. Shuningdek kauchukni "sovuq vulkanlash" uchun S_2Cl_2 ishlatiladi. Tabiiy kauchuk rezina olish uchun, sintetik kauchuk xo'jalik mollari (shisha, penoplast, rezina asboblar) olishda ishlatiladi.

Mavzu: Alkinlar. Atsetilen qatori uglevodorodlari.

Ta'rif: *Tarkibida bitta uchbog' tutgan ochiq zanjirli to'yinmagan uglevodorodlarga alkinlar deyiladi.*

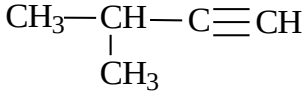
Ularning umumiy formulasi: C_nH_{2n-2}

Gibridlanishi – sp 

Nomlanishi va izomeriyasi:

Alkinlarni nomlash uchun tarkibida uchbog' tutgan eng uzun uglevodorod zanjiri tanlanib, uchbog' yaqin tomondan raqamlanadi va *– in* qo'shimchasi qo'shiladi.

$CH \equiv CH$	$CH_3 - C \equiv CH$	$CH \equiv C - C_2H_5$	$CH_3 - C \equiv C - CH_3$
etin, atsetilen	propin, metilatsetilen	butin, etilatsetilen	butin-2, dimetilatsetilen



3-metilbutin-1

Olinishi:

Alkinlar asosan parchalanish reaksiyalari yordamida olinadi.

1) Atsetilen CaC_2 ni gidroliz qilib olinadi:

$$CaC_2 + 2H_2O = Ca(OH)_2 + C_2H_2$$

2) Metan yoki etanni piroliz qilib olinadi:

$$2CH_4 \xrightarrow{1500°C} C_2H_2 + 3H_2$$

$$C_2H_6 \xrightarrow{t°C} C_2H_2 + 2H_2\uparrow$$

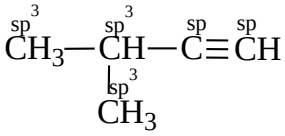
3) Atsetilenning gomologlari atsetilenni alkillab olinadi:

$$CH{\equiv}CH + Na \rightarrow CH \equiv C - Na + R - J \rightarrow CH_3 - C - R + NaJ$$

Fizikaviy xossalari:

C_2H_2 efir hidiga ega rangsiz gaz, C_4H_6 dan boshlab suyuqlik, $C_{12}H_{22}$ dan boshlab qattiq moddalardir.

Molekula tuzulishi:



1) sp^3 -3x4=12ta
2) sp -2x2=4ta
3) s -8ta
4) p-4ta

Kimyoviy xossalari:

Alkinlarda 2 ta π bog' bo'lganligi uchun ular birikish reaksiyalariga oson kirishadi.

1) Alkinlar gidrogenlanib alken va alkanlarni hosil qiladi:

$$CH{\equiv}CH + H_2 \xrightarrow{Ni} CH_2{=}CH_2 + H_2 \xrightarrow{Ni} CH_3{-}CH_3$$

etin eten etan

2) Atsetilen HCl bilan birikib vinilxloridni hosil qiladi:

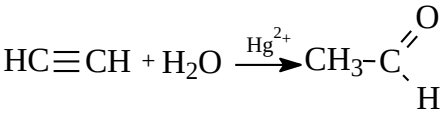
$$CH{\equiv}CH + HCl \rightarrow CH_2{=}CH{-}Cl$$

vinilxlorid

3) $CH_3{-}C{\equiv}CH + Br_2 \rightarrow CH_3{-}CBr{=}CHBr \rightarrow CH_3{-}CBr_2{-}CHBr_2$

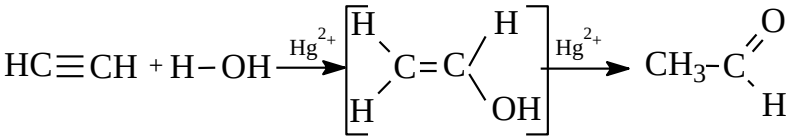
1,2-dibrompropen 1,1,2,2-tetrabrompropan

4) Alkinlar $HgSO_4$ katalizatori ishtirokoda suv bilan birikadi. Bunda atsetilendan *sirka aldegid*, qolgan vakillaridan *ketonlar* hosil bo'ladi. Bu reaksiyani M.G.Kucherov 1881 yil ochgan (Kucherov reaksiyasi).

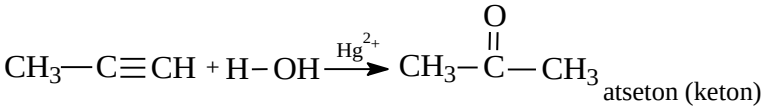


etanal (aldegid)

Reaksiya mexanizmi:



vinil spirt (beqaror) sirka aldegid



atseton (keton)

5) Alkinlar vodorod sianid bilan birikib alkilonitrillarni hosil qiladi:

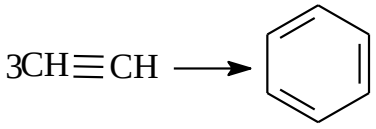
$$CH{\equiv}CH + HCN \rightarrow H_2C{=}CH{-}C{\equiv}N$$

akrilonitril

6) Alkinlar dimerlanish va polimerlanish reaksiyalariga kirishadi:

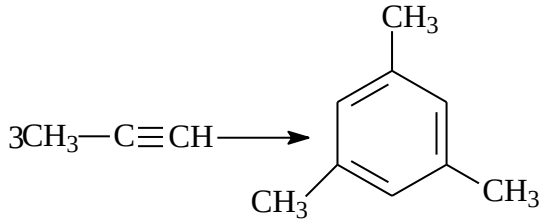
$$2HC{\equiv}CH \xrightarrow{Cu^+} HC{\equiv}C{-}CH{=}CH_2$$

vinilatsetilen



benzol

Bu reaksiyaga *Zelinskiy* reaksiyasi deyiladi.



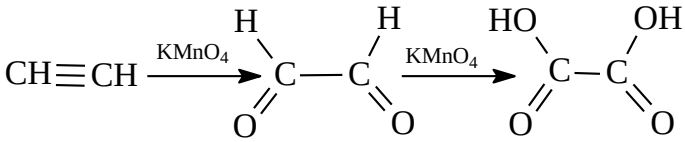
1,3,5-trimetilbenzol

7) Alkinlar og'ir metallarning (I) valentli birikmalari bilan atsetilenidlarni hosil qiladi. Bunday reaksiya amalga oshishi uchun uchbog' birinchi o'rinda (chetda) joylashishi kerak:

$$HC{\equiv}CH + 2Ag^{+} \rightarrow Ag{-}C{\equiv}C{-}Ag{\downarrow}$$

$$R{-}C{\equiv}CH + Cu{+} \rightarrow R{-}C{\equiv}C{-}Cu$$

8) Atsetilenning oxirgi oksidlanish mahsuloti oksalat kislota hisoblanadi:



glioksal oksalat kislota

9) Alkinlar yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_2H_2 + 2{,}5O_2 \rightarrow 2CO_2 + H_2O$$

$$C_nH_{2n-2} + 1{,}5n\text{-}0{,}5O_2 \rightarrow nCO_2 + n\text{-}1H_2O$$

Ishlatilishi:

Atsetilen PVX, poliakrilonitril, xloropren kauchuk, butadiyen kauchuk, sirka aldegid va sirka kislota olishda ishlatiladi. Atsetilen yonganda kuchli issiqlik ajralib chiqqanligi uchun u metallarni payvandlashda va qirqishda foydalaniladi.

Mavzu: Neftni qayta ishlash. Kreking jarayoni.

Neft – turli uglevodorodlar aralashmasidan iborat yoqilg'i sifatida ishlatiladigan foydali qazilma hisoblanadi.

Uning tarkibidagi uglevodorodlar soniga qarab 250-300°C da qaynaydi.

Neftning quyidagi turlari bor:

1) Metan neftlari – ko'proq alkanlar tutadi;
2) Naften neftlari – ko'proq sikloalkanlar tutadi;
3) Aralash neftlar – tarkibida alkan, naften va aromatik uglevodorodlar tutadi.

Shuningdek neft tarkibida *suv* va *yo'ldosh gazlar* tutadi.

Neftning o'rtcha zichligi 0,9g/ml atrofida bo'ladi.

Neft *fraksion qayta ishlash* yo'li bilan qayta ishlanadi. Ya'ni ular qaynash temperaturasiga ko'ra ajratiladi. Bu jarayon *rektifikatsion kolonnada* olib boriladi. Bu kolonnada bug'langan neft tarelkalarda kondensatlanadi.

Neftning asosiy fraksiyalari quyidagilar.

1) Benzin;
2) Kerosin;

3) Gazoyl;
4) Mazut.

Benzin fraksiyasi 150°C gacha olib boriladi. Bunda asosan uglerod soni 5-9 gacha bo'lgan yengil uglevodorodlar ajraladi. Bunda 40-70°C da gazolin yoki *petroley efiri*, keyin qaynash temperaturasi 70-120°C bo'lgan *benzin* ajraladi. Benzin fraksiyasida ichki yonuv dvigatellarida ishlatiladigan *aviatsiya* va *avtomobil benzini* olinadi.

Keyingi fraksiyada 120-140°C da qaynaydigan *ligroin* hosil bo'ladi. Ligroin dizel yoqilg'isi sifatida ishlatiladi.

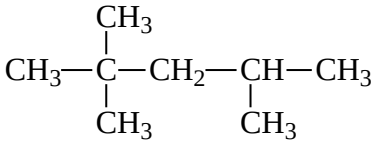
Kerosin fraksiyasida uglerod atomlari soni 9-11 gacha bo'lgan uglevodorodlar bo'ladi. Kerosin traktorlar uchun yoqilg'i va uy-ro'zg'or ihslarida ishlatiladi.

Gazoyl fraksiyasida uglerod atomlari soni 11-16 gacha bo'lgan uglevodorodlar bo'ladi.

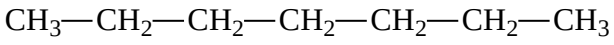
Mazut fraksiyasida atomlari soni 16 tadan ko'p bo'lgan uglevodorodlar bo'ladi. Mazut(qoramoy) qayta haydaladi. Bundan *solyar moylari va surkov moylari* hosil bo'ladi.

Qoramoy haydalgandan qolgan qoldiq *gudron* deyiladi va u *asfalt* sifatida ishlatiladi.

Benzinning eng muhim xusuiyati – *oktan soni* hisoblanadi. ya'ni izooktan va geptanga nisbatan olinadi.



2,2,4-trimetilpentan



n-geptan

Geptan qanchalik ko'p bo'lsa, benzin shuncha ko'p *detonatsiyalanadi*. Uning oldini olish uchun antidetonator tetraeilqo'rg'oshin (TEQ) $Pb(C_2H_5)_4$ qo'shiladi. Motor tubiga cho'kkan qo'rg'oshinni tozalash uchun 1,2-dibrometan qo'shiladi va qo'rg'oshin $PbBr_4$ holida atmosferaga chiqariladi. Bu esa atmosfera havosni ifloslanishiga sabab bo'ladi.

Kreking.

Neftdan olinayotgan benzin barcha iste'molchilar talabini qondirishga yetmaydi. Shuning uchun yuqori uglerod soniga ega uglevodorodlar *piroliz* qilinadi. Bu jarayon *kreking* (*crack* - parchalash) ham deyiladi.

Krekingni quyidagicha ifodalash mumkin:

Alkan → Alken + Alken

Kreking 2 xil bo'ladi:

1) Termik kreking;
2) Katalatik kreking.

Termik krekingda temperatura 450°C dan yuqori bo'ladi. Bunda yuqori uglerosli alkanlardan quyi alkan va alken hosil bo'ladi:

$$C_{16}H_{34} \xrightarrow{t>450°C} C_8H_{18} + C_8H_{16}$$

Katalitik kreking 450°C dan past temperaturada olib boriladi. Bunda katalizator sifatida $AlCl_3$ va alyumosilikatlar ishlatiladi.

Gazoyl → Yuqori oktan sonli benzin

Neftdan ajratib olingan benzinning oktan sonini oshirish uchun *rifroming* jarayonidan foydalaniladi. Riformingda tarmoqlanmagan uglevodorodlar tarmoqlangan uglevodorodlarga aylanadi. Bunda katalizator sifatida Al_2O_3 qo'llaniladi.

Mavzu: Aromatik ugelvodorodlar – Arenlar.

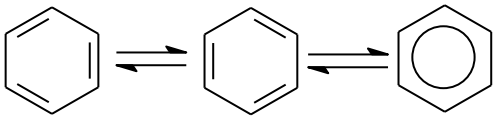
Ta'rif: *Tarkibida aromatik xalqa, ya'ni benzol xalqasi tutgan uglevodorodlarga aromatik uglevodorodlar ya'ni arenlar deyiladi.*

Umumiy formulasi: C_nH_{2n-6}. $n \geq 6$.

1825 yil M.Faradey toshko'mirdan benzolni ajratib oladi va unda C va H atomlari 1:1 nisbatda ekanligini aniqlaydi.

Libix bu moddaga benzol nomini beradi.

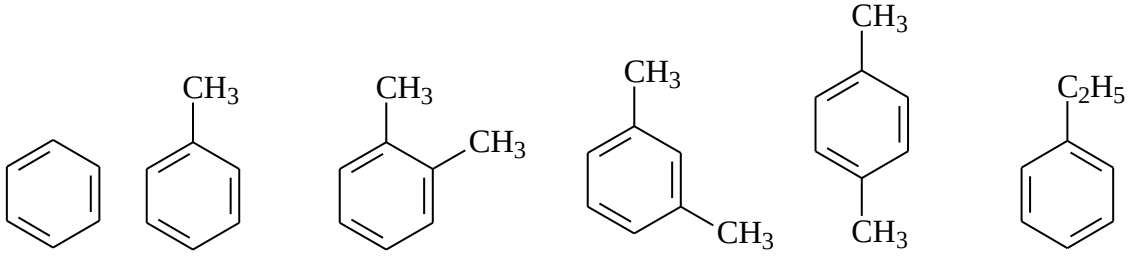
Benzol o'ziga xos hidga ega edi va u juda qiziqarli xossalarni namoyon qiladi. U juda "to'yinmagan" bo'lishiga qaramasdan birikish reaksiyalariga juda qiyin kirishadi va o'rin olish olish reaksiyalariga oson kirishadi. Shuning uchun benzol va hosilalari *aromatik uglevodorodlar* deb nomlanadi.



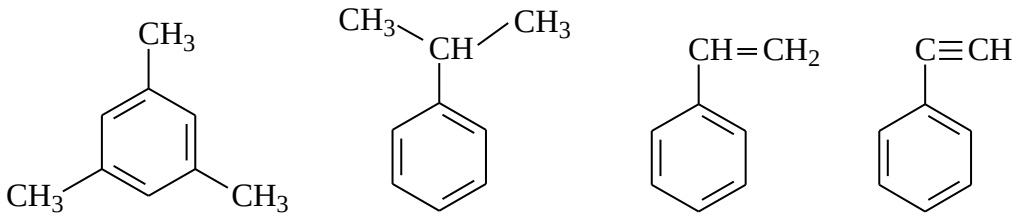
Benzolning tuzilishini 1865 yil nemis olimi A.Kekule taklif qilgan.

Nomlanishi va izomeriyasi:

Benzol va uning hosilalari benzol yadrosiga nisbatan nomlanadi. Bunda avval kichik radikal, so'ngra kattaroq radikal nomlanadi.

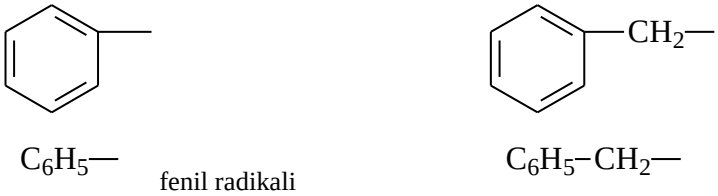


benzol — metilbenzol toluol — 1,2-dimetilbenzol o'-ksilol — 1,3-dimetilbenzol m'-ksilol — 1,2-dimetilbenzol o'-ksilol — etilbenzol



1,3,5-trimetilbenzol — izopropilbenzol kumol — vinilbenzol* stirol — fenilatsetilen*

*vinilbenzol va fenilatsetilen benzol gomologi emas.



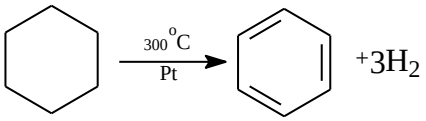
C_6H_5— fenil radikali

C_6H_5–CH_2— benzil radikali

Olinishi:

Dastlab arenlar toshko'mirni quruq haydab olingan. Benzol va fenol neft tarkibida ham uchraydi.

1) Arenlar sikloalkanlarni degidrogenlab olinadi:



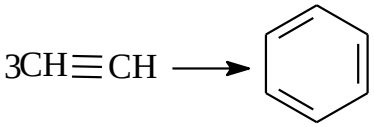
$C_6H_{12} \rightarrow C_6H_6 + 3H_2$

2) Alkanlarni degidrogenlab olinadi:

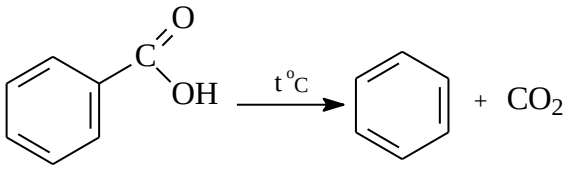
$$CH_3–(CH_2)_5–CH_3 \xrightarrow{Al_2O_3,t°C} C_6H_5–CH_3 + 4H_2$$

geptan — toluol

3) Atsetilenni trimerlab olinadi (Zelinskiy reaksiyasi):



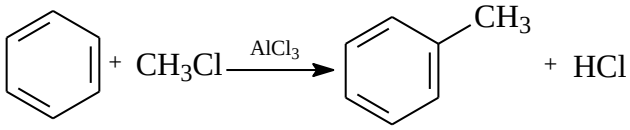
4) Aromatik kislotalarni qizdirib olinadi (dekarboksillash):

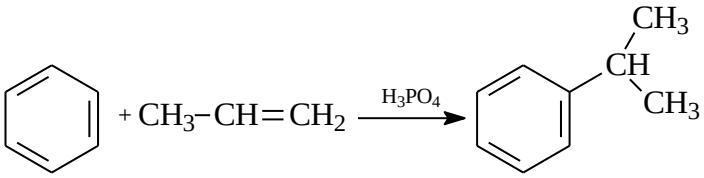


$C_6H_5–COOH \rightarrow C_6H_6 + CO_2$

benzoy kislota — benzol

5) Benzol gomologlari Fridel-Krafts bo'yicha alkillab olinadi:





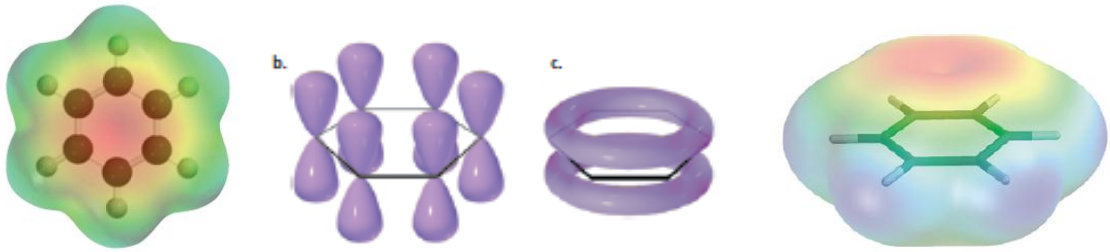
propen — kumol

<u>Fizikaviy xossalari:</u>

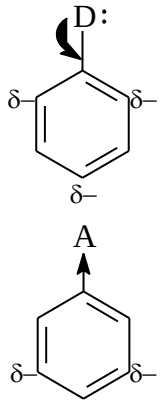
Benzol va gomologlari rangsiz suyuqliklar hisoblanadi. Yuqori vakillari kristall moddalardir.

<u>Molekula tuzilishi:</u>

Benzol yadrosidagi barcha uglerod atomlari sp^2 gibridlangan holda bo'ladi.



1) sp^2 – 6x3=18ta
2) p – 6ta
3) s – 6ta



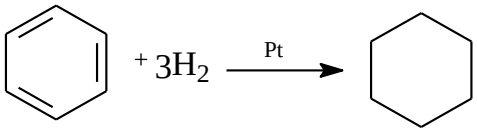
Benzol yadrosiga 2 xil o'rinbosarlar ta'sir qiladi.

1) I tur o'rinbosarlar – *elektrodonor* guruhlar. *o'*- va *p'*- holat elektron buluti zichligini kuchaytiragi. Ularga $–CH_3$ (Alk), $-CH=CH_2$, -OH, $-NH_2$, -F, -Cl, -Br va –J kiradi.
2) II tur o'rinbosarlar – *elektroakseptor* guruhlar. Ular *m'*- holatga yo'naltiradi. Ularga $-NO_2$, -CHO, -COOH, -CN va $–SO_3H$ kiradi.

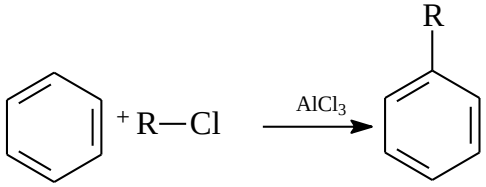
Kimyoviy xossalari:

Benzol va uning gomologlari uchun *o'rin olish* reaksiyasi xarakterli. Chunki aromatik xalqa barqarorlikni ta'minlaydi.

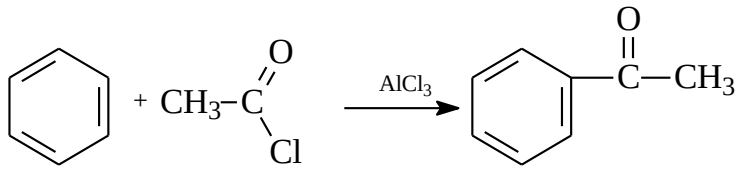
1) Benzol gidrogenlanganda siklogeksan hosil bo'ladi:



2) Benzol galogenoalkanlar bilan alkillanish reaksiyasiga kirishadi:

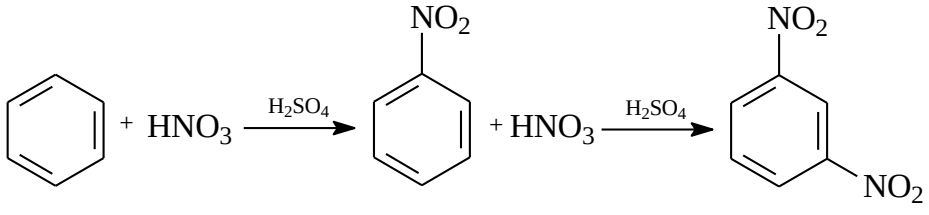


3) Benzol Fridel-Krafts katalizatori ishtirokida xlorangidridlar bilan atsillanib arilketonlarni hosil qiladi:



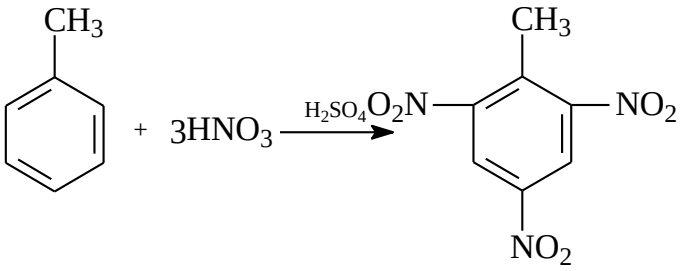
metilfenilketon

4) Benzol va uning gomologlari nitrolovchi aralashma (HNO_3 + H_2SO_4) ta'sirida nitrobirikmlarni hosil qiladi:



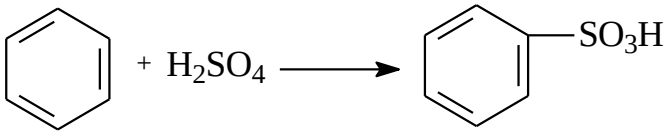
nitrobenzol 1,3-dinitrobenzol

5) Toluol nitrolanganda trinitrotoluol (TNT) hosil bo'ladi. TNT kuchli portlovchi modda:



2,4,6-trinitrotoluol – TNT

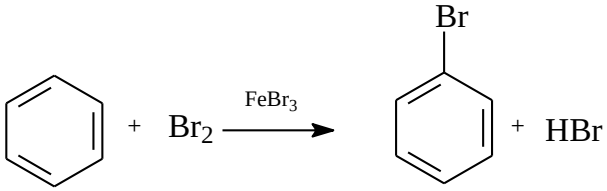
6) Benzol kons. H_2SO_4 bilan qizdirilganda reaksiyaga kirishadi:



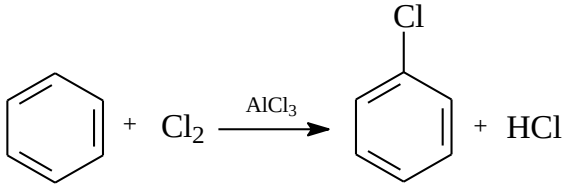
benzolsulfo kislota

7) Benzol va uning gomologlari galogenlanish reaksiyasiga oson kirishadi.

a) Reaksiya $FeBr_3$ yoki $AlCl_3$ ishtirokida borganda o'rin olish reaksiyasi sodir bo'ladi:

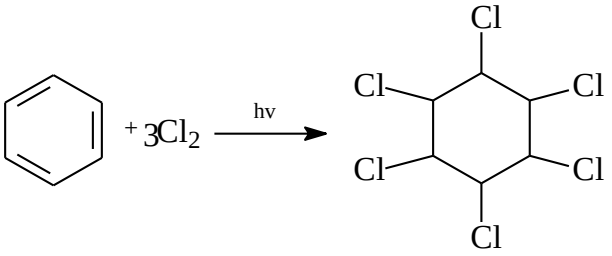


brombenzol



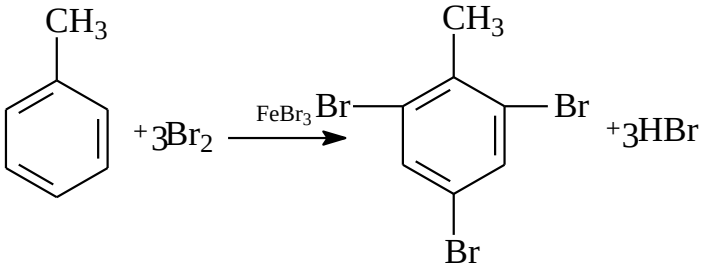
xlorbenzol

b) Benzol ultrabinafsha nurlar ta'sirida xlorlanganda birikish reaksiyasi sodir bo'ladi:



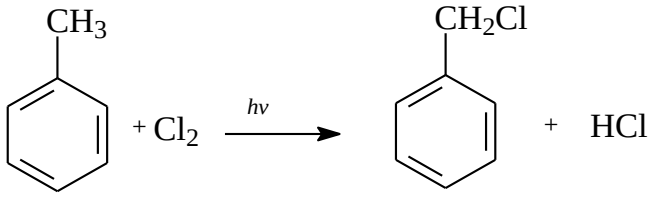
geksaxlorsiklogeksan, geksaxloran

c) Toluol katalizator ishtirokida galogenlanganda trigalogenli hosila hosil bo'ladi:



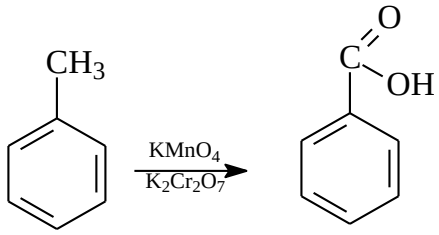
2,4,6-tribromtoluol

d)Toluol quyosh nurlari ishtirokida xlorlanganda xlor yon zanjirga birikadi:

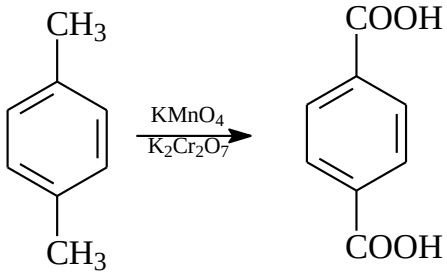


benzilxlorid

8) Benzol hosilalari oksidlanganda xalqadagi o'rinbosarlar soniga ko'ra aromatik mono- va dikarbon kislotalar hosil bo'ladi. Oksidlovchi sifatida $KMnO_4$ yoki $K_2Cr_2O_7$ qo'llaniladi:

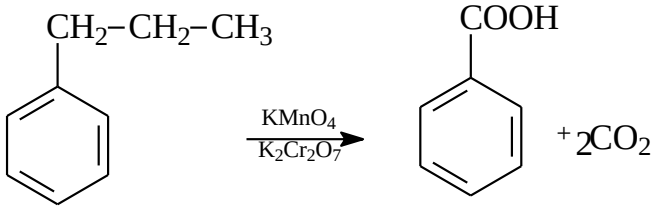


benzoy kislota



tereftal kislota

Shunisi muhimki, bitta o'rinbosarli hosilada uglerod sonidan qat'iy nazar benzoy kislota hosil bo'ladi. Qolgan uglerodlar CO_2 ko'rinishida ajralib chiqadi:



$$5C_6H_5–CH_2–CH_2–CH_3 + 18KMnO_4 + 28H_2SO_4 = 5C_6H_5–COOH + 10CO_2 + 9K2_SO_4 + + 18MnSO_4 + 42H_2O$$

9) Arenlar yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_6H_6 + 7{,}5O_2 = 6CO_2 + 3H_2O$$

$$C_nH_{2n-6} + 1{,}5n\text{-}1{,}5O_2 = nCO_2 + n\text{-}3H_2O$$

Ishlatilishi:

Benzol erituvchi sifatida ishlatiladi. Unda yog', kauchuk va laklar yaxshi eriydi. Kumol atseton va fenol olishda oraliq mahsulot hisoblanadi. Stirol polistirol kauchuk olishda ishlatiladi. Geksaxloran insektitsid sifatida ishlatiladi.

III BOB. KISLOROD SAQLOVCHI ORGANIK BIRIKMALAR.

Mavzu: Spirtlar.

Ta'rif: *Tarkibida uglevodorod radikali bilan bog'langan gidroksil guruh –OH tutgan organik birikmalar sinfiga spirtlar deyiladi.*

Spirtlar radikal tabiatiga ko'ra to'yingan va to'yinmagan spirtlarga bo'linadi. Gidroksil guruh soniga ko'ra esa bir va ko'p atomli spirtlarga bo'linadi.

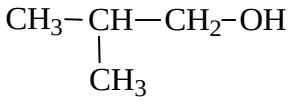
To'yingan bir atomli spirtlarning umumiy formulasi $C_nH_{2n+1}OH$.

Nomlanishi va izomeriyasi:

Spirtlarni nomlash uchun gidroksil guruh yaqin tomondan raqamlanib, tegishli alkan nomiga *–ol* qo'shimchasi qo'shiladi.

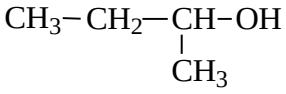
CH_3OH methanol, metil spirt

$CH_3–CH_2–CH_2–CH_2–OH$ butanol-1, butil spirt



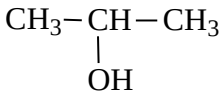
2-metilpropanol-1, izopropil spirt

C_2H_5OH etanol, etil spir

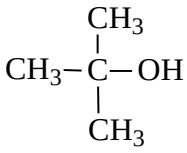


butanol-2, ikkilamchi butil spirt

$CH_3–CH_2–CH_2–OH$ propanol-1, propil spirt



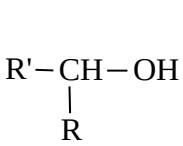
propanol-2, izopropil spirt



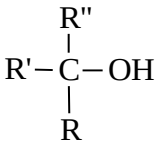
2-metilpropanol-2, uchlamchi butil spirt

$C_5H_{11}–OH$ pentanol, amil spirt

Gidroksil guruh bilan bog'langan uglerod xarakteriga ko'ra birlamchi, ikkilamchi va uchlamchi spirtlarga bo'linadi:



ikkilamchi



uchlamchi

$R–CH_2–OH$ birlamchi

Olinishi:

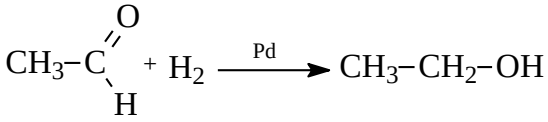
1) Galogenalkanlarga ishqorning suvli eritmasi ta'sir ettirib:

$$CH_3–Cl + NaOH \xrightarrow{H_2O} CH_3–OH + NaCl$$

2) Alkenlarni gidroliz qilib olinadi:

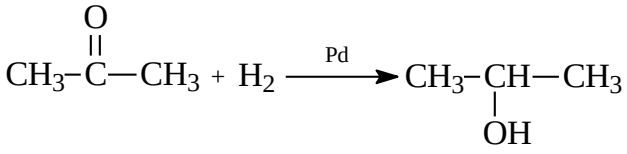
$$CH_3–CH=CH_2 + HOH \xrightarrow{H^+} CH_3–CH(OH)–CH_3$$

3) Aldegid va ketonlarni gidrogenlab olinadi. Aldegidlar gidrogenlanganda birlamchi, ketonlar gidrogenlanganda ikkilamchi spirtlar hosil bo'ladi:



etanal

etanol



propanon propanol-2

4) Metanol sintez gazidan olinadi:

$$CO + 2H_2 \xrightarrow{ZnO,\ CuO} CH_3OH$$

5) Etanol glyukozaning spirtli bijg'ishidan hosil qilinadi:

$$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$$

Fizikaviy xossalari:

Spirtlarning quyi vakillari rangsiz suyuqliklar, yuqori vakillari kristall moddalardir. Ular o'zaro va suv molekulalari bilan molekulalararo vodorod bog'lanish hosil qiladi.

Molekula tuzilishi:

To'yingan bir atomli spirtlarda uglerod atomlari sp^3 gibridlangan holda bo'ladi:

$CH_3–CH_2–OH$ 1) sp^3 – 2x4=8ta 2) s – 6ta

Kimyoviy xossalari:

Alkanollar uchun gidroksil guruh –O–H va radikal bo'yicha boradigan reaksiyalar farq qiladi.

1) Alkanollar juda kuchsiz kislota xossasini namoyon qiladi. ular ishqoriy metallar bilan alkogolyatlar hosil qiladi:

$$CH_3OH + Na \rightarrow \underset{\text{natriy metilat}}{CH_3ONa} + {}^1/_2H_2$$

2) Spirtlar karbon kislotalar bilan ta'sirlashib murakkab efirlarni hosil qiladi. reaksiya kislotali muhitda amalga oshadi. Bunda spirtning RO–H bog'i uziladi:

$$CH_3COOH + C_2H_5OH \overset{H^+}{\Leftrightarrow} \underset{\text{etilatsetat}}{CH_3COOC_2H_5} + H_2O$$

3) Spirtlarga galogenovodrodlar ta'siridan alkilgalogenidlar hosil bo'ladi:

$$R–OH + H–Г \rightarrow R–Г + HOH$$

$$C_2H_5OH + HCl \rightarrow C_2H_5Cl + H_2O$$

4) Spirtlar sulfat kislota ishtirokida 140°C da qizdirilganda molekulalararo degidratlanib oddiy efirlar hosil bo'ladi:

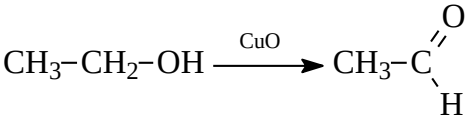
$$2C_2H_5OH \xrightarrow{140°C} \underset{\text{dietil efir}}{C_2H_5–O–C_2H_5} + H_2O$$

5) Spirtlar sulfat kislota ishtirokida 170°C da qizdirilganda ichki molekulyar degidratlanib alkenlar hosil bo'ladi:

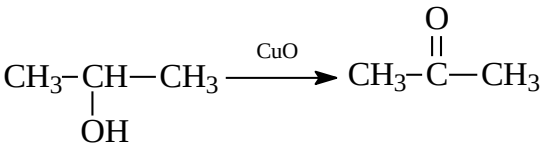
$$CH_3–CH_2–OH \xrightarrow{170°C} \underset{\text{eten}}{CH_2=CH_2} + H_2O$$

6) Spirtlar CuO yoki ZnO ishtirokida oksidlanganda karbonil birikmalar hosil bo'ladi.

a) Birlamchi spirtlar oksidlanganda aldegidlar hosil bo'ladi:



b) Ikkilamchi spirtlardan esa ketonlar hosil bo'ladi:



7) Spirtlar yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$$

$$C_nH_{2n+1}OH + 1{,}5nO_2 \rightarrow nCO_2 + n{+}1H_2O$$

Ishlatilishi:

Methanol asosan erituvchi sifatida va formaldegid olish uchun ishlatiladi. U juda kuchli zahar (5ml ko'r qiladi, 30ml o'limga olib keladi).

Etanol oziq-ovqat sanoatida, erituvchi sifatida, Lebedev usulida butadiyen kauchuk olishda, sirka aldegid va etilatsetat olishda ishlatiladi.

Propanol va butanol lak va kraskalarni eritishda ishlatiladi.

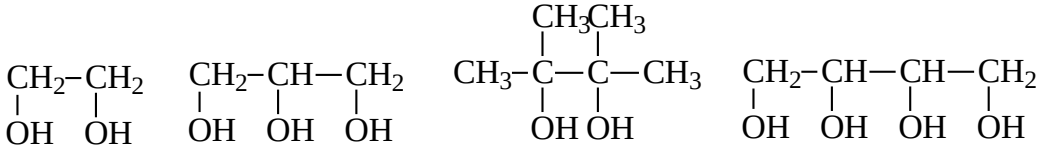
Mavzu: Ko'p atomli spirtlar.

Ta'rif: *Tarkibida ikki yoki undan ortiq gidroksil guruh –OH tutgan organik moddalarga ko'p atomli spirtlar deyiladi.*

Umumiy formulasi: $R(OH)_n$ n= 2, 3, 4…

Nomlanishi va izomeriyasi:

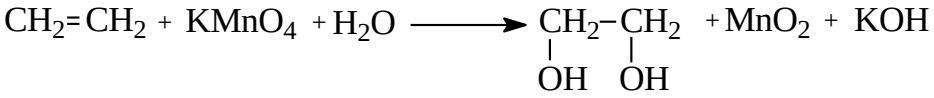
Ko'p atomli spirtlarni nomlash uchun gidroksil guruhlar tutgan eng uzun uglevodorod zanjiri tanlanib, tegishli gidroksil guruhlar soniga *–ol* qo'shimchasi qo'shiladi.



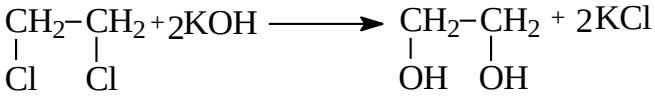
etandiol-1,2 glikol, etilenglikol — propantriol-1,2,3 glitserin — 2,3-dimetilbutandiol-2,3 — butantetraol-1,2,3,4

Olinishi:

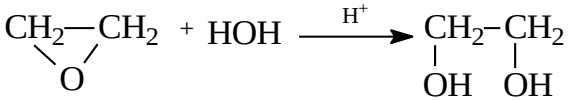
1) Etilenglikol etilenni $KMnO_4$ ning suvli eritmasi bilan oksidlab olinadi:



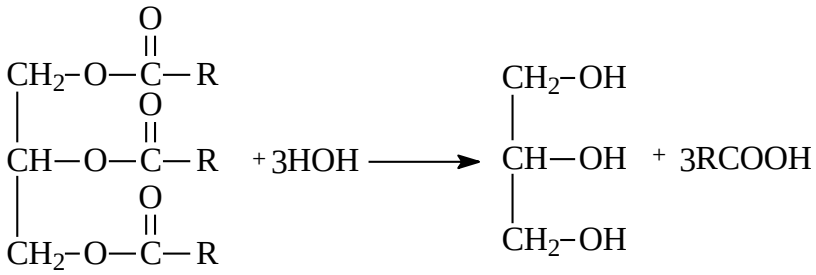
2) Glikol 1,2-dixloretanni ishqorning suvli eritmasi bilan ta'siridan olinadi:



3) Etilenoksidni kislotali muhitda suv bilan ta'siridan olinadi:



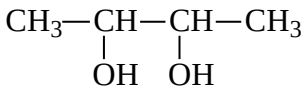
4) Glitserin yog'larni gidroliz qilib olinadi:



Fizikaviy xossalari:

Etilenglikol rangsiz qovushqoq suyuqlik. Suv bilan har qanday nisbatda aralashadi. Zaharli.
Glitserin qovushqoq shirin ta'mli rangsiz suyuqlik. Suv bilan har qnday nisbatda joylashadi.

Molekula tuzilishi:

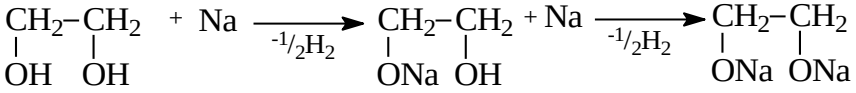


Ko'p atomli spirtlarda barcha uglerod atomlari sp^3 gibridlangan holda bo'ladi.
sp^3 – 4x4=1
s – 10ta

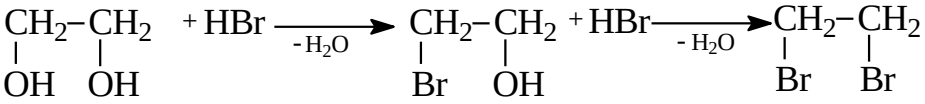
Kimyoviy xossalari:

Ko'p atomli spirtlar bir atomli spirtlar kabi xossalarga ega.

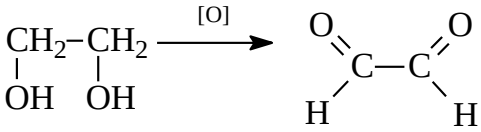
1) Ko'p atomli spirtlar aktiv metallar bilan alkogolyatlar hosil qiladi:



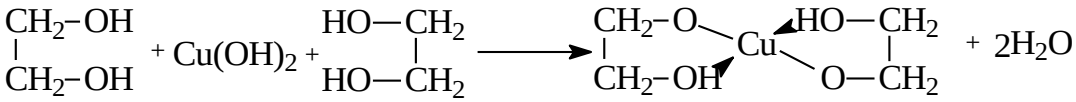
2) Ularning gidroksil guruhi galogenovodorodlar ta'sirida almashinadi:



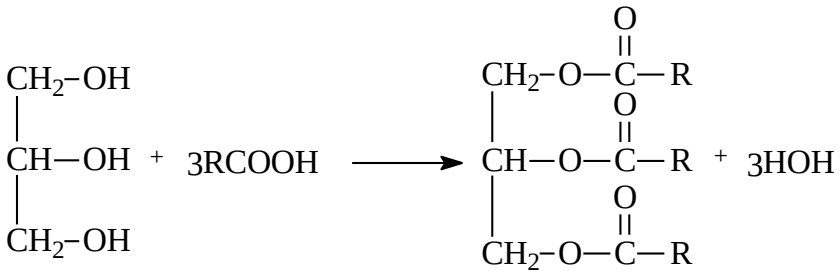
3) Etilenglikol oksidlanganda glioksal hosil bo'ladi:



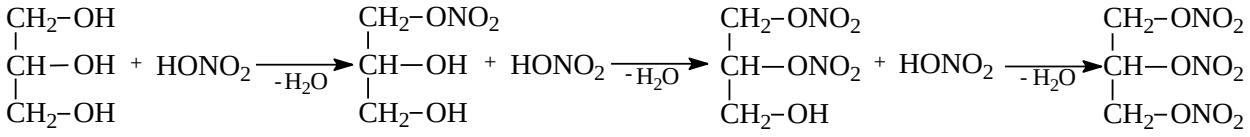
4) Glikollar yangi tayyorlangan $Cu(OH)_2$ bilan kompleks tuz hosil qiladi. bu reaksiyadan glikollarni aniqlashda foydalaniladi.



5) Glitserin anorganik va organik kislotalar bilan murakkab efirlarni hosil qiladi. bunda mono, di- va tri- almashgan efirlar hosil bo'ladi:



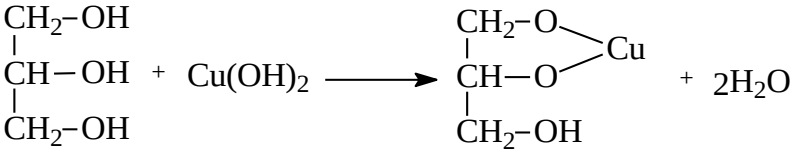
6) Glitserin nitrolanganda nitroefirlar hosil bo'ladi:

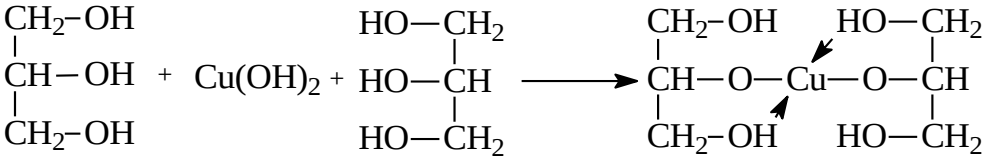


mononitroglitserin dinitroglitserin trinitroglitserin

Trinitroglitserin kuchli portlovchi modda. Undan dinamit tayyorlanadi (A.Nobel).

7) Glitserin yangi tayyorlangan $Cu(OH)_2$ bilan glitserat hosil qiladi:





Ishlatilishi:

Etilenglikol antifriz, tormoz suyuqligi, poliefir tola (lavsan) olishda ishlatiladi. Glitserinni 1779 yili Sheele olgan. U dinamit tayyorlashda, poliefirlar olishda, kosmetika sanoati va meditsinada ishlatiladi.

Mavzu: Oddiy efirlar.

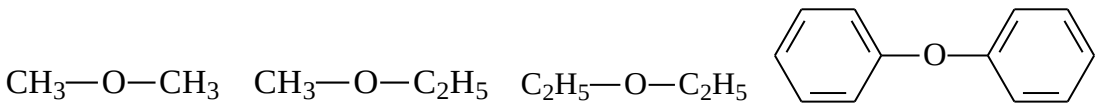
Ta'rif: *Ikkita uglevodorod radikali kislorod ko'prigi (-O-) orqali bog'langan organik moddalar sinfiga oddiy efirlar deyiladi.*

Umumiy formulasi: R–O–R'

R – radikal to'yingan, to'yinmagan yoki aromatik bo'lishi mumkin.

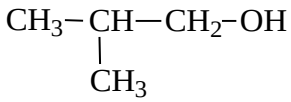
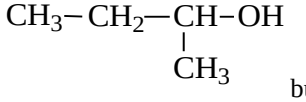
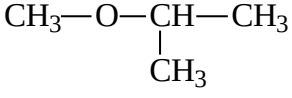
Nomlanishi va izomeriyasi:

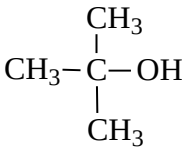
Oddiy efirlarni nomlash uchun avval kichik radikal, so'ngra kattaroq radikal nomi aytilib, *efir* so'zi qo'shiladi.



dimetil efir metiletil efir dietil efir difenil efir

To'yingan efirlar to'yingan bir atomli spirtlarga izomer hisoblanadi. Masalan, $C_4H_{10}O$ formulaga quyidagi spirt va oddiy efirlar mos keladi:

Spirt	*Oddiy efir*
$CH_3–CH_2–CH_2–CH_2–OH$ butanol-1	$C_2H_5—O—C_2H_5$ dietil efir
 2-metilpropanol-1	$CH_3—O—CH_2—CH_2—CH_3$ metilpropil efir
 butanol-2	 metilizopropil efir



2-metilpropanol-2

Olinishi:

1) Spirtlarni pastroq temperaturada ichki molekulayar degidratlab olinadi:

$$2R{-}OH \xrightarrow{t< 170^oC} R{-}O{-}R + H_2O$$

$$2C_2H_5{-}OH \xrightarrow{t< 170^oC} C_2H_5{-}O{-}C_2H_5 + H_2O$$

2) Alkogolyatlarga alkilgalogenidlar ta'sir ettirib olinadi:

$$R{-}CH_2{-}ONa + Г{-}CH_2{-}R' \rightarrow R{-}CH_2{-}O{-}CH_2{-}R' + NaГ$$

Fizikaviy xossalari:

Oddiy efirlar oz'iga xos hidli, rangsiz suyuqliklar hisoblanadi. Ularning qaynash temperaturasi tegishli spirtlarnikiga qaraganda past. Chunki ularda vodorod bog'lanish yo'q.

Kimyoviy xossalari:

Oddiy efirlar asosan donor-akseptor bog'lanish hisobiga moddalar hosil qiladi.

Ishlatilishi:

Dietil efir metalorganik birikmalarni eritishda erituvchi sifatida va meditsinada umumiy narkoz sifatida ishlatiladi.

Mavzu: Fenollar.

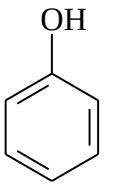
Ta'rif: *Benzol yadrosi bilan bevosita bog'langan gidroksil guruh –O–H ga ega organik moddalar sinfiga fenollar deyiladi.*

Ularning umumiy formulasi: Ar–OH.

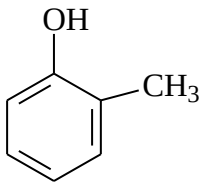
Benzol yadrosi uglerodlari sp^2 gibridlangan.

Nomlanishi va izomeriyasi:

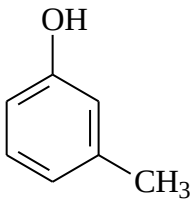
Fenollarni nomlash uchun tegishli aren nomiga *–ol* qo'shimchasi qo'shiladi.



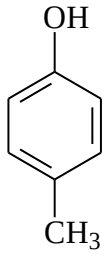
fenol,
karbol kislota



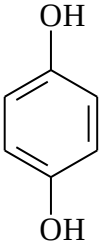
2-metilfenol
o'-krezol



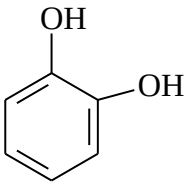
3-metilfenol
m'-krezol



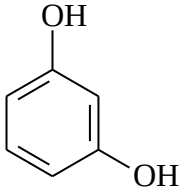
4-metilfenol
p'-krezol



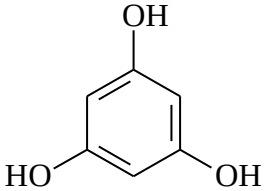
gidroxinon



pirokatexin



rezortsin

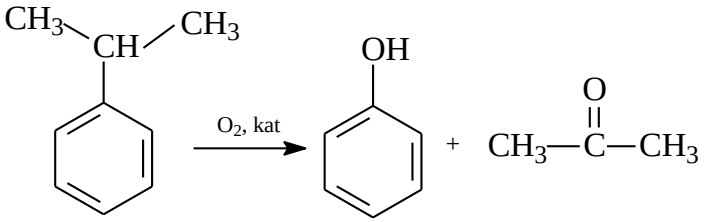


pirogallol

Olinishi:

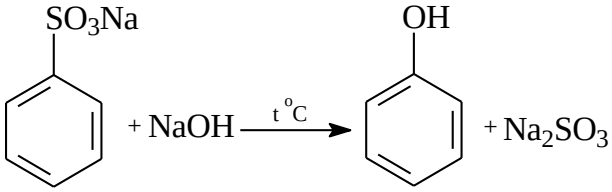
Fenol va uning gomologlari toshko'mir smolasidan, shuningdek sintez usulida olinadi.

1) Fenol kumolni katalitik oksidlab olinadi:

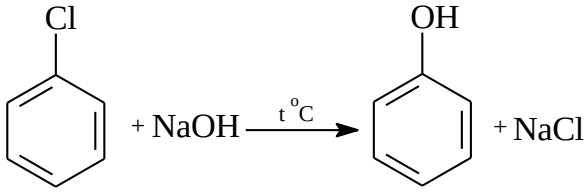


fenol, gidroksibenzol atseton

2) Aromatik sulfokislota tuzlariga ishqor qo'shib suyuqlantirib olinadi:



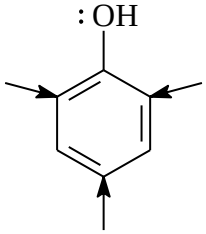
3) Fenol xlorbenzolga 350°C da yuqori bosimda NaOH eirtmasi ta'sir ettirib olinadi:



Fizikaviy xossalari:

Ko'pchilik fenollar rangsiz moddalar hisoblanadi. Ular o'ziga xos hidga ega.

Molekula tuzilishi:

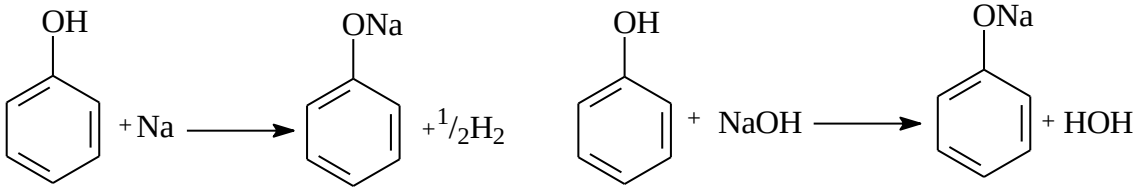


Fenol molekulasida benzol yadrosi uglerodlari sp^2 gibridlangan holda bo'ladi. OH guruh I tur o'rinbosar (elektrodonor) hisoblanadi. Shuning uchun o'- va p'-holatlar aktiv bo'ladi.

Kimyoviy xossalari:

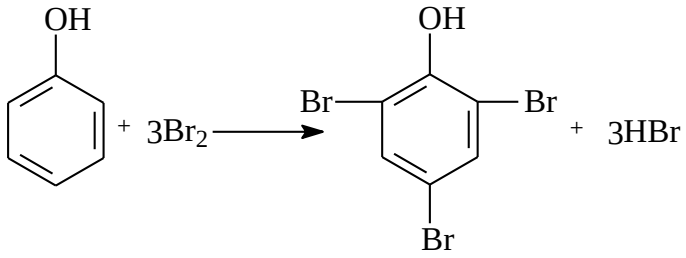
Fenollar uchun benzol yadrosiga va gidroksil guruh bo'yicha amalga oshadigan reaksiyalar farqlanadi.

1) Fenollar spirtlarga qaraganda kuchliroq kislotalik xossasini namoyon qiladi. Shuning uchun ular ishqoriy metallar va ishqorlar bilan ta'sirlashib fenolyatlarni hosil qiladi:

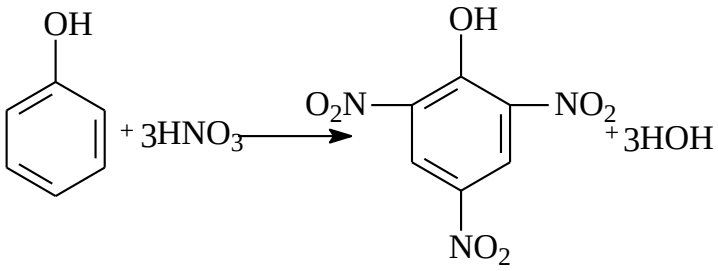


natriy fenolyat

2) Fenollar osonlik bilan galogenlanadi:

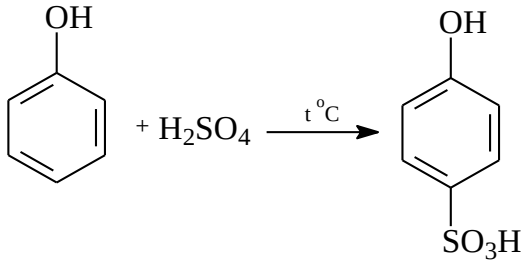


3) Fenol kons. nitrat kislota bilan ta'sirlashib trinitrofenol – kuchli portlovchi moddani hosil qiladi:



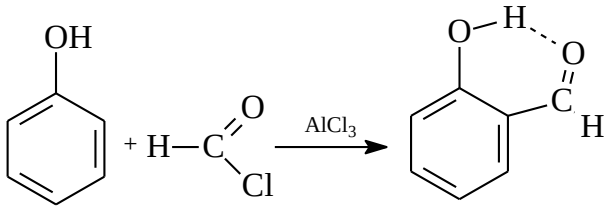
2,4,6-trinitrofenol, pikrin kislota

4) Fenol kons. sulfat kislota bilan qizdirilganda reaksiyaga kirishadi:



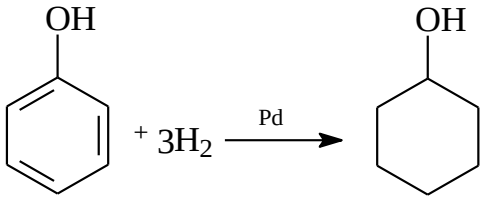
p'-fenolsulfokislota

5) Fenol Fridel-Krafts katalizatori ishtirokida osonlik bilan atsillanadi:



formilxlorid salitsil aldegid

6) Fenol katalitik gidrogenlanganda siklogeksanol hosil bo'ladi:

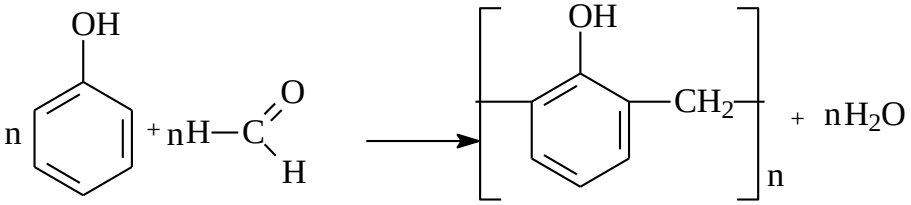


siklogeksanol

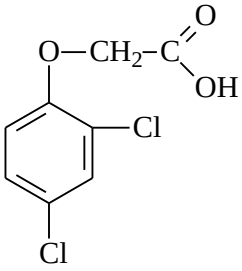
7) Fenollar yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_6H_5–OH + 7O_2 \rightarrow 6CO_2 + 3H_2O$$

8) Fenol metanal bilan sopolimerlanib fenolformaldegid smolasini hosil qiladi:



Ishlatilishi:



Fenolning ko’p qismi fenolformaldegid smolasi olsih uchun ishlatiladi. Fenol shuningdek antiseptik sifatida ham ishlatiladi. U terini ya’llig’laydi.

Krezollar bo’yoqlar sifatida ishlatiladi. Salitsil kislotasi farmasevtikada qo’llaniladi. 2,4-dixlorfenoksisirka kislota va uning natriyli tuzi gerbitsid sifatida ishlatiladi.

Sifat reaksiya:

Eritmada fenol borligi $FeCl_3$ eritmasi bilan aniqlanadi. Bunda binafsha rangli kompleks hosil bo’ladi.

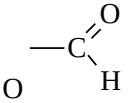
Mavzu: Karbonil birikmalar.

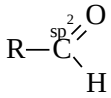
Ta’rif: *Tarkibida karbonil guruh*  *tutgan birikmlarga karbonil birikmalar deyiladi.*

Karbonil birikmalar 2 ga bo’linadi:

1) Aldegidlar
2) Ketonlar.

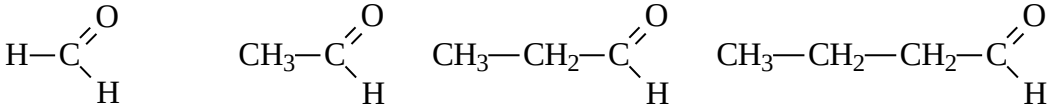
Mavzu: Aldegidlar.

Ta’rif: *Tarkibida aldegid*  *guruh tutgan organik moddalarga aldegidlar deyiladi.*

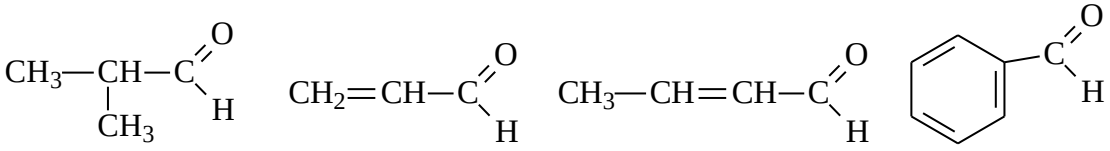
Umumiy formulasi: 

Nomlanishi va izomeriyasi:

Aldegidlarni nomlash uchun karbonil guruh tutgan eng uzun uglevodorod zanjiri tanlanib, aldegid guruh uglerodi 1 raqamli deb olinadi. Tegishli uglevodorod nomiga *–al* qo’shimchasi qo’shiladi.



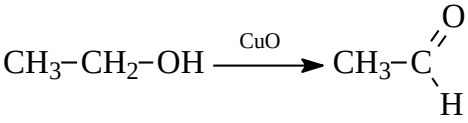
metanal, formaldegid chumoli aldegid — etanal sirka aldegid — propanal propion aldegid — butanal moy aldegid



2-metilpropanal izomoy aldegid — propenal akrolein — buten-2-al kroton aldegid — benzaldegid

Olinishi:

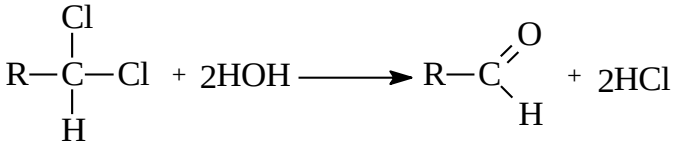
1) Birlamchi spirtlarni oksidlab olinadi:



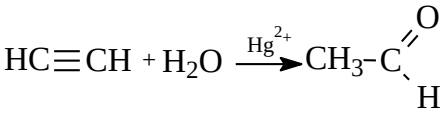
etanol etanal

2) Formaldegid metanni 450°C da $AlPO_4$ yoki NO_x katalizatorlari ishtirokida oksidlab olinadi:

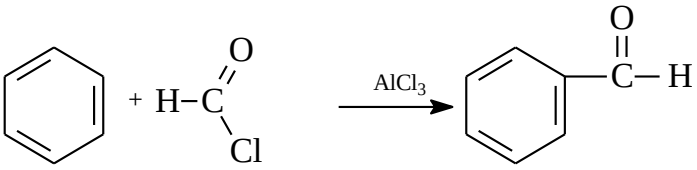
3) Digalogenalkanlarni gidroliz qilib olinadi:



4) Atsetilenni Kucherov reaksiyasi asosida gidratlab olinadi:



5) Benzaldegid benzolga $AlCl_3$ katalizatori ishtirokida formilxlorid ta'siridan olinadi:

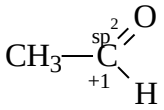


chumoli kilota xlorangidridi benzaldegid

Fizikaviy xossalari:

To'yingan aldegidlar rangsiz o'ziga xos hidli suyuqliklardir. Formaldegid o'tkir hisli gaz.

Molekula tuzilishi:



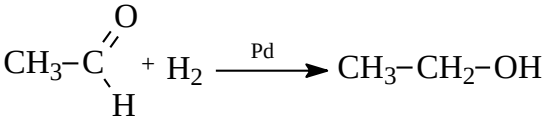
Aldegidlardagi karbonil guruh uglerodi *sp*^{2} gibridlangan holda bo'ladi.

1) sp^3 – 4ta 2) sp^2 – 3ta

3) p – 2ta 4) s – 4ta

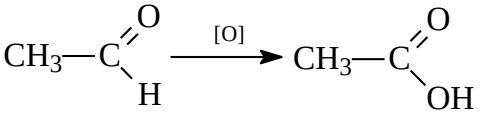
Kimyoviy xossalari:

1) Aldegidlar qaytarilganda birlamchi spirtlar hosil bo'ladi:



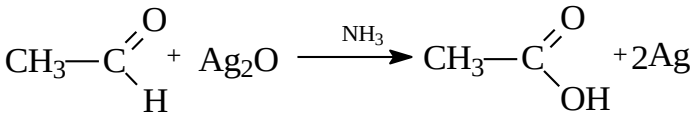
etanal etanol

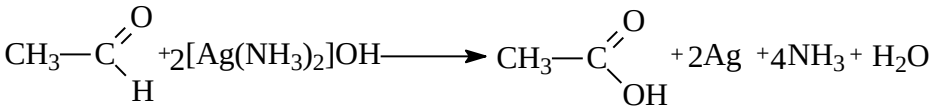
2) Aldegidlar oksidlanganda karbon kislotalar hosil bo'ladi:

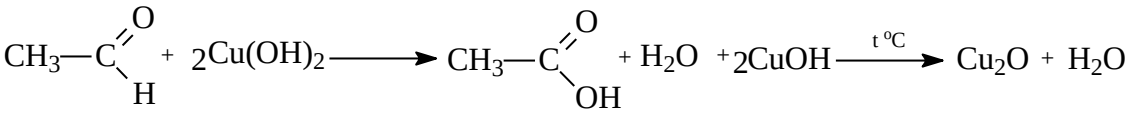


sirka aldegid sirka kislota

3) Aldegidlar uchun sifat reaksiya bu – ularning Ag_2O ning ammiakdagi eritmasi yoki yangi tayyorlangan $Cu(OH)_2$ bilan oksidlanish reaksiyasidir. Birinchi reaksiyaga “kumush ko’zgu” reaksiyasi deyiladi:







zangori sariq qizil

4) Formaldegid polimerlanish reaksiyasiga kirishganda poliformaldegid hosil bo’ladi:

$$nCH_2O \rightarrow (–CH_2–O–)_n$$

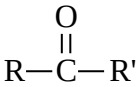
Ishlatilsihi:

Formaldegid fenolformaldegid smolasi olishda, uning 35-40% li suvli eritmasi – formalin biopreparatlarni saqlashda ishlatiladi.

Atsetalsegid sirka kislota va sirka angidridi olishda ishlatiladi.

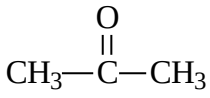
Akrolein atseton va glitserin olishda ishlatiladi.

Mavzu: Ketonlar.

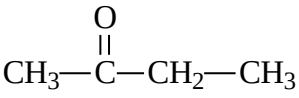
Ta’rif: *Tarkibi*  *bo’lgan organik moddalarga ketonlar deyiladi.*

Nomlanishi va izomeriyasi:

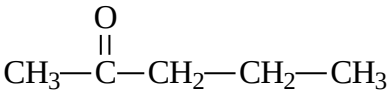
Ketonlarni nomlash uchun karbonil guruh tutgan eng uzun uglevodorod zanjiri tanlanib, karbonil guruh yaqin tomondan raqamlanadi va tegishli uglevodorod nomiga *–on* qo’shimchasi qo’shiladi.



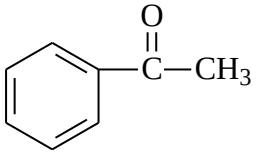
propanon
dimetilketon



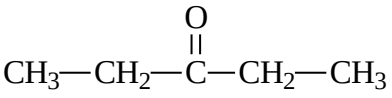
butanon
metiletilketon



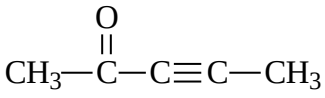
pentanon-2
metilpropilketon



metilfenilketon
atsetofenon



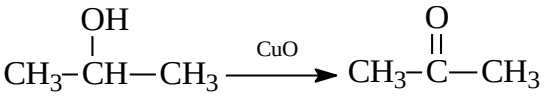
pentanon-2
dietilketon



geksin-3-on-2

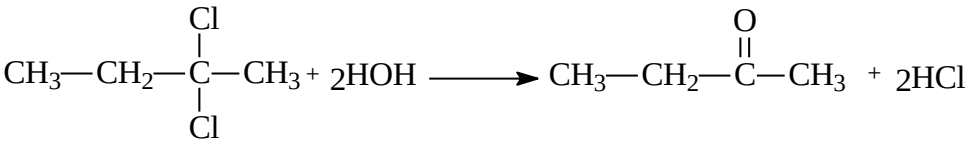
Olinishi:

1) Ikkilamchi spirtlarni oksidlab olinadi:



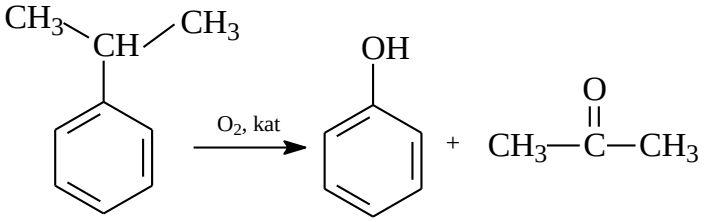
propanol-2 propanon

2) Digalogenalkanlarni gidroliz qilib olinadi:



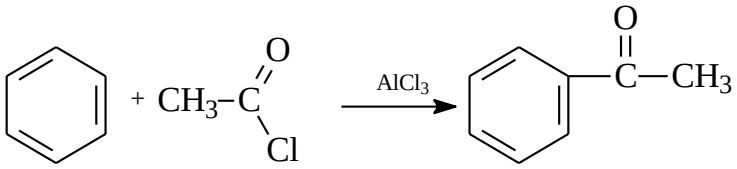
2,2-dixlorbutan butanon

3) Atseton kumolni oksdilab olinadi:



kumol fenol atseton

4) Aromatik ketonlar benzolni atsillab olinadi:



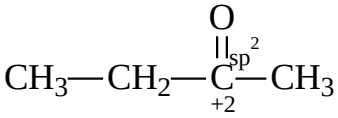
sirka kislota xlorangidridi atsetofenon

Fizikaviy xossalari:

Atseton yoqimli hidli rangsiz suyuqlik.

Molekula tuzilishi:

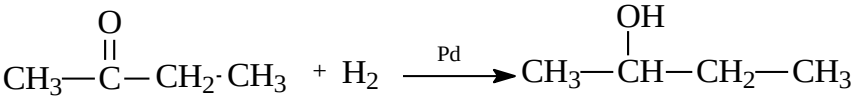
Ketonlardagi karbonil guruh uglerodi sp^2 gibridlangan holda bo'ladi.



1) sp^3 – 3x4=12ta
2) sp^2 – 3ta
3) p – 2ta
4) s – 8ta

Kimyoviy xossalari:

1) Ketonlar qaytarilganda ikkilamchi spirtlar hosil bo'ladi:



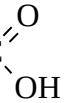
butanon ikkilamchi butil spirt

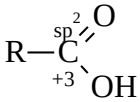
2) Ketonlar oksidlanishga chidamli. Ular "kumush ko'zgu" reaksiyasiga kirishmaydi.

Ishlatilishi:

Atseton nitrosellyuloza va boshqa moddalarni eritishda erituvchi sifatida ishlatiladi. Shuningdek u kinoplenka va portlovchi moddalar olishda ishlatiladi.

Mavzu: Karbon kislotalar.

Ta'rif: *Tarkibida uglevodorod radikali bilan bog'langan karboksil guruh*  *tutgan organik moddalar sinfiga karbon kislotalar deyiladi.*

Ularning umumiy formuladi: 

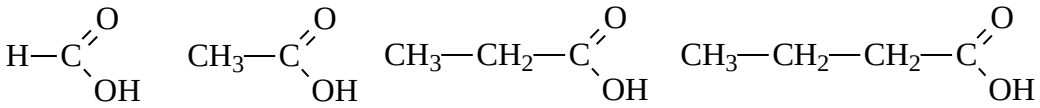
Karbon kislotalar quyidagicha bo'linadi:

1) Monokarbon kislotalar (to'yingan, to'yinmagan, aromatik);
2) Dikarbon kislotalar (to'yingan, to'yinmagan, aromatik);
3) Karbon kislotalarning hosilalalri (galogen, gidroksi, aminokarbon kisloatalar).

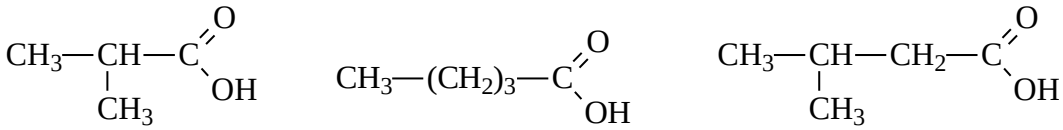
Nomlanishi va izomeriyasi:

Karbon kislotalarni nomlash uchun karboksil guruh uglerodi 1 deb olinib, tegishli uglevodorod nomiga *kislota* so'zi qo'shib aytiladi.

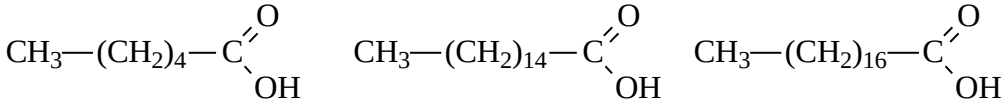
To'yingan monokarbon



metan kislota, chumoli kislota — etan kislota, sirka kislota — propan kislota, propion kislota — butan kislota, moy kislota

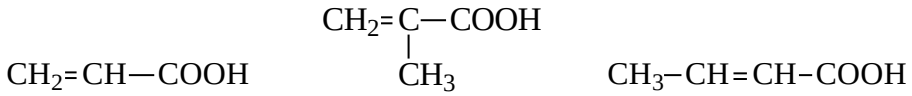


2-metilpropan kislota, izomoy kislota — pentan kislota, valerian kislota — 3-metilbutan kislota, izovalerian kislota

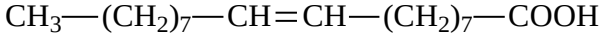


geksan kislota, kapron kislota — geksadekan kislota, palmitin kislota — oktadekan kislota, stearin kislota

To'yinmagan monokarbon

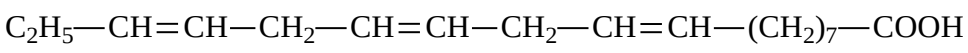


propen kislota, akril kislota — 2-metilpropen kislota, metakril kislota — buten-2 kislota, kroton kislota

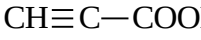


yoki $C_{17}H_{33}COOH$ olein kislota

yoki $C_{17}H_{31}COOH$ linol kislota

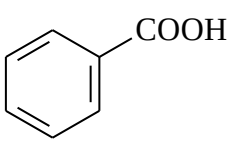


yoki $C_{17}H_{29}COOH$ linolen kislota

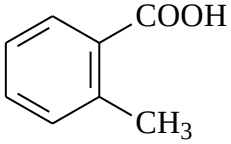


propin kislota

Aromatik monokarbon kislotalar

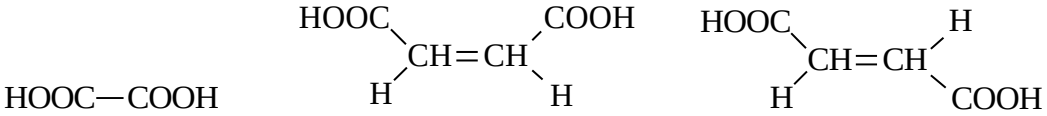


benzoy kislota



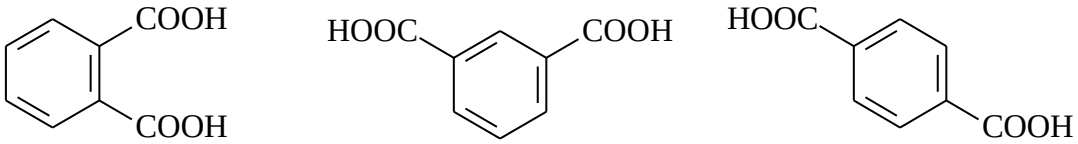
o'-toluol kislota

Dikarbon kislotalar



oksalat kislota | malein kislota | fumar kislota

Aromatik dikarbon kislotalar

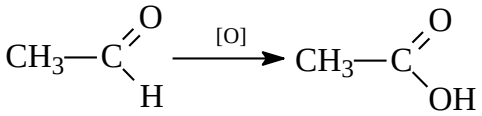


ftal kislota | izoftal kislota | tereftal kislota

Olinishi:

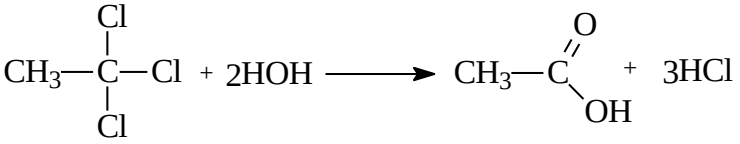
Ko'pchilik organik moddalar, masalan, spirtlar va aldegidlarning oxirgi oksidlanish mahsuloti karbon kislotalar hisoblanadi.

1) Aldegidlarni oksidlab olinadi:

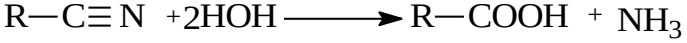


sirka aldegid | sirka kislota

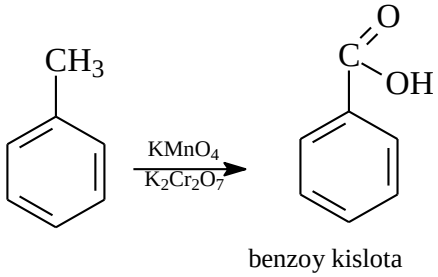
2) Alkil trixlorli hosilalarni yoki nitrillarni gidroliz ailib olinadi:



1,1,1-trixloretan | etan kislota

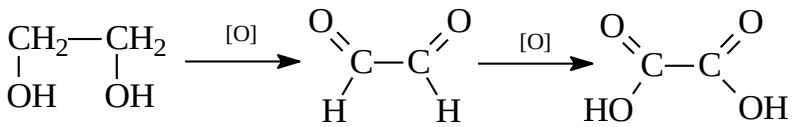


3) Benzol hosilalari oksidlanganda benzoy kislota hosil bo'ladi:



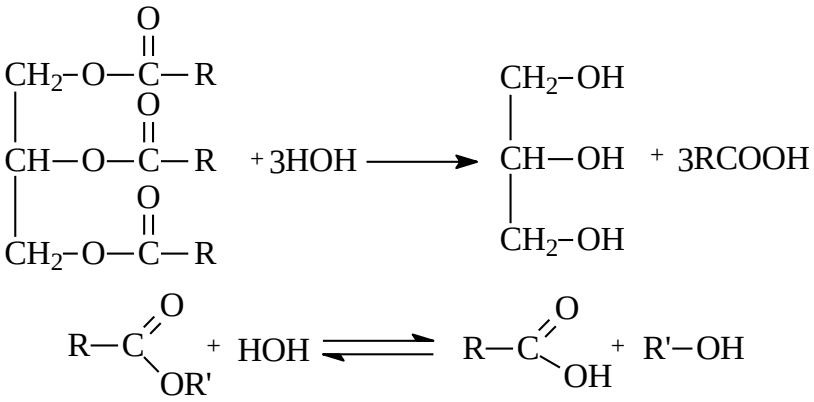
benzoy kislota

4) Etilenglikol oksidlanganda oksalat kislota hosil bo'ladi:



etilenglikol | glioksal | oksalat kislota

5) Yog'lar va murakkab efirlar gidrolizlanganda ham karbon kislotalar hosil bo'ladi:



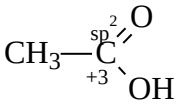
Fizilaviy xossalari:

Karbon kislotalarning quyi vakillari suyuq rangsiz moddalardir. Yuqoti vakillari rangsiz kristall moddalardir. Molekulada uglerod soni ortishi bilan ularning suvda eruvchanligi kamayadi.

Karbon kislotalarda molekulalararo vodorod bog'lanish mavjud bo'lganligi uchun ularning qaynash temperaturasi tegishli murakkab efirlarnikiga qaraganda yuqori.

Molekula tuzilishi:

Karbon kislotalarda karboksil guruh uglerodi sp^2 gibridlangan holda bo'ladi:



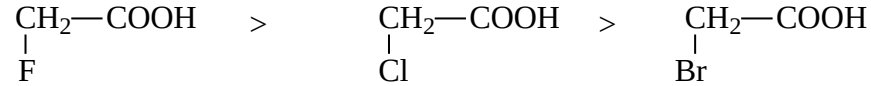
1) sp^2 – 3ta
2) sp^3 – 4ta
3) s – 4ta
4) p – 2ta

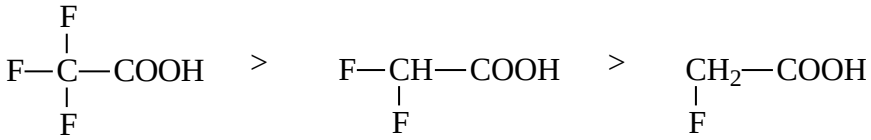
Kimyoviy xossalari:

Karbon kislotalar kislotalik xossasini namoyon qiladi. To'yingan karbon kislotalarda radikalda uglerod soni ortishi bilan kislotalik kuchi kamayadi:

$$HCOOH > CH_3COOH > C_2H_5COOH > C_3H_7COOH > C_4H_9COOH$$

Agar to'yingan radikalda galogen mavjud bo'lsa, kislota kuchi ortadi:





1) Karbon kislotalar metallar, metal oksidlari va ishqorlar bilan ta'sirlashib karbon kislota tuzlarini hosil qiladi:

$$CH_3COOH + Na \rightarrow CH_3COONa + {}^1/_2H_2$$
$$CH_3COOH + NaOH \rightarrow CH_3COONa + HOH$$
$$2CH_3COOH + CaO \rightarrow (CH_3COO)_2Ca + H_2O$$

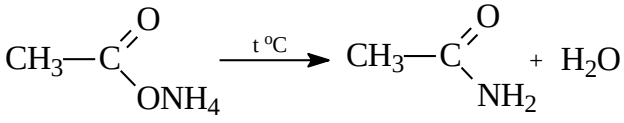
2) Hosil bo'lgan karbon kislota tuzlari ishqor bilan qizdirilganda dekarboksillanish reaksiyasi amalga oshadi:

$$CH_3–CH_2–COONa + NaOH \xrightarrow{t°C} CH_3–CH_3 + Na_2CO_3$$

3) Karbon kislotalar shuningdek NH_3 va NH_4OH bilan ta'sirlashib ammoniy tuzlarini hosil qiladi:

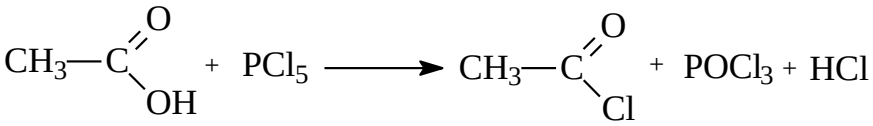
$$CH_3COOH + NH_3 \rightarrow CH_3COONH_4$$

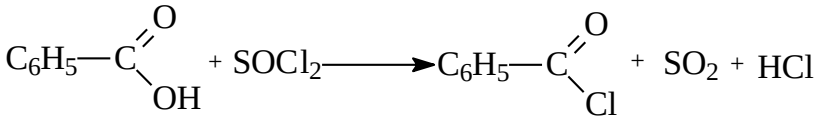
Ammoniy tuzlari 200°C da qizdirilganda degidratlanib amidlarni hosil qiladi:



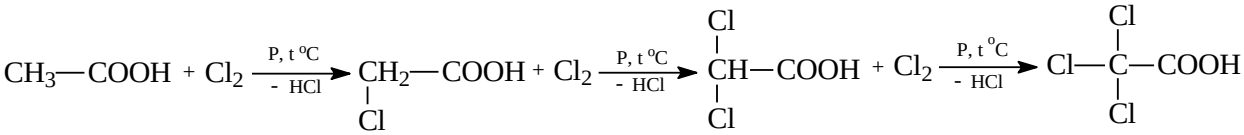
ammoniy atsetat — atsetamid

4) Karbon kisloatalarga PCl_5 yoki tionilxlorid $SOCl_2$ ta'sir ettirilganda xlorangidridlar hosil bo'ladi:



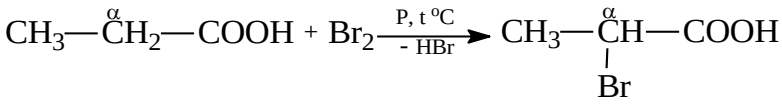


5) Issiq sirka kislota qizil fosfor ishtirokida xlorlanganda xlor radikalga birikadi:

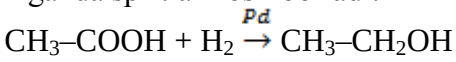


sirka kislota — xlorsirka kislota — dixlorsirka kislota — trixlorsirka kislota

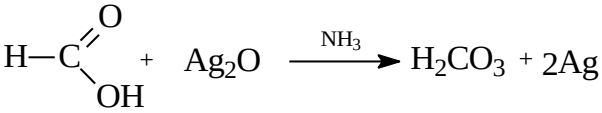
Qolgan gomologlari ham galogenlanganda dastlab faqat α-holat galogenlanadi:



6) Karbon kislotalar qaytarilganda spirtlar hosil bo'ladi:

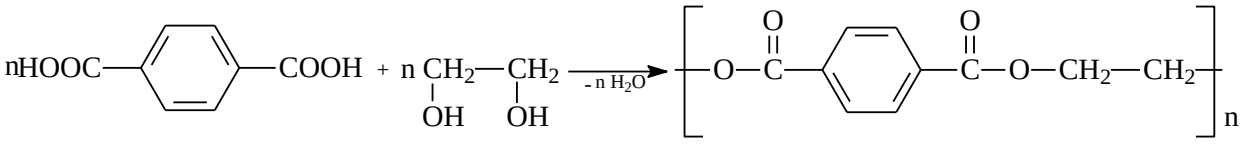


7) Karbon kislotalardan faqat chumoli kislota "kumush ko'zgu" reaksiyasiga kirishadi:



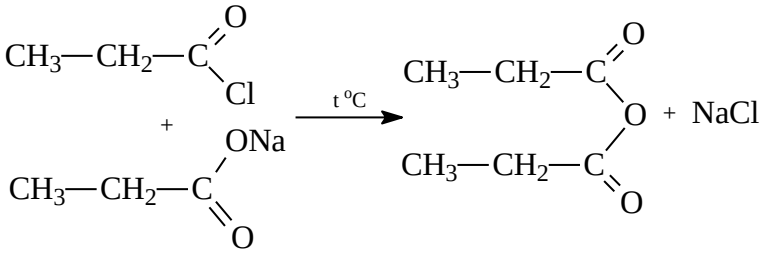
metan kislota — karbonat kislota

8) Tereftal kislota etilenglikol bilan eterifikatsiyasidan lavsan poliefiri hosil bo'ladi:



tereftal kislota — etandiol-1,2 — lavsan, Dakron

9) Karbon kislota xlorangidridlari tegishli tuzlar bilan qizdirilganda angidridlar hosil bo'ladi:

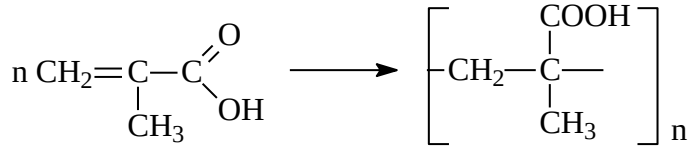


10) Karbon kislotalar yonganda suv va karbonat angidrid hosil bo'ladi:

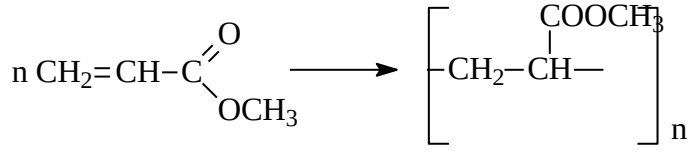
$$CH_3COOH + 2O_2 \rightarrow 2CO_2 + 2H_2O$$

Ishlatilishi:

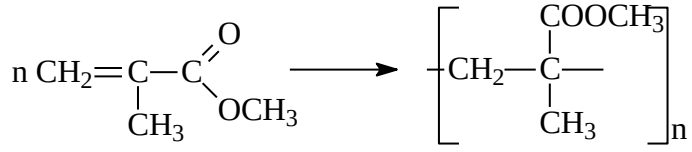
Chumoli kislota junga ishlov berishda, sirka kilsota sirka va sirka angidrid (undan atsetat shoyisi va aspirin olinadi) olishda ishlatiladi. Palmitin va stearin kislotalar sovun ichlab chiqarishda ishlatiladi. Akril va metakril kislotaning metil efirlari organik shisha (pleksiglas) ishlab chiqarishda ishlatiladi:



metakril ksilota polimetakrilat



metilakrilat efiri polimetilakrilat

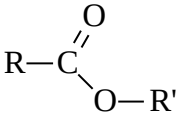


metilmetakrilat efiri polimetilmetakrilat

Olein va linol kislotalar moylar tarkibiga kiradi. Benzoy kislota konserva va dori-darmon sanoatida ishlatiladi.

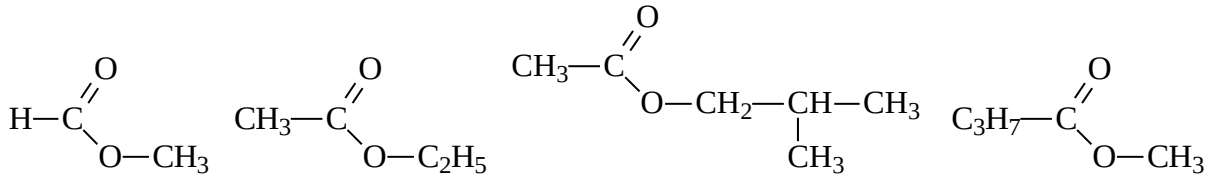
Mavzu: Murakkab efirlar.

Ta'rif: *Karbon kislotalar va spirtlardan hosil bo'lgan karbon kislota hosilalariga murakkab efirlar deyiladi.*

Ularning umumiy formulasi: 

Nomlanishi va izomeriyasi:

Murakkab efirlarni nomlash uchun tegishli kislota nomiga spirt nomi qo'shib *efiri* deyiladi, yoki spirt nomidan keyin tegishli kislota nomi aytiladi.

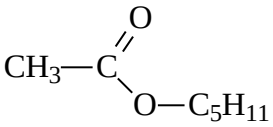


chumoli kislotaning metil efiri, metilformiat

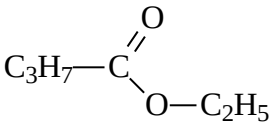
sirka kislotaning etil efiri, etilatsetat

sirka ksilotaning izobutilefiri izobutilatsetat (banan hidi)

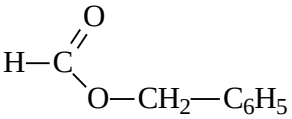
moy kislotaning metil efiri metilbutirat (olma hidi)



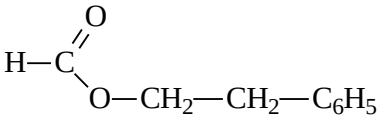
sirka kislotaning izoamil efiri, izoamilatsetat (nok hidi)



moy kislotaning etil efiri etilbutirat (ananas hidi)



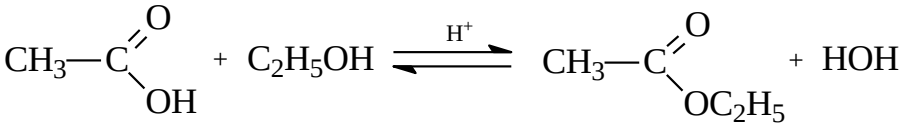
chumoli kislotaning benzil efiri, benzilformiat (jasmin hidi)



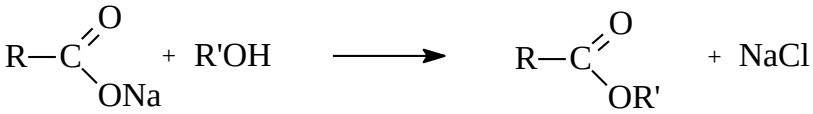
chumoli kislotaning feniletil efiri feniletilformiat (xrizantema hidi)

Olinishi:

Murakkab efirlar asosan eterifikatsiya reaksiyasi yordamida olinadi:



Shuningdek karbon kislota tuzlariga galogenoalkanlar ta’siridan olinadi:

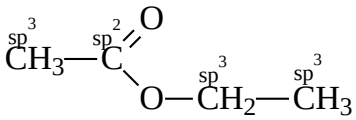


Fizikaviy xossalari:

Murakkab efirlar rangsiz, yoqimli hidli suyuqliklar hisoblanadi. Ularda vodorod bog’anish mavjud emas.

Molekula tuzilishi:

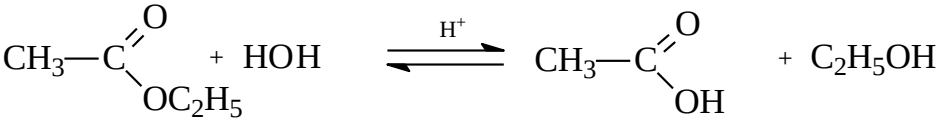
Murakkab efirlardagi karboksil guruh uglerodi sp^2 gibridlangan holda bo’ladi.



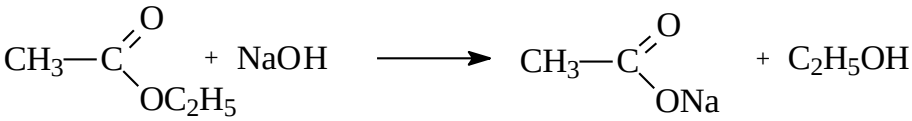
1) sp^3 – 4x4=16ta
2) sp^2 – 3ta
3) s – 8ta
4) p -2 ta

Kimyoviy xossalari:

1) Murakkab efirlar kislotali muhitda qaytar gidrolizga uchraydi. Bunda tegishli kislota va spirt hosil bo’ladi:

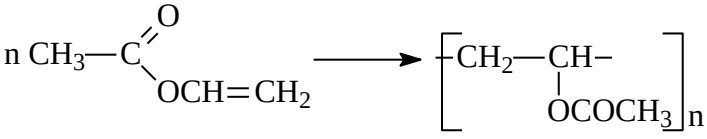


2) Murakkab efirlar ishqorlar bilan qaytmas gidrolziga uchraydi. Bunda karbon kislota tuzi va spirt hosil bo’ladi:



Ishlatilishi:

Murakkab efirlar yoqimli hidga ega bo’lganligi uchun mevalarning sun’iy hidlarini hosil qilishda ishlatiladi. Vinilatsetatning polimeri kley va laklar tayyorlashda ishlatiladi.



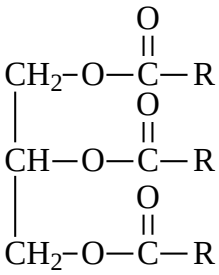
PVA - polivinilatsetat

Polimetilmetakrilat organik shisha sifatida ishlatiladi.

Mavzu: Yog'lar.

Ta'rif: *Glitserin va yuqori yog' kilsotalarining murakkab efirlariga yog'lar deyiladi.*

Ularning umumiy formulasi:



To'yingan yog' kislotalaridan qattiq yog'lar hosil bo'ladi. Ularga quyidagilar kiradi:

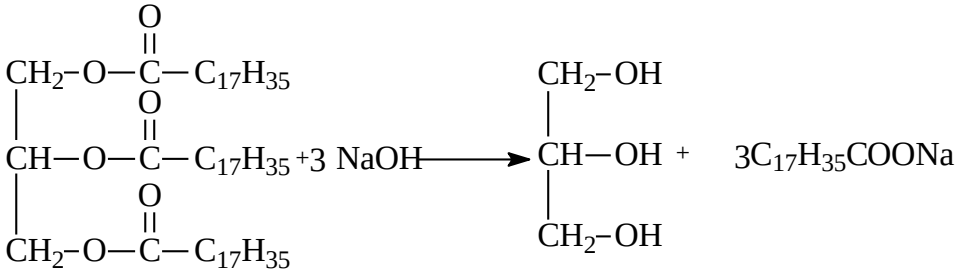
$C_{15}H_{31}–COOH$ palmitin kislota $C_{17}H_{35}–COOH$ stearin kislota

To'yinmagan yog' kisloatalaridan suyuq yog'lar, ya'ni moylar hosil bo'ladi:

$C_{17}H_{33}–COOH$ olein kislota $C_{17}H_{31}–COOH$ linol kislota $C_{17}H_{29}–COOH$ linolen kislota

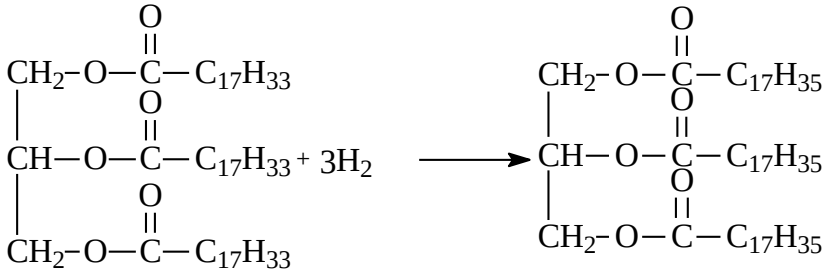
Hayvon yog'lari to'yingan, o'simlik yog'lari to'yinmagan kislotalaridan hosil bo'ladi.

Yog'larga ishqor ta'sir ettirilganda glitserin va karbon kislotaning ishqorli tuzi hosil bo'ladi. Bunga "*yog'larning sovunlanishi*" reaksiyasi deyiladi.



glitserin tristearati glitserin natriy stearat – sovun

Suyuq moylar gidrogenlanganda qattiq yog'lar hosil bo'ladi. Bu reaksiyaga *margarinlash* reaksiyasi deyiladi:



glitserin trioleati glitserin tristearati

Yog' kislotalarining kaliyli tuzlari suyuq bo'ladi.

Yog' kislotalarining Ca li va Mg li tuzlari suvda erimaydi. Shuning uchun "qattiq suv"da sovun ishlatib bo'lmaydi. Bunda sintetik yuvish vositalari – sulfokislotalarning natriyli tuzlari ishlatiladi.

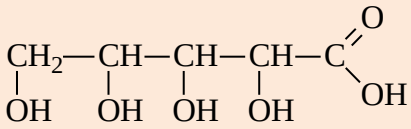
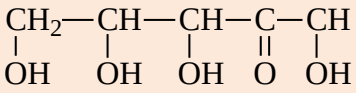
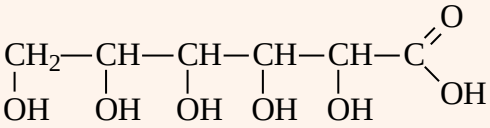
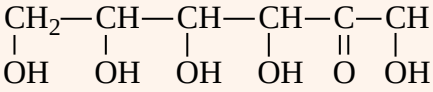
Mavzu: Uglevodlar.

Ta’rif: *Tarkibida gidroksil va karbonil guruhga ega organik moddalarga uglevodlar deyiladi.*
Umumiy formuladi: $C_n(H_2O)_m$.
Uglevodlar monosaxaridlar, disaxaridlar va polisaxaridlarga bo’linadi.

Mavzu: Monosaxaridlar.

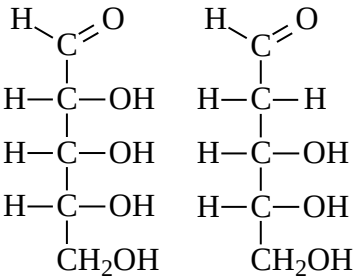
Monosaxaridlarda bitta uglevod molekulasi mavjud bo’ladi. Ular tarkibidagi uglerod soniga ko’ra tetroza, pentoza va geksozalarga bo’linadi.

Shuningdek, tarkibidagi karbonil guruh tabiatiga qarab aldoza va ketozalarga bo’linadi.

	Aldoza	Ketoza
Pentoza		
Geksoza		

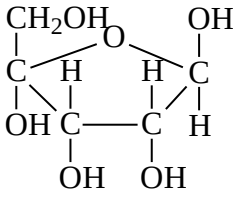
Pentozalar $C_5H_{10}O_5$ formulaga muvofiq keladi. Ularning asosiy vakillari riboza va dezoksiriboza hisoblanadi.

Uar ochiq, shiningdek, yopiq, ya’ni poluatsetal shaklda ham bo’ladi:

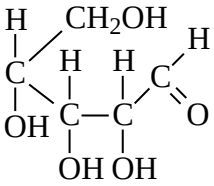


D-riboza

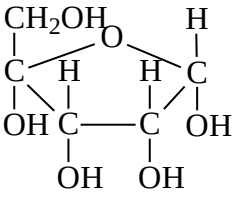
D-dezoksi-riboza



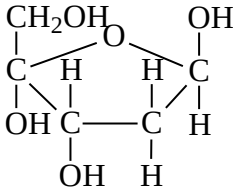
β-D-ribofuranoza



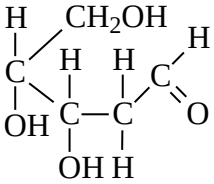
D-riboza (aldegid shakli)



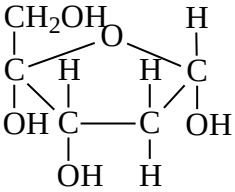
α-D-ribofuranoza



β-D-dezoksiriboza



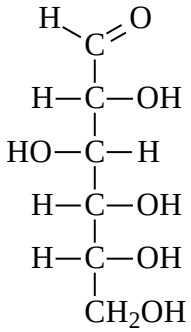
D-dezoksiriboza (aldegid shakli)



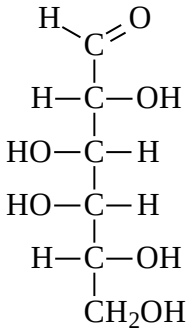
α-D-dezoksiriboza

RNK da ribozaning siklik β-shakli, DNK da dezoksiribozaning siklik β-shaklida bo’ladi.

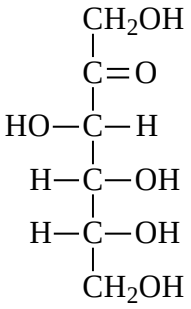
Geksozalar $C_6H_{12}O_6$ formulaga muvofiq keladi. Ularning asosiy vakillari glyukoza, fruktoza va galaktoza hisoblanadi.



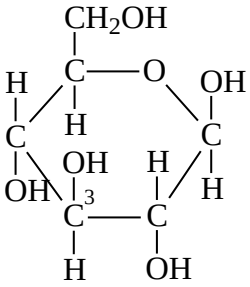
D-glyukoza



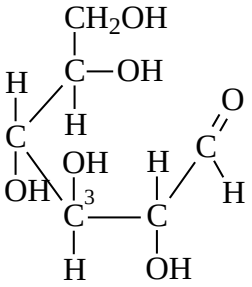
D-galaktoza



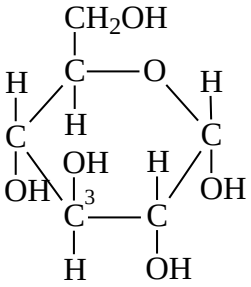
D-fruktoza



β-D-glyukoza



D-glyukoza



α-D-glyukoza

Fizikaviy xossalari:

Glyukoza va fruktoza rangsiz shirin ta'mli moddalardir. Ular suvda yaxshi eriydi.

Kimyoviy xossalari:

1) Glyukoza qaytarilganda olti atomli spirt hosil bo'ladi:

$$CH_2OH–(CHOH)_4–CHO + H_2 \rightarrow \underset{\text{sorbit}}{CH_2OH–(CHOH)_4–CH_2OH}$$

2) Glyukoza aldegidlar kabi "kumush ko'zgu" reaksiyasiga kirishadi. Bunda glyukon kislota hosil bo'ladi:

$$CH_2OH–(CHOH)_4–CHO + Ag_2O \xrightarrow{NH_3} \underset{\text{glyukon kislota}}{CH_2OH–(CHOH)_4–COOH}$$

3) Glyukoza shuningdek yangi tayyorlangan $Cu(OH)_2$ bilan ham aldegildar kabi ta'sirlashadi:

$$CH_2OH–(CHOH)_4–CHO + 2Cu(OH)_2 \rightarrow \underset{\text{glyukon kislota}}{CH_2OH–(CHOH)_4–COOH} + 2CuOH + H_2O$$

4) Glyukoza uchun 4 xil bijg'ish xarakterli:

a) Spirtli bijg'ish – etanol hosil bo'ladi:

$$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$$

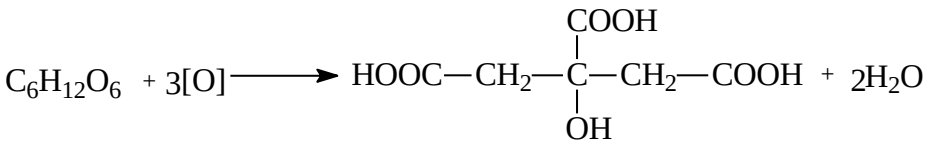
b) Moy kislotali bijg'ish – butan kislota hosil bo'ladi:

$$C_6H_{12}O_6 \rightarrow C_3H_7COOH + 2CO_2 + 2H_2$$

c) Sut kislotali bijg'ish – 2-gidroksipropan kislota hosil bo'ladi:

$$C_6H_{12}O_6 \rightarrow 2CH_3–CH(OH)–COOH$$

d) Limon kislotali bijg'ish:

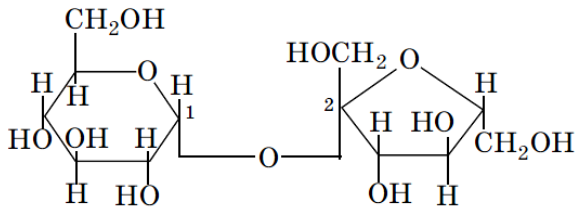


5) Glyukoza yonganda suv va karbonat angidrid hosil bo'ladi:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$

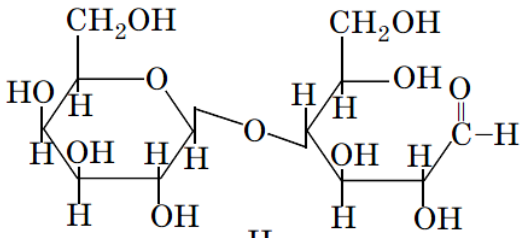
Mavzu: Disaxaridlar-$C_{12}H_{22}O_{11}$.

Disaxaridlar ikkita monosaxaridlardan hosil bo'lgan. Ularga saxaroza, maltoza va laktoza kiradi.



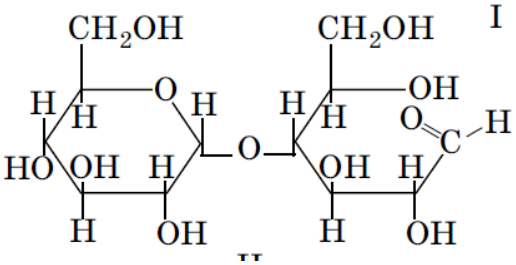
Saxaroza α-D-glyukoza va β-D-fruktozadan tuzilgan. Shuning uchun saxaroza gidrolizidan glyukoza va fruktoza hosil bo'ladi.

$$C_{12}H_{22}O_{11} + H_2O \rightarrow \underset{\text{glyukoza}}{C_6H_{12}O_6} + \underset{\text{fruktoza}}{C_6H_{12}O_6}$$



Laktoza β-D-galaktoza va β-D-glyukozadan tuzilgan. Shining uchun laktoza gidrolizidan galatoza va glyukoza hosil bo'ladi.

$$C_{12}H_{22}O_{11} + H_2O \rightarrow \underset{\text{glyukoza}}{C_6H_{12}O_6} + \underset{\text{galaktoza}}{C_6H_{12}O_6}$$



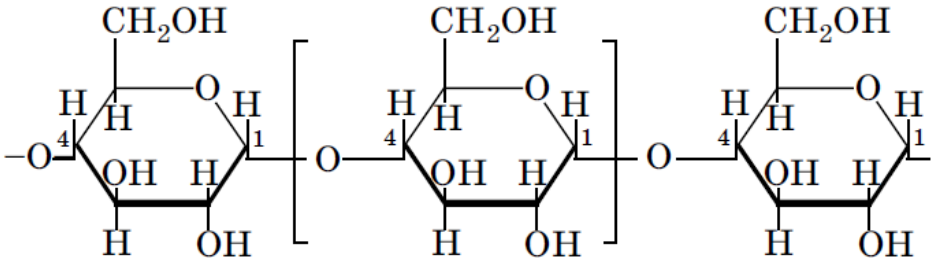
Maltoza ikki molekula α-D-glyukozadan tuzilgan. Shing uchin maltoza gidrolizidan faqat glyukoza hosil bo'ladi.

$$C_{12}H_{22}O_{11} + H_2O \rightarrow 2\underset{\text{glyukoza}}{C_6H_{12}O_6}$$

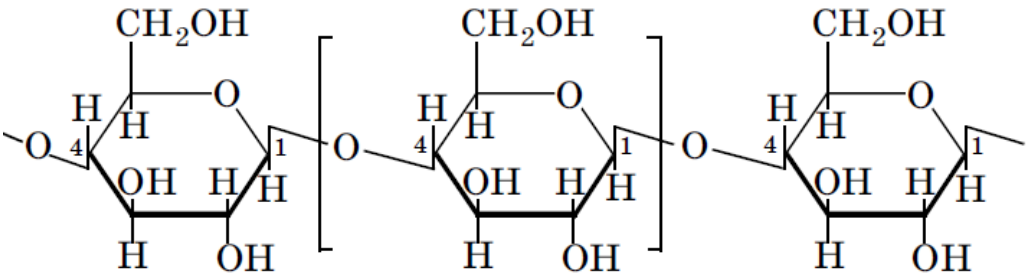
Mavzu: Polisaxaridlar – $(C_6H_{10}O_5)_n$.

Polisaxaridlarga kraxmal, sellyuloza va glikogen kiradi.

Kraxmal α-D-glyukozalar zanjiridan tuzilgan:



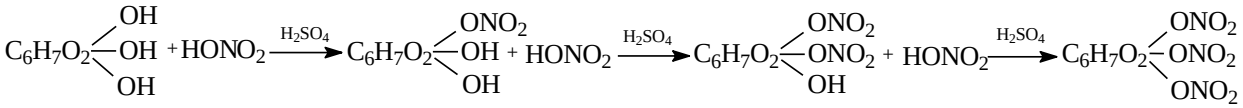
Sellyuloza β-D-glyukozalar zanjiridan tuzilgan:



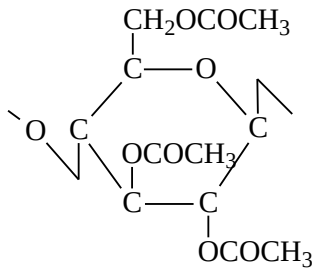
Kraxmal va sellyuloza gidrolizining oxirgi mahsuloti glyukoza hisoblanadi:

$$(C_6H_{10}O_5)_n + nH_2O \xrightarrow{t°C,\ H^+} nC_6H_{12}O_6$$

Sellyuloza molekulasida 3 ta gidroksil guruh bo'ganligi uchun u nitrat kislota bilan mono-, di- va trinitrohosilalarni hosil qiladi. Hosil bo'lgan mahsulotlar murakkab efir hisoblanadi:



sellyuloza — mononitroselyuloza — dinitroselyuloza — trinitroselyuloza



Trinitrosellyuloza – piroksilin tutunsiz porox sifatida ishlatiladi.

Shuningdek sellyuloza sirka kislota bilan atsetat efirlar hosil qiladi. bu efirlar sun'iy atsetat tolalar olishda ishlatiladi:

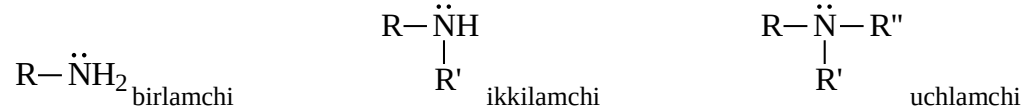
IV BOB. AZOT SAQLOVCHI ORGANIK BIRIKMALAR.

Mavzu: Aminlar.

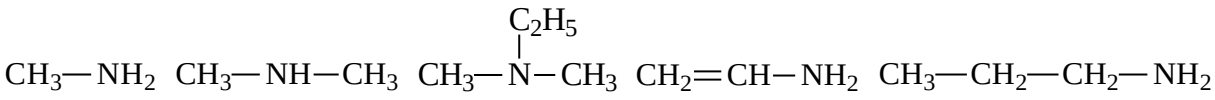
Ta'rif: *Ammiak molekulasidagi bitta, ikkita yoki uchta vodorod atomining uglevodorod radikaliga almashinishidan hosil bo'lgan organik moddalar sinfiga aminlar deyiladi.*

Nomlanishi va izomeriyasi:

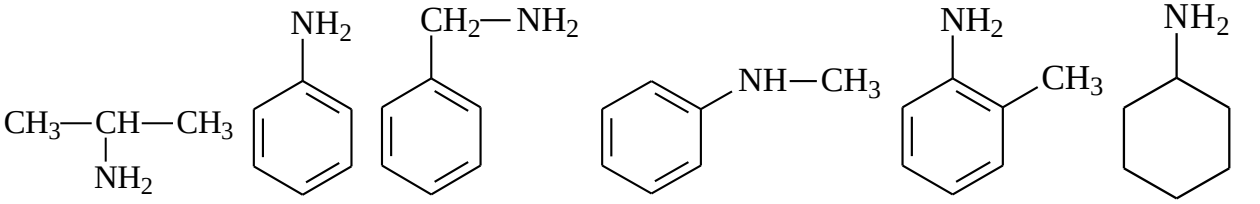
Aminlar ammiakdagi vodorod almashinish darajasiga ko'ra birlamchi, ikkilamchi va uchlamchi aminlarga bo'linadi:



Aminlarni nomlash uchun azotga tutash radikallar nomi aytiladi:



metilamin dimetilamin dimetiletilamin vinilamin 1-aminopropan, propilamin



2-aminopropan izopropilamin fenilamin anilin benzilamin N'-metilanilin o'-toluidin siklogeksilamin

Olinishi:

1) Ammiak va aminlarni galgenalkanlar bilan alkillab olinadi:

$$CH_3–J + NH_3 \rightarrow [CH_3–NH_3]^+J^- + NH_3 \rightarrow CH_3–NH_2 + NH_4J$$

2) Spirtlarning Al_2O_3 katalizatori ishtirokida ammiak bilan ta'siridan olinadi:

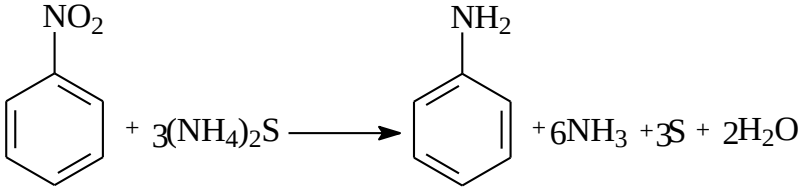
$$R–OH + NH_3 \xrightarrow{Al_2O_3} R–NH_2 + H_2O$$

3) Nitrobirikmalarni yoki nitrillarni katalitik gidrogenlab olinadi:

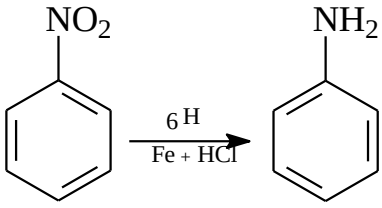
$$CH_3–NO_2 \xrightarrow{[H]} CH_3–NH_2$$

$$CH_3–C\equiv N \xrightarrow{[H]} CH_3–CH_2–NH_2$$

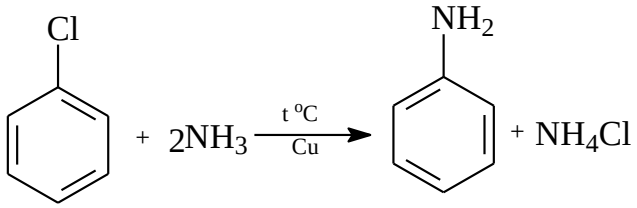
4) Anilinni birinchi bo'lib 1842 yil Zinin nitrobenzolni ammoniy sulfid bilan qaytarib olgan:



5) Hozirgi vaqtda anilin nitrobenzolni katalitik gidrogenlab olinadi:



6) Galogenalkanlarga ammiak ta'sir ettirib olinadi:



Fizikaviy xossalari:

Alkinaminlar rangsiz gaz yoki suyuqliklardir. Anilin o'ziga xos hidli moysimon suyuqlik.

Aminlarda molekulalararo vodorod bog'lanish mavjud.

Yuqori aminlar aminokislotalar parchalanishidan hosil bo'lganligi uchun ular aynigan baliq hidiga ega.

Molekula tuzilishi:

Aminlarda gibridlanish radikal tabiatiga bog'liq.

Kimyoviy xossalari:

Aminlar asoslik xossasini namoyon qiladi. Alifatik aminlar ammiakdan kuchliroq asos hisoblansa, aromatik aminlarning asosligi ammiaknikidan kuchsiz:

$$(C_6H_5)_3N \rightarrow (C_6H_5)_2NH \rightarrow C_6H_5NH_2 \rightarrow NH_3 \rightarrow CH_3NH_2 \rightarrow (CH_3)_2NH \rightarrow (CH_3)_3N$$

1) Aminlar mineral kislotalar bilan ta'sirlashib alkilammoniy tuzlarini hosil qiladi:

$$CH_3–NH_2 + HCl \rightarrow [CH_3–NH_3]^+Cl^-$$

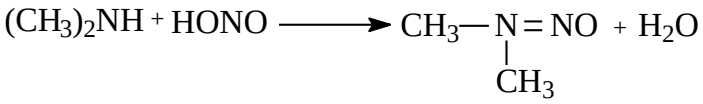
metilammnoniyxlorid

2) Aminlar nitrit kislota bilan ta'sirlashadi:

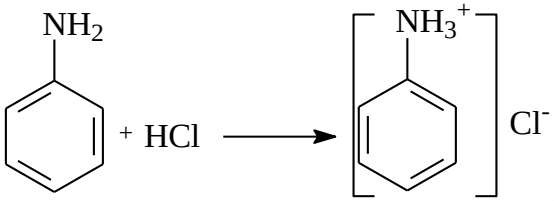
a) Birlamchi aminlar nitrit kislota bilan ta'sirlashganda spirt, azot va suv hosil bo'ladi:

$$CH_3–NH_2 + HONO \rightarrow CH_3–OH + N_2 + H_2O$$

b) Ikkilamchi aminlar nitrit kislota ta'sirida nitrozaaminlarni hosil qiladi:

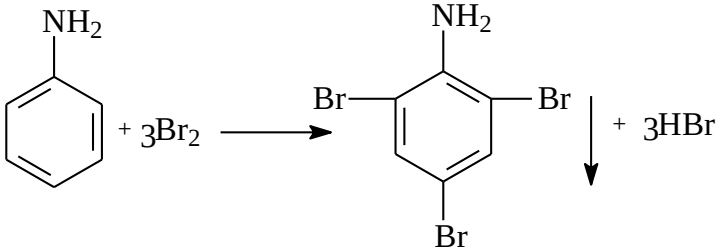


3) Anilin kislotalar bilan xuddi alifatik aminlardek ta'sirlashadi:



fenilammoniyxlorid

4) Aminoguruh I tur o'rinbosar hisoblanganligi uchun reaksion markazni o' va p' holatga yo'naltiradi:



2,4,6-tribromanilin

5) Aminlar yonganda karbonat angidrid, azot va suv hosil bo'ladi:

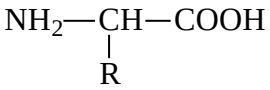
$$4CH_3–NH_2 + 9O_2 \rightarrow 4CO_2 + 2N_2 + 10H_2O$$

Ishlatilishi:

Anilin bo'yoqlar va portlovchi moddalar olishda ishlatiladi. Metilamin va dimetilamin dori ishlab chiqarishda ishlatiladi.

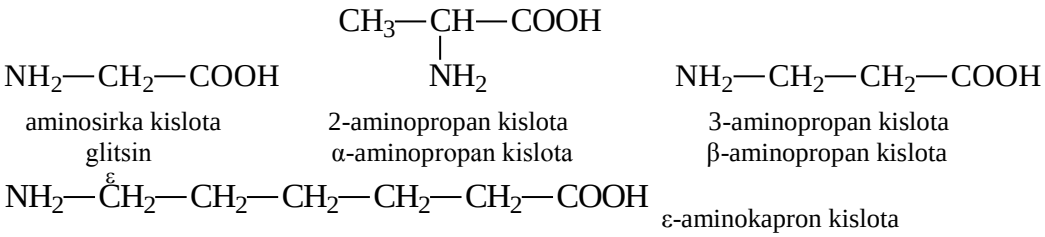
Mavzu: Aminokislotalar.

Ta'rif: *Tarkibida ham amino $-NH_2$ ham karboksil $-COOH$ guruh tutgan organik moddalarga aminokislotalar deyiladi.*

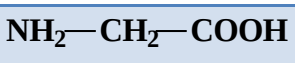
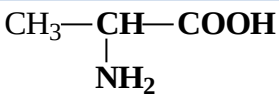
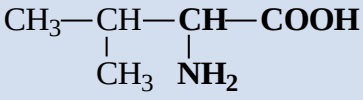
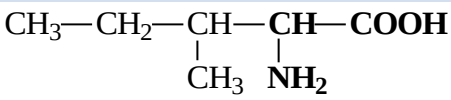
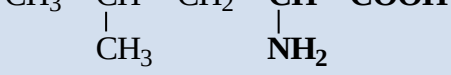
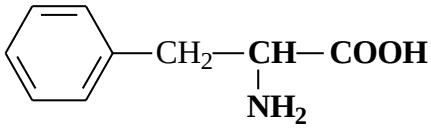
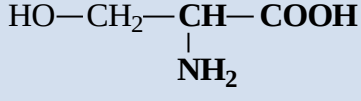
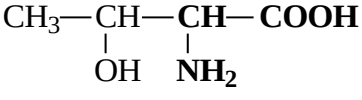
Umumiy formulasi: 

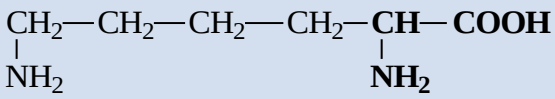
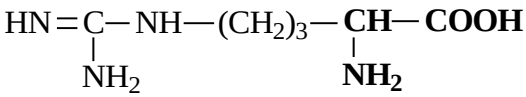
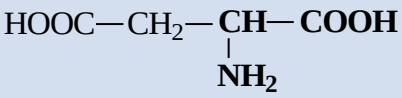
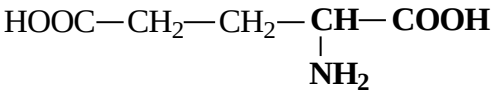
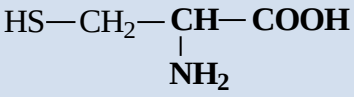
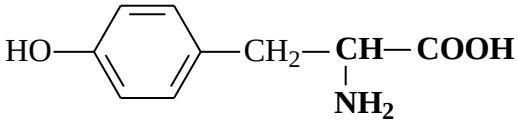
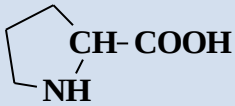
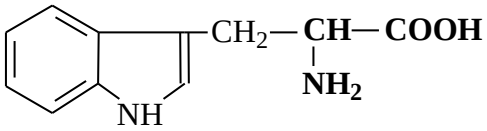
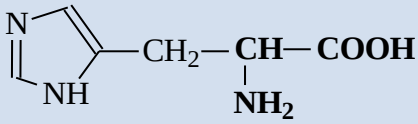
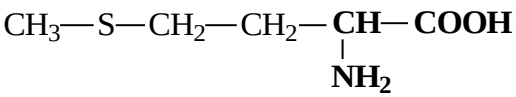
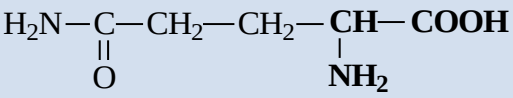
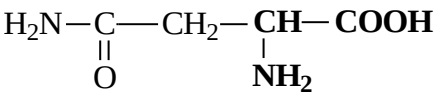
Nomlanishi va izomeriyasi:

Aminokislotalarda karboksil guruh 1 deb olinib, aminoguruh joyi qo'shib aytiladi. Shuningdek karboksil guruhdan keying uglerod α holatga nisbatan nomlanadi:



Eng ko'p uchraydigani bu α-aminokislotalar hisoblanadi:

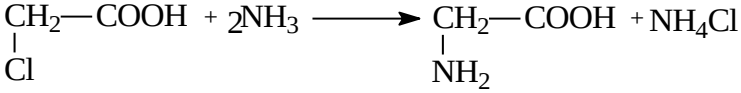
№	*Nomi*	*Formulasi*	*Belgisi*	*Harfli belgisi*
1	Glitsin		Gly	G
2	Alanin		Ala	A
3	Valin		Val	V
4	Izoleysin		Ile	I
5	Leysin		Leu	L
6	Fenilalanin		Phe	F
7	Serin		Ser	S
8	Treonin		Thr	T

9	Lizin		Lys	K
10	Arginin		Arg	R
11	Asparagin kislota		Asp	D
12	Glutamin kislota		Glu	E
13	Sistein		Cys	C
14	Tirozin		Tyr	Y
15	Prolin		Pro	P
16	Triptofan		Trp	W
17	Gistidin		His	H
18	Metionin		Met	M
19	Glutamin		Gln	Q
20	Asparagin		Asn	N

Olinishi:

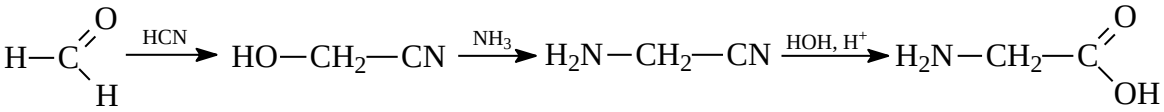
Aminokislotalar oqsillarning monomeri hisoblanadi. Shuning uchun ular oqsil gidrolizidan hosil bo'ladi.

1) Karbon kislotaning gelogenli hosilalariga ammiak ta'siridan olinadi:



2-xlorsirka kisloata 2-aminosirka kislota

2) Glitsinni formaldegiddan olish mumkin:

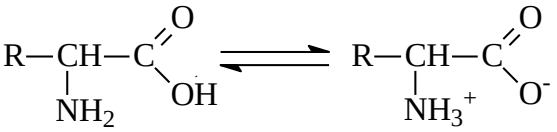


Fizikaviy xossalari:

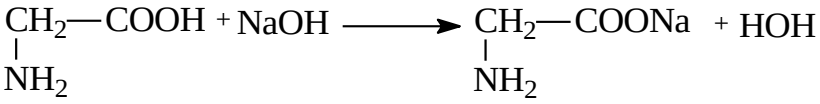
Aminokislotalar rangsiz kristall moddalar bo'lib, suvda yaxshi eriydi. Organik erituvchilarda kam eriydi. Ko'pchiligi shirin ta'mli.

Kimyoviy xossalari:

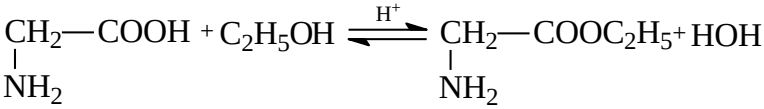
Aminokislotalarda ham amino (asos), ham karboksil (kislota) guruh bo'lganligi uchun ular ichki tuz – betainlarni hosil qiladi:



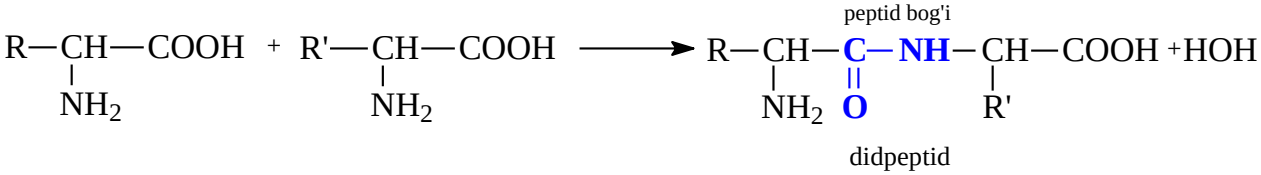
1) Aminokislotalar kuchsiz kislotalik xossasini namoyon qiladi. Ular ishqorlar bilan ta'sirlashib tuzlarni hosil qiladi:



2) Aminokislotalar kislotalar ishtirokida spirtlar bilan eterifikatsiya reaksiyasiga kirishadi:



3) Aminokislotalar o'zaro kondensatlanib polipeptidlarni hosil qiladi:



Ishlatilishi:

Aminokislotalar muhim biologik moddalar hisoblanadi. Ular oqsillarning asosiy tarkibidir. ε-aminokapron kislota kaprolaktam olishda ishlatiladi. Kaprolaktam poliamid materiallar (naylon) olishda ishlatiladi.

Mavzu: Oqsillar.

Ta'rif: *Bir-birlari bilan peptid bog'lari orqali bog'langan α-aminokislotalardan tashkil topgan tabiiy biopolimerlarga oqsillar deyiladi.*

Oqsillar tarkibiga ko'ra 2 ga bo'linadi:

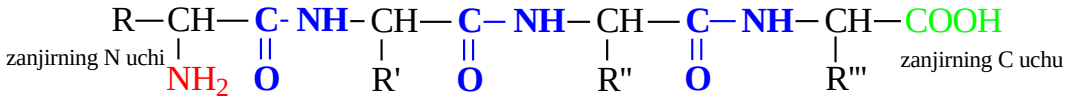
1) Proteinlar.
2) Proteidlar.

Proteinlar faqat aminokislotalar qoldig'idan tuzilgan. Ular albuminlar (ular suvda eriydi, sut, tuxum va qon oqsili kiradi), globulinlar (suvda erimaydi, qon globilinlari va mushak oqsili – miozin kiradi), skleroproteinlar (suvda erimaydi, keratin, teri oqsili va fibroin kiradi)ga bo'linadi.

Proteidlar – murakkab oqsillar, aminokislotalar va oqsil bo'lmagan qoldiqlardan tuzilgan. Ularga fosfoproteidlar (fosfat kislota qoldig'i tutgan oqsil, masalan, sut oqsili kazein), glikoproteidlar (uglevod

qoldig'i tutgan oqsillar), xromoproteidlar (rangli moddalar, masalan, gemoglobin), nukleoproteidlar (nuklein kislota qoldig'i tutgan oqsillar) kiradi.

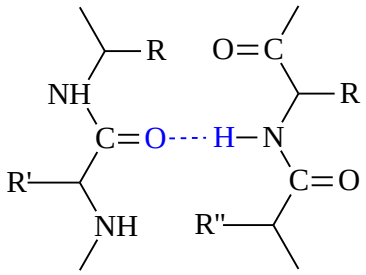
Oqsillar faqat α-aminokislotalar qoldig'idan tuzilgan:



Oqsillar 4 xil strukturada mavjud bo'ladi:

1) Birlamchi;
2) Ikkilamchi;
3) Uchlamchi;
4) To'rtlamchi.

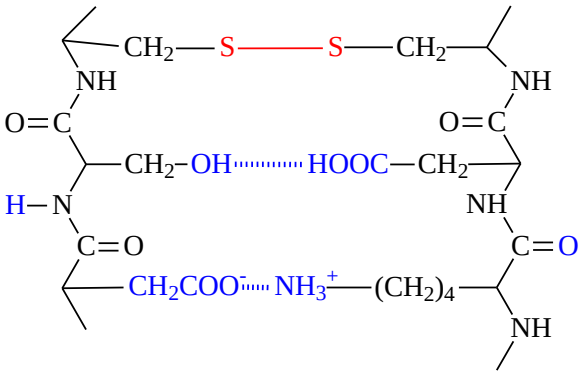
1) Oqsillarning birlamchi strukturasi aminokislotalarning chiziqli zanjiridir:



Phe-Val-Asn-Gln-His-Leu-Cys-Gly-Ser-His-Leu-Val-Glu-Ala-Leu-Tyr-Leu-Val-**Cys**

2) Oqsillarning ikkilamchi strukturasida aminokislotalar molekulasidagi karbonil va amino guruhlar orasida vujuga kelgan vodorod bog'lari tufayli spiral fazoviy shaklga keladi:

3) Oqsilning uchlamchi strukturasi polipeptid zanjiridagi funksional guruhlari o'zaro ta'sridan vujudga keladi. Bunda karboksil va aminoguruhdan tuz ko'prigi, karboksil va gidroksil guruhdan murakkab efir ko'prigi, oltingugurt atomlari o'zaro bog'lanishidan disulfid ko'prigi, shuningdek gidrofob ta'sirlar natijasida hosil bo'ladi.



4) Oqsilning to'rtlamchi strukturasida bir nechta oqsil molekulalari yig'ilib, murakkab tuzsilishni hosil qiladi:

Oqsillarning barqarorligi turlicha hisoblanadi. Ular kislotali yoki ishqoriy muhitda gidrolizlanib, α-aminokislotalarni hosil qiladi.

Oqsillar tarkibiga turli funksional guruhlarning kirganligi rangli reaksiyalar yordamida aniqlanadi.

1) *Biuret* reaksiyasi – oqsilga ishqoriy muhitda $CuSO_4$ eritmasi qo'shilganda binafsha rang hosil bo'ladi. Bu peptid bog'ga sifat reaksiya hisoblanadi.
2) *Ksantoprotein* reaksiyasi – aromatik va geteroatomli xalqali oqsillarga kons.HNO_3 qo'shilganda, sariq rangga kiradi (xalqaning nitrolanishi). Ishqor qo'shilganda sariq rang zarg'aldoq rangga kiradi (fenilalanin va tirozin).
3) *Millon* reaksiyasi – oqsilga $Hg(NO_3)_2$ va nitrat kislota ta'sirida qizil-qo'ng'ir cho'kma hosil bo'ladi.
4) Agar oqsil tarkibida oltingugurt tutsa, qo'rg'oshin tuzlari ta'sirida eritmada qora PbS cho'kmasi hosil bo'ladi.

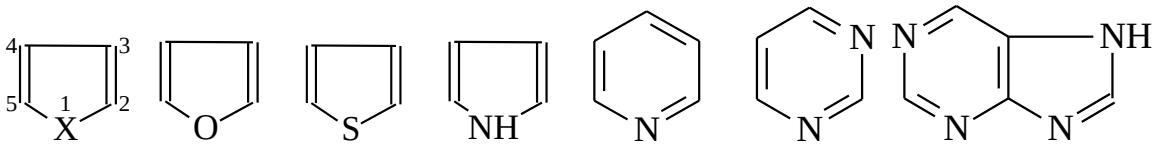
Oqsillar hayotning asosi hisoblanadi. Masalan, gemoglobin oqsili $(C_{738}H_{1166}O_{208}S_2Fe)_4$, insulin gormoni $C_{254}H_{377}N_{65}O_{75}S_6$ oqsillar shular jumlasiga kiradi.

Mavzu: Geterosiklik birikmalar.

Ta'rif: *Xalqa tarkibida uglerod atomidan boshqa element atomlari (N, S, O) tutgan moddalarga geterosiklik birikmalar deyiladi.*

Nomlanishi va izomeriyasi:

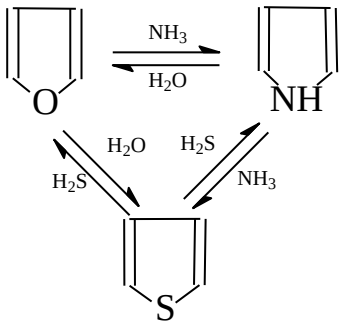
Geterosiklda geteroatom 1 deb raqamlanib, sikl nomi aytiladi:



C_4H_4O	C_4H_4S	C_4H_5N	C_5H_5N	$C_4H_4N_2$	$C_5H_4N_4$
furan	tiofen	pirrol	piridin	pirimidin	purin

Olinishi:

Al_2O_3 katalizatori sihtirokida ularning bir-biriga aylanishini quyidagicha tasvirlash mumkin:

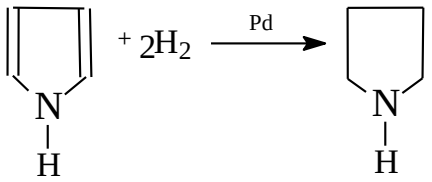


Fizikaviy xossalari:

Pirrol, tiofen va furan yoqimli hidli rangsiz suyuqliklardir.

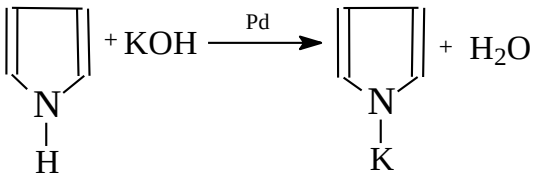
Kimyoviy xossalari:

1) Ularning barchasi gidrogenlanganda qo'shbog' uziladi:



pirrol pirrolidin

2) Pirrolning vodorodi nisbatan erkin. Shuning uchun u kuchsiz kislota xossasini namoyon qiladi:

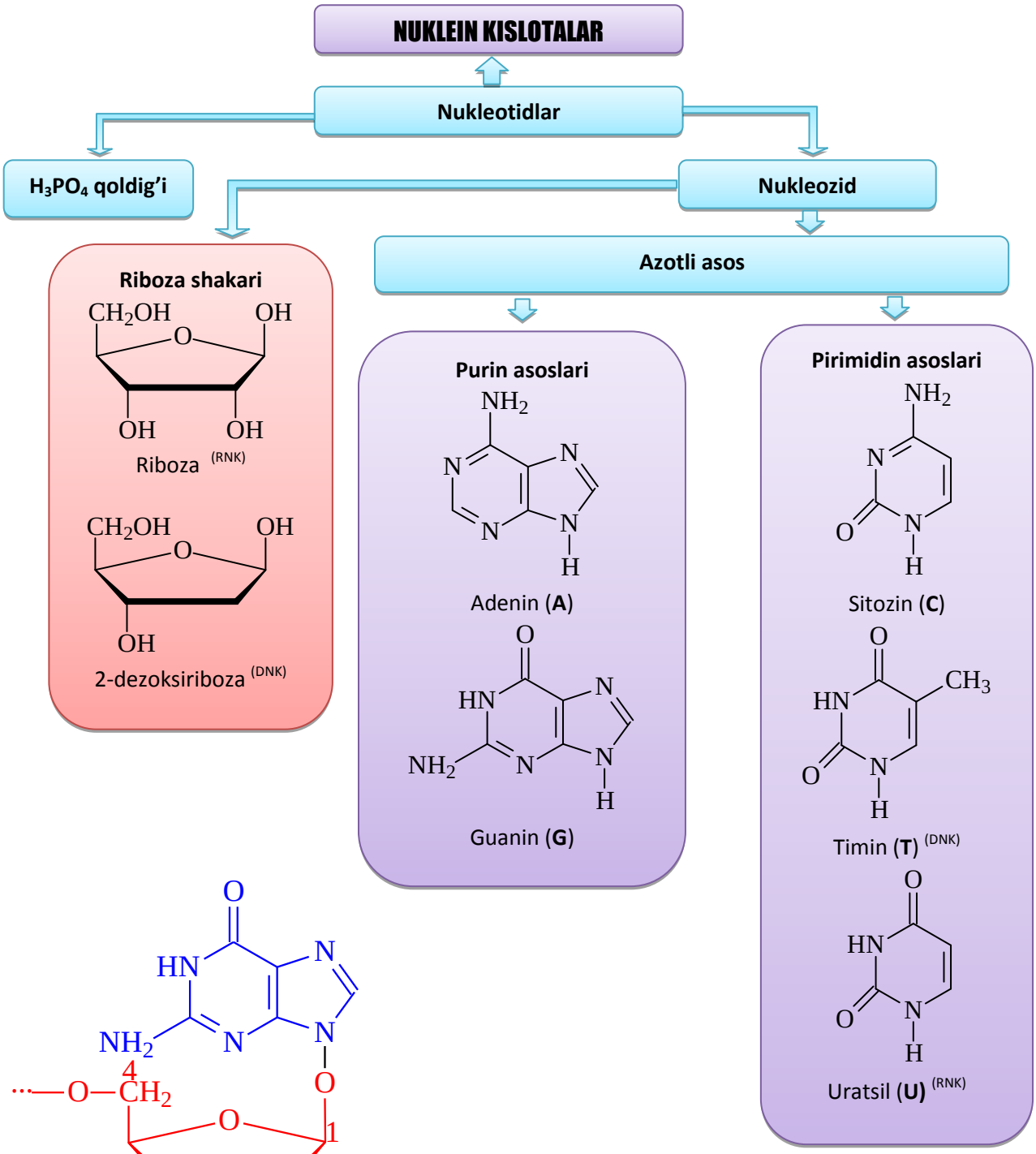


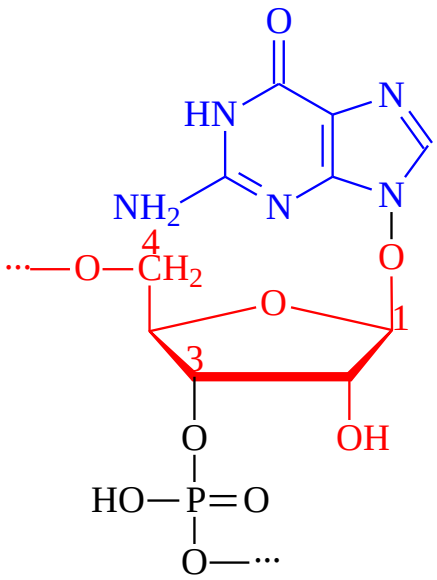
Ishlatilishi:

Pirrol va furan organik sintezda ishlatiladi. Piridin organik erituvchi sifatida ishlatiladi.

Mavzu: Nuklein kislotalar.

Ta'rif: *Nukleotid monomerlarining makromolekulasiga nuklein kislotalar deyiladi.*





Nukleozidlar – bu purin va prirmidin asoslarining riboza yoki dezoksiriboza bilan birikmasidir.

Ribonuklein kislota molekulasini quyidagicha tasvirlash mumkin:

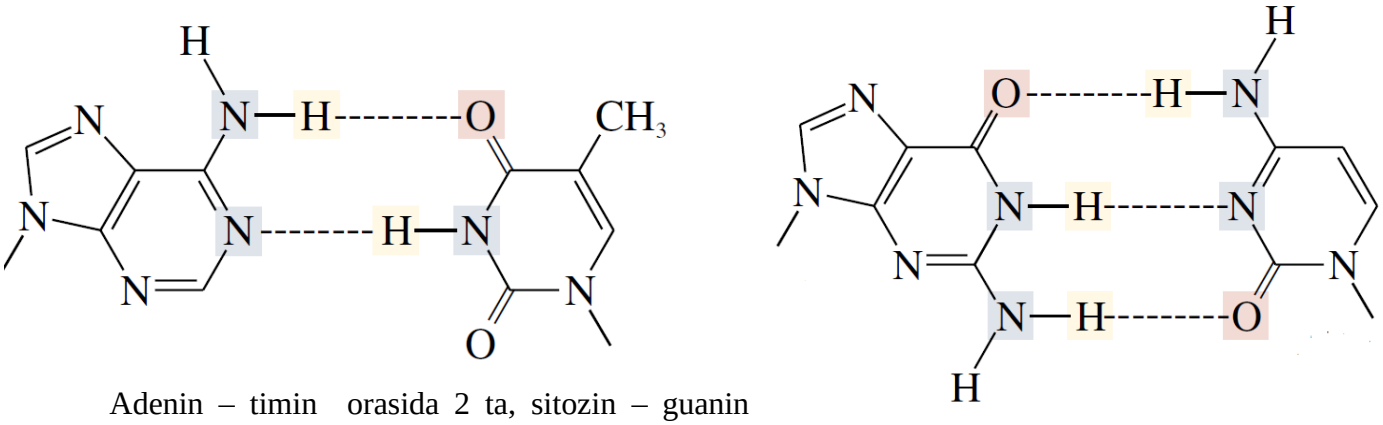
Zanjirda azotli asos bilan pentozaning 1’-uglerodi, fosfat kislota qoldig’i bilan 3’-uglerodi va keyingi nukleozid bilan 5’-ulerod orqali bog’langan.

Hujayra tarkibida ribonuklein kislota (RNK) va dezoksiribonuklein kislota (DNK) farqlanadi.

RNK tarkibida *riboza*, fosfat kislota qoldig’i, adenin, guanin, sitozin va *uratsil* bo’ladi. DNK tarkibida esa *dezoksiriboza*, fosfat kislota qoldig’i , adenin, guanin, sitozin va *timin* bo’ladi.

DNK zanjiri qo’shaloq spiral tuzilishga ega. Buni 1953 yilda (1962 yilgi Nobel mukofoti sovrindorlari) D.Uotson va F.Krik ochishgan. Bu ikki spiral bir-birlari bilan purin va pirimidin asoslari orasida vujudga keladigan *vodorod bog’lanish* orqali bog’langan bo’ladi. Molekulalararo vodorod bog’lanish *komplementar* (mos) juftlarni hosil qiladi.

Ya’ni adenin – guanin (A – T) jufti va sitozin – guanin (C – G) juftlari.



Adenin – timin orasida 2 ta, sitozin – guanin orasida 3 ta vodorod bog’i mavjud.

Inson DNK si tarkibida purin va pirimidin asoslarining ulushi quyidagicha:

Purin	*Pirimidin*	*Asos nisbati*
Adenin (A) 30,3%	Timin (T) 30,3%	A/T=1,00
Guanin (G) 19,5%	Sitozin (C) 19,9%	G/C=0,98
Jami purinlar: 49,8%	Jami pirimidinlar: 50,1%	

RNK da timin asosiga uratsil asosi mos keladi.

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2. Угай А. «Неорганическая химия», М.: Высшая школа, 1989.
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7. “Kimyo-mavzulashtirilgan testlar to’plami”, Buxoro, 2009.

4-Qism

ILOVALAR

*Ma'lumotlar

*Jadvallar

*Kattaliklar

ILOVALAR

VALENTLIK

O’zgarmas valentli elementlar:

I	Li, Na, K, Rb, Cs, H, F, Ag
II	Be, Mg, Ca, Sr, Ba, Zn, Cd, O
III	B, Al

O’zgaruvchan valentli elementlar:

II-IV	C, Si, Sn, Pb
III-V	P, As
II-IV-VI	S, Se, Te
I-III-V-VII	Cl, Br, J
I-II-III-IV	N
II-III-VI	Cr, Mo
II-III-IV-VI-VII	Mn
II-III	Fe, Co, Ni
I-II	Cu, Hg
I-III	Au, Tl

Guruh valentliklari:

I valentli

-OH	Gidroksil
$-NO_2$	Nitrit
$-NO_3$	Nitrat
-Г (F, Cl, Br, J)	Galogenid
-ГО (Cl, Br, J)	Gipo+Г+it
$-ГO_2$ (Cl, Br, J)	Г+it
$-ГO_3$ (Cl, Br, J)	Г+at
$-ГO_4$ (Cl, Br, J)	Per+Г+at
-CN	Sianid
$-MnO_4$	Permanganat
$-NH_4$	Ammoniy

II valentli

=S	Sulfid
$=SO_3$	Sulfit
$=SO_4$	Sulfat
$=CO_3$	Karbonat
$=SiO_3$	Silikat
$=CrO_4$	Xromat
$=Cr_2O_7$	Bixromat, dixromat
$=MnO_4$	Manganat
$=B_4O_7$	Tetraborat
$=HPO_3$	Fosfit
$=S_2O_3$	Tiosulfat

III valentli

≡N	Nitrid
≡P	Fosfid
$≡PO_4$	Fosfat
$≡AsO_3$	Arsenit
$≡AsO_4$	Arsenat
$≡BO_3$	Borat

IV valentli

P_2O_7	Pirofosfat
SiO_4	Ortosilikat

ANORGANIK BIRIKMALARNING ASOSIY SINFLARI

Valentligi	Oksidlar	Asoslar	Kislotalar	Tuzlar
	E_2O_x	$Me(OH)_n$	H_nAc	Me_nAc_m
I	E_2O *(Na_2O)*	MeOH *(NaOH)*		
II	EO *(CaO)*	$Me(OH)_2$ *($Ca(OH)_2$)*		
III	E_2O_3 *(Al_2O_3)*	$Me(OH)_3$ *($Al(OH)_3$)*		
IV	EO_2 *(NO_2)*			
V	E_2O_5 *(N_2O_5)*			
VI	EO_3 *(SO_3)*			
VII	E_2O_7 *(Cl_2O_7)*			

VALENTLIK ASOSIDA FORMULALAR TUZISH

Me* I valentli, Ac** I valentli – hech qanday indeks qo'yilmaydi.
MeAc - *NaCl, $KMnO_4$, $AgNO_3$;*

Me I valentli, Ac II valentli – metaldan so'ng 2 indeksi qo'yiladi.
Me_2Ac – *Na_2SO_4, Li_2CO_3, K_2MnO_4;*

Me I valentli, Ac III valentli – metaldan so'ng 3 indeksi qo'yiladi.
Me_3Ac – *Na_3PO_4, Li_3BO_3, Cs_3AsO_3;*

Me II valentli, Ac I valentli – kislota qoldig'idan so'ng 2 indeksi qo'yiladi.
$MeAc_2$ – *$CaCl_2$, $Mg(ClO_4)_2$, $Fe(CN)_2$;*

Me II valentli, Ac II valentli – hech qanday indeks qo'yilmaydi.
MeAc – *$CaSO_4$, $MgCO_3$, CdS;*

Me II valentli, Ac III valentli – valentliklar almashtirilib indeksga qo'yiladi.
Me_3Ac_2 – *$Ca_3(PO_4)_2$, Mg_3P_2, $Sr_3(AsO_3)_2$;*

Me III valentli, Ac I valentli – kislota qoldig'idan so'ng 3 indeksi qo'yiladi.
$MeAc_3$ – *$AlCl_3$; $Fe(CN)_3$, $Al(JO_3)_3$;*

Me III valentli, Ac II valentli – valentliklar almashtirilib indeksga qo'yiladi.
Me_2Ac_3 – *$Al_2(SO_4)_3$, Cr_2S_3, $Al_2(CO_3)_3$;*

Me III valentli, Ac III valentli – hech qanday indeks qo'yilmaydi.
MeAc – *$AlPO_4$, $FeAsO_3$, AlN;*

KIMYODA QO'LLANILADIGAN O'ZGARMAS KATTALIKLAR

$\mathbf{N_A}=6{,}02\cdot10^{23}$	Avogadro soni
$\mathbf{m_{ē}}=9{,}11\cdot10^{-31}$ kg	Elektronning absolyut massasi
$\mathbf{q_{ē}}=1{,}6\cdot10^{-19}$ Kl	Elektronning kulonlardagi zaryadi
1 u.b.$=1{,}66\cdot10^{-24}$ g	u.b. = uglerod birligi
F=96500 Kl	Faradey soni
R=8,314	Universal gaz doimiysi
$\mathbf{T_o}$=273K	Normal sharoitdagi absolyut temperatura
$\mathbf{P_o}$=101,325 KPa	Normal sharoitdagi bosim
$\mathbf{V_M}$=22,4 L	Gazning molyar hajmi

KIMYOVIY TENGLAMALAR BOYICHA PROPORTSIYALAR TUZISH*

Massa va hajm bo'yicha hisoblashlarda

gramm kg	litr m^3

Hajmlar bo'yicha hisoblashlarda

litr m^3 hajm	litr m^3 hajm

Massa va modda miqdori bo'yicha

mol	gramm

Massalar bo'yicha hisoblashlarda

gramm kg	gramm kg

Hajm va modda miqdori bo'yicha

mol	litr

*proportsiyada ayni birlik tagidan o'sha birlik yozilishiga e'tibor beriladi.

ELEMENTLARNING ELEKTRON KONFIGURATSIYASINI TUZISH

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{14}\ 5d^{10}\ 6p^6\ 7s^2\ 5f^{14}\ 6d^{10}\ 7p^6$

KIMYODA QO'LLANILADIGAN BELGILASHLAR

Belgisi	Ma'nosi	Birligi*
m	Massa	[**g**, kg, t, mg]
V	Hajm	[**l**, ml. m^3]
ρ	Zichlik	[**g/ml**]
n	Modda miqdori	[**mol**]
$\mathbf{A_r}$	Nisbiy atom massa	[**m.a.b**]
$\mathbf{M_r}$	Nisbiy molekulyar massa	[**m.a.b**]
M	Molyar massa	[**g/mol**]
τ	Reaksiya vaqti	[**sek**, min, soat]
$\mathbf{K_M}$	Muvozanat konstantasi	
$\mathbf{C_N}$	Normal konsentratsiya	[**N**, mol-ekv/l]
T	Eritma titri	[**g/ml**]
α	Dissosilanish darajasi	[**%**]
k	Moddaning elektrokimyoviy ekvivalenti	[**mg/Kl**]
t	Elektroliz vaqti	[**sekund**]
E	Kimyoviy ekvivalent	
Q	Issiqlik miqdori	[**J**]

Belgisi	Ma'nosi	Birligi
$\mathbf{D_X}$	Biror gazning X gazga nisbatan zichligi	
t	Selsiy shkalasida temperatura	[**°C**]
T	Absolyut temperatura	[**K**]
P	Bosim	[**KPa**, atm, sim.ustuni]
ω	Massa ulush	[**%**]
φ	Hajmiy ulush	[**%**]
υ	Reaksiya tezligi	[**mol/l·sek**]
γ	Reaksiya tezligining temperatura koeffitsienti	
$\mathbf{C_M}$	Molyar konsentratsiya	[**mol/l, M**]
$\mathbf{C_m}$	Molyal konsentratsiya	[**m**]
$\mathbf{K_D}$	Dissosilanish konstantasi	
pH	Vodorod ko'rsatkich	
q	Tok miqdori	[**Kl**]
I	Tok kuchi	[A]
η	Reaksiya unumi	[**%**]
ΔH	Entalpiya o'zhgarishi	**KJ/mol**

* birliklarning asosiy qo'llaniladigani qalin shriftda berilgan

KIMYOVIY REAKSIYA TENGLAMALARINI TUZISH

Kimyoviy reaksiyalar tenglamalarini tuzishda quyidagi hollar inobatga olinadi:

1. Birikish reaksiyalarida oddiy moddalar o'zaro valentliklariga muvofiq murakkab moddani hosil qiladi:
   $H_2+Cl_2=2HCl$ $4Al+3O_2=2Al_2O_3$
2. Oddiy moddalar kislorodda yonganda metallardan faqat **1** ta oksid(Na va K da peroksid va nadperoksid) hosil bo'ladi:
   $4Li+O_2=2Li_2O$ $3Fe+2O_2=Fe_3O_4$ $2Na+O_2=Na_2O_2$
3. Metalmaslar yonganda kislorod kam bo'lsa quyi oksid(chala yonish), kislorod mo'l bo'lsa yuqori oksid(to'la yonish) hosil bo'ladi:
   $2C+O_2=2CO$ $C+O_2=CO_2$
4. Vodorod bilan ko'pchilik metalmaslar va faqat ishqoriy/ishqoriy-yer metallari kirishib gidridlar hosil qiladi. (EH_x-x element valentligi):
   $C+2H_2=CH_4$ $2Na+H_2=2NaH$ $N_2+3H_2=2NH_3$
5. Suvdan odatdagi sharoitda faqat ishqoriy va ishqoriy-yer metallari vodorodni siqib chiqarib tegishli asoslarni hosil qiladi. Qolgan metallar odatdagi sharoitda suv bilan ta'sirlashmaydi(erimaydi):
   $2Na+2HOH=2NaOH+H_2$ $Ca+2HOH=Ca(OH)_2+H_2$
6. Qolgan metal va metalmaslar faqat qizdirilgandagina suv bilan ta'sirlashib tegishli oksid va vodorodni hosil qiladi:
   $C+H_2O=CO+H_2$ $3Fe+4H_2O=Fe_3O_4+4H_2$
7. Aktiv metallar (elektrod potensiallar qatorida H_2 dan chapda joylashgan) kislotalar bilan ta'sirlashganda vodorodni siqib chiqaradi va tegishli tuzlar hosil bo'ladi:
   $2Na+H_2SO_4=Na_2SO_4+H_2$ $Fe+2HCl=FeCl_2+H_2$
8. Nitrat kislotadan va kons.H_2SO_4 dan hech qaysi metal vodorodni siqib chiqara olmaydi. Bunday reaksiyalarda tuz, suv va metalmas oksidi hosil bo'ladi:
   $2Fe+6H_2SO_{4(kons)}=Fe_2(SO_4)_3+3SO_2+6H_2O$
   $3Cu+8HNO_{3(suyult)}=3Cu(NO_3)_2+2NO+4H_2O$
9. O'rin olish reaksiyalarida tegishli metal yoki metalmasning o'rni boshqasiga almashinadi:
   $Fe+CuSO_4=FeSO_4+Cu$ $2KJ+Cl_2=2KCl+J_2$
10. Almashinish reaksiylarini tenglamalarini tuzishda musbat qism musbat qismga, manfiy qism ham manfiyga o'zaro almashtiriladi. Bunda funksional guruh tarkibi o'zgarmaydi:
    $Al_4C_3+12HOH=4Al(OH)_3+3CH_4$ $BaCl_2+Na_2SO_4=BaSO_4+2NaCl$
11. Kislotali oksidlar suvda erib tegishli kislotalarni hosil qiladi, bunda metalmas valentligi o'zgarmaydi:
    $CO_2+H_2O=H_2CO_3$ $SO_3+H_2O=H_2SO_4$ $Cl_2O_7+H_2O=2HClO_4$
12. Asosli oksidlardan faqat ishqoriy va ishqoriy yer metallari odatdagi sharoitda suvda erib tegishli ishqorlarni hosil qiladi:
    $Na_2O+H_2O=2NaOH$ $CaO+H_2O=Ca(OH)_2$
13. Murakkab modda yonganda (oksidlanganda) uning tarkibiy qismlari yonib tegishli oksidlarni hosil qiladi:
    $CH_4+2O_2=CO_2+2H_2O$ $2ZnS+3O_2=2ZnO+2SO_2$

Metallar elektrod potensiallar qatori

Li, K, Ba, Ca, Na, Mg, Al, Mn, Zn, Cr, Fe, Cd, Co, Ni, Sn, Pb **(H_2) Cu, Hg, Ag, Pt, Au**

Aktivlik kamayadi

KIMYOVIY MASALALAR YECHISHDA ENG KO'P UCHRAYDIGAN REAKSIYALAR TENGLAMALARI

1. Suv gazining hosil bo'lishi:
$$C+H_2O=CO+H_2$$
2. Kaliy permanganatning parchalish reaksiyasi:
$$2KMnO_4=K_2MnO_4+MnO_2+O_2$$
3. Ammiakning katalizatorsiz oksidlanishi:
$$4NH_3+3O_2=2N_2+6H_2O$$
4. Ammiakning katalizator (Fe/Pt) ishtirokida oksidlanishi:
$$4NH_3+5O_2=4NO+6H_2O$$
5. Temir(II)sulfatning kislotali muhitda kaliy permanganat bilan oksidlanishi:
$$10FeSO_4+2KMnO_4+8H_2SO_4=5Fe_2(SO_4)_3+2MnSO_4+K_2SO_4+8H_2O$$
6. Temir(II)sulfatning kislotali muhitda kaliy bixromat bilan oksidlanishi:
$$6FeSO_4+K_2Cr_2O_7+7H_2SO_4=3Fe_2(SO_4)_3+Cr_2(SO_4)_3+K_2SO_4+7H_2O$$
7. Xlorning sovuq ishqor eritmasida erishi:
$$Cl_2+2NaOH=NaCl+NaClO+H_2O$$
8. Xlorning qaynoq ishqor eritmasida erishi:
$$3Cl_2+6NaOH=5NaCl+NaClO_3+3H_2O$$
9. Vodorod peroksidning ishqoriy muhitda kaliy permanganat bilan oksidlanishi:
$$H_2O_2+KMnO_4+KOH=K_2MnO_4+O_2+H_2O$$
10. Ozonning kaliy yodid eritmasi bilan ta'siri:
$$O_3+2KJ+H_2O=J_2+O_2+2KOH$$
11. Oltinning "zar suvi"("shox arog'i")da erishi:
$$Au+HNO_3+3HCl=AuCl_3+NO+2H_2O$$
12. Oltinning "zar suvi"("shox arog'i")da erishi(kompleks kislota hosil bo'lishi):
$$Au+HNO_3+4HCl=H[AuCl_4]+NO+2H_2O$$
13. Qo'rg'oshin(IV)oksidning sirka kislota ishtirokida vodorod peroksid bilan reaksiyasi:
$$PbO_2+H_2O_2+2CH_3COOH=(CH_3COO)_2Pb+O_2+2H_2O$$
14. Natriy okslataning sulfat kislota ishtirokida kaliy permanganat bilan oksidlanishi:
$$5Na_2C_2O_4+2KMnO_4+8H_2SO_4=10CO_2+5Na_2SO_4+K_2SO_4+2MnSO_4+8H_2O$$
15. Azot(IV)oksidning kislorod ishtirokisiz suvda erishi:
$$2NO_2+H_2O=HNO_2+HNO_3$$
16. Azot(IV)oksidning kislorod ishtirokida suvda erishi:
$$4NO_2+O_2+2H_2O=4HNO_3$$
17. Metanolning sulfat kislota ishtirokida kaliy permanganat bilan oksidlanishi:
$$5CH_3OH+4KMnO_4+6H_2SO_4=5HCOOH+2K_2SO_4+4MnSO_4+11H_2O$$
18. Kaliy xloratning MnO_2 katalizatori ishtirokida parchalanishi(150°C):
$$2KClO_3=2KCl+3O_2$$
19. Kaliy xloratning katalizatorsiz termik parchalanishi(400°C):
$$4KClO_3=KCl+3KClO_4$$
20. Ammoniy bixromatning parchlanishi:
$$(NH_4)_2Cr_2O_7=N_2+Cr_2O_3+4H_2O$$
21. Misning konsentrlangan nitrat kislotada erishi:

$$Cu+4HNO_3=Cu(NO_3)_2+2NO_2+2H_2O$$

22. Misning suyultirilgan nitrat kislotada erishi:

$$3Cu+8HNO_3=3Cu(NO_3)_2+2NO+4H_2O$$

23. Oltin(III)xloridning ishqoriy muhitda vodorod peroksid bilan ta'siri:

$$2AuCl_3+3H_2O_2+6KOH=2Au+3O_2+6KCl+6H_2O$$

24. Oltin(III)xloridning ishqoriy muhitda metanal bilan ta'siri:

$$2AuCl_3+3HCOH+9NaOH=2Au+3HCOONa+6NaCl+6H_2O$$

25. Glyukozaning spirtli bijg'ishi:

$$C_6H_{12}O_6=2C_2H_5OH+2CO_2$$

26. Alyuminiy karbidning gidrolizi reaksiyasi:

$$Al_4C_3+12H_2O=4Al(OH)_3+3CH_4$$

27. Kalsiy karbidning gidrolizi reaksiyasi:

$$CaC_2+2H_2O=Ca(OH)_2+C_2H_2$$

28. Oltingugurt(VI)oksidning bromli suv bilan oksidlanishi:

$$SO_2+Br_2+2H_2O=2HBr+H_2SO_4$$

29. Kaliy permanganatning xlorid kislota bilan ta'siri:

$$2KMnO_4+16HCl=2KCl+2MnCl_2+5Cl_2+8H_2O$$

30. Marganes(IV)oksidning xlorid kislotada erishi:

$$MnO_2+4HCl=MnCl_2+Cl_2+2H_2O$$

31. Atsetilenning Hg^{2+} katalizatori ishtirokida gidratlanishi (Kucherov reaksiyasi):

$$C_2H_2+H_2O=CH_3COH$$

32. Metanning 1500°C da pirolizi reaksiyasi:

$$2CH_4=C_2H_2+3H_2$$

33. Piritni kuydirish reaksiyasi:

$$4FeS_2+11O_2=2Fe_2O_3+8SO_2$$

34. Temir(II)gidroksidning nam havoda oksidlanib qo'ng'ir rangga kirishi:

$$4Fe(OH)_2+2H_2O+O_2=4Fe(OH)_3$$

35. Kalsiy fosfatdan fosfor olish reaksiyasi:

$$Ca_3(PO_4)_2+3SiO_2+5C=3CaSiO_3+2P+5CO$$

36. Alyuminiyning ishqor eritmasida erishi va tetragidroksoalyuminat tuzi hosil bo'lishi (H_2 ajralishi bilan boradi):

$$2Al+2NaOH+6H_2O=2Na[Al(OH)_4]+3H_2$$

37. Metilaminning yonish reaksiyasi:

$$4CH_3NH_2+9O_2=4CO_2+2N_2+10H_2O$$

38. Nitrobenzolning ammoniy sulfid bilan qaytarilishi(Zelinskiy reaksiyasi):

$$C_6H_5NO_2+3(NH_4)_2S=C_6H_5NH_2+6NH_3+3S+2H_2O$$

39. Sulfit kislota/oltingugurt(IV)oksid va vodorod sulfidning o'zaro ta'siridan cko'kma-S hosil bo'lishi:

$$SO_2+2H_2S=3S+2H_2O \qquad H_2SO_3+2H_2S=3S+3H_2O$$

40. Vodorod sulfidning chala va to'la yonish reaksiyalari:

$$2H_2S+O_2=2S+2H_2O \qquad 2H_2S+3O_2=2SO_2+2H_2O$$

41. Uglerodning konsentrlangan sulfat kislota bilan ta'siri:

$$C+2H_2SO_4=CO_2+2SO_2+2H_2O$$

42. Mis(II)oksidning ammiak ishtirokida qaytarilishi:

$$2NH_3+3CuO=N_2+3Cu+3H_2O$$

43. Ammoniy nitrit va nitrat tuzlarining parchalanish reaksiyalari:

$$NH_4NO_2=N_2+2H_2O \qquad NH_4NO_3=N_2O+H_2O$$

44. Chumoli kislotaning konsentrlangan sulfat kislota ta'siridan parchalanishi:

$$HCOOH=CO+H_2O$$

45. Xlorli ohakning hosil bo'lish reaksiyasi:

$$Cl_2+Ca(OH)_2=CaOCl_2+H_2O$$

46. Kaliy bixromatning xlorid kislotada erishi:

$$K_2Cr_2O_7+14HCl=2KCl+2CrCl_3+3Cl_2+7H_2O$$

47. Kalsiy karbidning olinishi:

$$3C+CaO=CaC_2+CO$$

48. Kalsiy karbonat suspenziyasi orqali CO_2 o'tkazilganda eritma tiniqlashishi:

$$CaCO_3+CO_2+H_2O=Ca(HCO_3)_2$$

49. Metal nitratlarning parchalanishi qonuniyati:

49.1. Me kuchlanishlar qatorida Mg dan chapda:

$$MeNO_3 \xrightarrow{t} MeNO_2+O_2$$

49.2. Me kuchlanishlar qatorida Mg bilan Cu orasida:

$$MeNO_3 \xrightarrow{t} MeO+NO_2+O_2$$

49.3. Me kuchlanishlar qatorida Cu dan o'ngda:

$$MeNO_3 \xrightarrow{t} Me+NO_2+O_2$$

50. Malaxitning parchlanish reaksiyasi:

$$CuCO_3\cdot Cu(OH)_2 \rightarrow 2CuO+CO_2+H_2O$$

51. Fosforning suyultirilgan nitrat kislotada erishi:

$$3P+5HNO_3+2H_2O=3H_3PO_4+5NO$$

52. Fosforning konsentrlangan nitrat kislotada erishi:

$$P+5HNO_3=H_3PO_4+5NO_2+H_2O$$

IZOTOP ARALASHMALARIDAN MOLEKULA KOMBINATSIYALARINI HISOBLASH JADVALI*

Izotop / Indeks	1	2	3	4
1	1	2	3	4
2	1	3	6	10
3	1	4	10	20
4	1	5	15	35

***Izoh.** Masalan, bizdan uchta kislorod izotoplaridan ^{16}O, ^{17}O va ^{18}O hosil bo'lishi mumkin bo'lgan ozon molekulasi kombinatsiyalarini so'ralsin. Izotop qatoridan 3 va ozon indeksidagi 3 kesishgan joyda 10 kombinatsiya soni turibdi.

Murakkab moddada element kombinatsiyalari o'zaro ko'paytiriladi. Masalan, 3 ta vodorod va 2 ta kislorod izotopidan hosil bo'lgan suv molekulasi kombinatsiyalari soni 6x2=12 ga teng.

KIMYOVIY MASALALAR YECHISH FORMULALARI

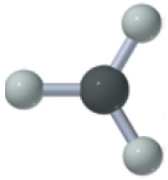
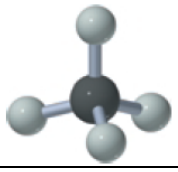
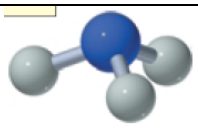
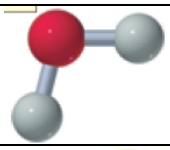
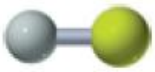
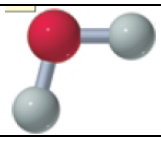
1	Atom/molekulaning absolyut massasini toppish	$m_a = A_r \cdot 1{,}66 \cdot 10^{-24}\ g$
2	Modda miqdorini hisoblash(massa bo'yicha)	$n = \frac{m}{M}$
3	Modda miqdorini hisoblash(hajm bo'yicha)	$n = \frac{V}{22{,}4}$
4	Modda miqdorini hisoblash(molekula soni bo'yicha)	$n = \frac{N}{N_A}$
5	Modda zichligini topish	$\rho = \frac{m}{V}$
6	Birlashgan gaz qonuni	$\frac{P_0V_0}{T_0} = \frac{P_1V_1}{T_1}$
7	Ideal gazning holat trnglamasi	$PV = nRT$
8	Mendeleyev-Klapeyron tenglamasi	$PV = \frac{m}{M}RT$ $PM = \rho RT$
9	Gazlar aralashmasining hajmiy ulushini topish	$\bar{M} = \frac{M_1x + M_2(100 - x)}{100}$
10	Oddiy moddaning ekvivalentini topish	$E = \frac{A_r}{valentlik}$
11	Murakkab moddaning ekvivalentini topish	$E_{Oksid} = \frac{M_{Oksid}}{Um\ val}$ $E_{Asos} = \frac{M_{Asos}}{Val_{Metal}}$ $E_{Kislota} = \frac{M_{K-ta}}{Kislota\ negizi}$ $E_{Tuz} = \frac{M_{Tuz}}{Um\ val}$
12	Kimyoviy reaksiya tezligi	$v = \pm\frac{\Delta c}{\Delta t} = \pm\frac{\Delta n}{V\Delta t}$
13	Kimyoviy reaksiya tezligiga konsentratsiya ta'siri	$v = k \cdot C_A \cdot C_B$
14	Kimyoviy reaksiya tezligiga bosim ta'siri	$v = k \cdot P_A \cdot P_B$
15	Vant-Goff qoidasi	$\frac{v_{t_2}}{v_{t_1}} = \gamma^{\frac{t_2 - t_1}{10}}$ $\frac{v_{t_2}}{v_{t_2}} = \frac{t_1}{t_2}$
16	Kimyoviy muvozanat konstantasi	$K_M = \frac{C_C^c \cdot C_D^d}{C_A^a \cdot C_B^b}$
17	Eritma foiz konsentratsiyasini hisoblash	$\omega = \frac{m_{modda}}{m_{eritma}} \cdot 100\%$
18	Molyar konsentratsiyani hisoblash	$C_M = \frac{n}{V}$
19	Normal konsentratsiyani hisoblash	$C_N = \frac{m}{E\ V}$

20	Foiz konsentratsiyadan molyarlikka o’tish	$C_M = \frac{10\ \omega\ \rho}{M}$
21	Foiz konsentratsiyadan normalikka o’tish	$C_N = \frac{10\ \omega\ \rho}{E}$
22	Eruvchanlik va massa ulush bog’liqligi	$\omega = \frac{S}{S+100}100\%$
23	Eritma titrini hisoblash	$T = \frac{N\ E}{1000}$
24	Dissosilanish darajasini hisoblash	$\alpha = \frac{n}{N}100\%$
25	Ostvaldning suyultirish qonuni	$K_D = \frac{\alpha^2 c}{1-\alpha}$ $\alpha = \sqrt{\frac{K_D}{c}}$
26	Vodorod ko’rsatkichni hisoblash	$pH = -\lg[H^+]$
27	Faradeyning 1-qonuni	$m = \frac{E\ I\ t}{F}$

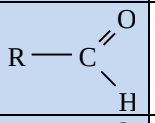
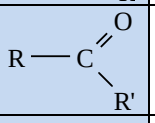
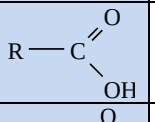
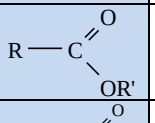
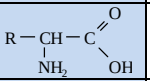
ANORGANIK KIMYODA SIFAT REAKSIYALAR

Kationlar				
№	***Kation***	***Reagent***	***Reaksiya tenglamasi***	***Kuzatilayotgan hodisa***
1	Ag^+	Cl^-	Ag+ + Cl- = AgCl↓	Oq cho’kma
2	Ba^{2+}	SO_4^{2-}	$Ba^{2+} + SO_4^{2-} = BaSO_4\downarrow$	Oq cho’kma
3	Fe^{2+}	$[Fe(CN)_6]^{3-}$	$Fe^{2+} + [Fe(CN)_6]^{3-} = Fe_3[Fe(CN)_6]_2$	Toq ko’k cho’kma (Turnbul ko’ki)
4	Fe^{3+}	$[Fe(CN)_6]^{4-}$	$Fe^{3+} + [Fe(CN)_6]^{4-} = Fe_4[Fe(CN)_6]_3$	Toq ko’k cho’kma (Berlin zangorisi)
5	H^+ (k-ta)	Metiloranj	Indikator rangi sariqdan qizil rangga o’tadi	
		Lakmus	Eritma rangi qizilga o’zgaradi	
6	NH_4^+	Ishqorlar	$NH_4^+ + OH^- = NH_3\uparrow + H_2O$	Ammiak hidi
Anionlar				
1	Cl^-	Ag^+ ($AgNO_3$)	Ag+ + Cl- = AgCl↓	Oq cho’kma
2	CO_3^{2-}	Kislotalar	$CO_3^{2-} + 2H^+ = CO_2\uparrow + H_2O$	Gaz ajraladi
3	OH- (ishqor)	Fenolftalein	Indikator rangi malina rangga o’tadi	
		Lakmus	Ertima rangi ko’kka o’zgaradi	
4	S^{2-}	Pb^{2+}	$Pb^{2+} + S^{2-} = PbS\downarrow$	Qora cho’kma
5	SO_4^{2-}	Ba^{2+} ($BaCl_2$)	$Ba^{2+} + SO_4^{2-} = BaSO_4\downarrow$	Oq cho’kma
Anorganik moddalar				
1	CO_2	$Ca(OH)_2$ eritmasi (ohakli suv)	$CO_2 + Ca(OH)_2 = CaCO_3\downarrow + H_2O$ yana davom ettirilsa $CaCO_3 + CO_2 + H_2O = Ca(HCO_3)_2$	Avval oq cho’kma, keyin yana eriydi
2	NH_3	HCl	$NH_3 + HCl = NH_4Cl$	Oq tutun

ATOM ORBITALLARINING GIBRIDLANISHI

№	Gibridlanish turi	Xarakteristik belgisi	Molekula fazoviy tuzilishi	Molekula fazoviy shakli	Misollar
			Standart gibridlanish holati		
1	**sp**	Faqat 2 ta σ bog' **VB 180°**	Chiziqli		Alkinlar, $BeCl_2$, CO_2, (CO, N_2), HCN
2	**sp^2**	Faqat 3 ta σ bog' **VB 120°**	Uchburchakli		Alkenlar va diyenlar qo'shbog' uglerodi, BF_3, $AlCl_3$, SO_3, NO_3^-, CO_3^{2-}
3	**sp^3**	Faqat 4 ta σ bog' **VB 109°28´**	Tetraedr		CH_4 va alkanlar, NH_4^+,SO_4^{2-}, PO_4^{3-}, ClO_4^-, MnO_4^{2-}, MnO_4^-, SiO_2
4	**sp^3d**	Faqat 5 ta σ bog' **VB 3x120° va 2x90°**	Trigonal bipiramida		PCl_5, SbF_5, XeO_3F_2
5	**sp^3d^2**	Faqat 6 ta σ bog' **VB 6x90°**	Oktaedrik		SF_6, XeO_2F_4
			Nostandart gibridlanish holati		
6	**sp^3**	3 ta σ bog' va 1 ta taqsimlanmagan elektron jufti **VB 107,3°**	Uchburchakli piramida		NH_3, H_3O^+, ClO_3^-, XeO_3
7	**sp^3**	2 ta σ bog' va 2 ta taqsimlanmagan elektron jufti **VB 104,5°**	Burchakli		H_2O, ClO_2^-, XeO_2
8	**sp^3**	1 ta σ bog' va 3 ta taqsimlanmagan elektron jufti **VB 100°**	Chiziqli		Galogenovodorodlar НГ (Г=F, Cl, Br, J)
9	**sp^2**	2 ta σ bog' va 1 ta taqsimlanmagan elektron jufti **VB 120°**	Burchakli		SO_2

ORGANIK BIRIKMALAR KLASSIFIKATSIYASI

№	Sinf nomi		Umumiy formulasi	Xarakteristik belgisi	Sifat reaksiya	Gibridla-nishi
1	Uglevodorodlar C_nH_m	Alkanlar	C_nH_{2n+2}	Faqat **σ** bog'li to'yingan ochiq zanjirli		sp^3
2		Alkenlar Sikloalkanlar	C_nH_{2n}	1 ta qo'shbog'li (**=**) ochiq zanjirli	Br_2 li suv	sp^2
3		Alkadiyenlar Alkinlar	C_nH_{2n-2}	2 ta qo'shbog'li (**=**) ochiq zanjirli	Br_2 li suv	sp^2
4		Alkinlar Alkadiyenlar	C_nH_{2n-2}	1 ta uchbog'li (**≡**) ochiq zanjirli	Ag_2O/NH_3	sp
5		Arenlar	C_nH_{2n-6}	Aromatik xalqali yopiq zanjirli		sp^2
6		Sikloalkanlar Alkenlar	C_nH_{2n}	Faqat **σ** bog'li to'yingan yopiq zanjirli		sp^3
7	Spirtlar		R-OH	**OH** guruh alkil radikaliga bog'langan		sp^3
	a) Bir aromli Oddiy efirlar		R-OH	1 ta **OH** guruh alkil radikaliga bog'langan		sp^3
	b) Ko'p atomli		$R(OH)_n$	1 dan ortiq **OH** guruh alkil radikaliga bog'langan	$Cu(OH)_2$	sp^3
8	Oddiy efirlar Bir atomli spirtlar		R-O-R	Alkil radikallar **-O-** ko'prigi orqali bog'langan		sp^3
9	Fenollar		Ar-OH	**OH** guruh aromatik xalqa(benzol)ga bog'langan	$FeCl_3$	sp^2
10	Galogen hosilalar		R-Г	Galogenlar(**F, Cl, Br, J**) radikalga bog'langan		sp^3
11	Karbonil birikmalar					
	a) Aldegidlar Ketonlar			Tarkibida aldegid guruhi mavjud	Ag_2O/NH_3	sp^2
	b) Ketonlar Aldegidlar			Alkil yoki aromatik radikallar o'zaro **-CO-** ko'prigi orqali bog'langan		sp^2
12	Karboksil birikmalar					
	a) Karbon kislotalar Murakkab efirlar			Radikallar karboksil guruhiga bog'langan kislota xossasiga ega moddalar		sp^2
	b) Murakkab efirlar Karbon kislotalar			Karbon kislota vodorodi radikalga eterifikatsiya reaksiyasi orqali almashingan		sp^2
13	Aminokislotalar			Aminoguruh (**NH_2**) karbon kislota radikaliga bog'langan kislota hosilalari		sp^2
14	Nitrobirikmalar		$R-NO_2$	Nitroguruh (**NO_2**) radikalga bog'langan		sp^2
15	Aminlar		$R-NH_2$	Ammiak vodorodi bir yoki bir nechta radikalga almashingan		sp^3
16	Uglevodlar		$C_n(H_2O)_m$	Tarkibida gidroksil (**OH**) va karbonil (**C=O**) guruhi mavjud		
17	Geterosiklik birikmalar			Xalqada ugleroddan tashqari geteroatom (**N, O, S**) tutgan yopiq zanjirli		sp^2

Izoh: Sinfning yuqorisida o'zaro izomer moddalar sinfi ko'rsatilgan

BA'ZI KIMYOVIY MODDALARNING TARIXIY NOMI

1. **Akril kislota** = propen kislota – CH_2=CH-COOH
2. **Aktinoidlar** – Th-Lr
3. **Akrolein** = propenal – CH_2=CH-COH
4. **Alebastr** – $CaSO_4 \cdot 2H_2O$
5. **Alyumokaliyli achchiqtosh** – $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
6. **Amil spirt** – $C_5H_{11}OH$
7. **Ammiakli selitra** – NH_4NO_3
8. **Angidrit** – $CaSO_4$
9. **Anilin** – $C_6H_5NH_2$
10. **Antixlor** – $Na_2S_2O_3 \cdot 5H_2O$
11. **Asbest** – $3MgO \cdot 2SiO_2 \cdot 2H_2O$
12. **Atsetilen** – C_2H_2
13. **Atseton** – CH_3-CO-CH_3
14. **Barit** – $BaSO_4$
15. **Berlin zangorisi** – $Fe_4[Fe(CN)_6]_3$
16. **Berolle tuzi** – $KClO_3$
17. **Boksit** – $Al_2O_3 \cdot nH_2O$
18. **Bura** – $Na_2B_4O_7 \cdot 10H_2O$
19. **Chili selitrasi** – $NaNO_3$
20. **Diammofos** – $(NH_4)_2HPO_4$
21. **Dolomit** – $CaCO_3 \cdot MgCO_3$
22. **Eruvchan shisha** – $K_2O \cdot CaO \cdot 6SiO_2$
23. **Etilenglikol** = etandiol-1,2 – $CH_2(OH)$-$CH_2(OH)$
24. **Fenolformaldegid smolasi** - Fenol+Metanal – C_6H_5-OH+HCOH
25. **Flyuorit** – CaF_2
26. **Fosfin** – PH_3
27. **Fosforit** – $Ca_3(PO_4)_2$
28. **Fosgen** – $COCl_2$
29. **Fumar kislota** – trans HOOC-CH=CH-COOH
30. **Generator gazi** - CO+N_2
31. **Glauber tuzi** – $Na_2SO_4 \cdot 10H_2O$
32. **Glinozyom** – Al_2O_3
33. **Glitserin** = propantriol-1,2,3 – $CH_2(OH)$-CH(OH)-$CH_2(OH)$
34. **Glitsin** = aminosirka kislota – NH_2-CH_2-COOH
35. **Glyukon kislota** – $C_6H_{12}O_7$
36. **Hind selitrasi** – KNO_3
37. **Ichimlik soda** – $NaHCO_3$
38. **Izopren** – CH_2=C(CH_3)-CH=CH_2
39. **Izosianat kislota** – HCNO
40. **Javel suvi** – KCl+KClO
41. **Kalomel** – Hg_2Cl_2
42. **Kalsit, bo'r, ohaktosh, marmar** – $CaCO_3$
43. **Kaolin** – $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$
44. **Kapron kislota** = geksan kislota – C_5H_{11}-COOH
45. **Karbamid/mochevina** – $CO(NH_2)_2$
46. **Karbol kislota=fenol**
47. **Karborund** – SiC
48. **Kinovar** – HgS
49. **Korund** – Al_2O_3
50. **Kraxmal/sellyuloza** – $C_6H_{10}O_5$
51. **Krezollar** = metilfenollar – $C_6H_4(CH_3)OH$
52. **Kriolit** – $Na_3[AlF_6]$
53. **Kristall soda** – $Na_2CO_3 \cdot 10H_2O$
54. **Kroton aldegid** = buten-2-al – CH_3-CH=CH-COOH
55. **Ksilol**-o', m' va p'= dimetilbenzollar – $C_6H_4(CH_3)_2$
56. **Kumol** = izopropilbenzol – C_6H_5-$CH(CH_3)_2$
57. **Kuporos moyi** – kons.H_2SO_4
58. **Kvarts/qum** – SiO_2
59. **Labborak suvi** – NaCl+NaClO
60. **Lantanoidlar** – Ce-Lu
61. **Lavsan** = Tereftal kislota +Etielnglikol – HOOC-C_6H_4-COOH+$CH_2(OH)$-$CH_2(OH)$
62. **Linol kislota** – $C_{17}H_{31}COOH$

63. **Linolen kislota** - $C_{17}H_{29}COOH$
64. **Magnezit** – $MgCO_3$
65. **Magnitli temirtosh** – Fe_3O_4
66. **Malaxit** – $CuCO_3 \cdot Cu(OH)_2$
67. **Malein kislota** - sis HOOC-CH=CH-COOH
68. **Metakril kislota** – $CH_2=C(CH_3)-COOH$
69. **Mis kuporosi** – $CuSO_4 \cdot 5H_2O$
70. **Mor tuzi** – $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$
71. **Nodir gazlar** – He, Ne, Ar, Kr, Xe, Rn
72. **Nodir metallar** – Ag, Au, Pt. Ru. Rh, Ir, Os
73. **Norvegiya selitrasi** – $Ca(NO_3)_2$
74. **Novshadil spirt** – NH_4OH
75. **O'tish metallari** – *d*- va *f*-elementlar
76. **O'yuvchi kaliy** – KOH
77. **O'yuvchi natriy/kaustik soda** - NaOH
78. **Og'ir metallar** (ρ>5 g/sm^3) – Mn, Fe, Co, Ni, Cu, Zn, Cd, Hg, Sn, Pb
79. **Oksalat kislota** – $H_2C_2O_4$
80. **Olein kislota** – $C_{17}H_{33}COOH$
81. **Oleum** – $H_2SO_4 \cdot nSO_3$
82. **Oson suyuqlanuvchan metallar** (t_s<1000°C) – Li-Cs, Mg,Ca, Al
83. **Palmitin kislota** – $C_{15}H_{31}COOH$
84. **Pikrin kislota** = 2,4,6-trinitrofenol - $C_6H_2(OH)(NO_2)_3$
85. **Piridin** - C_5H_5N
86. **Pirit** – FeS_2
87. **Pirogallol** =trigidroksibenzol – $C_6H_3(OH)_3$
88. **Pirolyuzit** – MnO_2
89. **Plavik kislota** – HF
90. **Qaldiroq gaz** – $2H_2+O_2$
91. **Qiyin suyuqlanuvchan metallar** (t_s>1000°C) – Ti, Ir, Hf, W, Nb, Ta, Cr, Re
92. **Qizil qon tuzi** – $K_3[Fe(CN)_6]$
93. **Qo'rg'oshin shakari** – $Pb(CH_3COO)_2 \cdot 3H_2O$
94. **Qora metallar** – Fe va uning qotishmalari
95. **Quruq muz** – CO_2
96. **Rangli metallar** – Ag, Au, Cu, Mn, Co, Ni
97. **Rux aldamasi** – ZnS
98. **Sariq qon tuzi** – $K_4[Fe(CN)_6]$
99. **Saxaroza/maltoza/laktoza** – $C_{12}H_{22}O_{11}$
100. **Shisha** – $Na_2O \cdot CaO \cdot 6SiO_2$

MUNDARIJA

II KITOB

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