KIMYO

II-Qism

DARSLIK

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KimyoII-Qism

DARSLIK

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Organik moddalarning klassifikatsiyasi va nomlanishi.

Molekulalarning tuzilishlarining o'ziga xosligi.

Fizikaviy xossalari

Organik moddalarning klassifikatsiyalarining asosida uglerod zanjirlarining tuzilishlaridagi farq yotadi. SHunga ko'ra barcha organik birikmalar **atsiklik** va **siklik** birikmalarga bo'linadi.

- **atsiklik** (siklik bo'lmagan) – uglerod atomlarining ochiq (yopiq bo'lmagan) zanjirli birikmalaridir. Ular **alifatik** birikmalar yoki **yog'** qatori birikmalari deb ham ataladi, chunki, bu birikmalardan birinchi qatorida yog'lar tarkibiga kiruvchi organik kislotalar o'rganilgan. Atsiklik birikmalar, o'z navbatida quyidagilarga bo'linadi;
  * **to'yingan** (alkanlar);

  * **to'yinmagan** (alkenlar, alkinlar, dienuglevodorodlari).

- **siklik**–birikmalar, ularning molekulalarida sikllar (xalqa) bo'ladi.
  * Agar sikllar faqat uglerod atomlaridan tarkib topgan bo'lsa, u holda bunday birikmalarga karbotsiklik birikmalar deyiladi.

  * Agar sikl tarkibiga uglerod atomlari bilan bir vaqtda boshqa elementlarning (azot, kislorod, oltingugurt) atomlari ham kirsa, u holda bunday birikmalarga **geterotsiklik** birikmalar deyiladi. Karbotsiklik birikmalar, o'z navbatida atsiklik va aromatik birikmalarga bo'linadi.

Atsiklik birikmalar, ularda sikllar mavjud bo'lishiga qaramasdan xossalari bo'yicha ochiq zanjirli birikmalardan keskin farq qilmaydi.

Aromatik birikmalar–maxsus xarakterli sikllardan iborat bo'ladi, buning natijasida bunday birikmalarning xossalari ochiq zanjirli birikmalarning xossalaridan keskin farq qiladi.

1 bob. To'yingan uglevodorodlar

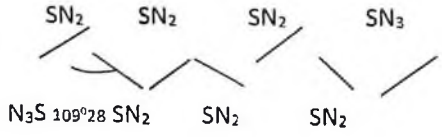
Тўйинган углеводородлар– бу углеводородларнинг молекулаларида ҳамма углерод атомлари sp^3-гибридланган ҳолатда бўлади ва улар бир-бири билан фақат σ - боғланиш орқали бирикади.

Sikloalkanlardan boshqalari birikish reaksiyalariga kirishmay-dilar, shuning uchun ham ularga to'yingan uglevodorodlar deyiladi.

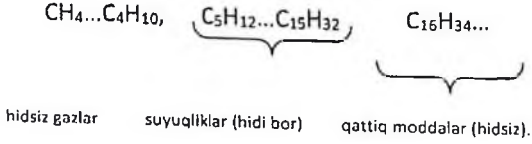
1§. Alkanlar (parafinlar)

Алканлар–тўйинган углеводородлар, уларда углеродли занжир туташмаган ва боғлар карралийли (икки ёки уч боғлар) бўлмайди.

- umumiy formulasi S_nN_{2n+2}, bu erda n≥1.
- molyar massalari M=14n+2.
- nomlarida xarakterli «-an» bilan tugallanadi.
- vodorod atomlarini boshqa atomlar yoki atomlar gruppasiga almashinishi natijasida olingan alkanlarning molekulalari qoldiqlariga alifatik radikallar yoki alkillar deyiladi (R- bilan belgilanadi).
- bir valentli qoldiqlarning (alkillar) umumiy formulasi S_nN_{2n+1}, bu erda n≥ 1.
- alkillarning molyar massalari M=14n+1.
- nomlarida xarakterli «-il» bilan tugallanadi.
- alkan molekulalarining tuzilishidagi o'ziga xoslik:
- S-S bog'lanish uzunligi 0,154 nm ga teng,
- S-N bog'lanish uzunligi 0,109 nm ga teng,
- valent burchagi (-S-S- bog'lar orasidagi burchak) 109°28` ga teng



Fizikaviy xossalari.



Alkanlar – rangsiz moddalar, suvda erimaydi.

Normal alkanlarning gomologik qatori (tarmoqlanmagan) tuzilishlari va ularning bir valentli qoldiqlari (alkillar)

Formulasi	Nomlanishi	Bir valentli radikali	Nomlanishi
CH_4	Metan	$-SN_3$	metil
S_2N_6	Etan	$-S_2N_5$	etil
S_3N_8	Propan	$-S_3N_7$	propil
S_4N_{10}	Butan	$-S_4N_9$	butil
S_5N_{12}	Pentan	$-S_5N_{11}$	pentil
S_6N_{14}	Geksan	$-S_6N_{13}$	geksil
S_7N_{16}	Geptan	$-S_7N_{15}$	geptil
S_8N_{18}	Oktan	$-S_8N_{17}$	oktil
S_9N_{20}	Nonan	$-S_9N_{19}$	nonil
$S_{10}N_{22}$	Dekan	$-S_{10}N_{21}$	detsil
$S_{11}N_{24}$	Undekan	$-S_{11}N_{23}$	undetsil
$S_{12}N_{26}$	Dodekan	$-S_{12}N_{25}$	dodetsid
$S_{13}N_{28}$	Tridekan	$-S_{13}N_{27}$	tridetsil
$S_{14}N_{30}$	Tetradekan	$-S_{14}N_{29}$	tetradetsil
$S_{15}N_{32}$	Pentadekan	$-S_{15}N_{31}$	pentadetsil
**********			
$S_{20}N_{42}$	Eykozan	$-S_{20}N_{41}$	Eykozil

Normal tuzlilishga ega bo'lgan alkanlarni va alkillarni ayrim paytlarda «n» harfi bilan ham belgilanadi.

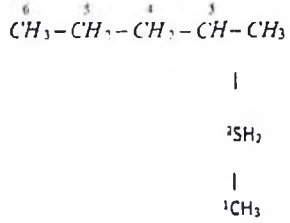
Masalan: $SN_3 - SN_2 - SN_2 - SN_2 - SN_2 - SN_3$ n-geksan

$SN_3 - SN_2 - SN_2 - SN_2 - SN_2 - SN_2 -$ n-geksil

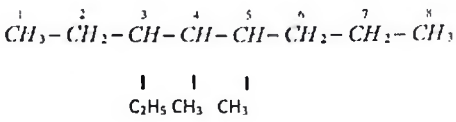
- tarmoqlangan tuzilishdagi alkanlarni nomlashda:

* uglerod atomlarining eng uzun (bosh) zanjiri tanlanadi;
* bosh zanjirga kirmagan, unga yaqin joylashgan alkil radikallari tomonidan bosh zanjirdagi uglerod atomlari nomerlanadi;
* alkan nomining oldidan radikal nomi qo'shiladi, bunda bosh zan-jirdagi qaysi uglerod atomida joylashgan soni ko'rsatiladi, bunda avval eng sodda radikallar, keyin esa murakkabroqlari ko'rsatiladi;
* bir xil radikallar soni grekcha sonlar: di-, tri-, tetra-, va h.k. lar bilan belgilanadi.

Masalan:



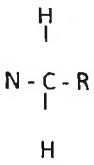
3-metilgeksan



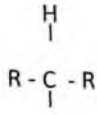
4,5 dimetil-3- etiloktan

* organik birikmalarda uglerod to'rt valentli, shu bilan birga uglerod zanjiridagi uglerod atomlarining;

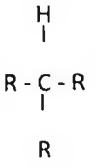
* uchta valentligi vodorod atomlari bilan bog'lanishga va bittasi boshqa uglerod atomi bilan bog'lanishga sarf bo'lgan bo'lsa birlamchi:



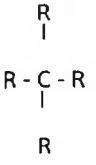
* ikkita valentligi vodorod atomlari bilan bog'lanishga va ikkitasi boshqa uglerod atomlari bilan bog'lanishga sarf bo'lgan bo'lsa ikkilamchi:



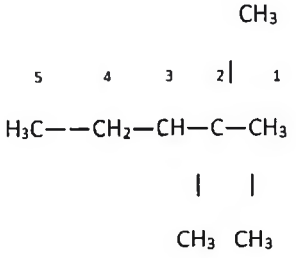
* bitta valentligi vodorod atomi bilan bog'lanishga va qolgan uchtasi boshqa uglerod atomlari bilan bog'lanishga sarf bo'lgan bo'lsa uchlamchi:



* hamma, to'rtta valentligi ham uglerod atomlari bilan bog'lanishga sarf bo'lgan bo'lsa, to'rtlamchi deyiladi:



Masalan 2,2,3- trimetilpentan molekulasida:



bosh zanjirdagi uglerod atomlari

1- chi va 5-chi – birlamchi

4- chi - ikkilamchi

3 – chi – uchlamchi

2 – chi – to'rtlamchi

Bir valentli uglevodorod radikallari ulardagi bo'sh valentlik qaysi uglerodga tegishli ekanligiga muvofiq holda

* birlamchi uglerod atomida bo'lsa - birlamchi so'zi qo'shiladi.

Masalan: $-SN_2-SN_2-SN_3$ $-SN_2-SN(SN_3)-SN_3$

birlamchi propil (propil) birlamchi izopropil (izobutil)

* ikkilamchi, uglerod atomida bo'lsa - ikkilamchi deyiladi.

Masalan: $SN_3-SN(SN_3)-SN_3$ $SN_3-SN-SN_2-SN_3$

ikkilamchi propil (izopropil) ikkilamchi butil

* uchlamchi uglerod atomida bo'lsa – uchlamchi deyiladi.

Masalan: $SN_3-S(SN_3)(SN_3)-SN_3$

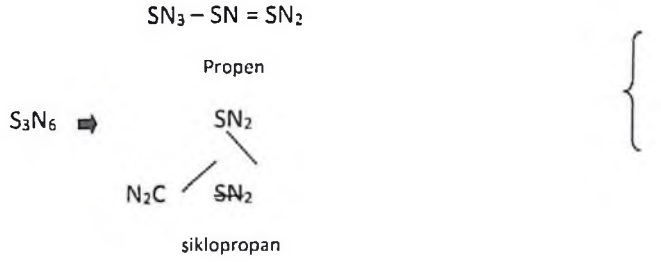
uchlamchi butil

2 §. Sikloalkanlar (sikloparafinlar)

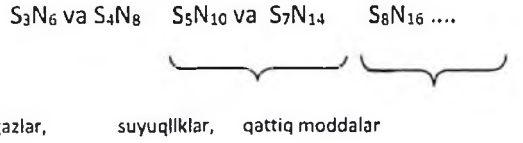
Циклоалканлар – бу уч ва ундан кўпроқ углерод атомлари тутган цикллардан иборат тўйинган углеводородлардир.

- Sikloalkanlarning umumiy formulasi S_nH_{2n}, bu erda $n \geq 3$.
- Molyar massalari M=14 n
- Nomlanishlarida xarakterli cuffiks «siklo-» qo'shib o'qiladi.

- Molekulasida bir xil sondagi uglerod atomlari bo'lgan alkenlar bilan izomer bo'ladi. Masalan,

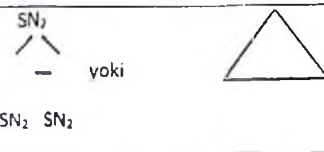
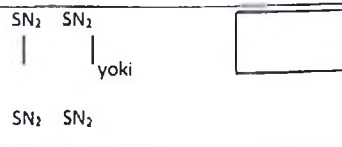
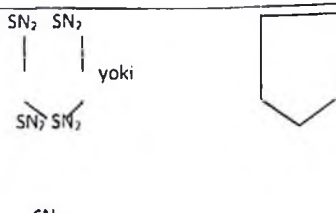
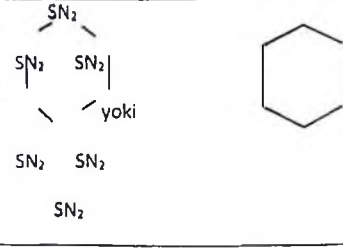


- Fizikaviy xosalari.

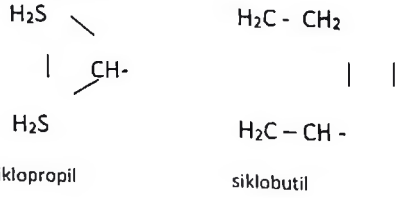


Hamma sikloalkanlar suvda erimaydi.

Sikloalkanlarning gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
S_3N_6	siklopropan	
S_4N_8	siklobutan	
S_5N_{10}	siklopentan	
S_6N_{12}	sikloheksan	

- bir valentli radikallarni «-an» qo'shimchasini «-il» qo'shimchasiga almashtirish yo'li bilan nomlanadi.



siklopropil siklobutil

2 bob. To'yinmagan uglevodorodlar (olefinlar)

Тўйинмаган углеводородлар деб бир ёки бир нечта каррали (икки ёки уч) кўшбоғлари бўлган углеводородларга айтилади.

Olefinlar uchun karrali bog'lari bor joylarga birikish reaksiyalari xarakterli, shundan ularning to'yinmagan deb nomlanishlari kelib chiqadi.

1 §. Alkenlar

Алкенлар – молекуласида битта қўшбоғи бўлган тўйинмаган углеводородлардир.

- Umumiy formulasi S_nH_{2n}, bu erda $n \geq 2$.
- Molyar massasi **M=14n**.
- Nomlanishlarida xarakterli qo'shimcha «-en».
- Molekulasida bir xil sondagi uglerod atomlari bo'lgan sikloalkanlar bilan izomer bo'ladi.

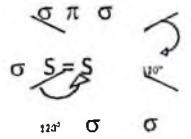
Masalan:

S_4N_8 — $SN_2\ SN_2$ (| |) $SN_2\ SN_2$ - siklobutan

$SN_3 - SN = SN - SN_3$ – buten-2

- Alken molekulalari tuzilishining o'ziga xosligi:

* bitta σ - va bitta π - bog'i bo'lgan, **bitta** qo'sh bog'dan iborat:



* π - bog', σ - bog' tekisligiga perpendikulyar tekislikda yotadi;

* qo'sh bog'ga bog'langan uglerod atomlari sp^2 gibridlanish holatida bo'ladi (qolgan hamma uglerod atomlari sp^3 gibridlanish holatida bo'ladi);

* - C = C - bog' uzunligi - 0,133 nm ga teng;

* sp^2 – gibridlanish holatida turgan uglerod atomlari uchun valent burchagi 120^0 ga teng, molekuladagi boshqa uglerod atomlari uchun – $109^028'$ bo'ladi.

- Alkenlardan hosil bo'ladigan bir valentli radikallarning umumiy formulasi S_nH_{2n-1}

Masalan:

$SN_2=SN$ -, $SN_2 = SN - SN_2$ –

vinil (etinil) allil

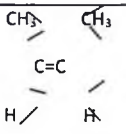
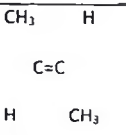
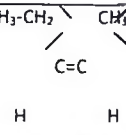
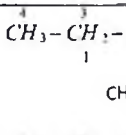
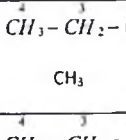
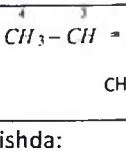
- Fizikaviy xossalari.

$(S_2N_4 \dots S_4N_8)$, $(S_5N_{10} \dots\dots S_{16}N_{32})$ $(S_{17}N_{34} \dots\dots)$

gazlar suyuqliklar qattiq moddalar

Hamma alkenlar suvda erimaydi.

Alkenlarning gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
S_2N_4	eten (etilen)	$SN_2 = SN_2$
S_3N_6	propen (propilen)	$SN_3 - SN = SN_2$
S_4N_8	buten – 1 (butilen)	$\overset{4}{C}H_3 - \overset{3}{C}H_2 - \overset{2}{C}H = \overset{1}{C}H_2$
	buten-2 (sis-izomer)	
	buten-2 (trans-izomer)	
C_5H_{10}	penten-1 (amilen)	$CH_3-CH_2-CH_2-CH=CH_2$
	penten-2 (sis-izomer)	
	2-metil buten-1	
	3- metil buten-1	
	2- metil buten-2	

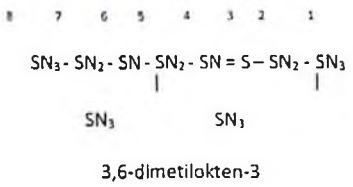
- tarmoqlangan tuzilishdagi alkenlarni nomlarini tuzishda:

*qo'sh bog'i bo'lgan uglerod atomlarining eng uzun bosh zanjirl tanlanadi va bu zanjirdagi uglerod atomlari qo'sh bog'ga yaqin tomondan nomerlanadi. Agar molekuladagi qo'sh bog' simmetrik joylashgan bo'lsa nomerlashni yon radikali yaqin joylashgan tomondan boshlanadi.

*bosh zanjirda qancha uglerod bo'lsa shunga mos keladigan alkan nomlanadi.

*«-an» qo'shimchasi «-en» ga almashtiriladi va qo'sh bog'ning holati va yon radikallar ko'rsatiladi.

Masalan:



3,6-dimetilokten-3

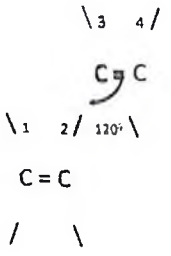
2 §. Alkadienlar (dien uglevodorodlar)

Алкадиенлар–бу тўйинмаган углеводородлар бўлиб, уларнинг молекулаларида иккита кўш боғ бўлади.

- alkadienlarning umumiy formulalari S_nH_{2n-2}, bu erda $n \geq 3$.
- molyar massalari M = 14n-2.
- nomlanishidagi xarakterli qo'shimcha «-dien»;
- dienlardan bitta bog' bilan (bitta σ bog' bilan ajralganlari) bog'langanlari katta ahamiyatga ega. Bitta uglerod atomida ikkita qo'sh bog'lar to'plangan dienlar va izolirlangan bog'ga (qo'sh bog' ikki va ko'p birlamchi σ bog'lar bilan ajralgan) ega bo'lgan dienlar amaliy ahamiyatga ega emas.
- molekulalarining tuzilishining o'ziga xosligi

*qo'sh bog'lar bilan bog'langan uglerod atomlari sp^2-gibridlanishda bo'ladi.

*qo'sh bog'ning uzunligi 0,133 nm ga teng, qo'sh bog' bilan ajralgan birlamchi bog'larning uzunligi-0,146 nm ga teng, qolgan S – S bog'lar uzunligi 0,154 nm ga teng.



* qo'sh bog'lar bilan bog'langan uglerod atomlari uchun valent burchagi 120° teng.

- molekulasida bir xil sondagi uglerod atomlari bo'lgan alkinlar bilan izomer.

Masalan:

C_3H_4

$SN_2 = S = SN_2$ - propadien

$SN_3 - S \equiv SN$ - propin

- fizikaviy xossalari.

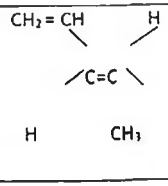
$SN_2 = SN - SN = SN_2$ gaz

$SN_2 = S - SN \equiv SN_2$ SN_3 oson qaynaydigan suyuqlik

- tarmoqlangan tuzilishga ega bo'lgan dienlarning nomlanishi alkenlarni nomlanishidagi qoidalardek nomlanadi.

Dien uglevodorodlarining gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
S_3N_4	propadien - 1,2 (allen)	$SN_2 = S = SN_2$
S_4N_6	butadien - 1,3 (divinil)	1 2 3 4 $SN_2 = SN - SN = SN_2$
S_5N_8	2-metil butadien 1,3 (izopren)	$SN_3 = S - SN = SN_2$ SN_3
	pentadien-1,3 (sis-izomer)	$CH_2 = CH$ CH_3 C=C H H

	pentadien-1,3 (trans-izomer)	

3 §. Alkinlar

Алкинлар-молекуласида битта уч боғ бўлган тўйинмаган углеводородлардир.

- umumiy formulasi S_nH_{2n-2}, bu erda $p \geq 2$.
- molyar massalari **M = 14n-2**
- nomlanishlarida xarakterli qo'shimcha «-in».
- alkinlar molekulalarining tuzilishidagi o'ziga xoslik:

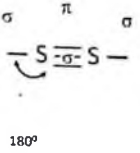
* bitta σ - va ikkita π - bog'lardan iborat bitta uch bog' bo'ladi;

* π -bog'larning tekisliklari o'zaro perpendikulyar;

* uch bog'larning uzunligi 0,121 nm ga teng;

* uch bog' bilan bog'langan uglerod atomlari sr-gibridlanish holatida bo'ladi. Qolgan uglerod atomlari sr^3 -gibridlanish holatida bo'ladi.

* sr-gibridlangan uglerod atomlari uchun valent burchagi 180°:



- molekulasida bir xil sondagi uglerod atomlari bo'lgan dien uglevodorodlari bilan izomerdir.

Masalan: $SN_3 - SN_2 - S \equiv SN$

S_4N_6 butin -1

$SN_2 = SN - SN = SN_2$

butadien –1,3

- alkinlardan hosil bo'ladigan bir valentli radikallarning umumiy formulasi S_nH_{2n-3}. Masalan:

$$- S \equiv SN$$

etinil

- bir vaqtning o'zida uchlamchi va ikkilamchi bog'lari bo'lgan uglevodorodlar ma'lum.
  Masalan:

$$SN \equiv S - SN = SN_2$$

vinilatsetilen

- fizikaviy xossalari.

$(S_2N_2 \ldots S_4N_6)$, $(S_5N_8 \ldots S_{15}N_{28})$ $(S_{16}N_{30} \ldots\ldots)$

gazlar suyuqliklar qattiq moddalar

Alkinlarning hech qaysisi suvda erimaydi.

Alkinlarning gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
S_2N_2	etin (atsetilen)	$SN \equiv SN$
S_3N_4	propin (metilatsetilen)	$\overset{3}{CH_3} - \overset{2}{C} \equiv \overset{1}{CH}$
S_4N_6	butin-1 (etilatsetilen)	$SN_3 - SH_2 - S \equiv SN$
	butin–2 (dimetilatsetilen)	$SN_3 - S \equiv S - SN_3$
S_5N_8	pentin-1 (propilatsetilen)	$SN_3\text{-}SN_2\text{-}SN_2\text{-}S\equiv CH$
	pentin-2 (metiletilatsetilen)	$\overset{5}{CH_3} - \overset{4}{CH_2} - \overset{3}{C} \equiv \overset{2}{C} - \overset{1}{CH_3}$ (CH₃ pastda)

	3-metilbutin-1 (izopropilatsetilen)	$\overset{4}{CH_3}-\overset{3}{C}(SH_3)-\overset{2}{C}\equiv\overset{1}{CH}$

- tarmoqlangan tuzilishga ega bo'lgan alkinlarning nomlanishi tarmoqlangan tuzilishdagi alkenlarni nomlanishdagi qo'llaniladigan qoidadagidek bo'ladi. Alkinlarni atsetilenlarning hosilalari deb qaraladigan nomlanishlardan ham foydalaniladi.

Masalan:

$$\overset{6}{CH_3}-\overset{5}{CH}(SN_3)-\overset{4}{CH_2}-\overset{3}{C}\equiv\overset{2}{C}-\overset{1}{CH_3}$$

5-metilgeksin-2

(metilizobutilatsetilen).

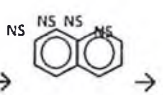
3 bob. Aromatik uglevodorodlar (arenlar)

Ароматик углеводородлар – бу молекулаларида битта ёки бир нечта бензол халқаси ва ён занжирида тўйинган ёки тўйинмаган радикаллар бўлган углеводородлардир.

Masalan:

$S_6N_5-SN=SN_2 \rightarrow$  $SN=SN_2$

vinilbenzol



$S_{10}N_8 \rightarrow \rightarrow$

naftalin

- molyar massalari M = 14n-6.
- bitta benzol xalqasida va yon zanjirida alifatik radikali bo'lgan aromatik uglevodorodlarning umumiy formulalari S_nH_{2n-6}, bu erda $p \geq 6$.
- bir valentli aromatik radikallarning umumiy formulalari S_nH_{2n-7}. Arillar Ar - bilan belgilanadi.

Masalan: S_6N_5 - ; $S_6N_5 - SN_2 -$

fenil benzil

- arillarning molyar massalari M=14n-7, bu erda p≥ 6.
- molekulalarining tuzilishlarning o'ziga xosligi:

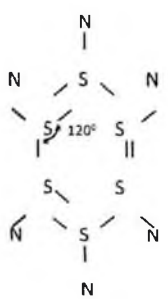
*benzol yadrosidagi uglerod atomlari sp^2-gibridlanish holatida bo'ladi:

* uglerod atomlarining gibridlanmagan r-orbitallari xalqa tekisligida perpendikulyar joylashadilar va juftlashib bog'lanadilar va olti elektronli yaxlit xalqa hosil qiladilar, yuqori barqarorlikka ega bo'ladi va unga **aromatik elektron sistema** deyiladi;

*benzol xalqasi **tutashgan** π-bog'lar sistemasidir;

*benzol xalqasini hosil qiladigan uglerod atomlari orasidagi bog' uzunligi **0,139 nm** ga teng;

*xalqani hosil qiladigan uglerod atomlari orasidagi valent burchagi **120^0** ga teng.

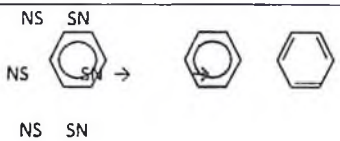
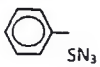
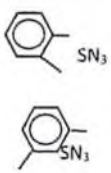
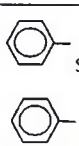


- fizikaviy xossalari.

Benzol va toluol- rangsiz suyuqliklar, xarakterli hidli, zaharli, suv bilan aralashmaydilar, yaxshi erituvchilar.

Bitta benzol xalqali arenlarning gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi

S_6N_6	benzol	
$S_6N_5—SN_3$	metilbenzol (toluol)	
$S_6N_5—S_2N_5$	etilbenzol	
$S_6N_4(SN_3)_2$	1,2-dimetilbenzol (orta-ksilol)	
	1,3-dimetilbenzol (meta-ksilol)	
	1,4-dimetilbenzol (para-ksilol)	SN_3 - SN_3
$S_6N_5—S_3N_7$	propilbenzol	 $SN_2—SN_2—SN_3$
	izopropilbenzol	$SN—SN_3$ | SN_3

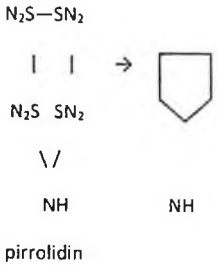
- ayrim bir valentli aromatik radikallarining nomlanishi:

S_6N_5 -; $SN_3 - S_6N_4$ -; $S_6N_5 - SN_2$ -.

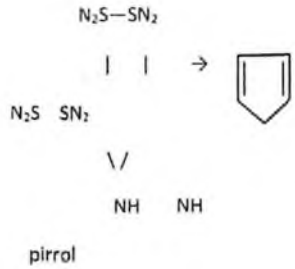
fenil tolil benzil

- benzol va uning gomologlari, hamda sikloparafinlar karbotsiklik birikmalarga mansub, chunki ularning xalqalari faqat uglerod atomlaridan tuzilgan.
Agar sikllarda uglerod atomlari bilan birga boshqa elementlarning atomlari (N, S, O) bo'lsa, u holda bunday birikmalar geterotsiklik birikmalar deyiladi.

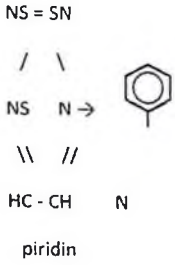
Masalan:



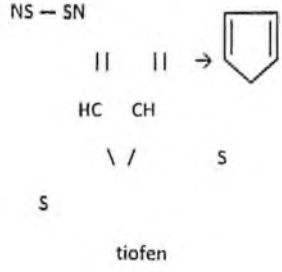
pirrolidin



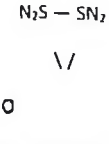
pirrol



piridin

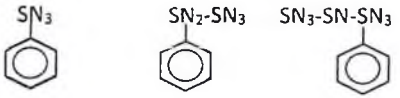


tiofen



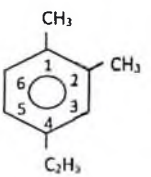
etilenoksid (epoksietan)

Aromatik uglevodorodlarni nomlarini tuzishda «benzol» so'ziga yon radikal nomi qo'shiladi:



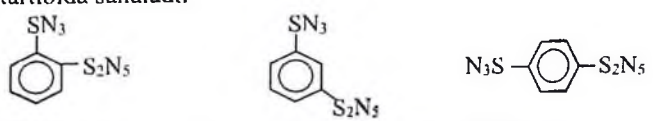
metilbenzol (toluol) etilbenzol izopropilbenzol

*benzol yadrosida bir qancha yon radikallar bo'lsa, benzol yadrosidagi uglerod atomlari berilgan radikallardan birinchi radikal joylashgan atomdan boshlab nomerlanadi. Nomerlashni shunday hisob bilan qilish lozimki, radikallar raqamlarining yig'indisi eng kichik bo'lishi lozim.



1,2-dimetil-4-etilbenzol

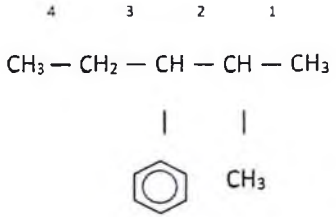
*ikkita radikal mavjud bo'lganda:
1,2-holatni orto- (o-);
1,3-chi holatni meta- (m-);
1,4-chi holatlar para- (p-) deb belgilanadi va radikallarni murakkablashib borishi tartibida sanaladi:



o-metiletilbenzol m- metiletilbenzol n-metiletilbenzol

*murakkab yon zanjiri bo'lgan aromatik uglevodorod bo'lgan holda, uni fenil radikali bo'lgan (S_6N_5-) alifatik uglevodorod sifatida qaraladi.

Masalan:



2-metil-3-fenilpentan

4 bob. Bitta funksional gruppasi bo'lgan uglevodorodlarning hosilalari

To'yingan, to'yinmagan yoki aromatik uglevodorodlarning molekulalaridagi bitta yoki bir necha vodorod atomlarining, birorta funksional gruppaga (-OH, $-NH_2$, $-NO_2$, –G, –CHO, -COOH) almashinishidan tegishli uglevodorodlar hosilalarining - spirtlar, aminlar, nitrobirikmalar, galogen hosilalari, aldegidlar va kislotalarga muvofiq holda gomologik qatorlari hosil bo'ladi.

Функционал группа *деб – атомлар ёки атомлар группасига айтилади, уларнинг молекулаларда мавжуд бўлиши берилган модда синфини характерли кимёвий хоссаларини таъминлайди.*

xh

Ayrim funksional gruppalarning va organik moddalar sinflarining nomlanishlari

Gruppa	Gruppalarning nomlari	SInflarning nomlari	Misollar
F -	ftor	galogen	SN_3-Cl

Cl -	xlor	hosilalari	C_2N_5-Br
Br -	brom		
I -	yod		
OH -	gidroksil	spirtlar	C_2H_5OH
-SNO	aldegid	aldegidlar	SN_3 - SNO
	karbonil	ketonlar	$SN_3 - S - SN_3$ || O
-SOON	karboksil	karbon kislotalar	$S_{17}N_{35}$ - SOON
- NO_2	nitrogruppa	nitrobirikmalar	S_6N_5 - NO_2
-SO_3H	sulfogruppa	sulfokislotalar	S_6N_5 - SO_3H
- SO – NH -	peptid	peptidlar (oqsillar)	CH_2-CO-NH-CH_2-SOOH | NH_2

1 §. Spirtlar

Bir atomli spirtlarning alifatik qatori (alkanollar).

Бир атомли спиртлар- бу молекуласида битта гидроксил группа - OH бўлган тўйинган углеводородларнинг ҳосилаларидир.

- umumiy formulasi R-OH yoki C_nH_{2n+1}-ON, bu erda n≥1.
- molyar massasi M=14n+18.
- nomlanishlarda xarakterli qo'shimcha «-ol».
- molekulalarida bir xil sondagi uglerod atomlari bo'lgan oddiy efirlar bilan izomerlardir.

Masalan: SN_3 - SN_2 – ON

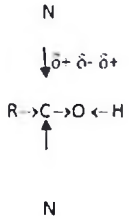
etanol

S_2N_6O

$SN_3 - O - SN_3$

dimetil efir

- spirt molekulasining elektron tuzilishi:



- spirtlarning o'ziga xosligi – molekulasida vodorod bog'lanish mavjudligidir. SHuning uchun spirtlarning gomologik qatorlarida gaz holidagi moddalar yo'q.
- fizikaviy xossalari.

SN_3ON .... $S_{11}N_{23}ON$ $S_{12}N_{25}ON$ .....

suyuqliklar qattiq moddalar.

Hamma spirtlar rangsiz suyuqliklar o'tkir hidli, qattiqlari hidga ega emas. Metanol, etanol, propanol suv bilan har qanday nisbatda aralashadi. Uglerod atomlarining soni ortib borishi bilan spirtlarning suvda eruvchanligi kamayadi. YUqori spirtlar suvda erimaydi.

YOg' qatori bir atomli spirtlarning gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
CH_3ON	metanol (metil, yog'och spirti)	SN_3 - ON
C_2H_5OH	etanol (etil, vino spirti)	$SN_3 - SN_2$ - ON
C_3H_7OH	propanol-1 (propil, birlamchi propil spirti)	3 2 1 SN_3 - SN_2 - SN_2 - ON
	propanol-2 (izopropil ikki-propil	

	spirti)	$SN_3 - SN - SN_3$ OH
C_4H_9OH	butanol-1 (birlamchi butil spirti) butanol-2 (ikkilamchi butil spirti) 2-metil propanol-1 (izobutil spirti) 2-metilpropanol-2 (uchlamchi butil spirt)	$CH_3 - CH_2 - CH_2 - CH_2 - OH$ $SN_3 - SN - SN_2 - SN_3$ ON $SN_3 - SN - SN_2 - ON$ SN_3 SN_3 $SN_3 - S - ON$ SN_3

- tarmoqlangan tuzilishdagi spirtlarni nomlarini tuzishda:
  *gidroksil gruppa -ON tutgan molekuladagi uglerod atomlarining bosh zanjiri ajratiladi;

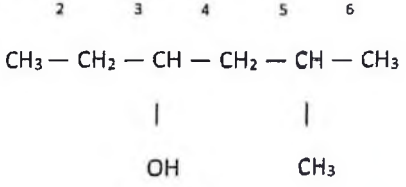
  *bu zanjirdagi uglerod atomlari nomerlanadi, bunda -ON gruppa tutgan uglerod atomi eng kichik songa ega bo'lishi kerak;

  *bosh zanjirda qancha uglerod atomi bo'lsa, shuncha uglerod atomi bo'lgan alkan nomlanadi;

  *alkan nomiga «-ol» qo'shimchasi qo'shiladi va hamma yon radikallar va

  –ON gruppa holatlari ko'rsatiladi.

Masalan:



5-metilgeksanol-3

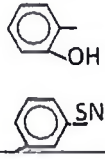
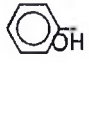
Aromatik qatorning bir atomli spirtlari.

Ароматик қаторнинг бир атомли спиртлари – бу бензол ҳалқасидаги углерод атомида ёки ён радикалида гидроксил группаси бўлган ароматик углеводородларнинг ҳосилаларидир.

- umumiy formulasi Ar-OH yoki C_nH_{2n-7}-OH, bu erda n≥6.
- molekuyar massasi M=14n+10.
- fizikaviy xossalari

Bir atomli aromatik spirtlarning gomologik qatorining birinchi vakili fenol rangsiz, kristallik modda, zaharli. Suvda eruvchanligi cheklangan, 66°S dan yuqori temperaturada suv bilan har qanday nisbatda aralashadi.

Bir atomli aromatik spirtlarning gomologik qatori

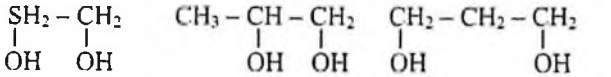
Formulasi	Nomlanishi	Struktura formulasi
C_6H_5ON	gidroksi benzol (fenol, karbol kislota	
C_6H_5-CH_2OH	benzil spirti	
CH_3-C_6H_4OH	orto- krezol	
	meta – krezol	

	para-krezol	CH_3— OH

Alifatik qatorning ikki atomli spirtlari (glikollar)

Гликоллар–*бу тўйинган углеводородларнинг ҳосилалари бўлиб, молекуласида ҳар хил углерод атомларида иккита гидроксил группа бўлади.*

Masalan:

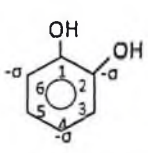


etandiol-1,2 (etilenglikol) | propandiol-1,2 (propanglikol) | propandiol-1,3

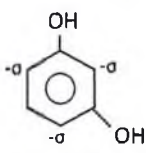
- umumiy formulasi $S_pN_{2p}(ON)_2$, bu erda $p \geq 2$.
- molyar massasi M=14p+34
- nomlaridagi xarakterli qo'shimchasi «-diol».

Ikki atomli alifatik spirtlarning gomologik qatorining birinchi vakili – etilenglikol rangsiz, yopishqoq suyuqlik, suvda yaxshi eriydi, zaharli.

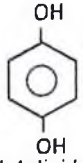
Aromatik qatorning ikki atomli spirtlari



1,2-digidroksibenzol (pirokatexin)



1,3-digidroksibenzol (rezorsin)



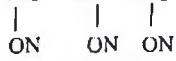
1,4-digidroksibenzol (gidroxinon)

$S_6N_4(ON)_2$

Alifatik qatorning uch atomli spirtlari (glitserinlar)

Глицеринлар *– ҳар хил углерод атомларида учта гидроксил группа бўлган тўйинган углеводородларнинг ҳосилаларидир.*

Masalan:



propantriol-1,2,3

(glitserin)

- umumiy formulasi C_nH_{2n+1}-$(OH)_3$, bu erda p≥3.
- molyar massasi M=14n+50.
- fizikaviy xossasi.

Uch atomli spirtlarning gomologik qatorining birinchi vakili–glitserin - rangsiz yopishqoq, shirin suyuqlik, suvda yaxshi eriydi, zaharli emas.

2 §. Aldegidlar

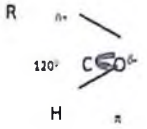
Альдегидлар – молекуласида альдегид группаси - CHO бўлган алифатик ёки ароматик углеводородларнинг хосилаларидир.

Alifatik qatorning aldegidlari

- umumiy formulasi R- CHO yoki $C_nH_{2n+1}CHO$, bu erda n≥0.
- molyar massasi M=14n+30.
- nomlanishlarida xarakterli qo'shimcha «-al».
- molekula tuzilishining o'ziga xosligi:

*karbonil gruppasidagi uglerod atomi hamisha uglerod zanjirining oxiri bo'ladi:
*karbonil gruppasidagi uglerod atomi sp^2-gibridlanish holatida bo'ladi.

- molekulalarning elektron tuzilishlari:



- Zanjirda uglerod atomlari soni bir xil bo'lgan ketonlar bilan izomer bo'ladi:

$SN_3 - SN_2 - SNO$

propanal

S_3N_6O

$SN_3 - S - SN_3$

||

O

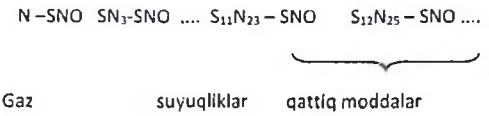
propanon (atseton).

- To'yinmagan radikalli aldegidlar ham mavjud, masalan:

$SN_2 = SN - SNO$

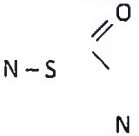
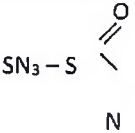
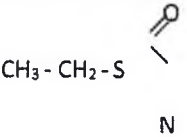
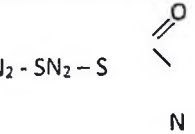
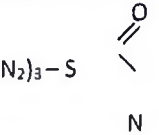
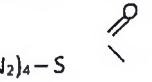
akril aldegidi (akroleln)

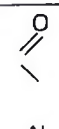
- Fizikaviy xossalari:



CHumoli, sirka va propion aldegidlari suvda yaxshi eriydi. Uglerod atomlarining soni ortib borishi bilan aldegidlarning suvda eruvchanligi kamayib boradi. Quyi aldegidlar o'tkir hidli, uglerod atomlarining soni 8-12 bo'lgan aldegidlar yoqimli hidli moddalar.

Normal (tarmoqlanmagan) tuzilishli alifatik aldegidlarning gomologik qatorlari

Formulasi	Nomlanishi	Struktura formulasi
NCHO	metanal (formaldegid, chumoli aldegid)	
CH_3-CHO	etanal, atsetaldegid, sirka aldegid)	
CH_3-CH_2SNO	Propanal (propan aldegid)	
S_3N_7SNO	butanal (moy aldegid)	
S_4N_9SNO	pentanal (valerlan aldegid)	
S_5N_{11}SNO	geksanal (kapron aldegid)	

		N
$S_6N_{13}SNO$	geptanal (enant aldegid)	$SN_3 - (SN_2)_5 - S$ 
-------	----------	----------
$S_{15}N_{31}SNO$	palmetin aldegid	$SN_3 - (SN_2)_{14} - S$ 
$S_{16}N_{33}SNO$	margarin aldegid	$SN_3 - (SN_2)_{15} - S$ 
$S_{17}N_{35}SNO$	stearin aldegid	$SN_3 - (SN_2)_{16} - S$ 

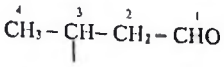
• Tarmoqlangan tuzilishdagi aldegidlarning nomlarini tuzishda:

*uglerod atomli aldegid gruppasi bo'lgan, uglerod atomlarining bosh zanjiri tanlanadi;

*bu zanjirdagi uglerod atomlari aldegid gruppasidagi uglerod atomidan boshlab nomerlanadi;

*uglerod atomlariga muvofiq keladigan alkan nomlanadi;

*alkan nomiga «-al» qo'shimchasi qo'shiladi va yon radikallar holati ko'rsatiladi; aldegid gruppasi holati ko'rsatilmaydi. Masalan:



SN_3

3-metilbutanal

Aromatik qator aldegidlari

- Umumiy formulasi Ar –C – HO yoki $S_nH_{2n-7}CHO$, bu erda $n \geq 6$
- Molyar massasi M=14n +22.
- Aromatik aldegidlar gomologik qatorining birinchi vakili - benzoy aldegidi yoki benzaldegid, rangsiz suyuqlik, achchiq bodom hidli:

S_6N_5 – SNO

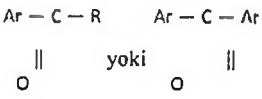
3 §. Ketonlar

Кетонлар молекуласида карбонил группаси = C = O бўлган алифатик ёки ароматик углеводородларнинг ҳосилаларидир.

Umumiy formulasi:

*alifatik qator ketonlariniki R – C – R

*aromatik qator ketonlariniki



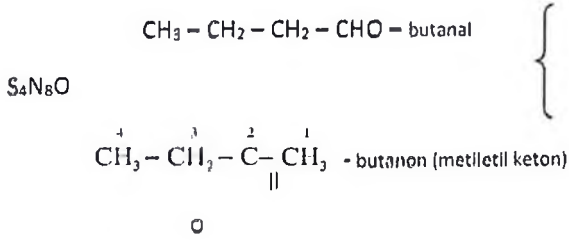
- nomlanishidagi xarakterli qo'shimcha «***on***»
- molekula tuzilishidagi o'ziga xoslik:

*karbonil guruppa C = O zanjir oxiri bo'la olmaydi, u hamisha ikkita radikal orasiga joylashadi. Radikallar bir xil yoki har xil alifatik yoki aromatik bo'lishi mumkin;

*karbonil gruppasidagi uglerod atomi sp^2-gibridlanish holatida bo'ladi.

- ketonlar bir xil sondagi uglerod atomlari bo'lgan aldegidlar bilan izomer bo'ladi.

Masalan:



Ketonlarning nomlarini tuzishda:

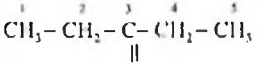
*uglerod atomli karbonil gruppa bo'lgan uglerod atomlarining bosh zanjiri tanlanadi;

*karbonil gruppasi yaqin joylashgan tomondan boshlab, uglerod zanjiridagi uglerod atomlari nomerlanadi;

*bosh zanjirdagi uglerod atomlari soniga teng bo'lgan alkan nomlanadi va uning nomiga «-on» qo'shimcha qo'shiladi va yon radikallar hamda karbonil gruppasi holati ko'rsatiladi.

Ketonlarni nomlashda karbonil gruppasiga birikkan radikallarning nomlaridan tuzilgan va qadimiy nomlanishdan ham foydalaniladi.

Masalan:

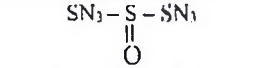


pentanon-3

(dietilketon)

• fizikaviy xossalari

Ketonlarning gomologik qatorining birinchi vakili



propanon, dimetil keton

(atseton)

xarakterli hidli, rangsiz suyuqlik, suvda yaxshi eriydi.

4 §. Karbon kislotalar

***Карбон кислоталар**–молекуласида карбоксил группаси (-COOH) бўлган алифатик ёки ароматик углеводородларнинг ҳосилаларидир.*

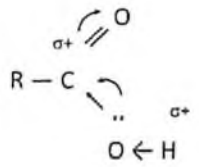
Alifatik qatorning bir negizli karbon kislotalari

• to'yingan radikalli *kislotalarning* umumiy formulalari:
R –COOH yoki S_nH_{2n-1}-COOH, bu erda n≥ 0

• molyar massasi M = 14n + 46.

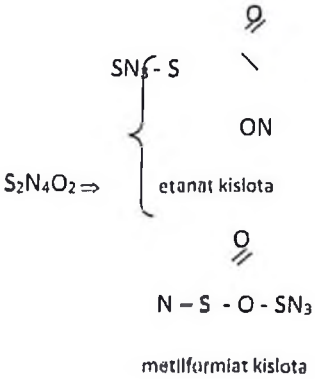
• nomlanishidagi *xarakterli* qo'shimcha «-at»

Molekulaning elektron tuzilishi:

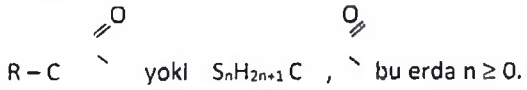


- karboksil gruppasidagi uglerod atomi sp^2-gibridlanish holatida bo'ladi.
- molekulasida bir xil sondagi uglerod atomlari bo'lgan murakkab efirlar bilan izomer.

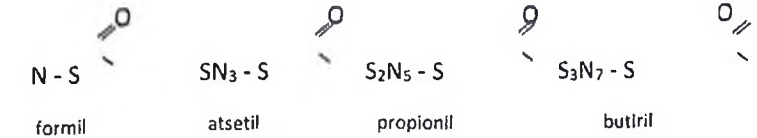
Masalan:



- kislotalardan -ON gruppasini olish yo'li bilan olingan karbon kislotalarning qoldiqlarga atsillar deyiladi.
- atsillarning umumiy formulasi:



Masalan:



Kislotalarda vodorod bog'lanish spirtlarga nisbatan kuchliroq ifodalangan, shu sababli kislotalarning qaynash temperaturasi tegishli spirtlarnikiga nisbatan yuqoriroq.

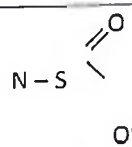
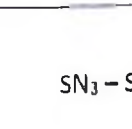
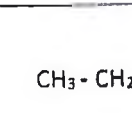
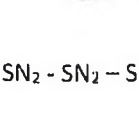
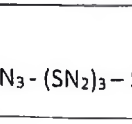
• Fizikaviy xossalari:

HCOOH, ... $C_9H_{19}COOH$ $C_{10}H_{21}COOH$...

Suyuqliklar qattiq moddalar

CHumoli va sirka kislotalari rangsiz suyuqlikklar, o'tkir hidli, suv bilan istalgan nisbatlarda aralashadi. Molekulada uglerod atomlarning soni ortib borishi bilan karbon kislotalarning suvda eruvchanligi kamayib boradi.

Tarmoqlanmagan karbon kislotalarning gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
NCOOH	metanat (chumoli)	
CH_3-COOH	etanat (sirka)	
CH_3CH_2SOON	propanat (propion)	
S_3N_7SOON	butanat (moy)	
S_4N_9SOON	pentanat (valerian)	

		ON
$S_5N_{11}SOON$	gektanat (kapron)	$SN_3-(SN_2)_4-S$  ON
$S_6N_{13}SNO$	gepsanat (enant)	$SN_3-(SN_2)_5-S$  ON
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$S_{15}N_{31}SOON$	palmetinat	$SN_3-(SN_2)_{14}-S$  ON
$S_{16}N_{33}SOON$	margarinat	$SN_3-(SN_2)_{15}-S$  ON
$S_{17}N_{35}SOON$	stearinat	$SN_3-(SN_2)_{16}-S$  ON

- karbon kislotalarni nomlarini tuzishda:

*uglerod atomli karboksil gruppasi bo'lgan uglerod atomlarining bosh zanjiri tanlanadi;

*bu zanjirdagi uglerod atomlari karboksil gruppasidan boshlab nomerlanadi;

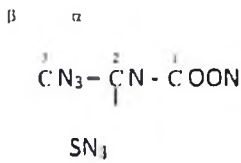
*uglerod atomlari soniga muvofiq keladigan alkan nomiga «-at» qo'shimchasi qo'shiladi va yon radikallarning holati ko'rsatiladi

–SOON gruppasi holati ko'rsatilmaydi;

*kislotalarning nomlarini tuzishda bosh zanjirdagi uglerod atomlarini karboksil gruppa yonidagi uglerod atomidan boshlab grekcha harflar (α, β, γ .....) belgilab nomlashdan ham foydalaniladi.

Kislotalarning qadimiy nomlaridan ham foydalaniladi.

Masalan:



2-metilpropanat,

α-metil propion (izomoy) kislota.

- bir negizli <u>to'yinmagan</u> karbon kislotalar ham mavjud.
  Masalan:

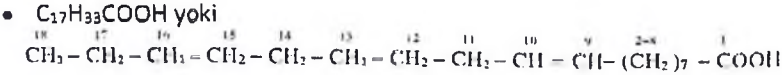
2-propen k-ta

(akril)

2-metilpropenat k-ta

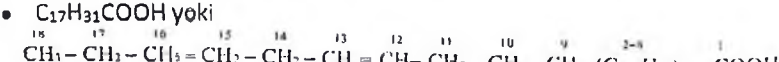
(metakrilat)

- $C_{17}H_{33}COOH$ yoki



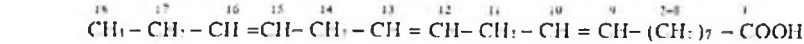
oktadetsen 9-at (olenat) k-ta

- $C_{17}H_{31}COOH$ yoki



Oktadekadien -9,12-at (linol) k-ta

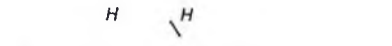
- $C_{17}H_{29}COOH$ yoki



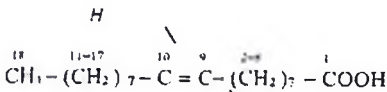
Oktadekatrin -9,12,15-at (linolen) k-ta

YUqori to'yinmagan karbon kislotalari fazoviy sis va trans-izomerlar ko'rinishida mavjud bo'ladi.

Masalan:



sis-olenat k-ta



trans-olenat k-ta

Bir negizli aromatik karbon kislotalar misolida

S_6N_5SOON yoki  xizmat qiladi.

Benzoy kislota - oq kristallik modda, suvda oz eriydi.

Ikki negizli karbon kislotalari

- ikki negizli alifatik qator kislotalarning umumiy formulasi.

NOOS-$(SN_2)_n$-SOON, bu erda $n \geq 0$.

- molyar massasi M=14n+90
- nomlanishida xarakterli qo'shimcha «-dlat».
- fizikaviy xossalari.

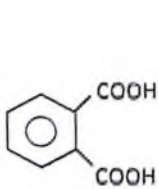
Ikki negizli alifatik karbon kislotalarning gomologik qatorining birinchi vakili – oksalat kislotasi-oq kristall modda, suvda eriydi.

Ikki negizli alifatik karbon kislotalarning

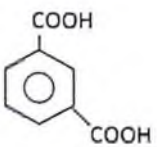
gomologik qatori

Formulasi	Nomlanishi	Struktura formulasi
$N_2S_2O_4$	etandiat (oksalat)	NOOS – SOON
$CH_2(COOH)_2$	propandiat (malon)	NOOS - SN_2 – SOON
$C_2H_4(SOON)_2$	butandiat (yantar)	NOOS - CH_2 – CH_2 - SOOH
$S_3N_6(SOON)_2$	pentandiat (glutarat)	NOOS-SN_2-SN_2-SN_2-SOON
$S_4N_8(SOON)_2$	geksandiat (adipinat)	NOOS - $(SN_2)_4$ - SOON

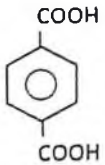
Ikki negizli karbon kislotalarning aromatik qatori ham mavjud:



1,2- benzoldikarbon k-ta (o-ftalat)



1,3- benzoldikarbon k-ta (m-ftalat, izoftalat)



1,4- benzoldikarbon k-ta (p-ftalat, tereftalat)

$S_6N_4(COON)_2$

5 §. Karbon kislotalarning hosilalari

Karbonkislotalarning tuzlari

Tuzlar-SOON gruppasidagi vodorod atomiga metall almashinishidan hosil bo'lgan mahsulotdir.

- bir negizli karbon kislotalari tuzlarining umumiy formulasi $(RCOO)_nMe$, bu erda n-metall valentligi

- nomlanishidagi xarakterli qo'shimcha «at»
- ikki negizli karbon kislotalari ikki qator tuzlar - nordon va o'rta tuzlar hosil qiladilar.
- yog' qatori yuqori bir negizli kislotalarning natriyli va kaliyli tuzlari, radikaldagi uglerod atomlari soni 10-18 bo'lganlari sovunlar deyiladi;

*natriyli tuzlar - qattiq sovunlar;

masalan: $S_{17}N_{35}SOONa$ – natriy stearat;

*kaliyli tuzlar-suyuq, masalan: $S_{15}N_{31}SOOK$ - kaliypalmitat.

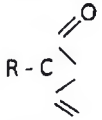
Ayrim karbon kislotalar anionlarining nomlanishlari

Kislotalarning formulalari	Anion	Anionning nomlanishi
NSOON	$NSOO^-$	formiat
SN_3SOON	SN_3SOO^-	atsetat
C_2H_5SOON	$C_2H_5SOO^-$	propionat
S_3N_7SOON	$S_3N_7SOO^-$	butirat
S_4N_9SOON	$S_4H_9COO^-$	valerianat
$S_5H_{11}COOH$	$C_5H_4COO^-$	kapronat
$C_{15}H_{31}COOH$	$C_{15}H_{31}COO^-$	palmitat
$C_{17}H_{35}$ COOH	$C_{17}H_{35}$ COO^-	stearat
$H_2C_2O_4$	$HC_2O^-_4$	gidrooksalat
	$C_2O^{2-}_4$	oksalat
C_6H_5COOH	$C_6H_5COO^-$	benzoat
$C_{17}H_{33}COOH$	$C_{17}H_{33}COO^-$	oleat
$C_{17}H_{31}COOH$	$C_{17}H_{31}COO^-$	linoleat

Karbon kislotalarning angidridlari

Angidridlar-*ikkita bir xil yoki har xil molekula bir negizli karbon kislotalar yoki ikki negizli bitta molekula kislotalardan N_2O molekulasini tortib olingan mahsulotlardir.*

- bir negizli karbon kislotalarining angidridlarining umumiy formulasi

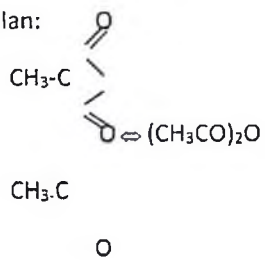


O yoki $(RCO)_2O$

R-C

O

Masalan:

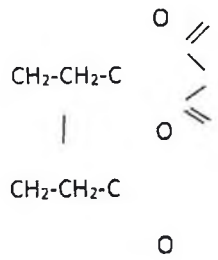


CH_3-C

O ⇔ $(CH_3CO)_2O$

CH_3-C

O



CH_2-CH_2-C

O

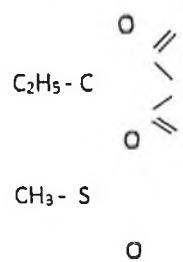
CH_2-CH_2-C

O

sirka kislotasi angidridi (atsetangidrid) adipin k-ta angidridi

- chumoli kislotasidan boshqa hamma karbon kislotaning angidridlari mavjud.
- ikkita har xil kislotalardan suvni olish yo'li bilan olingan angidridlarga aralash angidridlar deyiladi.

Masalan:



C_2H_5 - C

O

CH_3 - S

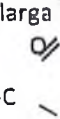
O

sirka proponangidrid

Karbon kislotalarning amidlari

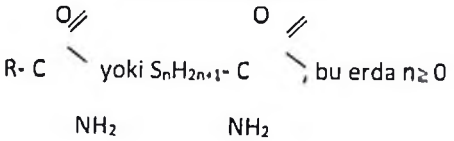
***Amidlar**-kislotalardagi karboksil gruppasidagi gidroksilni (-ON), amino gruppaga (-NH_2) almashinishidan hosil bo'lgan mahsulotlardir.*

- amidlarga NH_3 molekulasidagi vodorod atomini kislota qoldig'i

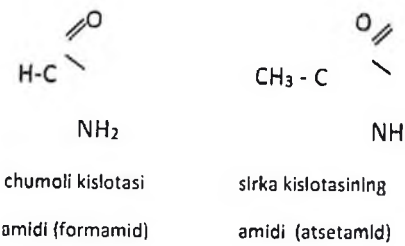


atsilga R-C almashgan mahsulotlar deb ham qarash mumkin.

- karbon kislotalarning amidlarini umumiy formulasi



Masalan:



- molyar massasi M=14n+33
- karbonat kislotasining amidi H_2N

CO yoki $(NH_2)_2CO$ mochevina

H_2N

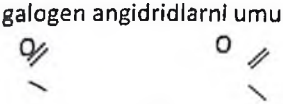
deyiladi va karbamid azotli o'g'it sifatida foydalaniladi.

- amidlarning kimyoviy xossalarining o'zlga xosligi: karbonil gruppasi >S=O bilan bog'langan va uning ta'sirida bo'lgan $-NH_2$ gruppa amalda asosli xossasini namoyon qilmaydi.

Karbon kislotalarning galogenangidridlari

Galogenangidridlar–karboksil gruppadagi gidroksilga (-ON) galogenlar (-G) almashgan maxsulotlar.

- karbon kislotalarning galogen angidridlarni umumiy formulasi



R - C yoki S_nH_{2n+1}- C , bu erda n≥ 0

G G

O

Masalan: $CH_3 - C$ \ - sirka kislotasining xlorangidridi.

Cl

6 §. Efirlar. Oddiy efirlar

Oddiy efirlar- kislorod atomlari orqali bir – birlari bilan bog'langan, ikkita alifatik radikallardan tuzilgan organik moddalardir.

• oddiy efirlarni suvdagi (N-O-N) ikkala vodorod atomlariga bir xil yoki har xil alifatik radikallarning almashinishidan hosil bo'lgan mahsulotlar deb ham qarash mumkin.

• oddiy efirlarning umumiy formulasi: R - O - R.

• nomlanishida xarakterli qo'shimcha bo'lmaydi.

• oddiy efirlarning nomlari uni hosil qiladigan radikallarning nomlaridan tuziladi. Bunda birinchi bo'lib oddiy radikal nomlanadi. Masalan:

$SN_3 – O - S_3N_7$

metilpropilefiri

Agar efir ikkita bir hil radikallardan hosil bo'lgan bo'lsa «-di» old qo'shimchasini qo'yish shart emas:

$S_2N_5 – O - S_2N_5$

dietil (etil) efiri

• oddiy efirlar bir xil sondagi uglerod atomlari bo'lgan bir atomli spirtlar bilan izomer, masalan:

S_3N_8O	$SN_3 – O - S_2N_5$ metil etil efir

	SN_3- SN_2 – SN_2- ON propanol – 1
	SN_3-SN-SN_3 OH propanol - 2

• fizikaviy xossalari.
Gomologik qatorning birinchi vakillari:

SN_3-O-SN_3 SN_3-O-S_2N_5 S_2N_5-O-S_2N_5

dimetil efir metiletil efir dietil efir

rangsiz past temperaturada qaynaydigan suyuqliklar, xarakterli hidli, suvda erimaydilar.

Murakkab efirlar

Murakkab efirlar – karbon kislotalar yoki neorganik okso kislotalar bilan spirtlarning o'zaro ta'sir mahsulotlaridir.

• kislota va spirtlardan murakkab efir olish reaksiyasiga eterifikatsiya reaksiyasi deyiladi. («eter»-efir).

Murakkab efirlarning umumiy formulasi:

R_1COOR yoki R_1-C(=O)-O-R,

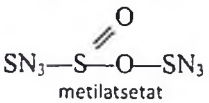
bu erda R_1 va R_2 bir xil yoki har xil radikallar, buning ustiga R_1 vodorod atomi ham bo'lishi mumkin (chumoli kislota efirlari).

• nomlanishlarida xarakterli qo'shimcha bo'lmaydi.
• bir xil sondagi uglerod atomlari bo'lgan bir negizli karbon kislotalar bilan izomer.

Masalan:

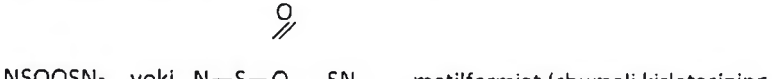
$SN_3—SN_2—S—ON$

$C_3H_6O_2 \Rightarrow$ propanat k-ta



metilatsetat

• gomologik qatorning birinchi vakillari:

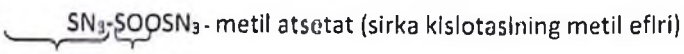


$NSOOSN_3$ yoki $N—S—O—SN_3$ metilformiat (chumoli kislotasining metil efiri)

formiat metil

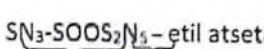
Murakkab efirlarning nomlari spirtni hosil qiluvchi radikal va kislota qoldig'i nomlaridan tuziladi. Bunda efirni shartli ravishda-SOON gruppadagi vodorod atomiga alifatik radikal[1] almashgan mahsulot deb qaraladi.

Masalan:



SN_3-$SOOSN_3$ - metil atsetat (sirka kislotasining metil efiri)

atsetat metil



SN_3-$SOOS_2N_5$ – etil atsetat (sirka kislotasining etil efiri).

atsetat etil

$CH_2=C$-$COOCH_3$ - metil metakrilat (metakrilat kislotasining metil efiri)

CH_3 metil

metakrilat

$C_2H_5—O$ dietil sulfat (sulfat kislotasining dietil efiri)

$C_2H_5—O$ O

dietil sulfat

[1] Ҳақиқатда эса мураккаб эфир ҳосил бўлишида кислотадан –ОН группаси кетади

$CH_3—O—NO_2$ - metil nitrat (nitrat kislotasining metil efiri)

metil nitrat

$CH_2—O—NO_2$

$CH—O—NO_2$ – glitserin triniltratl (trinitroglitserin, nitroglitserin)

$CH_2—O—NO_2$

• uch atomli spirt glitserin va karbon kislotalardan hosil bo'lgan murakkab efirlarni uch glitseridlar deyiladi. Uglerod atomlari soni 8 dan to 24 gacha bo'lgan normal tuzilishli karbon kislotalardan hosil bo'ladigan uch glitseridlarga yog'lar deyiladi. Hayvonlarning yog'lari-qattiq moddalar (baliq moyidan boshqalari) asosan tuyingan kislotalarning qoldiqlaridan iborat:

*$S_{17}N_{35}SOON$ - stearin,

*$S_{15}N_{31}SOON$ - palmitin,

*$S_{13}N_{27}SOON$ - miristin.

O'simliklarning moylari–suyuq moddalar, asosan to'yinmagan karbon kislotalarning qoldiqlaridan iborat:

*$S_{17}N_{33}SOON$ - olein,

*$S_{17}N_{31}SOON$ - linol,

*$S_{17}N_{29}SOON$ - linolen.

• fizikaviy xossalari.

Tarkibi bo'yicha oddiy bo'lgan karbon kislotalarning murakkab efirlari – rangsiz oson qaynaydigan yoqimli meva hidli suyuqliklar. YUqori murakkab efirlar qovushqoq suyuqlik yoki qattiq, mumga o'xshash moddalar (masalan asalari mumiga). Hamma murakkab efirlar suvda erimaydi.

7 §. Galogenli hosilalar

Galogenli hosilalar-alifatik yoki aromatik uglevodo-rodlarning molekulalaridagi vodorod atomlariga galogenlar atomlarining

almashingan mahsulotlardir.

• umumiy formulasi:
*alifatik galogen hosilalariniki R-G, bu erda R- to'yingan yoki to'yinmagan alifatik radikal, G- F, Cl, Br, I:

*aromatik galogen hosilalari Ar-G, bu erda Ar-aromatik radikal.

• gomologik qatorning birinchi vakili:
*alifatik galogen hosilalariniki SN_3-G,

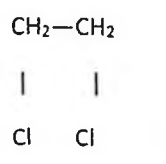
*aromatik galogen hosilasiniki S_6N_5-G.

• nomlanishida xarakterli qo'shimcha bo'lmaydi.
• galogen hosllalarini nomlarini tuzishda bosh zanjirdagi uglerod atomlari soniga mos keladigan alkan nomiga galogen nomi qo'shiladi va gologenning holati hamda yon radikalar ko'rsatiladi. Galogen va radikallarning nomlaridan iborat nomlanishdan, hamda qadimiy nomlanishlardan ham foydalanishga ijozat etiladi.
Masalan: SN_3Sl – xlormetan (metilxlorid, xlorli metil),

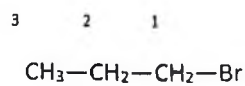
CH_2Cl_2 – dixlormetan (metilenxlorid, xlorli metilen),

$CHCl_3$ – trixlormetan (xloroform),

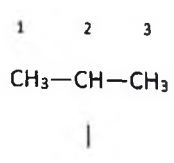
CCl_4 – tetraxlormetan (uglerod to'rtxlorid),



1,2-dixloretan

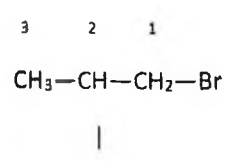


1-brompropan (birlamchi propil bromid)



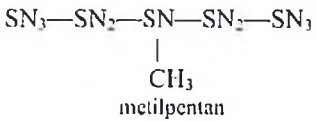
2-brompropan

(Ikkilamchi-propilbromid)

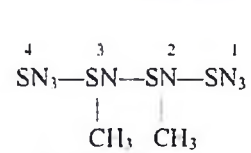


2-metil 1- brompropan

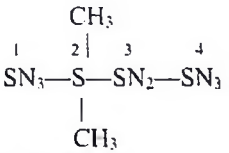
(birlamchi butilbromid)



3- metilpentan



2,3-dimetil butan



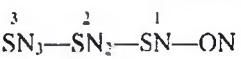
2,2-dimetil butan

Alkanlar qatorining birinchi uchta vakilida izomerlar bo'lmaydi (SN_4, S_2N_6, S_3N_8).

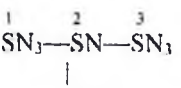
Holat izomeriyasi uglerod zanjirida hamda benzol yadrosidagi radikallarda funksional gruppalar va qo'sh bog'larning har xil holatlarda bo'lishi bilan bog'liq.

Masalan:

S_3N_7ON

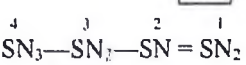


propanol-1

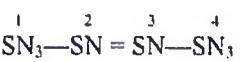


propanol -2 (izopropil spirt)

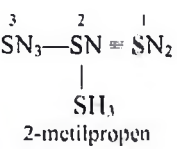
S_4N_8



buten - 1

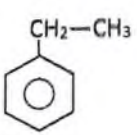


buten - 2

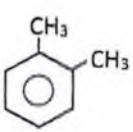


2-metilpropen

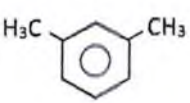
S_8N_{10}



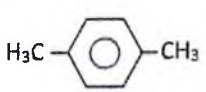
Etilbenzol



1,2 - dimetilbenzol (orto - ksilol)



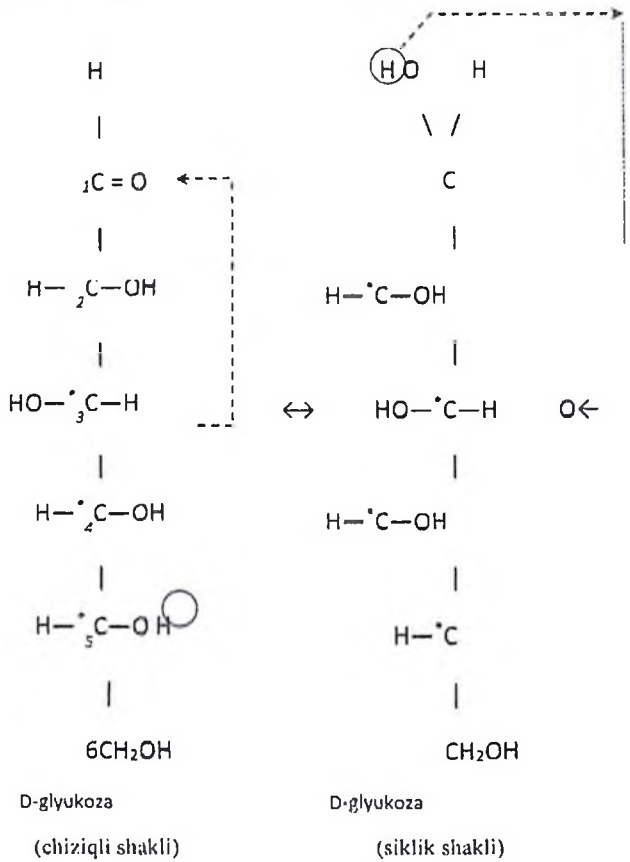
1,3-dimetilbenzol (meta- ksilol)



1,4-dimetilbenzol (para- ksilol)

Tautomeriya – molekuladagi bitta uglerod atomidan vodorod atomini boshqa uglerod atomiga migratsiyasi hisobiga va yana teskari yo'nalishda o'tishidan izomerlarning mavjud bo'lish hodisasidir.

Tautomer almashinish qobiliyat natijasida modda hamma izomerlar molekulalar muvozanat aralashmalari ko'rinishida mavjud bo'ladi. Masalan: glyukoza ikki xil – chiziqli va siklik ko'rinishdagi tautomer shaklda mavjud bo'ladi.



Sinflararo izomeriya – strukturaviy izomeriyaning har xil ko'rinishi. Quyidagi organik birikmalarning sinflari bir-birlari bilan izomerdir:

- sikloalkanlar va alkenlar;
- alkinlar va dien uglevodorodlari;
- spirtlar va oddiy efirlar;
- aldegidlar va ketonlar;
- murakkab efirlar va bir negizli karbon kislotalar.

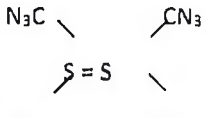
Fazoviy (yoki stereo) izomeriya–geometrik va optik izomeriyalarni o'z ichiga oladi.

Geometrik yoki sis-, trans– izomeriya qo'sh bog'ga nisbatan atomlar yoki radikallarning har holatlari bilan bog'liq, u bilan bog'langan uglerod atomlarining erkin aylanish imkoniyati mustasno.

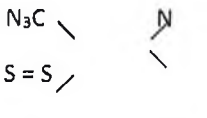
Geometrik izomeriya alkenlar va dien uglevodorodlari uchun shunday sharoitda xarakterliki, ya'ni qo'sh bog'dagi har bir uglerod atomi har xil o'rinbosarlarga ega bo'lganda (atomlar, radikallar yoki atomlar gruppasi)

Masalan: buten-1 (CH_3-CH_2-CH=CH_2) geometrik izomerga ega emas, chunki qo'sh bog' bilan bog'langan uglerod atomlaridan biri bir xil o'rinbosar (vodorod atomlari) ga ega.

Buten-2 (CH_3-CH=CH-CH_3) ikki ko'rinishdagi izomerlari mavjud:



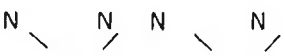
sis-izomer



trans-izomer

Sis – bir xil o'rinbosarlar qo'sh bog'ning bir tomonida joylashganligini, *trans*–bir xil o'rinbosarlar qo'sh bog'ning har xil tomonlarida joylashganligini bildiradi (*trans* - ustidan).

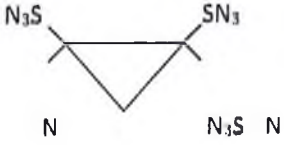
Sis- va *trans–* izomerlar ko'rinishida mavjud bo'ladigan dienga linol kislotasi $S_{17}N_{31}SOON$ misol bo'ladi:



$SN_3 – (SN_2)_4 – S = S – SN_2 – S = S - (SN_2)_7 – SOON$

sis-sis-oktadekadien-9,12 linol k-ta

Sikldagi S-S bog' atrofida aylanish mumkin bo'lmagani uchun sis- va trans–izomerlari sikloalkanlarning gomologlari va hosilalari uchun ham xarakterli. Masalan:



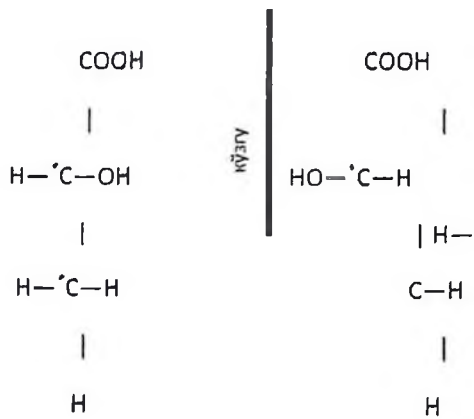
sis-1,2-dimetilsiklopropan

trans-1,2- dimetilsiklopropan

Optik izomeriya molekulada bitta yoki bir qancha asimmetrik uglerod atomlari, ya'ni to'rtta har xil o'rinbosarlar bilan bog'langan uglerod atomi bor bo'lganda yuzaga keladi.

Molekulada bitta asimmetrik uglerod atomi mavjud bo'lsa (masalan: sut kislotasi molekulasi), ikki xil optik izomerlar bo'lishi mumkin, ular bir–birlaridan o'zlarining oynadagi tasviri predmeti kabi farq qiladilar. SHuning uchun optik izomeriyani ko'zgu izomeriyasi ham deyiladi.

Masalan:



2-oksipropion k-ta (α -oksipropion yoki sut k-ta)

Asimmetrik uglerod atomlarini odatda yulduzcha bilan belgilanadi.

Sut kislotasining ikkala izomeri ham optik aktiv: ularning eritmasi orqali chiziqli polyarlangan nur o'tganda ular nurning polyarlanish tekisligida **burilladilar.** Buning ustiga bitta izomer nurning polyarlanish tekisligida o'ngga buriladi, boshqasi esa shuncha burchak chapga buriladi.

Molekulada bir qancha asimmetrik uglerod atomlari bo'lsa, optik ko'zgu izomerlar soni quyidagi formula bo'yicha aniqlanadi:

$N= 2^n$, bu erda n- asimmetrik uglerod atomlari soni.

Masalan: D- glyukoza molekulasining chiziqli shaklida to'rtta asimmetrik uglerod atomi bor va natijada uning $2^4 = 16$ ko'zgu izomeri, D- glyukoza molekulasining siklik shaklida 5 ta asimmetrik uglerod atomi bor unda $2^5=32$ ko'zgu izomeri bo'ladi.

Boshqa ko'rinishdagi fazoviy izomerlar ham mavjud.

Izomerlar fizikaviy xossalari bilan ham kimyoviy xossalari bilan ham farq qiladilar.

Masalan: S_2N_6O birikmasi ikki xil izomer ko'rinishida mavjud bo'ladi: etil spirti CH_3-CH_2-OH va dimetil efiri CH_3-O-CH_3 ya'ni birinchisi odatdagi sharoitda- suyuqlik, ikkinchisi esa – gaz.

Bu moddalarning kimyoviy xossalari ham har xil. SHunday ekan, etil spirti ishqoriy metallar bilan oson ta'sirlashadi.

$$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2\uparrow$$

dimetil efiri esa ishqoriy metallar bilan ta'sirlashmaydi.

Keltirilgan misoldan A.M.Butlerov nazariyasining asosiy hollaridan biri kelib chiqadi:

Moddalarning fizikaviy va kimyoviy xossalari molekula tarkibiga qaysi atomlar va qanday miqdorda kirganligiga emas, balki ularning birikish tartibiga, ya'ni molekulaning kimyoviy tuzilishiga bog'liq bo'ladi.

4 bo'lim. Organik moddalarning kimyoviy xossalari

1 bob. Suvga munosabatlari

Suvni organik moddalarga birikishiga gidratatsiyalanish reaksiyasi deyiladi.		
To'yinmagan uglevodorodlar suvni N-ON biriktirib spirtlar hosil qiladilar. Birikish Markovnikov qoidasi bo'yicha boradi: N-ON dagi vodorod atomi qo'sh bog'dagi uglerod atomlaridan qaysi birida vodorod atomlari ko'p bo'lsa o'sha uglerod atomiga birikadi, -ON gruppasi esa bu bog'dagi boshqa uglerod atomiga birikadi.		$CH_3-CH=CH_2+H_2O \xrightarrow{kat} CH_3-CH-CH_3$ propen (propilen) | OH Propanol -2 (izopropil spirt)
Suvni alkinlarga birikishidan olinadigan spirtlar beqaror va tezlik bilan aldegidlarga yoki ketonlarga izomerlanadi (Kucherov reaksiyasi).		$HC\equiv CH + H_2O \xrightarrow[H^+]{Hg^{2+}} [CH_2=CH] \xrightarrow{izomerlanish} CH_3-CHO$ | etin ON etanal (atsetilen) → vinil spirt | || $CH_3-C\equiv CH + H_2O \xrightarrow[H]{Hg^{2+}} [CH_3-C=CH_2] \xrightarrow{izomerlanish} CH_3-C-CH_3$ propin ON O atseton
Kuchli oksidlovchilar ishti-rokida suvning alkenlarga birikishidan ikki atomli spirtlar – glikollar, alkin-larga birikishidan ikki ne-gizli yoki bir negizli kislota-lar hosil bo'ladi. Bunda $KMnO_4$ ning rangsizlanishi sodir bo'ladi, shuning uchun bu reaksiyalar to'yinmagan ugle-vodorodlar uchun sifat reak-siyalari hisoblanadi.		$CH_3-CH=CH_2+H_2O+[O] \xrightarrow{KMnO_4} CH_3-CH-CH_2$ propen (propilen) | | OH OH propendiol – 1,2 (propilenglikol) $HC\equiv CH+H_2O+3[O] \xrightarrow{KMnO_4} NOOC-COOH$ etin oksalat k-ta

		(atsetilen) $SN_3{-}S{=}S{-}SN_3 + N_2O + 3[O] \xrightarrow{KMnO_4} 2CH_3COOH$ butin -2 sirka k-ta
Karbon kislotalarning sik-lik amidlariga suvning birikishi tegishli amino-kislotalarning hosil bo'li-shiga olib keladi.	☞	$SN_2{-}SN_2{-}SN_2$ | $C{=}O + N_2O \rightarrow NH{-}(CH_2)_5{-}COOH$ S капролактам ε-аминокапрон кислота
Suvni alifatik aminlarga birikishi asoslarning hosil bo'lishiga olib keladi.	☞	$C_2H_5NH_2 + H_2O \rightarrow [C_2H_5NH_3]OH$ etilamin etilammoniy gidroksid $(C_2H_5)_2NH + H_2O \rightarrow [(C_2H_5)_2NH_2]OH$ dietilamin dietilammoniy gidrooksidi $(C_2H_5)_3N + H_2O \rightarrow [(C_2H_5)_3NH]OH$ trietilamin trietilammony
Ko'pchilik organik birik-malar suv ta'siridan par-chalanadilar. Bu jarayonga gidroliz deyiladi. Gid-rolizga uchraydilar: • murakkab efirlar	☞	$HCOOC_4H_9 + H_2O \rightarrow HCOOH + C_4H_9OH$ butilformiat chumoli kislotasi butanol
• triglitseridlar (yog'lar)	☞	$SH_2\text{-}OCO\text{-}C_{17}H_{35}$ $CH_2\text{-}OH$ $C_{17}H_{35}COOH^*$ | | $SH\text{-}OCO\text{-}C_{15}H_{31} + 3H_2O \Leftrightarrow CH\text{-}OH + C_{15}H_{31}COOH^{**}$ $SH_2\text{-}OCO\text{-}C_{17}H_{33}$ $CH_2\text{-}OH$ $C_{17}H_{33}COOH^{***}$ Palmitooleinostearat glitserin *stearin k-ta **palmitin k-ta ***olein k-ta

• galogenli hosilalari	☞	$CH_3Cl+H_2O \leftrightarrow CH_3OH+HCl$ xlormetan metanol $SN_2-SN_2 \quad SN_2-SN_2$ $\vert \quad \vert + 2H_2O \leftrightarrow \vert \quad \vert + 2HCl$ $Cl \quad Cl \quad OH \quad OH$ dixloretan – 1,2 etandiol – 1,2 (etilenglikol)
polipeptidlar (oqsillar)	☞	$SN_3-SN-SO-NH-CH-COOH+H_2O \leftrightarrow 2CH_3-CH-COOH$ $\vert \quad \vert \quad \vert$ $NH_2 \quad CH_3 \quad NH_2$ alanil-alanin (dipeptid) alanin

• alkogolyatlar *alifatik spirtlarning alkogolyatlarining gidrolizi – qaytmas jarayon, chunki hosil bo'lgan mahsulotlar amalda bir-birlari bilan reaksiyaga kirishmaydilar. *aromatik spirtlarning alkogolyatlarining gidrolizi – qay-tar jarayon, odatdagi sharoitda reaksiya muvozanati kuchli darajada chapga siljigan va bu reaksiya ahamiyatga ega emas.	☞	$S_2H_5ONa + H_2O \longrightarrow C_2H_5OH + NaOH$ natriy etilat — etanol $S_6H_5ONa + H_2O \not\rightarrow$ natriy fenolyat
• amidlar	☞	$SN_3{-}S(=O){-}NH_2 + N_2O \xrightarrow{t,kat} SN_3{-}S(=O){-}OH + NH_3\uparrow$ atsetamid — sirka k-ta
• polisaxaridlar	☞	$(S_6N_{10}O_5)n + nH_2O \quad nC_6H_{12}O_6$ kraxmal — glyukoza
2 bob. Bir-birlariga munosabatlari		

To'yinmagan uglevodorodlar bir-birlari bilan ulkan molekulaga birikishlari mumkin. Ularning Mr yuz minglab birlikka etadi. Bu reaksiyaga polimerlanish reaksiyasi deyiladi. («poli »- ko'p, meros - qism), a olingan mahsulotlarga polimerlar deyiladi. Polimerlanish qizdi-rilganda katalizator ishtiro-kida yoki ionlashtiruvchi nurlar ta'sirida boradi.

$$nCH_2=CH-CH_3 \xrightarrow{t,kat} -CH(CH_3)-CH_2-$$

propilen — polipropilen

$$nCH_2=CH-Cl \xrightarrow{t,kat} -CH_2-CH(Cl)-$$

vinilxlorid — polivinilxlorid

$$nCH_2=CH-CH=CH_2 \xrightarrow{t,kat} (-CH_2-CH=CH-CH_2-)_n$$

divinil — divinil (sintetik) kauchuk

Monomerning ikkita mole-kulasini birikishi bilan bora-digan polimerlanishga dimer-lanish, uchtasi biriksa – trimerlanish deyiladi.

$$nCH_2=C(CH_3)-CH=CH_2 \xrightarrow{t,kat} -CH_2-C(CH_3)=CH-CH_2-$$

izopren — izopren (tabiy kauchuk)

Agar to'yinmagan uglevodo-rodlarning har xil moleku-lalari bir-birlari bilan bi-riksa, u holda jarayonga birga-likdagi polimerlanish yoki so-polimerlanish deyiladi, olingan polimerga – sopolimer deyiladi.

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

atsetilin atsetilin — vinilatsetilin

$$3HC\equiv CH \xrightarrow[\text{oxir. ko'mir}]{600^\circ C} C_6H_6$$

atsetilen — benzol

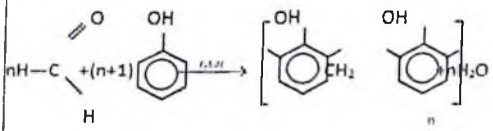
$$nCH_2=CH-CH=CH_2 + nC_6H_5-CH=CH_2 \xrightarrow{t,kat}$$

butadien-1,3 — stirol

$$\rightarrow -CH_2-CH=CH-CH_2-CH(C_6H_5)-CH_2-$$

butadienstirol kauchuk

Agar molekulalarning bir – birlari bilan birikishidan polimerdan tashqari quyi mole-kulyar birikmalar (H_2O, NH_3, HG) hosil bo'lsa, u holda bunday jarayonga polikondensatsiyala-nish deyiladi.



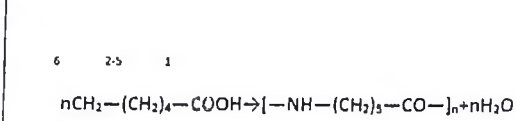
formaldegid fenol fenol formaldegid smolasi

Polikondensatsiyalanish reak-siyasiga misol bo'ladi:

- ε -aminokapron kislotasidan kapron va ω aminoenant kislo-tasidan enant kabi sintetik tolalarning olish reaksiyalari
- aminokislotalardan polipep-tidlarni (oqsillarni) olish reaksiyalari

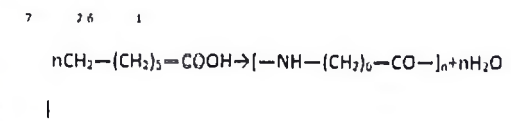
Polikondensatsiyalanish va po-limerlanish reaksiyalari bir-birlaridan farq qiladilar:

- dastlabki moddalarning tar-kibi bilan,
- mahsulotlar tarkibi bilan

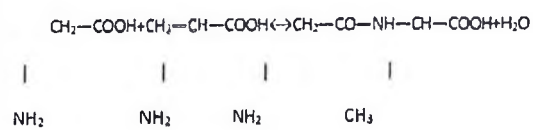


ε -aminokapron kapron

(6-aminogeksan) k-ta



ω -aminoenant (7-aminogeptan) enant



glitsin alanin glitsil-alanin (dipentid)

6 bob. Tuzlarga munosabatlari

Organik moddalar bi-lan tuzlar orasidagi reaksiyalar kam. Faqat HCOOH, CH_3COOH, C_2H_5COOH C_3H_7COOH, o'rtacha kuchdagi kislotalar bo'lgani uchun ancha kuchsiz kislotalar (H_2CO_3, H_2S, H_2SiO_3) ni ularning tuzlaridan si-qib chiqaradi.	☞	$K_2S+2HCOOH \rightarrow 2HCOOK+H_2S\uparrow$ chumoli kislota kaliy formiat $K_2SiO_3+2CH_3COOH \rightarrow 2CH_3COOK+H_2SiO_3\downarrow$ sirka kislota kaliy formiat $Na_2CO_3+2C_2H_5COOH \rightarrow 2C_2H_5COONa+H_2O+CO_2\uparrow$ propion kislota natriy propionat $NaHCO_3+C_3H_7COOH \rightarrow C_3H_7COONa+H_2O+CO_2\uparrow$ butan natriy kislota butirat
Kuchli oksidlovchi xossasiga ega bo'lgan tuz-lar, ($KMnO_4$, $K_2Cr_2O_7$) eritmalarda ko'pchilik organik moddalarni oksidlaydilar.	☞	$3CH_2=CH_2+4H_2O+2KMnO_4 \rightarrow 3CH_2(OH)-CH_2(OH)+2MnO_2\downarrow+2KOH$ etilen etilenglikol $3C_2H_5OH+K_2Cr_2O_7+4H_2SO_4 \rightarrow CH_3CHO+K_2SO_4+Cr_2(SO_4)_3+7H_2O$ etanol sirka aldegid yoki atsetaldegid

Odatda ($AlCl_3$, $FeBr_3$, $HgCl_2$, $CuCl_2$, $NiCl_2$) va boshqa tuzlar organik sintezda katalizatorlar sifatida ishlatiladi.

7 bob. Metallarga munosabatlari

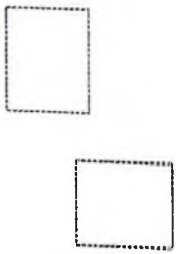
Aktiv metallar (ish-qoriy, ishqoriy-er, ham-da Zn va Mg) ta'sir-lashadilar. Karbon kislotalar bi-lan – tuz hosil qila-dilar va vodorod aj-raladi.	☞	$2CH_3COOH+Zn \rightarrow (CH_3COO)_2Zn+H_2\uparrow$ sirka k-ta rux atsetat $HOOC-COOH+2Na \rightarrow NaOOC-COONa+H_2\uparrow$ (oksalat k-ta) natriy oksalat

Aminokislotalar bilan tuz hosil bo'ladi va vodorod ajralib chiqadi	$H_2C_2O_4+2Na \rightarrow Na_2C_2O_4+H_2\uparrow$ $2C_6H_5COOH+2K \rightarrow 2C_6H_5COOK+H_2\uparrow$ benzoy k-ta kaliy benzoat

Galogen hosilalari bi-lan (Vyurs reaksiyasi) – alkanlarni hosil qi-ladi. Vyurs reakslyasi-dan uglevodorodlar zan-jirini uzaytirishda foydalaniladi.	☞	$CH_3—Cl + 2Na + Cl—CH_3 \rightarrow CH_3—CH_3 + 2NaCl$ metilxlorid metilxlorid etan $SH_3—Br + 2Na + Br—C_2H_5 \rightarrow CH_3—C_2H_5 + 2NaBr$ brommetan brometan propan $S_2H_5—Sl + 2Na + Cl—C_6H_5 \rightarrow C_2H_5—C_6H_5 + 2NaCl$ xloretan xlorbenzol etilbenzol $S_2H_5—Sl + 2Na + Cl \rightarrow C_2H_5 + 2NaCl$

Spirtlar bilan – alkogolyatlar hosil qiladi	☞	$2CH_3—OH+2Na \rightarrow 2CH_3—ONa+H_2\uparrow$ metanol natriy metilat $CH_2—OH \quad CH_2—O$ $\vert \quad + Ba \rightarrow \vert \quad Ba+H_2\uparrow$ $CH_2—OH \quad CH_2—O$ etandiol-1,2 bariy etilenglikol (etilenglikol) $CH_2—OH \quad CH_2—ONa$ $\vert \quad \vert$ $2CH—OH+6Na \rightarrow 2CH—ONa+3H_2\uparrow$ $\vert \quad \vert$ $CH_2—OH \quad CH_2—ONa$ propantriol -1,2,3 trinatriyglitserat (glitserin) Metall etishmaganda birlamchi va ikkilamchi almashingan maxsulotlar – natriy glitserinat va natriy ikkigli-serinatlar hosil bo'ladi.
Fenol bilan - fenolyatlarni hosil qiladi.	☞	 $OH+2K \rightarrow 2$  $OK + H_2\uparrow$ $2C_6H_5—OH + 2K \rightarrow 2C_6H_5—OK + H_2\uparrow$ fenol kaliy fenolyat
Ikkigalogenli hosila-lar	☞	

bilan – sharoitga va metall aktivligiga bog'-liq holda yoki alken, yoki sikloalkan hosil bo'-ladi.	SH_2-Cl | +Zn ⟶ $CH_2=CH_2+ZnCl_2$ CH_2-Cl eten 1,2-dixloretan CH_2-Cl CH_2 SH_2 + 2Na ⟶ / \ +2NaCl CH_2-Cl H_2C-CH_2 1,3 dixlorpropan sikloporopan



Oksidlanish reaksiyalariga misollar:

- alkanlar

$2SH_4 + O_2 \xrightarrow{t,kat} 2CH_3OH$

metan — metanol

$SH_4 + O_2 \xrightarrow{t,kat} H-C + H_2O$

metan — H

metanal

$2SH_4 + O_2 \xrightarrow{t,kat} 2HCOOH + 2H_2O$

metan — chumoli k-ta

- alkenlar

$CH_2 = CH_2 + [O] \xrightarrow{t,kat} CH_3-C$

etilen — H

etanal

$2CH_2 = CH_2 + O_2 \xrightarrow{t,kat} 2H_2C - CH_2$

etilen — \ /

O

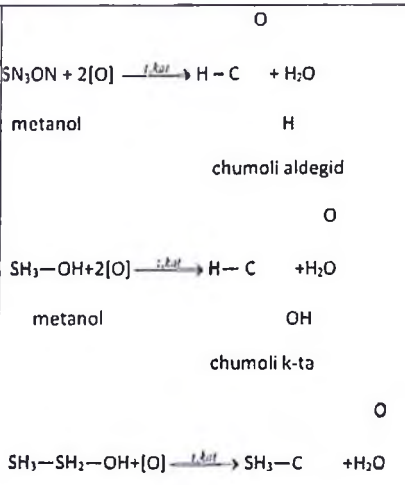
etilen oksid

- alkinlar

$HC \equiv CH + [O] \xrightarrow{t,kat} HOOC-COOH$

atsetilin — oksalat k-ta

- spirtlardan dastlab aldegidlar hosil bo'ladi, keyin esa o'shancha sondagi uglerod atomlari bo'lgan karbon kislotalar. Odat-dagi sharoitda spirtlar-ning oksidlanishi sekin boradi. Havo kislorodi bilan etil spirtining ok-sidlanishi vinoning achi-shini tushuntiriladi.



• <u>aromatik uglevodorodlar</u> Benzol oksidlovchilar ta'si-riga chidamli. Benzol gomo-loglari yon radikalning uzun-ligidan qat'iy nazar kis-lotali muhitda $KMnO_4$ bilan benzoy kislotagacha ok-sidlanadi.	☞	$C_6H_6 - [O] \not\rightarrow$ $C_6H_5 - CH_3 + 3[O] \xrightarrow{H^+, KMnO_4} C_6H_5 - COOH + H_2O$ metilbenzol benzoy k-ta (toluol) $C_6H_5 - C_2H_5 + 6[O] \xrightarrow[KMnO_4]{H^+} C_6H_5 - COOH + 2H_2O + CO_2\uparrow$ etilbenzol benzoy k-ta

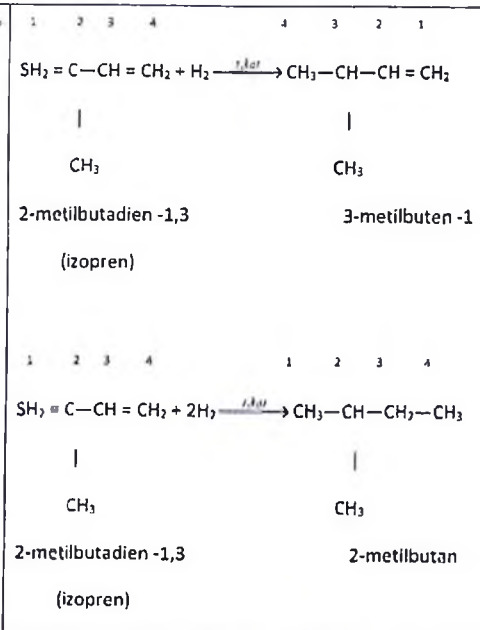
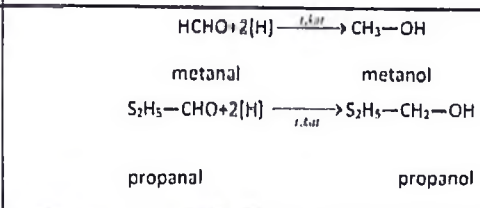
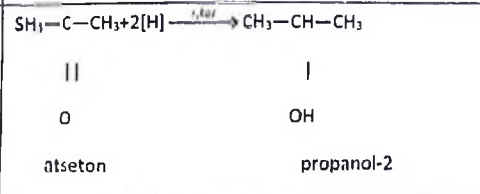
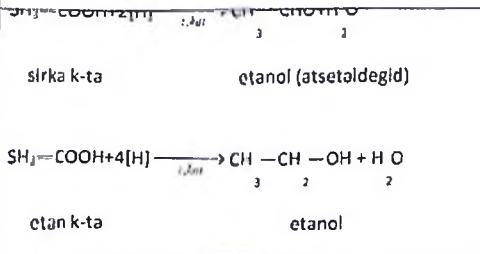
• <u>aldegidlar</u> Aldegidlarni oksid-lanishi odatdagi sharo-itda oson boradi.	☞	$H-C(=O)-H + [O] \rightarrow H-COOH$ metanal chumoli k-ta (formaldegid) $SH_3-C(=O)-H + [O] \rightarrow SH_3-COOH$ etanal sirka k-ta (atsetaldegid) $S_6H_5-C(=O)-H + [O] \rightarrow S_6H_5-COOH$ benzaldegid benzoy k-ta
YOnish reaksiyalariga misollar:		
• alkanlar	☞	$S_nH_{2n+2} + \frac{3n+1}{2} O_2 \longrightarrow nCO_2 + (n+1)H_2O$

		$2C_2H_6+7O_2 \xrightarrow{t} 4CO_2+6H_2O$ $2C_2H_6+5O_{2(kam)} \xrightarrow{t} 4CO+6H_2O$
• alkenlar, sikloalkanlar	☞	$C_nH_{2n}+\frac{3n}{2}O_2 \xrightarrow{t} nCO_2+nH_2O$ $CH_2=CH_2+3O_2 \xrightarrow{t} 2CO_2+2H_2O$ H_2C-CH_2 $\vert \quad \vert +6O_2 \xrightarrow{t} 4CO_2+4H_2O$ H_2C-CH_2
• alkinlar, dienlar	☞	$C_nH_{2n-2}+\frac{3n-1}{2}O_2 \xrightarrow{t} nCO_2+(n-1)H_2O$ $2HC\equiv CH+5O_2 \xrightarrow{t} 4CO_2+2H_2O$ $2H_2C=CH-CH=CH_2+11O_2 \xrightarrow{t} 8CO_2+6H_2O$
• arenlar (aromatik uglevodorodlar)	☞	$C_nH_{2n-6}+\frac{3n-3}{2}O_2 \xrightarrow{t} nCO_2+(n-3)H_2O$ $2C_6H_6+15O_2 \xrightarrow{t} 12CO_2+6H_2O$
• spirtlar, oddiy efirlar	☞	$C_nH_{2n+2}O+\frac{3n}{2}O_2 \xrightarrow{t} nCO_2+(n+1)H_2O$ $2C_2H_5OH+6O_2 \xrightarrow{t} 4CO_2+6H_2O$ $SN_3\text{-}O\text{-}SN_3+4O_{2(kam)} \xrightarrow{t} 4SO+6N_2O$
• karbon kislota-lari, murakkab efirlar	☞	$C_nH_{2n}+\frac{3n-2}{2}O_2 \xrightarrow{t} nCO_2+nH_2O$ $CH_3COOH+2O_2 \xrightarrow{t} 2CO_2+2H_2O$ $CH_3COOS_2H_5+5O_2 \xrightarrow{t} 4CO_2+4H_2O$

• aldegidlar, ketonlar	☞	$C_nH_{2n}O+\frac{3n-1}{2}O_2 \xrightarrow{t} nCO_2+nH_2O$ $2CH_3CHO+5O_2 \xrightarrow{t} 4CO_2+4H_2O$ $CH_3-\underset{\underset{O}{\|}}{C}-CH_3+4O_2 \xrightarrow{t} 3CO_2+3H_2O$
• aminlar		$C_nH_{2n+3}N+\frac{6n+3}{2}O_2 \xrightarrow{t} 2nCO_2+(2n+3)H_2O+N_2$ $4CH_3NH_2+9O_2 \xrightarrow{t} 4CO_2+10H_2O+2N_2$ $4C_6H_5NH_2+31O_2 \xrightarrow{t} 24CO_2+14H_2O+2N_2$
• aminokislotalar, nitrobirikmalar	☞	$2C_nH_{2n+1}NO_2+\frac{6n-3}{2}O_2 \xrightarrow{t} 2nCO_2+(2n+1)H_2O+N_2$ $4C_6H_5NO_2+25O_2 \xrightarrow{t} 24CO_2+10H_2O+2N_2$ $4NH_2-CH_2-COOH+9O_2 \xrightarrow{t} 8CO_2+10H_2O+2N_2$
Gidrogenlash reaksiyala-ri molekulyar yoki atomar vodorodni birikishi – yuqori temperatura va bosimda katalizatorlar ta'sirida boradi. Gidrogenlashga uchraydilar:	☞	

▫ sikloalkanlar – alkanlar hosil bo'ladi. ▪ alkenlar – alkanlar hosil bo'ladi	☞	CH_2 / \ $+ H_2 \xrightarrow{t,kat} CH_3—CH_3—CH_3$ $H_2C—CH_2$ propan siklopropan $C_2H_5—CH = CH_2 + H_2 \xrightarrow{t,kat} C_2H_5—CH_2—CH_3$ buten-1 butan $CH_2 = CH_2 + H_2 \xrightarrow{t,kat} CH_3—CH_3$ eten (etilen) etan

alkinlar – dastlab alkenlar keyin esa alkanlar hosil bo'ladi.	☞	$HC \equiv CH + H_2 \xrightarrow{t,kat} CH_2 = CH_2$ etin (atsetilen) eten $HC \equiv CH + 2H_2 \xrightarrow{t,kat} CH_3—CH_3$ etin (atsetilen) etan $SH_3—C \equiv CH+H_2 \xrightarrow{t,kat} CH_3—CH = CH_2$ propin propen $CH_3 - C \equiv CH + 2H_2 \xrightarrow{t,kat} CH_3 - CH_2 - CH_3$ propin propan
Arenlar – sikloalkan-lar hosil bo'ladi. Aren-larni gidrogenlaganda benzol yadrosining to'yin-magan xarakteri yo'qoladi	☞	benzol siklogeksan $+3H_2 \xrightarrow{t,kat}$

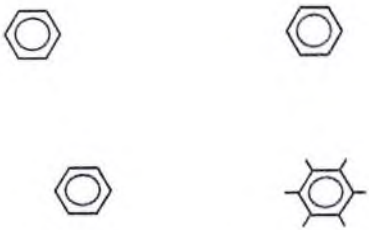
• dienlar - dastlab alkenlar keyin esa alkanlar hosil bo'ladi.	☞	
<u>aldegidlar</u> – birlamchi spirtlar hosil bo'ladi.	☞	
<u>ketonlar</u> – ikkilamchi spirtlar hosil bo'ladi.	☞	
• <u>karbon kislotalari</u> – dastlab aldegidlar, keyin esa molekulada o'shancha uglerod atomlari bo'lgan spirtlar hosil bo'ladi.	☞	

• triglitseridlar to'yinmagan kislota qoldiqlari bo'lgan (suyuq yog'lar) – qattiq yog'lar hosil qiladi. To'yin-magan kislota qoldiq-lari bo'lgan yog'larni gidrirlashga gidrogen-lash deyiladi.	☞	$CH_2-O-CO-C_{17}H_{33}$ $CH_2-O-CO-C_{17}H_{35}$ | | $CH-O-CO-C_{17}H_{33} + 3H_2 \rightarrow CH-O-CO-C_{17}H_{35}$ | | $CH_2-O-CO-C_{17}H_{33}$ $CH_2-O-CO-C_{17}H_{35}$ suyuq yog' qattiq yog' ucholeat uchstearat
• nitrobirikmalar – aminlarni hosil qi-ladi. Nitrobenzolni anilingacha qaytarish reaksiyasiga Zinin reaksiyasi deyiladi.	☞	$CH_3-NO_2+6[H] \xrightarrow[Fe+HCl]{t,kat} CH_3-NH_2+2H_2O$ nitrometan metilamin $C_6H_5-NO_2+6[H] \xrightarrow[Fe+HCl]{t,kat} C_6H_5-NH_2+2H_2O$ nitrobenzol anilin $-NO_2 + 6[H] \xrightarrow[Fe+HCl]{t,kat} -NH_2 + 2H_2O$

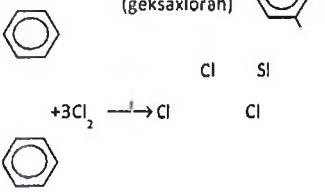
Galogenlash reaksiyalari – organik modda molekulasiga S-G bog'ini hosil qiladigan galogenlarning atomlarini kiritish. Galogenlashga uch-raydilar: • *alkanlar* - galogen hosi-lalarini hosil qiladilar. Alkanlarni galogenlash yorug'likda boradi. Reaksiya mexanizmi zanjirli erkin radikalli. Reaksiya vodorod atomlariga galogen atomla-rini to'liq almashinishiga qadar davom etadi. Galogen-larning eritmalari (xlorli yoki bromli suv) bilan al-kanlar ta'sirlashmaydilar.	☞	$CH_4+Cl_2 \xrightarrow{h\nu} CH_3Cl+HCl$ metan xlormetan $CH_3Cl + Cl_2 \xrightarrow{h\nu} CH_2Cl_2+HCl$ xlormetan dixlormetan $CH_2Cl_2 + Cl_2 \xrightarrow{h\nu} CHCl_3+HCl$ dixlormetan trixlormetan (xloroform) $CHCl_3 + Cl_2 \xrightarrow{h\nu} CCl_4+HCl$ trixlormetan tetraxlormetan (xloroform) $CH_4 + Cl_2$ (sust. eritma) →
• *alkenlar* – digalogenli hosilalarini hosil qila-dilar.	☞	$SH_3—CH = CH_2+Cl_2 \rightarrow CH_3—CH—CH_2$ propen Cl Cl 1,2-dixlorpropan
• *alkinlar* – dastlab di-galogenli hosilalari keyin tetragalogenli hosilalari hosil bo'ladi.	☞	Cl Cl $HC \equiv CH+Cl_2 \rightarrow CH = CH+Cl_2 \rightarrow CH—CH$ etin (atsetilin) Cl Cl Cl Cl 1,2-dixloreten 1,1,2,2-tetraxloretan

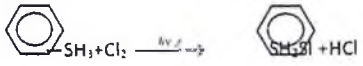
• *dienlar* – dastlab digalo-gen hosilalari keyin tet-ragalogen hosilalari ho-sil bo'ladi. Alkenlarni, alkinlarni va dienlarni galogenlash odatdagi sharo-itda oson boradi.	1 2 3 4 $H_2C = CH—CH = CH_2 + Cl_2 \rightarrow CH_3—C = C—CH_3$ butandien 1,3 (divinil) | | Sl Cl 2,3-dixlorbuten-2 1 2 3 4 $CH_3—C = C—CH_3 + Cl_2 \rightarrow CH_2—CH—CH—CH_2$ | | | | | | Cl Cl Cl Cl Cl Cl 2,3-dixlorbuten-2 1,2,3,4-tetraxlorbutan

aromatik uglevodorodlari *benzol xalqasida, katalizatorga bog'liq holda galogenga yoki hamma vodorod atomlari, yoki bittasi almashinadi.	☞	$S_6H_6+Cl_2 \xrightarrow{FeCl_3} C_6H_5-Cl+HCl$ benzol xlorbenzol $-H + Cl-Cl \xrightarrow{FeCl_3} -Cl+HCl$ $S_6H_6+6Cl_2 \xrightarrow{HCl} C_6Cl_6+6HCl$ benzol geksaxlorbenzol Cl Cl $+ 6Cl_2 \xrightarrow{AlCl_3}$ Cl +6HCl Cl Cl



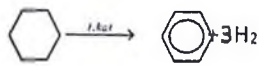
*katalizator ishtiro-kida benzol gomolog-lari galogenlanganda orto- va paragalogenli hosilalari aralashmasi galogen mo'l bo'lganda 2,4,6 trigalogenli hosi-lalari hosil bo'ladi.	☞	metilbenzol (toluol) o-xlortoluol p-xlortoluol  $C_6H_5CH_3 + 3Cl_{2(mo'l)} \xrightarrow{FeCl_3} C_6H_2Cl_3CH_3 + 3HCl$ metilbenzol 2,4,6-trixlortoluol
*<u>fenol</u> va anilinlarni ham katalizator ishti-rokida galogenlash yuqo-ridagiga o'xshash boradi.	☞	fenol (karbol k-ta) 2,4,6-trixlorfenol $C_6H_5OH + 3Cl_{2(mol)} \xrightarrow{FeCl_3} C_6H_2Cl_3OH + 3HCl$ Anilin (karbol k-ta) 2,4,6-uchxloranilin $C_6H_5NH_2 + 3Cl_{2(mol)} \xrightarrow{FeCl_3} C_6H_2Cl_3NH_2 + 3HCl$

*benzolni galogen ish-tirokida <u>katalizatorsiz</u> qizdirilganda galogen-larni birikishiga olib keladi. Bunda benzol xal-qasining to'yinmaganlik xarakteri yo'qoladi.	☞	G G G geksaxlorsiklogeksan (geksaxloran)  Cl Cl $+3Cl_2 \xrightarrow{l}$ Cl Cl

*benzol gomologlarini galogenlar bilan kataliza-torsiz yorqin yorug'likda qizdirilganda yon radikaldagi vodorod atomlari galogenlarga almashadi.	☞	$C_6H_5-CH_3+Cl_2 \xrightarrow{hv,t} C_6H_5-CH_2Cl+HCl$ metilbenzol — xlormetilbenzol (toluol) — (benzilxlorid) 
Galogenlarni bir negizli to'yingan karbon kislotalarga ta'sir ettirilgan-da, vodorod atomlariga almashinish uglevodorod radikallarida sodir bo'ladi va bunda birinchi navbatda almashinish karboksil (-SOON) gruppaga nisba-tan α-holatdagi uglerod atomida bo'ladi.		$CH_3COOH+Cl_2 \xrightarrow{hv,t} CH_2Cl-COOH+HCl$ sirka k-ta — xlor sirka k-ta $CH_2Cl-COOH+Cl_2 \xrightarrow{hv,t} CHCl_2-COOH+HCl$ sirka k-ta — dixlorsirka k-ta $CHCl_2-COOH+Cl_2 \xrightarrow{hv,t} CCl_3-COOH+HCl$ uchxlorsirka k-ta 3 2 1 — 3 2 1 β α — β α $CH_3-CH_2-COOH + Cl \rightarrow CH_3-CHCl-COOH+HCl$ propion k-ta — 2 xlorpropan k-ta (α-xlorpropan)

9 bob. Qizdirishga bo'lgan munosabatlari

150-250^{0}S dan oshmaydigan haroratda, kataliza-tor ishtirokida atomlarning birikish tartibini o'zgartirish-dan iborat bo'lgan or-ganik moddalarning struk-turalarini qayta tuzilishi sodir bo'la-di. Bu jarayonga izo-merlanish deyiladi, olingan moddaga esa izomerlar deyiladi.	☞	$SN_3-SN_2-SN_2-SN_3 \xrightarrow{t,kat} SN_3-SN-SN_3$ butan — SN_3 — izobutan 4 3 2 1 — 4 3 2 1 $SN_3-SN_2-SN=SN_2 \xrightarrow{t,kat} SN_3-SN=SN-SN_3$ buten-1 — buten-2 4 3 2 1 — 3 2 1 $SN_3-SN_2-SN=SN_2 \xrightarrow{t,kat} SN_3-S=SN_2$

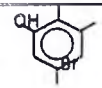
		buten-1 SN_3 2- metilpropen (izobutan)
300-600^{0}S haroratda katalizator ishtirokida S—N, S—O, ya'ni bog'larning uzilishi sodir bo'ladi. Bunda quyidagilar hosil bo'ladi: • vodorod molekulasi (degidridlash)	☞	$2SN_4 \xrightarrow{t,kat} SN_2{=}SN_2{+}2N_2$ metan eten $S_2N_4 \xrightarrow{t,kat} SN{\equiv}SN{+}N_2$ eten (etilen) etin (atsetilen) $2SN_4 \xrightarrow{t,kat} SN{\equiv}SN{+}3N_2$ etin $SN_3{-}SN_2{-}SN_2{-}SN_3 \xrightarrow{t,kat} SN_3{-}SN{=}SN{-}SN_3 + N_2$ butan buten-2  $+3H_2$ $SN_3{-}SN_2{-}SN_2{-}SN_3 \xrightarrow{t,kat} SN_2{=}SN{-}SN{=}SN_2 + N_2$ butan butadien-1,3 $SN_3{-}\underset{\vert}{SN}{-}SN_3 \xrightarrow{t,kat} SN_3{-}\underset{\Vert}{S}{-}SN_3 + N_2$ ON O propanol – 2 atseton (izopropil spirt)
• suv N_2O molekulasi (degidratlanish)	☞	$SN_3{-}SN_2{-}ON \xrightarrow{t,kat} SN_2{=}SN_2 + N_2O$ etanol eten $2SN_3SOON \xrightarrow{t} (SN_3SO)_2O + N_2O$ sirka kislota sirka kislota angidridi $NOOS{-}SOON \xrightarrow{t,H_2SO_4} SO_2 + SO + N_2O$ etandian kislota (oksalat) $NSOON \xrightarrow{t,H_2SO_4} SO + N_2O$

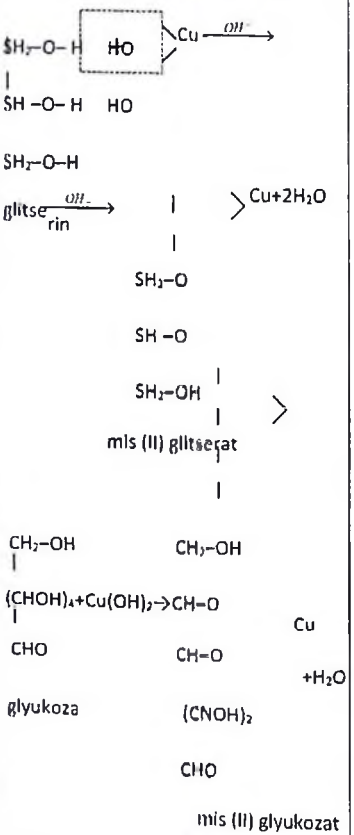
Karbon kislotalarining ammoniyli tuzlari qizdirilganda amidlarga aylanadi.	☞	metan kislota (chumoli) O $CH_3COONH_4 \xrightarrow{t} CH_3-C + H_2O\uparrow$ ammoniy NH_2 atsetat atsetamid
suv va vodorod molekulalari (degidratasiya va degidridlash)	☞	$2SN_3-SN_2-ON \xrightarrow{t,kat} SN_2=SN-SN=SN_2+2N_2O+N_2\uparrow$ etanol butadien-1,3 (divinil)
• H_2 molekulasi uglerod molekulasini siklilarga tutashishi (siklanish, alkan-larni aromatlanishi)	☞	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_3 \xrightarrow{t,kat}$  $CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3 \xrightarrow{t,kat}$  н-гептан толуол $C_6H_{13}-R \xrightarrow{t,kat}$ 
• yoki molekulalarni bir-birlari bilan birikib yuqori molekulalarning hosil bo'lishi bilan (polimerlanish, polikondensatsiyalanish)	☞	$nSN_2=SN_2 \xrightarrow{t,kat} (-SN_2-SN_2-)_n$ etilen polietilen $nSN_2=SN-SN=SN_2 \xrightarrow{t,kat} (-SN_2-SN=SN-SN_2-)_n$ butadien-1,3 polibutadien
700-1000°S haroratda S—S bog'larning uzilishi natijasida molekulalarni ancha kichik molekulalarga ajralishi sodir bo'ladi. (kreking)	☞	$SN_3-SN_2-SN_2-SN_3 \xrightarrow{t,kat} SN_3-SN_3+SN_2=SN_2$ butan etan eten

1000^0S dan yuqori temperaturada hamma kimyoviy bog'lar buziladi va kreking natijasida S, N_2 va boshqa oddiy moddalar hosil bo'ladi.	☞	$SN_4 \xrightarrow{t,kat} S+2N_2$ metan $SN_2=SN_2 \xrightarrow{t,kat} 2S+2N_2$ eten (etilen) $NS \equiv SN \xrightarrow{t,kat} 2S+2N_2$ etin (atsetilen) $2SN_3-NH_2 \xrightarrow{t,kat} 2S+5N_2+N_2$ metilamin

10 bob. Organik moddalarga sifatiy reaksiyalar

Modda, funksional gruppa	Reaktiv	Reaksiya	Xarakterli belgilari
To'yinmagan uglevodorodlar (alkenlar, alkinlar, dienlar) qo'sh bog'lar	$KMnO_4$ eritmasi (gunafsha-pushti)	$SN_2=SN_2 + N_2O \xrightarrow{[O]} SN_2-SN_2$ eten OH OH etilenglikol	Eritmani rangsizlanishi
	I_2 eritmasi (qo'ng'ir)	$SN_2=SN-SN_3+I_2 \rightarrow SN_2-SN-SN_3$ propen 1,2 diyodpropan	Eritmani rangsizlanishi
	Br_2 eritmasi (sariq)	$SN_2=SN-SN=SN_2+Br \rightarrow$ butadien-1,3 $\rightarrow SN_2-SN=SN-SN_2$ Br Br 1,4-dibrombuten-2	Eritmani rangsizlanishi
Atsetilen	Ag_2O-ning ammiakli eritmasi	$SN \equiv SN + Ag_2O \rightarrow AgS \equiv SAg\downarrow + N_2O$ atsetilen kumush atsetalenid	Sariq rangli cho'kma hosil bo'lishi (portlovchi)
Benzol	Nitrolovchi aralashma $HNO_3+H_2SO_4$	$S_6N_6+HNO_3 \xrightarrow[H_2SO_4]{t} S_6N_5-NO_2+H_2O$ benzol nitrobenzol	Achchiq bodom hidli, och sariq rangli, og'ir suyuqlikning hosil bo'lishi

Toluol	$KMnO_4$ eritmasi (pushti)	$S_6N_5SN_3+3[O]\rightarrow S_6N_5SOON+H_2O$ toluol benzoy kislota	Eritmani rangsizlanishi
Fenol (Karbol kislota)	$FeCl_3$ eritmasi (och sarlq)	$3S_6N_5ON+FeCl_3\rightarrow(S_6N_5O)_3Fe+3HCl$ fenol temir (III) fenolyati	eritmaning gunafsha rangga kirishi
	Br_2 to'yingan eritmasi (bromli suv)	 $S_6N_5ON+3Br_2\rightarrow$ ↓ $+3HBr$ fenol Br	O'ziga xos hidli oq cho'kmaning hosil bo'lishi
Anilin (aminobenzol)	$CaOCl_2$ xlorli ohak eritmasi (rangsiz)		Eritmaning gunafsha rangga kirishi
Etanol	I_2 to'yingan eritmasi + NaOH eritmasi	$S_2N_5ON+4I_2+6NaOH\rightarrow$ etanol $\rightarrow CHI_3\downarrow+HCOONa+5NaI+5H_2O$	O'ziga xos hidli mayda kristal cho'kma CHI_3, och sariq rangli
	CuO qizdirilgan mis simi	$S_2N_5ON+CuO\rightarrow Cu\downarrow+CH_3CHO+H_2O$ etanol etanal	Cu metallning ajralishi, atsetaldegid-ning o'ziga xos hidi
Gidroksogruppa (spirtlar, fenol gidrokso-kislotalar)	Metallik natriy	$2R-OH+2Na\rightarrow 2R-ONa+H_2\uparrow$ $2S_6N_5ON+2Na\rightarrow 2S_6N_5ONa+H_2\uparrow$ fenol natriy fenolyat	Gaz pufakchalari-ning chiqishi (N_2), kolloid-simon massa-ning hosil

			bo'lishi
Efirlar (oddiy va murakkab)	NaOH ishtirokida qizdirilganda N_2O bilan (gidroliz)	$CH_3COOC_2H_5+H_2O \leftrightarrow CH_3COOH+$ etilatsetat $+C_2H_5OH$ sirka kislota	O'ziga xos hid
Ko'p atomli spirtlar, glyukoza	Kuchli ishqoriy muhitda yangi cho'ktirilgan mis (II) gidroksidi		Eritmaning yorqin ko'k rangga bo'yalishi

Karbonil gruppa -  -S N (aldegidlar, glyukoza)	Ag_2O ning ammiakli eritmasi	$R-CHO+Ag_2O \xrightarrow[NH_3]{t} R-COOH+2Ag\downarrow$ aldegid karbon kislota	Idish devorlarida yaltiroq Ag qoplama (kumush ko'zgu) hosil bo'lishi
	YAngi cho'ktirilgan $Cu(OH)_2$	 $\xrightarrow{t} R-COOH+Cu_2O\downarrow+2H_2O$ aldegid karbon kislota	Cu_2O ning qizil cho'kmasi hosil bo'lishi
Karbon kislotalar	Lakmus		Eritmaning pushti rangga bo'yalishi
	Spirt+ kons. H_2SO_4	$R-COOH+HO-R_1 \overset{t}{\leftrightarrow} RCOOR_1+H_2O$ karbon kislota spirt murakkab efir	Hosil bo'lgan murakkab efirning o'ziga xos hidi
CHumoli kislota	Lakmus		Eritmaning pushti rangga bo'yalishi
	Ag_2O-ammiakli eritmasi	$HCOOH+Ag_2O \xrightarrow[NH_3]{t} H_2O+CO_2\uparrow+2Ag\downarrow$ chumoli kislota	Idish devorlarida «kumush ko'zgu» hosil bo'lishi
Olein kislota	$KMnO_4$ eritmasi (pushti) yoki I_2 eritmasi (qo'ng'ir)	$S_1H_{33}COOH \xrightarrow[KMnO_4]{HOH,[O]}$ olein kislota $\rightarrow S_8H_{17}-CH-CH-(CH_2)_7-COOH$	Eritmalar-ning rangsiz-lanishi

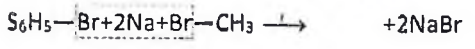
		OH OH 9,10 - digidroksioktadekan kislota $S_{17}H_{33}COOH+I_2\rightarrow$ olein kislota $\rightarrow S_8H_{17}-CH-CH-(CH_2)_7-COOH$ 9,10-diyodoktadekan kislota	
Atsetatlar (sirka kislota tuzlari)	$FeCl_3$ eritmasi	$3CH_3COONa+FeCl_3\rightarrow$ natriy atsetat $\rightarrow (CH_3COO)_3Fe+3NaCl$ temir (III) atsetat	Eritma ran-gini qizil-qo'ng'ir rangga bo'yalishi
Natriy stearat (sovun)	N_2O (gidroliz)+ fenoftalein	$S_{17}H_{35}COONa+H_2O\leftrightarrow$ natriy stearat $\leftrightarrow S_{17}H_{35}COOH+NaOH$ stearin kislota	Eritmaning malina rangi-ga bo'yalishi
	Kalsiy tuzi-ning to'yingan eritmasi	$2S_{17}H_{35}COONa+Sa^{2+}\rightarrow$ natriy stearat $\rightarrow (S_{17}H_{35}COO)_2Ca\downarrow+2Na^+$ kalsiy stearat	Kulrang cho'kma hosil bo'lishi
	Konsentrlan-gan anorganik kislota	$S_{17}H_{35}COONa+H^+\rightarrow$ natriy stearat $\rightarrow S_{17}H_{35}COOH\downarrow+Na^+$ stearat kislota	Oq cho'kmaning hosil bo'lishi

11 bob. Organik kimyodagi nomli reaksiyalar

1. Vyurs reaksiyasi (alkanlardagi uglevodorod zanjirining uzayishi)

metil xlorid etil xlorid propan

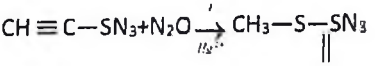
Vyurs-Fittig reaksiyasi (benzol gomologlarining olinishi)



benzol bromid metil bromid toluol

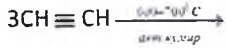
2. Kucherov reaksiyasi (alkinlarning gidratlanishi)

etin vinil spirti etanal



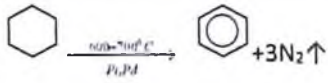
propin propanon-2 (atseton)

3. Zelinskiy reaksiyasi (atsetilenning trimerlanishi)



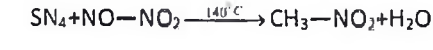
etin benzol

4. Zelinskiy-Kazanskiy reaksiyasi (siklogeksandan benzolning olinishi)



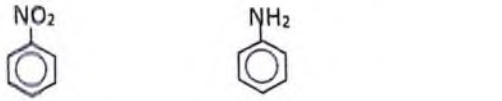
siklogeksan benzol

5. Konovalov reaksiyasi (alkanlarni nitrolanishi)



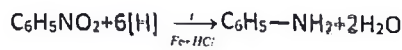
metan nitrat kislota nitrometan

6. Zinin reaksiyasi (nitrobenzolni anilingacha qaytarilishi)

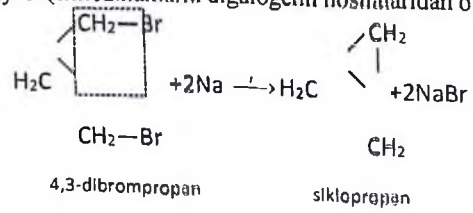


nitrobenzol anilin

yoki

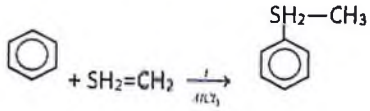


7. Gustavson reaksiyasi (sikloalkanlarni digalogenli hosilalaridan olinishi)

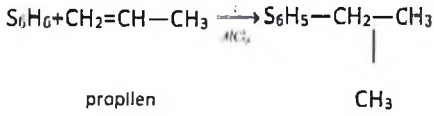


4,3-dibrompropan siklopropan

8. Fridel-Kraft reaksiyasi (benzol gomologlarining olinishi)

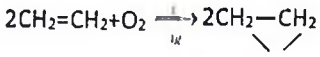


benzol etilen etilbenzol



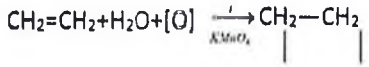
propilen izopropilbenzol (kumol)

9. Prilejaev reaksiyasi (etilenni molekulyar kislorod bilan katalitik oksidlanishi)



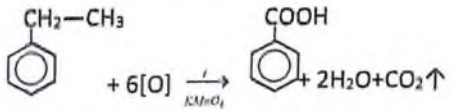
etilen etilen oksidi (epoksietan)

10. Vagner reaksiyasi (alkanlar, alkinlar va benzol gomologlarining kaliy permanganat bilan oksidlanishi)



etilen etilenglikol

atsetilen etandiat (oksalat) kislota



benzoy kislota

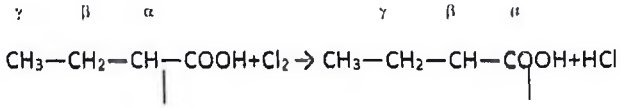
12 bob. Molekuladagi atomlarning o'zaro ta'siri to'g'risidagi tushunchalar

1§. Induksion va mezomer effektlar

Molekulani hosil qiluvchi atomlar yoki atomlar gruppasi, bir-birlariga ta'sir qiladilar va moddaning kimyoviy xossalari shu ta'sirga bog'liq bo'ladi.

To'g'ridan-to'g'ri bog'langan atomlar bir-birlariga eng kuchli ta'sir ko'rsatadilar.

To'g'ridan-to'g'ri bog'lanmagan atomlarning o'zaro ta'sirlari ancha kuchsiz va atomlar bir-birlaridan uzoqlashgan sari bu ta'sir tez so'nadi. Masalan, —SOON gruppasi qo'shni uglerod atomidagi vodorod atomlariga eng kuchli ta'sir ko'rsatadi (ya'ni bu gruppaga nisbatan α-holatda turgan uglerod atomiga). SHuning uchun karbon kislotalarlga galogenlar ta'sir ettirilganda α-galogen hosilalari hosil bo'ladi.



butan (moy) kislota α-xlormoy (2-xlorbutan) kislota

Atomlarning o'zaro ta'siri elektron zichlikni funksional gruppaga yoki undan siljishi natijasida kimyoviy bog'larning *qisman polyarlanishiga* olib keladi. Natijada atomlarda elementar zaryaddan ($<1{,}6\cdot10^{-19}$Kl) kichik (-σ, +σ) *xususiy* zaryadlar yuzaga keladi.

Elektron zichlikni σ-*bog' zanjiri bo'yicha* siljishi *induksion (I) effekt* nomini oldi.

- agar elektron zichlikni siljishi o'rinbosarga tomon borsa (funksional gruppaga), bunday induksion effekt *manfiy (-I effekt)* hisoblanadi.
- agar siljish o'rinbosardan bo'lsa — *musbat (+I effekt)* bo'ladi.

I effekt, bu effektni yuzaga keltiruvchi o'rinbosardan uzoqlashgani sari tez sustlashadi.

Manfiy induksion effekt molekulada elektron-akseptor (elektrofil) o'rinbosarlar mavjud bo'lganda yuzaga keladi (—SOON, —SNO, >C=O, —NO_2, galogenlar). Bunday o'rinbosarlar uglerod atomlarining zanjiridagi elektron zichlikni *kamaytiradi* (ayniqsa α-holatdagi):

$+\sigma_4 \quad +\sigma_3 \quad +\sigma_2 \quad +\sigma_1 \quad -\sigma$

$CH_3 \rightarrow CH_2 \rightarrow CH_2 \rightarrow CH_3 \rightarrow Cl \quad (\sigma_1>\sigma_2>\sigma_3>\sigma_4)$

Molekuladagi elektrodonor (nukleofil) o'rinbosarlar (—SN_3, —S_2N_5, metallar) mavjud bo'lsa, musbat induksion effekt yuzaga keladi.

Nukleofil o'rinbosarlar uglerod atomlari zanjiridagi (ayniqsa α-holatdagi) elektron zichlikni *kuchaytiradi*, masalan:

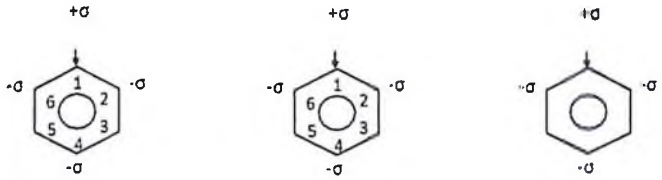
$+\sigma \quad -\sigma_1 \quad -\sigma_2$

$CH_3 \rightarrow CH = CH_2 \quad (\sigma_1>\sigma_2)$

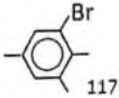
Elektron zichlik tutash π-bog'lar *zanjir bo'ylicha siljishiga* (masalan, benzol yadrosida) *mezomer* yoki *M-effekt* deyiladi.

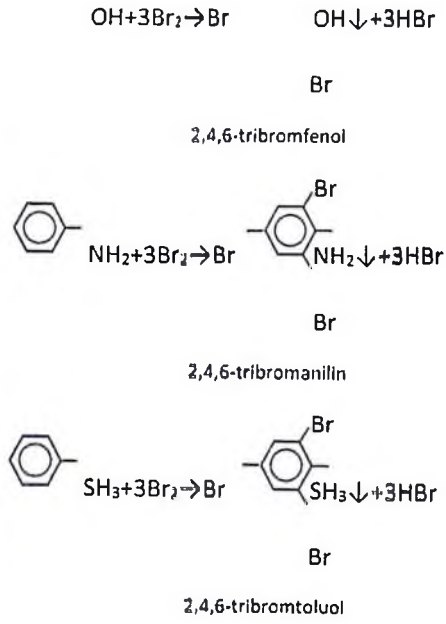
I effektdan farqli, mezomer effekt tutash bog'lar zanjiri bo'yicha susaytirmasdan beriladi. —OH, —NH_2, —CH_3 elektrodonor gruppalari benzol halqasidagi π-bog'lar zanjirdagi elektron zichlikni kuchaytiradi (+M-effekt).

O'rinbosar joylashgandagi uglerod atomlariga nisbatan, ayniqsa orto- va para- holatlarda turgan uglerod atomlarida elektron zichlikni ortishi sezilarli bo'ladi. Masalan, fenol, toluol, anilin, nitrobenzol molekulalarida



Natijada bu holatlarda vodorod atomlari ancha harakatchan bo'ladi va boshqa atomlarga, gruppalarga yoki radikallarga oson almashinadi:

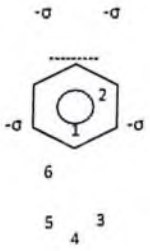




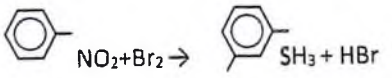
(reaksiyalar oraliq orto- va para- hosilalari bo'lishi orqali boradi)

Benzol yadrosidagi elektron zichlikni oshiradigan va keyingi o'rinbosarlarni orto- va para- holatlarga yo'naltiradigan (—ON, —NH_2, —CH_3,—C_2H_5,—OR, —Cl, —Br, —I) *o'rinbosarlar 1-turdagi orientantlar* nomini oldi.

Elektron akseptor gruppalar π-bog'lar zanjirdagi elektron zichlikni kamaytiradilar (-M effekt). Bunda ayniqsa orto- va para- holatlardagi elektron zichlik sezilarli darajada kamayadi. Meta- holatda turgan uglerod atomining elektron zichligi esa ortadi. Masalan, nitrobenzol molekulasida:



Meta- holatdagi uglerod atomidagi vodorod atomlari harakatchan bo'ladi va boshqa atomlar hamda atomlar gruppasiga oson almashinadi.



Br

m-bromnitrobenzol

—NO_2, —COOH, —CHO, >C=O, SO_3H tipidagi o'rinbosarlar keyingi o'rinbosarlarni ko'pincha meta-holatga yo'naltirganliklari uchun II-tur o'rinbosarlar (orientatlar) nomini oldilar.

O'rinbosarlarning benzol halqasiga ta'sirini, benzolga nisbatan, benzol hosilalarini bir muncha aktivligi fakti ham tushuntiradi. Masalan, fenol, toluol, anilin va nitrobenzol Br_2 bilan ancha kuchli ta'sirlashadilar, bu vaqtda benzolning o'zi esa Br_2 bilan faqat katalizator bo'lganda yoki qizdirilganda va ultrabinafsha nurlar bilan nurlantirilganda ta'sirlashadi.

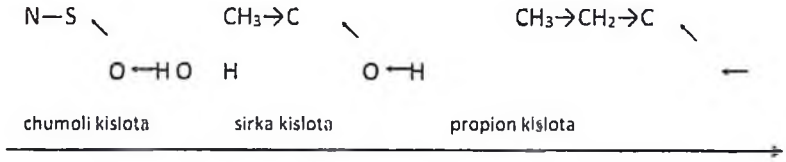
Molekulalarda atomlarning ta'siri o'zaro: shunchaki benzol halqasining —ON, —NH_2, —CH_3 gruppalariga ta'siri bu gruppalarning elektron zichliklarini qisman kamayishiga sabab bo'ladi, bu esa o'z navbatida O—N, N—H, C—H bog'larning qutbliligini ortishiga olib keladi, buning natijasida bu gruppalardagi vodorod atomlari ancha harakatchan va almashinishga qobiliyatli bo'ladi. Qisman shu bilan fenolning kuchsiz kislotalik xossasi tushuntiriladi, bunday vaqtda alifatik spirtlar shunday xossaga ega emas.

2§. Fenol va chumoli kislotaning o'ziga xosligi

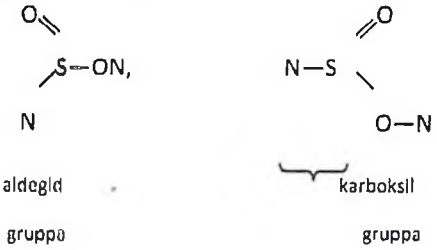
CHumoli (metan) kislotasini karbon kislotalar gomologik qatordagi boshqa a'zolari bilan taqqoslaganda uning tuzilishi bilan bog'liq bir qator maxsus xossalarga ega.

- chumoli kislotasi molekulasida karboksil gruppasi — SOON uglevodorod radikali bilan emas, vodorod atomi bilan bog'langan. SHu sababli molekulada musbat induksion effekt (+I) kuchsiz ifodalangan va amalda O—N bog'ining qutbliligiga ta'sir ko'rsatmaydi. Natijada chumoli kislota boshqa bir asosli karbon kislotalariga nisbatan eng kuchlisi hisoblanadi:

O O O



- chumoli kislotasi molekulasida karboksil gruppasi bilan bir qatorda aldegid gruppasini ham ajratish mumkin:



SHuning uchun chumoli kislota kislotalar uchun ham va aldegidlar uchun ham xarakterli reaksiyalarni beradi, ya'ni kumush ko'zgu reaksiyasini va mis (II) gidroksidi bilan reaksiyalarini beradi. Bularda chumoli kislotasi karbonat kislotasigacha oksidlanadi:

$$NSOON+Ag_2O \xrightarrow{NH_3} 2Ag\downarrow+CO_2\uparrow+H_2O$$

$$NSOON+2Cu(OH)_2 \xrightarrow{t} Cu_2O\downarrow+CO_2\uparrow+H_2O$$

qizil rangli cho'kma

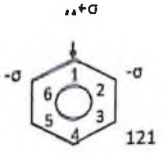
- boshqa karbon kislotalaridan farqli chumoli kislotasi qizdirilganda osonlik bilan parchalanadi:

$$NSOON \xrightarrow{H_2SO_4} SO\uparrow + N_2O$$

- chumoli kislotaning angidridi yo'q.

Fenolning o'ziga xosligi uning molekulasining tuzilishi bilan shartlangan.

Fenol molekulasi qutbli (dipol), buning ustiga benzol yadrosi manfiy zaryadli, —ON gruppasi esa musbat. Dipol momenti benzol yadrosi tomon yo'nalgan.



—ON gruppasidagi kislorod atomining bitta elektron jufti benzol halqasidagi π- bilan tutashadi va halqa tomonga siljiydi. Bu bir tomondan benzol halqasidagi elektron zichlikni oshirsa (ayniqsa orto- va para- holatlarda) boshqa tomondan esa —O—N bog'dagi qutblilikni oshiradi. Benzol halqasi va —ON gruppasining o'zaro ta'siri fenolning kimyoviy xossasini aniqlaydi. Birinchidan, benzol halqasidagi orto- va para- holatlardagi vodorod atomlarining almashinish qobiliyatlari ortadi. Almashinish reaksiyasi natijasida odatda fenolning uchlamchi almashgan hosilalari hosil bo'ladi. Ikkinchidan, O—N bog'idagi qutbliilkni ortishi fenol molekulasining suvli eritmalarda kislota tipi bo'yicha dissotsiyalanishiga olib keladi:

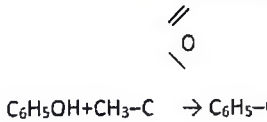
$$S_6N_5ON \leftrightarrow S_6N_5O^- + N^+$$

fenolyat loni

Fenol kuchsiz kislota hisoblanadi. Uning alifatik spirtlardan asosiy farqi ham shu bilan ifodalanadi. Alifatik spirtlarda uglevodorod radikalini —ON gruppasiga ta'siri ancha zalf.

Fenol va etanol xossalarini taqqoslash

Fenol	Etanol
Uy temperaturasida - qattiq modda	Uy temperaturasida - suyuqlik
Suvda eruvchanligi cheklangan	Suv bilan istalgan nisbatda aralashadi.
Eritma muhiti kuchsiz kislotali	Eritma muhiti amalda neytral
NaOH bilan fenolyat hosil qilib oson ta'sirlashadi $C_6H_5OH+NaOH \rightarrow C_6H_5ONa+H_2O$	NaOH bilan amalda ta'sirlashmaydi $C_2H_5OH+NaOH \not\rightarrow$

Karbon kislotalari bilan murakkab efirlar hosil qilmaydi (murakkab efirlar faqat kislota oksidlari va xlorangidridlaridan hosil bo'ladi)  Sirka kislota xlorangidridi	Karbon kislotalari bilan osonlikcha murakkab efirlar hosil qiladi $CH_3COOH+C_2H_5OH \leftrightarrow$ $\leftrightarrow CH_3COOC_2H_5+H_2O$
Galogen vodorodlar bilan ta'sirlashmaydilar $C_6H_5OH+HSl$	Galogen vodorodlar bilan galogenalkanlar hosil qiladi $C_2H_5OH+HSl \rightarrow C_2H_5Sl+H_2O$
Vodorod bilan siklogeksanolgacha gidrirlanadi $C_6H_5OH+3N_2 \xrightarrow{t,kat} C_6H_{11}OH$	Vodorod bilan ta'sirlashmaydi $C_2H_5OH+H_2$
Suyultirilgan nitrat kislotasi bilan trinitrofenolni hosil qiladi $C_6H_5OH+3HNO_3 \rightarrow C_6H_2(NO_2)_3OH+3H_2O$	Nitrat kislotasining suvli eritmasi bilan ta'sirlashmaydi $C_2H_5OH+HNO_3$
Konsentrlangan sulfat kislotasi sulfokislotalar hosil qiladi $C_6H_5OH+H_2SO_4 \rightarrow HO-C_6H_4-SO_3H+H_2O$	Konsentrlangan sulfat kislota eritmasi bilan degidratlanish boradi va etilen yoki oddiy efir hosil bo'ladi $C_2H_5OH \xrightarrow[H_2SO_4]{t<140^0C} CH_2=CH_2+H_2O$ $2C_2H_5OH \xrightarrow[H_2SO_4]{t<140^0C} C_2H_5O-C_2H_5+H_2O$
Bromli suv bilan oson ta'sirlashadi va tribromfenol hosil bo'ladi $C_6H_5OH+3Br_2 \rightarrow C_6H_2Br_3OH+3HBr$	Bromli suv bilan ta'sirlashmaydi $C_2H_5OH+Br_2$
Fenol uchun sifat reaksiyalari $FeCl_3$ bilan	$FeCl_3$ ishtirokida rang o'zgarishi

binafsha rang $C_6H_5OH+FeCl_3 \rightarrow (C_6H_5O)_3Fe+3HCl$	kuzatilmaydi $C_2H_5OH+FeCl_3$

13 bob. Organik reaksiyalarning tiplari

1. Birikish reaksiyalari
   - gidridlash (N_2 - birikishi):

$SN_2{=}SN_2+N_2 \xrightarrow{t,kat} SN_3{-}SN_3$

etan

   - gidratlanish (N_2O - birikishi):

$SN_2{=}SN_2+N_2O \xrightarrow{t,kat} SN_3{-}SN_2{-}ON$

etanol

   - gidrogalogenlash (NG - birikishi):

$SN_2{=}SN_2+NCl \rightarrow SN_3{-}SN_2{-}Cl$

xloretan

2. Ajralish reaksiyalari
   - degidridlash (N_2 - ajralishi):

$SN_3{-}SN_3 \xrightarrow{t,kat} SN_2{=}SN_2+N_2$

eten

$S_6N_5{-}SN_2{-}SN_3 \xrightarrow{t,kat} S_6N_5{-}SN{=}SN_2+N_2$

etil benzol vinil benzol

   - degidratlanish (N_2O - ajralishi):

$SN_3{-}SN_2{-}ON \xrightarrow[H_2SO_4]{t=140^0C} SN_2{=}SN_2+N_2O$

etanol eten

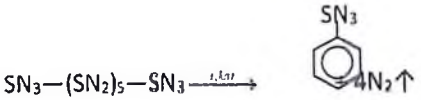
   - degidrogalogenlash (NG - ajralishi):

$SN_3{-}SN_2{-}SN{-}SN_2+KOH \xrightarrow{spirt\ sp.} CH_3{-}SN{=}SN_2{-}SN_3+KCl+H_2O$

Cl buten-2

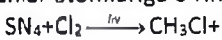
2-xlorbutan

   - degidrotsikllash (N_2 - ajralish bilan bir vaqtda uglerod zanjirini siklga bog'lanishi):



n-geptan toluol

3. O'rin olish reaksiyalari
   - galogenlash (vodorod atomlari, boshqa atomlar yoki gruppalarni galogenlar atomlariga o'rin almashinishi):

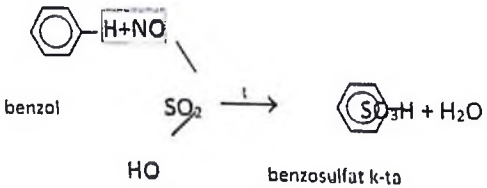


metan xlormetan

   - nitrolash (vodorod atomlari, boshqa atomlar yoki gruppalarni nitrogruppa $-NO_2$ga almashinishi):

benzol nitrobenzol

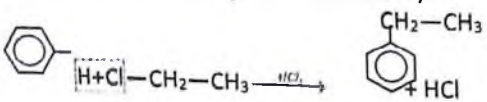
   - sulfolash (vodorod atomlari, boshqa atomlar yoki gruppalarni $-SO_3H$ sulfogruppalarga almashinishi):



benzol HO benzosulfat k-ta

sulfat k-ta

   - alkillash (vodorod atomlari, boshqa atomlar yoki gruppalarni alkil uglevodorod radikali $-R$ ga almashinishi):



benzol etilbenzol

4. Parchalanish reaksiyalari

- bijg'ish (monosaxaridlarni biologik katalizatorlar — fermentlar ta'sirida parchalanishi):
  - ❖ glyukozani spirtli bijg'ishi

    $S_6H_{12}O_6 \xrightarrow{ферменти} 2S_2H_5OH+2CO_2\uparrow$

    glyukoza etanol

  - ❖ glyukozani moy kislotali bijg'ishi

    $S_6H_{12}O_6 \xrightarrow{ферменти} S_3H_7SOOH+2H_2\uparrow+2CO_2\uparrow$

    glyukoza moy kislota

  - ❖ sut kislotali bijg'ish

    $S_6H_{12}O_6 \xrightarrow{ферменти} 2SH_3-\underset{|}{SH}-COON$

    glyukoza ON

    sut kislota

  - ❖ limon kislotali bijg'ish

$$S_6H_{12}O_6+3\,[O] \xrightarrow{ферменти} HOOS-SH_2-\underset{|}{\overset{|}{C}}-SH_2-SOON + 2N_2O$$

glyukoza ON

limon kislota

- kreking (molekulalardagi S—S, S—N bog'larni kam sonli uglerod atomlari bo'lgan molekulalar hosil qilib uzilishi):

$S_4N_{10} \xrightarrow{t,kat} SN_3-SN_3 + SN_2=SN_2$

butan etan eten

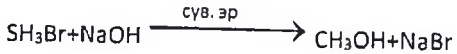
- piroliz

$SN_4 \xrightarrow{t} S+2N_2$

5. Almashinish reaksiyalari:

$C_2H_5ONa+H_2O \rightarrow C_2H_5OH+NaOH$

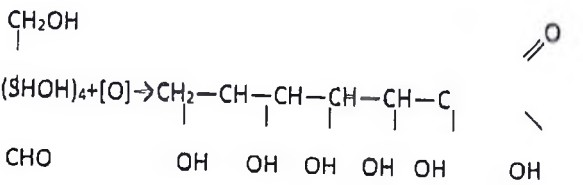
natriy etilat etanol



metilbromid metanol

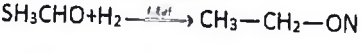
6. Oksidlanish reaksiyalari

propen (propilen) propandiol-1,3 (propilenglikol)

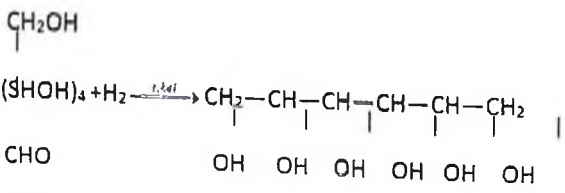


glyukoza glyukon kislota

7. Qaytarilish reaksiyalari:

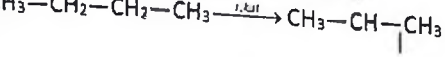


etanal etanol



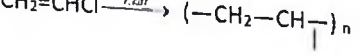
glyukoza sorbit (geksit)

8. Izomerlanish reaksiyalari (qayta gruppalanish) – alohida atomlar yoki gruppalarni molekulani bir joydan boshqa joyga migratsiyasi natijasida bir izomerdan boshqasiga aylanishi:



butan izobutan

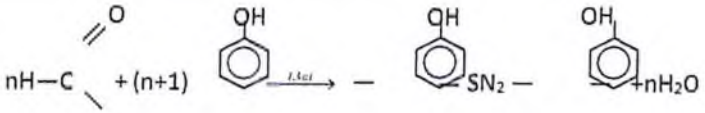
9. Polimerlanish reaksiyalari:



vinilxlorid

polivinilxlorid

10. Polikondensatsiyalanish reaksiyalari:



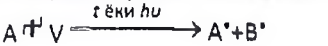
fenol

fenolformaldegid smolasi

Polimerlanish va polikondensatsiyalanish reaksiyalari birikish reaksiyalarining har xil ko'rinishlari hisoblanadi.

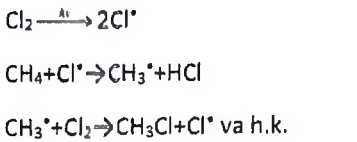
Ta'sirlashayotgan moddalar molekulalaridagi kovalent bog'larning uzilishi tipi bo'yicha organik reaksiyalar *gomolitik* va *geterolitik* reaksiyalarga klassifikatsiyalanadi.

- gomolitik uzilish (erkin radikal) — bunday uzilishda juftlashgan elektronlar, kovalent bog'lanishli bo'lib, ikkita yarim erkin radikal hosil qiladi:



erkin radikal

Gomolitik uzilishga qutbsiz yoki kuchsiz qutbli kovalent σ - bog'lanishlar yuqori temperatura yoki kvant nurlari ta'sirida uchraydilar. Hosil bo'lgan zarrachalarga erkin radikallar deyiladi. Erkin radikallar katta energiyaga, yuqori aktivlikka ega va juda qisqa vaqt mavjud bo'ladi. Erkin radikallar bilan boradigan reaksiyalar odatda zanjir tuzilishli bo'ladi. Unga metanga nur yordamida xlorning ta'sir reaksiyasini misol keltirishimiz mumkin:



(almashinish reaksiyasi metan tarkibidagi barcha vodorod atomlarini xlor atomlari bilan almashib bo'lguncha davom etadi).

- geterolitik (ion) uzilish — bunday uzilishda, elektron juftlar elektromanfiyligi kattaroq atomga o'tadi:

$$A|:B \rightarrow A^+ + :B^-$$

karbokation karboanion

Hosil bo'lgan zarrachalarga ionlar deyiladi. Ion tipidagi uzilishlar π – bog'lanishli va qutbli kovalent σ – bog'lanishli birikmalar uchun xarakterlidir. Masalan:

$$SH_2=CH_2+HCl \rightarrow C_2H_5Cl$$

$$SH_2=CH_2 + H^+ \rightarrow CH_3—CH_2^+$$

$$CH_3—CH_2^+ + Cl^- \rightarrow CH_3—CH_2—Cl$$

Organik ionlarning anorganik ionlardan farqi shundaki ular faqat reaksiya paytida vujudga keladi.

5 bo'lim. Organik birikmalarning olinishi

1 bob. Alkanlarning olinishi

Sanoatda

- tabiiy gazlardan va neft tarkibidagi yo'ldosh gazlardan
- suv gazini sintezidan (uglerod (II) oksidi va vodorod aralashmasidan)

$$nCO + (2n+1)H_2 \xrightarrow{t,kat} C_nH_{2n+2} + H_2O$$

$$CO + 3H_2 \xrightarrow{t,kat} \underset{\text{метан}}{CH_4} + H_2O$$

$$2CO + 5H_2 \xrightarrow{t,kat} \underset{\text{этан}}{C_2H_6} + 2H_2O$$

oddiy moddalardan olish – uglerod va vodoroddan

$$nC + (n+1)H_2 \xrightarrow{t,p,kat} C_nH_{2n+2}$$

$$C + 2H_2 \xrightarrow{500\,^oC,Ni} \underset{\text{метан}}{CH_4}$$

$$3C + 4H_2 \xrightarrow{t,p,kat} \underset{\text{пропан}}{C_3H_8}$$

Laboratoriyada

alkenlar va alkinlarni katalitik gidridlash:

$$C_nH_{2n} + H_2 \xrightarrow{t,p,kat} C_nH_{2n+2}$$

$$\underset{\text{этен}}{CH_2{=}CH_2} + H_2 \xrightarrow{400\,^oC,Ni} \underset{\text{этан}}{C_2H_6}$$

$$C_nH_{2n-2} + 2H_2 \xrightarrow{t,kat} C_nH_{2n+2}$$

$$HC{\equiv}CH + 2H_2 \xrightarrow{t,kat} \underset{\text{этан}}{C_2H_6}$$

• karbon kislota tuzlariga ishqor qo'shib qizdirish natijasida:

$$R-COONa + NaOH \xrightarrow{t} R-H + Na_2CO_3$$

$CH_3 — COONa + NaOH \xrightarrow{t} CH_4 + Na_2CO_3$

Натрий ацетат

- galogen alkanlarga natriy ta'sir ettirib (Vyurs reaksiyasi)

$R — G + 2Na + G — R_1 \rightarrow R — R_1 + 2NaG$

$C_3H_7 — Br + 2Na + Br — C_2H_5 \rightarrow C_5H_{12} + 2NaBr$

бромпропан бромэтан пентан

- alyuminiy karbidni gidrolizlab (metanning olinishi)

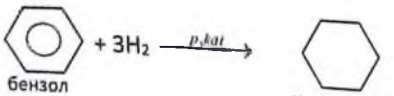
$Al_4C_3 + 12H_2O = 4Al(OH)_3 + 3CH_4 \uparrow$

алюминий метан

2 bob. Sikloalkanlarning olinishi

Sanoatda

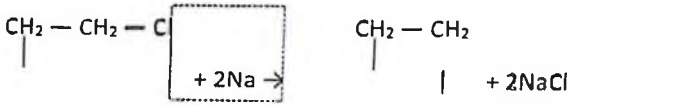
- neftdan (besh va olti a'zoli)
- aromatik uglevodorodlardan:



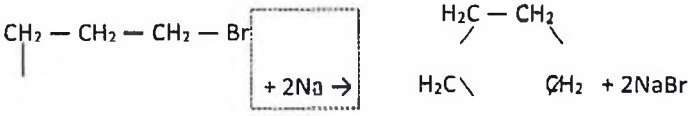
бензол циклогексан

Laboratoriyada

- digalogenidli hosilalardan (Vyursning ichki molekulyar reaksiyasi):



1,4 - дихлорбутан циклобутан



1,6 – дибромгексан

циклогексан

3 bob. Alkenlarning olinishi

Sanoatda

Alkanlarni krekinglab:

$$C_4H_{10} \xrightarrow{t,kat} CH_2 = CH_2 + C_2H_6$$

бутан этен этан

Alkanlarni degidrogenlab:

$$C_nH_{2n+2} \xrightarrow{t,kat} C_nH_{2n} + H_2$$

$$\underset{\text{метан}}{2CH_4} \xrightarrow{t,kat} \underset{\text{этен}}{CH_2 = CH_2} + 2H_2$$

$$\underset{\text{этан}}{C_2H_6} \xrightarrow{500\,C,Ni} \underset{\text{этен}}{CH_2 = CH_2} + H_2$$

- alkinlarni gidridlab:

$$C_nH_{2n-2} + H_2 \xrightarrow{kat} C_nH_{2n}$$

$$\underset{\text{бутин-2}}{CH_3 - C \equiv C - CH_3} + H_2 \xrightarrow{t,kat} \underset{\text{бутен-2}}{CH_3 - CH = CH - CH_3}$$

Laboratoriyada

- spirtlarni degidratlab:

$$R - CH_2 - CH_2 - OH \xrightarrow[H_2SO_4]{t>140\,C} R - CH_2 = CH_2 + H_2O$$

$$\underset{\text{этанол}}{CH_3 - CH_2 - OH} \xrightarrow[H_2SO_4]{t>140\,C} \underset{\text{этен(этилен)}}{CH_2 = CH_2} + H_2O$$

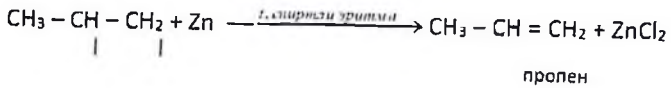
- monogalogen alkanlarni degidrogalogenlab:

$$R - CH_2 - CH_2 - Г + NaOH \xrightarrow{спиртли эритма} R - CH = CH_2 + NaГ + H_2O$$

$$\underset{\text{йодэтан}}{CH_3 - CH_2 - I} + NaOH \xrightarrow{спиртли эритма} \underset{\text{этен, (этилен)}}{CH_2 = CH_2} + NaI + H_2O$$

- digalogenalkanlarni degalogenlab:

$$R - \underset{|}{CH} - \underset{|}{CH_2} + Zn \xrightarrow{t,спиртли эритма} R - CH = CH_2 + ZnCl_2$$



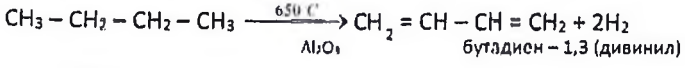
пропен

1,2 дибромпропан

4 bob. Dien uglevodorodlarning olinishi

Sanoatda.

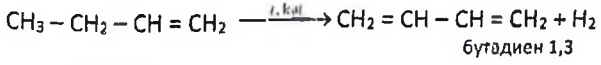
- alkanlarni degidrogenlab:



butan

бутадиен – 1,3 (дивинил)

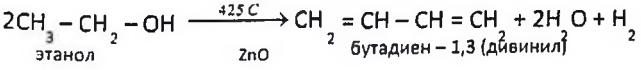
- alkenlarni degidrogenlab:



buten -1

бутадиен 1,3

- etanolni degidratlab va degidrogenlab (Lebedev reaksiyasi):



этанол

бутадиен – 1,3 (дивинил)

5 **bob. Alkinlarning olinishi**

Sanoatda

Alkanlarni termik parchalab:

$$2CH_4 \xrightarrow{1500^\circ C} HS \equiv CH + 3H_2$$

метан электрокрекинг

$$C_2H_6 \xrightarrow{t,\ kat} C_2H_2 + 2H_2$$

этан этин

Laboratoriyada

- kalsiy karbidni gidrolizlab (atsetilenning olinishi):

$$CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + HC \equiv CH \uparrow$$

кальций Этин

- digalogenidlarni degidrogalogenlab:

$$R - \underset{|}{CH} - \underset{|}{CH_2} + 2KOH \xrightarrow{спирт\ эритмаси} R - C \equiv CH + 2K\Gamma + H_2O$$

$$CH_3 - \underset{|}{CH} - \underset{|}{CH_2} + 2KOH \xrightarrow{спирт\ эритмаси} CH_3 - C \equiv CH + 2KCl + 2H_2O$$

пропин

1,2 дихлорпропан

● Asetilenidlardan:

$$HC \equiv CMe + R - G \rightarrow HC \equiv C - R + MeG$$

$$HC \equiv CNa + CH_3 - Br \rightarrow HC \equiv C - CH_3 + NaBr$$

Natriy bromметan propin

monoatsetilenid

$$MeC \equiv CMe + 2R - G \rightarrow R - C \equiv C - R + 2MeG$$

$$AgC \equiv C - Ag + 2CH_3J \rightarrow CH_3 - C \equiv C - CH_3 + 2AgJ \downarrow$$

kumush atsetilenid metiliodid butin - 2

6 bob. Arenlarning olinishi

Sanoatda

- neft va ko'mirni fraksiyalab haydash usuli bilan ajratish
- koks gazi va toshko'mir smolasidan
- uglerod atomlari soni 6 tadan ko'p bo'lgan alkanlarni degidrotsikillab:

$$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3 \xrightarrow{t,kat} C_6H_6 + 4H_2$$

geksan benzol

- atsetilenni trimerlanishidan (benzol olish):

$3HC \equiv CH \xrightarrow{600\,^{\circ}C} C_6H_6$

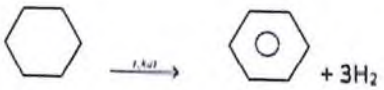
этин — бензол

активланган кўмир

- siklogeksan va uning gomologlarini degidrogenlab :

$C_6H_{12} \xrightarrow{300\,^{\circ}C,Ni} C_6H_6 + 3H_2$ yoki

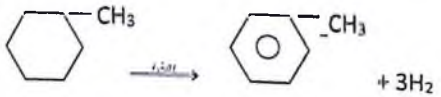
циклогексан — бензол



- $C_6H_{11} - CH_3 \xrightarrow{t,kat} C_6H_5 - CH_3 + 3H_2$ eki

metil siklogeksan — metilbenzol

(toluol)



- benzolni alkillab:

$C_6H_6 + R - G \xrightarrow{t,\ kat} C_6H_5 - R + HG$

$C_6H_6 + CH_3 - Cl \xrightarrow{t,\ kat} C_6H_5 - CH_3 + HCl$

бензол — хлорметан — толуол

Laboratoriyada

• benzoy kislota tuzlariga qattiq ishqor qo'shib suyuqlantirish natijasida:

$$C_6H_5-COONa + NaOH \xrightarrow{t} C_6H_6 + Na_2CO_3$$

натрий бензоат — бензол

• Vyurs reaksiyasi yordamida:

$$C_6H_5-Г + 2Na + Г-R \longrightarrow C_6H_5-R + 2NaГ$$

$$C_6H_5-Cl + 2Na + Cl-CH_3 \longrightarrow C_6H_5-CH_3 + 2NaCl$$

хлорбензол — хлорметан — метилбензол

7 bob. Galogen hosilalarning olinishi

Sanoatda va laboratoriyada

• alkenlarni gidrogalogenlab:

$$R-CH=CH_2 + H-Г \longrightarrow R-\underset{|}{CH}-CH_3$$

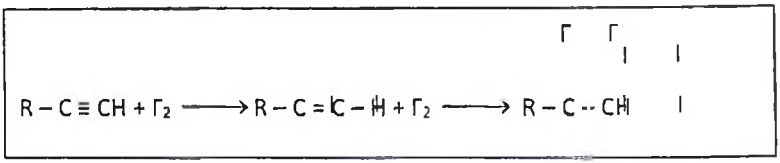
$$CH_2=CH_2 + H-Cl \longrightarrow CH_3-CH_2-Cl$$

этен — хлорэтан

$$C_3H_7-CH=CH_2 + H-Cl \longrightarrow C_3H_7-\underset{|}{CH}-CH_3$$

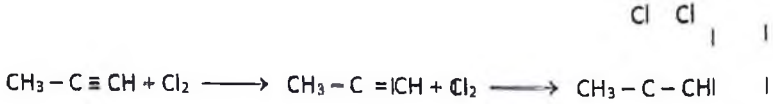
Пентен - 1 2- хлорпентан

- alkinlar va alkenlarni galogenlab:



этин

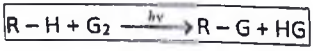
1,2 дихлорэтан 1,1,2,2-тетрахлорэтан

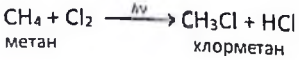


пропин

1,2 дихлорпропен 1,1,2,2-тетрахлорпропан

- alkanlarni galogenlab:





метан хлорметан

$$CH_4 + 2Cl_2 \xrightarrow{h\nu} CH_2Cl_2 + 2HCl$$
метан — дихлорметан

$$CH_4 + 3Cl_2 \xrightarrow{h\nu} CHCl_3 + 3HCl$$
метан — трихлорметан

$$CH_4 + 4Cl_2 \xrightarrow{h\nu} CHCl_4 + 4HCl$$
метан — тетрахлорметан

$$CH_3 - CH_3 + Cl_2 \xrightarrow{h\nu} CH_3 - CH_2 - Cl + HCl$$
хлорэтан

$$CH_3 - CH_3 + 2Cl_2 \xrightarrow{h\nu} CH_3 - \underset{\displaystyle Cl}{\underset{|}{CH}} - Cl + 2HCl$$

1,1 - дихлорэтан

- spirtlarga galogenovodorodlar ta'sir ettirib:

$$R - CH_2 - OH + H - \Gamma \xrightarrow{H_2SO_4} R - CH_2 - \Gamma + H_2O$$

$CH_3 - \boxed{OH + H} - Br \xrightarrow{H_2SO_4} CH_3 - Br + H_2O$

метанол — бромметан

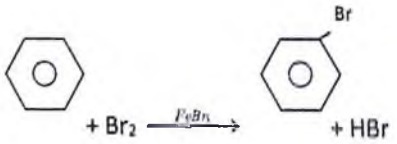
$CH_3 - CH_2 - \boxed{OH + H} - Cl \longrightarrow CH_3 - CH_2 - Cl + H_2O$

этанол — хлорэтан

- benzol va uning gomologlarini galogenlab:

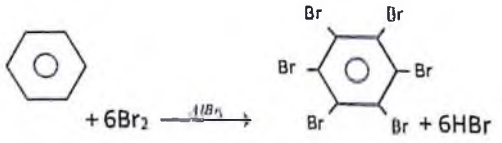
- $C_6H_6 + Br_2 \xrightarrow{FeBr_3} C_6H_5 - Br + HBr$ yoki

бензол — бромбензол



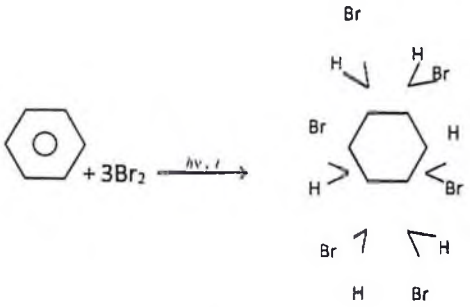
$C_6H_6 + 6Br_2 \xrightarrow{AlBr_3} C_6Br_6 + 6HBr$ yoki

бензол — гексабромбензол



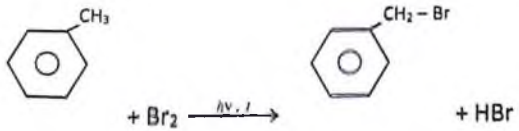
- $C_6H_6 + 3Br_2 \xrightarrow{h\nu,\ t} C_6H_6Br_6$ yoki

гексабромциклогексан



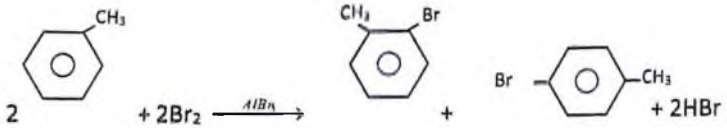
- $C_6H_5 - CH_3 + Br_2 \xrightarrow{h\nu,\ t} C_6H_5 - CH_2 - Br + HBr$ yoki

толуол — бензилбромид



- $2C_6H_5 - CH_3 + 2Br_2 \xrightarrow{AlBr_3} C_6H_4Br - CH_3 + C_6H_4BrCH_3 + 2HBr$ yoki

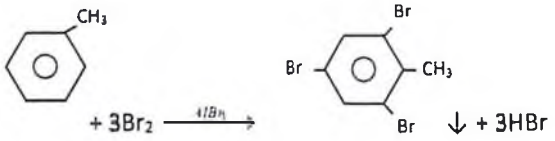
толуол — о-бромтолуол — п-бромтолуол



о-бромтолуол — п-бромтолуол

- $2C_6H_5 - CH_3 + 3Br_2 \xrightarrow{AlBr_3} C_6H_2Br_3CH_3\downarrow + 3HBr$ yoki

толуол — 2,4,6-трибромтолуол



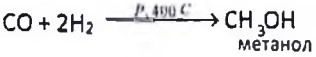
2,4,6-трибромтолуол

8 bob. Spirtlarning olinishi

1 §. Bir atomli spirtlarning olinishi

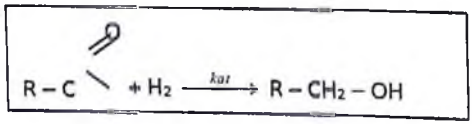
Sanoatda

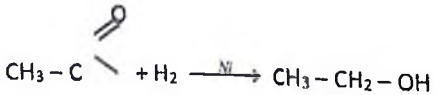
- uglerod (II) oksid va vodoroddan sintez qilish (metanol olish):



метанол

- aldegid va ketonlarni qaytarib:





этаналь этанол

- $R-\underset{\underset{O}{\|}}{C}-R + H_2 \xrightarrow{kat} R-\underset{\underset{OH}{|}}{CH}-R$

$$CH_3-\underset{\underset{O}{\|}}{C}-CH_3 + H_2 \xrightarrow{Ni} CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$$

ацетон пропанол - 2

- glyukozani bijg'itish (etanol olish):

$$C_6H_{12}O_6 \xrightarrow[\text{suvli eritma}]{\text{бижғитиш}} 2C_2H_5OH = 2CO_2\uparrow$$

- alkenlarni gidratlab:

$$R-CH=CH_2 + H_2O \xrightarrow{t,kat} R-\underset{\underset{OH}{|}}{CH}-CH_3$$

$$C_2H_5-CH=CH_2 + H_2O \xrightarrow{t,kat} C_2H_5-\underset{\underset{OH}{|}}{CH}-CH_3$$

бутен-1 бутанол-2

- alkenlarga katalizator ishtirokida uglerod (II) oksidi va vodorod ta'sir ettirib (uglerod zanjirini uzaytirish):

$$R - CH = CH_2 + CO + 2H_2 \xrightarrow{t,p,kat} R - CH_2 - CH_2 - CH_2 - OH$$

$$\underset{\text{этен}}{CH_2 = CH_2} + CO + 2H_2 \xrightarrow{t,p,kat} \underset{\text{пропанол}}{CH_3 - CH_2 - CH_2 - OH}$$

Laboratoriyada

- to'yingan uglevodorodlarning monogalogenli hosilalariga ishqorlarning suvli eritmasini ta'sir ettirib:

$$R - G + NaOH \xrightarrow{t,\ \text{сувли эритма}} R - OH + NaG$$

$$\underset{\text{хлорэтан}}{S_2H_5 - Cl} + NaOH \xrightarrow{t,\ \text{сувли эритма}} \underset{\text{этанол}}{C_2H_5OH} + NaCl$$

- murakkab efirlarni ishqorli gidrolizlab:

$$R - \overset{O}{\overset{\parallel}{C}} - O - R_1 + NaOH \longrightarrow R - \overset{O}{\overset{\parallel}{C}} \diagdown + R_1 - OH$$

$$\underset{\text{метилформиат}}{H - \overset{O}{\overset{\parallel}{C}} - O - CH_3} + NaOH \longrightarrow \underset{\text{натрийформиат}}{H - COONa} + \underset{\text{метанол}}{CH_3 - OH}$$

- alkagolyatlarni gidrolizlab:

$$R - ONa + H_2O \longrightarrow R - OH + NaOH$$

$CH_3 - ONa + H_2O \longrightarrow CH_3 - OH + NaOH$

натрий метилат — метанол

2

§. Ikki atomli spirtlarning olinishi

Sanoatda

- etilen oksidini katalitik gidratlab (etilenglikolyatni olinishi):

$$H_2C\!-\!CH_2 + H_2O \xrightarrow{200\,C,\ Ag} \underset{|}{CH_2}\!-\!\underset{|}{CH_2}$$

эпоксиэтан — этилгликол

- to'yingan uglevodorodlarning digalogenli hosilalariga ishqorning suvli eritmasini ta'sir ettirib:

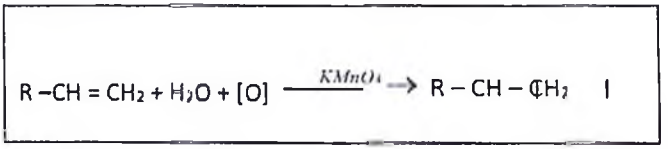
$$R - \underset{|}{CH} - \underset{|}{CH_2} + 2NaOH \xrightarrow{\text{сувли эритма}} R - \underset{|}{CH} - \underset{|}{CH_2} + 2NaCl$$

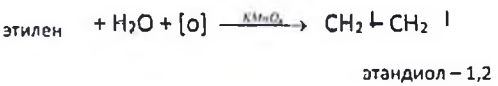
$$\underset{|}{CH_2} = \underset{|}{CH_2} + 2NaOH \xrightarrow{\text{сувли эритма}} \underset{|}{CH_2} - \underset{|}{CH_2} + 2NaCl$$

1,2 - дихлорэтан — этандиол – 1,2

Laboratoriyada

- alkenlarni oksidlab :

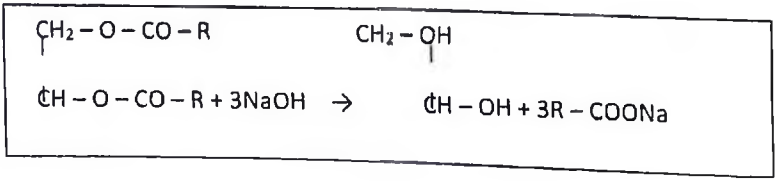




3 §. Uch atomli spirtlarning olinishi (glitserin)

Sanoatda

- yog'larni sovunlanishi (triglitseridlar):



$CH_2 - O - CO - C_{17}H_{33}$ $CH_2 - OH$

$CH - O - CO - C_{17}H_{33} + 3NaOH \rightarrow$ $CH - OH + 3C_{17}H_{33}$ натрий олеат

глицерин триолеат глицерин

- sxema bo'yicha propilendan olish :

$C_{пропилен}$ $CH_2 + O_2 \xrightarrow{t,kat} CH_2 = CH - C(=O)H + H_2O$

акролеин

$C_{акролеин}$ $CH_2 = CH - C(=O)H + H_2 \xrightarrow{t,kat} CH_2 = CH - C_{аллил\ спирти}$

$CH_2 = CH - CH_2OH + H_2O_2 \xrightarrow{t,kat} CH_2(OH) - CH(OH) - CH_2(OH)$

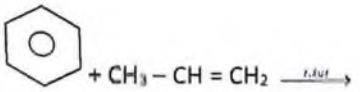
аллил спирти

1,2,3 – пропантриол

4 **§. Fenollarning olinishi**

Sanoatda

- sxema bo'yicha kumollash usulida:

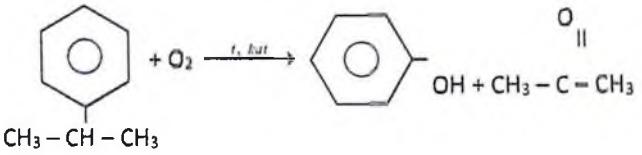


пропен

бензол

$H_3C - CH - CH_3$

Изопропил бензол



ацетон

изопропилбензол (кумол)

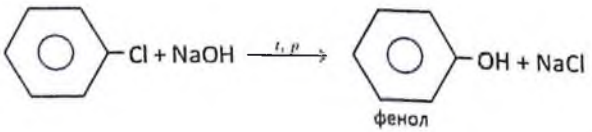
- toshko'mir smolasidan:

$C_6H_5ONa + H_2SO_4 \longrightarrow C_6H_5OH + NaHSO_4$

натрий фенолят — суюл — фенол

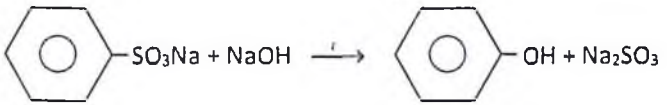
(смолани натрий ишқори билан қайта ишлаш маҳсулоти)

- aromatik uglevodorodlarning galogenli hosilalarini ishqor bilan ishlab:



хлорбензол

- aromatik sulfokislota tuzlarini qattiq ishqorlar bilan suyuqlantirib:

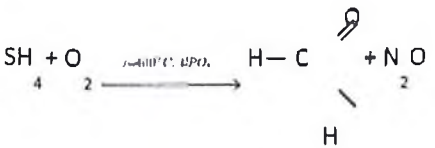


Бензосульфокислотанинг
натрийли тузи

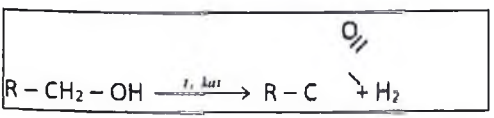
9 bob. Aldegidlarning olinishi

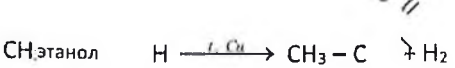
Sanoatda

- metanni katalitik oksidlab (formaldigedni olinishi):



- birlamchi spirtlarni katalitik degidridlab:

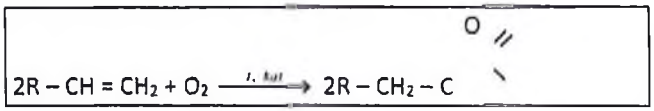


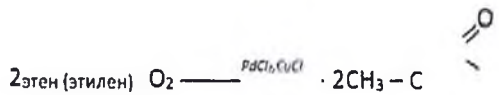


etanal

Bu reaksiya «aldegid» lotincha alcohol dehydrogenatius spirtdan vodorodni ajratish degan ma'noni bildiradi.

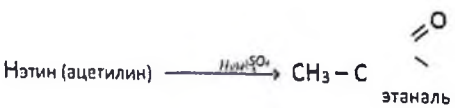
• alkenlarni katalitik oksidlab:





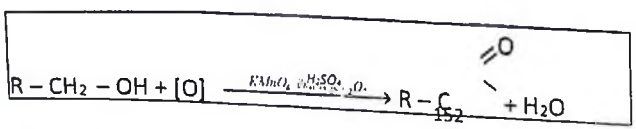
etanal

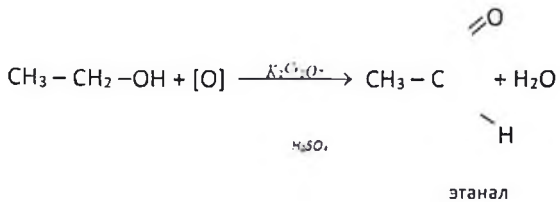
• Kucherev reaksiyasi bilan (atsetaldegidning olinishi):



Laboratoriyada

• birlamchi spirtlarni oksidlab:



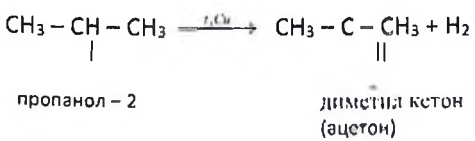


10 bob. Ketonlarni olinishi

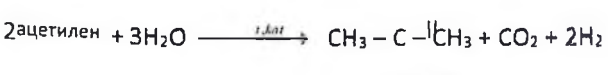
Sanoatda va laboratoriyada:

- atseton sanoatda fenolni kumollanish usulida qo'shimcha mahsulot sifatida olinadi.

- ikkilamchi spirtlarni katalitik degidridlab:

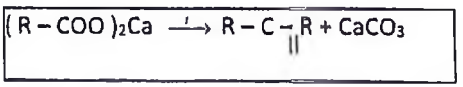


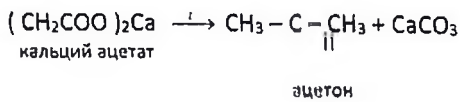
- atsetilenni katalitik gidratlab (atsetonni olinishi):



- ikkilamchi spirtlarni oksidlab:

- karbon kislotalarning kalsiyli tuzlarini parchalab:





11 bob. Bir asosli karbon kislotalarning olinishi

Sanoatda

• ko'pchilik karbon kislotalari sanoat chiqindilaridan olinadi (yog'lar, mum, o'simlik va efir yog'lari)

• alkanlarni oksidlab:

$$2CH_4 + 3O_2 \xrightarrow{t,\ kat} 2HCOOH + 2H_2O$$

метан — чумоли кислота (метан кислота)

$$2CH_3 - CH_2 - CH_2 - CH_3 + 5O_2 \xrightarrow{t,\ p,\ kat} 4CH_3COOH + 2H_2O$$

сирка кислота

• alkenlarni oksidlab:

$$CH_2 = CH_2 + O_2 \xrightarrow{t,\ kat} CH_3COOH$$

этан кислота (сирка кислота)

eten (etilen)

$$CH_3 - CH = CH_2 + 4[O] \xrightarrow{t,\ kat} CH_3COOH + HCOOH$$

propen — этан кислота (сирка кислота) — метан кислота (чумоли кислота)

• benzol gomologlarini oksidlab (benzoy kislotaning olinishi):

$$C_6H_5 - C_nH_{2n+1} + 3n[O] \xrightarrow[H^+]{KMnO_4} C_6H_5COOH + (n-1)CO_2 + nH_2O$$

$$C_6H_5 - CH_3 + 3[O] \xrightarrow[H^+]{KMnO_4} C_6H_5 - COOH + H_2O$$

метилбензол — бензой кислота

$$C_6H_5 - C_2H_5 + 6[O] \xrightarrow[H^+]{KMnO_4} C_6H_5 - COOH + CO_2 \uparrow + 2H_2O$$

этилбензол бензой кислота

• natriy gidroksidi va uglerod (II) oksidini bosim ostida qizdirish (chumoli kislota olish):

$$CO + NaOH \xrightarrow{t,\ P} HCOONa$$

натрий формиат

$$HCOONa + H_2SO_4 \longrightarrow HCOOH + NaHSO_4$$

натрий формиат метан кислота (чумоли кислота)

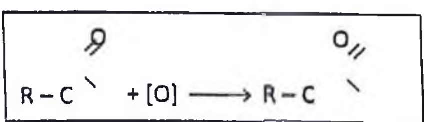
• metil spirti va uglerod (II) oksididan sintez qilish (sirka kislota olish):

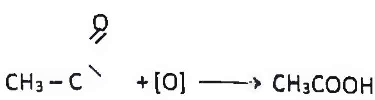
$$CH_3OH + CO \xrightarrow{t,\ kat} CH_3COOH$$

метанол этан кислота (сирка кислота)

Laboratoriyada

• aldegidlarni oksidlab (sanoatda ham foydalaniladi):





этаналь этан кислота (сирка кислота)

• spirtlarni oksidlab:

$$R - CH_2 - OH + 2[O] \xrightarrow{t,\ kat} R - COOH + H_2O$$

$$CH_3OH + 2[O] \xrightarrow{t,\ kat} HCOOH + H_2O$$

метанол — метан кислота (чумоли кислота)

$$C_2H_5OH + 2[O] \xrightarrow{t,\ kat} CH_3COOH + H_2O$$

этанол — этан кислота (сирка кислота)

• karbon kislota tuzlaridan:

$$R - COOK + HCl \longrightarrow R - COOH + KCl$$

$$HCOOK + HCl \longrightarrow HCOOH + KCl$$

калий формиат — (чумоли кислота)

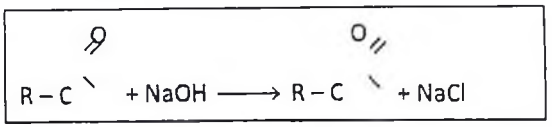
• angidridlarni suvda eritib:

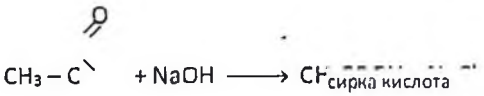
$$(R - CO)_2O + H_2O \longrightarrow 2R - COOH$$

$$(CH_3CO)_2O + H_2O \longrightarrow 2CH_3 - COOH$$

сирка ангидрид — сирка кислота

• galogenangidridlarni ishqorli gidrolizlab:

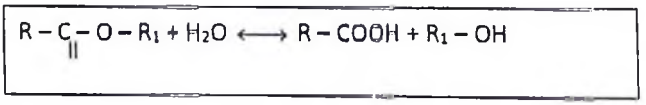


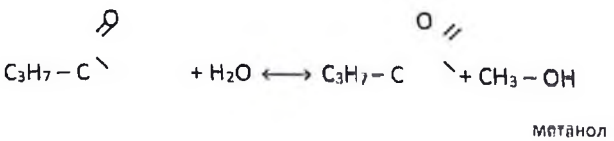


сирка кислотанинг

хлорангидриди

- murakkab efirlarni gidrolizlab:





метилбутират

Бутан (мой)

метанол

12 bob. Nitrobirikmalarning olinishi

Sanoatda va laboratoriyada

- alkanlarni nitrolab:

$$R - H + HO - NO_2 \xrightarrow{t} R - NO_2 + H_2O$$

$$C_2H_6 + HNO_3 \xrightarrow{t} C_2H_5 - NO_2 + H_2O$$

этан — нитроэтан

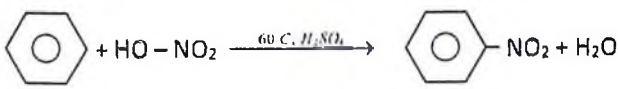
$$CH_3 - CH_2 - CH_3 + HNO_3 \xrightarrow{t} CH_3 - \underset{\displaystyle NO_2}{\underset{|}{CH}} - CH_3 + H_2O$$

пропан — 2-нитропропан

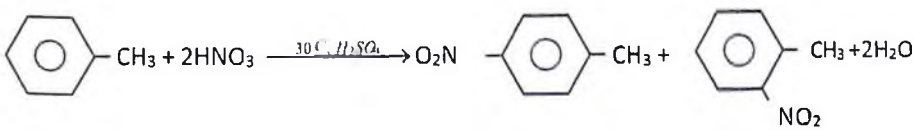
- benzol va uning gomologlarini nitrolab:

$$Ar - H + HO - NO_2 \xrightarrow{t} Ar - NO_2 + H_2O$$

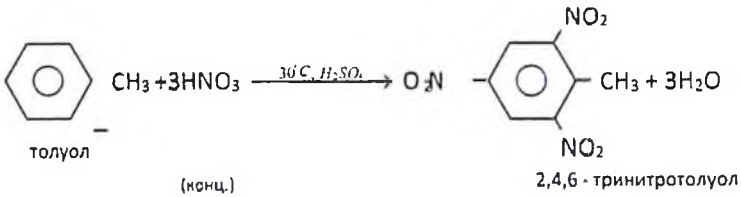
H_2SO_4 (конц)

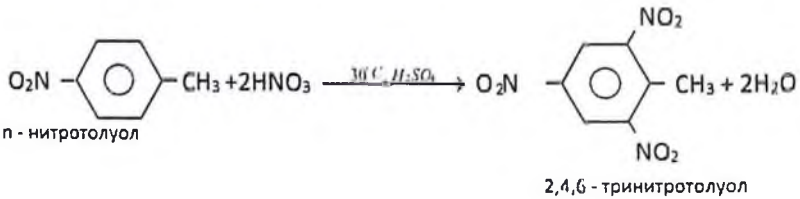


бензол — нитробензол



толуол — n - нитротолуол — 0- нитрофенол





13 bob. Aminlarning olinishi

Sanoatda

- nitrobirikmalarni qaytarib (Zinin reaksiyasi):

$$R - NO_2 + 3H_2 \xrightarrow{t,kat} R - NH_2 + 2H_2O$$

$$\underset{\text{нитроэтан}}{C_2H_5 - NO_2} + 3H_2 \xrightarrow{t,kat} \underset{\text{этиламин}}{C_2H_5 - NH_2} + 2H_2O$$

$$\underset{\text{нитробензол}}{C_6H_5 - NO_2} + 3H_2 \xrightarrow{t,Ni} \underset{\text{фениламин}}{C_6H_5 - NH_2} + 2H_2O$$

- galogenli hosilalariga ammiak tasir ettirib:

$$R - Г + 2NH_3 \longrightarrow R - NH_2 + NH_4Г$$

$$CH_3 - Br + 2NH_3 \longrightarrow CH_3 - NH_2 + NH_4Br$$

бромметан — метиламин

Laboratoriyada

- alkilammoniyli tuzlarga ishqor tasir ettirib:

$$[\ R - NH_3\ ]\ Г + NaOH \longrightarrow R - NH_2 + NaГ + H_2O$$

$$[\ CH_3 - NH_3\ ]\ Cl + NaOH \longrightarrow CH_3 - NH_2 + NaCl + H_2O$$

метиламмоний хлорид — метиламин

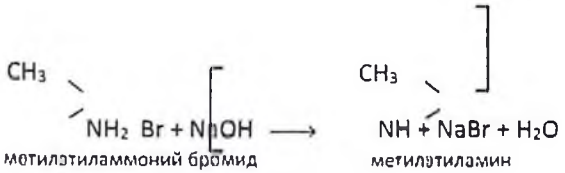
$$[\ C_6H_5 - NH_3\ ]\ Br + NaOH \longrightarrow C_6H_5 - NH_2 + NaBr + H_2O$$

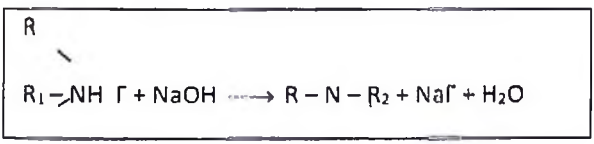
фенилламмоний бромид — фениламин

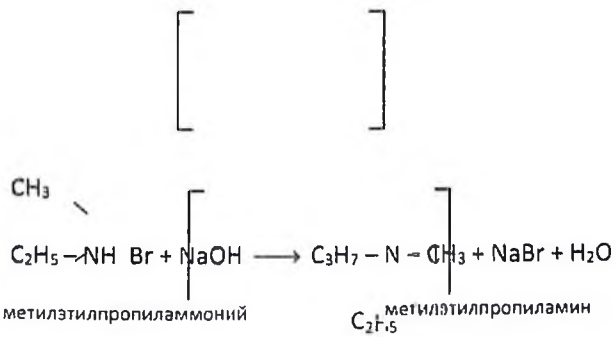
$$\left[\begin{matrix} R \\ \diagdown \\ \diagup \\ NH_2 \end{matrix}\right] Г + NaOH \longrightarrow \begin{matrix} R \\ \diagdown \\ \diagup \\ N - H \end{matrix} + NaГ + H_2O$$

$$\left[\begin{matrix} CH_3 \\ \diagdown \\ \diagup \\ NH_2 \end{matrix}\right] Cl + NaOH \longrightarrow \begin{matrix} CH_3 \\ \diagdown \\ \diagup \\ NH \end{matrix} + NaCl + H_2O$$

диметиламмоний хлорид


CH3
NH2 Br + NaOH
метилэтиламмоний бромид
CH3
NH + NaBr + H2O
метилэтиламин


R
R1 – NH Г + NaOH
R – N – R2 + NaГ + H2O


CH3
C2H5 – NH Br + NaOH
C3H7 – N – CH3 + NaBr + H2O
метилэтилпропиламмоний
C2H5
метилэтилпропиламин

14 bob. Aminokislotalarning olinishi

Sanoatda

Sxema bo'yicha karbon kislotalardan olish:

$$R - CH_2 - COOH + Cl_2 \xrightarrow{\lambda,hv} R - \underset{Cl}{CH} - COOH - HCl$$

$$R - \underset{Cl}{CH} - COOH + 2NH_3 \xrightarrow{\lambda,hv} R - \underset{NH_2}{CH} - COOH + NH_4Cl$$

3 2 1 3 2 1

$CH_3 - CH_2 - COOH + Cl_2 \xrightarrow{\lambda,hv} CH_3 - \underset{Cl}{CH} - COOH + HCl$

пропан кислота 2 – хлорпропан кислота

α

β α β α

$CH_3 - \underset{Cl}{CH} - COOH + 2NH_3 \longrightarrow CH_3 - \underset{NH_2}{CH} - COOH + NH_4Cl$

2-хлорпропан кислота 2 – аминопропан кислота

α

- polipiptedlarni gidrolizlab (oqsillarni gidrolizlab):

$$CH_2 - CO - NH - \underset{|}{CH} - COOH + H_2O \longrightarrow CH_2 - \underset{|}{COOH} + CH_3 - \underset{|}{CH} - COOH$$

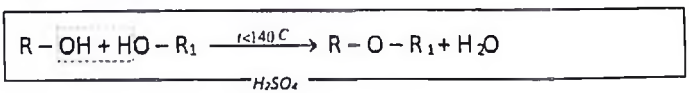
NH_2 CH_3 NH_2 NH_2

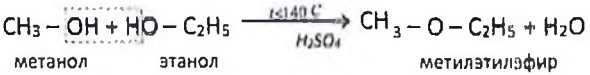
глицил-аланин(дипептид) глицин аланин

15 bob. Oddiy efirlarni olinishi

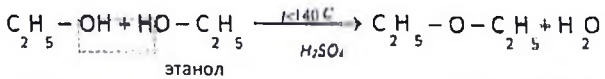
Sanoatda va laboratoriyada

- spirtlarni molekulalararo gidratlab:





метанол этанол метилэтилэфир

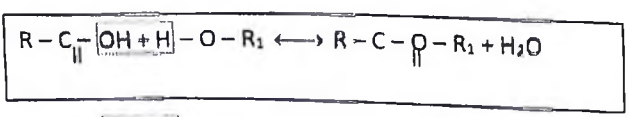


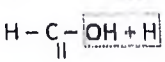
этанол этанол этил (диэтил) эфир

16 bob. Murakkab efirlarning olinishi

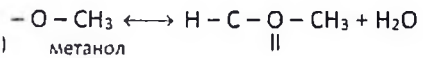
Sanoatda va laboratoriyada

- karbon va anorganik oksikislotalarni spirtlar bilan ta'siri natijasida (eterifikatsiya reaksiyasi):



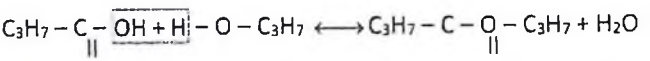


метан кислота
(чумоли кислота)



метанол

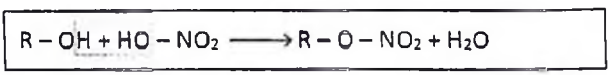
метилформиат



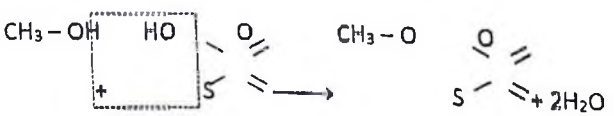
пропанол

бутан кислота (мой кислота)

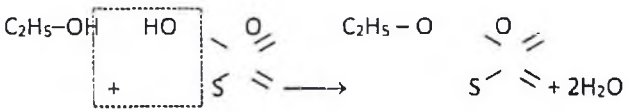
изопропилбутират



метанол нитрат кислота метилнитрат



метанол сульфат кислота Диметилсульфат



сульфат кислота метилэтилсульфат

17 bob. Monosaxaridlarni olinishi

- kraxmalni gidrolizlab:

$$(C_6H_{10}O_5)_n + nH_2O \xrightarrow{t,\ H^+} nC_6H_{12}O_6$$

крахмал глюкоза

- disaxaridlarni gidrolizlab:

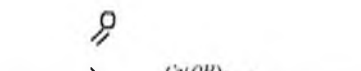
$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{t,\ H^+} 2C_6H_{12}O_6$$

мальтоза глюкоза

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{t,\ H^+} C_6H_{12}O_6 + C_6H_{12}O_6$$

сахароза глюкоза фруктоза

- formaldegiddan:



метаналь глюкоза

- fotosintez jarayonida hosil bo'ladi:

$$6CO_2 + 6H_2O \xrightarrow[\text{хлорофил}]{h\nu} C_6H_{12}O_6 + 6O_2 \uparrow$$

глюкоза

ILOVALAR

1. **Grek alfavitl**

Harfning yozilishi	Harfning nomlanishi	Harfning yozilishi	Harfning nomlanishi
A α	alfa	N ν	ni (nyu)
B β	beta	Ξ ξ	ksi
Γ γ	gamma	O o	omikron
Δ δ	delta	Π π	pi
E ε	epsilon	P ρ	ro
Z ζ	zeta	Σ σ	sigma
H η	eta	T τ	tau
Θ θ	teta	Y υ	Ipsilon
I ι	Iota	Φ ϕ	fi
K κ	kappa	X χ	xi
Λ λ	lyambda	Ψ ψ	psi
M μ	mi (myu)	Ω ω	omega

2. Fizikaviy kattaliklarni shartli belgilari

va ularni o'lchov birliklari

Fizikaviy kattaliklar	O'lchov birliklari

	SI	Amalda foydalanadigan sistemadan tashqari birliklar
1	2	3
M_r — nisbiy molekulyar massa	—	a.m.b
A_r — nisbiy atom massa	—	a.m.b
A — atomning massa soni	—	a.m.b
M — molyar massa	kg/mol	g/mol
M_{ekv} — ekvivalent molyar massa	kg/mol	g/mol
m — modda massasi, atom yoki molekulaning absolyut massasi	kg	g, mg
τ— vaqt	S	min
ϑ — modda miqdori	mol	
t_{ekv} — ekvivalentlik omili (ekvivalent)	—	—
N — strukturaviy birliklar soni (atomlar, molekulalar, ionlar)		
N_A — $6{,}02 \cdot 10^{23}$-Avogadro soni	mol^{-1}	
1	2	3
V — hajm	m^3	l, ml
V_m — molyar hajm	m^3/mol	l/mol
ω — massa ulush	—	%
ω^h— hajmiy ulush	—	%
C_m — molyar konsentratsiya	mol/m^3	mol/l
T — Kel'vin shkalasi bo'yicha temperatura	K	
t — Selsiy shkalasi bo'yicha temperatura		^0C
Q — issiqlik miqdori	D_j	kal
H — entalpiya	D_j	kal

α — dissotsiatsiya darajasi	—	%
h — gidroliz darajasi	—	%
η — reaksiya mahsuloti unumi	—	%
ρ — modda zichligi	kg/m^3	g/ml, g/l
λ — modda eruvchanligi	kg/m^3 H_2O	g/100g H_2O, g/l H_2O
D — gazning nisbiy zichligi	—	
D_{H_2} — gazning vodorod bo'yicha zichligi	—	
D_h — gazning havo bo'yicha zichligi	—	
P — bosim	$Pa \Leftrightarrow N/m^2$	atm, mm.s.mm, ust
pH — vodorod ko'rsatkich	—	
l — uzunlik	m	
r — radius	m	
ϕ^0 — standart potensial	V	
$\upsilon_{(gomog)}$ — gomogen kimyoviy reaksiya tezligi	$mol/m^3 \cdot s$	$mol/l \cdot s$, $mol/l \cdot min$
$\upsilon_{(geterg)}$ — geterogen kimyoviy reaksiya tezligi	$mol/m^2 \cdot s$	$mol/m^2 \cdot min$
q — elektr zaryad	Kl	
m — elektr momenti	$Kl \cdot m$	
γ — reaksiya tezligining temperatura koeffitsenti	—	
I — ionlanish energiyasi	J	eV, kal
E — elektronga moyillik	J	eV, kal
X — elektromanfiylik	Dj	eV, kal
ε— nisbiy elekromanfiylik	—	

— - o'lchamsiz kattalik

3. Elementlarning nisbiy elektromanfiyliklari

	I	II	III	IV	V	VI	VII	VIII		
1	H 2,1							He -		
2	Li 1,0	Be 1,5	B 2,0	C 2,5	N 3,0	O 3,5	F 4,0	Ne -		
3	Na 0,9	Mg 1,2	Al 1,5	Si 1,8	P 2,1	S 2,5	Cl 3,0	Ar -		
4	K 0,9	Ca 1,0	Sc 1,3	Ti 1,5	V 1,6	Cr 1,6	Mn 1,5	Fe 1,9	CO 1,9	Ni 1,9
	Cu 1,9	Zn 1,6	Ga 1,6	Ge 1,8	As 2,0	Se 2,4	Br 2,8	Kr -		
5	Rb 0,8	Sr 1,0	Y 1,2	Zr 1,5	Nb 1,6	Mo 1,8	Tc 1,9	Ru 2,2	Rh 2,2	Pd 2,2
	Ag 1,9	Cd 1,7	In 1,7	Su 1,8	Sb 1,9	Te 2,1	I 2,5	Xe -		
6	Cs 0,7	Ba 0,9	La 1,0	Ht 1,3	Ta 1,5	W 1,7	Re 1,9	Os 2,2	Ir 2,2	Pt 2,2
	Au 2,4	Hg 1,9	Tl 1,8	Pb 1,9	Bi 1,9	Po 2,0	At 2,2	Rn -		
7	Fr 0,7	Ra 0,9	Ac 1,1							

4. Oksidlar, kislotalar, tuzlar va asoslarning nisbiy molekulyar massalari

Ani-onlar	Kationlar														
	N^+	NH_4^+	K^+	Na^+	Ag^+	Ba^{2+}	Ca^{2+}	Mg^{2+}	Zn^{2+}	Cu^{2+}	Pb^{2+}	Hg^{2+}	Fe^{2+}	Fe^{3+}	Al^{3+}
O^{2-}	18	-	94	62	232	153	56	40	81	79,5	223	217	72	160	102
OH^-	18	35	56	40	125	171	74	58	99	97,5	241	235	90	107	78
Cl^-	36,5	53,5	74,5	58,5	143,5	208	111	75	136	134,5	278	272	127	162,5	133,5
Br^-	81	98	119	103	188	297	200	184	225	223,5	367	361	216	296	267
I^-	128	145	166	150	235	391	294	278	319	317,5	461	455	310	437	408
S^{2-}	34	68	110	78	248	169	72	56	97	95,5	289	233	88	208	150
NO_3^-	63	80	101	85	170	261	164	148	189	187,5	331	325	180	242	213

SO_3^{2-}	82	116	158	126	296	217	120	104	145	143,5	287	281	136	352	294
SO_4^{2-}	98	132	174	142	312	233	136	120	161	159,5	303	297	152	400	342
CO_3^{2-}	62	96	138	106	276	197	100	84	125	123,5	267	261	116	292	234
SiO_3^{2-}	78	112	154	122	292	231	116	100	141	139,5	283	277	132	340	282
PO_4^{3-}	98	149	212	164	419	601	310	262	385	380,5	811	793	358	151	122
CH_3COO^-	60	77	98	82	167	255	158	142	183	181,5	315	318	174	233	204

5. Ayrim o'rta, nordon, asosli tuzlar va kristallogidratlarning nisbiy molekulyar massalari

Tuz formulasi	M_r
Gidrosulfatlar	
$NaHSO_4$	120
$KHSO_4$	136
NH_4HSO_4	115
$Ca(HSO_4)_2$	234
$Mg(HSO_4)_2$	218
$Ba(HSO_4)_2$	331
$Al(HSO_4)_3$	318

Tuz formulasi	M_r
Digidro va gidrofosfatlar	
NaH_2PO_4	120
KH_2PO_4	136
$NH_4H_2PO_4$	115
$Ca(H_2PO_4)_2$	234
$Mg(H_2PO_4)_2$	218
$Ba(H_2PO_4)_2$	331
Na_2HPO_4	142

Gidrosulfitlar	
$NaHSO_3$	104
$KHSO_3$	120
NH_4HSO_3	99
$Ca(HSO_3)_2$	202
$Mg(HSO_3)_2$	186
$Ba(HSO_3)_2$	299
$Al(HSO_3)_3$	270
Gidrokarbonatlar	
$NaHCO_3$	84
$KHCO_3$	100
NH_4HCO_3	79
$Ca(HCO_3)_2$	162
$Mg(HCO_3)_2$	146
$Ba(HCO_3)_2$	259
$Al(HCO_3)_2$	210
O'rta tuzlar	
$NaAlO_2$	82
$KAlO_2$	98
$Na[Al(OH)_4]$	118
$K[Al(OH)_4]$	134
$KClO_3$	122,5
$KMnO_4$	158
K_2CrO_4	194
K_2HPO_4	174
$(NH_4)_2HPO_4$	132
$Ca(H_2PO_4)_2 \cdot 2CaSO_4$	506
$CaHPO_4$	136
$MgHPO_4$	120
BaH_2PO_4	233
Asosli tuzlar	
$MgOHCl$	76,5
$MgOHNO_3$	103
$(MgOH)_2SO_4$	178
$CuOHCl$	116
$CuOHNO_3$	142,5
$(CuOH)_2SO_4$	257
$Al(OH)_2Cl$	96,5
$Al(OH)_2NO_3$	123
Kristallogidratlar	
$Na_2SO_4 \cdot 10H_2O$	322
$Na_2CO_3 \cdot 10H_2O$	286
$CaCl_2 \cdot 6H_2O$	219
$BaCl_2 \cdot 2H_2O$	244
$CaHPO_4 \cdot 2H_2O$	172
$MgSO_4 \cdot 7H_2O$	246
$ZnSO_4 \cdot 7H_2O$	287

$K_2Cr_2O_7$	294
$(NH_4)_2Cr_2O_7$	252
$(NH_4)_2CrO_4$	152

$CuSO_4 \cdot 5H_2O$	249,5
$FeSO_4 \cdot 7H_2O$	278

6. Ayrim fizikaviy kattaliklar orasidagi nisbatlar

7. Металларнинг электрокимёвий кучланиш катори

Hajm birliklari
1 мл=1 $см^3$
1 $m^3 = 10^3$ l = 10^6 ml
1 l = 10^3 ml = 10^{-3} m^3
1 ml = 10^{-3} l = 10^{-6} m^3
Massa birliklari
1 kg = 10^3 g = 10^6 mg
1 mg = 10^{-3} g = 10^{-6} kg
Zichlik birliklari
1 g/ml = 10^3 kg/m^3
1 g/l = 1 kg/m^3
Uzunlik birliklari
1 nm = 10^{-9} m
1 mkm = 10^{-6} m
Bosim birliklari

Металл электрод	Стандарт потенциал, В
Li / Li^+	-3,05
K / K^+	-2,92
Cs / Cs^+	-2,92
Rb / Rb^+	-2,92
Ba / Ba^{2+}	-2,91
Sr / Sr^{2+}	-2,89
Ca / Ca^{2+}	-2,87
Na / Na^+	-2,71
Mg / Mg^{2+}	-2,36
Be / Be^{2+}	-1,85
Al / Al^{3+}	-1,66
Mn / Mn^{2+}	-1,18
Zn / Zn^{2+}	-0,76
Cr / Cr^{3+}	-0,74
W / W^{2+}	-0,50
Fe / Fe^{2+}	-0,44
Co / Co^{2+}	-0,28

1 atm = 101325 Pa 1 atm = 760 mm.sim.ust
Energiya birliklari
1 eV = 1,6,10^{-9} Dj 1 kal = 4,187 Dj

8. **Kislota tuz va asoslarning odatdagi sharoitda suvda eruvchanlik jadvali**

Ani-onlar	Kationlar Pb^{2+}																	
	N^+	K^+ Na^+	NH_4^+	Ba^{2+}	Ca^{2+}	Mg^{2+}	Sr^{2+}	Al^{3+}	Cr^{3+}	Fe^{2+}	Fe^{3+}	Ni^{2+}	Mn^{2+}	Zn^{2+}	Ag^+	Hg^{2+}	Pb^{2+}	Cu^{2+}
OH^-		E	E	E	O	E*	O	E*	E*	E*	E*	E*	E*	E*	-	-	E*	E*
F^-	E	E	E	O	E*	E*	E*	O	E*	E*	E*	E	E	E	E	-	E*	E
Cl^-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E*	E	O	E
Br^-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E*	O	O	E
I^-	E	E	E	E	E	E	E	E		E		E	E	E	E*	E*	E*	E
S^{2-}	E	E	E	-	-	-	E*	-	-	E*	-	E*	E*	E*	E*	E*	E*	E*
HS^-	E	E	E	E	E	E	E											
SO_3^{2-}	E	E	E	E*	E*	O	E*		-	E*	-	E*		O	E*	E*	E*	E*
HSO_3^-	E	E	E	E	E	E	E											
SO_4^{2-}	E	E	E	E*	O	E	E*	E	E	E	E	E	E	E	O	-	E*	E
HSO_4^-	E	E	E	E			-										E*	
NO_3^-	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
NO_2^-	E	E	E	E	E	E	E					E			O			
PO_4^{3-}	E*	E*	-	E*	E*	E*	E*	E*	E*	E*	E*	E*	E*	E*	E*	E*	E*	E*
HPO_4^{2-}	E	E	E	E*	E*	O	E*			E*			E*	-	-	-	-	-
$H_2PO_4^-$	E	E	E	E	E	E	E			E			E	E	E		-	
CO_3^{2-}	E	E	E	E*	E*	E*	E*			E*		E*	E*	E*	E*	-	E*	E*
SiO_3^{2-}	E*	E	-	E*	E*	E*	E*		E*	E*		E*	E*	-	E*	-	E*	-
CH_3COO^-	E	E	-	E	E	E	E	E*	E	E	-	E	E	E	E	E	E	E

Э - **eriydi (100 g suvda 1 g dan ko'p eriydi).**

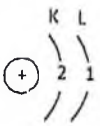
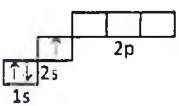
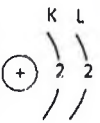
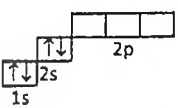
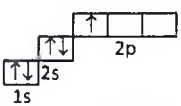
О - oz eriydi (100 g suvda 0,01 – 1,0 g).

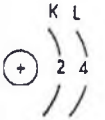
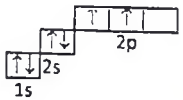
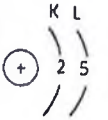
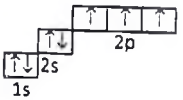
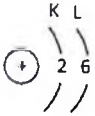
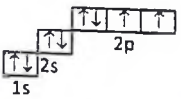
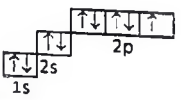
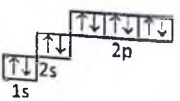
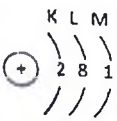
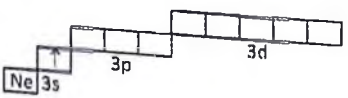
Э* - erimaydi (100 g suvda 0,01 dan kam).

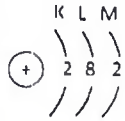
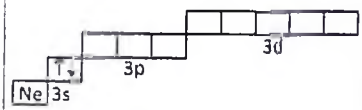
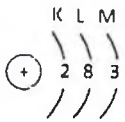
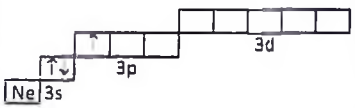
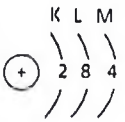
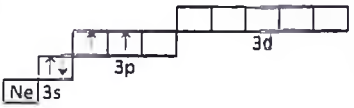
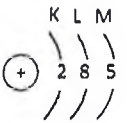
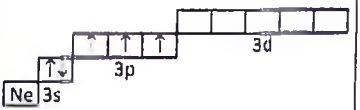
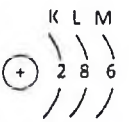
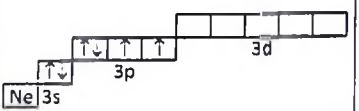
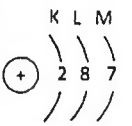
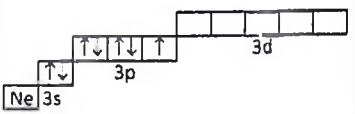
 - suvda to'liq buziladi.

 -moddaning mavjudligi haqida to'liq ma'lumot yo'q.

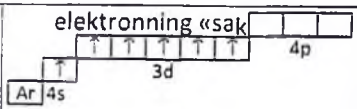
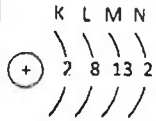
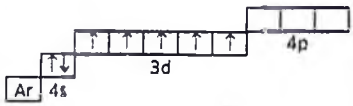
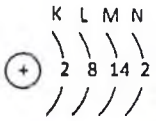
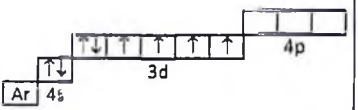
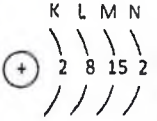
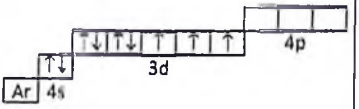
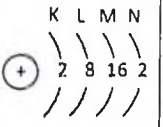
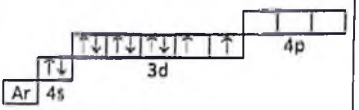
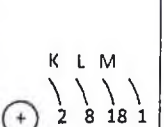
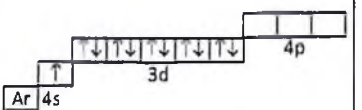
9. I-IV davrlar elementlar atomlarining elektron qavatlarining tuzilishlari

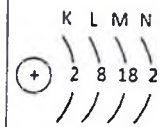
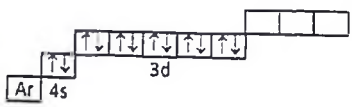
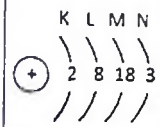
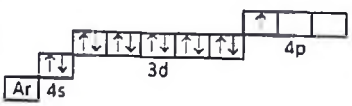
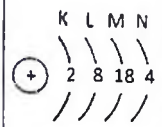
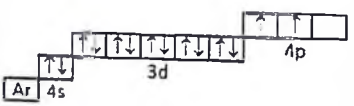
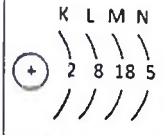
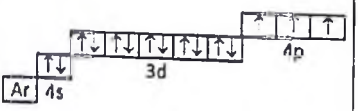
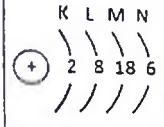
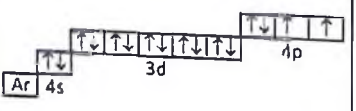
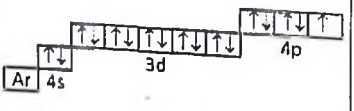
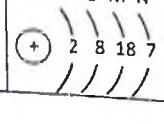
Element-larning tartib ra-qami va nomla-nishi	Elektron tuzili-shining sxemasi	Atom elektron konfiguratsiyasi	Elektron formulasi (to'liq va qisqa)
$_1$H Vodorod			$1s^1$
$_2$He Geliy			$1s^2$
$_3$Li Litiy			$1s^2 \cdot 2s^1$ [He] $2s^1$
$_4$Be Beriliy			$1s^2 \cdot 2s^2$ [He] $2s^2$
$_5$B Bor			$1s^2 \cdot 2s^2 \cdot 2p^1$ [He] $2s^2 \cdot 2p^1$

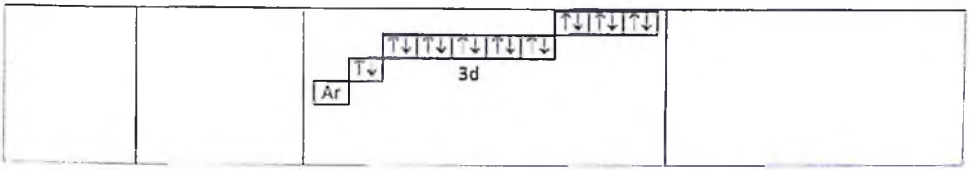
$_{6}C$ Uglerod			$1s^2 \cdot 2s^2 \cdot 2p^2$ [He] $2s^2 \cdot 2p^2$
$_{7}N$ Azot			$1s^2 \cdot 2s^2 \cdot 2p^3$ [He] $2s^2 \cdot 2p^3$
$_{8}O$ Kislorod			$1s^2 \cdot 2s^2 \cdot 2p^4$ [He] $2s^2 \cdot 2p^4$
$_{9}F$ Ftor			$1s^2 \cdot 2s^2 \cdot 2p^5$ [He] $2s^2 \cdot 2p^5$
$_{10}Ne$ Neon			$1s^2 \cdot 2s^2 \cdot 2p^6$ [He] $2s^2 \cdot 2p^6$
$_{11}Na$ Natriy			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^1$ [Ne] $3s^1$

$_{12}Mg$ Magniy			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2$ $[Ne]\ 3s^2$
$_{13}Al$ Alyu- miniy			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^1$ $[Ne]\ 3s^2 \cdot 3p^1$
$_{14}Si$ Kremniy			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^2$ $[Ne]\ 3s^2 \cdot 3p^2$
$_{15}P$ Fosfor			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^3$ $[Ne]\ 3s^2 \cdot 3p^3$
$_{16}S$ Oltin-gugurt			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^4$ $[Ne]\ 3s^2 \cdot 3p^4$
$_{17}Cl$ Xlor			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^5$ $[Ne]\ 3s^2 \cdot 3p^5$
$_{18}Ar$ Argon			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6$ $[Ne]\ 3s^2 \cdot 3p^6$

	K L M + 2 8 8	Ne 3s 3p 3d	
$_{19}K$ Kaliy	K L M N + 2 8 8 1	Ar 4s 3d 4p 1s	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^1$ $[Ar]\ 4s^1$
$_{20}Ca$ Kalsiy	K L M N + 2 8 8 2	Ar 4s 3d 4p 1s	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2$ $[Ar]\ 4s^2$
$_{21}Sc$ Skandiy	K L M N + 2 8 9 2	Ar 4s 3d 4p 1s	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^1$ $[Ar]\ 4s^2 \cdot 3d^1$
$_{22}Ti$ Titan	K L M N + 2 8 10 2	Ar 4s 3d 4p 1s	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^2$ $[Ar]\ 4s^2 \cdot 3d^2$
$_{23}V$ Vanadiy	K L M N + 2 8 11 2	Ar 4s 3d 4p 1s	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^3$ $[Ar]\ 4s^2 \cdot 3d^3$
$_{24}Cr$ Xrom	K L M N + 2 8 13 1	4s-pog'onadan 3d-pog'onaga	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^1 \cdot 3d^5$ $[Ar]\ 4s^1 \cdot 3d^5$

		elektronning «sak  	
$_{25}$Mn Marganets	 	 	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^5$ [Ar] $4s^2 \cdot 3d^5$
$_{26}$Fe Temir	 	 	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^6$ [Ar] $4s^2 \cdot 3d^6$
$_{27}$Co Kobalt	 	 	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^7$ [Ar] $4s^2 \cdot 3d^7$
$_{28}$Ni Nikel	 	 	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^8$ [Ar] $4s^2 \cdot 3d^8$
$_{29}$Cu Mis	 	 4s-pog'onadan 3d-pog'onaga elektronning «sakrashi»	$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^1 \cdot 3d^{10}$ [Ar] $4s^1 \cdot 3d^{10}$

$_{30}Zn$ Rux			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10}$ $[Ar]\ 4s^2 \cdot 3d^{10}$
$_{31}Ga$ Galliy			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10} \cdot 4p^1$ $[Ar]\ 4s^2 \cdot 3d^{10} \cdot 4p^1$
$_{32}Ge$ Germaniy			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10} \cdot 4p^2$ $[Ar]\ 4s^2 \cdot 3d^{10} \cdot 4p^2$
$_{33}As$ Mishyak			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10} \cdot 4p^3$ $[Ar]\ 4s^2 \cdot 3d^{10} \cdot 4p^3$
$_{34}Se$ Selen			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10} \cdot 4p^4$ $[Ar]\ 4s^2 \cdot 3d^{10} \cdot 4p^4$
$_{35}Br$ Brom			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10} \cdot 4p^5$ $[Ar]\ 4s^2 \cdot 3d^{10} \cdot 4p^5$
$_{36}Kr$ Kripton			$1s^2 \cdot 2s^2 \cdot 2p^6 \cdot 3s^2 \cdot 3p^6 \cdot 4s^2 \cdot 3d^{10} \cdot 4p^6$ $[Ar]\ 4s^2 \cdot 3d^{10} \cdot 4p^6$



10. Ayrim moddalar, aralashmalar va eritmalarning tarixiy (trivial) nomlanishlari

Suv

- Ammiakli — NH_3 to'yingan (25% li) eritmasi
- Bariyli — $Ba(OH)_2$ suvdagi to'yingan eritmasi
- Bromli — Br_2 suvdagi eritmasi
- Javel — KOH yoki NaOH suvdagi Cl_2 bilan to'yintirilgan eritmasi
- Qattiq — Ca^{2+} va Mg^{2+} ionlari 8 mekv/l dan ko'p bo'lgan
- Ohakli — $Ca(OH)_2$ suvdagi to'yingan eritmasi
- Yodli — I_2 suvdagi eritmasi
- Kristallizatsiya — kristallogidratlarning tarkibiga kiradigan
- YUmshoq — Ca^{2+} va Mg^{2+} ionlari 4 mekv/l dan kam bo'lgan
- Eng og'ir — T_2O
- Vodorod sulfidli — H_2S suvdagi eritmasi
- Og'ir — D_2O
- (ftorli suv yo'q)
- Xlorli — Cl_2 suvdagi eritmasi

Gaz

- Kuldiruvchi — N_2O
- Suv — CO va H_2 aralashmasi
- Qaldiroq — H_2 va O_2 aralashmasi (2:1 hajm bo'yicha)
- Kuydirilgan — FeS_2 kuyganda olinadigan (SO_2+O_2+N_2 aralashmasi + boshqa gazlar aralashmasi)
- Tabiiy (botqoq, ma'dan) — CH_4 (98% gacha+boshqa gazlar aralashmasi)
- Sulfitli — SO_2
- Sulfatli — SO_3
- Is — CO
- Karbonatli — CO_2

Tuz

- Bertole — $KClO_3$
- Glauber — $Na_2SO_4 \cdot 10H_2O$
- Achchiq, ingliz — $MgSO_4 \cdot 7H_2O$
- Sariq qon — $K_4[Fe(CN)_6]$
- Qizil qon — $K_3[Fe(CN)_6]$
- Mor — $(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$
- Osh, tosh — NaCl

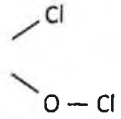
Soda

- Kalsinatsiyalangan — Na_2CO_3
- Kaustik — NaOH
- Kristallik — $Na_2CO_3 \cdot 10H_2O$
- Ichimlik — $NaHCO_3$

SHisha

- Suyuq — Na_2SiO_3 yoki K_2SiO_3 suvdagi eritmasi
- Kvars — SiO_2
- Dereza — $Na_2O \cdot CaO \cdot 6SiO_2$
- Organik (polimetilmetakrilat) — $-CH_2-\underset{\displaystyle COOCH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}}-_n$
- Eruvchan — $Na_2SiO_3 \cdot 9H_2O$
- Xrustal — $K_2O \cdot PbO \cdot 6SiO_2$

Ohak

- Oqlovchi, xlorli (xlorka) — $CaCl_2 \cdot Ca(ClO)_2 \Leftrightarrow CaOCl_2 \Leftrightarrow$ 
- So'ndirilgan (pushonka) — $Ca(OH)_2$
- Ohak qorishma — $Ca(OH)_2$, qum va suv aralashmasi
- Ohakli suv — ohakli suvdagi $Ca(OH)_2$ suspenziyasi
- Natron — NaOH va $Ca(OH)_2$ qattiq aralashmasi
- So'ndirilmagan — CaO

Qotishmalar

- Amalgamalar — Me Hg bilan qotishmalari
- Bronza — Cu(80-90%)+Sn(20-10%)
- Dyural, duralyumin — Al(95%)+Cu(3-5%)+Mn va Mg qo'shimcha
- Oltindan yuvelir buyumlar — Au Ag bilan va boshqa metallar bilan qotishmasi (yuvelir buyumlardagi probalar oltinni foiz miqdorini ko'rsatadi, masalan 375 proba — 37,5% Au, 583 proba — 58,3% Au)
- Latun — Cu+Zn(4-50%)
- Melxior — Cu+Ni(5-30%)
- Po'lat — Fe(98%)+C(1,5%)+ qo'shimchalar Mn, Cr, Ni, S, P, Si va b.r.
- CHo'yan — Fe(93%)+C(4,5% gacha)+ qo'shimchalar Mn, Cr, Ni, S, P, Si va b.r.

O'g'itlar

- Ammofos — $NH_4H_2PO_4$ va $(NH_4)_2HPO_4$ aralashmasi
- Qo'sh superfosfat — $Sa(H_2PO_4)_2 \cdot H_2O$
- Mochevina (karbamid) — $(NH_4)_2CO$
- Potash — K_2CO_3
- Pretsipitat — $SaHPO_4 \cdot 2H_2O$
- Oddiy superfosfat — $Sa(H_2PO_4)_2$ va $CaSO_4$ aralashmasi
- Selitra — ishqoriy, ishqoriy – er metallarining nitratlari va ammoniy nitratning umumiy nomlari:
  - Natriyli (chili) — $NaNO_3$
  - Kaliyli (hind) — KNO_3

- Kalsiyli (norveg) — $Ca(NO_3)_2$
- Ammiakli — NH_4NO_3

- Fosforit (suyak) uni — $Ca_3(PO_4)_2$

Minerallar

- Asbest — $3MgO{\cdot}2SiO_2{\cdot}2H_2O$
- Oq loy(kaolin) — $Al_2O_3{\cdot}2SiO_2{\cdot}2H_2O$
- Boksit — $Al_2O_3{\cdot}nH_2O$
- Bura — $Na_2B_4O_7{\cdot}10H_2O$
- Qo'ng'ir temirtosh — $Fe_2O_3{\cdot}H_2O$
- Gips — $CaSO_4{\cdot}2H_2O$
- Loytuproq, korund — Al_2O_3·
- Dolomit — $CaCO_3{\cdot}MgCO_3$
- Kuydirilgan gips, alebastr — $CaSO_4{\cdot}\ 0{,}5H_2O \Leftrightarrow 2CaSO_4{\cdot}H_2O$
- Ohaktosh, bo'r, marmar (kalsit) — $CaCO_3$
- Kinovar — HgS
- Qizil temirtosh (gematit) — Fe_2O_3
- Qumtuproq, qum, kvars, kremen — SiO_2
- Kriolit — $AlF_3{\cdot}3NaF \Leftrightarrow Na_3AlF_6$
- Oq magneziya — $3MgCO_3{\cdot}Mg(OH)_2{\cdot}3H_2O$
- Kuydirilgan magneziya — MgO
- Magnit temir toshi (magnetit) — Fe_3O_4
- Malaxit — $(CuOH)_2CO_3 \Leftrightarrow CuCO_3{\cdot}Cu(OH)_2$
- Pirolyuzit — MnO_2
- Oltingugurtli yoki temir kolchedani, pirit — FeS_2
- Silvinit — $KCl{\cdot}NaCl$
- Talk — $3MgO{\cdot}4SiO_2{\cdot}H_2O$
- Fosforit — $Ca_3(PO_4)_2$
- Aldama rux — ZnS

Kuporos

- Temir — $FeSO_4{\cdot}7H_2O$
- Mis — $CuSO_4{\cdot}5H_2O$
- Kuporos moyi — H_2SO_4 (60-70% li eritmasi)
- Rux — $ZnSO_4{\cdot}7H_2O$

Spirt

- Vino, tibbiy — C_2H_5OH
- YOg'och — CH_3OH
- Nashatir — $NH_3 \cdot H_2O \Leftrightarrow NH_4OH$ (NH_3 suvdagi eritmasi)

Boshqalar

- Alyumokalsiyli achchiqtosh — $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O \Leftrightarrow \Leftrightarrow KAl(SO_4)_2 \cdot 12H_2O$
- Berlin lazuri — $Fe_4[Fe(CN)_6]_3$
- Aroq — 40% li (hajm bo'yicha) C_2H_5OH suvdagi eritmasi
- Gipосulfit — $Na_2S_2O_3 \cdot 5H_2O$
- Qaldiroq kumush — Ag_3N
- O'yuvchi natr — NaOH
- O'yuvchi kaliy — KOH
- Oltin tuz — $Na[AuCl_4] \cdot 2H_2O$
- Kalomel — Hg_2Cl_2
- Karborund — SiC
- Koks, ko'mir, qurum, grafit — C
- Lyapis — $AgNO_3$
- Margansovka — $KMnO_4$ suvdagi eritmasi
- Natr — Na_2O
- Nashatir — NH_4Cl
- Nitrolovchi aralashma — $HNO_{3(kons)} + H_2SO_{4(kons)}$ (1:2 hajm bo'yicha)
- Oleum — 100 % H_2SO_4 dagi SO_3 eritmasi
- Pergidrol — 30% li H_2O_2 suvdagi eritmasi
- Plavik kislota — HF eritmasi
- Zang — $FeOOH \Leftrightarrow Fe(=O)(-O-H)$
- Silan — SiH_4
- Silikagel — SiO_2
- Sianid kislota — HCN
- Xlorid kislota — HCl
- Susal oltini — Au yupqa bo'lagi, SnS_2 plastinkasi
- Sulema — $HgCl_2$
- Quruq muz — qattiq CO_2

- Turnbul ko'ki — $Fe_3[Fe(CN)_6]_2$
- Sirka — 3-9% li CH_3COOH eritmasi
- Sirka essensiyasi — 70-80% li CH_3COOH eritmasi
- Farfor, fayans — $xSiO_2 \cdot yAl_2O_3 \cdot zK_2O$
- Formalin — 40% li formaldegid HCHO suvdagi eritmasi
- Fosfin — $PH_3\uparrow$
- Xromli aralashma — $H_2SO_{4(kons)}+K_2Cr_2O_7$ to'yingan eritmasi (1:1 hajm bo'yicha)
- Zar suvi — $HNO_{3(kons)}+HCl_{(kons)}$ (1:3 hajm bo'yicha)

11. Ayrim uglevodorodlar va ular hosilalarining nisbiy molekulyar massalari

		–H	–Cl	–Br	–I	–OH	–CHO	–COOH	$–NH_2$	$–NO_2$
–H	1	2	36,5	81	128	18	30	46	17	47
$–CH_3$	15	16	50,5	95	142	32	44	60	31	61
$–C_2H_5$	29	30	645	109	156	46	58	74	45	75
$–C_3H_7$	73	74	78,5	123	170	60	72	88	59	89
$–C_4H_9$	57	58	92,5	137	184	74	86	102	73	103

C – Br	276	0,191
O – H	463	0,096
N – H	391	0,101
– H O**	~20	0,204

* Benzol yadrosidagi aromatik bog'lanish ** Vodorod bog'lanish

13. Ayrim organik moddalarning nisbly molekulyar massalari

Moddaning nomlanishi	Formulasi	Nisbly molekulyar massasi
Akril kislota	$CH_2 = CH - COOH$	72
Aminokapron kislota	$NH_2 - (CH_2)_5 - COOH$	131
α – aminopropan kislota	$CH_3 - CH - COOH$	89
Aminosirka kislota (glitsin, glikokol)	$NH_2 - CH_2 - COOH$	75
Atsetilen	$HC \equiv CH$	26
Mis(1)atsetilenidi	$Cu - C \equiv C - Cu$	151
Kumush atsetilenidi	$Ag - C \equiv C - Ag$	240

Monoxlorsirka kislota	$Cl - CH_2 - COOH$	94,5
Naftalin	$C_{10}H_8$	128
Etilen oksidi	$(CH_2)_2O$	44
Olein kislota	$C_{17}H_{33}COOH$	282
Pikrin kislota (trinitrofenol)	$HO - C_6H_2 - (NO_2)_3$	229
Saxaroza	$C_{12}H_{22}O_{11}$	342
Natriy stearat	$C_{17}H_{35}SOONa$	306
Stirol(vinilbenzol)	$C_6H_5 - CH = CH_2$	104
Tribromanilin	$NH_2 - C_6H_2 - Br$	330
Tribromfenol	$HO - C_6H_2 - Br_3$	331
Trimetilamin	$(CH_3)_3N$	59
Trinitrotoluol	$CH_3 - C_6H_2 - (NO_2)_3$	227
Trinitrotselyuloza	$C_6H_{17}O_5(NO_2)_3$	297
Ucholein	$CH_2 - OCO - C_{17}H_{33}$ $\vert$ $CH - OCO - C_{17}H_{33}$	884
Uchpalmitin	$CH_2 - OCO - C_{15}H_{31}$ $\vert$ $CH - OCO - C_{15}H_{31}$	806
Uchstearin	$CH_2 - OCO - C_{17}H_{35}$ $\vert$ $CH - OCO - C_{17}H_{35}$	890
Trixloranilin	$NH_2 - C_6H_2Cl_3$	196,5
Trietilamin	$(C_2H_5)_3N$	101

Sirka angidrid	$(CH_3CO)_2O$	102
Xloroform	$CHCl_3$	119,5
Siklogeksan	C_6H_{12}	84
Oksalat kislota	$H_2C_2O_4(HOOC-COOH)$	90
Etilamin	$C_2H_5-NH_2$	45
Etilatsetat	$CH_3COOC_2H_5$	88
Etilen	$CH_2=CH_2$	28
Etilenglikol	$\begin{matrix} CH_2 - CH_2 \\ \vert \quad\quad \vert \\ OH \quad\quad OH \end{matrix}$	62

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