

K I M Y O

fanidan ma'ruzalar

(slaydlar va animasiyalar)

- Muallif: t.f.n. Q.O'.Komilov

O'UK 540
BBk 24.1
N52

Muallif:

Komilov Q.O'.

Kimyo fanidan elektron o'quv-uslubiy majmua.

Taqrizchi: Toshkent irrigasiya va qishliq xo'jaligini mexanizatsiyalashtirish muxandislar instituti test-tahlil markazi
va axbrot – resurs markazi;
Institut sifat sifat komissiyasi

N52 Kimyo. Taqdimot materiallari. 1.0 taklif. [Elektron resurs] : ko'rgazmali qo'llanma / Komilov Q.O'. – Elektron ma'lumotnoma (6 Mb). – Toshkent: TIQXMMI, "Fizika va kimyo" kafedrasida 2017. – (Kimyo: FO'UM № - 2017 / rahbar Komilov Q.O'). – 1 - elektron disk(DVD). – Talab tizimi: *Intel Pentium* (yoki boshqa ishlab chiqaruvchining mos protsessori) 1 GGts; 512 Mb operativ xotira; 6 Mb ozod disk fazosi; *DVD o'tkazgich*; *Microsoft Windows 2000 SP 4 / XP SP 2 / Vista* (32 bit operatsion tizimi) ; *Microsoft Power Point 2003* yoki yuqori.

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Davlat registratsiyasi raqami

Davlat registratsiyasi raqami

(majmua)

(qo'llanma)

Ushbu jamlanma Kimyo fani bo'yicha ma'ruzalar matnini, laboratoriya – amaliyoti, mustaqil ishlar bo'yicha uslubiy ko'rsatmani, nazorat-o'lchov materiallarini "Kimyo. Test topshiriqlari banki" ni o'z ichiga olgan Kimyo fanidan elektron o'quv – uslubiy majmuaning bir qismi hisoblanadi.

Keltirilgan taqdimotlar (slydlar va animatsiyalar shaklida) «Kimyo» ning nazariy qismiga mo'ljallangan bo'lib,

Quyidagi yo'nalishlar: talabalariga mo'ljallangan.

© Toshkent irrigatsiya qishloq xo'jaligini mexanizatsiyalashtirish muxandislari instituti, 2017 y.
TIQXMMI o'quv-uslubiy Kengashi tomonidan chop etishga taqdim etilgan

Ishlanma va elektron ta'lim resursini bezash: TIQXMMI test-tahlil markazi va axbrot test markazi tomonidan amalga oshirildi

Ushbu elektron majmua ma'lumotlari mualliflik huquqi bilan chegaralangan va qonun bilan himoyalangan bo'lib, undan mualliflar rusatisiz husxa ko'chirish taqiqlanadi.

Foydalanish uchun imzo 25.10..2017

Hajmi 6 Mb

Toshkent: TIQXMMI, 100000, Toshkent, Qoriy Niyoziy ko'chasi, 39

Mundarija

Umumiy ma'lumotlar

1-modul. Kimyoning umumnazariy asoslari

- 1-bo'lim. Kimyoning asosiy tushunchalari va qonunlari
- 2-bo'lim. Kimyoviy jarayonlarning umumiy qonuniyatlari
- 3-bo'lim. Atom tuzilishi va davriy jadval
- 4-bo'lim. Kimyoviy bog'lanish
- 5-bo'lim. Dispers tizimlar va eritmalar

2-modul. Kimyoviy elementlar va ularning birikmalari

- 7-bo'lim. Kimyoviy elementlarning umumiy tavsifnomasi

3-modul. Kimyoviy identifikatsiya va moddalar tahlili

Umumiy ma'lumotlar

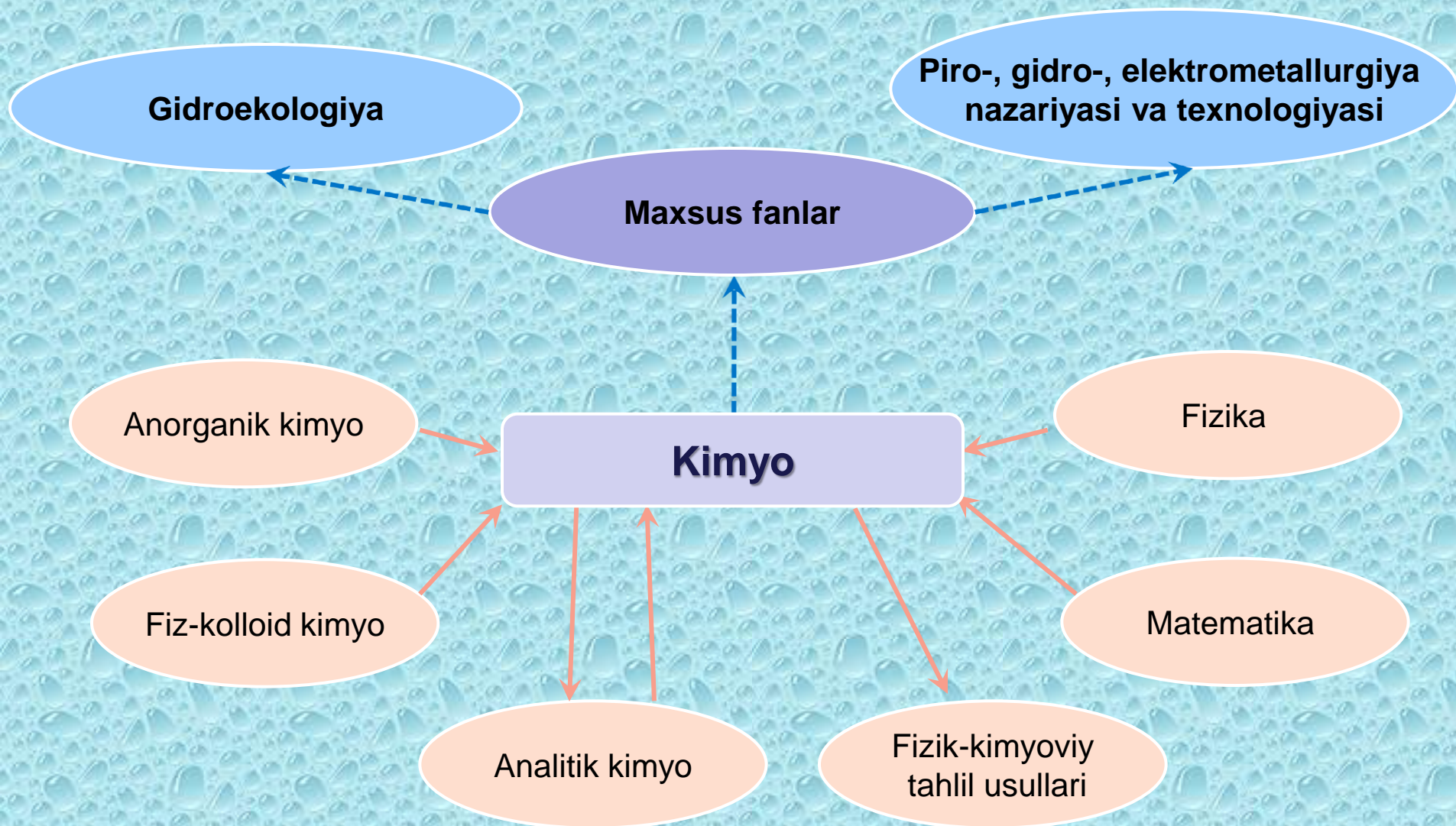
Kursning maqsadi:

- Yangi avlod bitiruvchisining shakllanishiga imkon yaratuvchi kompetentsiyalarni rivojlantirish.
- Asosiy qonuniyatlarni va kimyoning asosiy usullarini kimyoning turli muammolarini yeichishdagi fan sifatida o'rganish yo'li bilan talabalarda kimyoviy fikrlashni shakllantirish.
- Predmet tarkibini o'gatish va uni o'zlashtirilashi bo'yicha mos tashkiliy ishlarni (laboratoriya amaliyoti, mashq va masalalar yechish, ham laboratoriya- amaliyot, ham hazariy yo'nalishda) kelajak mutaxassis – bakalavrlarni ijodiy qobiliyatini shakllantirish.
- Talabalar tomonidan korxonalar va ilmiy tekshirish institutlari tahliliy laboratoriyalarida zamonaviy kimyoviy va fizik-kimyoviy metodlarni qo'llash ko'nikmalarini bilib olish.

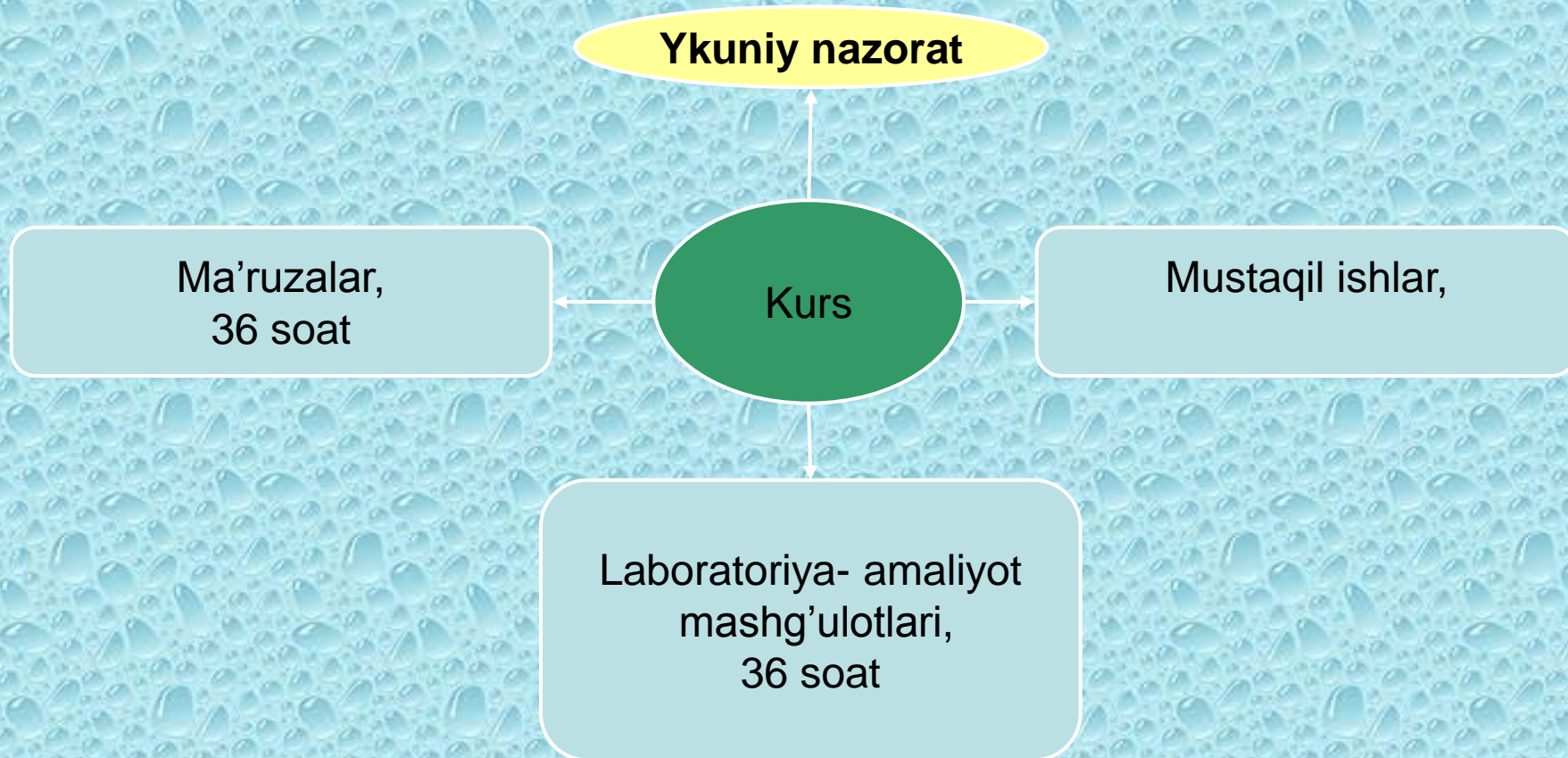
Kursning vazifasi

- **Xalq xo'jaligining (Qishloq va suv xo'jaligi) tarmoqlarida foydalaniladigan kimyoviy reaksiyalar tabiatini tushunishni o'rgatish.**
- **Kimyoviy reaksiyalarni borishining umumiy qonuniyatlarini, atom tuzilishi haqidagi zamonaviy tushunchani, elementlar davriy jadvalidagi elementlarni holati va kimyoviy bog'lanishdan foydalanish**
- **Kimyoviy reaksiyalar yo'nalishi va birikmalarning xossalari boshorat qilish va aniqlash**
- **Davriy jadvaldagi holati va element atomining tuzilishidan kelib chiqqan holda anorganik moddalarning xossalari tahlilini olib borish.**

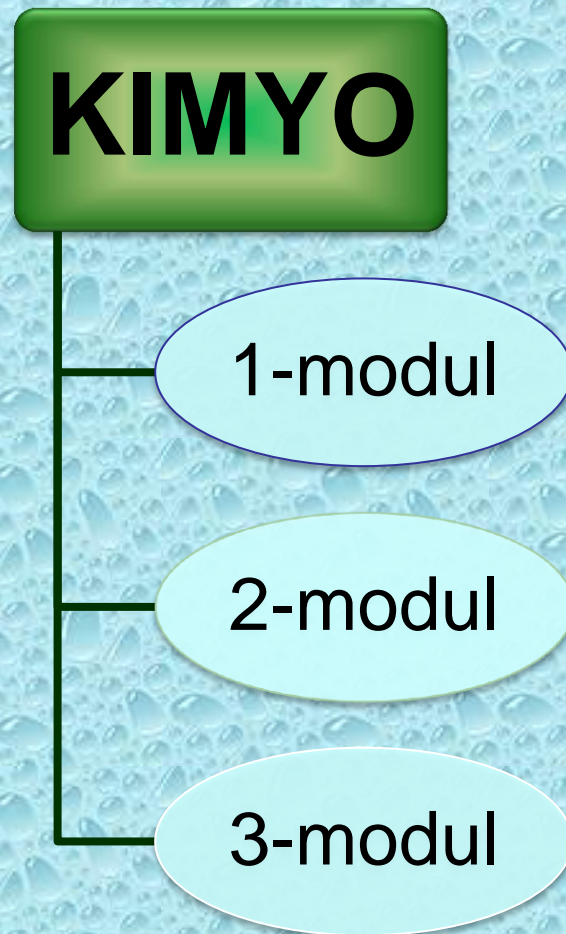
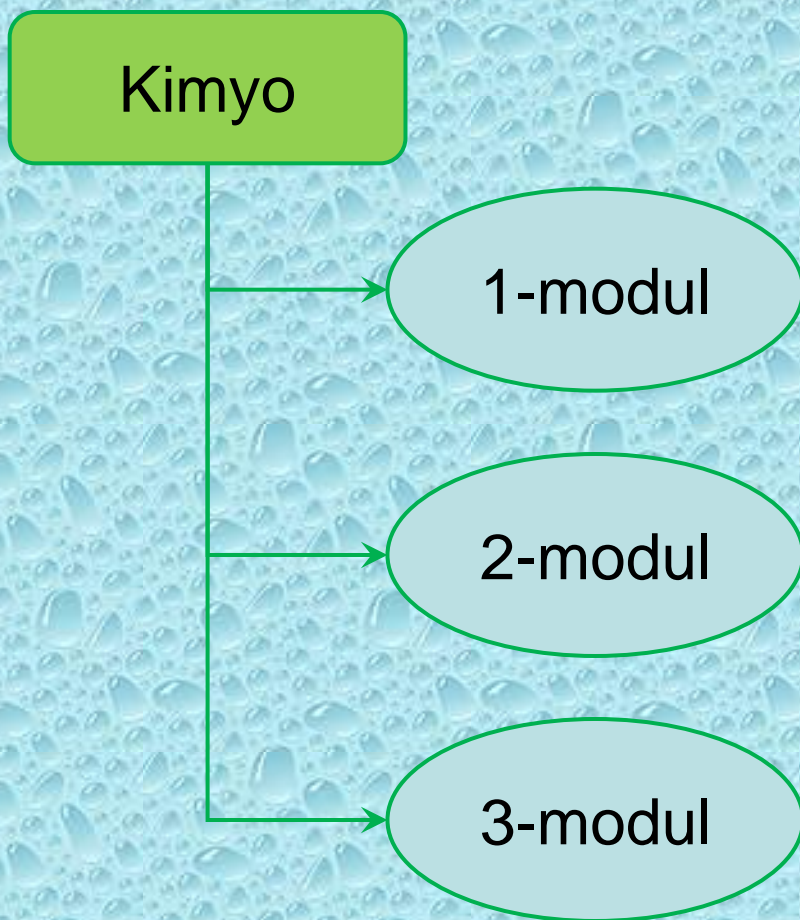
Fanlararo o'zaro bog'liqlik



Kurs qismlari



Kurs tarkibi



Foydalanilgan adabiyotlar

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9. Глинка, Н. Л. Общая химия / Н. Л. Глинка. – М. : Интеграл-Пресс, 2002. – 780с.
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12. Основы аналитической химии в 2-х кн., Книга 2. Методы химического анализа: учеб. для вузов под ред. А. Ю. Золотова. 2-е изд., перераб. и доп. – М. : Высш. шк., 1999 – 494с.

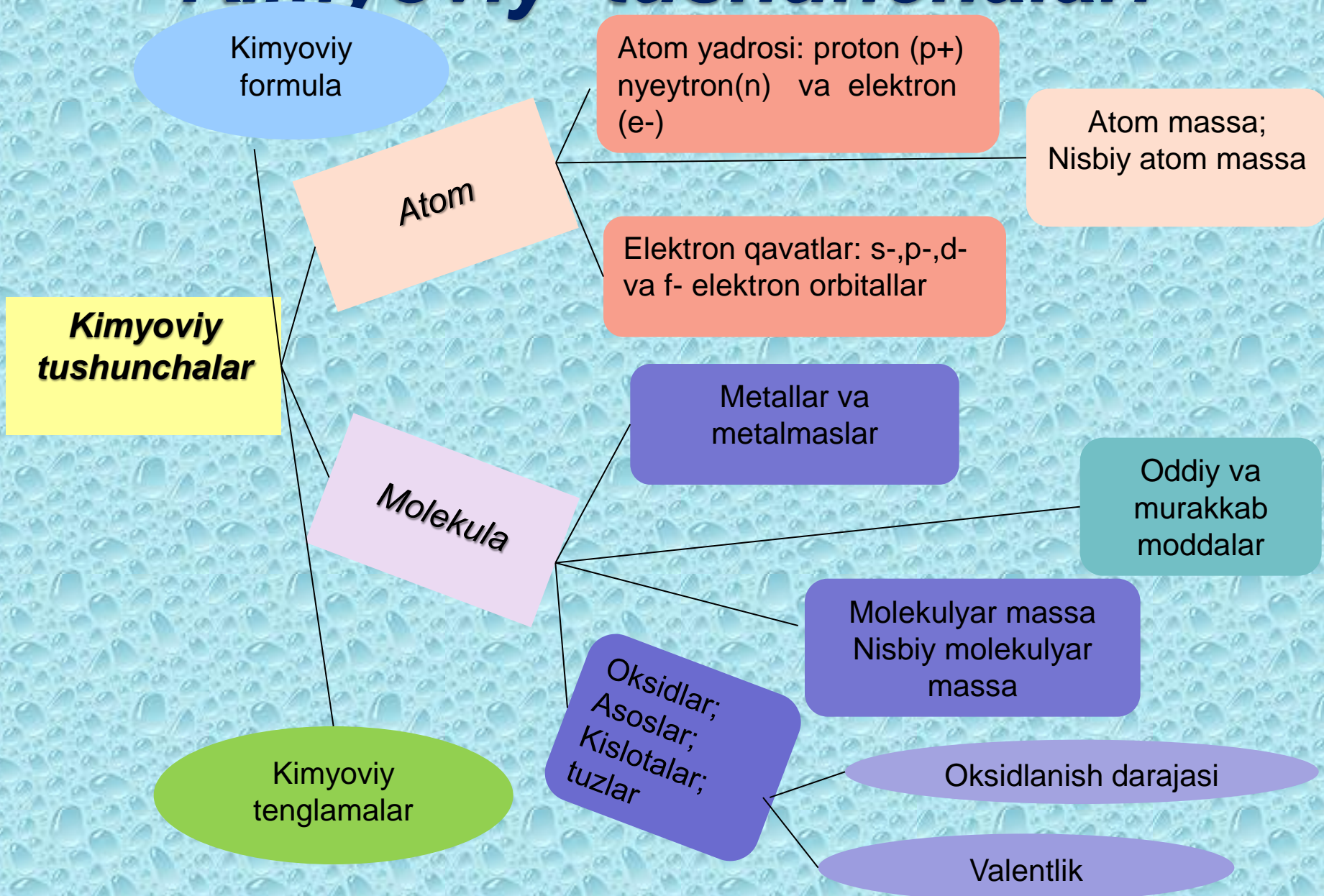
1 - modul

Kimyoning umumnazariy asoslari

1 - qism

Kimyoviy jarayonlarning umumiy qonuniyatlari

Kimyoviy tushunchalari



Kimyoviy formula

Atom

Atom yadrosi: proton (p+) nyeytron(n) va elektron (e-)

Atom massa; Nisbiy atom massa

Elektron qavatlar: s-,p-,d- va f- elektron orbitallar

Kimyoviy tushunchalar

Metallar va metalmaslar

Molekula

Oddiy va murakkab moddalar

Molekulyar massa Nisbiy molekulyar massa

Kimyoviy tenglamalar

Oksidlar; Asoslar; Kislotalar; tuzlar

Oksidlanish darajasi

Valentlik

Tushunchalar

Kimyo – moddalarning tarkibi, tuzilishi, xossalari va ularning bir turdan boshqa turga aylanishi sababi va qonuniyatlarini o'rganadigan fanidir.

Modda – bir turdagi molekula yoki kristallar to'plami bo'lib, o'zining aniq tarkibi, tuzilishi va xossasi bilan bir-biridan farq qiladigan turli ko'rinishdagi materiyadir.

Atom – bu musbat zaryadlangan atom yadrosi bilan manfiy zaryadlangan elektronlardan tarkib topgan elektroneytral zarrachadir.

- *Molekula* – bu berilgan moddaning kimyoviy xossalari ega bo'lgan eng kichik zarrachasidir. Molekulaning kimyoviy xossalari uning tarkibi va kimyoviy tuzilishi bilan aniqlanadi.

Kimyoviy element – bu yadrosining musbat zaryadi bir xil bo'lgan atomlarning muayyan turidir.

Bitta elementning atomlaridan hosil bo'lgan moddalar **oddiy** moddalar deb yuritiladi. Oddiy moddalarning sifat tarkibi bir xil, tuzilishi va xossalari har xil bo'lishi **allotropiya** hodisasi deyiladi, har bir holatga to'g'ri keluvchi moddalar **allotropik shakllar** deyiladi

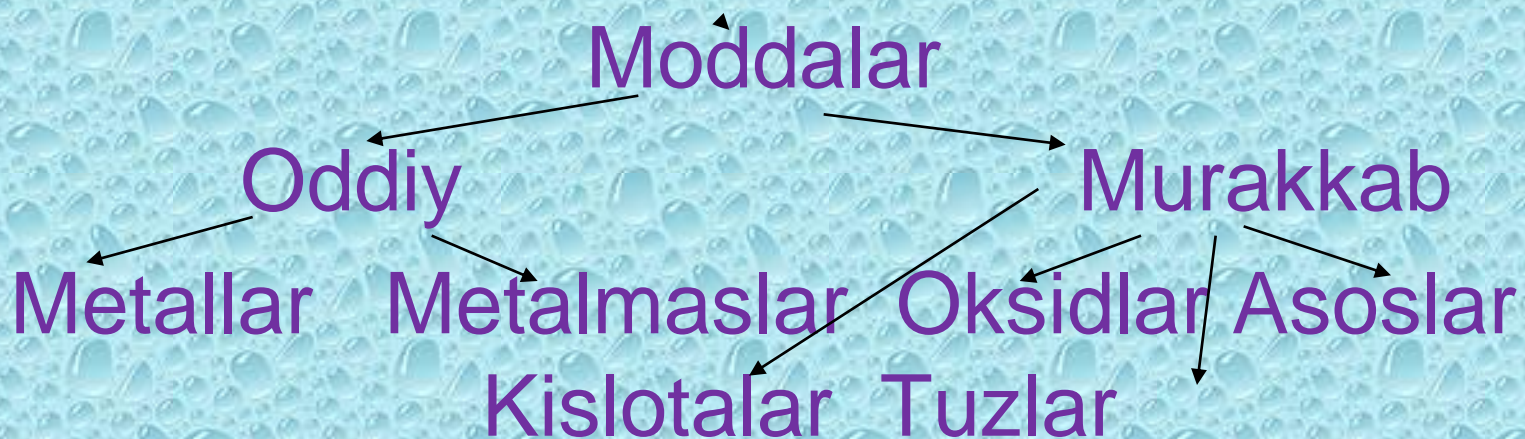
Kimyoviy tenglamalar

- Kimyoviy tenglamalar – kimyoviy hodisalarni, kimyoviy formula va koeffitsiyentlar yordamida ifodalashning shartli yozish usulidir.
 - k.t. ruy byerayotgan hodisaning kyechishini, kimyoviy ma'nosini bilishga;
 - k.t. ayni reaktsiyalarda moddalarning o'zaro miqdoriy munosabatlarini tushunib yetishga;
 - k.t. tyegishli hisoblashlarni amalga oshirishga yordam byeradi;
 - k.t. larni tuzganda uning ikki tomonidagi reaktsiyada ishtirok etuvchi, elyemyent atomlari sonio'zaro teng bo'lishi shart.

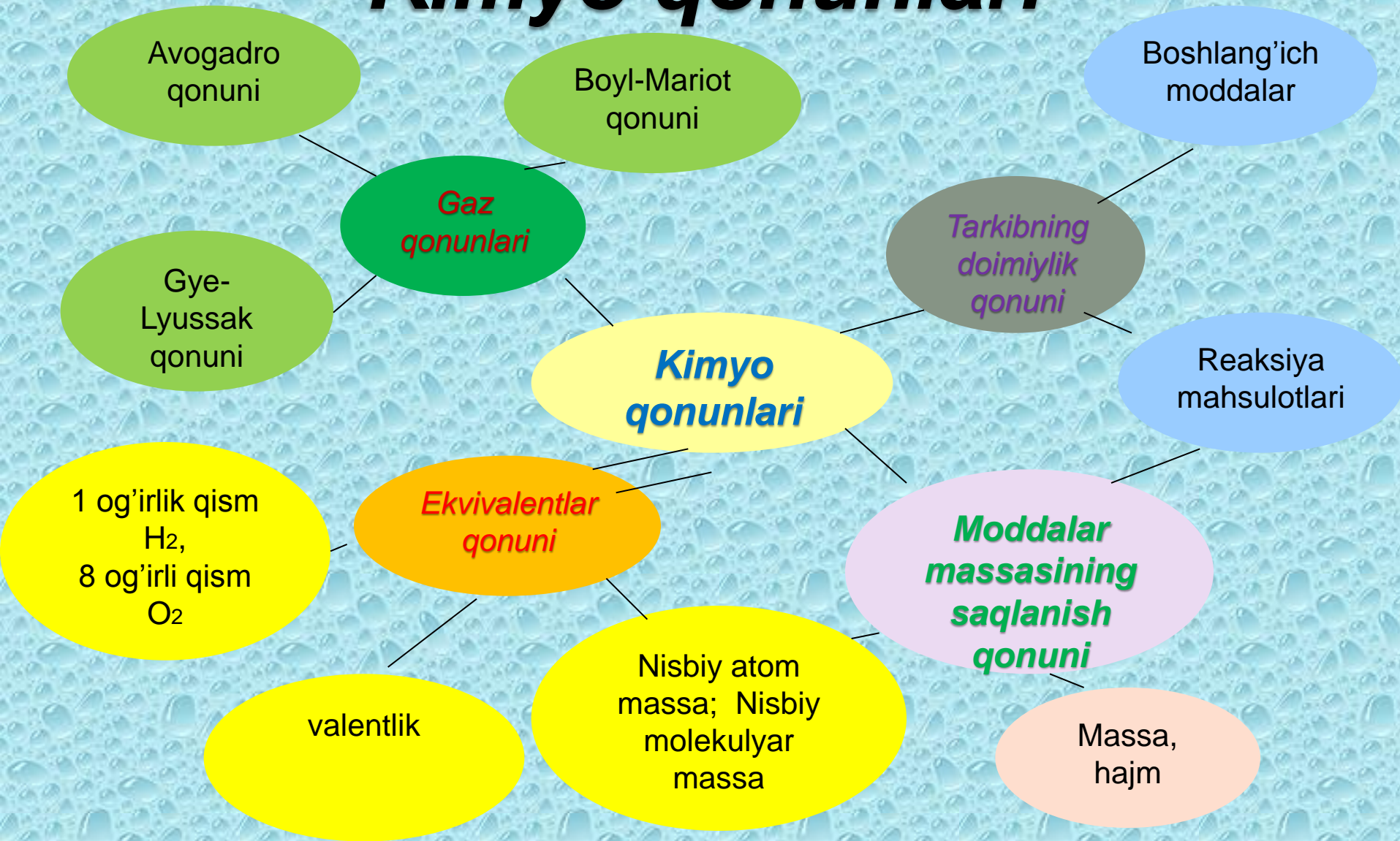


Oddiy moddalar – bu bir xil element atomlaridan iborat moddalar.

Murakkab moddalar - bu bir necha element atomlaridan tarkib topgan moddalardir. Murakkab moddalar oddiy moddalarga nisbatan ko'pchilikni tashkil etadi.



Kimyo qonunlari

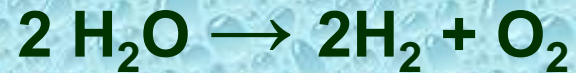




Moddalar massasining saqlanish qonuni



Lavuaz'e
(1789)



m_1

m_2

m_3

$$4 \cdot 1 + 2 \cdot 16 = 4 \cdot 1 + 2 \cdot 16$$

$$36 = 36$$



Lamonsov
(1756)

$$m_1 = m_2 + m_3$$

XP tenglamasini yozamiz

XP tenglamasi bo'yicha
masalani yechamiz

No	Modda	m	n	N
1	Azot	?	10 kmol	?
2	Karbonat angidrid	88 mg	?	?
3	Ozon	?	?	$24 \cdot 10^{26}$
4	Yod	?	5 mmol	?
5	Fosfor	6,2 kg	?	?



No	Modda	V	n	N	m
1 	Azot	?	?	$6 \cdot 10^{27}$?
2 	Uglerod (IV) oksid	44.8 m ³	?	?	?
	Kislород	11.2 l	?	?	?
	Ozon	?	3 kmol	?	?
	Xlor	?	?	?	106,5 mg



Modda tarkibining doimiylik qonuni.

J.-L. Prust tomonidan 1799 yilda asoslagan:

Har qanday toza modda uning olinish usulidan qat'iy nazar doimo bir xil sifatli va miqdoriy tarkibga ega.

Lekin XIX boshlarida. K. Bertolle ko'rsatib berganki, elementlar bilan ta'sirlashuvchi moddalarning massasiga ko'ra turli tengliklarda birikadi.

Avogadro qonuni.

Italiya olimi A. Avogadro 1811 yilda quyidagi gipotezani ilgari surdi: **bir xil sharoitda (bir xil harorat va bir xil bosimda) va barobar hajmda olingan turli gazlarning molekullari soni o'zaro teng bo'ladi.**

Avogadroning bu qonuni juda ko'p tajribalar yordamida tasdiqlandi va 1860 yildan boshlab qonun sifatida tan olindi. Avogadro qonunidan uchta xulosa chiqadi:

- 1. Oddiy gazlarning (kislorod, vodorod, azot, xlor) molekullari ikki atomdan iborat.**
- 2. Normal sharoitda bir mol gaz 22,4 l hajmni egallaydi.**

Avogadro qonunidan ikkita xulosa kelib chiqadi:

1. Bir xil sharoitda har qanday gazning bir molekulasini bir xil hajmni egallaydi. Bu hajm, normal sharoitda (bosim $P = 101325 \text{ Pa}$ va absolyut harorat $T = 273,15 \text{ K}$) molyr hajm - (V_m) $22,4 \text{ l}$ deb nomlanadi :

2. Bir xil sharoitda teng hajmda olingan ikki gaz massasi orasidagi nisbat shu gazlarning molekulyar massasi orasidagi nisbatga teng.

Bir gaz muayyan hajmi massasining xuddi shunday hajmdagi ikkinchi gaz (o'sha sharoitlarda olingan) massasiga nisbati birinchi gazning ikkinchi gazga nisbatan zichligi deyiladi. (D harfi bilan belgilanadi):

$$M_1 / M_2 = D, \text{ bundan } M_1 = M_2 * D$$

Sharl – Gey- Lyussak qonuniga muvofiq:

a) o'zgarmas bosimda gaz massasining hajmi gazning mutlaq haroratiga proportsional bo'ladi:

$$V = (\text{const} \cdot T) P_1 m \text{ yoki } V_1/V_2 = T_1 / T_2$$

Bu yerda: $T=273+t_0$; uni darajaning Kelvin shkalasi deyiladi (K harfi bilan yoziladi).

b) o'zgarmas hajmda o'zgarmas gaz massasining bosimi gazning mutlaq haroratiga proportsional bo'ladi:

$$P = (\text{const} \cdot T) V_1 m \text{ yoki } P_1/ P_2 = T_1 / T_2$$

Ideal gaz holati tenglamasi (Mendeleev – Klaypeyron tenglamasi)

$$pV = \frac{m}{M} RT \quad \text{yoki} \quad pV = nRT,$$

Bu yerda: p – bosim;

V – gaz hajmi; m – massa gaza;

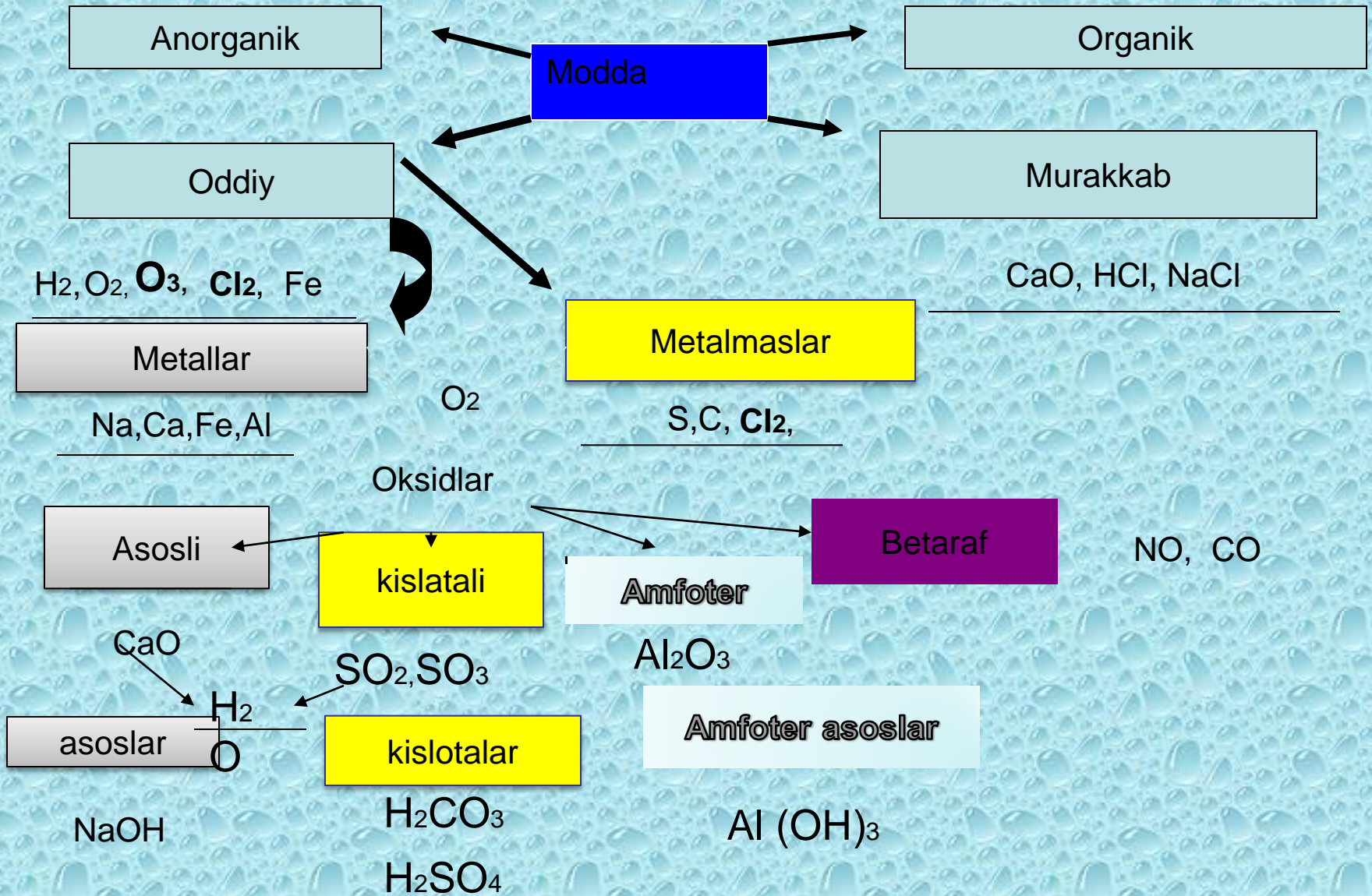
M – gazning molyar massasi;

T – harorat;

n – gaz moddasi miqdori, mol;

R – universal gaz doimiysi, uning qiymati birligi bosim va hajm o'lchanadigan birlikda o'lchanadi.

Anorganik birikmalarning sinflari



Genetik qator

•

${}_{20}\text{Ca}(4s^2)$
kalsiy

${}_{16}\text{S}(3s^23p^4)$
oltigugurt

Oddiy moddalar

Ca^0

S^0

$+\text{O}_2$

$+\text{O}_2$

$\text{Ca}^{+2}\text{O}^{-2}$

$\text{S}^{+4}\text{O}_2^{-2}$

kalsiy oksid

oltigugurt (IV) oksid

$+\text{H}_2\text{O}$

$+\text{H}_2\text{O}$

$\text{Ca}^{2+}(\text{OH}^-)_2$

$\text{H}_2+\text{S}^{+6}\text{O}_4^{-2}$

kalsiy gidroksid

sulfat kislota

$\text{Ca}^{2+}\text{SO}_4$

kalsiy sulfat tuzi

- Asosli oksid + H₂O = ishqor
 $\text{Ca(OH)}_2 + \text{H}_2\text{O} = \text{Ca(OH)}_2$
- Asosli oksid + kislota = tuz + H₂O
 $\text{Na}_2\text{O} + 2\text{HCl} = 2\text{NaCl} + \text{H}_2\text{O}$
- Asosli oksid + kislotali oksid = tuz
 $\text{K}_2\text{O} + \text{CO}_2 = \text{K}_2\text{CO}_3$
- Kislotali oksid + ishqor = tuz + H₂O
 $\text{N}_2\text{O}_5 + 2\text{NaOH} = 2\text{NaNO}_3 + \text{H}_2\text{O}$
- Kislotali oksid + H₂O = kislota
 $\text{SO}_3 + \text{H}_2\text{O} = \text{H}_2\text{SO}_4$

- Kislota + Me = Tuz + H₂
$$2\text{HCl} + \text{Zn} = \text{ZnCl}_2 + \text{H}_2$$
- Kislota + Me₂O_n = Tuz + H₂O
$$\text{H}_2\text{SO}_4 + \text{CaO} = \text{CaSO}_4 + \text{H}_2\text{O}$$
- Kislota + Me(OH)_n = Tuz + H₂O
$$3\text{HNO}_3 + \text{Fe(OH)}_3 = \text{Fe(NO}_3)_3 + 3\text{H}_2\text{O}$$
- Kislota + Tuz = Tuz* + Kislota*
$$\text{HCl} + \text{Na}_2\text{CO}_3 = 2\text{NaCl} + \text{CO}_2 + \text{H}_2\text{O}$$

Пойдевор учун конспект

- Ishqor + Hem₂O_m = Tuz + H₂O
 $2\text{NaOH} + \text{SO}_3 = \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- Ishqor + Kislota = Tuz + H₂O
 $\text{KOH} + \text{HNO}_3 = \text{KNO}_3 + \text{H}_2\text{O}$
- Ishqor + Tuz = Tuz' + ASos'
 $3\text{LiOH} + \text{FeCl}_3 = \text{Fe}(\text{OH})_3 + 3\text{LiCl}$
- Suvda erimaydigan asos + Kislota = Tuz + H₂O
 $\text{Zn}(\text{OH})_2 + \text{HCl} = \text{ZnCl}_2 + \text{H}_2\text{O}$
- Asos \longrightarrow Me₂O + H₂O
 $\text{Fe}(\text{OH})_2 \longrightarrow \text{FeO} + \text{H}_2\text{O}$

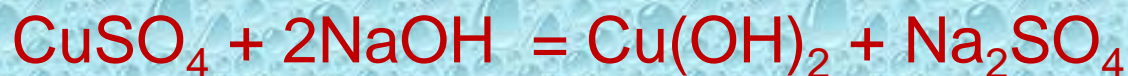
- Tuz + Me = Tuz + Me



Tuz + Kislota = Tuz + Kislota



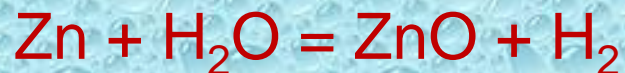
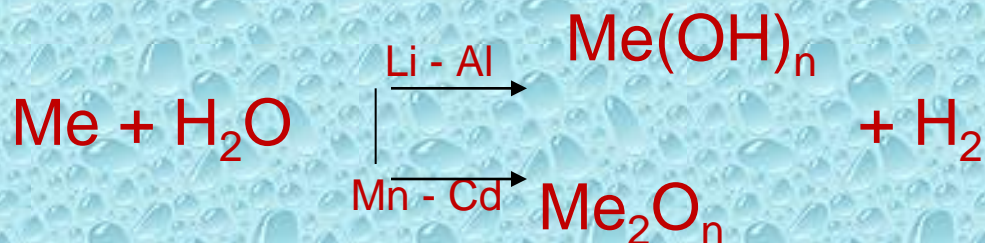
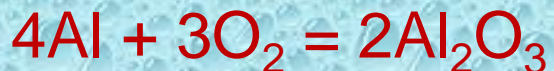
Tuz + Ishqor = Tuz + Asos



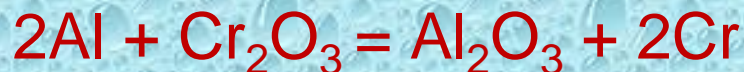
Tuz + Kislota = Tuz + Kislota



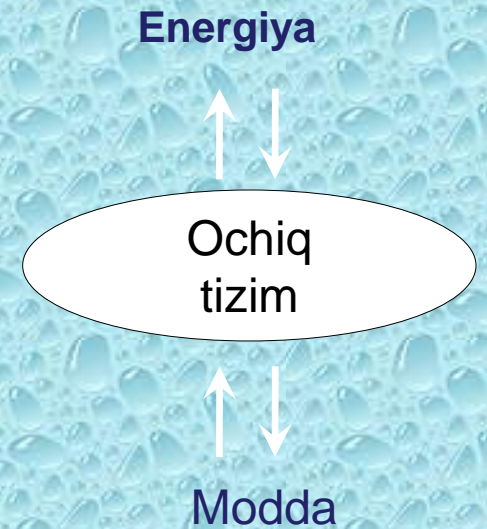
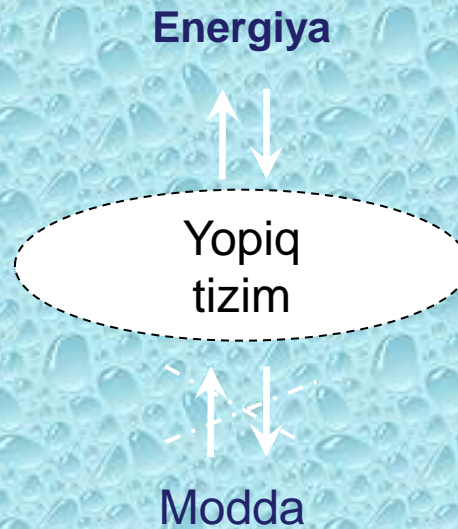
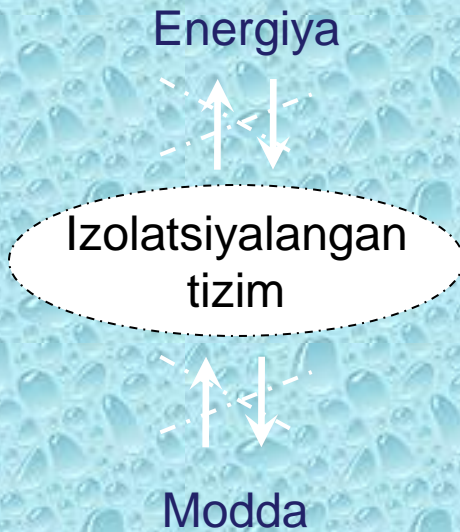
- Me + Metalmas = Tuz, Oksid



- Tuz + Me = Tuz + Me



Tizimlar tiplari



Termodinamikaning birinchi qonuni

Izolyatsiyalangan tizim energiyasi doimiydir.



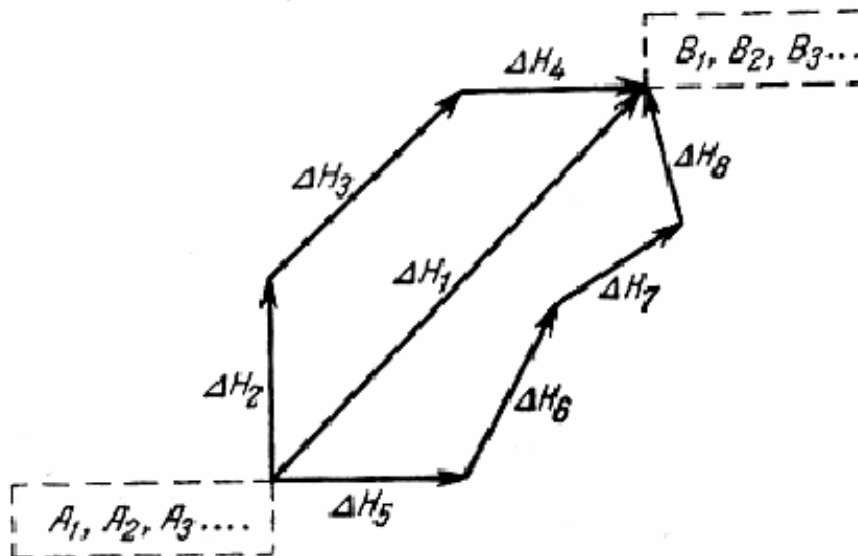
$$dU = \delta Q - \delta A$$

Sistema ichki energiyasining o'zgarishi (dU), sistemadan tashqi muhitga (yoki teskarisi) issiqlik miqdoriga (δQ) teng, y'nisistema tomonidan tashqi muhitga (yoki teskarisi) qilingan hamma turdagi ishlarni (δA) hisoblaganda.

Gess qonuni

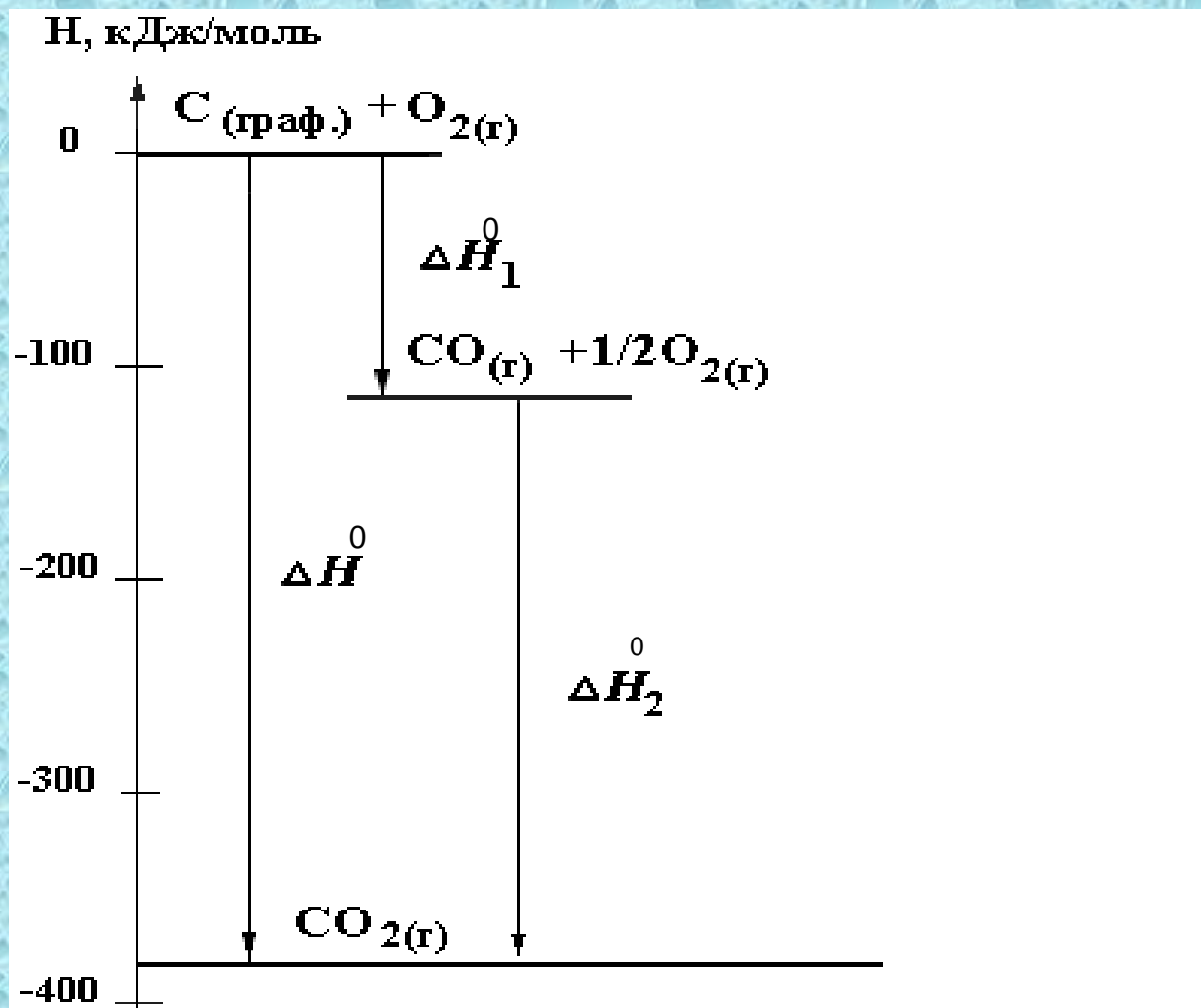
Kimyoviy reaksiyalarning issiqlik effekti boshlang'ich moddalarni va reaksiya mahsulotlarini turiga va holatiga bog'liq, lekin o'tish yo'liga bog'liq emas.

G. I. Gess (1836 y.) –
prof. Tog'chilik instituti ta
(Petrburg)

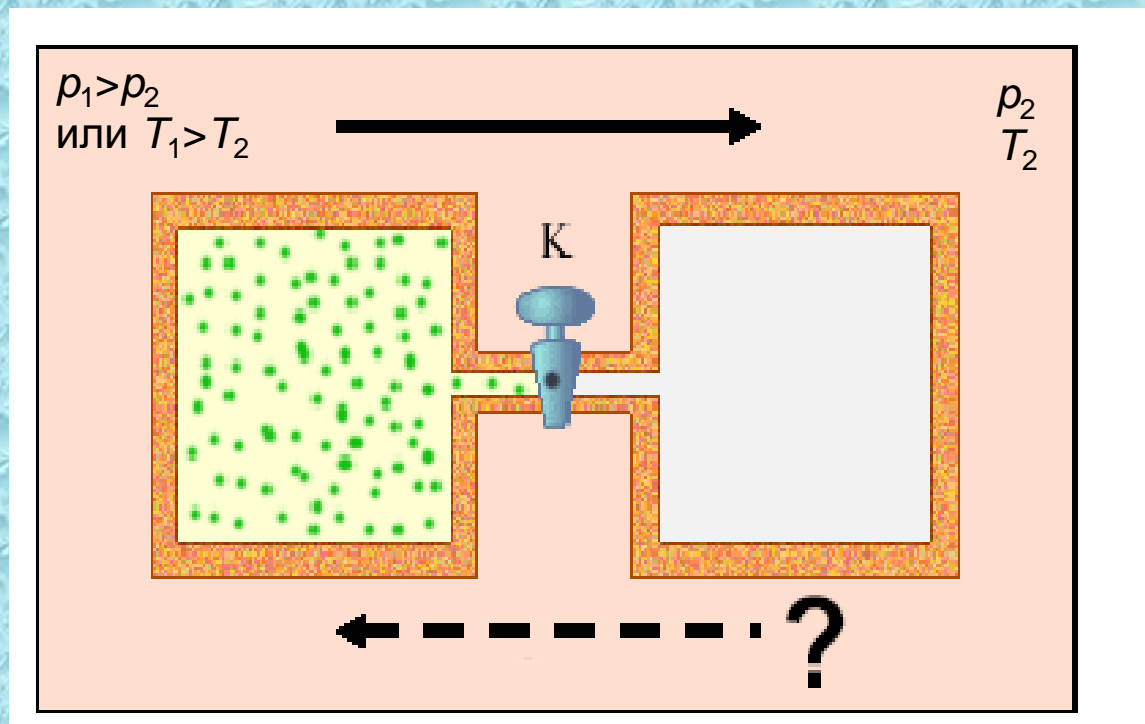


Xulosa: reaksiyaning issiqlik effekti, tenglamaning o'ng tomonida ko'rsatilgan (mahsulotlar), va chap tomonidagi keltirilgan (reagentlar) hamma moddalar hosil bo'lish issiqliklarini stexiometrik koeffitsentlari bilan olingan (yonish issiqligi uchun va teskarisi!) orasidagi farqqa teng.

Grafitni oksidlanishini ental'piya diagrammasi

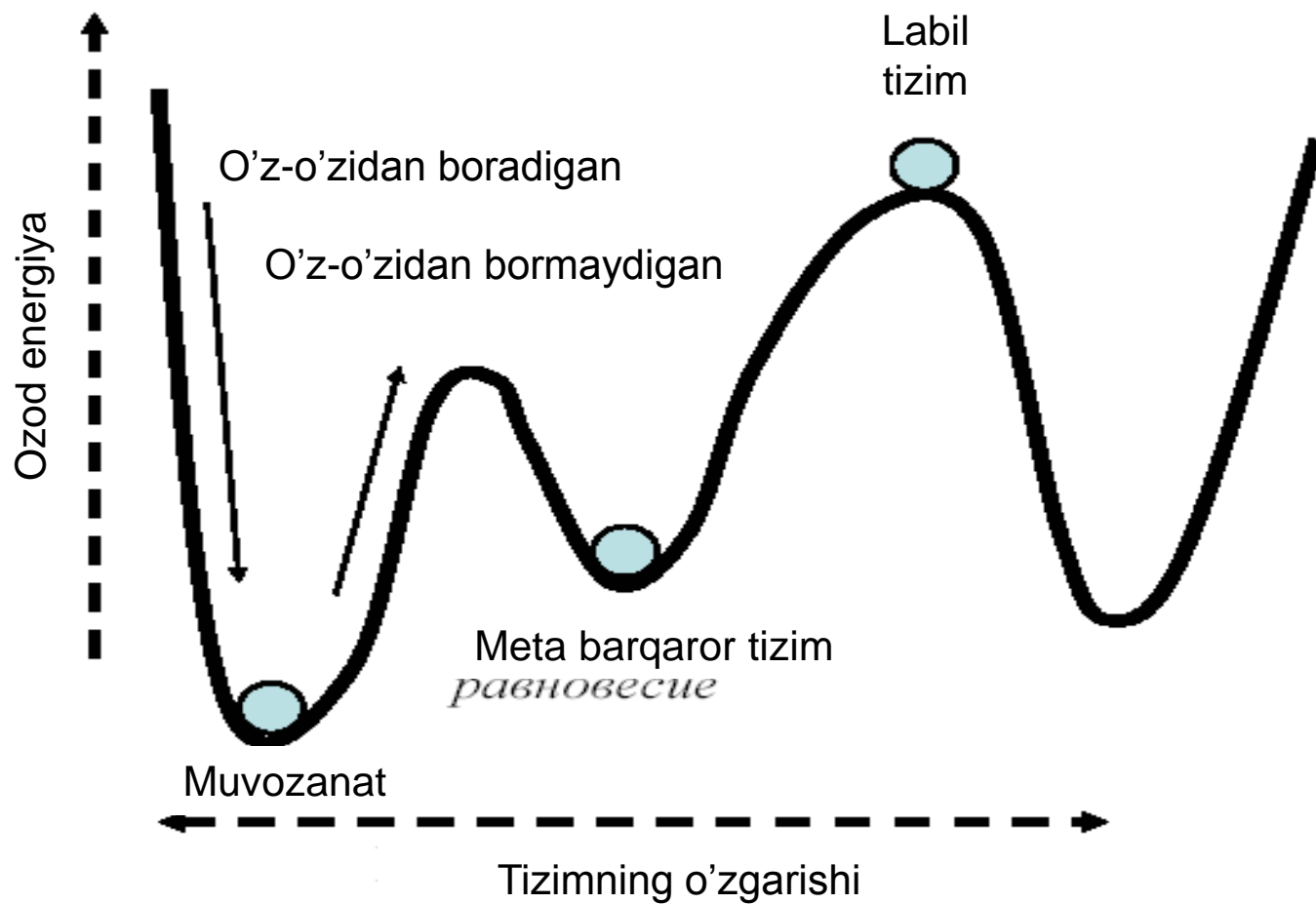


O'z-o'zidan boruvchi jarayonlar

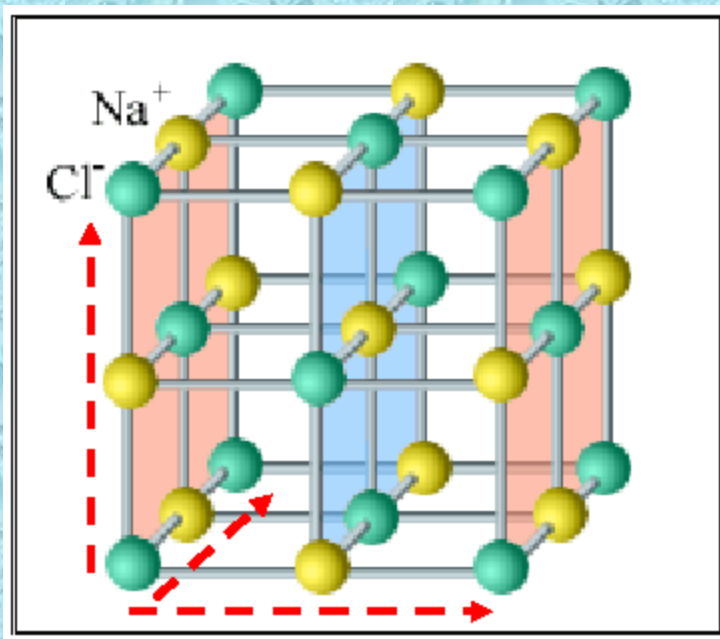


Gazlarni aralashtirish

Jarayonlarni yo'naltirish

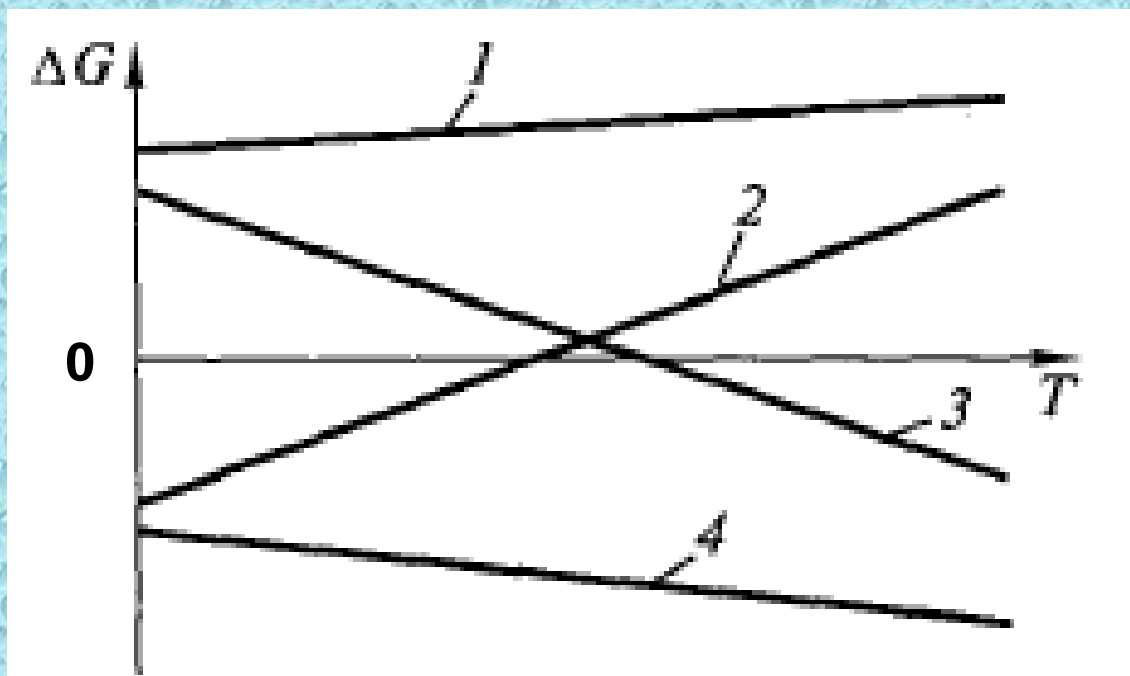


Termodinamikaning uchunchi qonuni

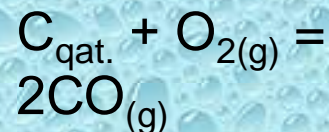
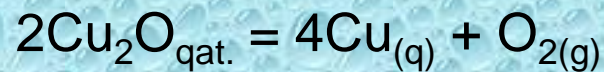
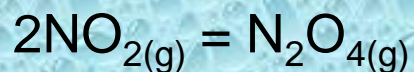
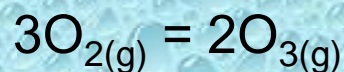


Toza moddaning ideal kristali entropiyasi absolyut
nolda nolga teng.
Plank (1911 y.)

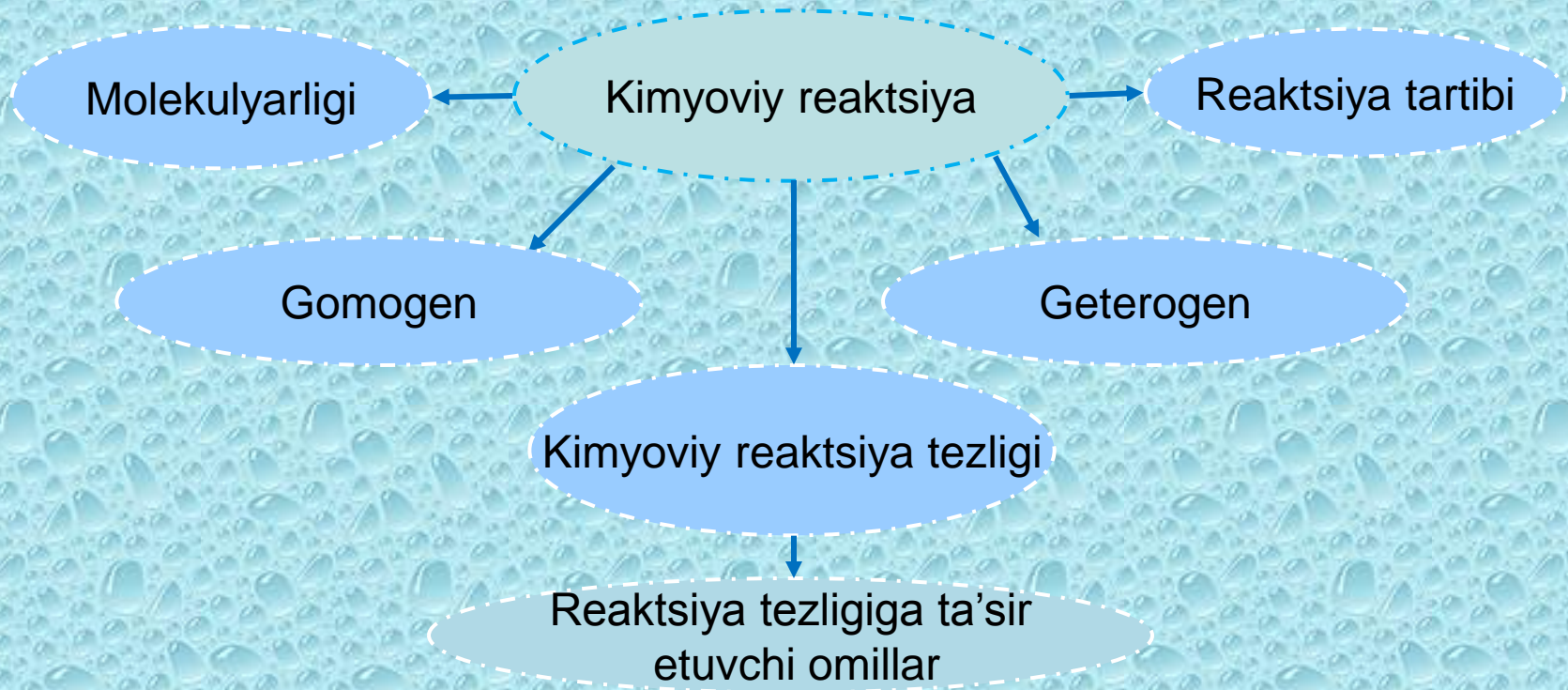
Haroratga bo'liq holda Gibbs energiyasini o'zgarishi



- 1 – $\Delta H > 0$, $\Delta S < 0$ o'z-o'zidan bormaydigan
- 2 – $\Delta H < 0$, $\Delta S < 0$ quyi T da mumkin
- 3 – $\Delta H > 0$, $\Delta S > 0$ yuqori T da mumkin
- 4 – $\Delta H < 0$, $\Delta S > 0$ o'z-o'zidan boradi



Kimyoviy kinetika



- Moddalar tabiati
- Konsentratsiya
- Harorat
- Bosim
- Katalizator

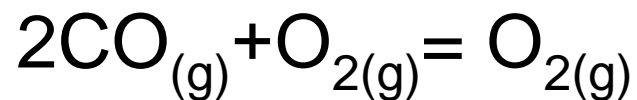
Moddalar massasining saqlanish qonuni

Vant-Goff qonuni
Faol kompleks nazariyasi

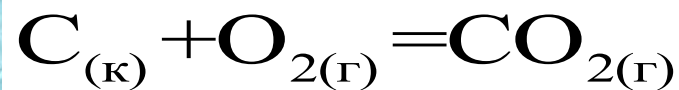
Moddalar massasining saqlanish qonuni



$$v = k \cdot C_A^{n_A} \cdot C_B^{n_B}$$

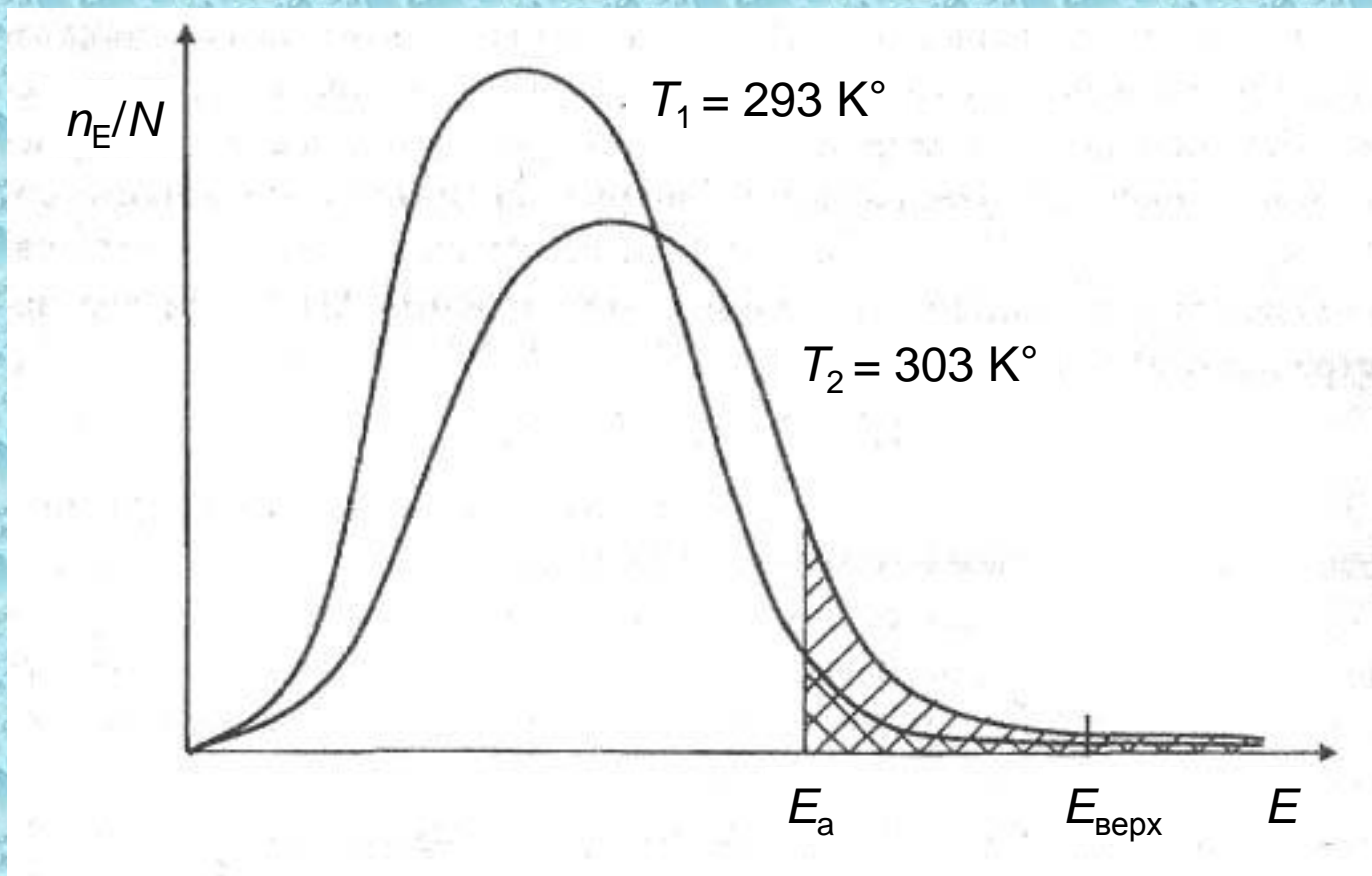


$$V_{\text{ГОМ}} = k \cdot C_{\text{CO}}^2 \cdot C_{\text{O}_2}$$



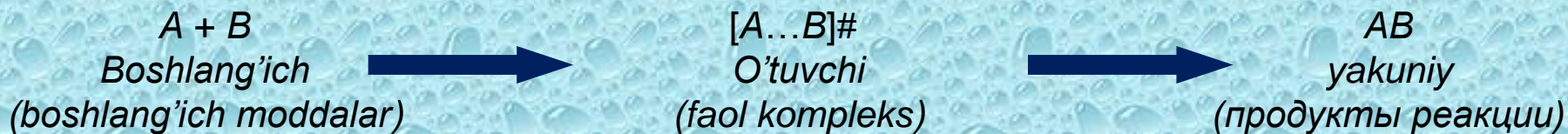
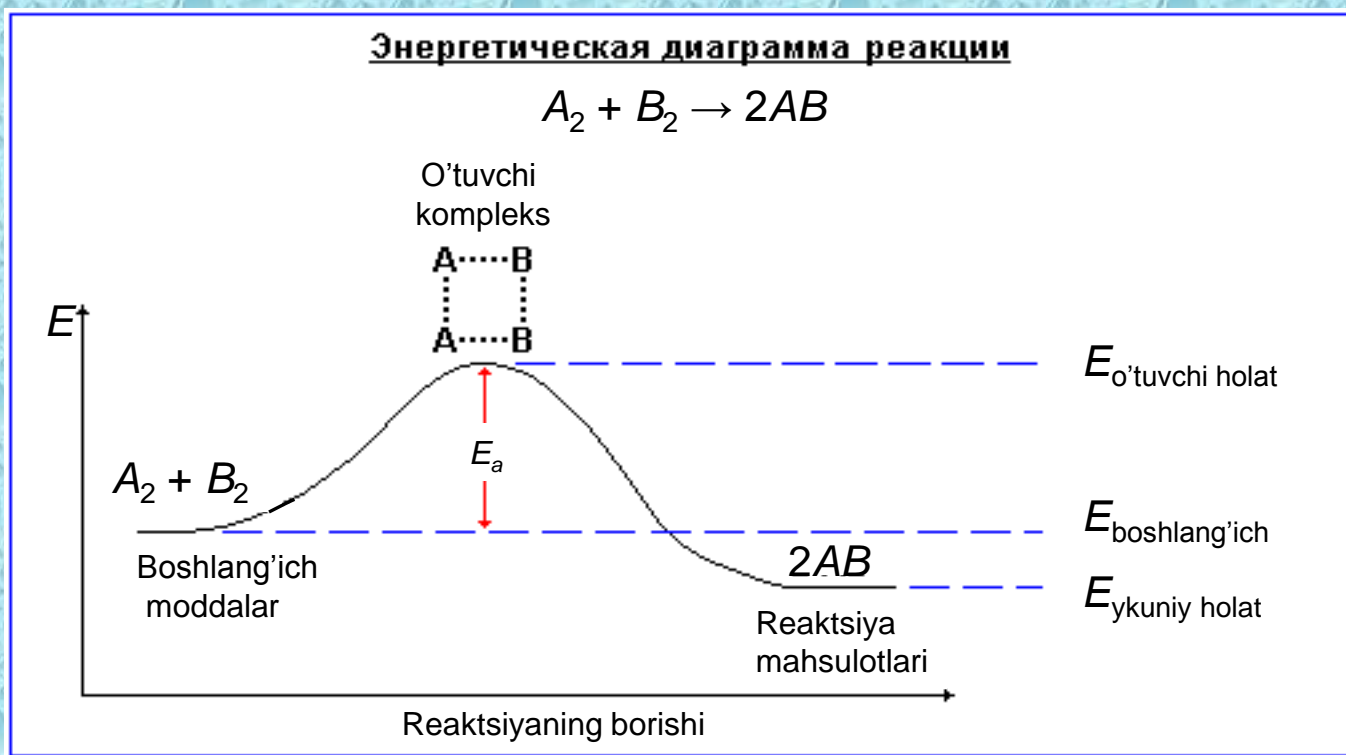
$$V_{\text{ГЕТ}} = k \cdot P_{\text{O}_2}$$

Reaktsiya tezligini haroratga bog'liqligi

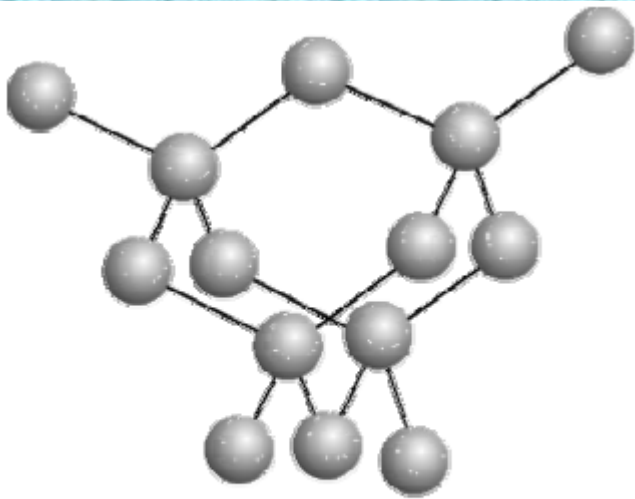


Harorat oshirilgandagi taqsimlanish egrisi turini o'zgarishi

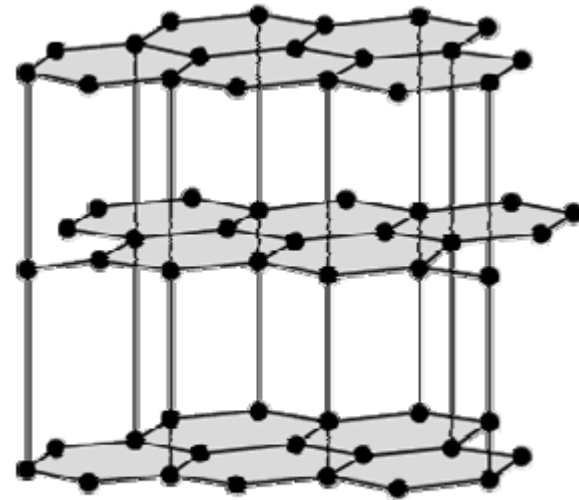
Faol kompleks hosil bo'lishi bilan boradigan reaksiyaning energetik diagrammasi



Графит va olmos



Алмаз
а



Графит
б



Katalizator



Yuqori p , T

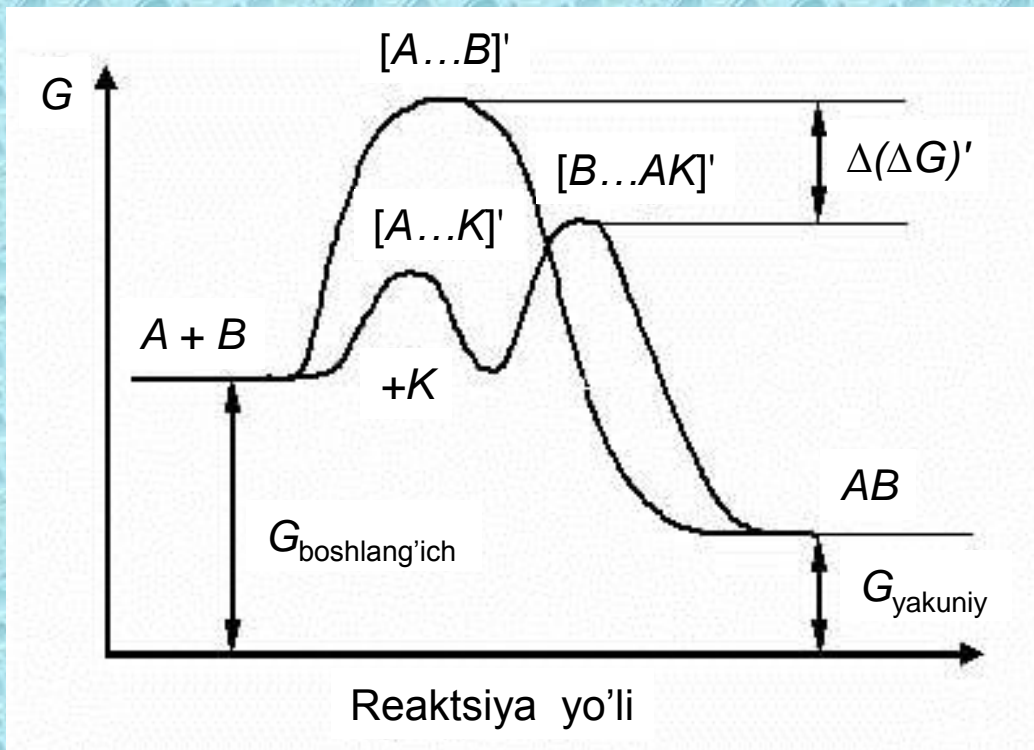


Kataliz

Musbat

Manfiy

Avtokataliz

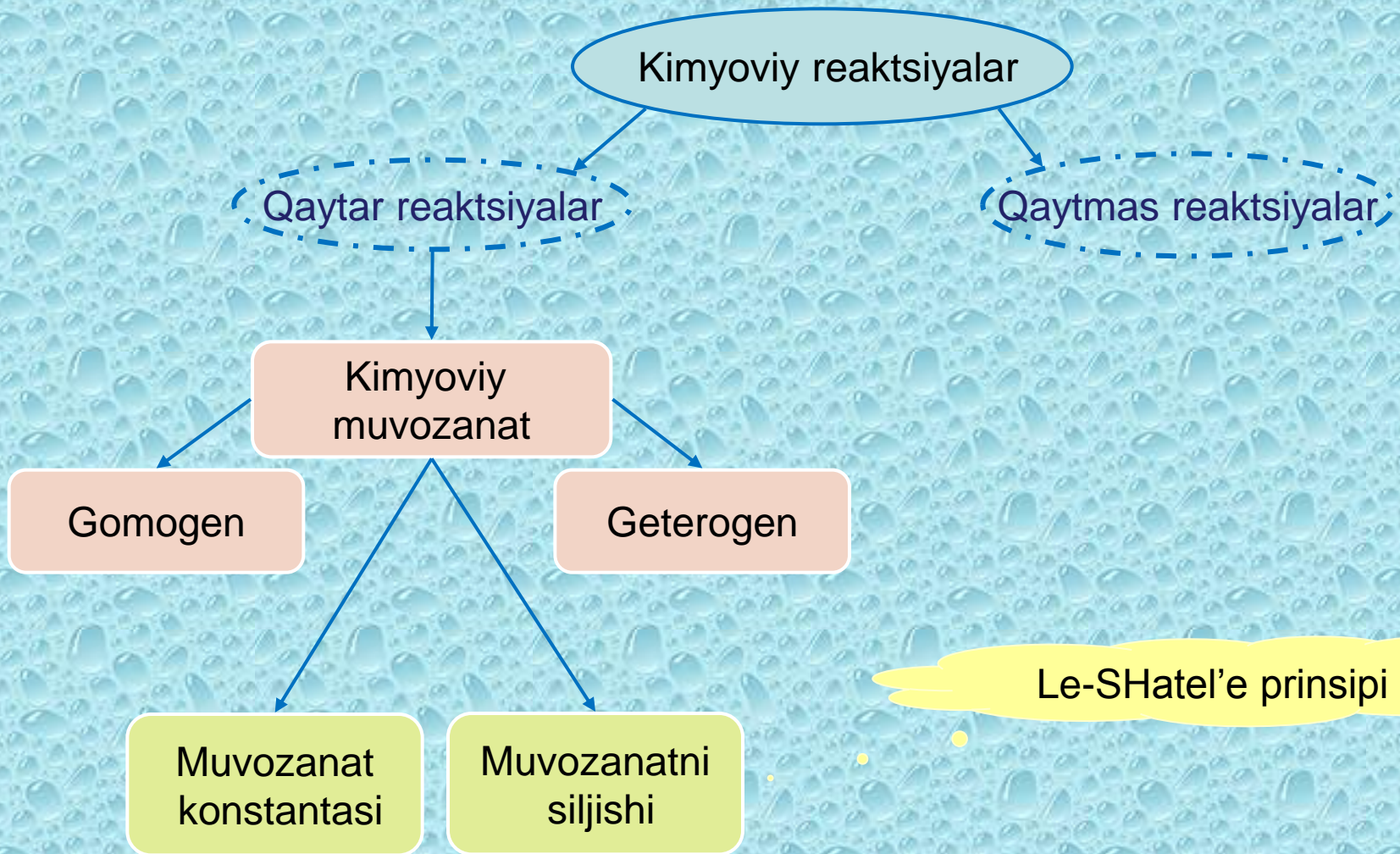


Katalitik zaharlar – katalizator harakatini yomonlashtiradi.

Promotrlar – katalizatorning harakatini kuchaytiruvchi modda

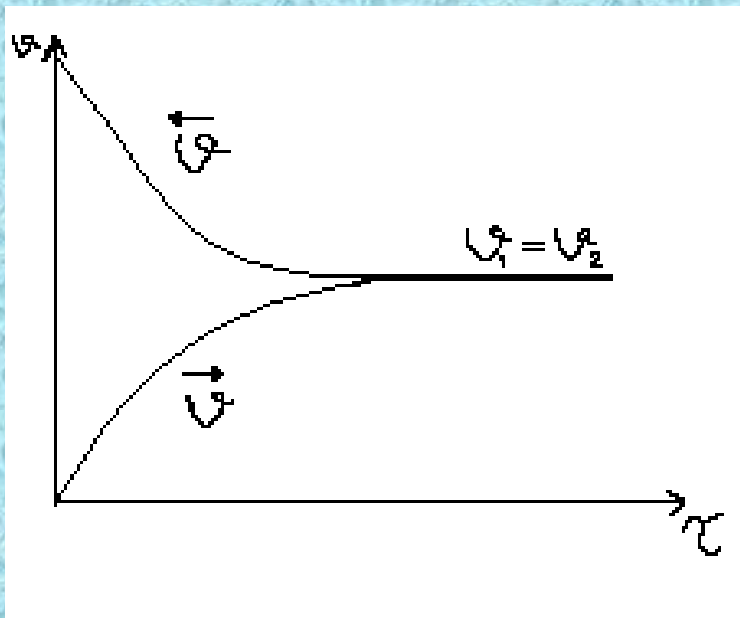
Ingibitorlar – reaksiya tezligini kamaytiruvchi modda

Kimyoviy muvozanat

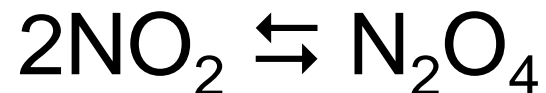


Le-Chatelier's principle

Gomogen tizimlarda kimyoviy muvozanat



$$\Delta G^0 = -RT \ln K_p$$



$$\vec{v}_1 = \overleftarrow{v}_2$$

$$\vec{k}[\text{NO}_2]^2 = \overleftarrow{k}[\text{N}_2\text{O}_4]$$

$$K_p = \frac{\vec{k}}{\overleftarrow{k}}$$

$$K_p = \frac{[\text{N}_2\text{O}_4]}{[\text{NO}_2]^2}$$

Kimyoviy muvozanatning siljishi

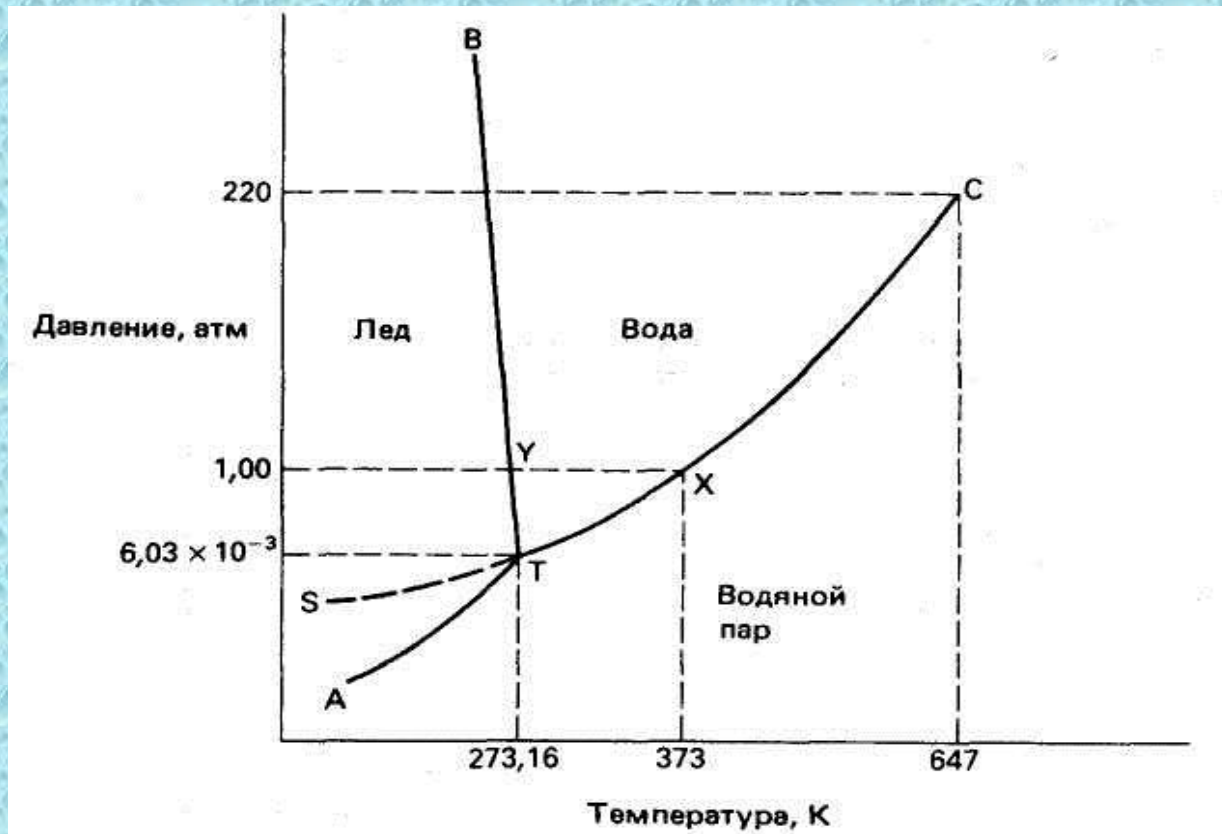


Anri-Lui Le-Шателье
(1850–1936)

Le-Шatel'e prinsipi:

Agarda kimyoviy muvozanatda turgan tizimga tashqi ta'sir ko'rsatilsa, unda shu ta'sirni kamaytirishga bo'lgan jarayon paydo bo'ladi.

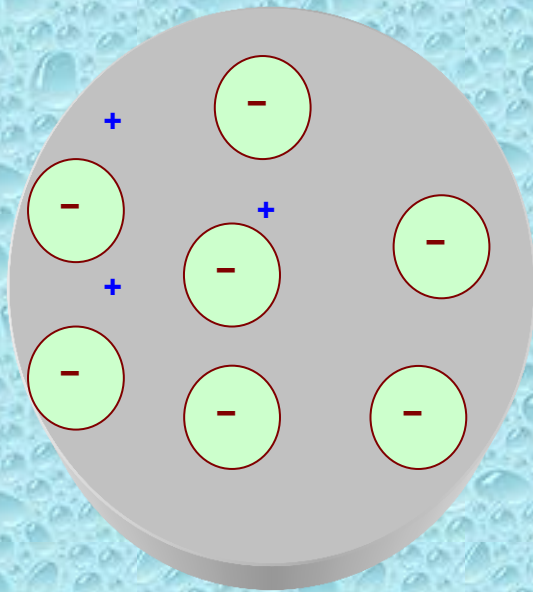
Suvning fazaviy diagrammasi



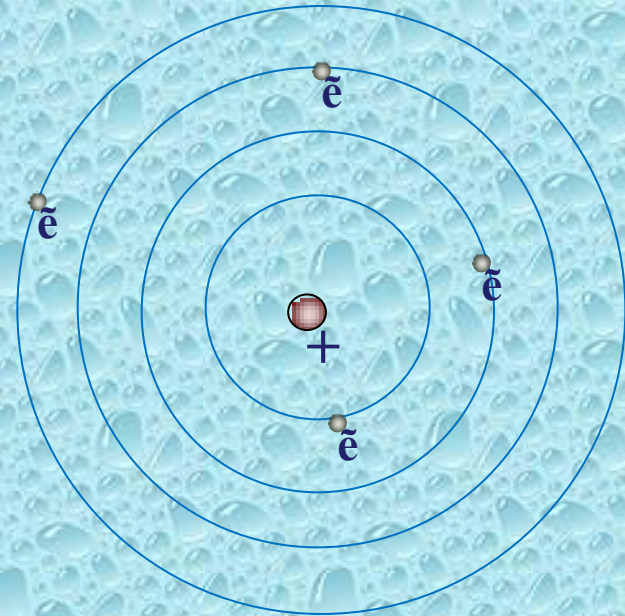
2 – bo'lim

Atom tuzilishi va elementlar davriy jadvali

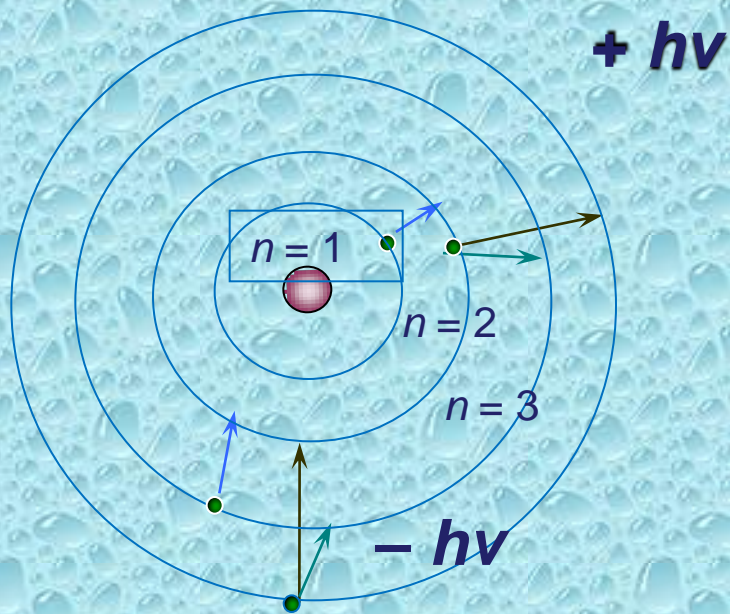
Tomson modeli



Rezerford modeli

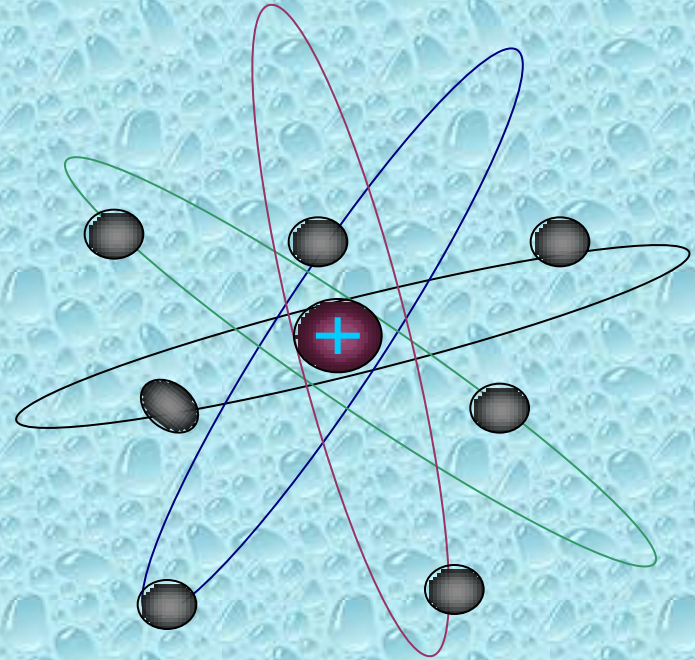


Bor modeli

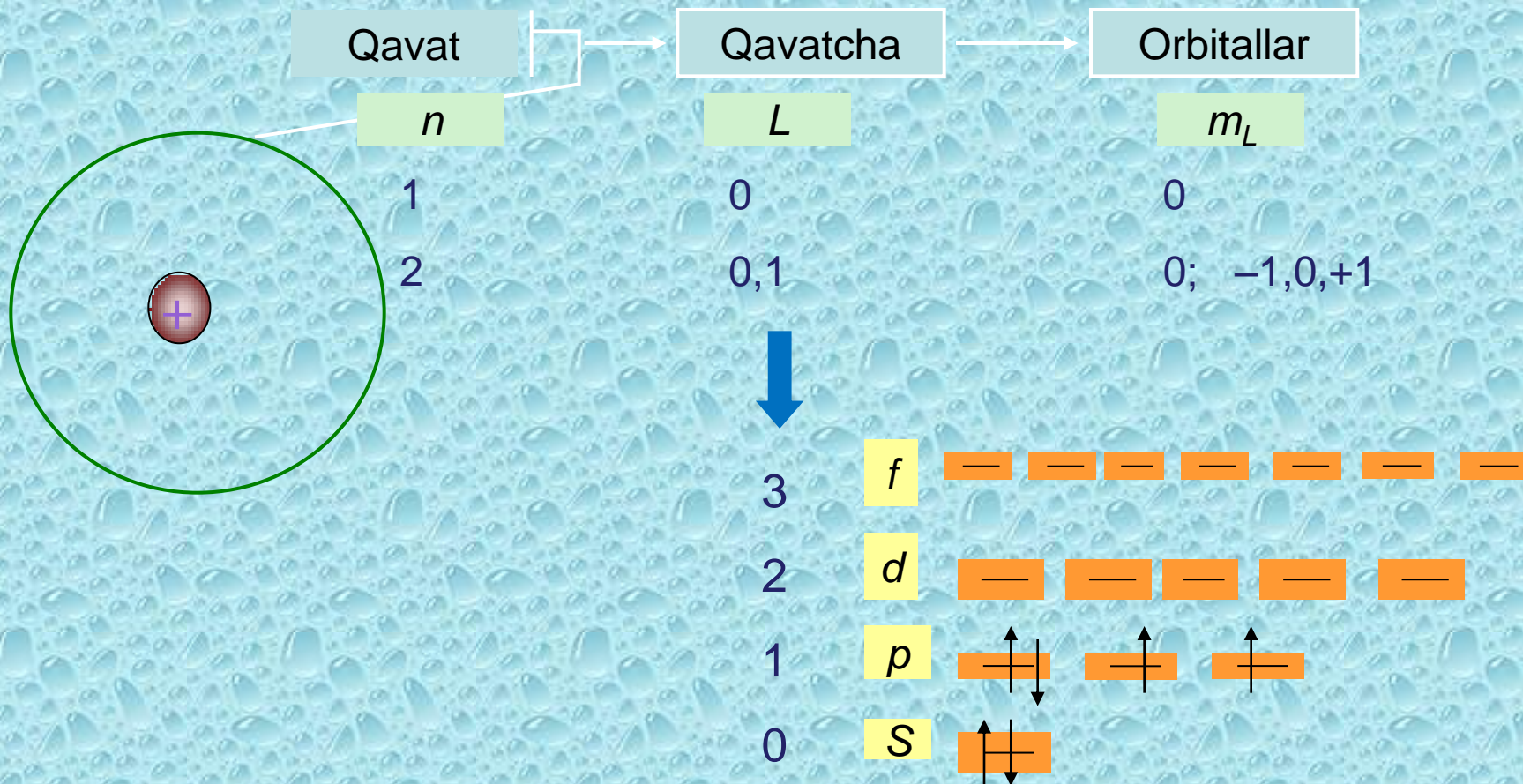


$$E = E_n - E_{(n-1)} = hv$$

Zommerfel'd modeli

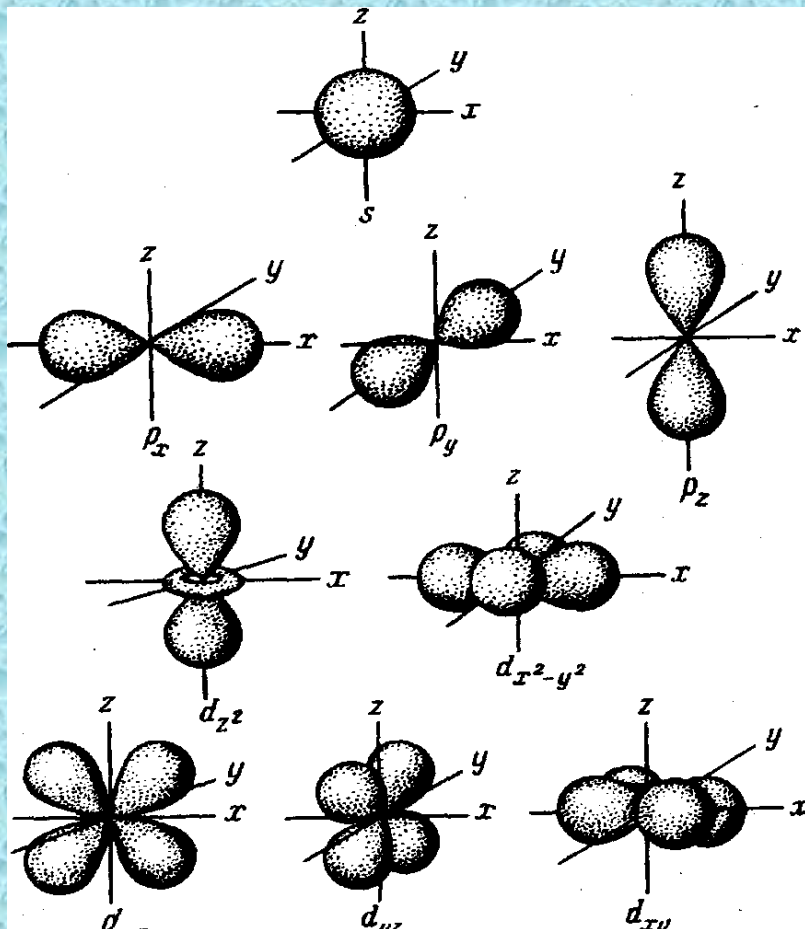


Ko'p elektronli atomlar



$1s < 2s < 2p < 3s < 3p < 4s \approx 3d < 4p < 5s \approx 4d < 5p < 6s \approx 4f \approx 5d < 6p < 7s$ и т. д.

Elektron orbitallarning shakllari



Spektrarning turlarini tahliliga asosan nomlash taklif etilgan:

s – «tezkor, aniq» (sharp);

p – «bosh» (principal);

d – «diffuziyali, yoyiq» (diffuse);

f – «asosiy» (fundamental);

g – keyingisi « f » dan keyin.

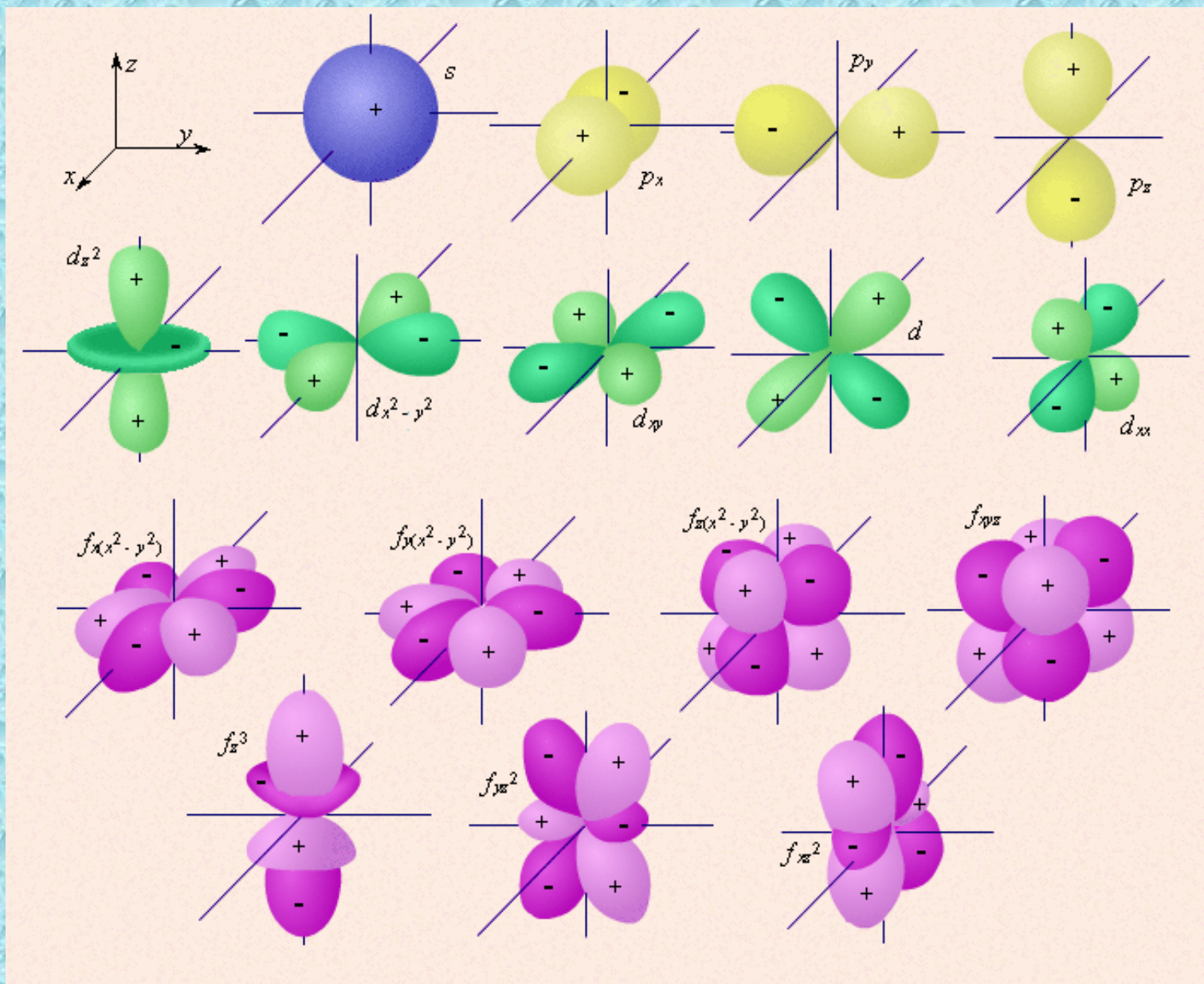
s -, p - va d - elektron bulutlar shakllari (orbitallar)

Kvant sonlar

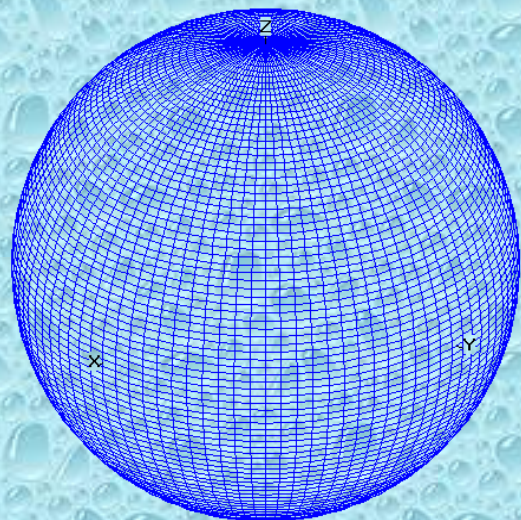
SHredinger tenglamasi

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} + \frac{\partial^2 \psi}{\partial z^2} + \frac{8\pi^2 m}{h} (E - U) \psi = 0$$

Kvant sonlar	Qabul qiladigan qiymatlari	Tavsiflanadigan xossalar	Qo'shimchalar
Asosiy(Bosh) (n)	1, 2, 3, ..., ∞	(E) qavat energiyasi. (r) yadrodan o'rtacha masofa	$n = \infty$ — yadro bilan o'zaro ta'sirni yo'qligi, $E = 0$
Orbital (l)	0, 1, ..., ($n - 1$) Shu n uchun n qiymatlar	Harakatlar miqdorini orbital momenti – orbitallarni fazoda joylashishi	Asosan harfli belgilardan foydalaniladi: L: 0 1 2 3 4 s p d f g
Magnit (m_l)	$-l, \dots, 0, \dots, l$ 2/ $l + 1$ ushbu holat uchun qiymatlar l	Shaxsiy magnit momenti orentatsiyasi	Turli m_l energiyaga ega orbitallarni magnit maydonida joylashishi
Spin (m_s)	$\pm \frac{1}{2}$ Orbitallar xossalariga bog'liq emas	Harakatlar miqdori momentining shaxsiy proyeksiyasi	\uparrow va \downarrow bilan belgilanadi

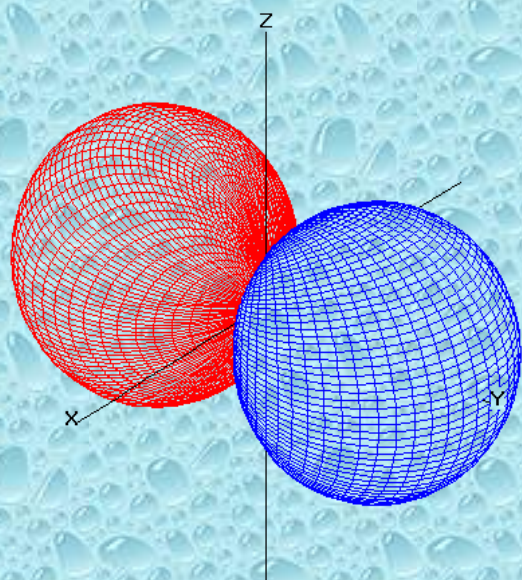
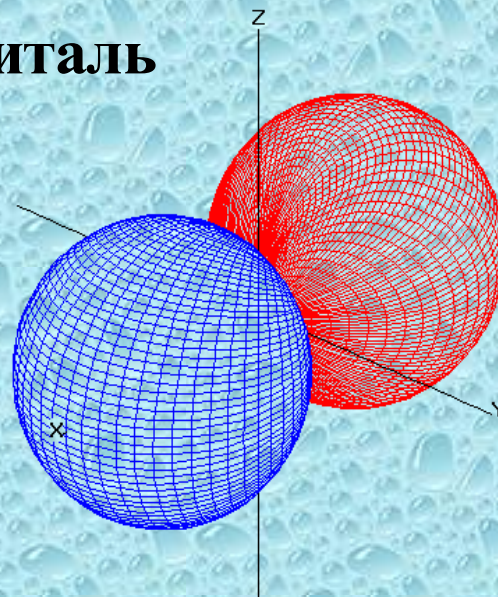


Формы s, p, d, f -орбиталей 57

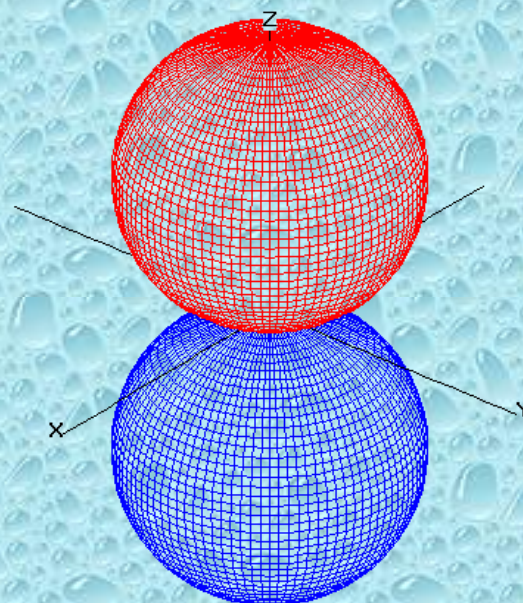


s – орбиталь

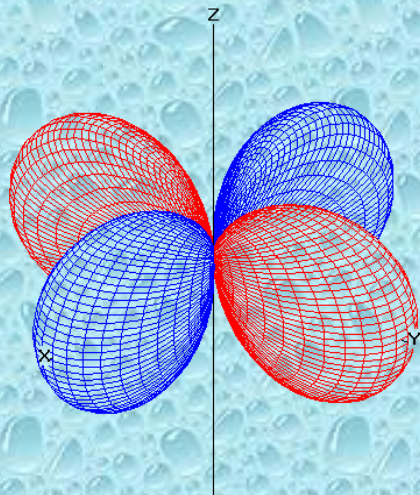
p_x – орбиталь



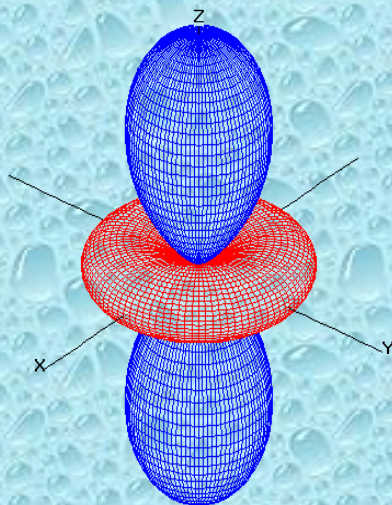
p_y – орбиталь



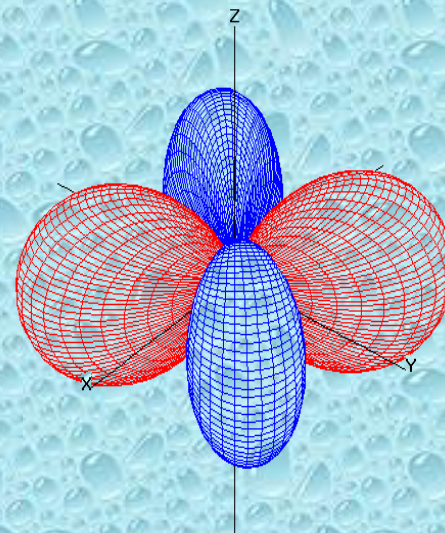
p_z – орбиталь



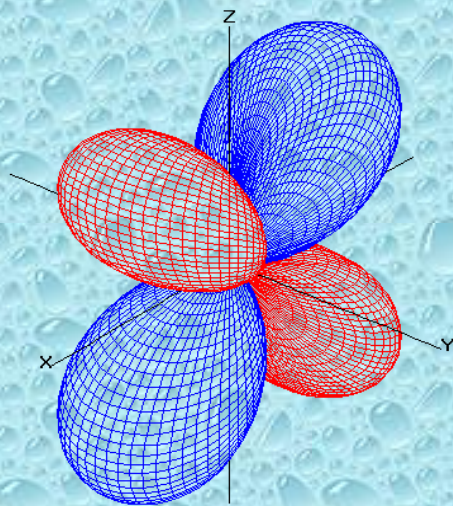
$d_{x^2-y^2}$ – орбиталь



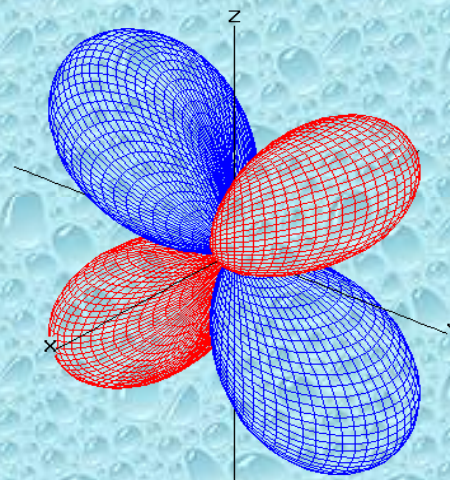
d_{z^2} – орбиталь



d_{xy} – орбиталь

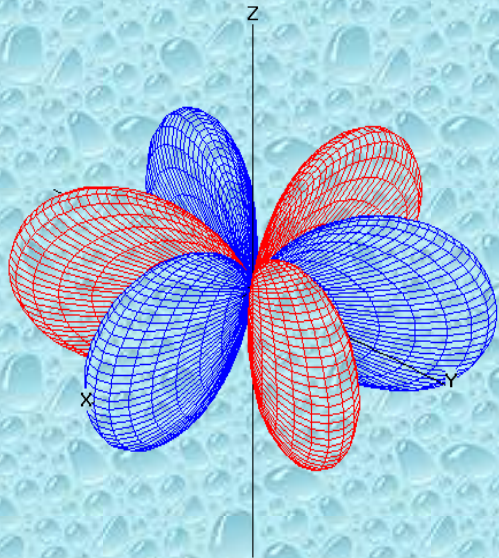


d_{xz} – орбиталь

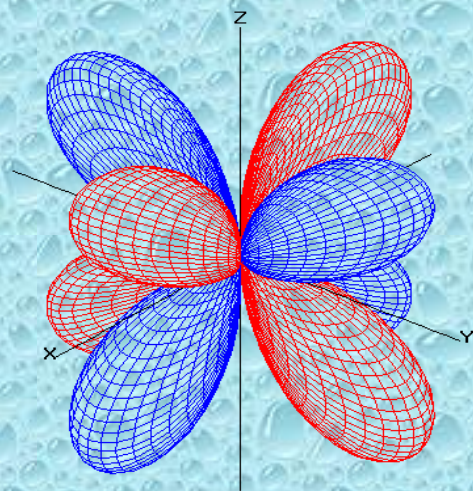
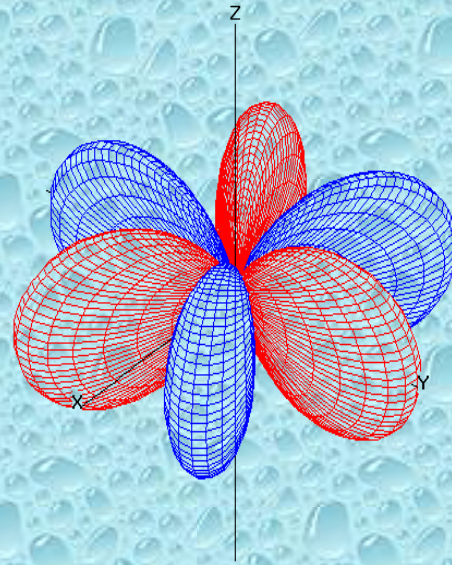


d_{yz} – орбиталь

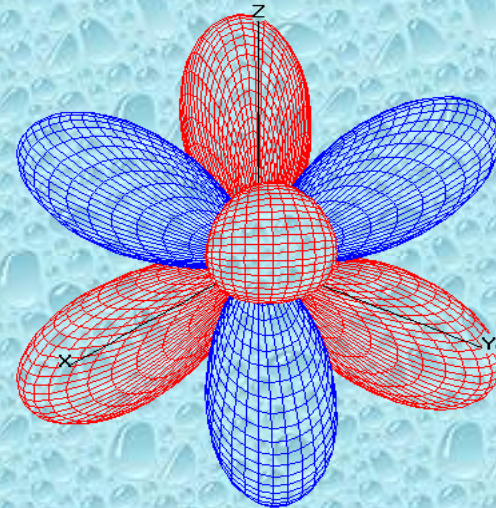
$f_{x(x^2-y^2)}$ – орбиталь



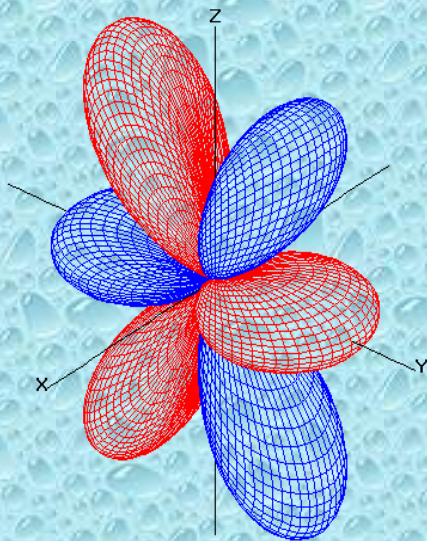
$f_{y(x^2-y^2)}$ – орбиталь



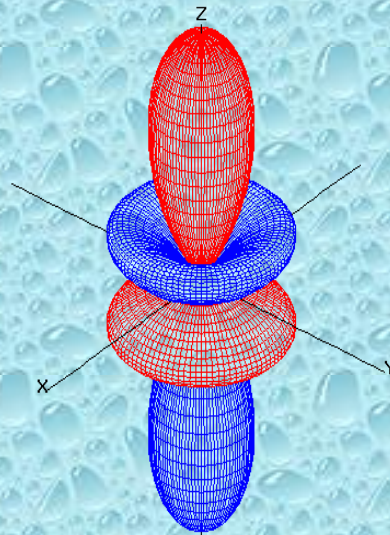
$f_{z(x^2-y^2)}$ – орбиталь



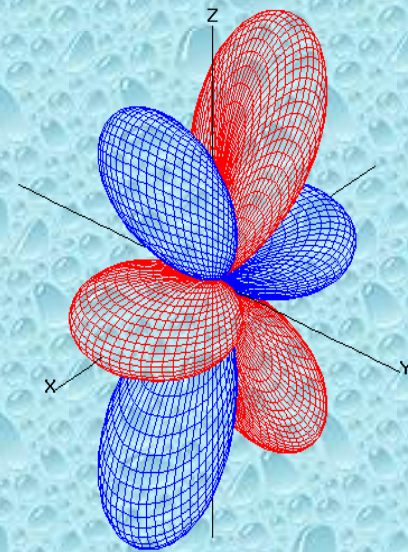
f_{xyz} – орбиталь



f_{yz^2} – орбиталь

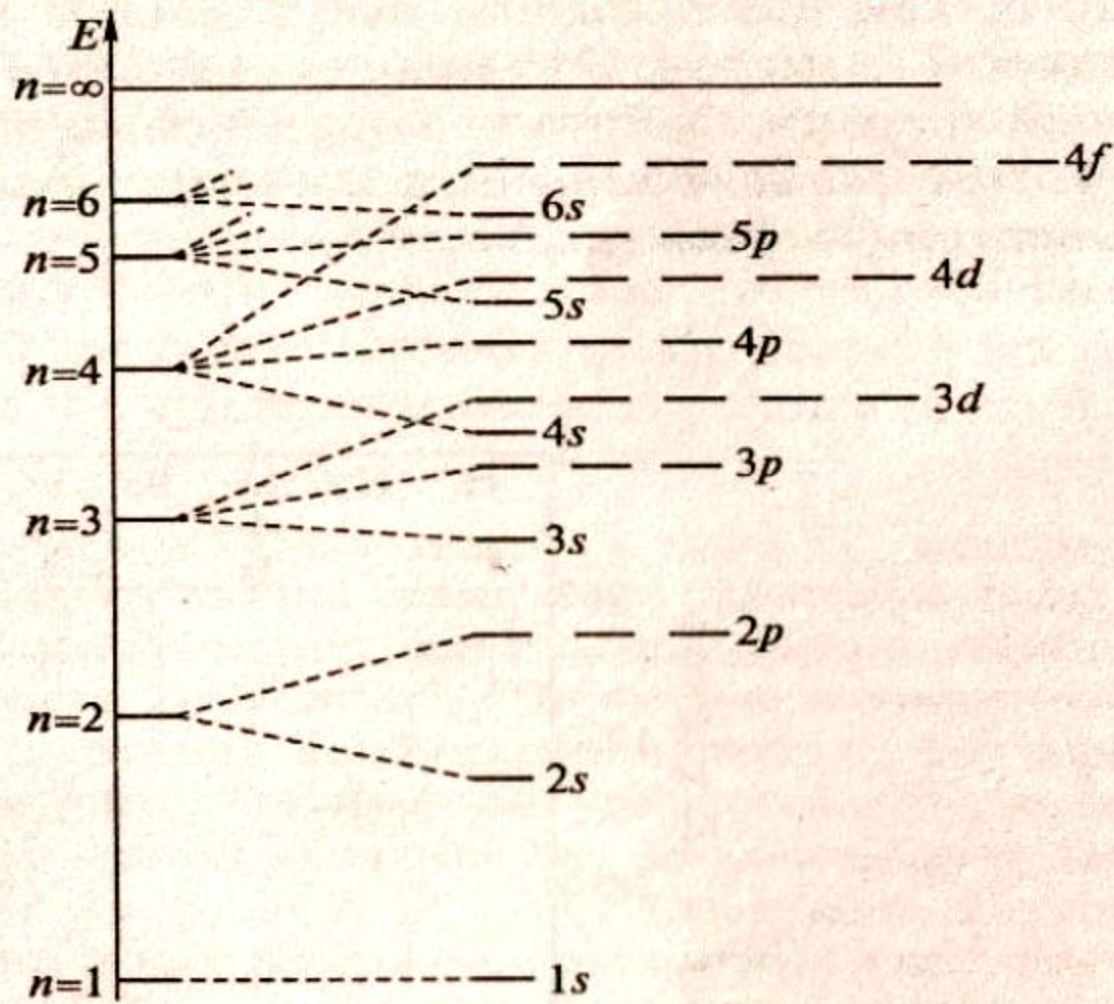


f_{z^3} – орбиталь



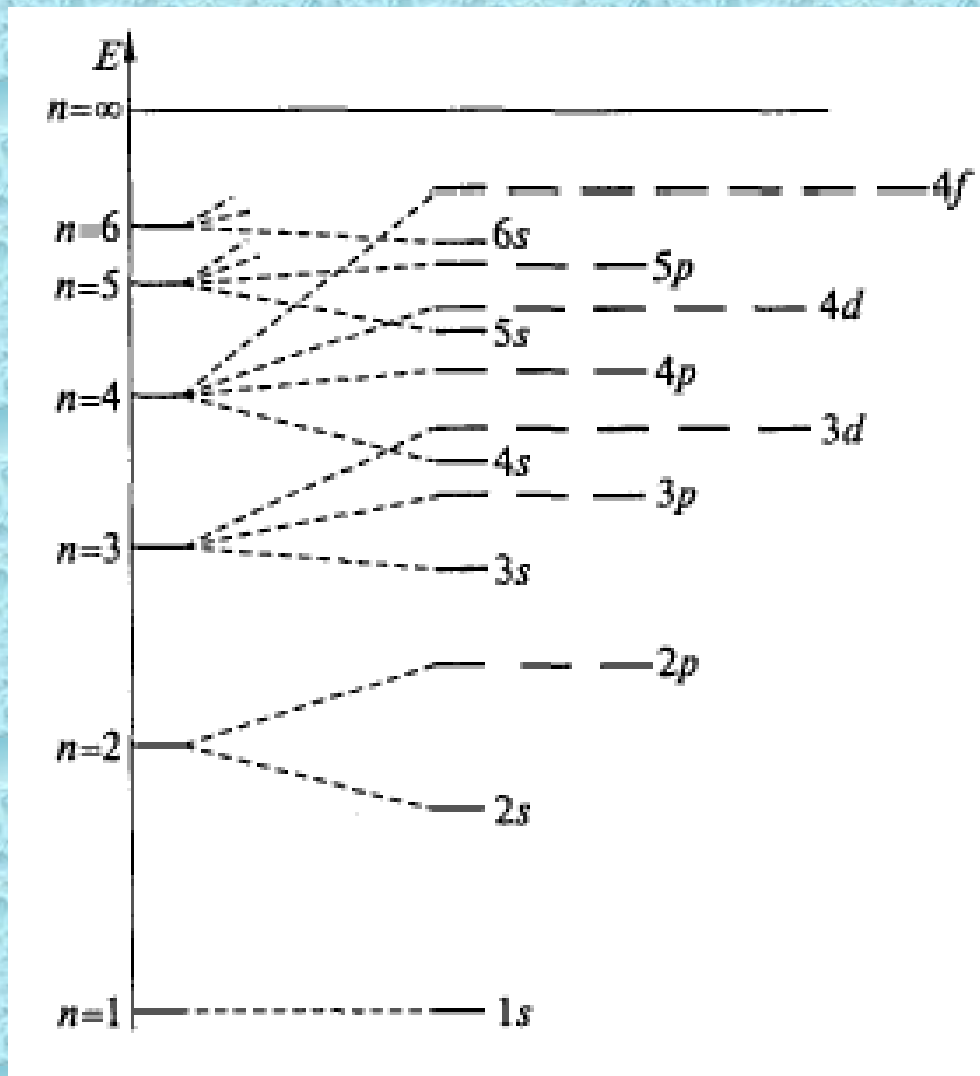
f_{xz^2} – орбиталь

Энергия орбиталей

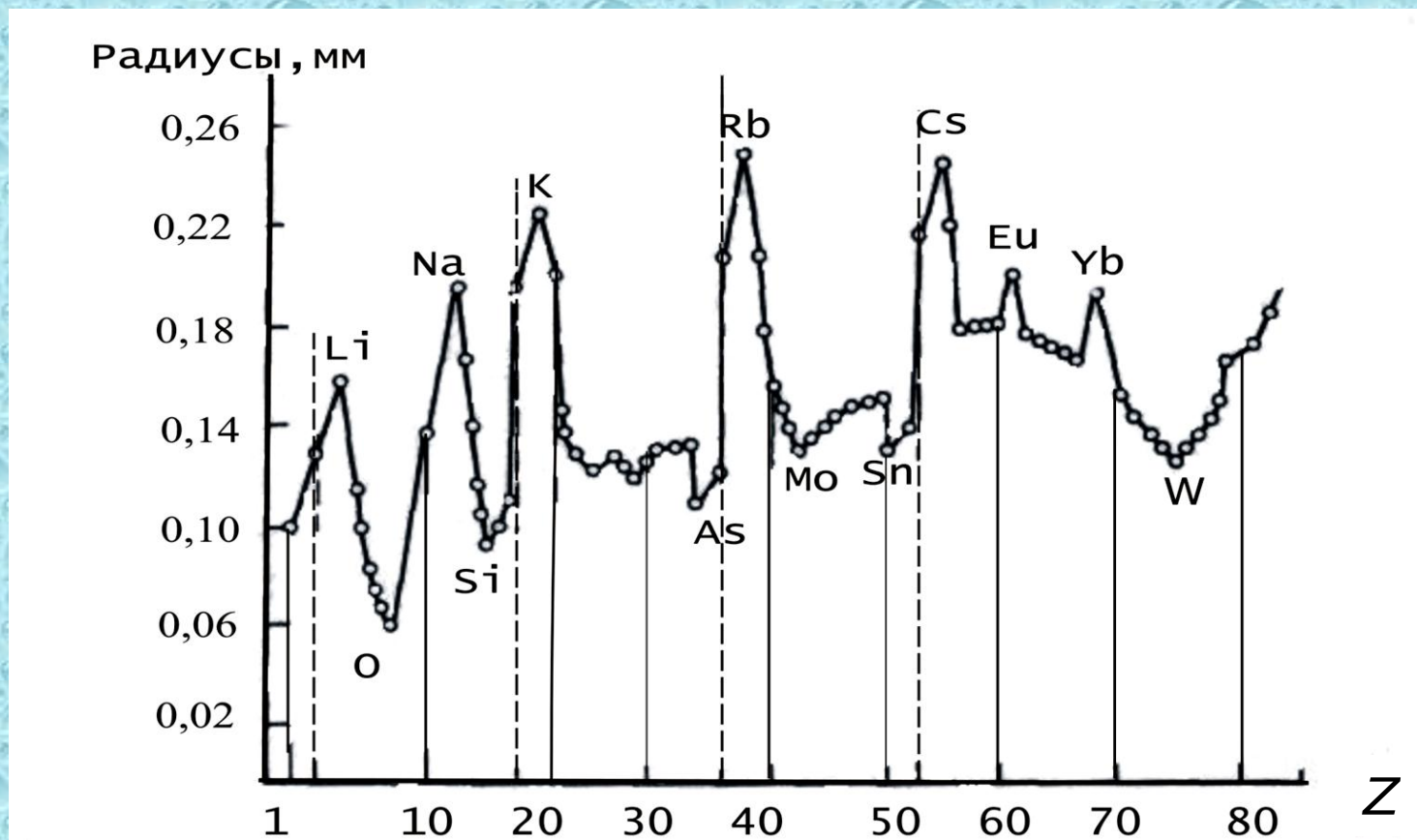


$1s < 2s < 2p < 3s < 3p < 4s < 3d < 4p < 5p < 6s < 4f < 5d$

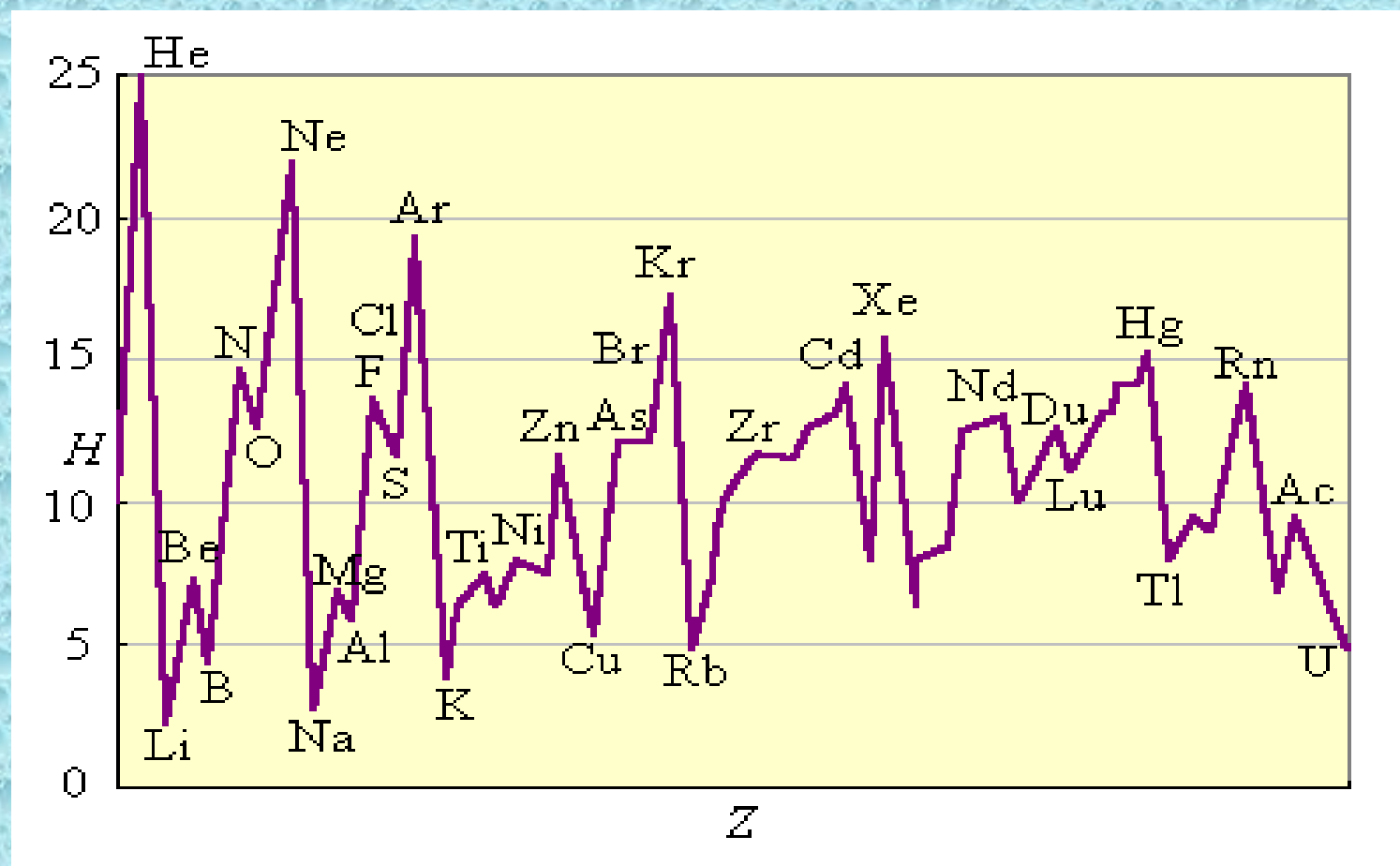
Vodorodga o'xshash atomning energetik qavatlarini



Atom radiuslarining yadro zaryadlariga Z bog'liqligi



Ionlanish potentsiallarini o'zgarishi



Elementlarni elektromanfiyligi

Шкала электроотрицательности элементов (Л. Полинг)

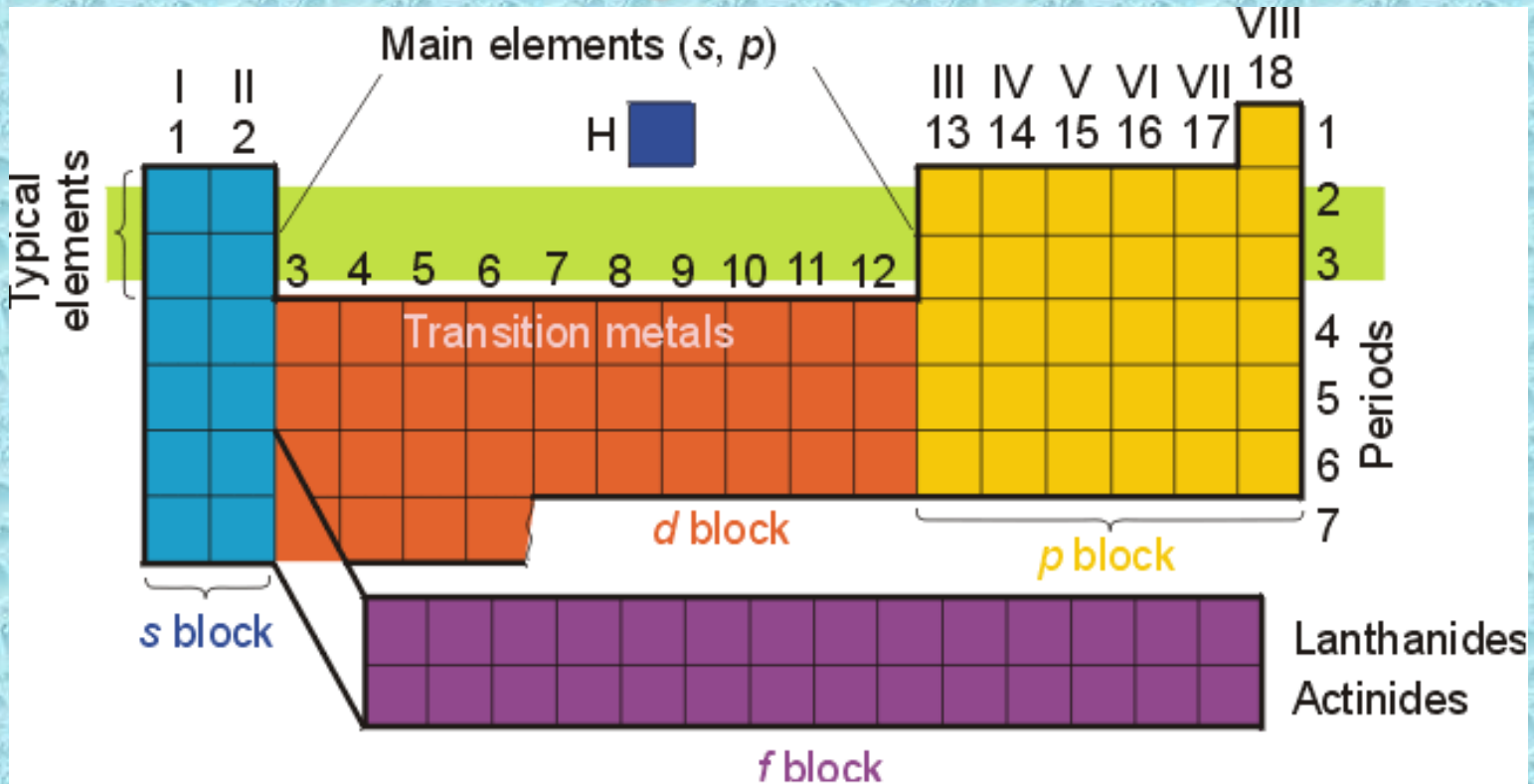
	I	II	III	IV	V	VI	VII
1	H 2,1						
2	Li 1,0	Be 1,5	B 2,0	C 2,5	N 3,0	O 3,5	F 4,0
3	Na 0,9	Mg 1,2	Al 1,5	Si 1,8	P 2,1	S 2,5	Cl 3,0
4	K 0,8						Br 2,8
5	Rb 0,8						I 2,5

Относительная электроотрицательность подчиняется периодическому закону: в периоде она растет с увеличением номера элемента, в группе - уменьшается.

Elementlar davriy jadvalini IYUPAK tasdiqlagan shakli (uzun davrli 18 ta elementli varianti)

H	1																He	
Li	Be	H										B	C	N	O	F	Ne	
Na	Mg	1.007976										Edit	Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac																
			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

DJ ning strukturasi



Lantanidlar (lantanoidlar) – 4f elementlar (id – grekchada keyyingisi; oid – grekchada o'xshash).

Shunga muvofiq, **aktinidlar (aktinoidlar)** – 5f elementlar

Galogenlar – 17 (7)- guruh elementlari

Xal'kogenlar – 16 (6) – guruh elementlari

Pniktogenlar - 15 (5) – guruh elementlari

РЯД ЭЛЕКТРООТРИЦАТЕЛЬНОСТИ ХИМИЧЕСКИХ ЭЛЕМЕНТОВ ПО ПОЛИНГУ

Cs	K	Ba	Na	Sr	Li	Ca	Mg	Mn	Be	Al	Zn	Cr	Fe	Co	Si	Cu	Ni	Ag	Sn	Hg	B	As	P	H	C	Se	S	I	Br	N	Cl	O	F
0,79	0,82	0,89	0,93	0,95	0,98	1,00	1,31	1,55	1,57	1,61	1,65	1,66	1,83	1,88	1,90	1,90	1,91	1,93	1,96	2,00	2,04	2,18	2,19	2,20	2,55	2,55	2,58	2,66	2,96	3,04	3,16	3,44	3,98

АТОМЛАРНИНГ НИСБИЙ ЭЛЕКТРОМАНФИЙЛИГИ (NEM)

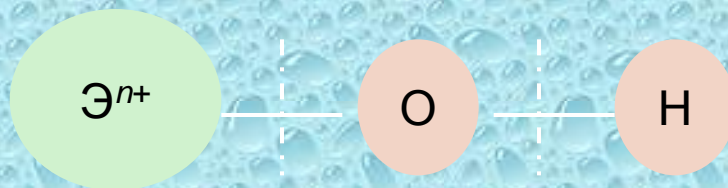
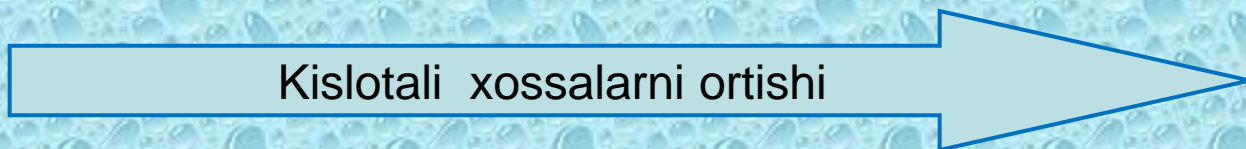
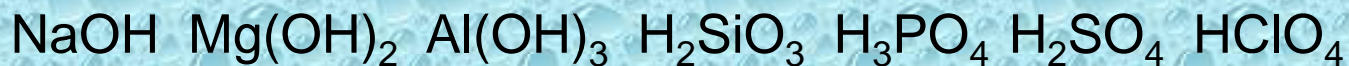
H 2,1						
Li 0,98	Be 1,5	B 2,0	C 2,5	N 3,07	O 3,5	F 4,0
Na 0,93	Mg 1,2	Al 1,6	Si 1,9	P 2,1	S 2,6	Cl 3,0
K 0,91	Ca 1,04	Ga 1,6	Ge 2,0	As 2,1	Se 2,5	Br 2,8
Rb 0,89	Sr 0,99	In 1,5	Sn 1,7	Sb 1,8	Te 2,1	I 2,6

Elektromanfiylik

Kimyoviy bog' hosil bo'lganda atomlar tomonidan elektron juftni o'ziga tortish qobiliyatini nisbiy o'lchami $\chi.O.=J_1+E_{o.r.}$

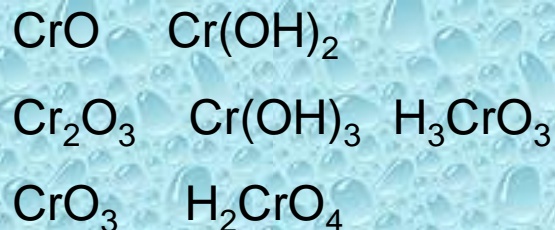
	Elementlarning elektromanfiyligi									
	I	II	III	IV	V	VI	VII	VIII		
1	H 2.1							He -		
2	Li 0.97	Be 1.47	B 2.01	C 2.5	N 3.07	O 3.5	F 4.10	Ne -		
3	Na 1.01	Mg 1.23	Al 1.47	Si 1.74	P 2.1	S 2.6	Cl 2.83	Ar -		
4	K 0.91	Ca 1.04	Sc 1.20	Ti 1.32	V 1.45	Cr 1.56	Mn 1.60	Fe 1.64	Co 1.70	Ni 1.75
	Cu 1.75	Zn 1.66	Ga 1.82	Ge 2.02	As 2.2	Se 2.48	Br 2.74	Kr -		
5	Rb 0.89	Sr 0.99	Y 1.11	Zr 1.22	Nb 1.23	Mo 1.3	Tc 1.36	Ru 1.42	Rh 1.45	Pd 1.35
		Cd 1.46	In 1.49	Sn 1.72	Sb 1.82	Te 2.01	I 2.21	Xe -		
6		Ba 0.97	La* 1.08	Hf 1.23	Ta 1.33	W 1.4	Re 1.46	Os 1.52	Ir 1.55	Pt 1.44
		Hg 1.44	Tl 1.44	Pb 1.55	Bi 1.67	Po 1.76	At 1.9	Rn -		
7		Ra	Ac			*Lantanoidlar- 1.08-1.14				

Kimyoviy elementlar birikmalarini kislota-asosli xossalari



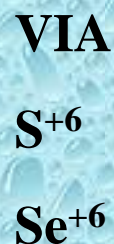
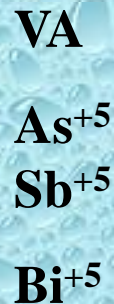
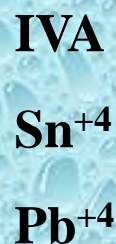
Radius↓, yadro zaryadi↑

+2	– asosli
+3	– amfoter
+6	– kislotali

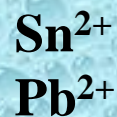
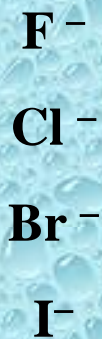


Elementlar birikmalarini kislota-asosli xossalari

Oksidlovchilik xossalari



Qaytaruvchilik xossalari



yonaki



kuchayishi



yonaki



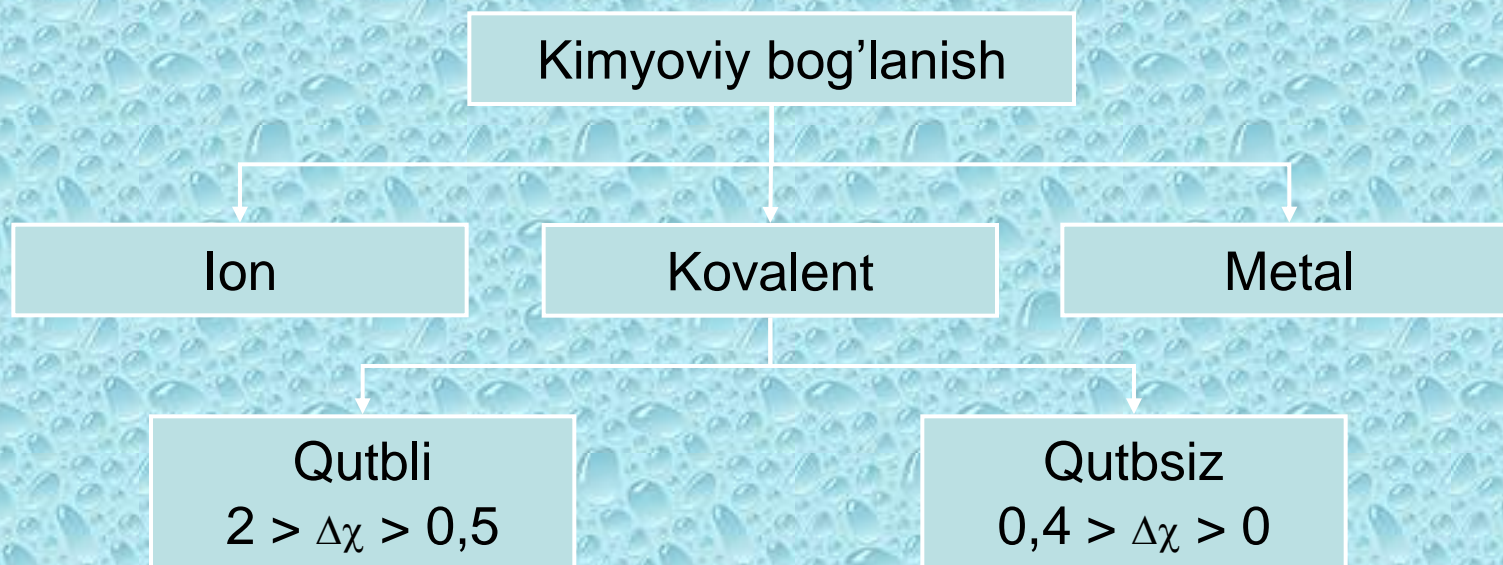
kuchayishi



3 – bo'lim

Kimyoviy bog'lanish

Kimyoviy bog'lanishning asosiy turlari



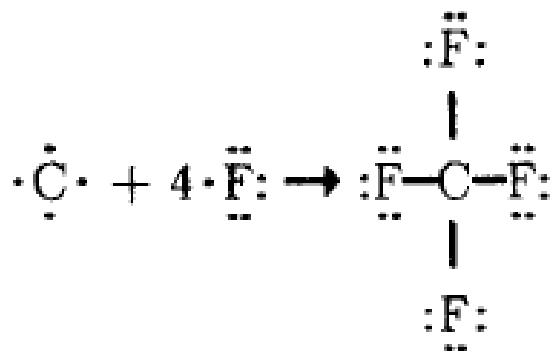
Kovalent bog'lanish.

Bog'ning hosil bo'lish mexanizmi:

- to'yinuvchanligi;
- yo'naluvchanligi;
- AO gibridlanish turlari;
- Molekulyar orbitallar usuli.

Molekulalararo o'zaro ta'sir

Kovalent bog'ning hosil bo'lish mexanizmi

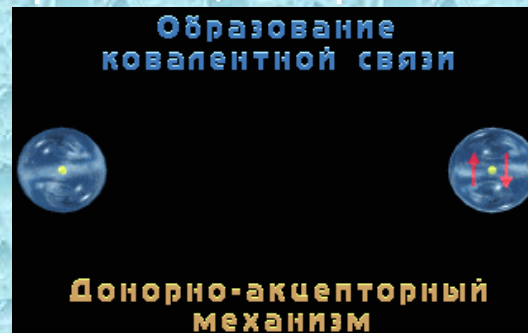


Almashinish mexanizmi

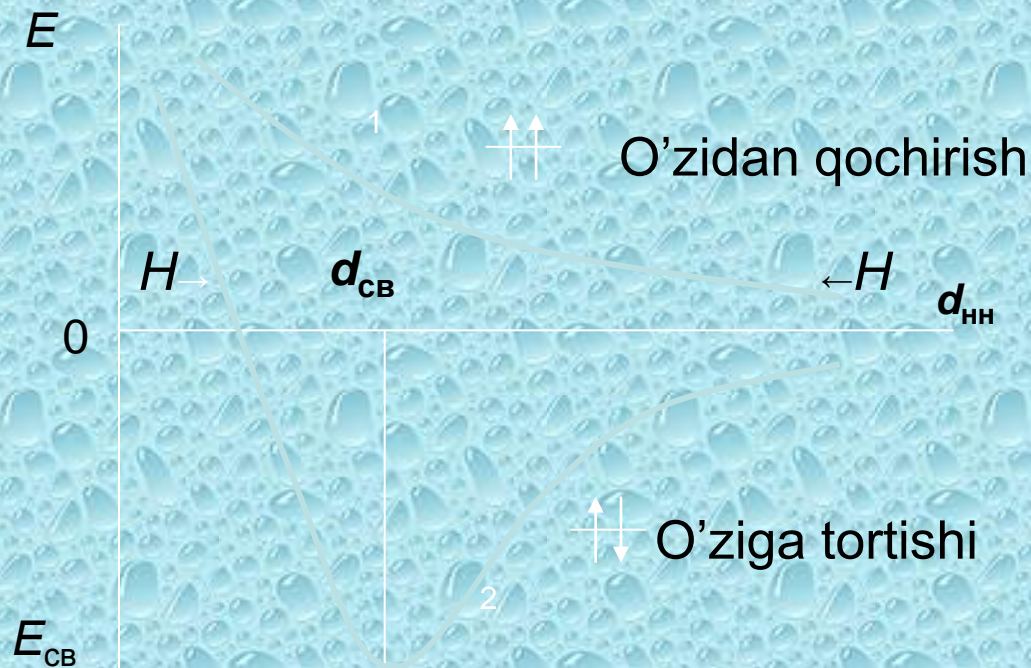


donor + aktseptor

Донорно-акцепторный механизм

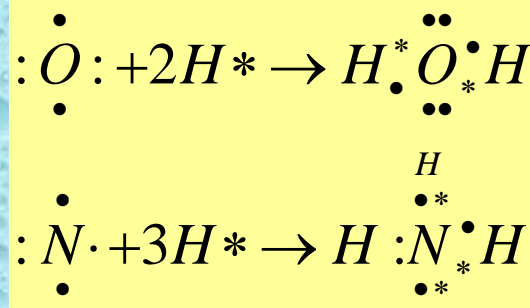
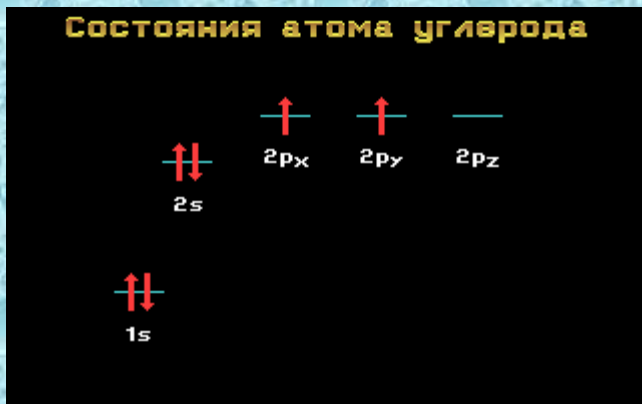
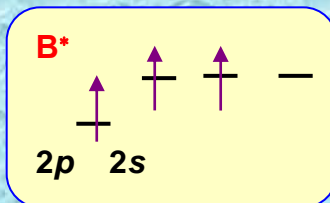
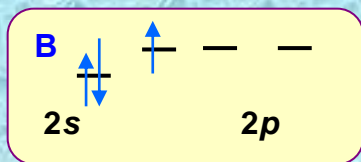
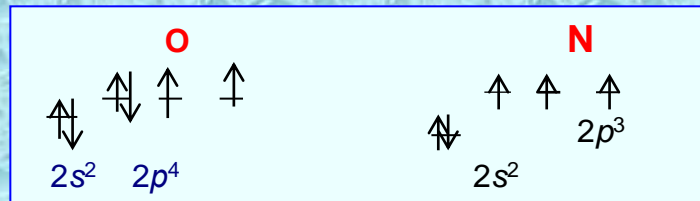
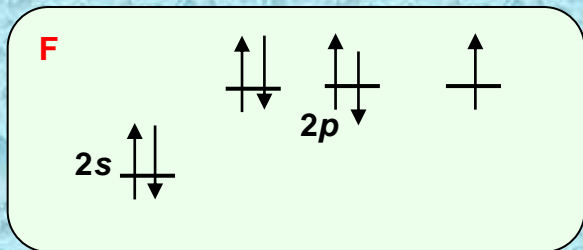


Vodorod molekulasida energiyaning o'zgarishi

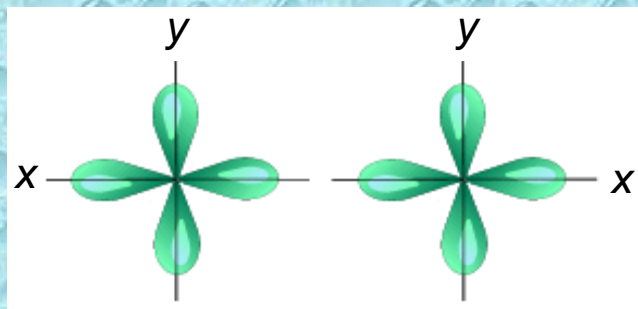
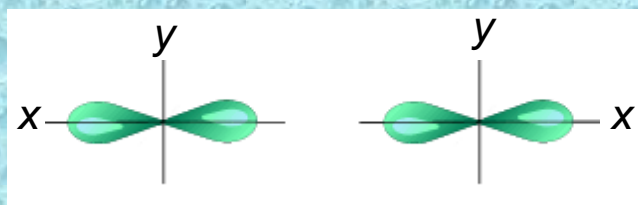
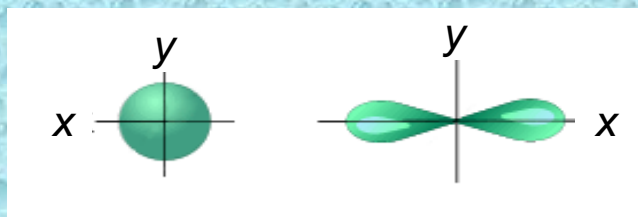
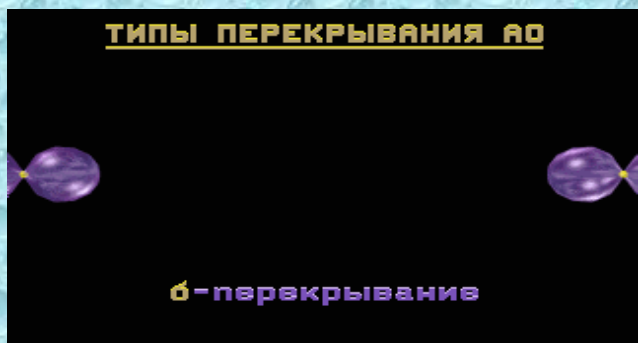


Ikkita bir-biriga yaqinlashayotgan vodorod atomlarini o'zaro ta'sir o'rtacha potentsial energiyalarini o'zgarishi

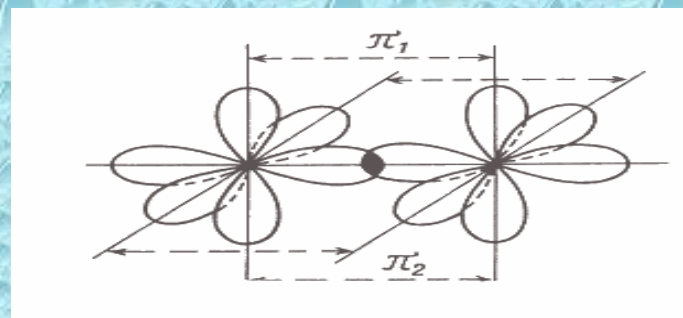
Kovalent bog'ning to'yinuvchanligi



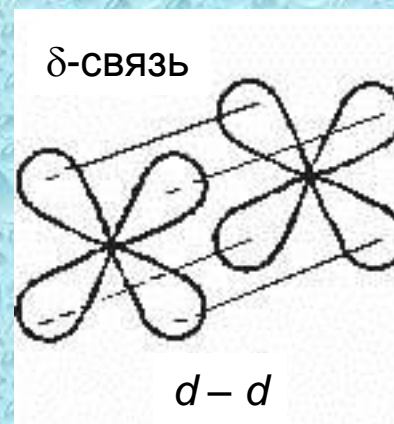
Kovalent bog'ining yo'naluvchanligi



π -qoplanish



δ -qoplanish



AO gibridlanish tiplari

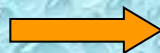
sp



S



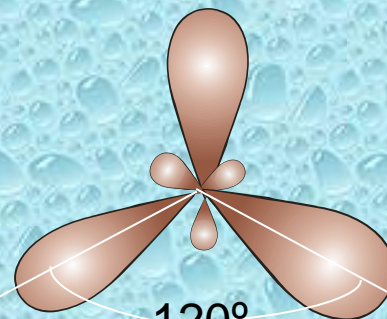
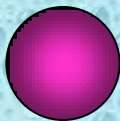
P



180°

Berilliy xlorid

sp^2

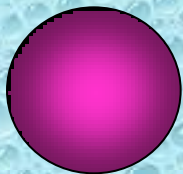


120°

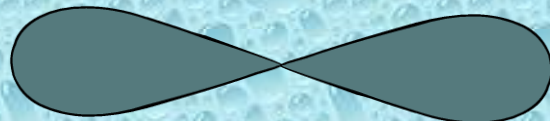
Bor xlorid

Gibridlanish turlari

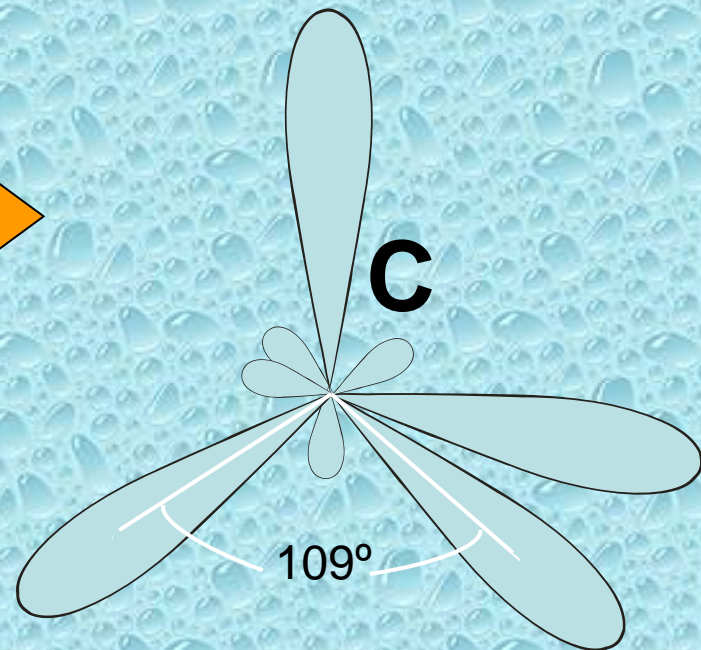
sp^3



S



P

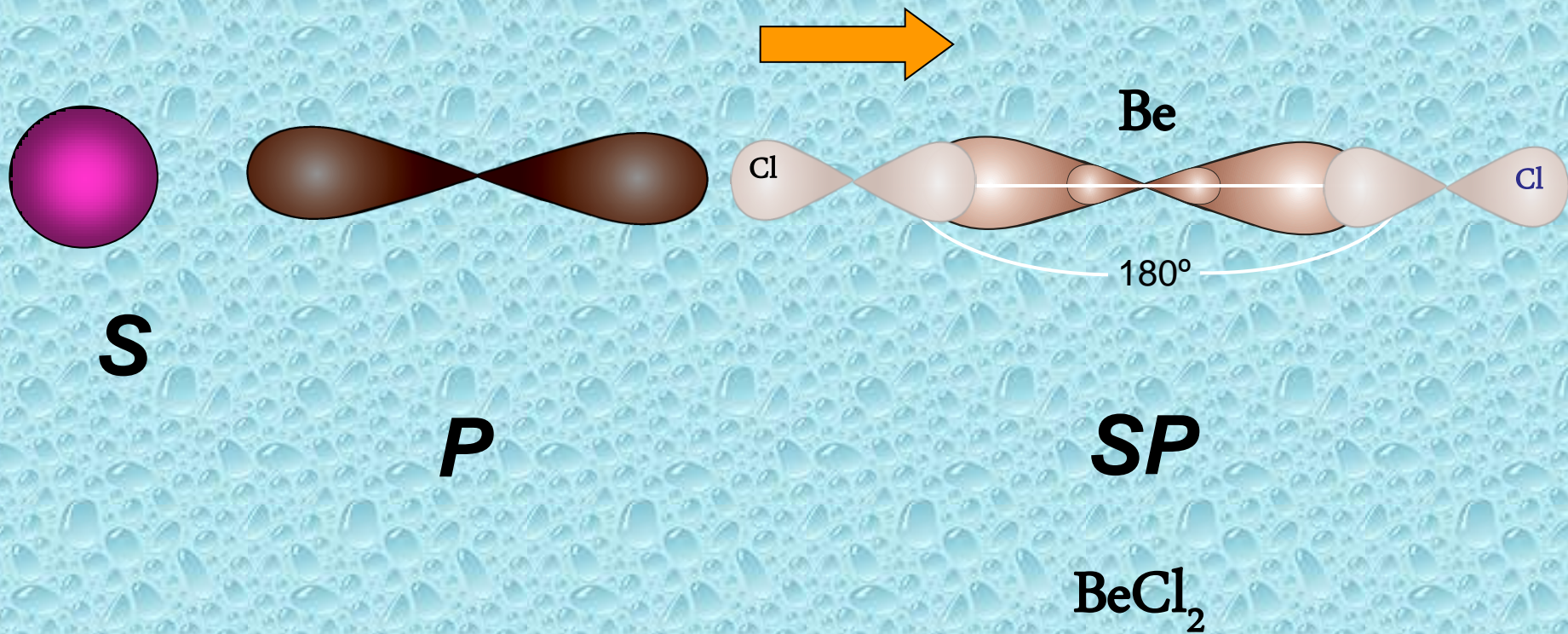


C

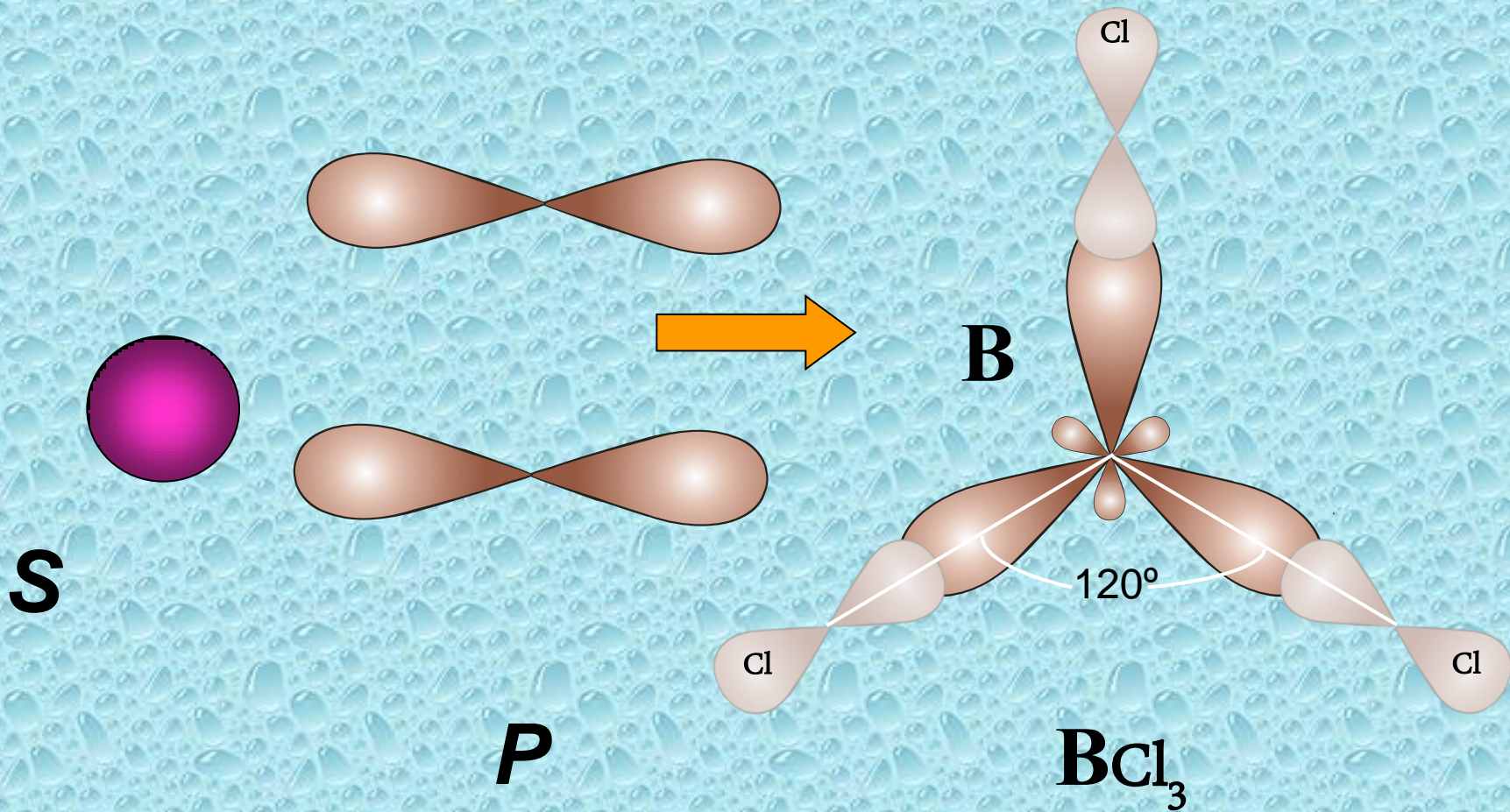
sp^3

Metan

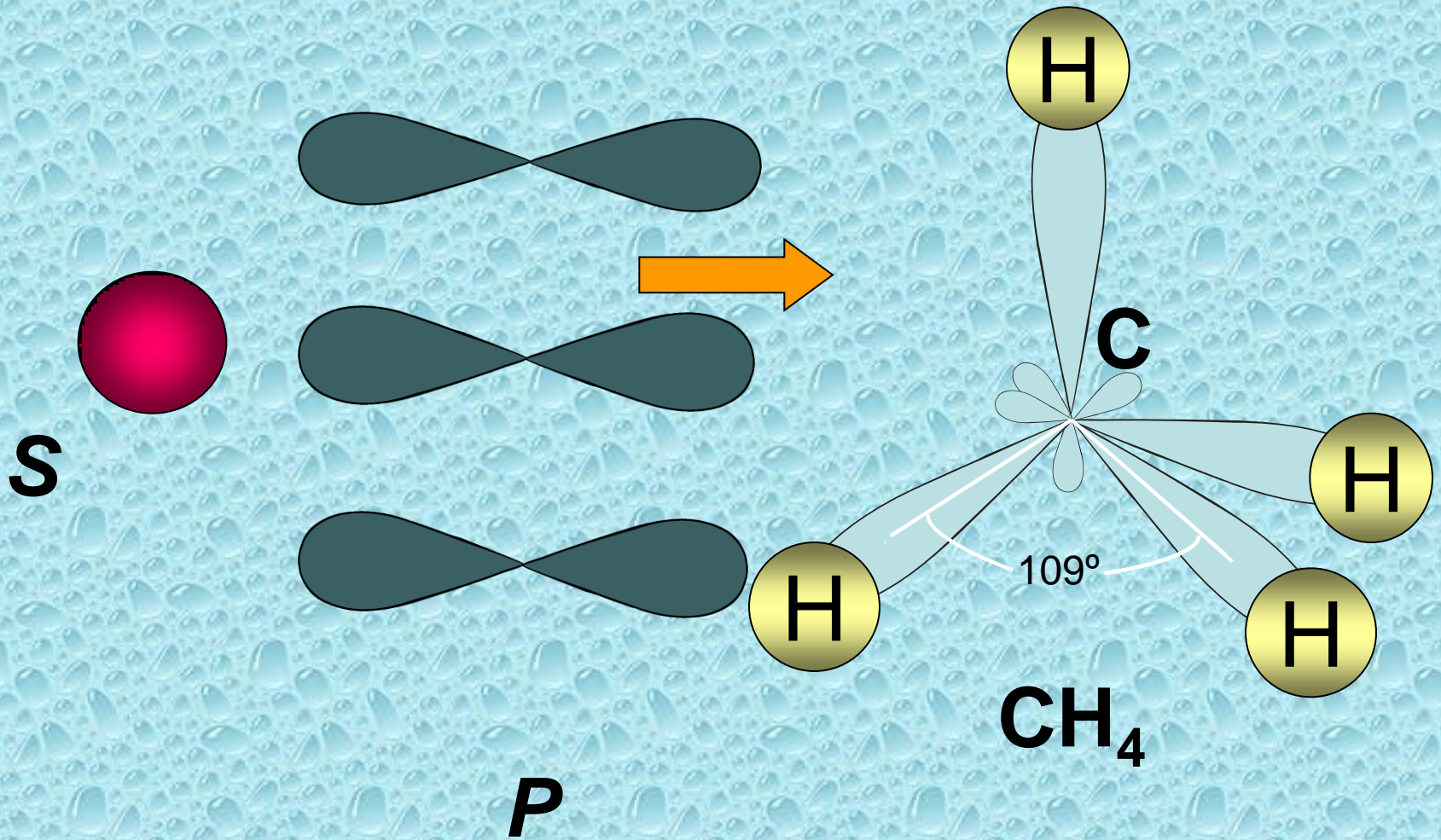
Berilliy xlorid



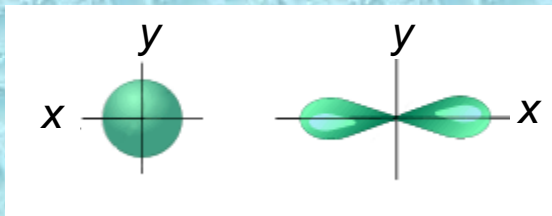
Bor xlorid



Metan molekulasining tuzilishi



Molekulalarga misollar



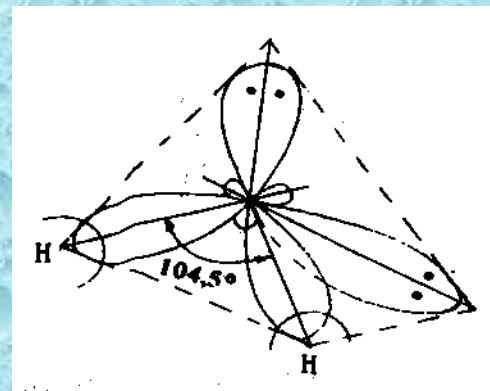
HCl



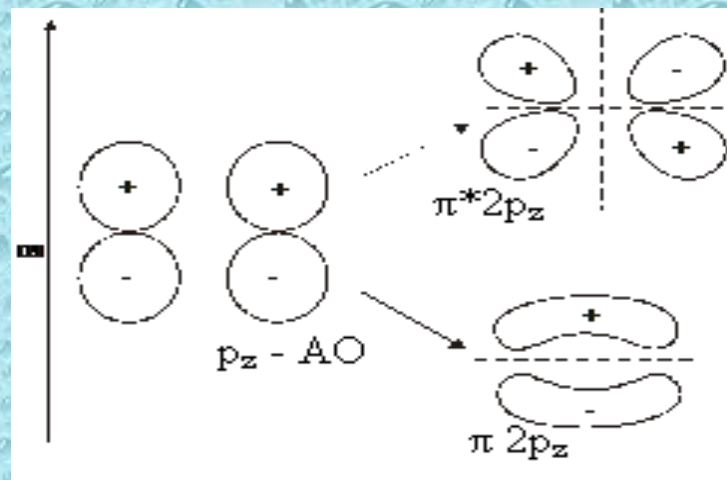
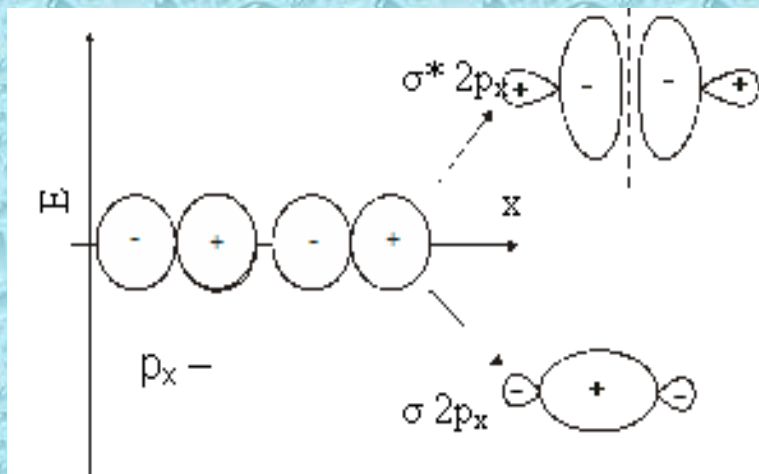
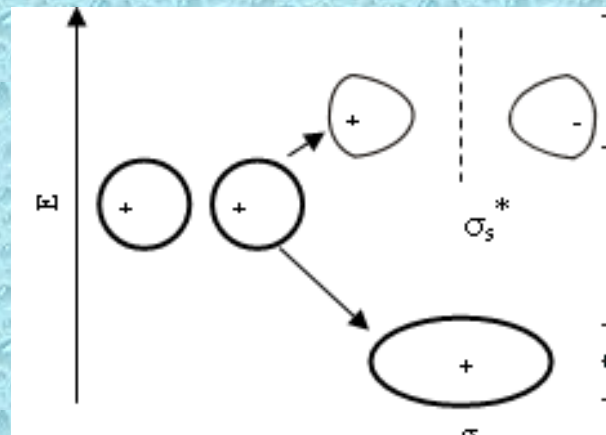
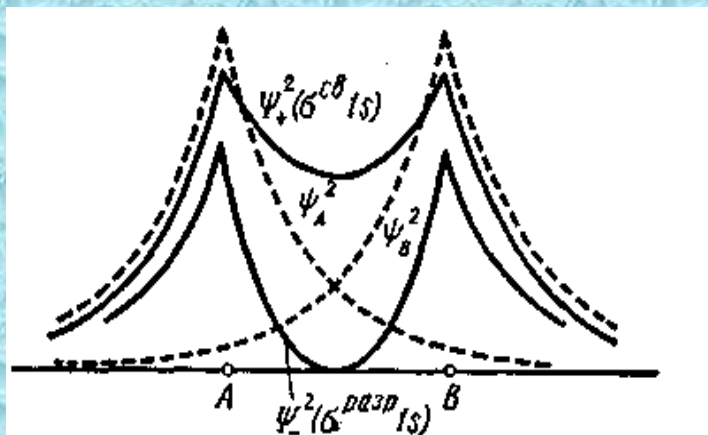
CH₄

NH₃

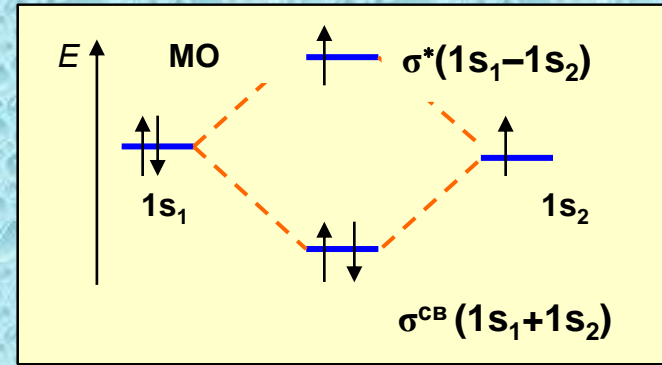
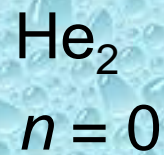
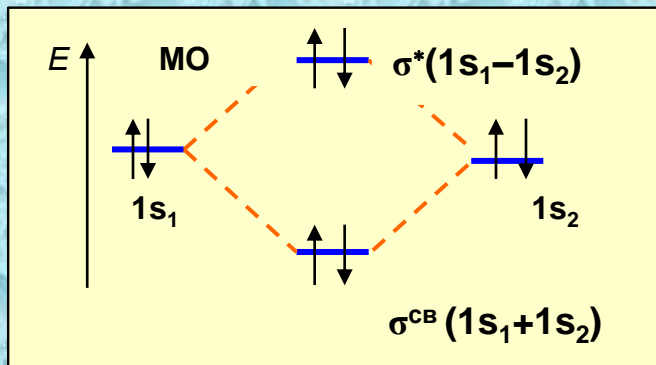
H₂O



Molekulyar orbitalar metodi

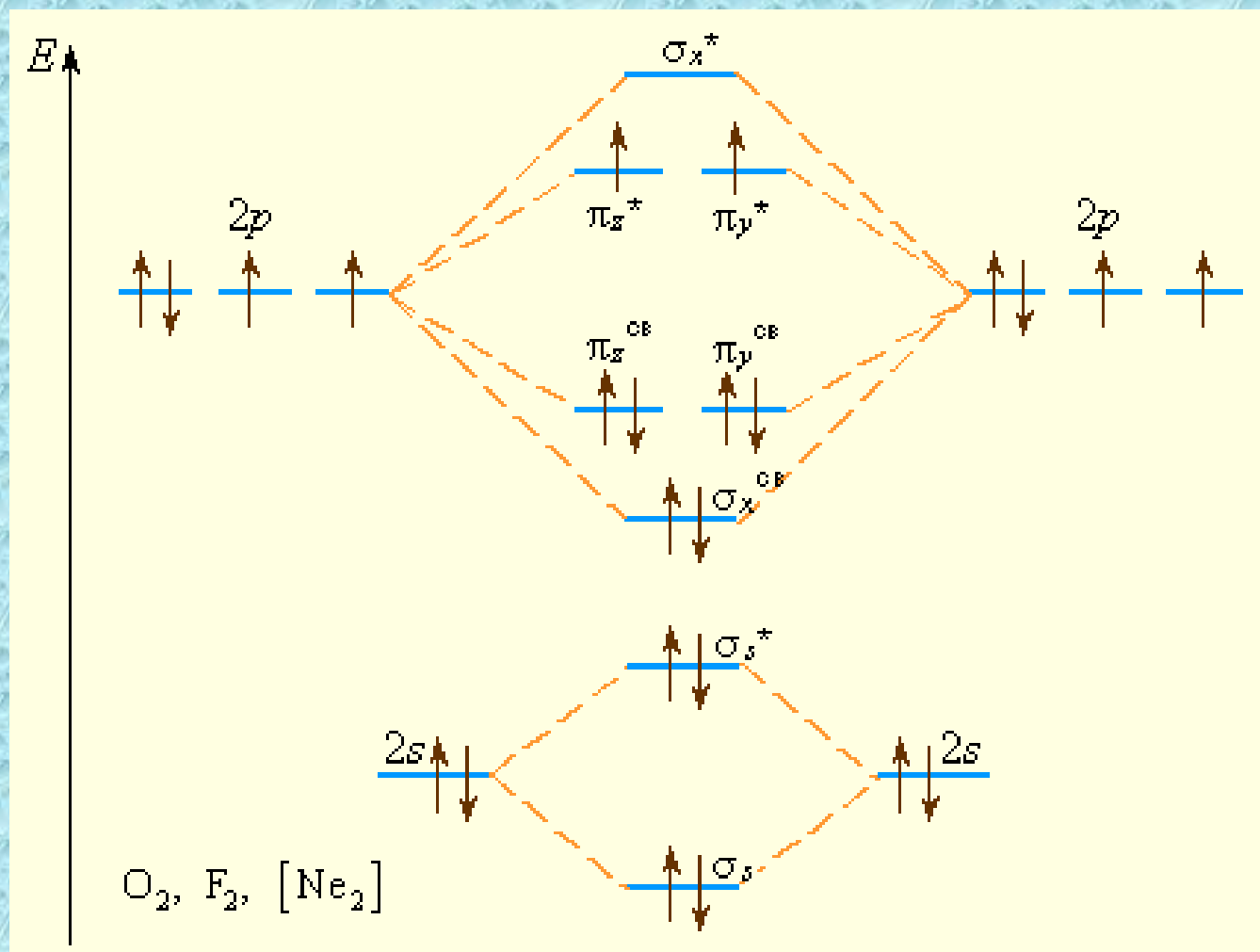


1-davr elementlarining ikki atomli gomoyadroli molekulari

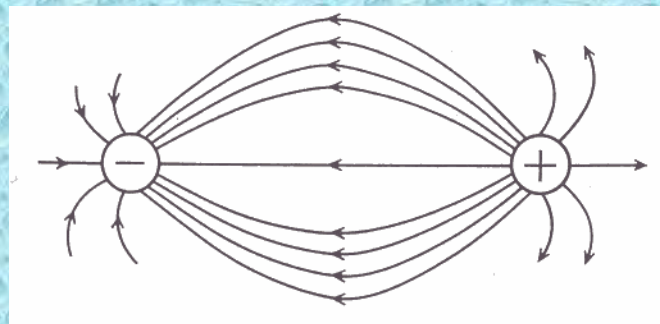
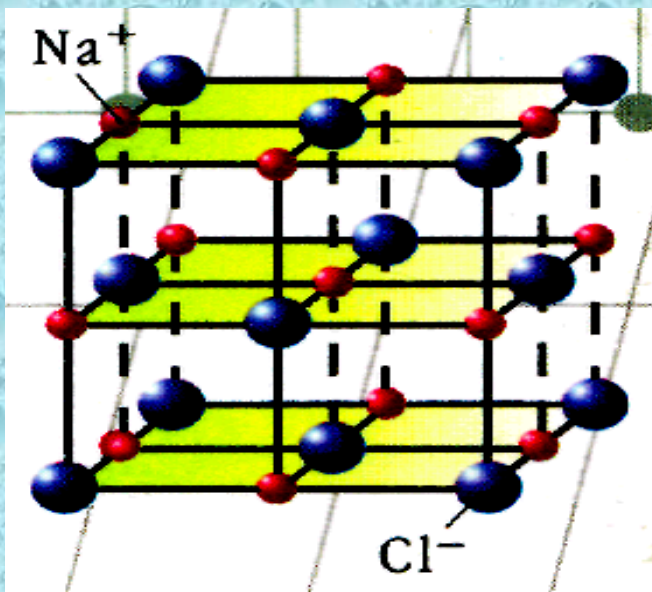


$$n = \frac{2-1}{2} = 0.5$$

MOM bo'yicha kislorod molekulasini



Ion bog'lanish



Molekulalararo o'zaro ta'sir

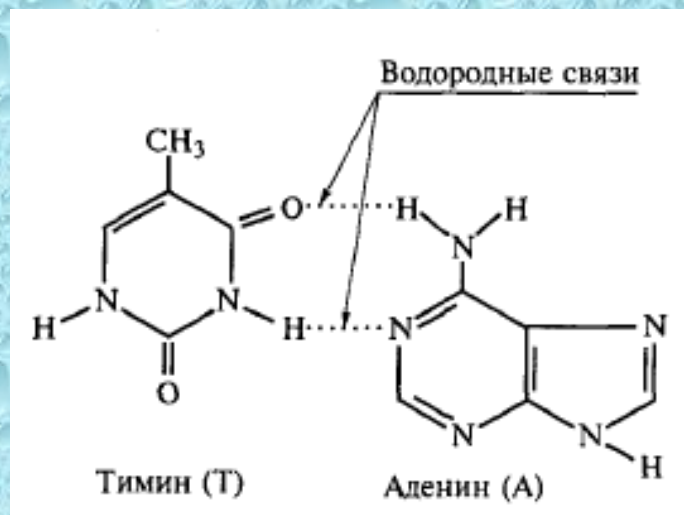
Orentatsion



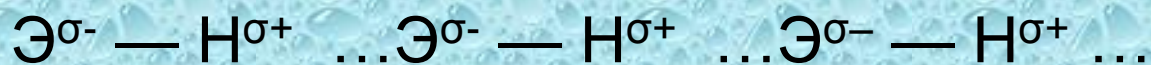
Induktsion



Dispersion



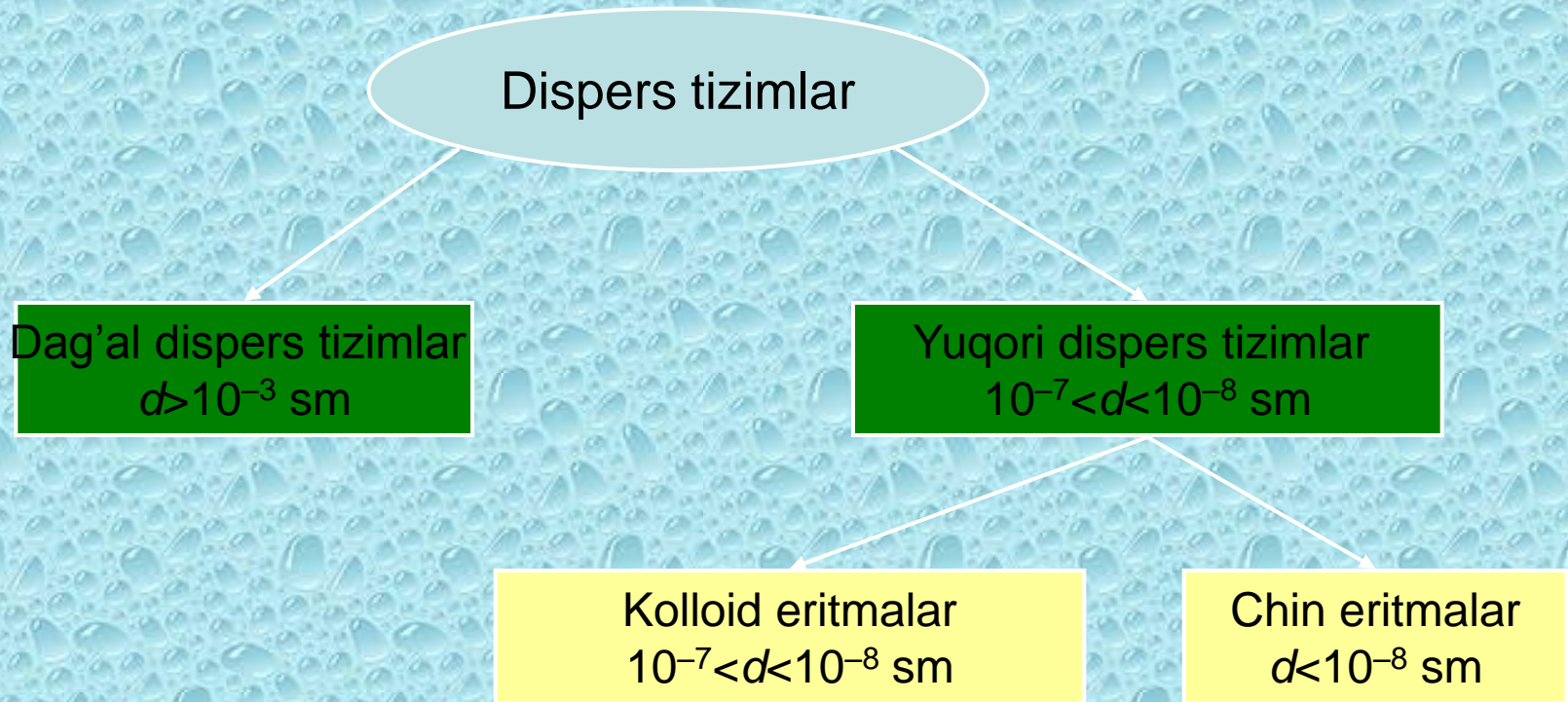
Vodorod bog'lanish



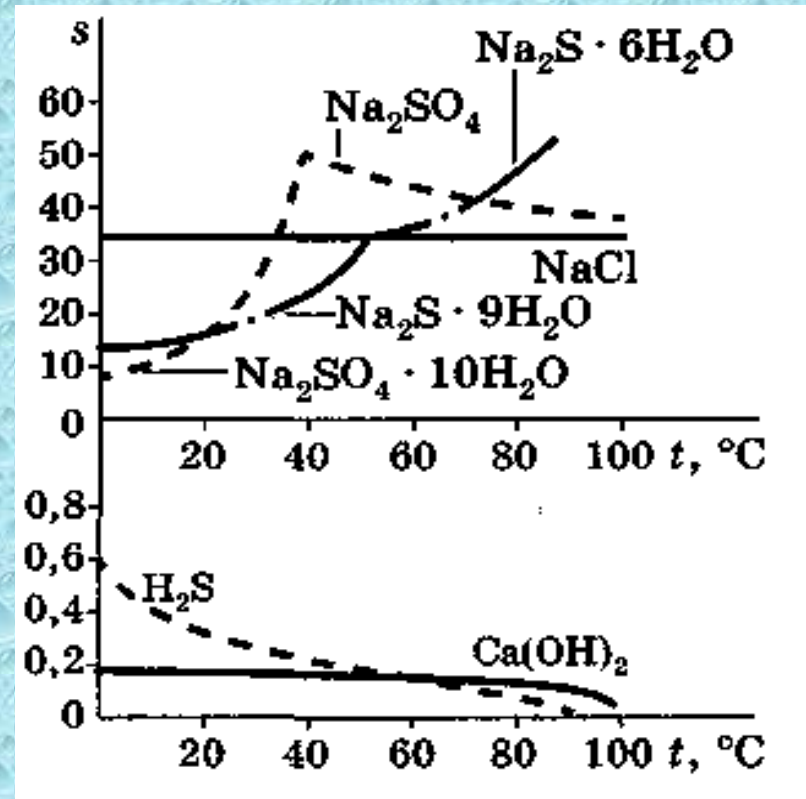
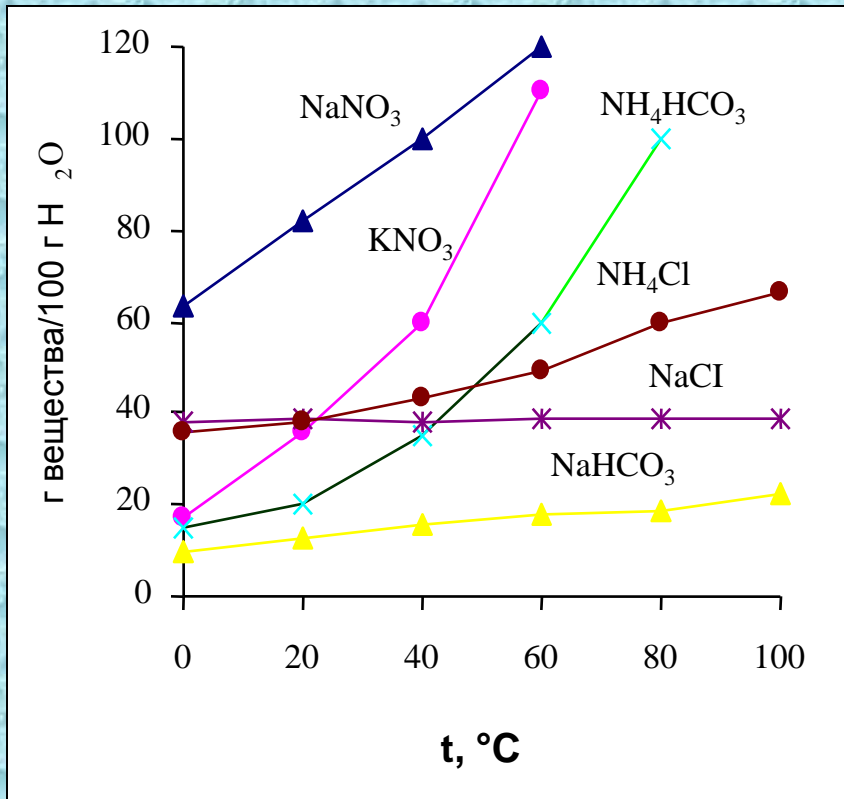
4-bo'lim

**Dispers tizimlar.
Eritmalar**

Dispers tizimlar

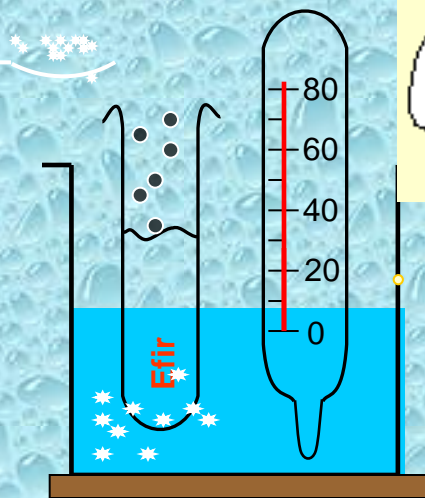


Eruvchanlik egrilari



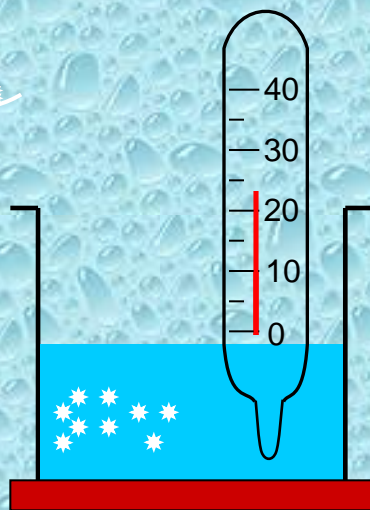
Erishning issiqlik effektlari

$\text{NaOH}_{(\text{qattiq})}$



Ekzotermik
 $Q > 0$, $\Delta H < 0$

NH_4Cl



Endotermik
 $Q < 0$, $\Delta H > 0$

Eritmalar konsentrtsiyalari

Massa ulush

$$\omega = \frac{m_x}{m_{\text{p-pa}}} \cdot 100, \%$$

$$M(f_{\text{ЭКВ}X} \cdot M_{(X)}) = f_{\text{ЭКВ}(X)} * M_{(X)}$$

Molyar konsentrtsiya

$$C = \frac{m}{M \cdot V}, \text{МОЛЬ/Л.}$$

Ekvivalent molyar konsentrtsiya

$$C_{(f_{\text{ЭКВ}(X)} \cdot X)} = \frac{n(f_{\text{ЭКВ}(X)} \cdot X)}{V}$$

X modda ekvivalent miqdori

$$n(f_{\text{ЭКВ}(X)} \cdot X) = \frac{m_{(X)}}{M(f_{\text{ЭКВ}(X)} \cdot M_{(X)})}$$

X modda ekvivalentini molyar massasi

$$M(f_{\text{ЭКВ}X} \cdot M_{(X)}) = f_{\text{ЭКВ}(X)} \cdot M_{(X)}$$

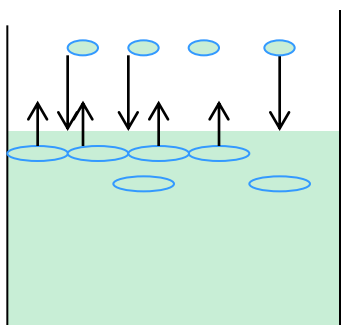
Ekvivalent faktori

Moddalarning kolligativ xossalari

Vant-Goff

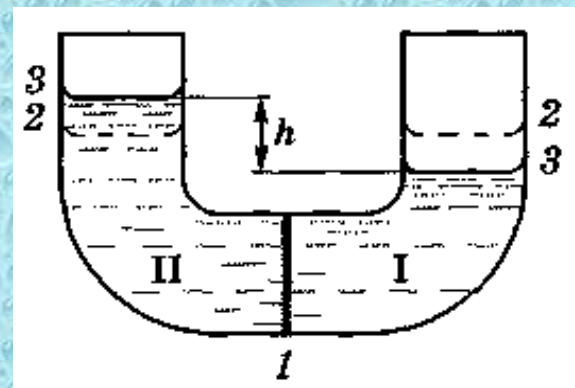
Osmotik bosim

Eritma ustidagi bug'ning bosimi



Raulning 1-qonuni:

$$\frac{P_1^0 - P_1}{P_1^0} \text{ yoki } \frac{\Delta P}{P_0} = X_2.$$



Qaynash harorati va eritmalarining kristallanishi

$$\Delta t_{\text{qay}} = E \cdot C_m$$

$$\Delta t_{\text{muz.}} = K \cdot C_m$$

– Raulning 2-qonuni

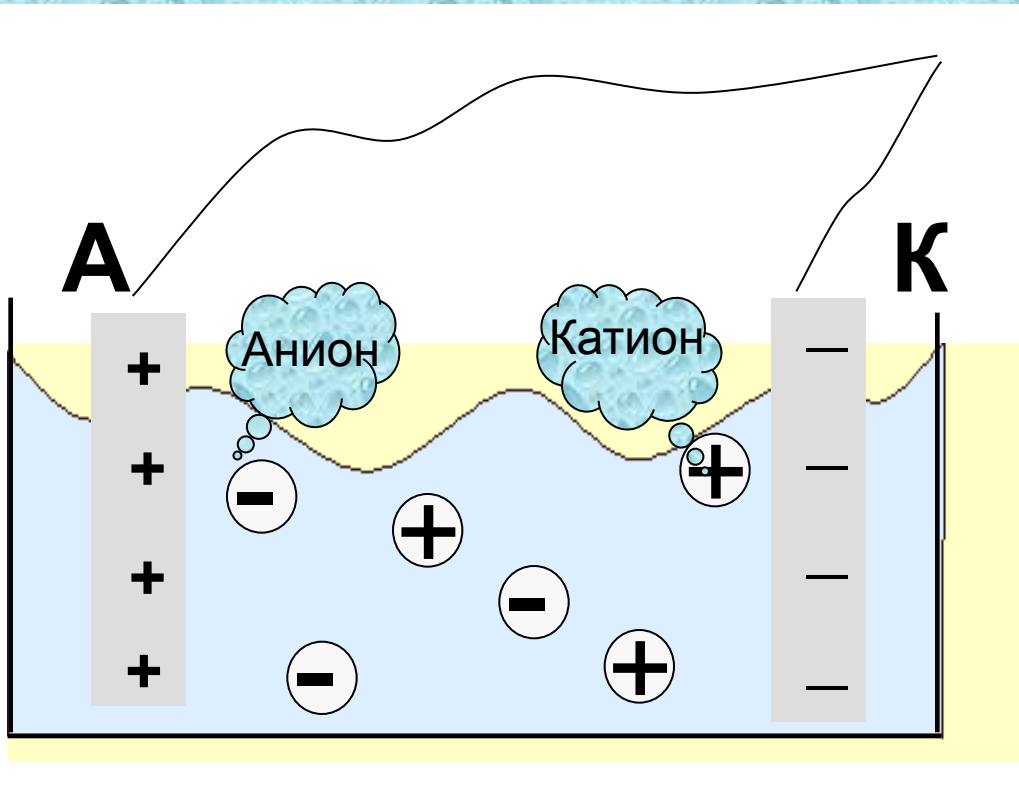
Osmosning sodir bo'lishi:

1 – yrim o'tkazgichli to'siq;
2 – eritmalarining boshlang'ich bosqichi;
I va II ($C_{II} > C_I$); 3 – eritmalarining muvozanatli bosqichi.

E – ebloskopik;
 K – krioskopik doimiylar (erituvchining);
 C_m – eritmaning molyal konsentratsiyasi.

$$P_{\text{osm}} = C_M \cdot R \cdot T.$$

Elektrolitlar

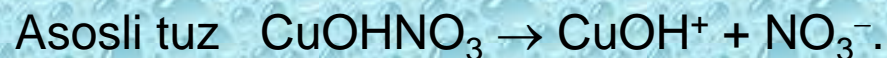
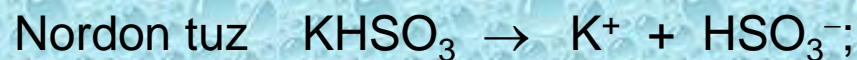
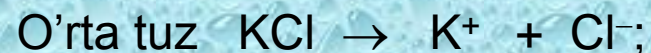


Bu quyidagi moddalar eritmalaridir:

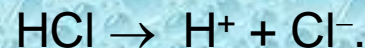
- ishqorlar;
- tuzlar;
- Anorganik kislotalarning suvdagi eritmaları;
- Organik erituchilarda erigan bir qator tuzlarning eritmaları.

Elektrolitik dissosiyalanish nazariyasi

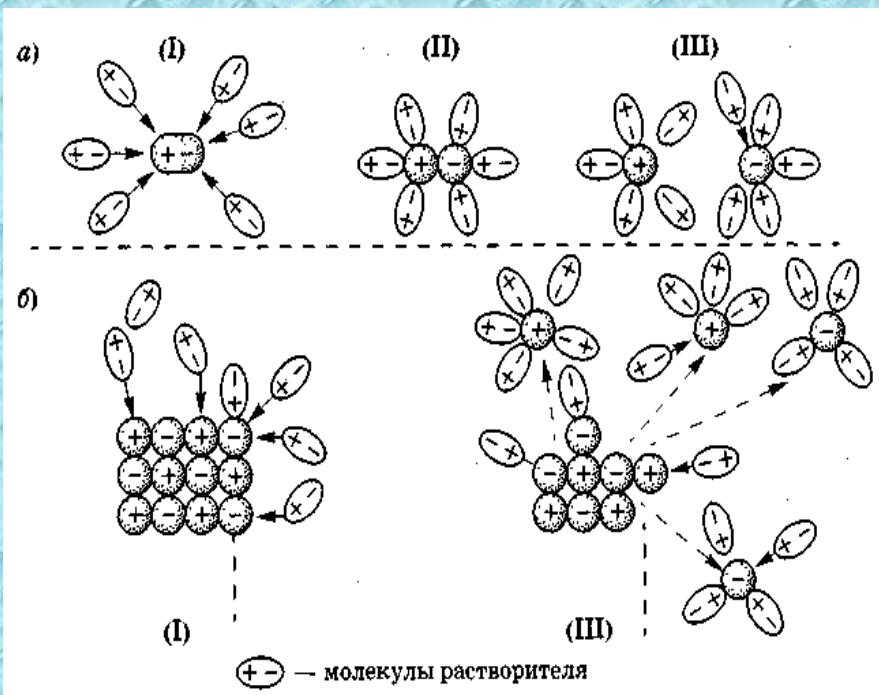
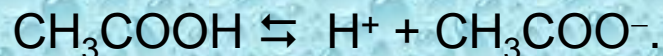
Ion bog'li tuzlarning dissosiyalanishi:



Qutbli molekullarni dissosiyalanishi:



Kuchsiz elektrolit:



Elektrolitik dissosiyalanish bisqichlari qutbli molekullarni (a) va ionli kristallarni (b):

I – solvatlanish; II – ionlanish;

III – dissosiyalanish.

Suvdagi elektrolitlarning sinflanishi

Kuchli

Tuzlar	Asoslar	Kislotalar
Amalda hammasi	Ishqoriy va ishqoriy er metallarining gidroksidlari: LiOH dan CsOH ga qarab, Ba(OH) ₂	HCl, HBr, HJ
		H ₂ SO ₄ , HNO ₃ , HClO ₃ , HClO ₄

Kuchsiz

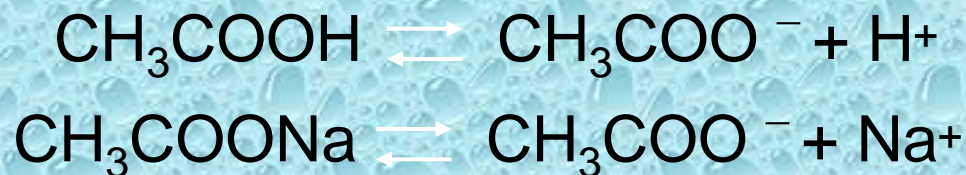
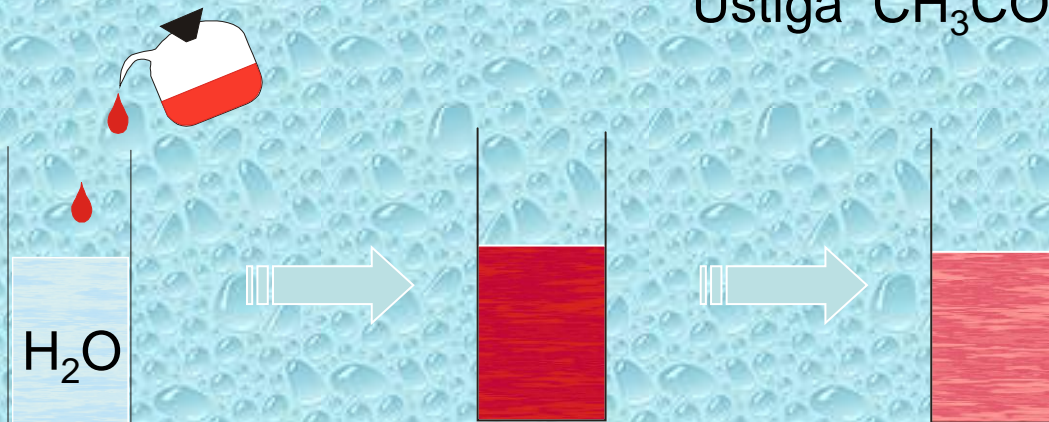
Tuzlar	Asoslar	Kislotalar
Ba'zi bir metallarni: HgCl ₂ , CdJ ₂ , Fe(CNS) ₃	Ammiakning suvli eritmasi, erimaydigan amfoter gidroksidlar: Mg(OH) ₂ , Be(OH) ₂ .	HF, H ₂ S, HCN,
		H ₂ SO ₃ , HNO ₂ , H ₂ CO ₃ , H ₃ PO ₄ , H ₃ PO ₃ , H ₂ SiO ₃ , CH ₃ COOH

Kuchsiz elektrolit muvozanatining siljishi

Suv solingan probirkkaga CH_3COOH + metil oranj – solamiz:

Rangi qizil.

Ustiga CH_3COONa qo'shamiz



Kuchsiz elektrolitlar eritmaları

Dissosiyalanish:

- $\text{H}_3\text{PO}_4 \rightleftharpoons \text{H}^+ + \text{H}_2\text{PO}_4^-$, $K_1 = 7,1 \cdot 10^{-3}$,
 $\alpha = 27 \%$;
- $\text{H}_2\text{PO}_4^- \rightleftharpoons \text{H}^+ + \text{HPO}_4^{2-}$, $K_2 = 6,2 \cdot 10^{-8}$,
 $\alpha = 0,15 \%$;
- $\text{HPO}_4^{2-} \rightleftharpoons \text{H}^+ + \text{PO}_4^{3-}$, $K_3 = 5,0 \cdot 10^{-13}$,
 $\alpha = 0,005 \%$.

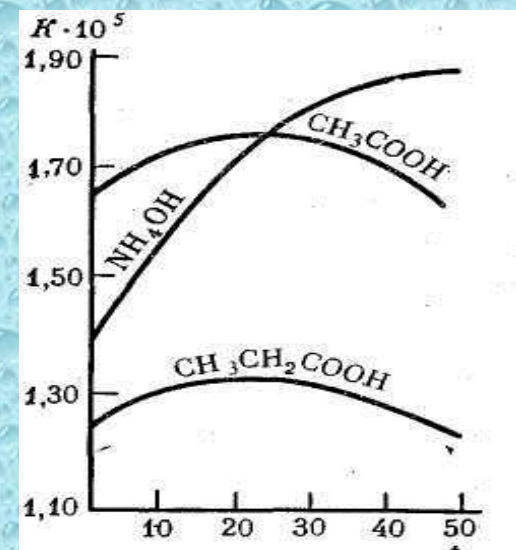
Muvozanat konstantasi:



$$K_d = \frac{[\text{CH}_3\text{COO}^-] \times [\text{H}^+]}{[\text{CH}_3\text{COOH}]}$$

Ostval'dning suyultirish qonuni:

$$\alpha = \sqrt{\frac{K}{C_M}}$$



Suvli eritmalarda ba'zi bir kuchsiz elektrolitlarning K_d haroratga bog'liqligi

Indikatorlar



Lakmus

Qizil

Binafsha

Ko'k

Fenolftalyin

Rangsiz

Rangsiz

Malina rangli

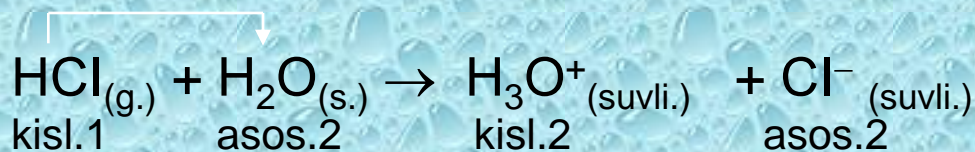
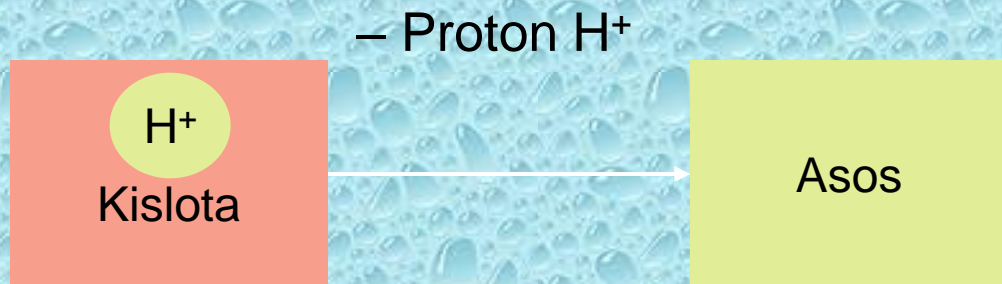
Metiloranj

Pushti

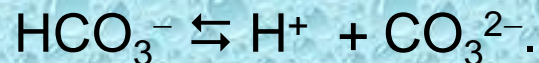
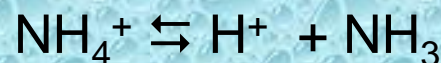
Qovoq rang

Sariq

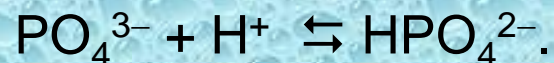
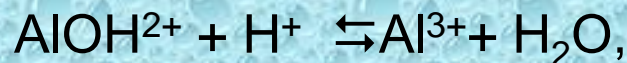
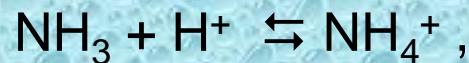
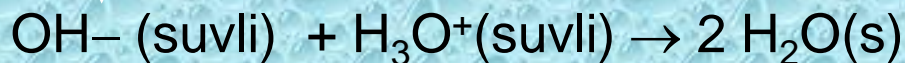
Kislota va asoslarning protolitik nazariyasi



Kislota – vodorod kationlari donori:



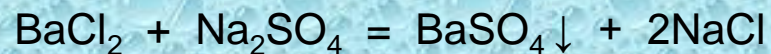
Asos – aktseptor vodorod kationlari:



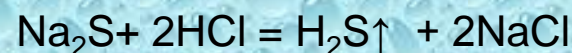
Ion almashinish reaksiyalari

Qaytmas reaksiyalar

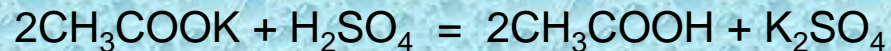
Cho'kma hosil bo'ladi (↓)



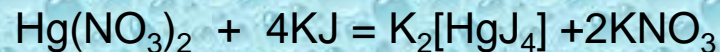
Gazsimon modda hosil bo'ladi



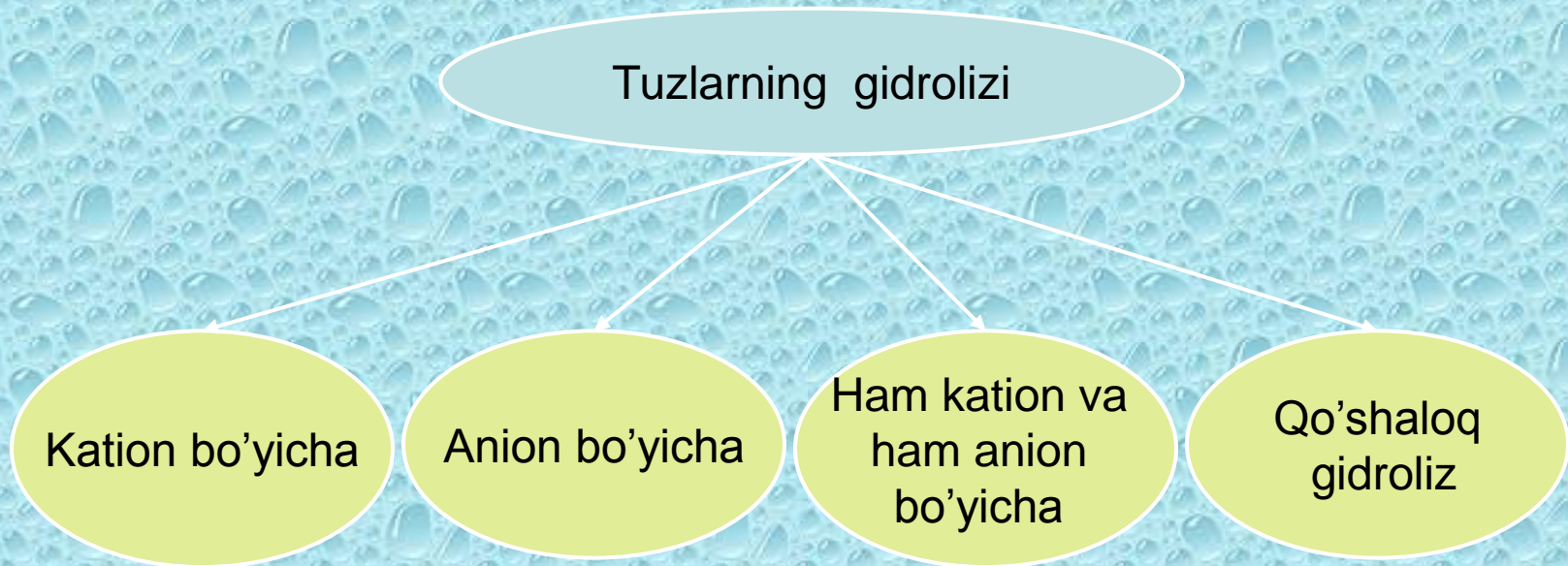
Kuchsiz elektrolit hosil bo'ladi



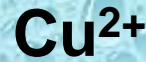
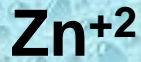
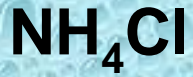
Kompleks birikma hosil bo'ladi



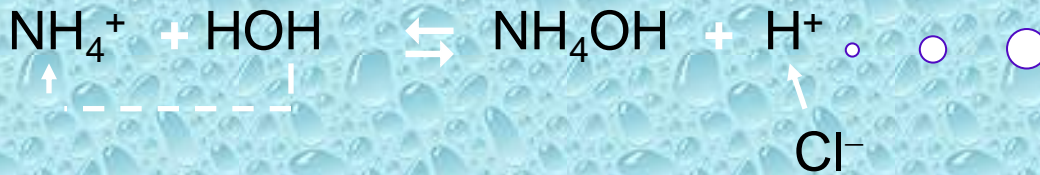
Tuzlarning gidrolizi



Kation bo'yicha gidroliz



Kation bir zaryadli:

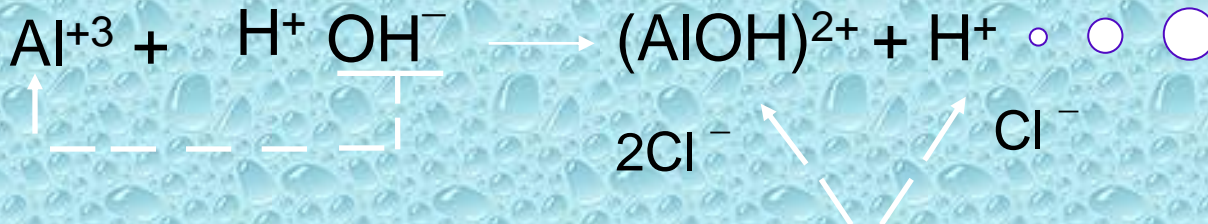


Muhit kislotali
pH < 7

Kation ko'p zaryadli:

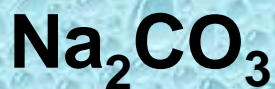


Alyuminiy gidroksi xlorid



Muhit kislotali
pH < 7

Anion bo'yicha gidroliz



Anion bir zaryadli:

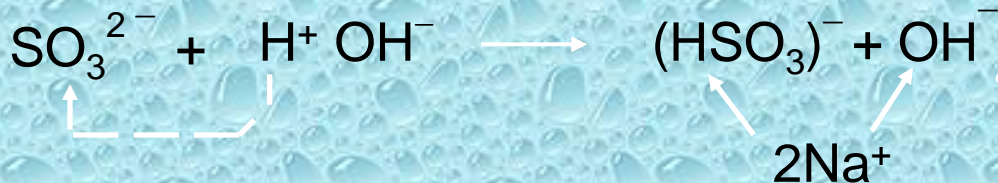


Muhit ishqoriy
pH>7

Anion ko'p zaryadli:



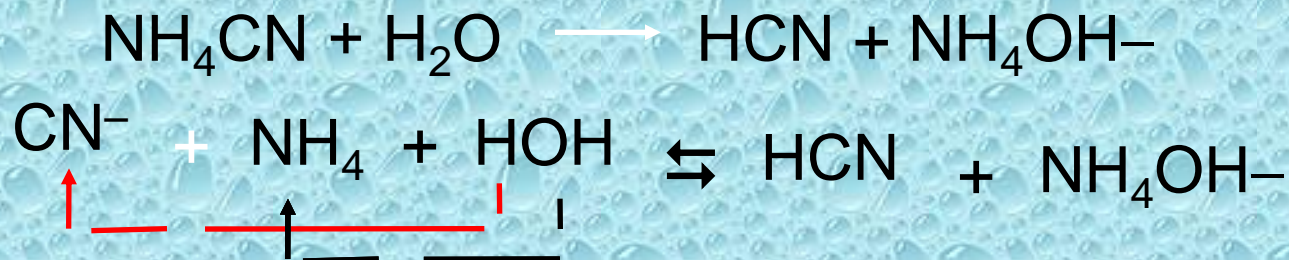
Natriy gidrosulfit



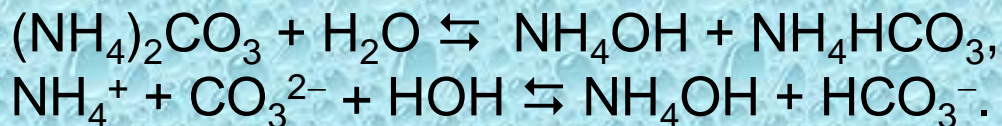
Muhit ishqoriy
pH>7

Kation va anion bo'yicha gidroliz

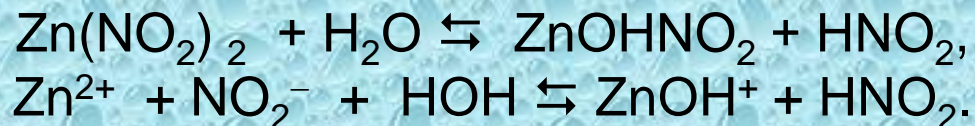
Bir zaryadli kation va anion:



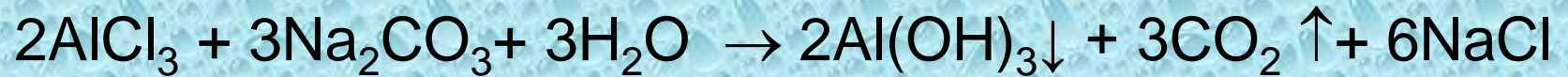
Bir zaryadli kation va ko'p zaryadli anion:



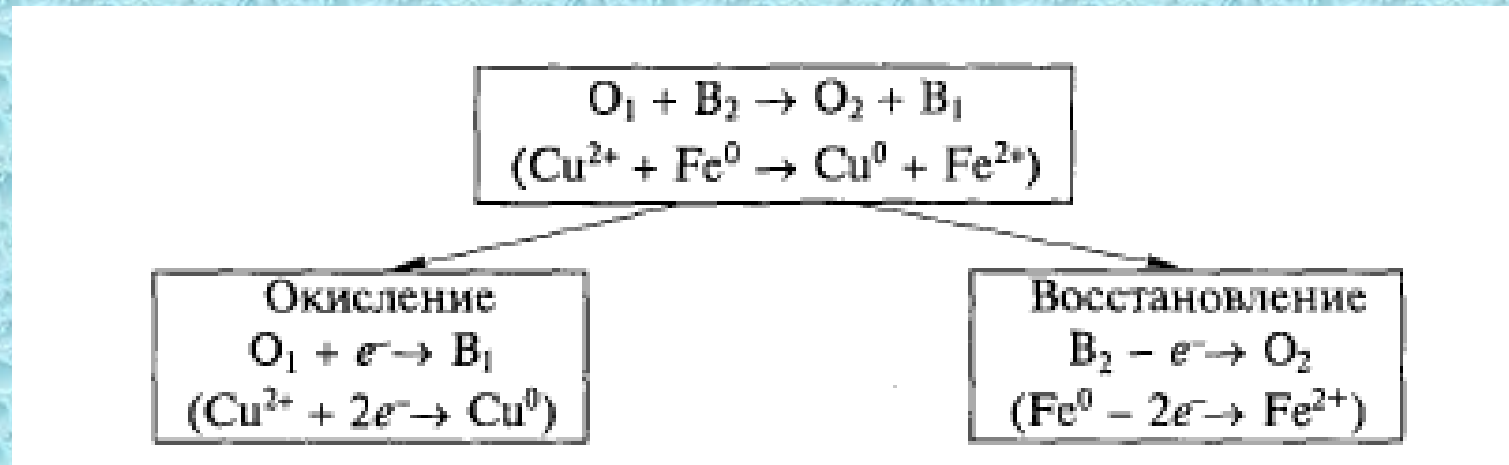
Ko'p zaryadli kation va bir zaryadli anion:



Gidroliz bilan boradigan almashinish reaksiyasi



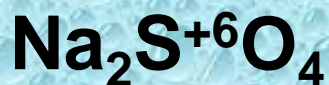
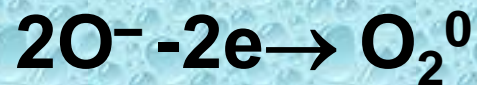
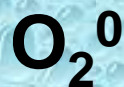
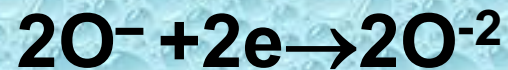
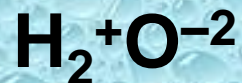
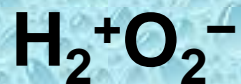
Oksidlanish qaytarilish reaksiyalari



Har qanday oksidlanish – qaytarilish reaksiyalarida ikki g'alayonlangan juft ishtirok etadi «**oksidlovchi-qaytaruvchi**» – O_1 , Q_1 va O_2 , Q_2 .

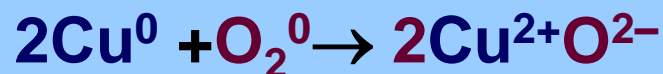
Lekin oksidlanish qaytarilishsiz bo'lmisligi mumkin emas, ikkala jarayonni ham alohida yozish mumkin.

O'tish oksidlanish darajasiga ega elementlar

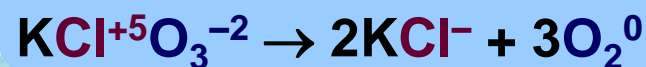
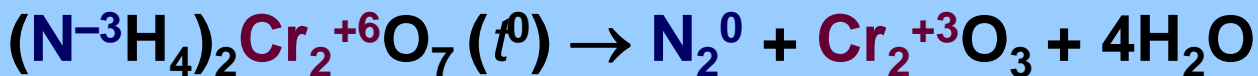


O-Q R turlari

Molekulararo



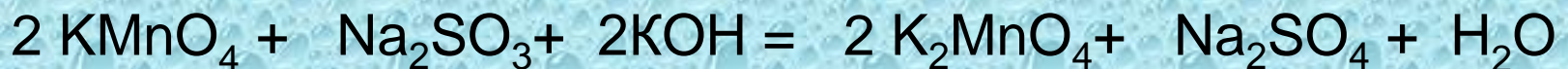
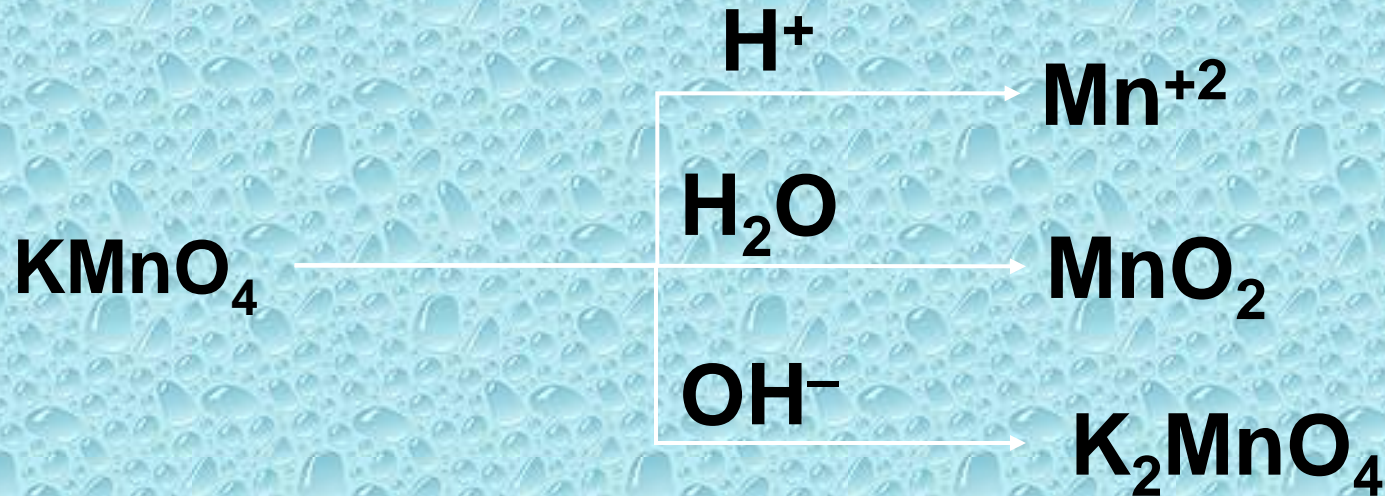
Ichki molekulyar



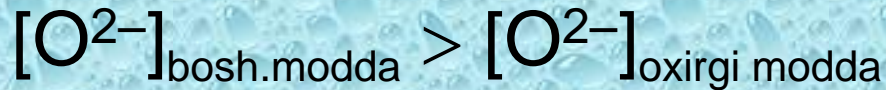
Disproportsiyalanish



Kaliy permanganat

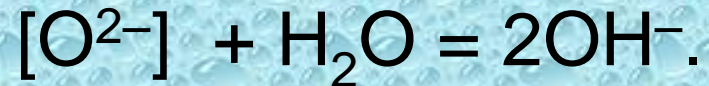
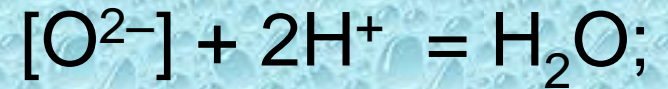


Ion – elektron usul



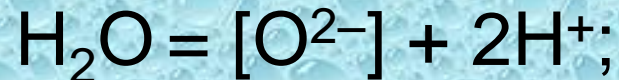
a) kislotali muhit

b) Ishqoriy va neytral muhit



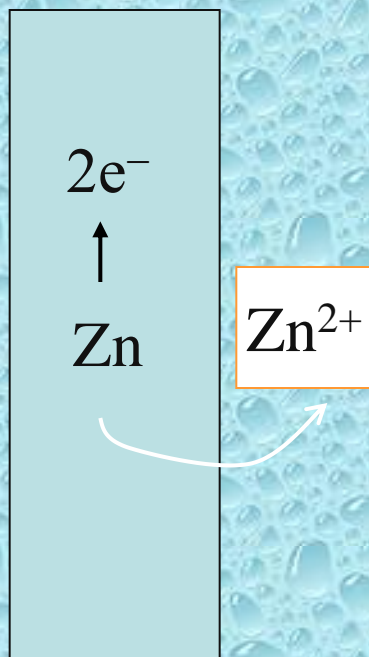
a) kislotali va neytral muhit

b) Ishqoriy muhit

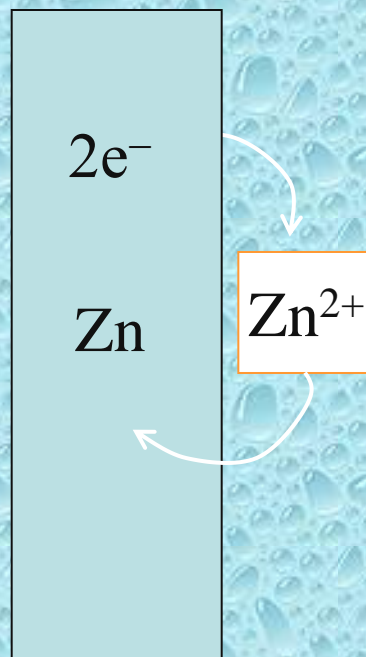


Elektrodlardagi jarayonlar

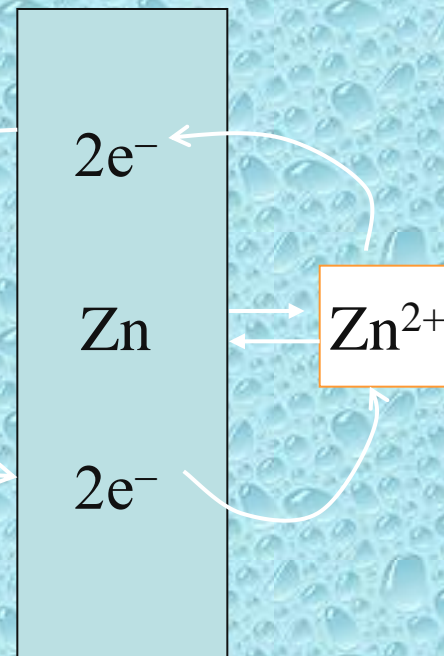
Oksidlanish



Qaytarilish

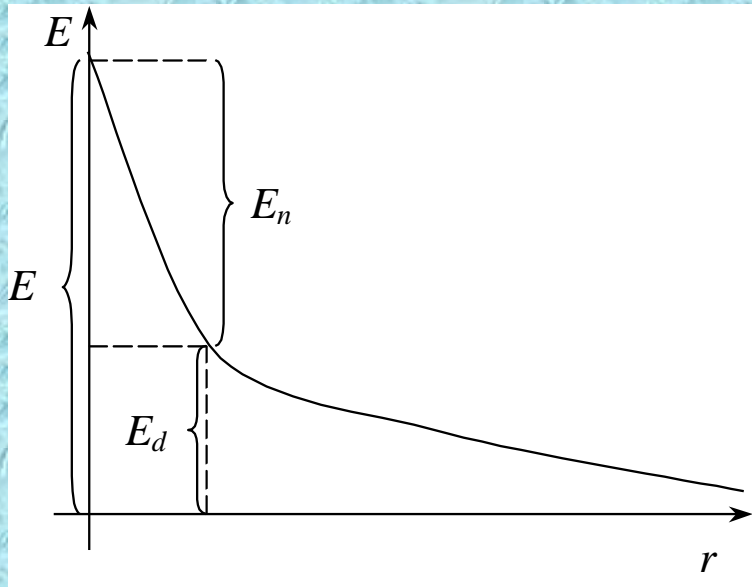


Muvozanat potentsiali



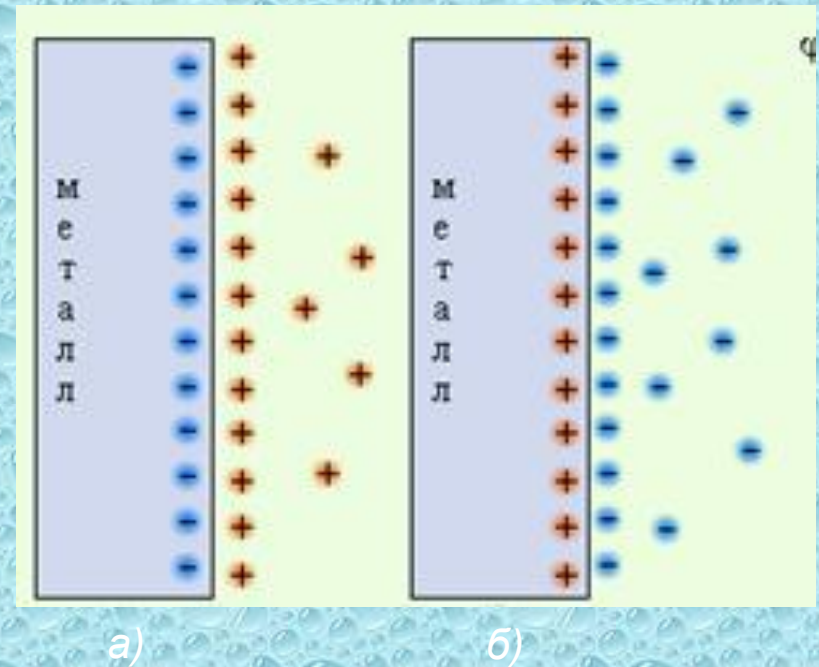
$$E_{\text{ОКСИЛ/ВОССТ}} = E^0_{\text{ОКСИЛ/ВОССТ}} + \frac{RT}{nF} \ln \frac{C_{\text{ОКСИЛ}}}{C_{\text{ВОССТ}}}$$

Ikki qavatli elektr qatlami

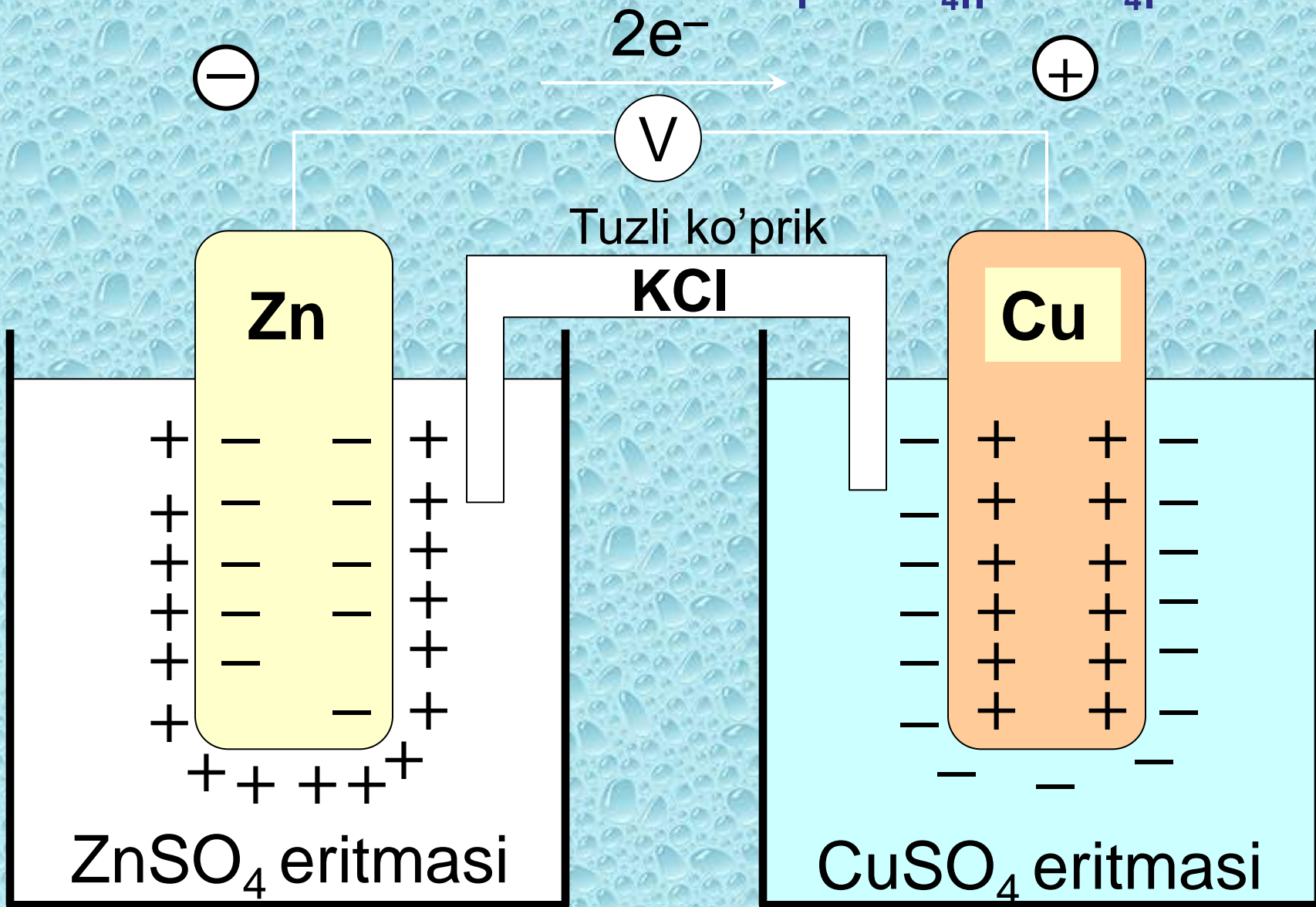


Ikki qatlamli elektr qatlamida potentsialni taqsimlanishi: r – metal yuzasidan bolgan masofa

Potentsialni shakllanishini ikki holati:
a – faol metal, manfiy potentsial;
b – faolsiz metal, musbat potentsial



Galvanik element sxemasi $Zn^0|ZnSO_4||CuSO_4|Cu^0$

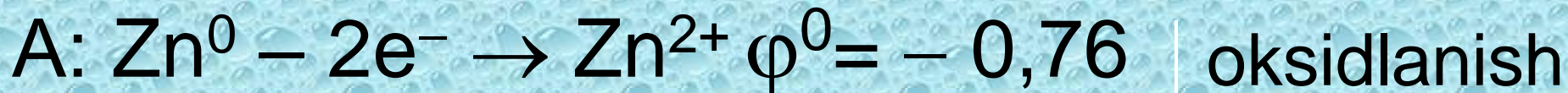


Anoddagi va katoddagi jarayonlar

Anod



Katod



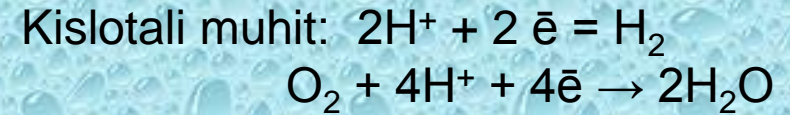
$$E^0 = \varphi^0_K - \varphi^0_A$$

$$E^0_{\text{Cu-Zn}} = 0,34 - (-0,76) = 1,1 \text{ B.}$$

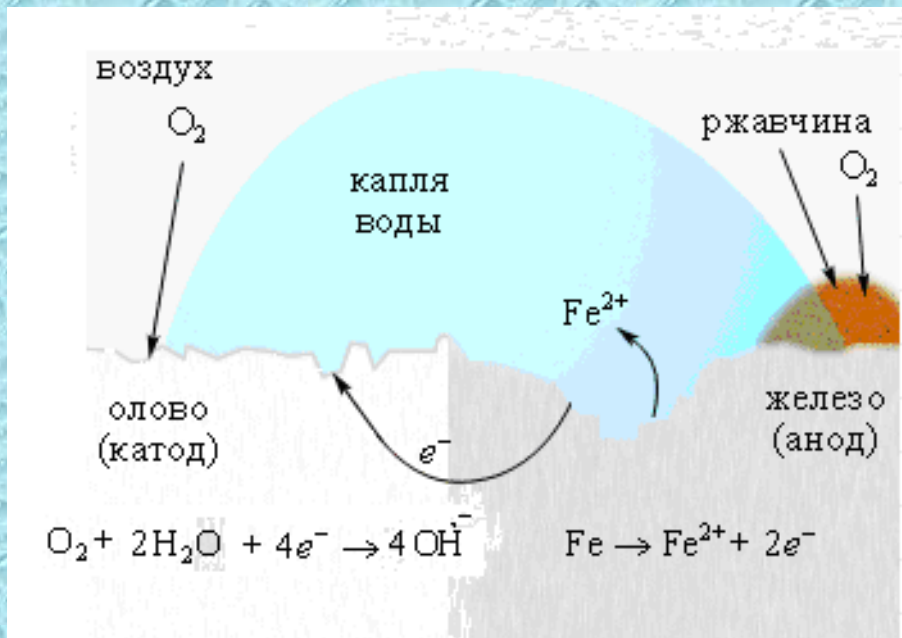
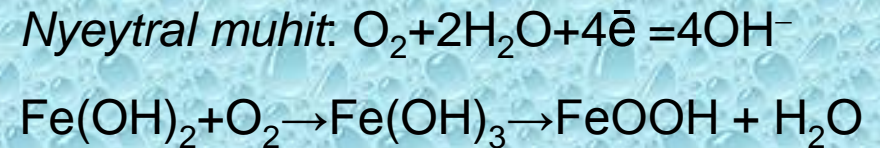
Metallar korroziyasi

Elektrokimyoviy korroziya

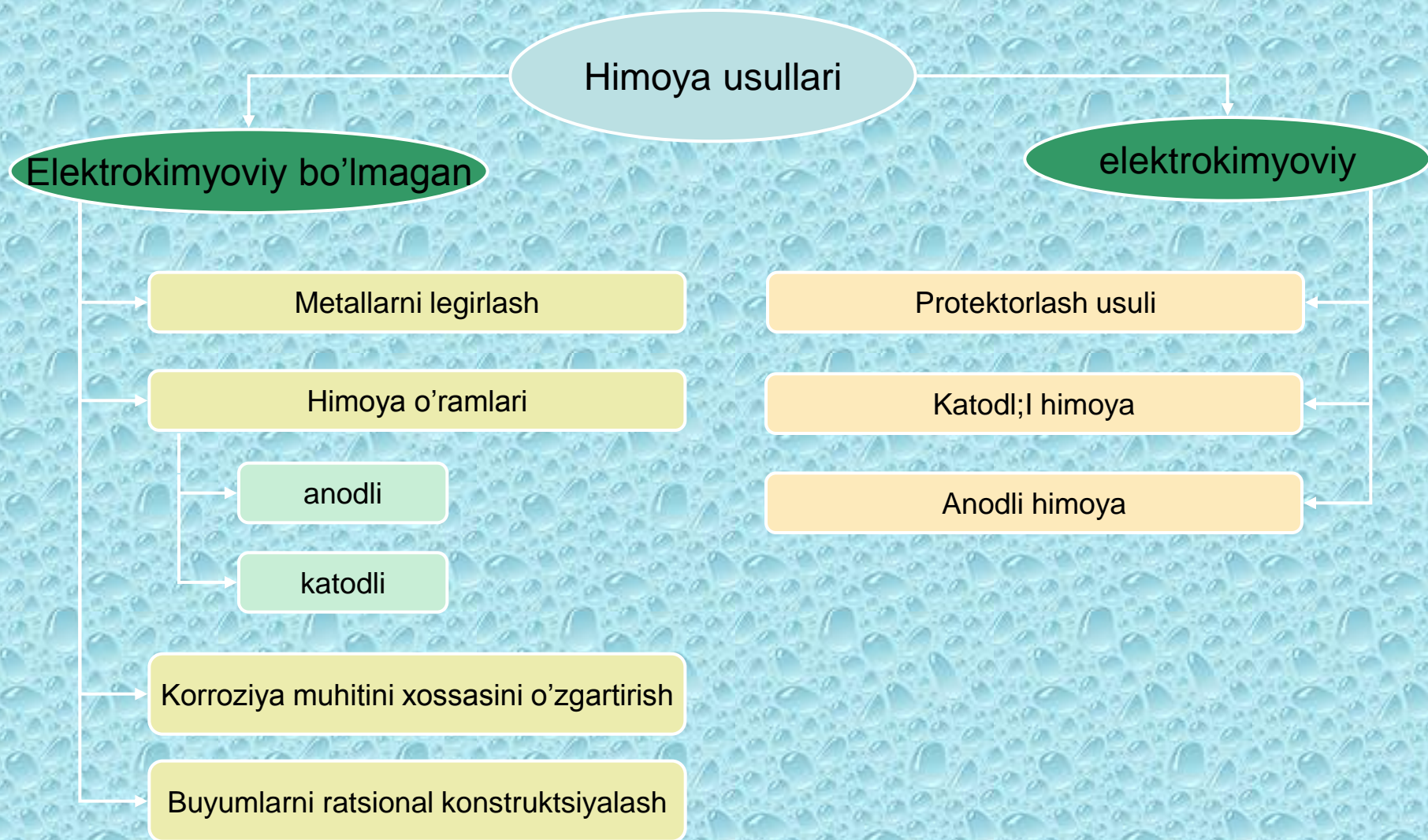
Vodorodli dequtblanish



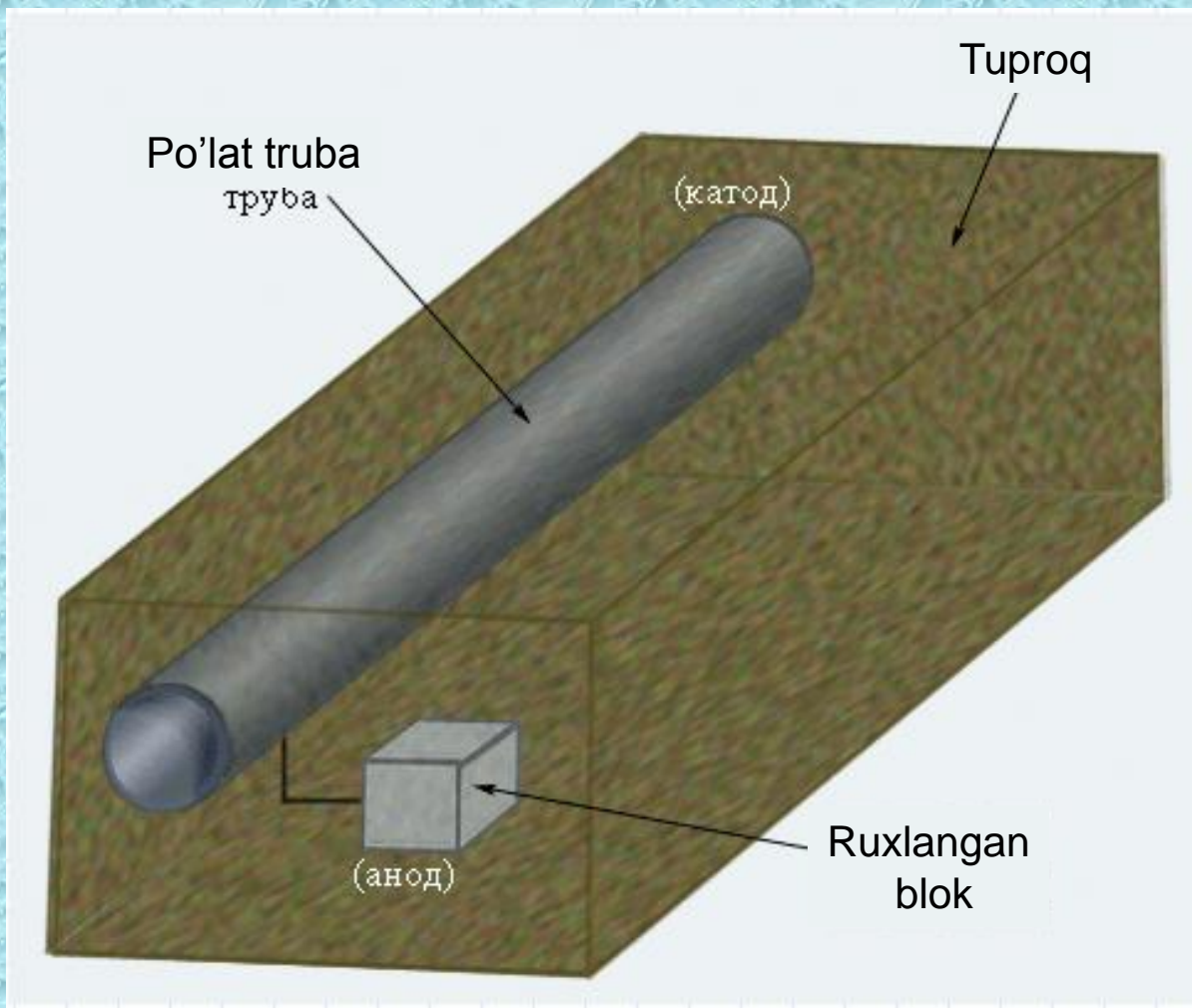
Kislородli dequtblanish



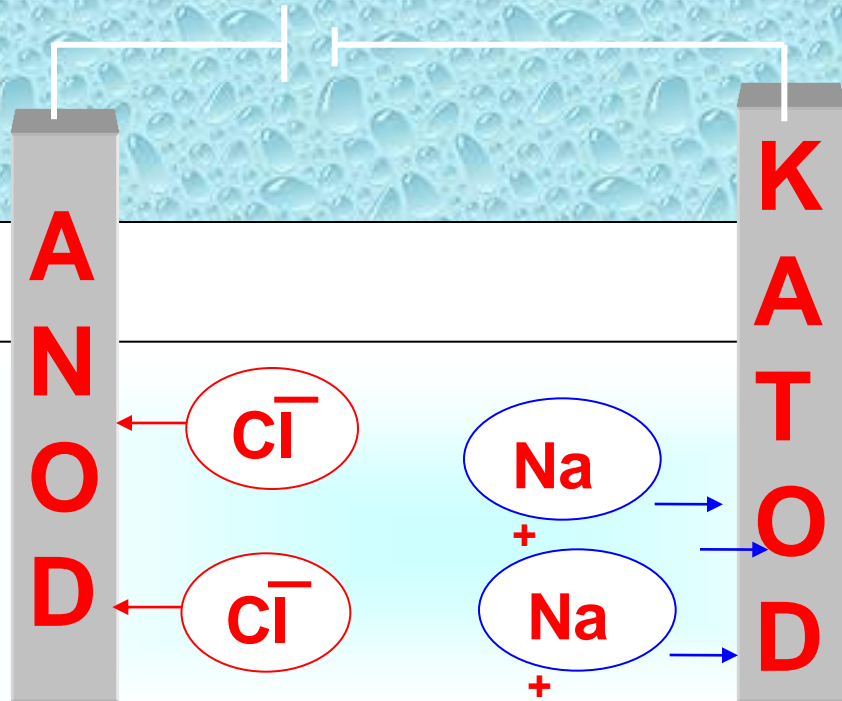
Korroziyadan himoya



Protektorli himoya



Suyuqlanma elektrolizi



Suvli eritmalar elektrolizi

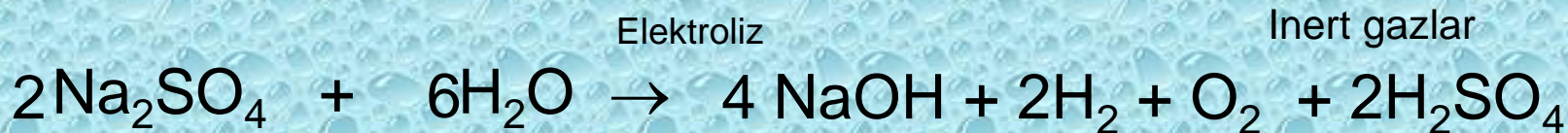
Katoddagi jarayonlar

Li Rb K Ba Ca Na Mg	Al Mn Zn Cr Fe Co	Sn Pb H Cu Hg Ag Pt Au
Qaytariladi: $2\text{H}_2\text{O} + 2\text{e}^- = \text{H}_2 + 2\text{OH}^-$ yoki $2\text{H}^+ + 2\text{e}^- = \text{H}_2$	Birgalikdagi qaytarilish: $\text{Me}^{n+} + \text{ze}^- = \text{Me}^0$ $2\text{H}_2\text{O} + 2\text{e}^- = \text{H}_2 + 2\text{OH}^-$	Metal qaytariladi: metal $\text{Me}^{n+} + \text{ne}^- = \text{Me}^0$

Anoddagi jarayonlar

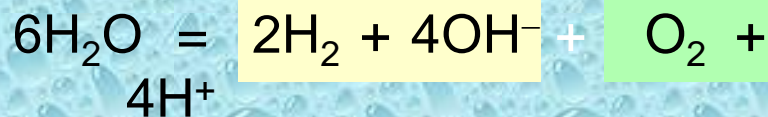
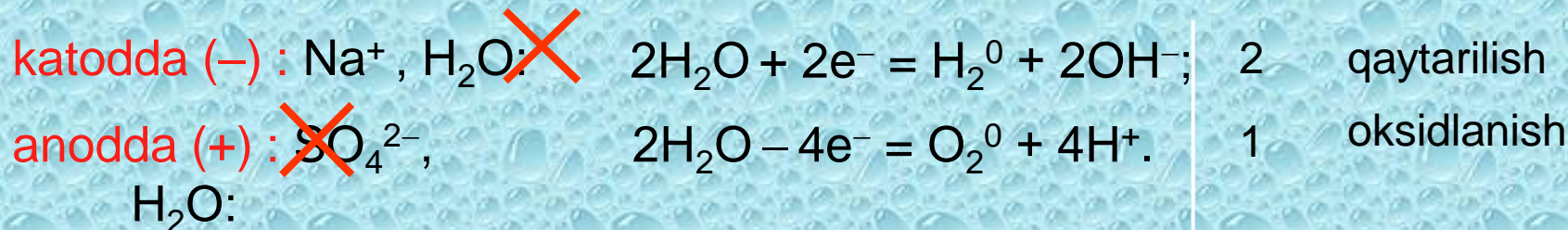
Suvli eritmalar		Ishqoriy eritmalar
Anionlar oksidlanadi: $\text{R-COO}^- < \text{Cl}^- < \text{Br}^- < \text{I}^- < \text{S}^{2-}$	Anionlar oksidlanmaydi: $\text{F}^- < \text{SO}_4^{2-} < \text{NO}_3^- < \text{CO}_3^{2-} < \text{PO}_4^{3-}$, Suv molekulasini oksidlanadi: $2\text{H}_2\text{O} - 4\text{e}^- = \text{O}_2 + 4\text{H}^+$	Oksidlanadi: $4\text{OH}^- - 4\text{e}^- = \text{O}_2 + 2\text{H}_2\text{O}$
$2\text{Cl}^- - 2\text{e}^- = \text{Cl}_2$ $2\text{R-COO}^- - 2\text{e}^- = 2\text{CO}_2 \uparrow + \text{R-R}$		

Eritma elektrolizi sxemasi



\downarrow \downarrow
Katod(-) **Anod(+)**

Boradigan jarayonlar

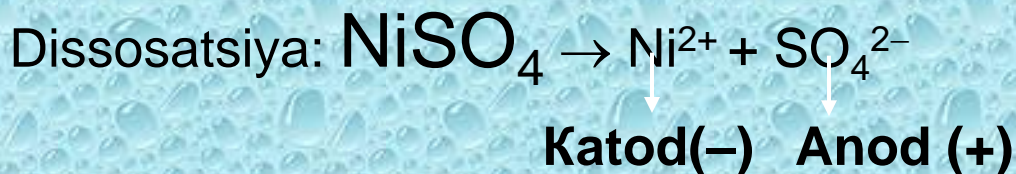


Elektrolizning
umumiy
tenglamasi

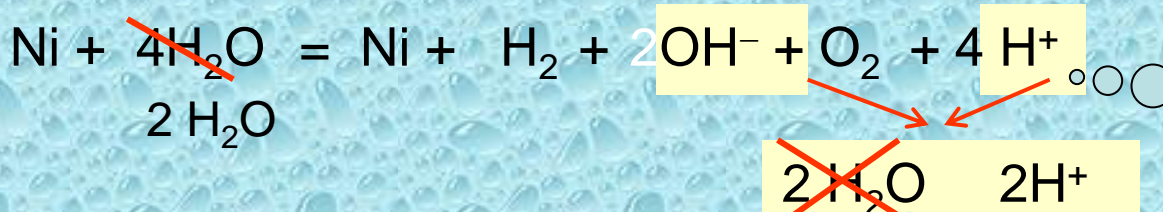
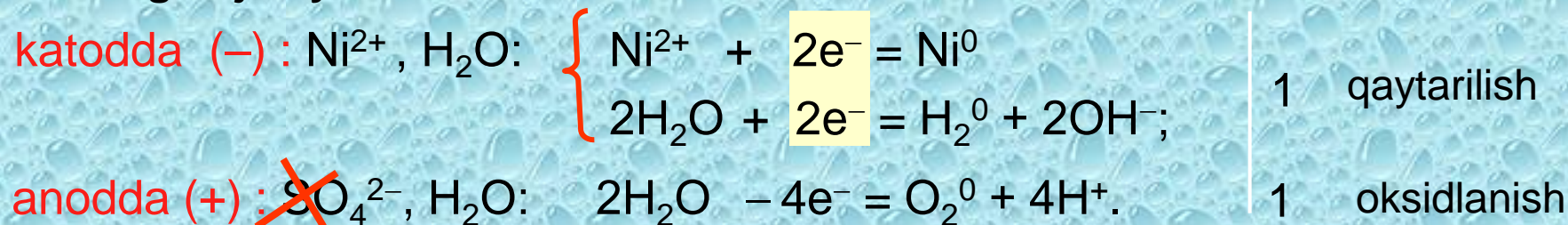
Mahsulotlar katodda: $\text{H}_2, \text{NaOH};$

anodda: $\text{O}_2, \text{H}_2\text{SO}_4.$

Eritma elektrolizini sxemasi



Boradigan jarayonlar



Elektrolizning umumiy formulasi

Mahsulotlar **katodda**: Ni, H₂;
anodda: O₂, H₂SO₄.

Faradiy qonuni



$$m = \frac{I \cdot t \cdot \Theta}{F}$$

buyerdagi m – hosil bo'lgan yoki reaksiyaga kirishgan modda;

E – moddaning ekvivalent massasi;

I – tok kuchi, A;

t – vaqt, s;

F – Faradiy doimiysi: 96500 Kl/mol.

Elektrodda bir mol ekvivalent mol moddani aylanishida, undan 96500 Kl (A·c) tok o'tadi.

2 - modul

Elementlar kimyosi va ularning birikmalari

6 – boʻlim

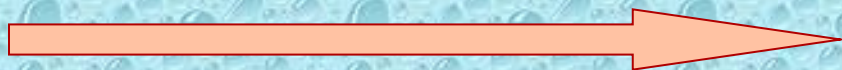
Kimyoviy elementlarning umumiy tavsifnomasi

Metalmaslarning xossalarini o'zgarishi


Atom radiuslarini kamayishi.

Ortib borishi: elektronga moyillik; oksidlovchilik faolligi.

Metallik xossalarini kuchsizlanishi.



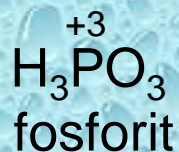
Peroid	Guruh					
n	IIIA	IVA	VA	VIA	VIIA	VIIIA
1					H	He
2	B	C	N	O	F	Ne
3	Al	Si	P	S	Cl	Ar
4	Ga	Ge	As	Se	Br	Kr
5	In	Sn	Sb	Te	I	Xe
6	Tl	Pb	Bi	Po	At	Rn
7	p ¹	p ²	p ³	p ⁴	p ⁵	p ⁶



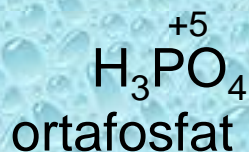
Atom radiuslarini ortib borishi

Elektronga moyillikni, oksidlovchilik faolligini kamayishi

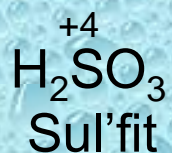
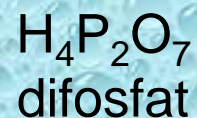
Metallaslar birikmalarini kislotali xossalarni o'zgarishi



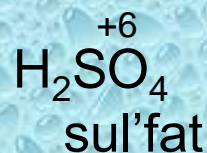
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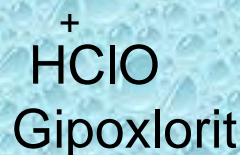
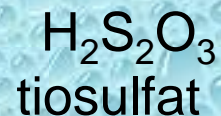
—



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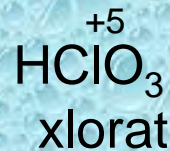
—



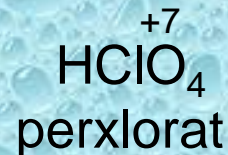
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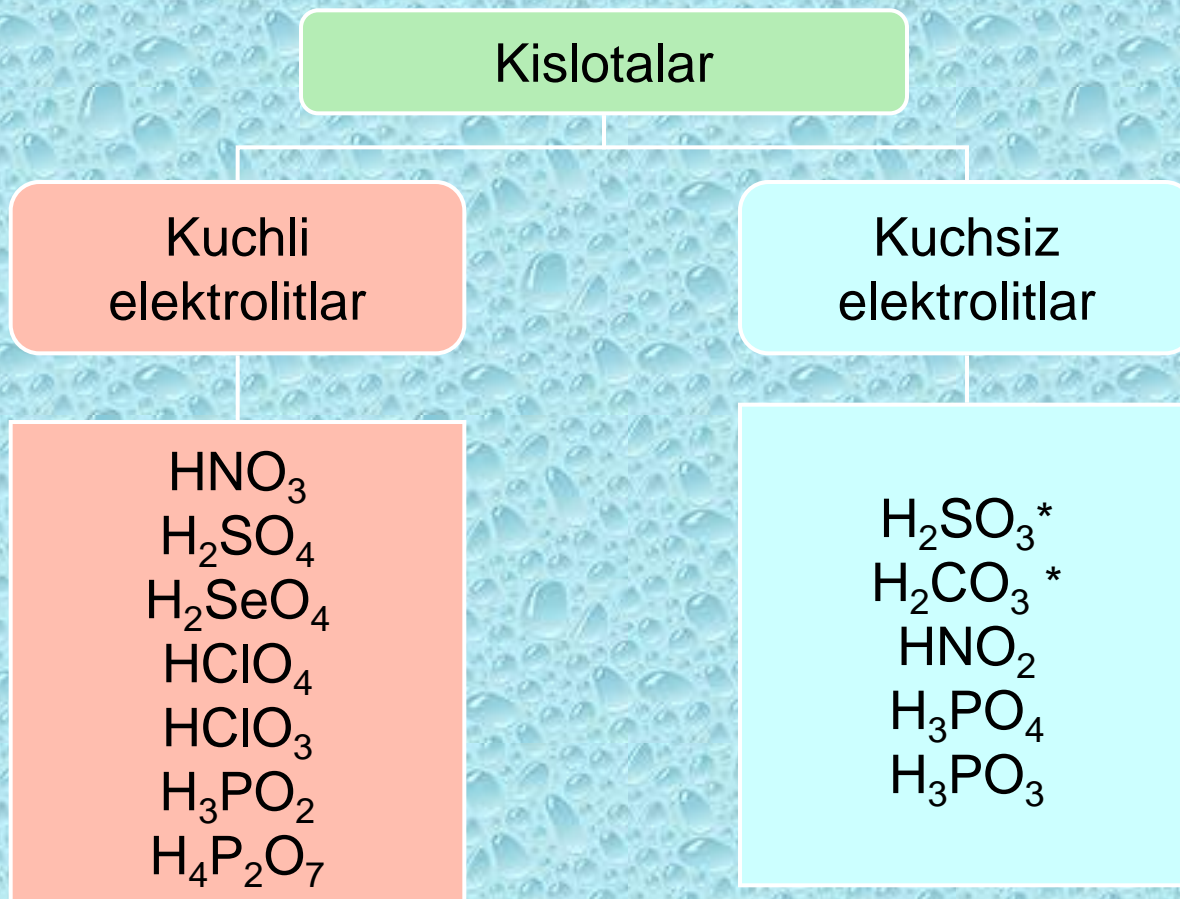
—



Kislotali xossalarni ortadi

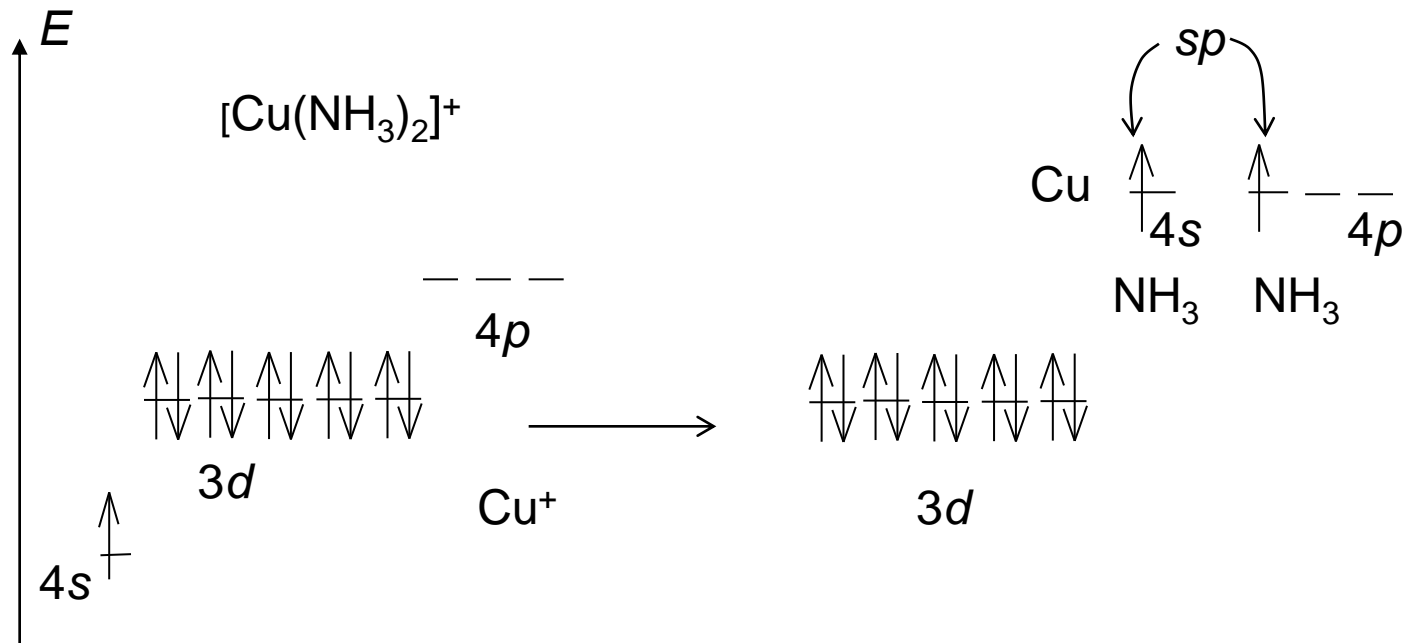


Metalmaslar kislotalari



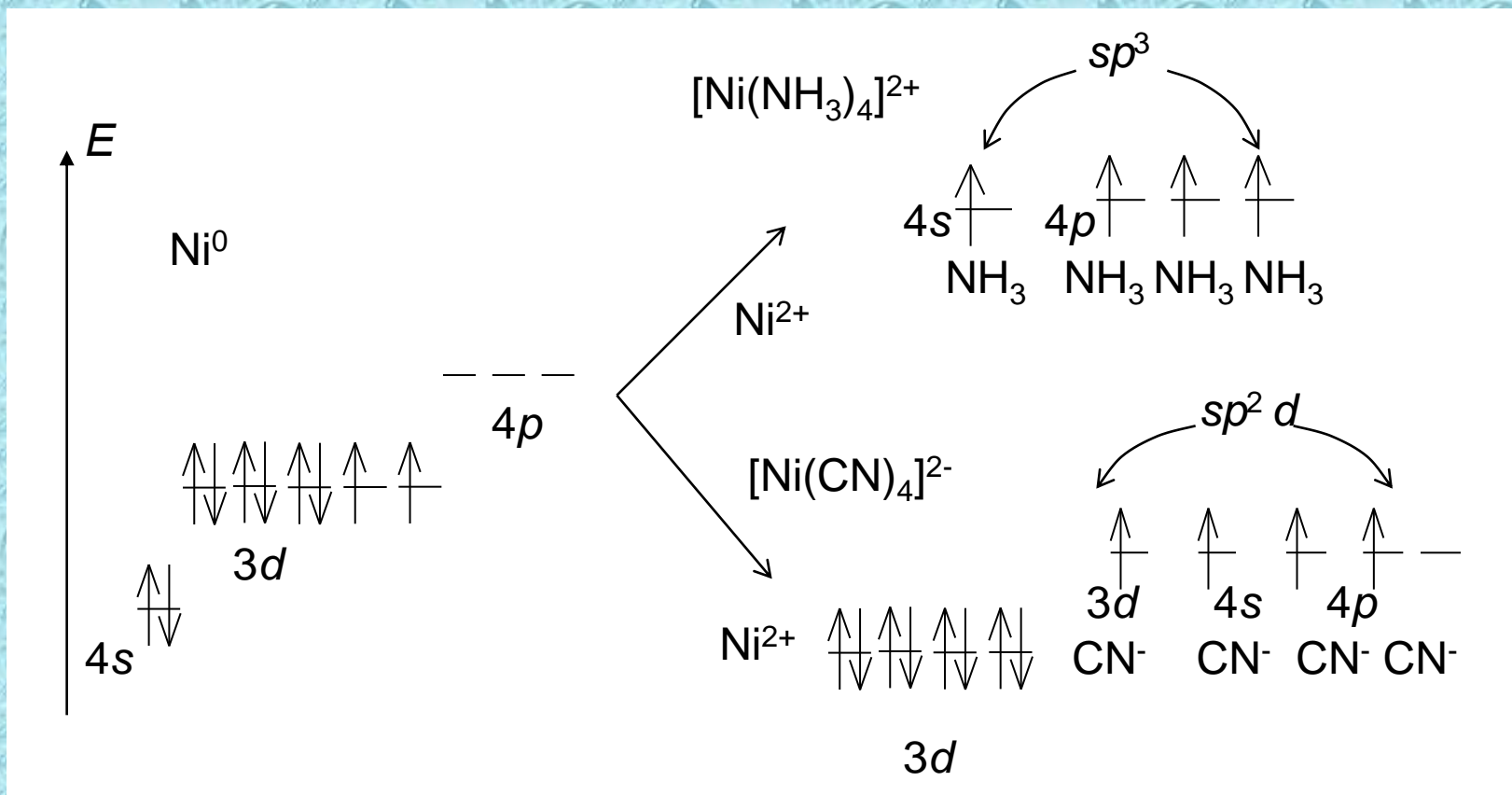
* – beqaror kislotalar

$[\text{Cu}(\text{NH}_3)_2]^+$ kationing strukturasi



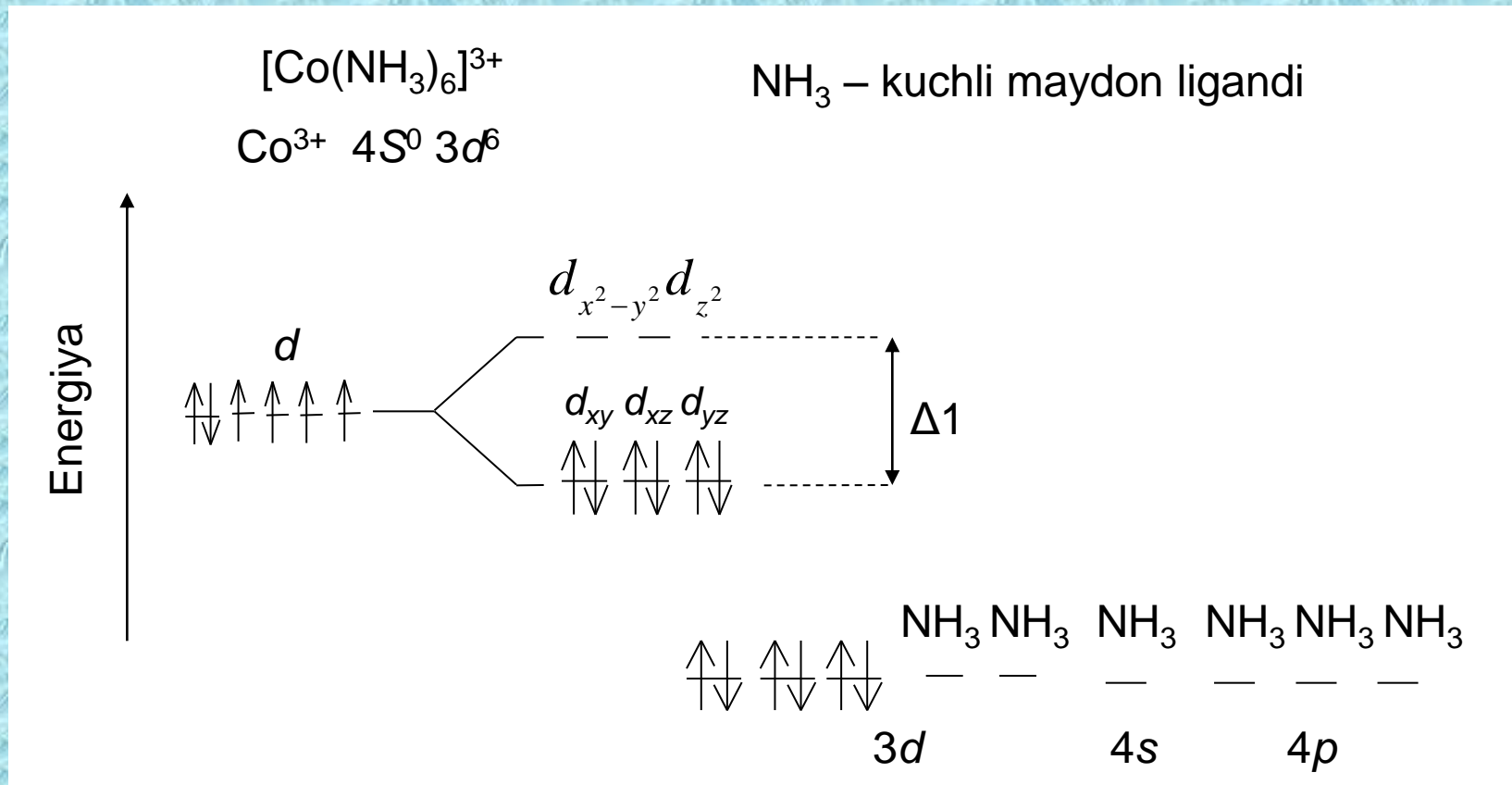
Ni²⁺ kationing kompleks birikmalari

Ni²⁺ ning para va diamagnit komplekslari hosil bo'lishida atom orbitallarini gibridlanishi

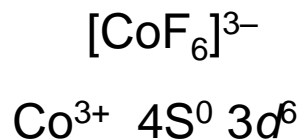


Kristal maydon nazariyasi

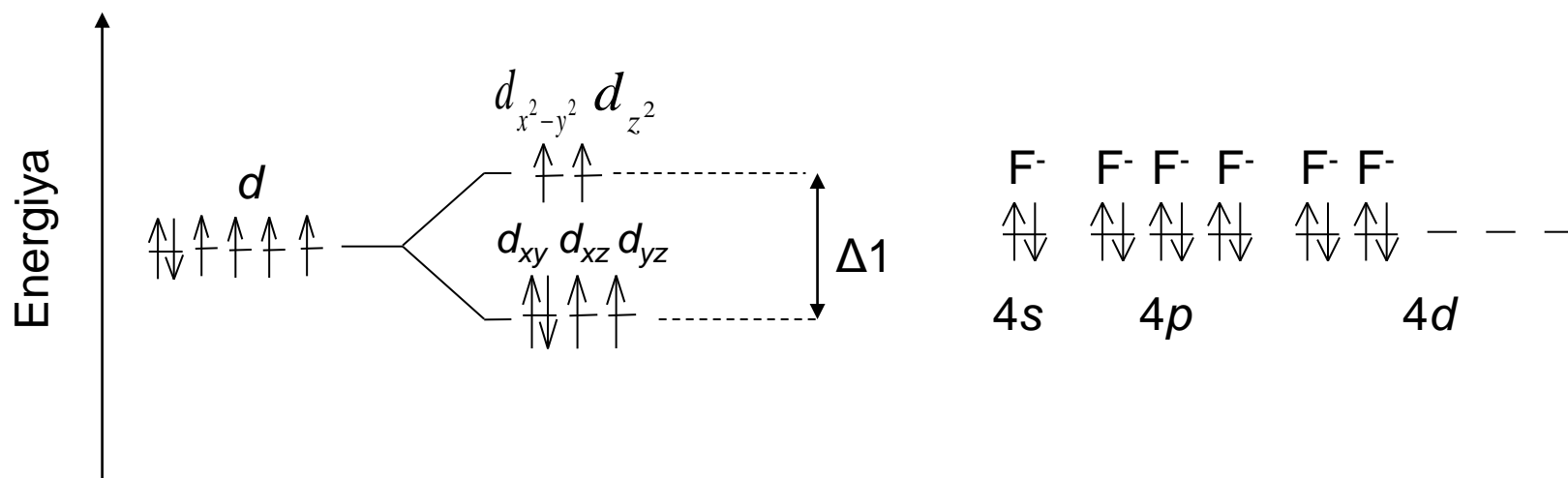
$[\text{Co}(\text{NH}_3)_6]^{3+}$ kompleksida elektronlarni energetik qavatchalar bo'yicha taqsimlanishi



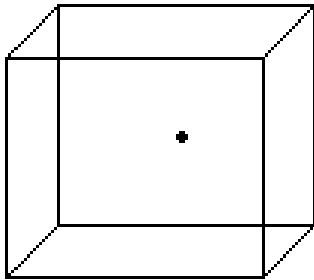
Kristal maydon nazariyasi



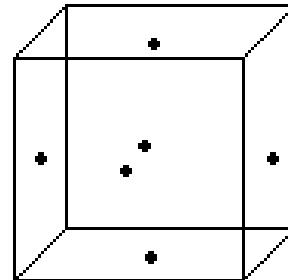
F^- – bo'linmagan elektron saqlovchi
 kuchsiz maydon ligandi.



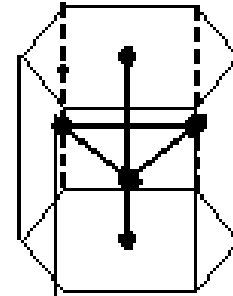
Metallarning kristal panjaralari



a



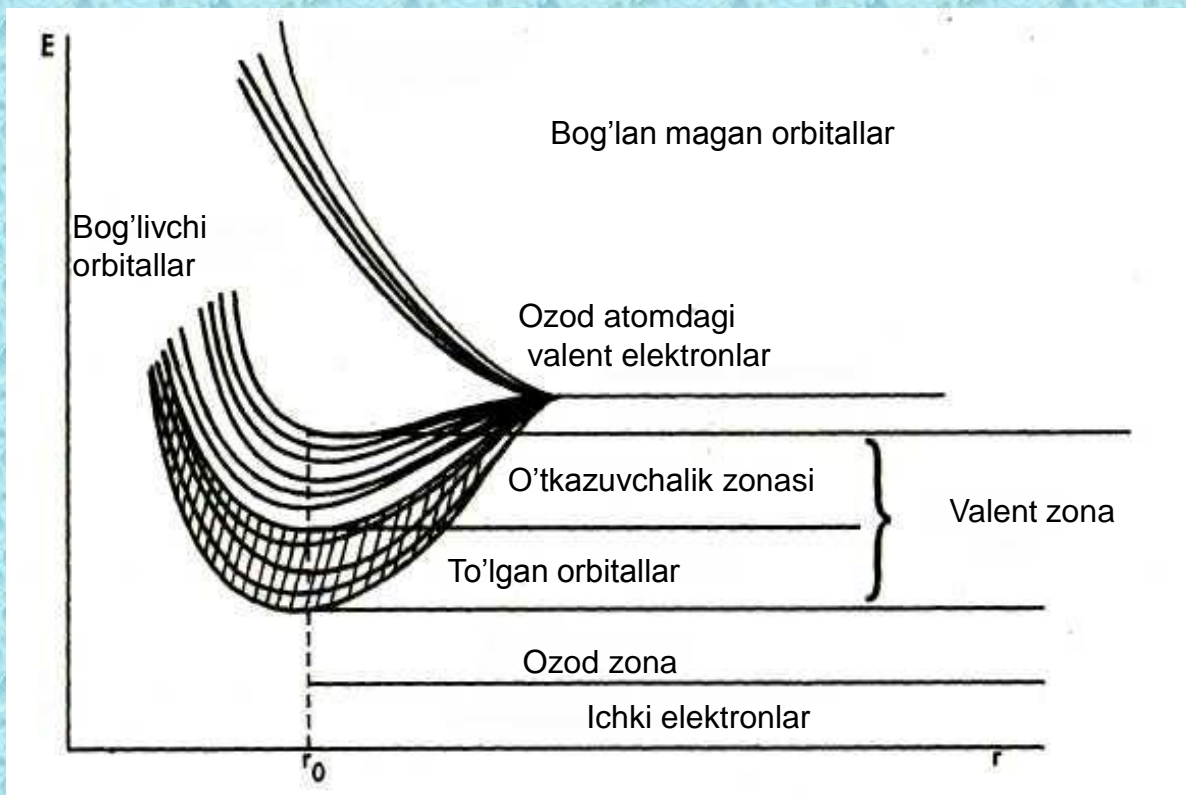
b



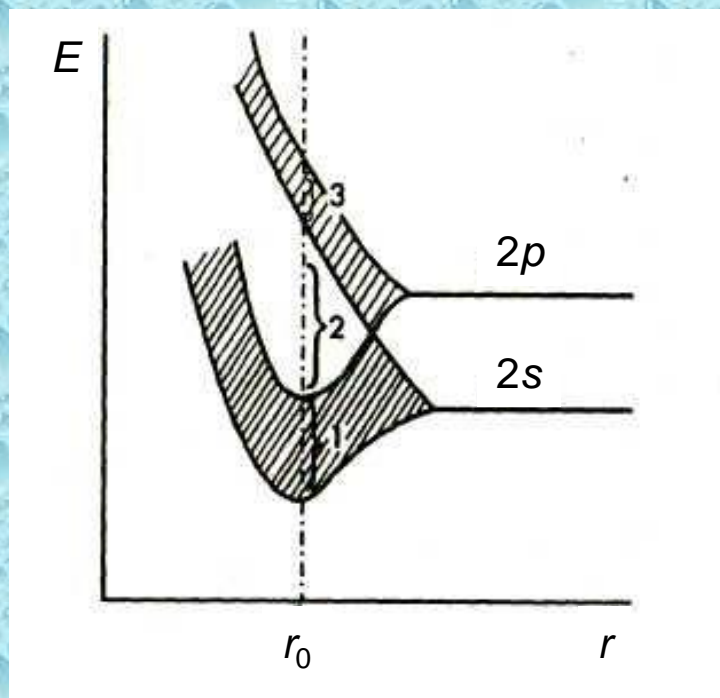
s

Metallarning kristal panjaralari:
a – hajmiy markazlashgan kubik;
b – yonlari markazlashgan kubik;
s – geksogonal

Bir valentli metalda energetik zonani hosil bo'lishi



Dielektrik kristallida masalan, olmosda energetik zonalarni hosil bo'lishi



- 1 – valent zona;
- 2 – taqiqlangan zona;
- 3 – o'tqazuvchanlik zonasi

s- va d – elementlar guruhlarida ionlash energiyalarining o'zgarishi

Davr	s- metallar	I , eV/mol	d- metallar	I , eV/mol
4	K	4,34	Cu	7,72
5	Rb	4,18	Ag	7,57
6	Cs	3,89	Au	9,22

Binar birikmalar

Oksidlar – Na_2O , BaO .

Peroksidlar – Na_2O_2 , BaO_2 .

Gallidlar – KCl , CaF_2 .

Sul'fidlar – MnS , Al_2S_3 .

Gidridlar – LiH , CaH_2 .

Nitridlar – Na_3N , AlN .

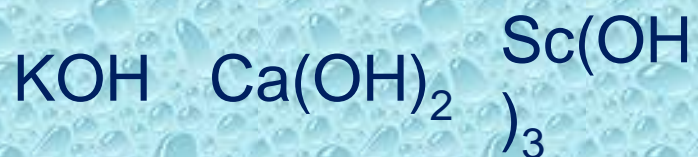
Karbidlar – Be_2C , CaC_2 .

Fosfidlar – Ca_3P_2 , Na_3P .

Boridlar – AlB , Mg_3B_2 .

Silisidlar – Mg_2Si , Al_4Si_3 .

Oksidlar va gidroksidlarning kislota-asosli xossalari



Asosli



O'zgaruvchan
(Amfoter)



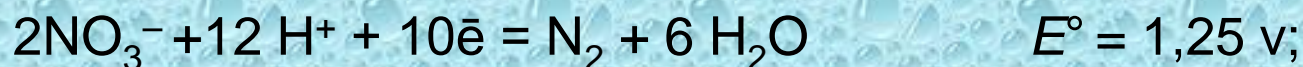
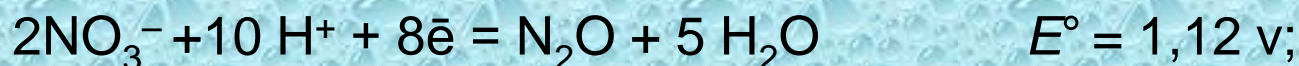
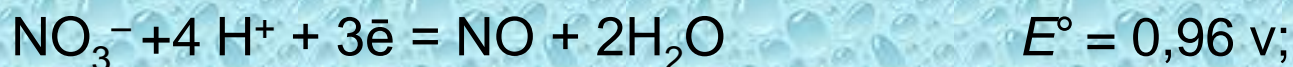
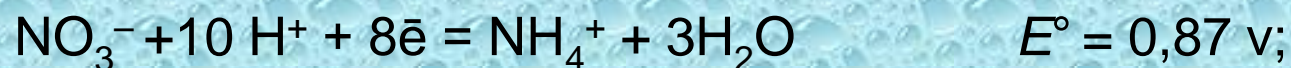
Kislotali

Konsentrlangan nitrat kislota

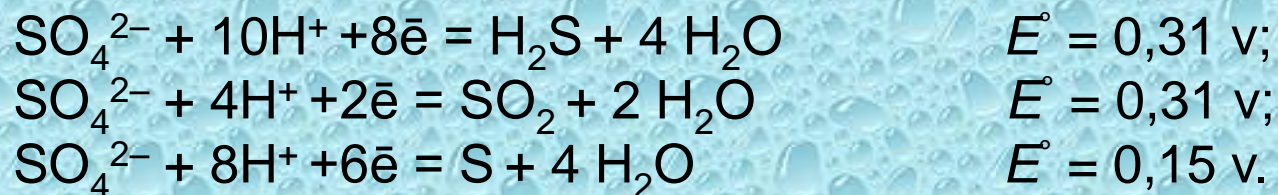
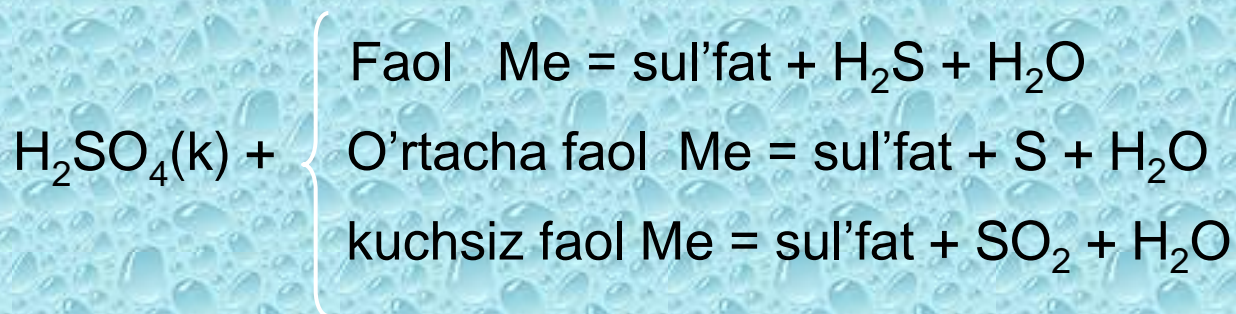
Faol Me = nitrat + NH₃ (NH₄NO₃) + H₂O

HNO₃(suyl.) + o'tacha faol Me = nitrat + N₂ (N₂O, N₂O₃, HNO₂) + H₂O

kuchsiz faol Me = nitrat + NO + H₂O



Konsentrlangan sul'fat kislota



Metallar rudalari (ma'danlari)

Oksidli

Fe_2O_3 – gematit

$\text{Al}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ – boksit

Cu_2O – kuprit

SnO_2 – kassiterit

MnO_2 – pirolyuzit

Sul'fidli

PbS – galenit

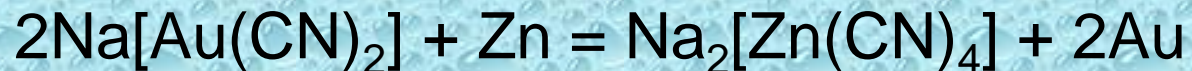
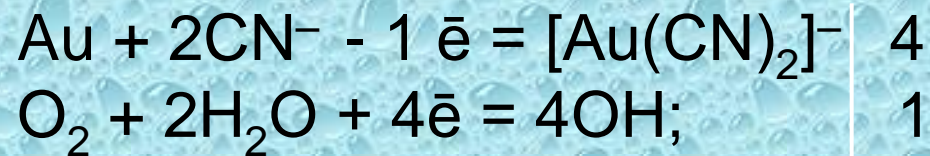
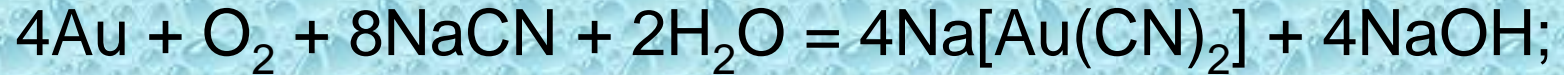
FeAsS – apsenopirit

FeS_2 – pirit

MoS_2 – molibdenit

CuFeS_2 – xal'kopirit

Oltinni olishning gidrometallurgik usuli



S- metallarning fizik-kimyoviy tavsifnomasi

Ionlanish energiyasini E_{ion} kamayishi,
Qaytaruvchanlik faolligini ortishi

E_{ion}	520	496	419	403	375	384
kDj/mol						
$\mathcal{E} \rightarrow \mathcal{E}^+$	Li	Na	K	Rb	Cs	Fr
Ra, nm	0,155	0,189	0,236	0,248	0,268	0,280
E_{ion}	899	738	590	549	503	509
kDj/mol						
$\mathcal{E}^+ \rightarrow \mathcal{E}^{2+}$	Be	Mg	Ca	Sr	Ba	Ra
Ra, nm	0,133	0,160	0,197	0,215	0,221	0,235

Atomlarning radiusini ortishi

nm – nanometr ($1 \text{ nm} = 10^{-9} \text{ m}$)

S-metallar ma'danlari

I A guruhcha

$\text{KCl} \cdot \text{NaCl}$ – sil'vinit

KCl – sil'vin

$\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ – karnallit

NaCl – galit

$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ – mirabilit

II A guruhcha

CaF_2 – flyuorit

CaCO_3 – kal'tsit

MgCO_3 – magnezit

$\text{MgCO}_3 \cdot \text{CaCO}_3$ – dolomit

$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ – gips

BaSO_4 – barit

SrSO_4 – selestin

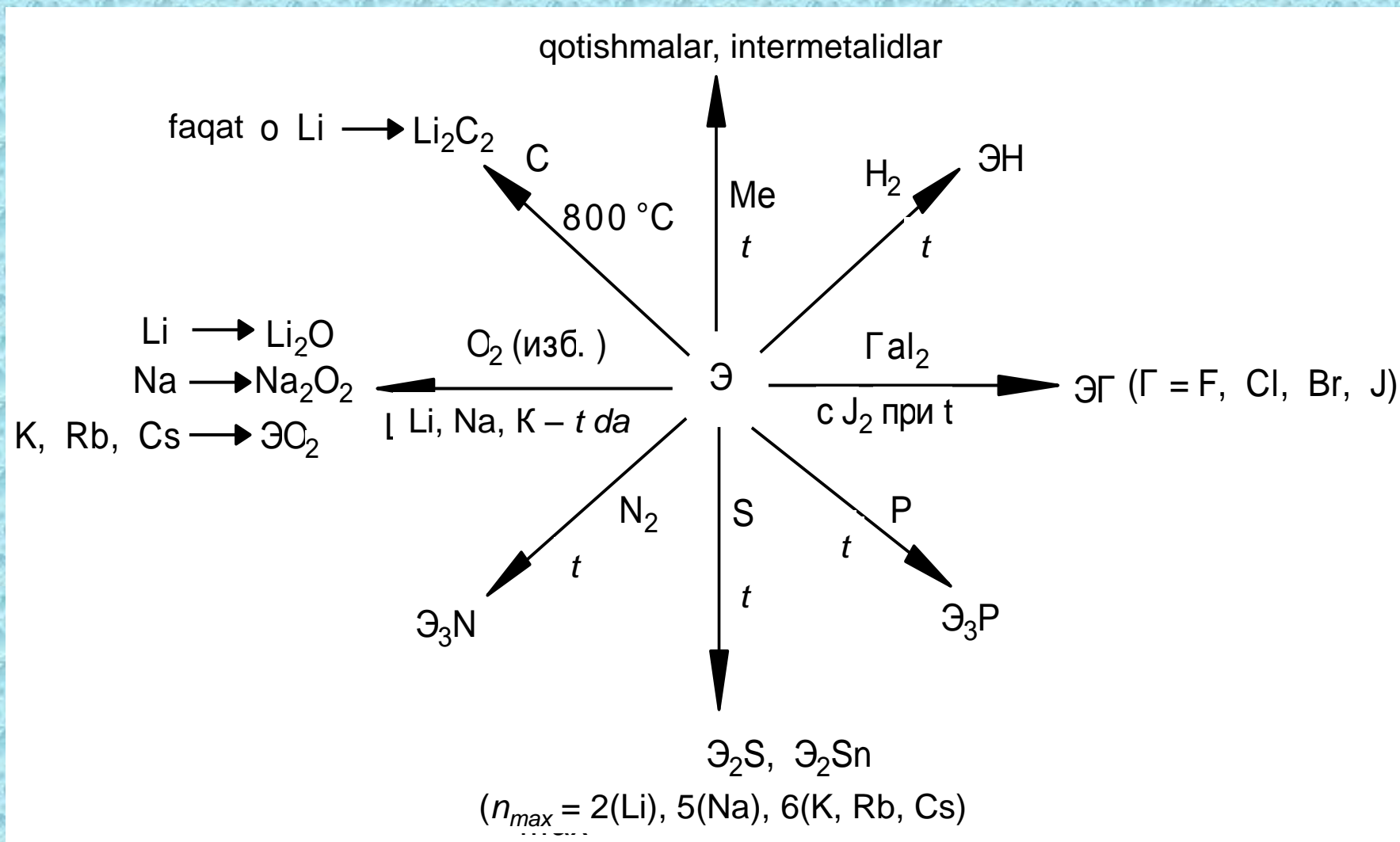
IA-guruhcha elementlarini fizikaviy xossalari

Metall	Li	Na	K	Rb	Cs	Fr
t_{erish} , °C	179,0	97,8	63,6	39,0	28,0	23,0
Zichlik, g/sm ³	0,53	0,97	0,86	1,53	1,9	2,2
Yer qobig'idagi miqdori, %	$3,2 \cdot 10^{-3}$	2,5	2,5	$1,5 \cdot 10^{-2}$	$3,7 \cdot 10^{-4}$	Radiofao I

IIA-guruhcha elementlarining fizikaviy xossalari

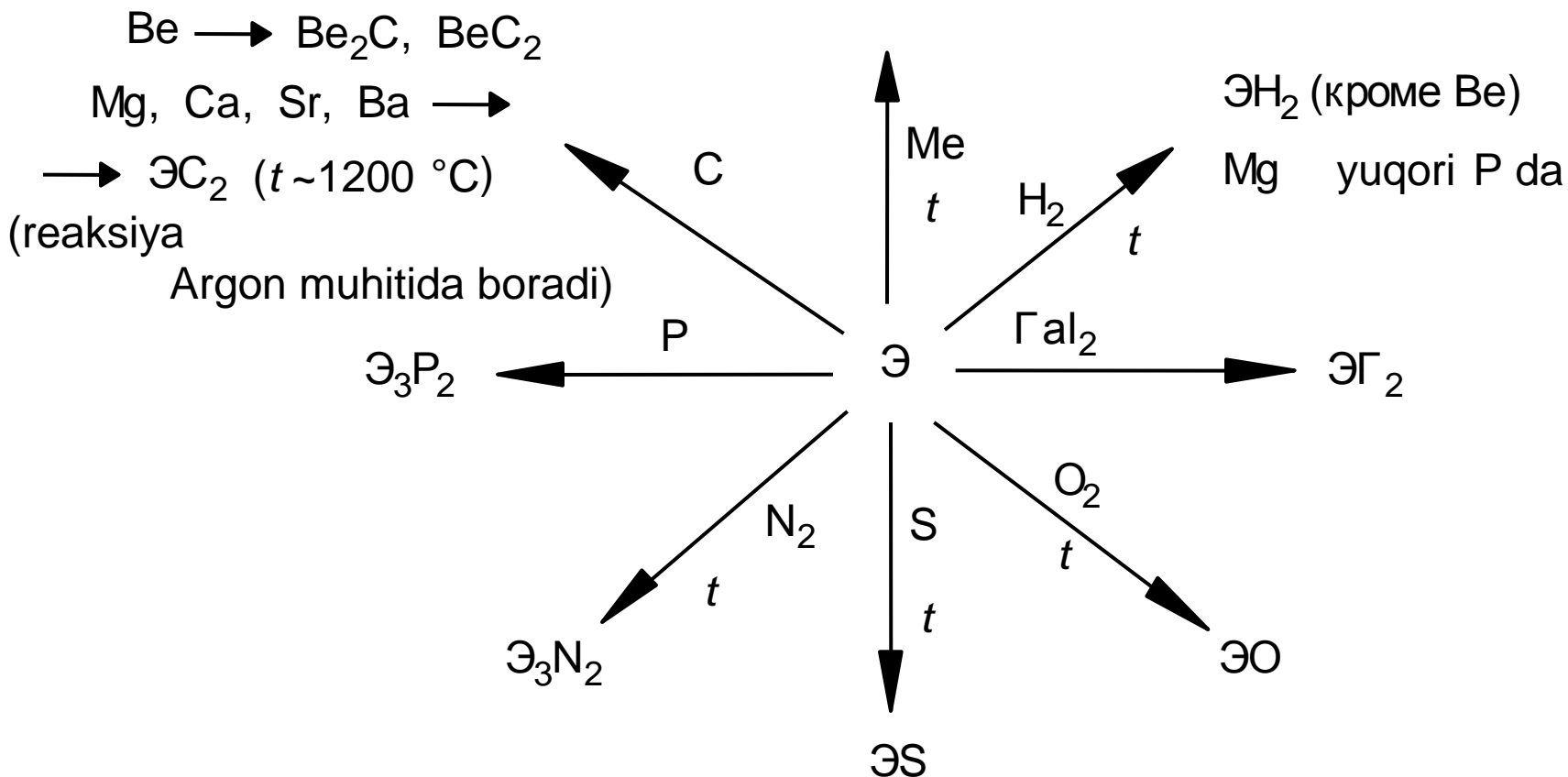
Metall	Be	Mg	Ca	Sr	Ba	Ra
<i>t erish</i> , °C	1284	651	851	757	710	700
Zichligi, g/sm ³	1,85	1,74	1,54	2,63	3,76	6,00
Yer qobig'idagi miqdori, %	$6 \cdot 10^{-4}$	2,40	2,96	$4 \cdot 10^{-2}$	$5 \cdot 10^{-2}$	$1 \cdot 10^{-10}$

IA-guruhcha elementlarini oddiy moddalar bilan o'zaro ta'siri



IIA-guruhcha elementlarini oddiy moddalarini bilan o'zaro ta'siri

qotishmalar, intermetalidlar



Metallar ma'danlari

Karbonatlar: CaCO_3 – kal'sit (bo'r, marmar, ohak tosh);
 SrCO_3 – stronsianit; $\text{CaCO}_3 \cdot \text{MgCO}_3$ - dolomit.

Sul'fatlar : BaSO_4 – barit
 $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ – gips; $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ – mirabilit.

Gallidlar: KCl – sil'vin; $\text{NaCl} \cdot \text{KCl}$ – sil'vinit;
 $\text{KCl} \cdot \text{MgCl}_2 \cdot \text{H}_2\text{O}$ – karnallit;
 $3\text{NaF} \cdot \text{AlF}_3$ – kriolit.

Silikatlar va alyumosilikatlar:
 ZrSiO_4 – sirkon; $3\text{BeO} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$ – berill;
 $\text{Na}_2\text{O} (\text{K}_2\text{O}) \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ – nefelin.

Yarim metal ma'danlar:

FeTiO_3 – il'menit (titanat);
 CaWO_4 – sheelit (vol'framat); PbCrO_4 – kroksit (xromat) va
boshqalar.

Margans oksidlari va gidroksidlarini kislota-asosli xossalari



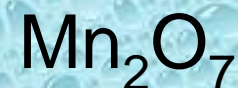
Asosli

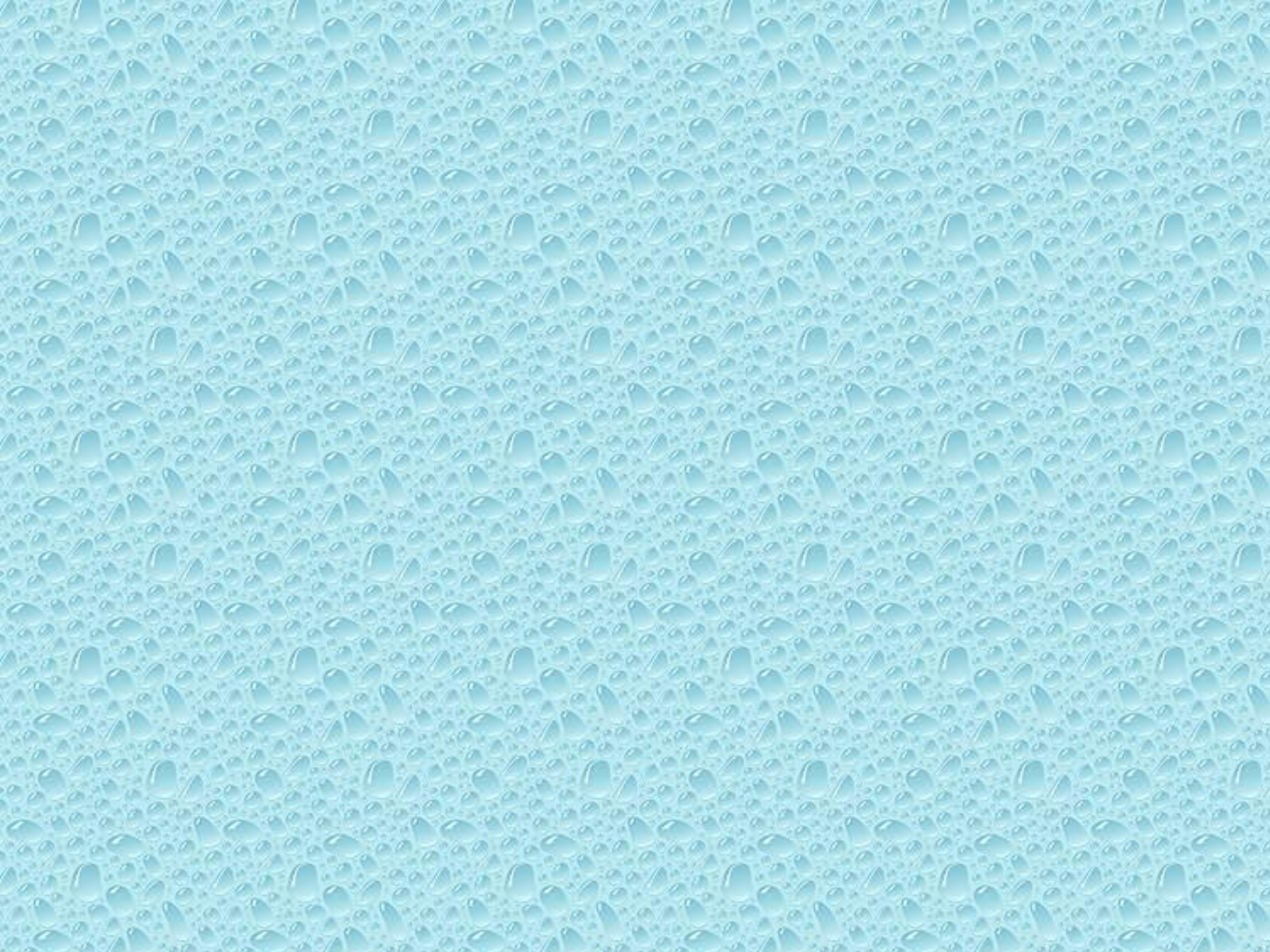


O'zgaruvchan
(Amfoter)



Kislotali





Polimerlar. Plastmassalar. Tolalar.

Maqsad:

- Plastmassalar va tolalar qanday moddalar ekanligini va ularning polimerlardan farqini bilish;
- Plastmassalar va tolalarni siqflanishini o'rganish;
- Plastmassalarni olinish usullari va qo'llanilish yo'nalinishini o'rganish.

Kelib chiqishiga ko'ra polimerlarni sinflanishi

Tabiiy

- ✦ Kraxmal
- ✦ Selluyloza
- ✦ Oqsil
- ✦ Sun'iy kauchuk

Sun'iy

- ✦ Viskoza
- ✦ Selluloid
- ✦ Asetat tolasi

Sintetik

- ✦ Polietilen
- ✦ Fenol-formaldegid polimerlari
- ✦ Sintetik tolalar
- ✦ Sintetik kauchuk

Makromolekulani shakliga ko'ra polimerlarni sinflanishi

chiziqli

- ✦ Polietilen
- ✦ Polipropilen
- ✦ Sintetik tola

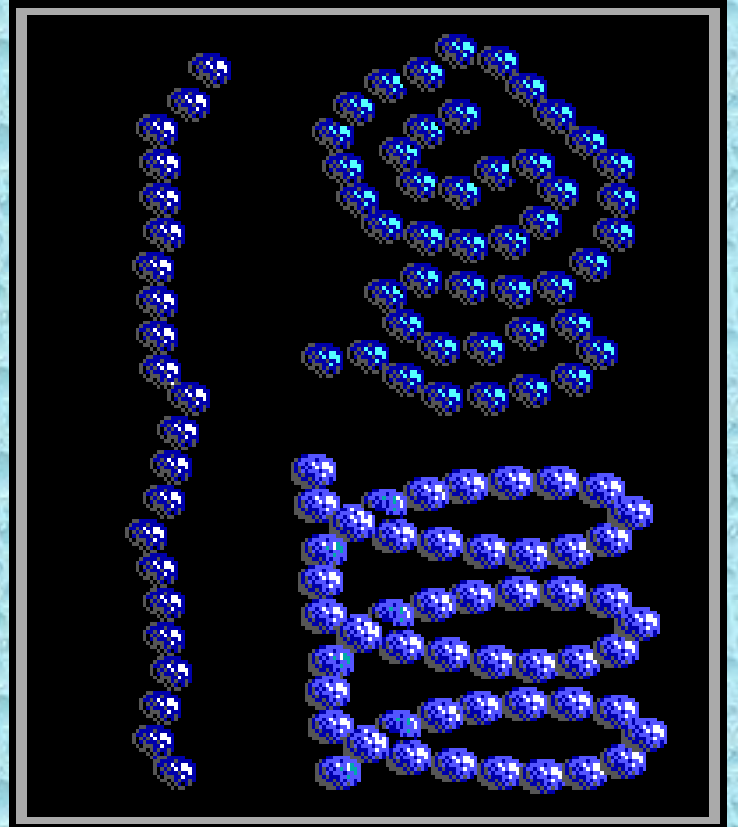
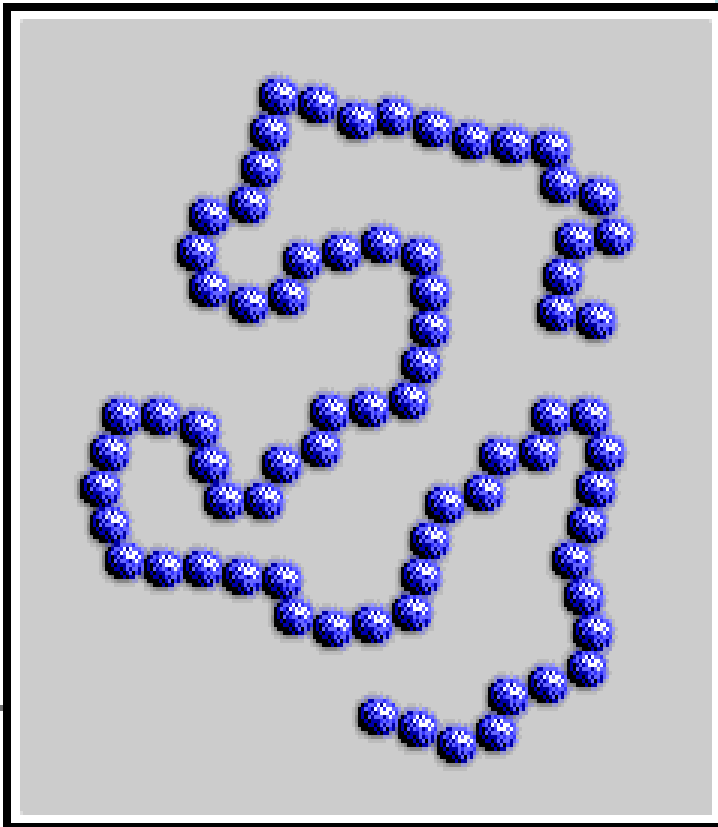
tarmoqlangan

- ✦ Kraxmal
- ✦ Sintetik kauchuk

fazoviy

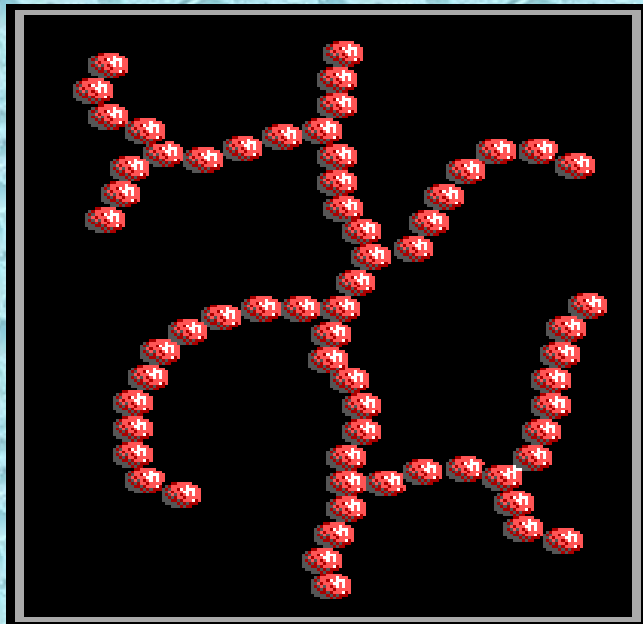
- ✦ Fenol-formaldegid polimerlari
- ✦ Rezina

Molikula shakli

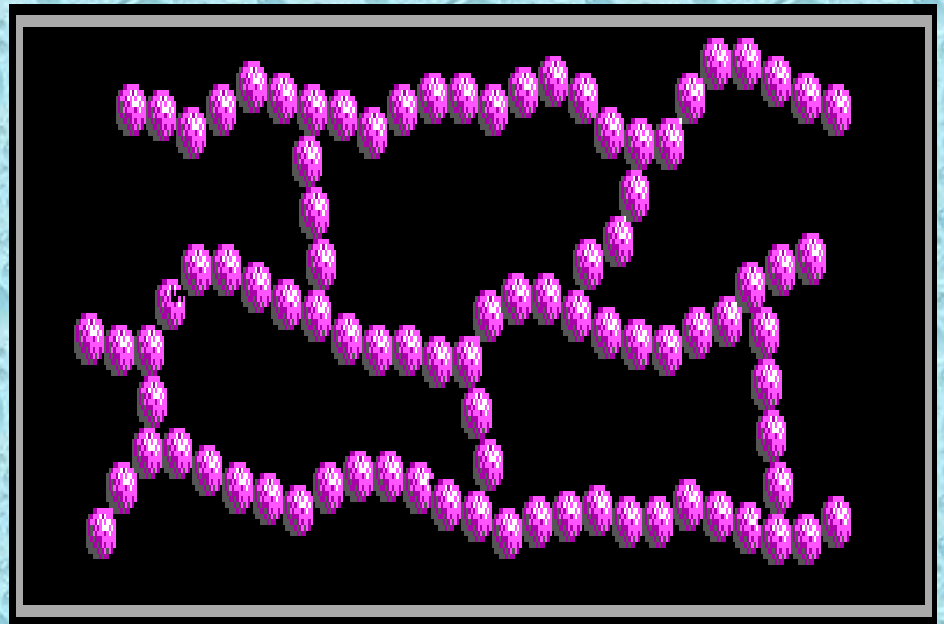


Chiziqli shakl

Molikula shakli



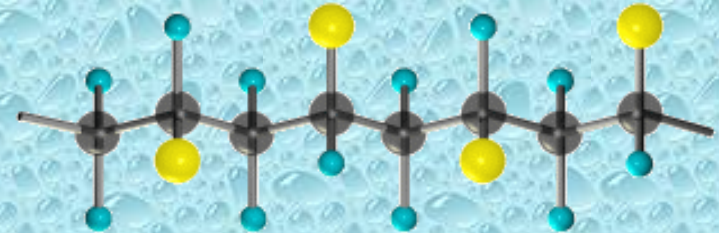
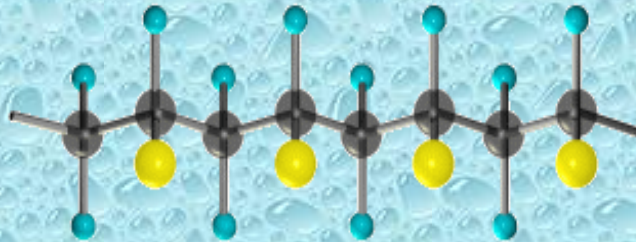
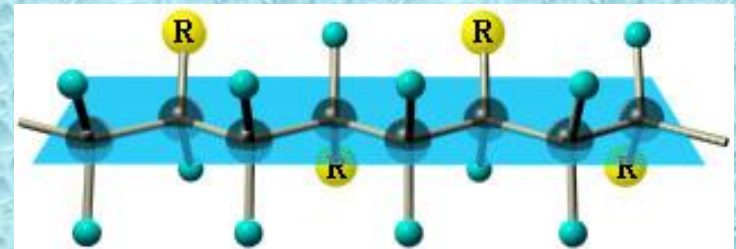
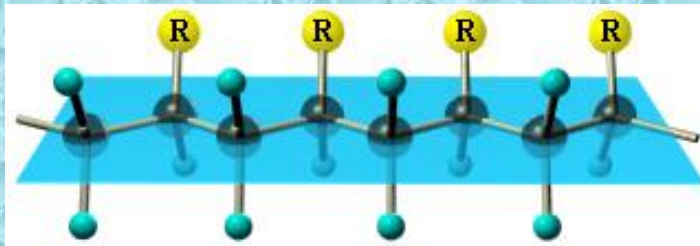
Tarmoqlangan shakl



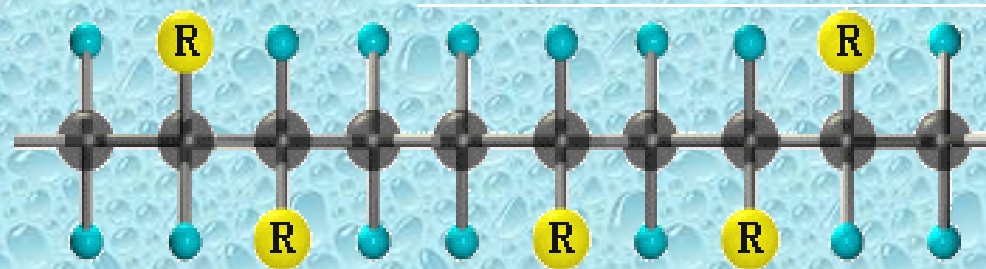
Fazoviy shakl

Sintetik kauchuklarni fazoviy konfiguratsiyasi

Stereoregulyar tuzilish



No Stereoregulyar tuzilish



Qizdirish bo'yicha polimerlarni sinflanishi

termoplastik polimerlar

- ✦ Polietilen
- ✦ Polipropilen
- ✦ Polivinilxlorid
- ✦ Kapron

termoreaktiv polimerlar

- ✦ Fenol-formaldegid smolalar
- ✦ Poliefir smolalar
- ✦ Karbomid smolalar

Plastmassalar xossalari va ularning shakllanish usullari

Plastmassalar xossalari:

- ★ Yengil
- ★ Izolyatorlar
- ★ Korroziyaga chidamli
- ★ Barqaror
- ★ Arzon
- ★ Qayta ishlash yengil

Plastmassalarni shakllanish usullari:

- ★ Kattalashtirish
- ★ Kichiraytirish
- ★ Shakillash
- Filerlar orqali o'tkazish

Plastmassalarni qo'llanilishi



Ekologik muammolar

Plastmassalar ishlatilishi natijasida qanday ekologik muammolarga duch kelish mumkin



O'simliklar tarkibi

Organik moddalar

Anorganik moddalar

oqsillar

C, O, H, N, P, S

Karbon
suvlari

C, O, H

Yog'lar

C, O, H

Nuklyin kislotalar

C, O, H, N, P

suv

H, O

Mineral tuzlar

P, N, K, Ca, Mg,
Fe, Mn, Cu, Zn

• makroelementlar

• mikroelementlar

**C, O, H, N, P,
S, K, Ca, Mg**

**Fe, Mn, Cu,
Zn, Cr va
boqalar**



Mineral o'g'itlarni sinflanishi



O'g'itlar

Oddiy

Kompleks

Azotli

Murakkab

Fosforli

Aralash

Kaliyli

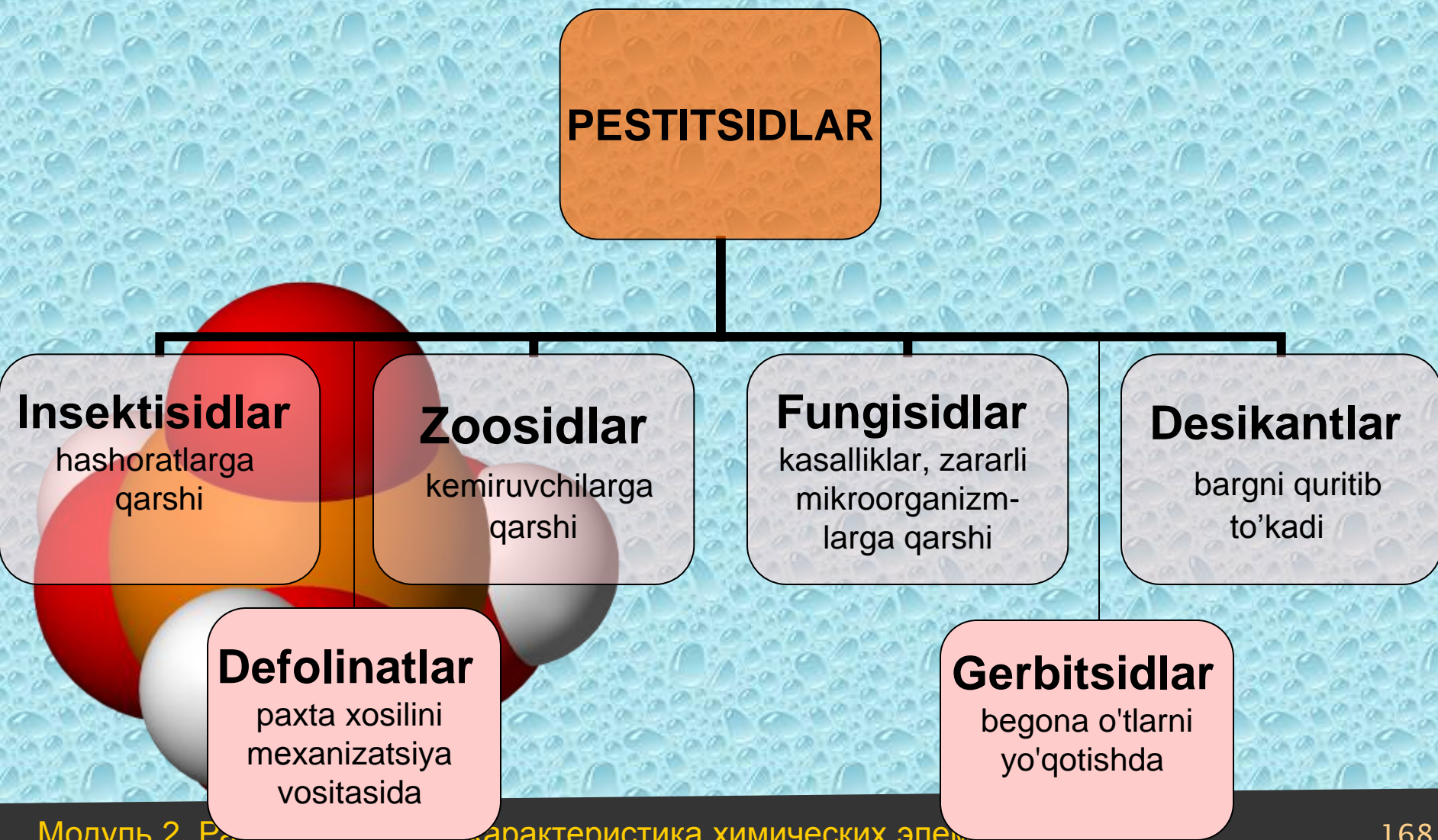


PESTITSIDLARNI QO'LLASHNING SALBIY OQIBATLARIGA QARSHI KURASH USULLARI

- KARANTIN USULI
- SELEKSIYA USULI
- AGROTEXNIK USUL
- KIMYOVIY USUL
- FIZIK USUL
- BIOLOGIK USUL



PESTITSIDLARNING GURUHLARI





- **Insektitsidlar** - hashoratlarga qarshi kurashda ishlatiladigan zaxarli ximikatlar.
Anorganik insektitsidlar Cu, As, S, B ning birikmalari, organik birikmalardan karbofos, xlorofos, geksaxloran, anabazin...
- **Zootsidlar** - kemiruvchilar (kalamush, sichqon, yumranqoziq) ga qarshi kurashda ishlatiladigan ximikatlar. Ms: rux fosfid Zn_3P_2 , uglerod sulfid SC_2 , talliy sulfat $TiSO_4$.
- **Fungitsidlar** – o'simliklarning zamburug'li kasalliklari va kasallik tarqatuvchi mikroorganizmlarga qarshi kurashda ishlatiladi. $CuSO_4$ - mis kuporasi, sunema, formalin.





- **Gerbitsidlar** - begona o'tlarni yo'qotishda ishlatiladigan ximikatlar. Tanlab ta'sir etuvchi gerbitsidlar katta ahamiyatga ega, ular begona o'tlarni quritadi va qishloq xo'jaligi ekinlariga ta'sir etmaydi. Ms: dalapon CN_3CCl_2COOH , simazin $C_7H_{12}N_5Cl$, simazin makkajo'xoriga ta'sir qilmaydi, begona o'tlarni quritadi.
- **Defolinatlar** - paxta xosilini mexanizatsiya vositasida terib olishda g'o'zalarni tayyorlash maqsadida o'simlik barglarini sun'iy yo'l bilan to'kish, ya'ni defoliatsiya qilish uchun ishlatiladigan vositalar (butifos, alfa, gemetrel)
- **Desikantlar** - bargni quritib to'kadi.
(Xlorat magniy)



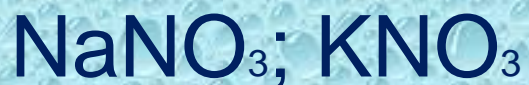
KIMYOVIIY TARKIBIGA KO'RA PESTITSIDLAR 3TA ASOSIY GURUHGA BO'LINADI:

- **Anorganik birikmalar** (margumush, mis, rux, ftor, bariy, simob, oltingugurt birikmalari, xloridlar va boratlar)
- **O'simliklar, bakteriyalar va zamburug'lardan olinadigan pestitsidlar** (anabazin, ikatin, peretrin, antibiotiklar)
- **Organik birikmalar** (xlor organik, fosfor organik, karbonat kislota va uning xosilalari, fenol va uning xosilalari)

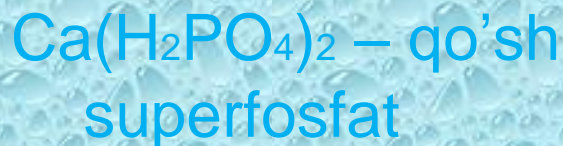
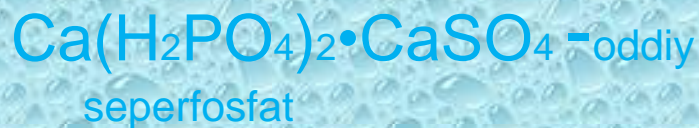


Mineral o'g'itlar

- Nitratli o'g'itlar

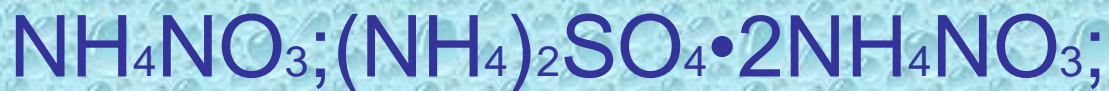


birgalikda qo'shiladi.



ammofos

- Ammoniyli o'g'itlar



Cl ortiqcha bo'lgan yerlarga



Hosildorligi kam sho'rlangan yerlarni tuproq strukturasi yaxshilovchi yangi gidrokimyoviy melioratlar (tarkibi nestixometrik polimer-polimer kompleks va fosfogips)

- Sho'r yerlarni kimyoviy meliorasiyalashda:



- Ohak bilan aralashmasi tuproqning kislotalik darajasini kamaytirishda:



- Mineral o'g'itli meliorant sifatida (1 τ KM da 10 kg fosforitlar bor).

- Biovositalar va organik o'g'itlar bilan kompostlashda.

O'g'itlarni ozuqaviy bahosi



O'g'itlarni ozuqaviy bahosini ulardagi quyidagi moddalarni massa uli bilan ifodaladi

- *asot N,*
- *fosfor (V) oksidi P_2O_5*
- *kaliy oksidi K_2O .*

Masala: Natriyli seletra, qo'sh superfosfat, kaliy xloridlarni ozuqaviy bahosini hisoblang?.

! Fosfor (kaliy) atomlarining soni o'g'it va oksid formulasida bir xil bo'lishi zarur:

- **2 (Ca HPO₄ x 2H₂O) → P2O₅**
- **2KCl → K2O**



3 - modul

Kimyoviy identifikatsiya va moddalar tahlili

7-bo'lim.

Tahlilning kimyoviy va
fizik-kimyoviy usulu

Sifat tahlilining asosiy qoidalari

Tortma tahlil usuli

Tahlilning fizik-kimyoviy usulini umumiy tavsifnoma.
Elektrokimyoviy usullar:
potensiometriya, volmtamperometriya, konduktometriya

8-bo'lim.
Tahlilning fizik usullari

Tahlilning spektral usullari

Moddalarni magnit maydoni bilan o'zaro ta'sirlashishiga asoslangan usullar

Tebranma spektroskopiya

Pentgenofluoressent usul

Radiofaollashtiruvchi usul

Sifat tahlilida analitik belgini olish sxemasi

Analitik reaksiya

Tahlil qilinayotgan
modda

Analitik reagent

Analitik belgi
beruvchi mahsulot

rang

hid

Gazning
ajralishi

Lyuminesinlanayotgan
modda

Cho'kma

Analitik reagentlarning sinflanishi

O'ziga xos
(masalan, I_2 ni aniqlash uchun kraxmal)

Analitik reagentlar

Tanlangan
(masalan, $Co(II)$, $Ni(II)$, $Fe(II)$ ionlarini aniqlash uchun amiakli bufer eritmadagi dimyetilglioksim)

Guruhli
(masalan, $Ag(I)$, $Hg(I)$, $Pb(II)$) ionlarini ajratish uchun HCl)

Titrlash usulini tanlash

Aniqlash sharti

Titrlash usuli

1. Aniqlanayotgan modda bilan titrantning reaksiyasi: stexiometrik, Tez sodir bo'ladi, miqdoriy.
2. Indikator mavjud.

Aniqlanayotgan modda + titrantni tatrlash nuqtasigacha tatrlash

1. Titrlash reaksiyasi sekin boradi.
2. Aniqlanayotgan modda uchuvchan
3. Indikator yo'q.

Teskari titrlash: tahlil qilinayotgan eritma + standart eritmani aniqlanayotgan hajmi; ortiqcha standart eritma + titrat titrlash nuqtasigacha

1. Titrlash reaksiyasi nestexiometrichna.
2. Aniqlanayotgan modda beqaror.
3. Indikator yo'q.

O'rinbosarni titrlash:
Tahlil qilinayotgan modda + ortiqcha yordamchi eritma → o'rinbosar + titrant titrlash nuqtasigacha