

K I M Y A - İ

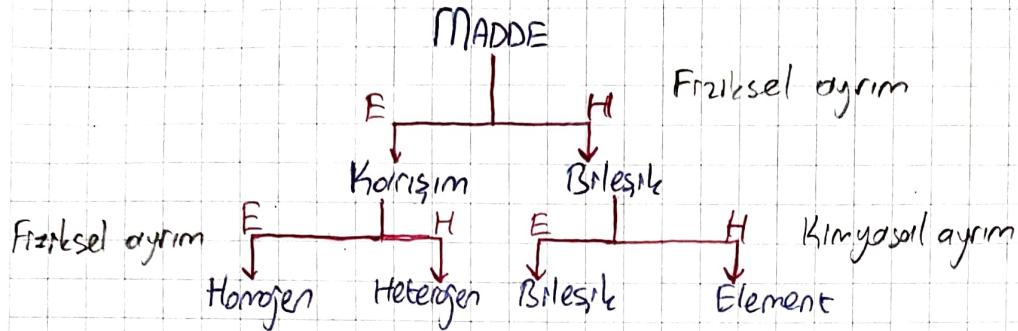
Sakarya Üniversitesi

Prof. Dr. Mustafa Küçükıslamoğlu

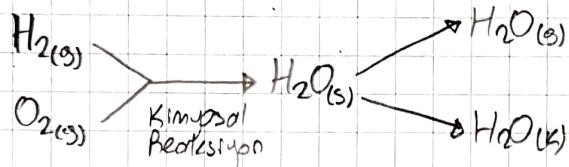
MUSAB UĞUR

150100037

Kimya: Madde ve maddenin fiziksel ve kimyasal özelliklerini inceleyer.
Madde: Uzayda bir hâlin kapları.



Bilesik: En az iki farklı elementin fiziksel ve kimyasal özelliklerini koruyarak bir maddenin oluşumundan denir.



Element: Benzer atomlardan oluşmuşsa, element denir.

Atom: Bir elementin fiziksel ve kimyasal özelliklerini taşıyan en küçük parçacıkdır.

Molekül: En az iki farklı atomdan oluşan bilesigin fiziksel ve kimyasal özelliklerini taşıyan en büyük birim.

SI (Standart International)

Uzunluk	m
Kütle	kg
Zaman	s
Sıcaklık	K
Madde miktarı	mol
Elektrik Akımı	A
Aydınılık	Cd

10^{18}	Ekso
10^{15}	Peta
10^{12}	Tera
10^9	Jigo
10^6	Mega
10^3	Kilo
10^2	Hekto
10	Deka

10^{-1}	Deci
10^{-2}	Santi
10^{-3}	Mili
10^{-6}	Mikro
10^{-9}	Nano
10^{-12}	Piko
10^{-15}	Femto
10^{-18}	Atto
10^{-21}	Zeppto
10^{-24}	Yokto

Kütle: Bir cisimdeki maddenin miktarını tanımlar (m)

$$W = m \cdot g$$

Ağırlık
Zamanı: s, dk, sa

$$\text{Sıcaklık: } K = t^\circ C + 273 \text{ celsius}$$

$$F^\circ t = \frac{9}{5}(t^\circ C + 32)$$

$$R^\circ t = F^\circ t + 453,69$$

$$\text{Yağışluk: } \frac{m}{V} = \frac{\text{Kütle}}{\text{hacim}} = d$$

$$\text{Kütle} \rightarrow g/cm^3$$

$$\text{Sıvı} \rightarrow g/mL$$

$$\text{Gaz} \rightarrow g/L$$

$$\text{Hg: } 13,6 \text{ g/mL}$$

$$\text{Os: } 22,59 \text{ g/cm}^3$$

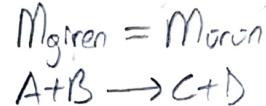
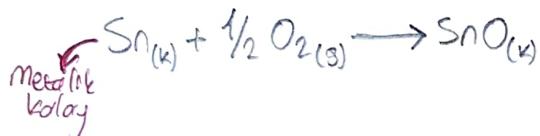
$$\Rightarrow 1,25 \text{ mg} \text{ küp şeklinde Osmiyum (Os) külesi} = ? \quad (1 \text{ mg} = 2,54 \text{ cm}) \quad (\rho_{\text{os}} = 22,59 \text{ g/cm}^3)$$

$$\text{mg Os} \rightarrow \text{cm Os} \rightarrow \text{cm}^3 \text{ Os} \rightarrow \text{g Os}$$

$$\text{g Os} = \left[1,25 \text{ mg} \times \frac{2,54 \text{ cm}}{1 \text{ mg}} \right]^3 \times \frac{22,59 \text{ g}}{1 \text{ cm}^3 \text{ Os}} = 723 \text{ g Os}$$

Kötlenim Kanunu Yasası

Larosier tarafından bulundu.



$\Rightarrow 0,455 \text{ g Mg ile } 2,315 \text{ g O}_2 \text{ tepkimeye girerek } \text{MgO}_{(k)} \text{ oluşuyor. } 2,015 \text{ g O}_2$ ortamda kaldığında göre kaç gr $\text{MgO}_{(k)}$ meydana gelmiştir?



$$2,315 \text{ g O}_2 - 2,015 \text{ g O}_2 = 0,300 \text{ g O}_2$$

$$\begin{array}{r} 0,455 \text{ g Mg}_{(k)} \\ + 2,315 \text{ g O}_2 \\ \hline 2,770 \text{ g Mg} + \text{O}_2 \end{array}$$

$$\begin{array}{l} 2,770 \text{ g Mg} + \text{O}_2 = \text{MgO}_{(k)} + 2,015 \text{ g O}_2 \\ \text{MgO}_{(k)} = 2,770 \text{ g} - 2,015 \text{ g O}_2 \\ \text{MgO}_{(k)} = 0,755 \text{ g} \end{array}$$

Sabit Oranlar Kanunu

	<u>ABD</u>	<u>H₂O</u>	<u>TÜRKİYE</u>
10,00 g H ₂ O			27,00 g H ₂ O
1,119 g H % 11,98			3,021 g H % 11,98
8,881 g O % 88,81			23,978 g O % 88,81

$\Rightarrow 0,755 \text{ g MgO}_{(k)}$ 'da $0,455 \text{ g Mg}$ varsa $0,500 \text{ g MgO}_{(k)}$ 'da kaç g Mg vardır?

$$\begin{array}{r} 0,455 \text{ g Mg} \\ a \\ \hline 0,500 \text{ g MgO}_{(k)} \\ 0,755 \text{ g MgO}_{(k)} \end{array}$$

$$a = \frac{0,455 \text{ g Mg} \times 0,500 \text{ g MgO}_{(k)}}{0,755 \text{ g MgO}_{(k)}} = 0,301 \text{ g Mg}$$

$$\begin{array}{l} \text{A} \\ 0,455 \text{ g Mg} \\ 0,755 - 0,455 \text{ g O}_2 \end{array}$$

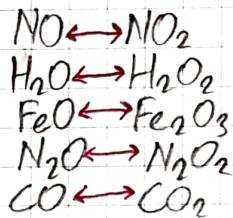
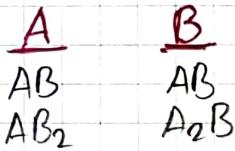
$$\begin{array}{l} \text{B} \\ 0,301 \text{ g Mg} \\ 0,500 - 0,301 \text{ g O}_2 \end{array}$$

Dalton

Atomlar kemyasal tepkime ile olusmaz. (Doğru)
Atomlar bolşenmez (Yanlış)

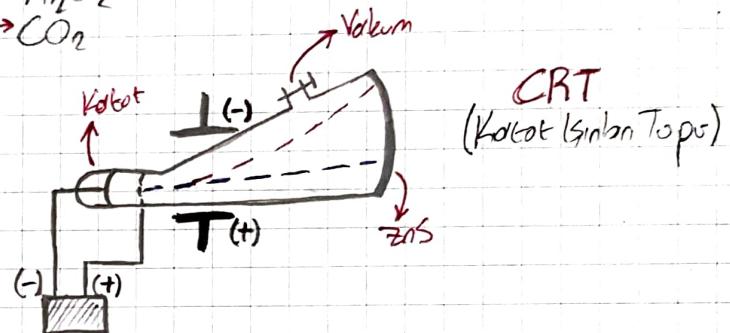
Katlı Oranlar Yasası

Bir atom birden fazla bilezik oluşturuyorsa, bu bilezikler arasında bir oran vardır. Bu oran Dalton bulmuştur.



Elektron

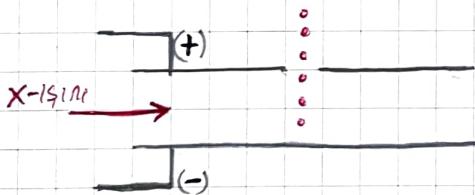
$$\begin{array}{l} (+) \leftrightarrow (-) \\ (+) \leftrightarrow (+) \\ (-) \leftrightarrow (-) \end{array}$$



CRT
(Koltok Işınları Topo)

- Elektrik alan ile Manyetik alan birbirlerine tersdir.
- Taneçit yolu Chadwick tarafından bulundu. Değeri; $-5,6857 \cdot 10^{-9} \text{ g/c} \rightarrow m/z$

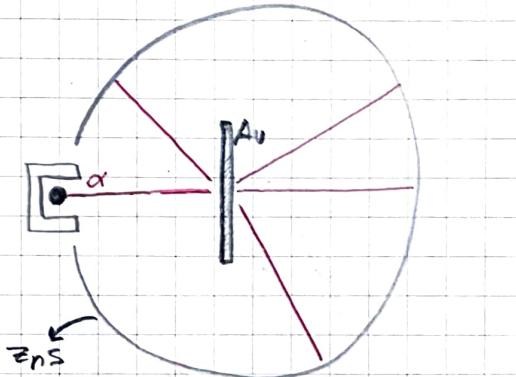
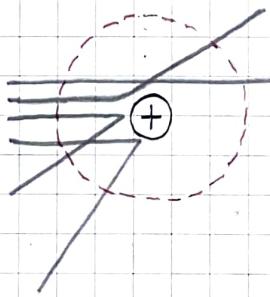
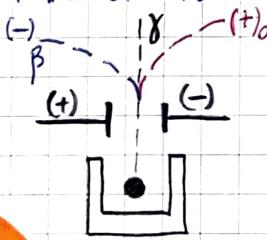
Millikan



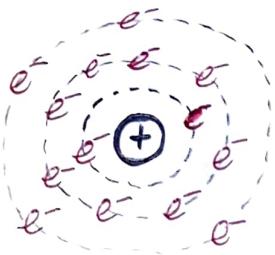
$$e = 1,6022 \cdot 10^{-19} \text{ C} \rightarrow z$$

$$m = 9,1094 \cdot 10^{-28} \text{ g}$$

Rutherford Atom Modeli



Bohr Atom Modeli



Kütle Numarası
A
Atom Numarası
z

$$z = p \\ A = p + n \\ p = e^-$$

$^{20}_{10}\text{Ne}$ $^{21}_{10}\text{Ne}$ $^{22}_{10}\text{Ne}$
%90,51 %0,27 %9,22
izotop

İYONLAR

$p+n$	A	$p=e^-$
\downarrow	\downarrow	\downarrow
^8O	$^{8-}$	^8p
^8F	$^{8-}$	^8s
^8N	$^{8-}$	^8p
^8M	$^{8-}$	^8n
^8Ne	$^{8-}$	$^{8-}10\text{e}$

* ^{11}Na $^{11}\text{Na}^+$
 ^{11}p ^{11}p
 ^{11}n ^{11}m
 $^{11}\text{e}^-$ $^{11}10\text{e}^-$

* $^{135}_{56}\text{Ba}^{+2}$
 $^{135}_{56}\text{Ba}$
 $^{135}_{56}\text{p}$
 $^{135}_{56}\text{n}$
 $^{135}_{56}\text{e}^-$

Atom Külesi

Teotoplardan dolayı atomların kületeleri tam sayı deşildir.

$^{20}_{10}\text{Ne}$ $^{21}_{10}\text{Ne}$ $^{22}_{10}\text{Ne}$

$$\text{Bölge Ortalama} = \left(\frac{\text{1. prototonun külesi}}{\text{bölge}} \times \text{1. izotopen külesi} \right) + \left(\frac{\text{2. prototonun külesi}}{\text{bölge}} \times \text{2. izotopen külesi} \right) + \left(\frac{\text{3. izotopenun külesi}}{\text{bölge}} \times \text{3. izotopen külesi} \right)$$

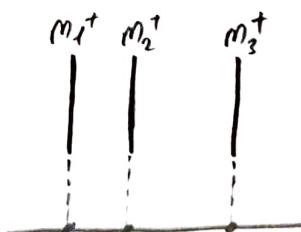
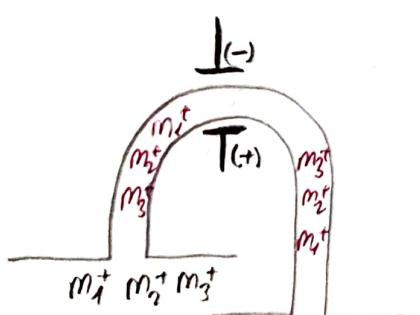
$$\begin{aligned} \text{Atom Ağırlığı} &= (0,9051 \times 20 \text{akb}) + (0,0027 \times 21 \text{akb}) + (0,0922 \times 22 \text{akb}) \\ &= 20,1797 \text{akb} \end{aligned}$$

$\Rightarrow ^{12}_6\text{C}$ $^{13}_6\text{C}$
%98,93 %1,07

Atom ağırlığı = 12,000...

NOT: Atom ağırlığı tam sayı olan tek element karbon (C)'dır. Bu yüzden spektroskopide referans olarak alınır.

Kütle Spektroskopisi



$$m_3^+ > m_2^+ > m_1^+$$

$$V_3 < V_2 < V_1$$

16 izotopen ağırlığı

$$^{16}_8\text{O} \quad 1,33291 \times 12,00000 = 15,99490 \text{akb}$$

cihazda ölçulen değer

Piterans

$\Rightarrow {}^{78}\text{Br}$ 'un kütlesi 78,9183 akb ve %50,69'dur. Bırçık ortalarası (atom kütlesi) = 79,904 olduğuna göre, ${}^{81}\text{Br}$ 'ın kütlesi nedir?

$$100,00 - 50,69 = 49,31 \rightarrow {}^{81}\text{Br}'\in \text{yazdesi}$$

$$79,904 \text{ akb} = (0,5069 \times 78,9183 \text{ akb}) + (0,4931 \times {}^{81}\text{Br})$$

$${}^{81}\text{Br} = 80,91 \text{ akb}$$

Periyodik Çedvel

${}^A_Z\text{E}$

Mendeleew, elementler hakkında bir tablo çizmiş ve keşfedilmeyen elementlerin varlığını黑洞lamış.

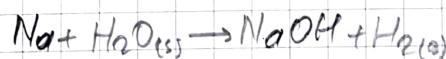
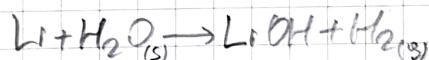
IA	IIA	III A	IV A	V A	VI A	VII A	He
H							
Li	Be	-	-	C	N	O	F
Na	Mg			Al	Si	P	Ne
K	Ca					S	Cl
						Ar	

113 tane element vardır. Periyodik tablo kimyonun özetini temsil eder.

- 1-Metaller
- 2-Ametaller
- 3-Yarı metaller

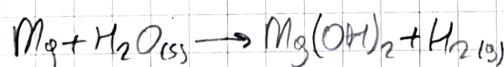
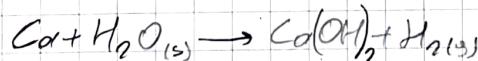
IA

- Alkali metaller
- En aktif metaller
- Buzlu özellikleri gösterir. Bu yüzden alkali denir.



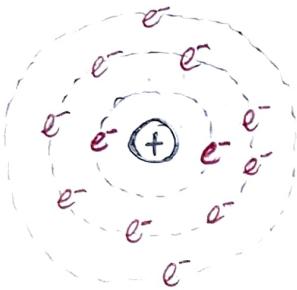
IIA

- Toprak alkali metaller
- Toprağı oluşturan elementler burada bulunduğu için toprak alkali denir.
- Topraktan en çok kalsiyum (Ca), kalsiyumdan sonra en çok magnezyum (Mg) bulunur.



Iyonlaşma Enerjisi: Nötr atomlardan $1e^-$ koparmak için gereklili enerji dir.

Atom Yarıçapı: En dıştaki e^- 'nın atom merkezine olan uzaklığdır.



$_{11}^{23}\text{Na}$	$_{12}^{24}\text{Mg}$	$_{18}^{36}\text{Ar}$
$1s_1$	$1s_2$	$1s_2$
$2s_1$	$2s_2$	$2s_2$
$2p_1$	$2p_2$	$2p_6$

$n=3$ kabuğu dolur.

Iyonlaşma enerjisi ve atom yarıçapı elementlerin fiziksel ve kimyasal olarak birbirinden ayıran en önemli unsurlardır.

Madde Miktari (mol)

Mol: $12,000\text{g } {}^{12}\text{C}$ atomunun sahip olduğu tanecek sayısına denir. Avogadro; $6,022 \times 10^{23}$

$$1\text{mol O} : 6,022 \times 10^{23}$$

$$1\text{mol S} : 6,022 \times 10^{23}$$

Mol Kötlesi:

$$\text{Li: } 6,941 \text{ g/mol} \quad 1\text{mol Li: } \underbrace{6,941 \text{ g}}_{\substack{\text{Litium çok hafif olduğu için} \\ \text{bilgisayar ve cep telefonlarında Li-ion} \\ \text{pil olurken kullanılır.}}} \quad 6,022 \times 10^{23} \text{ tane Li}$$

Litium çok hafif olduğu için
bilgisayar ve cep telefonlarında Li-ion
pil olurken kullanılır.

$$\Rightarrow \text{Zn: } 65,404 \text{ g/mol} \quad 10,0 \text{ g Zn} \quad \text{hangi elementin daha verimli olduğunu bulun.}$$

$$\text{Li: } 6,941 \text{ g/mol} \quad 10,0 \text{ g Li}$$

$$\text{Zn: } \frac{10,0}{65,404} = 0,15 \text{ mol} \quad \text{Li: } \frac{10,0}{6,941} = 1,44 \text{ mol} \quad \text{Li daha verimlidir.}$$

$\Rightarrow 4,07 \text{ g S}$ ve $32,07 \text{ g/mol S}$ olduğundan göre kaç mol kükürd, kaç tane kükürd atomu bulunur.

$$? \text{S mol} = 4,07 \text{ g S} \times \frac{1 \text{ mol S}}{32,07 \text{ g S}} = 0,127 \text{ mol S}$$

$$? \text{tane S atomu} = 4,07 \text{ g S} \times \frac{1 \text{ mol S}}{32,07 \text{ g S}} \times \frac{6,022 \times 10^{23} \text{ tane S}}{1 \text{ mol S}} = 7,64 \times 10^{22} \text{ tane S atomu}$$

→ Kurşunun 4 tane izotopu vardır. ^{226}Pb örneğinde kaç tane ^{206}Pb vardır?

- Pb: % 1,4 ^{204}Pb
% 24,1 ^{206}Pb
% 22,1 ^{207}Pb
% 52,4 ^{208}Pb

$$\text{? tane } ^{206}\text{Pb} = 22,6 \text{ g Pb} \times \frac{1 \text{ mol Pb}}{207,2 \text{ g Pb}} \times \frac{6,022 \times 10^{23} \text{ tane Pb}}{1 \text{ mol Pb}} \times \frac{24,1 \text{ tane } ^{206}\text{Pb}}{100 \text{ tane Pb}} = 1,58 \times 10^{22}$$

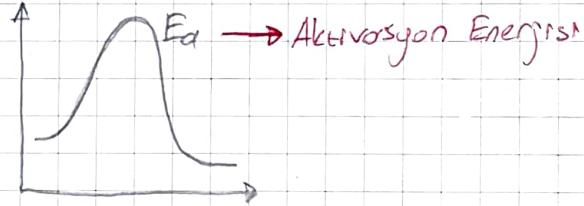
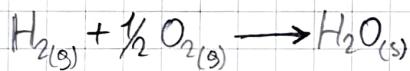
★ ^{40}K % 0,012 1,62 mg/mL 22 mL kaç ^{40}K taneği vardır? ($K: 39,098 \text{ g/mol}$)

mg 1 mL \rightarrow mg 225 mL \rightarrow g \rightarrow mol K \rightarrow tane K \rightarrow ^{40}K tane

$$\text{? } ^{40}\text{K} \text{ tane} = 1,62 \text{ mg} \frac{225 \text{ mL}}{1 \text{ mL}} \times \frac{1000}{1000 \text{ mg}} \times \frac{\text{mol K}}{39,098 \text{ g}} \times \frac{6,022 \times 10^{23} \text{ tane K}}{1 \text{ mol K}} \times \frac{0,012 \text{ tane } ^{40}\text{K}}{100 \text{ tane K}}$$

KİMYASAL BİLESİKLER

En az iki atomun birleşmesine bilesik denir.



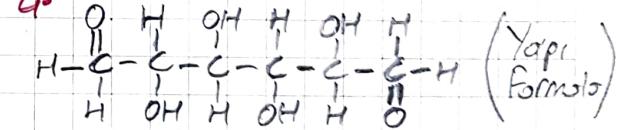
Formül: 1. Bir bilesigin hangi elementlerden olduğunu gösterir.
2. Hangi basit orantı bu elementler bir araya gelmiştir?
3. Bu elementlerin gerçek oranı nedir?
4. Bu elementler meydana getiren atomlar uzayda nasıl konumlanır?



(Kaba formül)



(Gerçek Kapalı
Formül)



Moleksel Yapılı Bilesikler: Molekul formundan bahsedilir. (H_2O vb.)

İyonik Yapılı Bilesikler: Kati halde düzligi vardır. Gaz ve sıvı çözeltisinde dengelerdir. Formül birimi kullanılır. ($\text{NaCl}, \text{MgCl}_2$ vb.)

Mol Kavramı

1 mol S \rightarrow 32,07 g S \rightarrow $6,022 \times 10^{23}$ tanıe S

1 mol H₂O \rightarrow 18,011 g H₂O \rightarrow $6,022 \times 10^{23}$ tanıe H₂O molekül

1 mol MgCl₂ \rightarrow 95,211 g MgCl₂ \rightarrow $6,022 \times 10^{23}$ tanıe MgCl₂ formül birim \rightarrow $3 \times 6,022 \times 10^{23}$ tanıe taneak vardır.

\Rightarrow C₂H₆S etil merkeptan (similastinmiş petrol, doğal gaz / keskin kokulu) 1,0 μ L
C₂H₆S'de kaç tanıe molekül vardır? (C₂H₆S: 62,1 g/mol d = 0,84 g/mL)

$$\text{? tanıe C}_2\text{H}_6\text{S molekül} = 1,0 \mu\text{L} \times \frac{1\text{ mL}}{1000 \mu\text{L}} \times \frac{0,84 \text{ g C}_2\text{H}_6\text{S}}{1\text{ mL C}_2\text{H}_6\text{S}} \times \frac{1\text{ mol C}_2\text{H}_6\text{S}}{62,1 \text{ g C}_2\text{H}_6\text{S}} \times \frac{6,022 \times 10^{23} \text{ tanıe C}_2\text{H}_6\text{S molekül}}{1\text{ mol C}_2\text{H}_6\text{S}}$$
$$= 8,22 \times 10^{18} \text{ tanıe molekül}$$

Bileşigin Bileşimi

$$(M) C₆H₁₂O₆ = (6 \times 12) + (12 \times 1) + (6 \times 16)$$
$$72 + 12 + 96 = 180 \text{ g/mol}$$

$$\% C = \frac{72 \text{ g C}}{180 \text{ g}} \times 100 = \% 40,0$$

$$\% H = \frac{12 \text{ g H}}{180 \text{ g}} \times 100 = \% 6,6$$

$$\% O = \frac{96 \text{ g O}}{180 \text{ g}} \times 100 = \% 53,3$$

\Rightarrow C₂HBrClF₃ M_A = 197,38 g/mol ise bileşigin yüzdé bileşimi nedir?

(CFC \rightarrow Kloro Floro Hidrokarbon)

$$\% C = \frac{2 \times 12 \text{ g C}}{197,38 \text{ g}} \times 100 = \% 12,17 \text{ C}$$

$$\% H = \frac{1,008 \text{ g H}}{197,38 \text{ g}} \times 100 = \% 0,51 \text{ H}$$

$$\% Br = \frac{79,80 \text{ g Br}}{197,38 \text{ g}} \times 100 = \% 40,37 \text{ Br}$$

$$\% Cl = \frac{35,53 \text{ g Cl}}{197,38 \text{ g}} \times 100 = \% 17,96 \text{ Cl}$$

$$\% F = \frac{3 \times 18,99 \text{ g F}}{197,38 \text{ g}} \times 100 = \% 28,88 \text{ F}$$

⇒ Deoksiriboz'un yüzde bileşimi; % 44,77 C, % 7,52 H, % 47,71 O ise gerçek formülü nedir? ($M_A = 134$ akb)

$$44,77 + 7,52 + 47,71 = 100,00\%$$

$$\text{? mol C} = \frac{44,77 \times C}{12,011 \text{ g C}} = 3,327 \text{ mol C}$$

$$\text{? mol H} = \frac{7,52 \times H}{1,008 \text{ g H}} = 7,46 \text{ mol H}$$

$$\text{? mol O} = \frac{47,71 \times O}{15,99 \text{ g O}} = 2,987 \text{ mol O}$$

$$M_A' = (5 \times 12,011) + (10 \times 1,008) + (4 \times 15,99) \\ 60 + 10 + 64 = 134 \text{ akb}$$

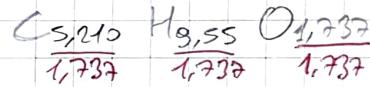
$C_5H_{10}O_4 \Rightarrow$ Hem karbon formül hem gerçek formül

⇒ Dibütil Süksinat (Bozuk olıcı/İldizmez)'ın yüzde bileşimi; % 65,58 C, % 9,63 H, % 27,79 O ise molekul formülü nedir? ($M_A = 230$ akb)

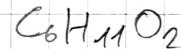
$$\text{? mol C} = \frac{65,58 \times C}{12,011 \text{ g C}} = 5,210 \text{ mol C}$$

$$\text{? mol H} = \frac{9,63 \times H}{1,008 \text{ g H}} = 9,55 \text{ mol H}$$

$$\text{? mol O} = \frac{27,79 \times O}{15,99 \text{ g O}} = 1,737 \text{ mol O}$$



2/C_{5,00} H_{9,49} O_{1,00}



$$M_A' = (6 \times 12,011) + (11 \times 1,008) + (2 \times 15,99) = 115 \text{ akb} \times 2 = 230 \text{ akb}$$

2/C₆H₁₁O₂ ⇒ C₁₂H₂₂O₄

⇒ Pentaeritrokloro (uyuşturucu özerkliği)'nın yüzde bileşimi; % 21,51 C, % 2,20 H, % 17,64 O ise molekul formülü nedir? ($M_A = 726$ akb)

$$21,51 + 2,20 + 17,64 = 41,37 \quad (C, H, O, Cl)$$

$$100 - 41,37 = \% 58,63 \text{ Cl}$$

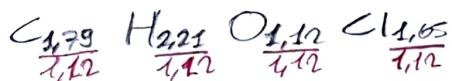
$$\text{? mol C} = \frac{21,51 \times C}{12,011 \text{ g C}} = 1,79 \text{ mol C} ; \quad \text{? mol O} = \frac{17,64 \times O}{15,99 \text{ g O}} = 1,12 \text{ mol O}$$

$$\text{? mol H} = \frac{2,20 \times H}{1,008 \text{ g H}} = 2,21 \text{ mol H} ; \quad \text{? mol Cl} = \frac{58,63 \times Cl}{35,50 \text{ g Cl}} = 1,65 \text{ mol Cl}$$

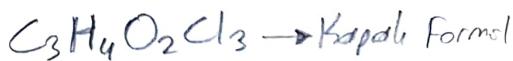
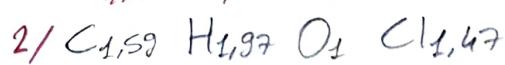
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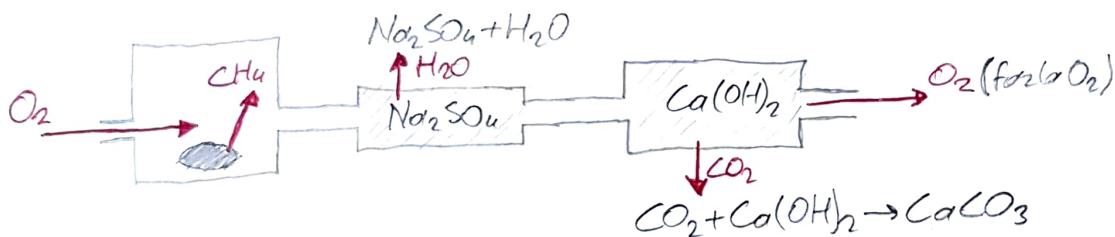
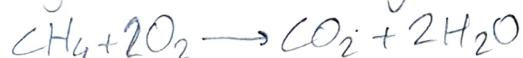
$$M_A' = (3 \times 12,01) + (4 \times 1,008) + (2 \times 15,93) + (3 \times 35,5) = 178,54 \text{ akk}$$



$$\frac{178,54 \text{ akk}}{178,54 \text{ akk}} = 1 \quad C_{12}H_{16}O_8Cl_{12}$$

Sağlamsız olan M_A' ini bul

Bd21 organik maddelerde yakınlık o maddeleri analiz edebiliriz.



$\Rightarrow 0,2000 \text{ g}$ Aksorbik asit (C vitamini), O_2 ile yakıldı. yar. $0,2938 \text{ g} CO_2$ ve $0,0813 \text{ g} H_2O$ oluşuyor. Bileşigin kapalı formolu nedir? ($M_A = 176,12 \text{ akk}$)

$$? \text{ mol } C = 0,2938 \text{ g } CO_2 \times \frac{1 \text{ mol } CO_2}{44,01 \text{ g } CO_2} \times \frac{1 \text{ mol } C}{1 \text{ mol } CO_2} = 0,006812 \text{ mol } C$$

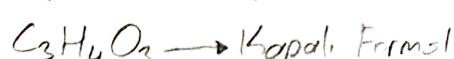
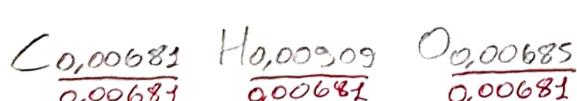
$$? \text{ mol } H = 0,0813 \text{ g } H_2O \times \frac{1 \text{ mol } H_2O}{18,01 \text{ g } H_2O} \times \frac{2 \text{ mol } H}{1 \text{ mol } H_2O} = 0,00909 \text{ mol } H$$

$$? \text{ g } C = 0,006812 \text{ mol } C \times \frac{12,01 \text{ g } C}{1 \text{ mol } C} = 0,0818 \text{ g } C$$

$$? \text{ g } H = 0,00909 \text{ mol } H \times \frac{1,008 \text{ g } H}{1 \text{ mol } H} = 0,00916 \text{ g } H$$

$$? \text{ g } O = 0,2000 \text{ g} \text{ Aksorbik Asit} - (0,0818 \text{ g } C + 0,00916 \text{ g } H) = 0,1096 \text{ g } O$$

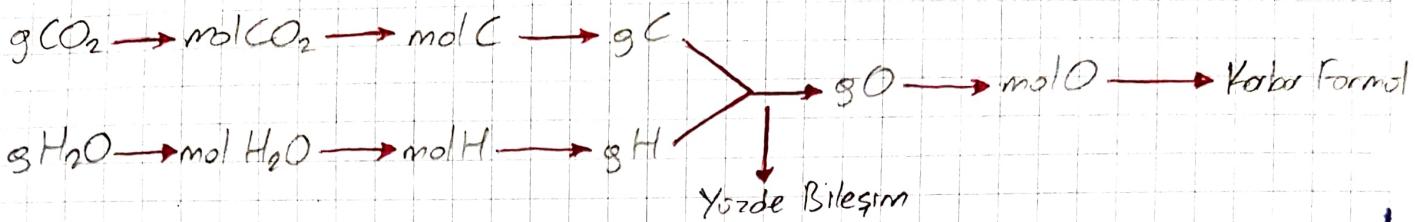
$$? \text{ mol } O = 0,1096 \text{ g } O \times \frac{1 \text{ mol } O}{15,99 \text{ g } O} = 0,00685 \text{ mol } O$$



$$\% C = \frac{0,0818 \text{ g } C}{0,2000 \text{ g A.A.}} \times 100 = 40,9$$

$$\% H = \frac{0,00916 \text{ g } H}{0,2000 \text{ g A.A.}} \times 100 = 4,58$$

$$\% O = \frac{0,1096 \text{ g } O}{0,2000 \text{ g A.A.}} \times 100 = 54,8$$



$\Rightarrow 1,152 \text{ g }$ izopropilpropiyonat (Tat verici maddesi), O_2 ile yakıldığında $2,726 \text{ g}$ CO_2 ve $1,116 \text{ g}$ H_2O oluşuyor. Izopropilpropiyonat'ın kabar formulu nedir?

$$? \text{ mol C} = 2,726 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44,01 \text{ g CO}_2} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = 0,061 \text{ mol C}$$

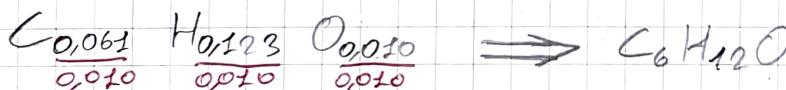
$$? \text{ mol H} = 1,116 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18,01 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 0,123 \text{ mol H}$$

$$? \text{ g C} = 0,061 \text{ mol C} \times \frac{12,01 \text{ g C}}{1 \text{ mol C}} = 0,732 \text{ g C}$$

$$? \text{ g H} = 0,123 \text{ mol H} \times \frac{1,008 \text{ g H}}{1 \text{ mol H}} = 0,123 \text{ g H}$$

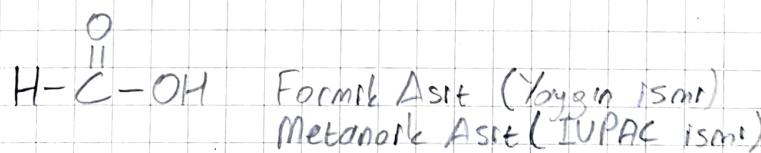
$$? \text{ g O} = 1,152 \text{ g IPP} - (0,732 \text{ g C} + 0,123 \text{ g H}) = 0,287 \text{ g O}$$

$$? \text{ mol O} = 0,287 \text{ g O} \times \frac{1 \text{ mol O}}{15,99 \text{ g O}} = 0,01 \text{ mol O}$$



Bileşiklerin Adlandırılması

IUPAC



[formik \rightarrow karınca]

- $\text{NaCl} \rightarrow$ Sodyum klorur
- $\text{MgCl}_2 \rightarrow$ Magnezyum klorur
- $\text{NaI} \rightarrow$ Sodyum iyodür
- $\text{KF} \rightarrow$ Potasyum florur

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Bazi Element ve Bileşiklerin İON Holleri	
Li^+	Al^{+3}
Na^+	Zn^{+2}
K^+	Ag^+
Mg^{+2}	
Ca^{+2}	
Sr^{+2}	
Ba^{+2}	
NH_4^+	
	$\text{Fe}^{+2}, \text{Fe}^{+3}$
	$\text{Cr}^{+2}, \text{Cr}^{+3}$
	$\text{Co}^{+2}, \text{Co}^{+3}$
	$\text{Cu}^{+1}, \text{Cu}^{+2}$
	$\text{Hg}^{+2}, \text{Hg}^{+3}$
	$\text{Sn}^{+2}, \text{Sn}^{+4}$
	$\text{Pb}^{+2}, \text{Pb}^{+4}$
	H^-
	F^-
	Cl^-
	Br^-
	I^-
	CH_3COO^-
	CO_3^{2-}
	HCO_3^-
	SO_4^{2-}
	HSO_4^-
	ClO^-
	ClO_2^-
	ClO_3^-
	ClO_4^-
	PO_4^{3-}
	HPO_4^{2-}
	H_2PO_4^-
	OH^-
	NO_2^-
	CrO_5^{2-}
	$\text{Cr}_2\text{O}_7^{2-}$
	NO_3^-
	MnO_4^-
	CN^-

Bazi Element ve Bileşiklerin ADLARI

$\text{CaSO}_4 \rightarrow$ Kalsiyum sulfat

$\text{NaHCO}_3 \rightarrow$ Sodyum bir karbonat

$\text{Na}_2\text{CO}_3 \rightarrow$ Sodyum karbonat

$\text{K}_2\text{HPO}_4 \rightarrow$ Potasyum fosfat

$\text{KH}_2\text{PO}_4 \rightarrow$ Potasyum di hidrojen fosfat

$(\text{NH}_4)_2\text{SO}_4 \rightarrow$ Amonyum sulfat

$\text{NH}_4\text{NO}_3 \rightarrow$ Amonyum nitrat (Portakalci, Gubre)

Asit Özelliğinin Eşiyarı Bazi Bileşikler

HF	HNO_3	HClO (hipoklorit asit)
HCl	H_2SO_4	HClO_2 (klorit)
HBr	H_3PO_4	HClO_3 (klorot)
HI	H_2SO_3 (solforik)	HClO_4 (per klorat)
		HNO_2 (nitroik)

Metaller Ametaller



Oksidasyon Sayısı

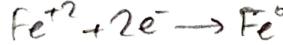
1-Yükseltgenme ($2\text{Cl}^- \xrightarrow{-2\text{e}^-} \text{Cl}-\text{Cl}$)

2-İndirgenme

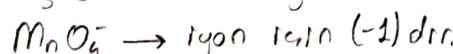
1-Yükseltgenme
2-indirgenme } Elementler üzerinde

Oksidasyon Basamakları

1-Dosya ortamında serbest olan, bileşile olmayan elementlerin yükseltgenme basamagi sıfırdır.



2-Moleküller, formül birimin yükseltgenme basamagi toplamı sıfırdır.



1.Grub (+1) 2.Grub (+2)

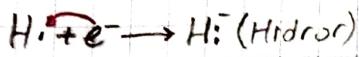
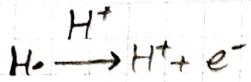
• Flor (F) her zaman (-1) değerlik alır.

Li	Be
Na	Mg
K	Ca
Cs	Sr
Rb	Ba

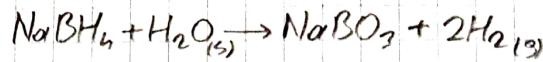
ClF_3	ClO_4^-
	ClO_3^-
	ClO^-
	ClO_2^-

Elektronegatiflik: Bir atomun koz elektronlarını çekme istegidir.





Natt
Cattta

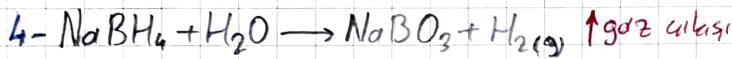
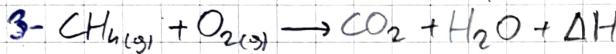
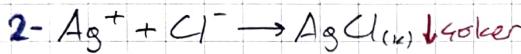


Kimyasal Tepkimeleler

Bir maddedeki mevcut kimyasal bağların kırılıp yerine yeni bağların oluşmasıdır.



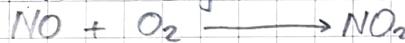
Kimyasal Reaksiyonları Gözlemlenmek İcm Gereken Yollar



5- Hızbırı almaz. Fakat yine de kimyasal reaksiyon gerçekleşti.

Kimyasal Tepkime Nasıl İfade Edilir

Azot monokisit + Oksijen \rightarrow Azot dioksit

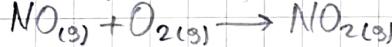


(g) \rightarrow Gaz

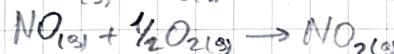
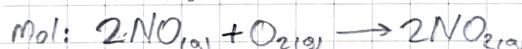
(s) \rightarrow Sıvı

(l) \rightarrow Kötü

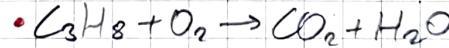
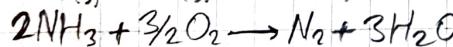
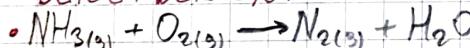
(aq) \rightarrow Sulu Gazeler



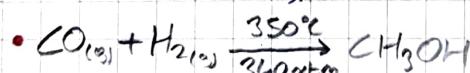
Kötlenin Korunumundan



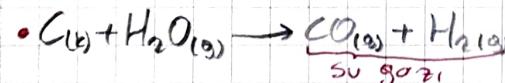
Denklem Denkleştirme



Dekompozisyon (Ayrılma) Tepkimesi



Mekanik (Dağalgaz) ve Kimyasal (CO)



Sıkıcı hınar ve yüksek sıcaklık olmalı
ve çok zehirli dir %15'in altında O₂ düşerse
bilinç kaybı olur.

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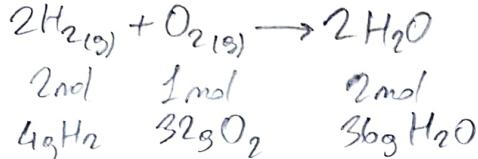
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Stokiyometri

Giren maddeler ve çıkış maddeleri arasındaki ilişkileri inceler. (stokiy → element)



2,72 mol Trietilenlikol yatkınlığında
kaç mol CO₂ elde eder?

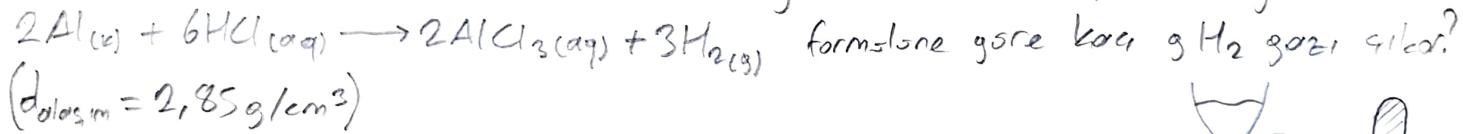


$$? \text{mol CO}_2 = 2,72 \text{ mol Trietilenlikol} \times \frac{12 \text{ mol CO}_2}{2 \text{ mol Trietilenlikol}} = 16,3 \text{ mol CO}_2$$

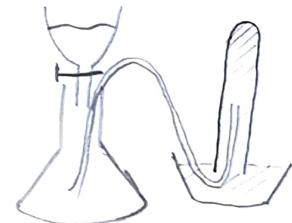
\Rightarrow 4,16 g C₆H₁₄O_n yatkınlığında kaç g CO₂ meydana gelir.

$$? \text{g CO}_2 = 4,16 \text{ g Trietilenlikol} \times \frac{1 \text{ mol Trietilenlikol}}{150,2 \text{ g Trietilenlikol}} \times \frac{12 \text{ mol CO}_2}{2 \text{ mol Trietilenlikol}} \times \frac{44,09 \text{ g CO}_2}{1 \text{ mol CO}_2} = 7,31 \text{ g CO}_2$$

\Rightarrow %93,7 Al ve %6,3 Cu əlaşım oluşturur. 0,631 cm³ əlaşım alınıyor.



$$\text{cm}^3 \text{ əlaşım} \rightarrow \text{g əlaşım} \rightarrow \text{g Al} \rightarrow \text{mol Al} \rightarrow \text{mol H}_2 \rightarrow \text{g H}_2$$



$$? \text{g H}_2 = 0,631 \text{ cm}^3 \text{ əlaşım} \times \frac{2,85 \text{ g əlaşım}}{10 \text{ cm}^3 \text{ əlaşım}} \times \frac{93,7 \text{ g Al}}{100 \text{ g əlaşım}} \times \frac{1 \text{ mol Al}}{26,98 \text{ g Al}} \times \frac{3 \text{ mol H}_2}{2 \text{ mol Al}} \times \frac{2,016 \text{ g H}_2}{1 \text{ mol H}_2}$$

$$= 0,207 \text{ g H}_2$$

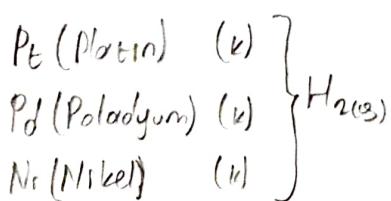
\Rightarrow Kotlucə %28'lik HCl əzəletisinin yoğunluğu 1,148/ml dir. $2\text{Al(s)} + 6\text{HCl(aq)} \rightarrow 2\text{AlCl}_3\text{(aq)} + 3\text{H}_2\text{(g)}$
tepkiməsine görə 1,87 g Al kənər mol %28,1 HCl əzəletisini oluşturur.

$$\text{g Al} \rightarrow \text{mol Al} \rightarrow \text{mol HCl} \rightarrow \text{g HCl(gaz)} \rightarrow \text{mL HCl(gaz)}$$

Gözələr: Gözənen \Rightarrow Homojen
Gözən \Rightarrow Heterojen

Gözənen: Miktarı az olan
Gözən: Miktarı fazla olan

Gözənen Su \Rightarrow Katalyza



Gözələr içindəki gözənen miktarı
mol → Molarite

$$\text{Molarite} = \frac{\text{mol soyus}}{\text{gözəletmin hacmi}} = \frac{N}{L}$$

$\Rightarrow 1,25 \text{ mol Glukoz'un } 1\text{L çözeltisi hazırlanırsa}$

$$M = \frac{1,25 \text{ mol}}{1\text{L}} = 1,25 \text{ mol/L (molar)}$$

$\Rightarrow 0,66 \text{ mol Üre'nin } 250\text{mL çözeltisi hazırlanırsa}$

$$M = \frac{0,66 \text{ mol}}{0,250\text{L}} = 2,64 \text{ mol/L (molar [M])}$$

$\Rightarrow 25,0\text{mL etanol } 250\text{ mL çözeltisini hazırlayıncı kaça M dir? } (d=0,78 \text{ g/mL})$

$$?M = 25,0 \text{ mL etanol} \times \frac{0,78 \text{ g}}{1\text{mL}} \times \frac{1 \text{ mol etanol}}{46,07 \text{ g etanol}} \times \frac{1}{0,250\text{L}} = 1,73 \text{ mol/L}$$

$\Rightarrow 250\text{mL } 0,250 \text{ M. } K_2CrO_4 \text{ (Potasyum Cromat) kaça gram d.r. ?}$

$$? \text{ g } K_2CrO_4 = 0,250\text{L} \times \frac{0,250 \text{ mol } K_2CrO_4}{1\text{L}} \times \frac{194,2 \text{ g } K_2CrO_4}{1 \text{ mol } K_2CrO_4} = 12,1 \text{ g } K_2CrO_4$$

Molarite

• $M = \frac{n}{V(L)}$ $\Rightarrow 0,250 \text{ M } K_2CrO_4 \quad 1\text{L'de } 0,250 \text{ mol } K_2CrO_4$
 $0,010 \text{ M } K_2CrO_4 \quad 250\text{mL'de kaça mol } K_2CrO_4 \text{ vardır?}$

$$M = \frac{n}{V(L)} \Rightarrow 0,010 \frac{\text{mol}}{\text{L}} = \frac{n}{0,250\text{L}} \quad n = 0,00250 \text{ mol } K_2CrO_4$$

$$\frac{1\text{L}}{x} \frac{0,250 \text{ mol}}{0,00250 \text{ mol}} \\ x = \frac{1\text{L} \times 0,00250 \text{ mol}}{0,250 \text{ mol}} = 0,010 \text{ L} = 10 \text{ mL}$$

$$\bullet \quad n_1 = n_2 \quad \Rightarrow M_1 = 0,250 \text{ M} \quad 0,250 \text{ M} \times V_1 = 0,010 \text{ M} \times 250 \text{ mL} \\ M_1 \cdot V_1 = M_2 \cdot V_2 \quad M_2 = 0,010 \text{ M} \quad V_1 = 10 \text{ mL} \\ V_2 = 250 \text{ mL} = 0,250 \text{ L} \\ V_1 = ?$$

$\Rightarrow 15 \text{ mL ve } 0,450 \text{ M } K_2CrO_4 \text{ çözeltisi, } 100 \text{ mL su ile seyreltiliyor.}$
Hazırlanan çözeltinin $M = ?$

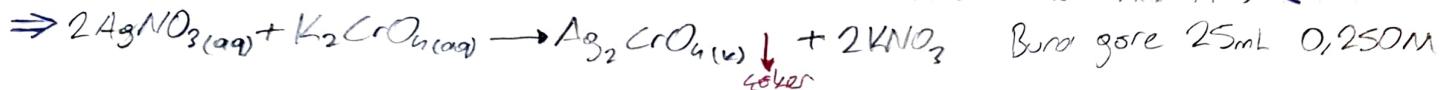
$$M_1 \cdot V_1 = M_2 \cdot V_2$$

$$V_2 = 100 \text{ mL} + 15 \text{ mL} = 115 \text{ mL}$$

$$0,450 \text{ M} \times 15 \text{ mL} = M_2 \times 115 \text{ mL}$$

$$\hookrightarrow M_2 = 0,070 \text{ M } K_2CrO_4$$

Daha doğruluk için kontrol (seyreltleme kontrol)

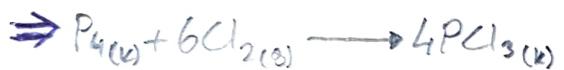


K_2CrO_4 ekleniyor. Kaç gram Ag_2CrO_4 oksider?

$$M = \frac{n}{V(L)} \Rightarrow n = 0,250 \text{ mol/L} \times 0,025 \text{ L}$$

$$n = 6,25 \times 10^{-3} \text{ mol } \text{K}_2\text{CrO}_4$$

$$? \text{g } \text{Ag}_2\text{CrO}_4 = 6,25 \times 10^{-3} \text{ mol } \text{K}_2\text{CrO}_4 \times \frac{1 \text{ mol Ag}_2\text{CrO}_4}{1 \text{ mol K}_2\text{CrO}_4} \times \frac{331,7 \text{ g Ag}_2\text{CrO}_4}{1 \text{ mol Ag}_2\text{CrO}_4} = 2,07 \text{ g Ag}_2\text{CrO}_4$$



323 g Cl_2 ve 125 g P_4 %100 verimle tepkimeye girmeye gidiyor. Kaç gram PCl_3 oluşur?

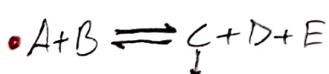
$$n_{\text{Cl}_2} = \frac{323 \text{ g Cl}_2}{70,92 \text{ g/mol}} = 4,56 \text{ mol Cl}_2 \quad n_{\text{P}_4} = \frac{125 \text{ g P}_4}{123,9 \text{ g/mol}} = 1,02 \text{ mol P}_4$$

1 mol P_4 ve 6 mol Cl_2 tepkimeye girmis. Elimizde 1 mol P_4 var fakat 6 mol Cl_2 yok.

$$? \text{g } \text{PCl}_3 = 4,56 \text{ mol Cl}_2 \times \frac{4 \text{ mol PCl}_3}{6 \text{ mol Cl}_2} \times \frac{137,3 \text{ g PCl}_3}{1 \text{ mol PCl}_3} = 417 \text{ g PCl}_3$$

$$? \text{g } \text{P}_4 = 4,56 \text{ mol Cl}_2 \times \frac{1 \text{ mol P}_4}{6 \text{ mol Cl}_2} \times \frac{123,9 \text{ g P}_4}{1 \text{ mol P}_4} = 94,1 \text{ g P}_4 \text{ reaksiyonda gidiyor.}$$

$$125 \text{ g P}_4 - 94,1 \text{ g P}_4 = 31 \text{ g P}_4 \text{ ortam.}$$



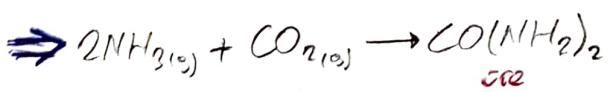
Verim:
 1 Kuramsal Verim
 2 Gerçek Verim
 3 % Verim

Verim Azaltan Faktörler:

- 1 Denge reaksiyonlarında ters yönde
- 2 Reaksiyonda yan ürünler olması
- 3 Sıyrılmış olayında

$$\% \text{ Verim} = \frac{\text{Güçlü Verim}}{\text{Kuramsal Verim}} \times 100$$

(çanti metabolizmaların da tepkimele)
 %100 verimle gerçekleşir.



3 mol NH_3 , 1 mol CO_2 tepkimeye gidiyor ve her bir mol CO_2 iken 47,7 g üre meydana geliyor.
 Tepkimenin % verimi kaçtır?

$$\text{Güçlü Verim} = 47,7 \text{ g}$$

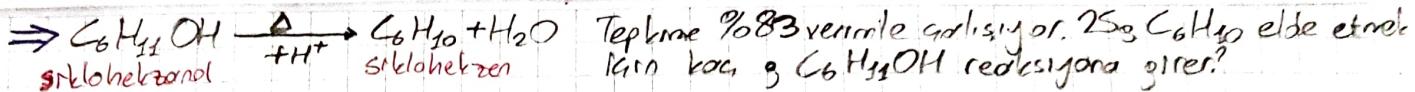
$$\text{Kuramsal Verim} = 60,1 \text{ g}$$

Yüzde Verim

$$1 \text{ mol CO}_2 \rightarrow 1 \text{ mol Üre}$$

$$? \text{g ÜRE} = 1 \text{ mol CO}_2 \times \frac{1 \text{ mol Üre}}{1 \text{ mol CO}_2} \times \frac{60,1 \text{ g Üre}}{1 \text{ mol Üre}} = 60,1 \text{ g Üre} \quad (\text{Kuramsal Verim})$$

$$\% \text{ Verim} = \frac{\text{Güçlü Verim}}{\text{Kuramsal Verim}} \times 100 \Rightarrow \frac{47,7 \text{ g}}{60,1 \text{ g}} \times 100 = \% 79,4$$



$$\% \text{ Verim} = \frac{\text{Geçerli Verim}}{\text{Kurumsal Verim}} \times 100$$

$$83 = \frac{25 \text{ g } C_6H_{10}}{\text{Kurumsal Verim}} \times 100$$

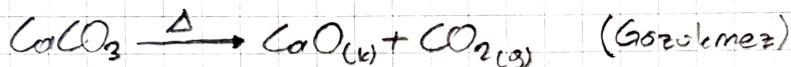
$$\text{Kurumsal Verim} = \frac{25 \text{ g } C_6H_{10}}{83} \times 100$$

$$= 30 \text{ g } C_6H_{10}$$

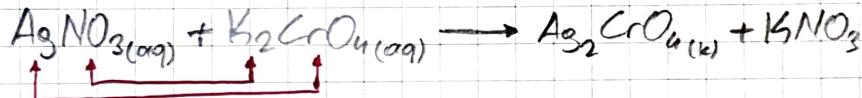
$$? \text{ g } C_6H_{11}OH = 30 \text{ g } C_6H_{10} \times \frac{1 \text{ mol } C_6H_{10}}{82,1 \text{ g}} \times \frac{1 \text{ mol } C_6H_{11}OH}{1 \text{ mol } C_6H_{10}} \times \frac{100,2 \text{ g } C_6H_{11}OH}{1 \text{ mol } C_6H_{11}OH} = 37,0 \text{ g } C_6H_{11}OH$$

SULU GÖZELTİ TEPKİMELERINE GİRİŞ

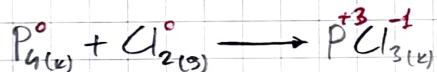
A-Bozulma Tepkimeleri



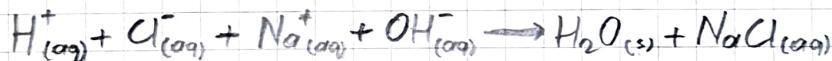
B-Yerdeğiştirme Tepkimeleri



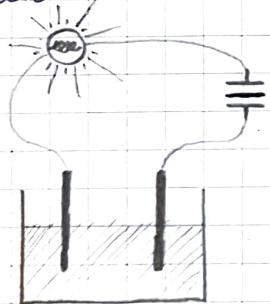
C-Redoks (Redüksiyon - Oksidalasyon) Tepkimeleri



D-Asit-Baz Tepkimeleri



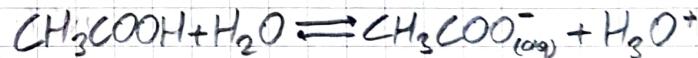
Sulu Gözelti



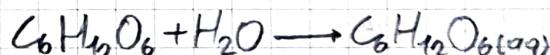
- Işık Şiddetli → Elektrolyt Gözelti



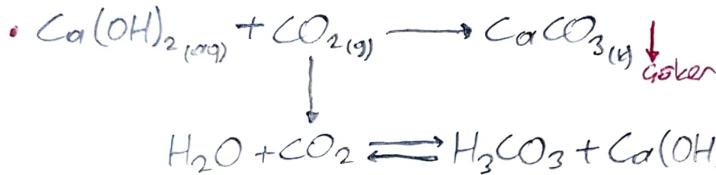
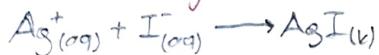
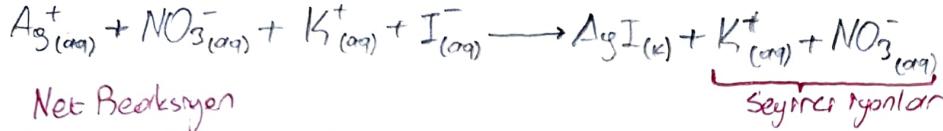
- Işık Zayıf → Zayıf Elektrolyt Gözelti



- Işık Yanmıyor → Elektrolyt Olmayan Gözelti



Yerdeşirgenme Tepkimeleler

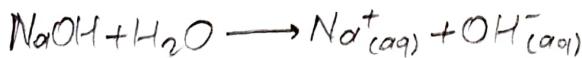
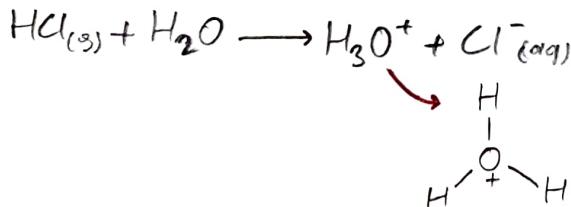


Asit Baz Tepkimeleleri

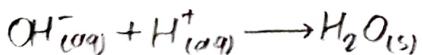
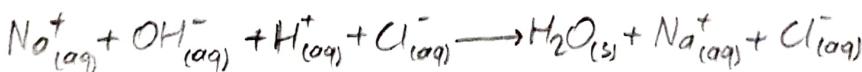
→ Lowry-Bronsted Asit Baz Tanımı

Asit: Sulu çözeltide H^+ iyonu veren $\rightarrow HCl, HF, HBr, HI, H_2SO_4, HNO_3$

Baz: Sulu çözeltide OH^- iyonu veren $\rightarrow NaOH, KOH, Ca(OH)_2, NH_3$



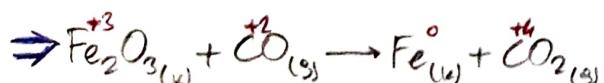
→ Asit Baz (Nötralleşme) Tepkimesi



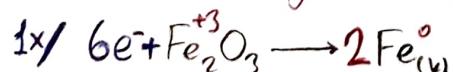
Redoks Tepkimeleleri

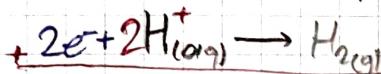
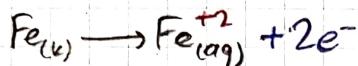
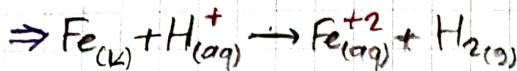
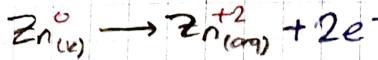
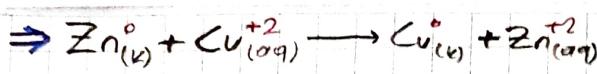
- 1 İndirgenme (Redüksiyon)
- 2 Yükseltgenme (Oksidasyon)

NOT: Metaller (+) oksidasyon basırmazı,
Ametaller (+, -) oksidasyon basırmazına
(F(-) hariç) sahiptir.

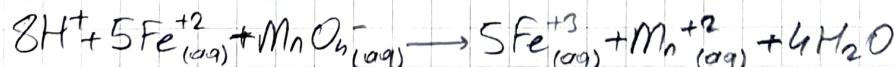
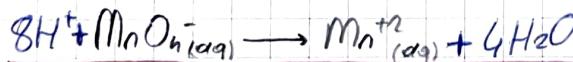
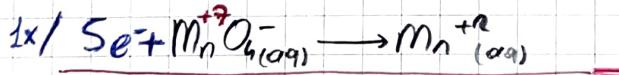
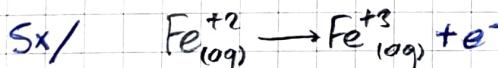
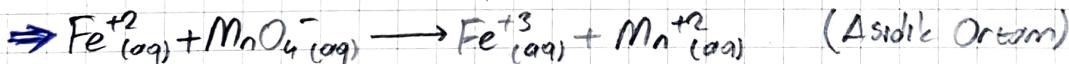
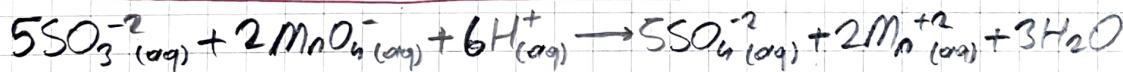
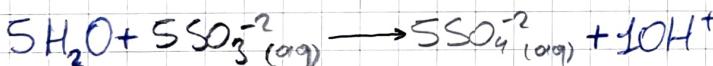
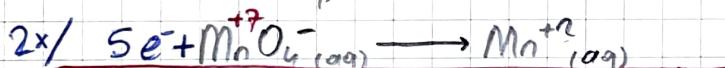
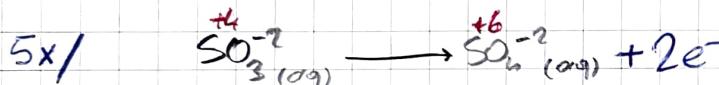
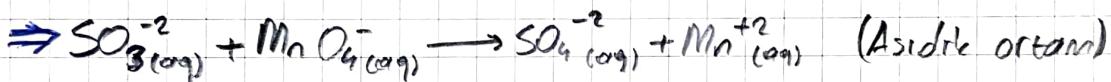
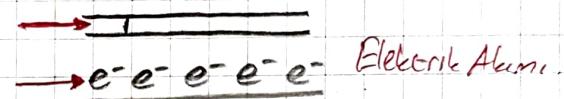
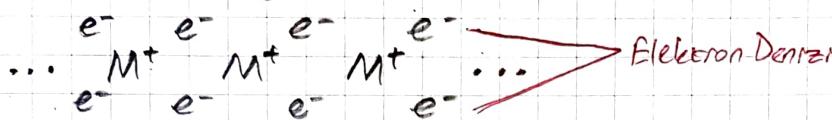


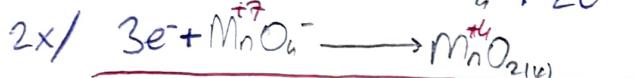
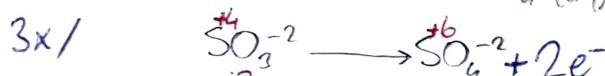
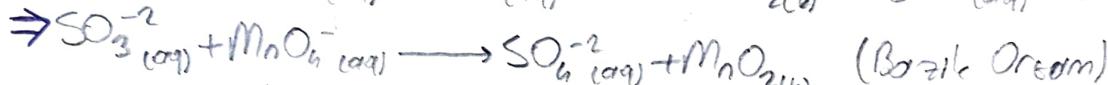
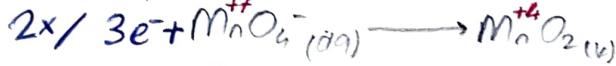
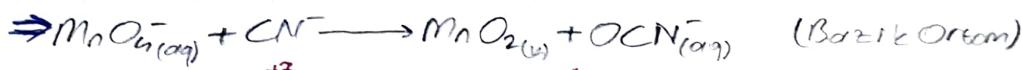
Yan Reaksiyonlar Yöntemi





NOT: Metalik Bağlar





...

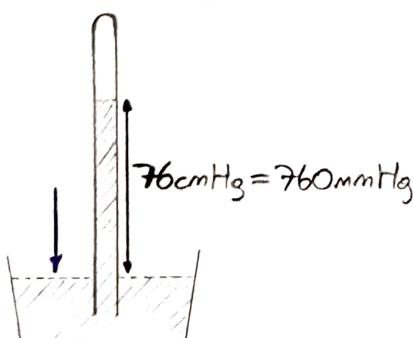
GAZLAR

Gazların yoğunluğu katılarla ve sıvılara göre daha azdır. Gazların yoğunluğunun birimi g/L dir.

Basınç = Birim alanda uygulanan kuvvetdir. $P = \frac{F}{A}$ kuvet
alan $= \frac{N}{m^2} = Pa$ Pascal $(N: 1\text{kg m s}^{-2})$

$$P = \frac{F}{A} = \frac{W}{A} = \frac{mg}{A} = \frac{gVd}{A} = \frac{gAhd}{A} = ghd \quad [W = g.m, d = \frac{m}{V}]$$

Torricelli Deneyi:



$$P = ghd$$

$$\Rightarrow h_{Hg} = 76 \text{ cm} \quad h_{H_2O} = ?$$

$$d_{Hg} = 13,6 \text{ g/mL} \quad d_{H_2O} = 1 \text{ g/mL}$$

$$gh_{Hg} \cdot d_{Hg} = g \cdot h_{H_2O} \cdot d_{H_2O}$$

$$76 \text{ cm} \times 13,6 \text{ g/mL} = h_{H_2O} \times 1 \text{ g/mL}$$

$$h_{H_2O} = 1033,6 \text{ cm}$$

Basınç Birimleri

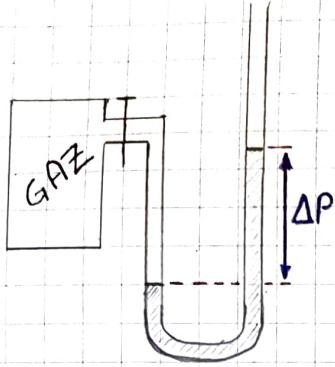
$$P(Pa) = 101325 = 1 \text{ atm} = 101,325 \text{ kPa}$$

Bar 1 atm 101325 Bar

mBar 1 atm 1013,25 mBar

$$1 \text{ atm} = 760 \text{ mm Hg} = 760 \text{ torr}$$

Manometre:



$$P_{gas} = P_{bar}$$

Vana açılırında

$$P_{gas} = P_{bar} + \Delta P$$

$$\Delta P = g h d$$

↓

Yakum yapılırsa

$$\Delta P = -g h d$$

$\Rightarrow P = 748,2 \text{ mmHg}$ cıva seviyeleri farklı $-8,6 \text{ mmHg}$ ise gazın basıncı nedir?

$$P_{bar} = -8,6 \text{ mmHg}$$

$$\begin{aligned} P &= 748,2 \text{ mmHg} - 8,6 \text{ mmHg} \\ &= 739,6 \text{ mmHg} \end{aligned}$$

Basit Gaz Yasaları

1- Boyle-Mariotte Yasası

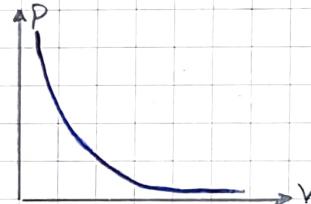
Sabit sıcaklık, sabit miktar havası ile basing ters orantılıdır.

T: sabit

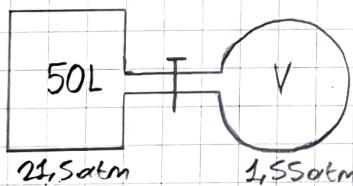
n: sabit

$$P \frac{1}{V} \quad P \cdot V = \alpha$$

$$P_1 \cdot V_1 = P_2 \cdot V_2$$



\Rightarrow Bir tankta SOL 21,5 atm N₂ gazı ile doludur. Basıncı bir tanka konuyor ve gazın basıncı 1,55 atm'e düşüyor. Son tankın hacmi nedir?



$$P_1 \cdot V_1 = P_2 \cdot V_2$$

$$21,5 \text{ atm} \times 50 \text{ L} = 1,55 \text{ atm} \times V_2 (\text{L})$$

$$V_2 = 693,5 \text{ L}$$

$$V_{tank_2} = V_2 - V_1 \Rightarrow 693,5 \text{ L} - 50 \text{ L} = 643,5 \text{ L}$$

2- Charles Yasası

P: sabit
n: sabit

$$V \propto T$$

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

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$\Rightarrow 24^\circ\text{C}$ de sabit bir balon 2,50L bir gaz dolduruluyor. -25°C deki disparitya neden oluyor. Balonun son hacmi nedir?

$$T(K) = t^\circ\text{C} + 273$$

$$T_1 = 24^\circ\text{C} + 273 = 297\text{K}$$

$$T_2 = -25^\circ\text{C} + 273 = 248\text{K}$$

$$V_1 = 2,50\text{L}$$

$$V_2 = ?$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{2,50\text{L}}{297\text{K}} = \frac{V_2}{248\text{K}}$$

$$V_2 = 2,09\text{L}$$

3-Avagadro Yosası

$$\begin{array}{ll} T: \text{sabit} & V \propto n \\ P: \text{sabit} & \frac{V}{n} = c \\ & \frac{V_1}{n_1} = \frac{V_2}{n_2} \end{array}$$

• 1mol gaz Normal Sartlar Altında (0°C ve 1atm) 22,4L hacim kaplar. $[\text{NSA} = \text{STP}]$

• $PV = a$

$$\left. \begin{array}{l} \frac{V}{T} = b \\ \frac{V}{n} = c \end{array} \right\} \frac{PV}{nT} = \text{sabit} \Rightarrow R(\text{gaz sabiti})$$

$$P \cdot V = n \cdot R \cdot T$$

ideal gaz denklemi

$$\underbrace{\bullet R = \frac{PV}{nT}}_{\text{STP}} \Rightarrow R = \frac{1\text{atm} \times 22,4\text{L}}{1\text{mol} \times 273\text{K}} = 0,082 \frac{\text{atmL}}{\text{mol K}}$$

$$P = 1\text{atm} \quad n = 1\text{mol}$$

$$V = 22,4\text{L} \quad T = 273\text{K}$$

$\Rightarrow 745\text{mmHg}$ 45°C de Cl_2 gazının kapladığı hacim kaçtir? ($M_{\text{Cl}_2} = 13,7\text{gr}$, $M_{\text{Ar}_{12}} = 71\text{g/mol}$)

$$P = 745\text{mmHg} \times \frac{1\text{atm}}{760\text{mmHg}} = 0,980\text{atm} \quad [R = 0,082 \frac{\text{atmL}}{\text{mol K}}]$$

$$n = \frac{13,7\text{g}}{71\text{g/mol}} = 0,193\text{mol}$$

$$T = 45^\circ\text{C} + 273 = 318\text{K}$$

$$V = ?$$

$$0,980\text{atm} \times V = 0,193\text{mol} \times 318\text{K} \times 0,082 \frac{\text{atmL}}{\text{mol K}}$$

$$V = 5,16\text{L}$$

$\Rightarrow 175^\circ\text{C}$, 350ml ve $1,0 \times 10^{20}$ tanesi N_2 molekulünün oluşturduğu basıncı kaç kPa dir.

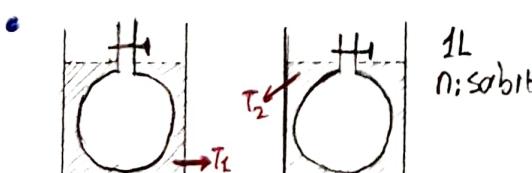
R
$0,082057 \frac{\text{atmL}}{\text{mol K}}$
$0,083145 \frac{\text{barL}}{\text{mol K}}$
$8,3145 \frac{\text{kPaL}}{\text{mol K}}$
$8,3145 \frac{\text{Pam}^3}{\text{mol K}}$
$8,3145 \frac{\text{J}}{\text{mol K}}$

$$T = 273 + 175^\circ\text{C}$$

$$V = 0,350\text{L}$$

$$n = 1,0 \times 10^{20} \times \frac{1\text{mol N}_2}{6,02 \times 10^{23} \text{taner N}_2} = 0,000166 \text{mol N}_2$$

$$P(1\text{kPa}), 0,350\text{L} = 0,000166 \text{mol} \times 448\text{K} \times 8,3145 \frac{\text{kPaL}}{\text{mol K}} \quad P = 1,76\text{kPa}$$



$$\frac{P_1 \cdot V_1}{T_1 \cdot n_1} = \frac{P_2 \cdot V_2}{T_2 \cdot n_2} \Rightarrow \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$\Rightarrow 36,2^\circ\text{C}$ 2,14 atm 1,0 mL N_2 gazının sıcaklığı, $37,8^\circ\text{C}'ye$ yükselir. Basınç ise 1,02 atm'e getiriliyor. Gaz orneğinin son hacmi kaçtır?

$$T_1 = 36,2^\circ\text{C} + 273 = 309,2\text{K}$$

$$P_1 = 2,14 \text{ atm}$$

$$T_2 = 37,8^\circ\text{C} + 273 = 310,8\text{K}$$

$$P_2 = 1,02 \text{ atm}$$

$V_2 > V_1$ olması beklenir.

$$\frac{2,14 \text{ atm} \times 1,0 \text{ mL}}{309,2\text{K}} = \frac{1,02 \text{ atm} \times V_2}{310,8\text{K}}$$

$$V_2 = 2,1 \text{ mL}$$

$$\bullet PV = nRT \Rightarrow PV = \frac{m}{M_A} \cdot R \cdot T$$

$$n = \frac{m}{M_A}$$

$$M_A = \frac{mR}{PV}$$

\Rightarrow Bir cam tüp 40,1305 gr. ağırlığı sahiptir. Bu tüp 25°C de su ile doldurulduğunda 138,2410 g. gelmektedir. Propilen gazı ile doldurulduğunda ise $24,0^\circ\text{C}$ sıcaklığı ve 740,3 mmHg basıncı koşullarında 40,2959 gr. gelmektedir. Propilenin mol kütlesi ne kadardır? (25°C de $d_{\text{su}} = 0,9970 \text{ g/mL}$)

$$Su \Rightarrow 138,2410 \text{ gr} - 40,1305 \text{ gr} = 98,1105 \text{ gr}$$

$$\text{Suyun hacmi} \Rightarrow V = \frac{m}{d} \quad V = \frac{98,1105 \text{ gr} Su}{0,9971 \text{ gr/mL}} = 98,41 \text{ mL} = 0,09841 \text{ L}$$

$$\text{Propilen} \Rightarrow 40,2959 \text{ gr} - 40,1305 \text{ gr} = 0,1654 \text{ gr}$$

$$T = 273 + 24^\circ\text{C} = 297\text{K}$$

$$P = \frac{740,3 \text{ mmHg}}{760 \text{ mmHg}} = 0,9741 \text{ atm}$$

$$P \cdot V = n \cdot R \cdot T \Leftrightarrow PV = \frac{m}{M_A} \cdot R \cdot T$$

$$0,9741 \text{ atm} \times 0,09841 \text{ L} = \frac{0,1654}{M_A} \times 0,082 \frac{\text{L atm}}{\text{mol K}} \times 297 \text{ K}$$

$$M_{\text{propilen}} = 47,08 \text{ g/mol}$$

$P \cdot V = n \cdot R \cdot T \Leftrightarrow PV = \frac{m}{M_A} \cdot R \cdot T$
$P \cdot M_A = \frac{m}{V} \cdot R \cdot T$
$P \cdot M_A = d \cdot R \cdot T$

\Rightarrow 0,987 atm basıncında, 298K sıcaklığında oksijen gazının yoğunluğu kaçtır? ($M_{O_2} = 32,01 \text{ g/mol}$)

$$T = 298 \text{ K}$$

$$P = 0,987 \text{ atm}$$

$$P \cdot M_A = d \cdot R \cdot T$$

$$M_{O_2} = 32,01 \text{ g/mol}$$

$$0,987 \text{ atm} \times 32,01 \text{ g/mol} = d \cdot 0,082 \frac{\text{Latm}}{\text{molK}} \times 298 \text{ K}$$

$$R = 0,082 \frac{\text{Latm}}{\text{molK}}$$

$$d_{O_2} = 1,29 \text{ g/L}$$

$\Rightarrow 2\text{NaN}_3(\text{s}) \xrightarrow{\Delta} 3\text{N}_2(\text{g}) + 2\text{Na}(\text{l})$ denklemine göre $75,0 \text{ g NaN}_3(\text{s})$ yarışması sonucu oluşan $\text{N}_2(\text{g})$ 'nın 735 mmHg basıncı ve 26°C sıcaklığında hacmi kaçtır?

$$? \text{ mol N}_2 = 75,0 \text{ g NaN}_3 \times \frac{1 \text{ mol NaN}_3}{65,01 \text{ g NaN}_3} \times \frac{3 \text{ mol N}_2}{2 \text{ mol NaN}_3} = 1,73 \text{ mol N}_2$$

$$P = \frac{735 \text{ mmHg}}{760 \text{ mmHg}} = 0,967 \text{ atm}$$

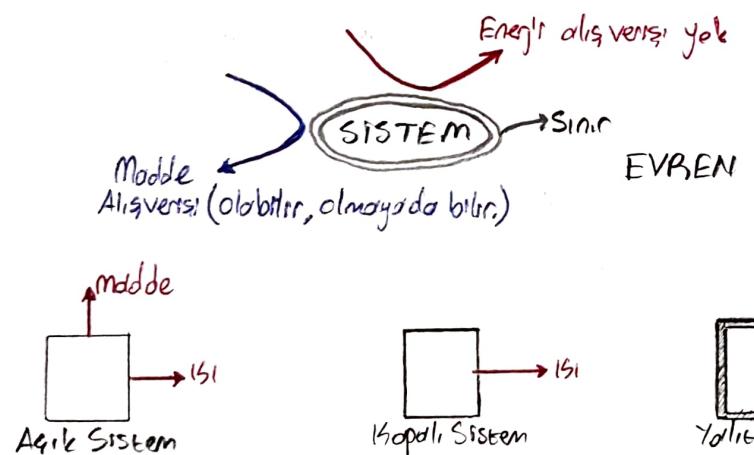
$$T = 273 + 26^\circ\text{C} = 299 \text{ K}$$

$$0,967 \text{ atm} \times V = 1,73 \text{ mol} \times 0,082 \frac{\text{Latm}}{\text{molK}} \times 299 \text{ K}$$

$$V = 43,9 \text{ L}$$

TERMOKİMYA

Sistem: Evrenin incelenmeye üzere seçilen belirli bir bölümdür.



NOT: En iyi yalıtlılmış sistem
vakum sistemi dir.



Kinetik Enerji: $E_K = \frac{1}{2} \cdot m \cdot V^2$

$$\begin{aligned} \text{İş: } W &= F \cdot d \\ &= F(N) \times d(m) \\ &= F(kg \cdot m/s^2) \times d(m) \\ &= Fd(kg \cdot m^2/s^2) \text{ joule} \end{aligned}$$

İş: Enerjidir. Sıcaklık değişimi, maddenin量 (miktari) ve maddenin **cinsî** (maddesi) ne bağlıdır. ($Q = mc\Delta t$)

calorî: 0°C dela 1 g suyun sıcaklığını 1°C artırmak için gereken enerjiye denir.
 $1 \text{ cal} = 4,184 \text{ J}$

NOT: Sistemdeki maddenin **isisi** ise 1 g suyun sıcaklığıdır. 1 g 'nın 1°C artırmadıktan sonra 1 cal isisi.

\Rightarrow 7,35 g suyun sıcaklığı, 21°C den 98°C ye yükseliyor. Bu işlem için ne kadar ısı gereklidir. ($4,184 \text{ J/g}^{\circ}\text{C}$, $1 \text{ cal}/\text{g}^{\circ}\text{C}$)

$$mc = 7,35 \text{ g Su} \times 4,184 \text{ J/g}^{\circ}\text{C} = 30,7 \text{ J}/^{\circ}\text{C}$$

$$\Delta t = 98^{\circ}\text{C} - 21^{\circ}\text{C} = 77^{\circ}\text{C}$$

$$Q = 30,7 \text{ J}/^{\circ}\text{C} \times 77^{\circ}\text{C} = 2,36 \times 10^3 \text{ J}$$

$$\boxed{Q = \underbrace{m \times \text{örəcl. isi}}_{\substack{\text{isi kapasitesi} \\ (C)}} \times \Delta t}$$

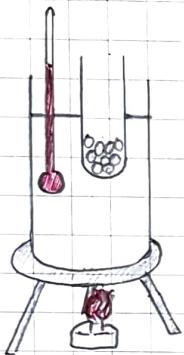
$$Q = mc\Delta t = C\Delta t$$

Termodinominin I. Yerəsi: Enerji yoktan var olmaz ve var olan enerji yox olmaz.

$$Q_{\text{sistem}} + Q_{\text{gerre}} = 0$$

$$Q_{\text{sistem}} = -Q_{\text{gerre}}$$

\Rightarrow



150 g Pb (kursun) 100°C ye kədər isitiliyor və $22,0^{\circ}\text{C}$ dekər 50 g lik suyu atılıyork. Suyun son sıcaklığı $28,8^{\circ}\text{C}$ olduğunda qədər kursunun əzəclisi kədərdir?

$$Q_{\text{su}} = 50 \text{ g Su} \times 4,184 \text{ J/g}^{\circ}\text{C} \times (28,8^{\circ}\text{C} - 22,0^{\circ}\text{C}) \\ = 1,4 \times 10^3 \text{ J}$$

$$Q_{\text{Pb}} = -Q_{\text{su}}$$

$$Q_{\text{Pb}} = -1,4 \times 10^3 \text{ J}$$

$$Q_{\text{Pb}} = mc\Delta t$$

$$-1,4 \times 10^3 \text{ J} = 150 \text{ g} \times c_{\text{Pb}} \times (28,8^{\circ}\text{C} - 100^{\circ}\text{C})$$

$$c_{\text{Pb}} = 0,13 \text{ J/g}^{\circ}\text{C}$$

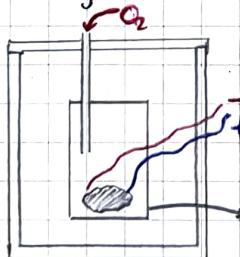
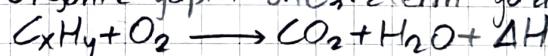
\Rightarrow 100°C de 1 kg Pb parçası $28,5^{\circ}\text{C}$ dekər suyu atılıyork. Dənənə sıcaklığı $35,2^{\circ}\text{C}$ olduğunda qədər suyun lastlesi kədərdir? ($c_{\text{Pb}} = 0,13 \text{ J/g}^{\circ}\text{C}$, $c_{\text{su}} = 4,184 \text{ J/g}^{\circ}\text{C}$)

$$m_{\text{Pb}} \times c_{\text{Pb}} \times \Delta t = m_{\text{su}} \times c_{\text{su}} \times \Delta t$$

$$1000 \text{ g Pb} \times 0,13 \text{ J/g}^{\circ}\text{C} \times (35,2^{\circ}\text{C} - 100^{\circ}\text{C}) = m_{\text{su}} \times 4,184 \text{ J/g}^{\circ}\text{C} \times (35,2^{\circ}\text{C} - 28,5^{\circ}\text{C})$$

$$m_{\text{su}} = 300,50 \text{ g}$$

Kalorimetri: Organik yarılır, birləşiklərin yəkəlməsi sonucu oluşan əsəri ölçər.



$$Q_{\text{Tepki}} = -Q_{\text{kalorimetri bəbi}}$$

$$Q_{\text{kal}} = mc\Delta t$$

$\Rightarrow 1,010\text{g } C_{12}H_{22}O_{11}$ (Sakkaroz) yakalınır. Sıcaklık 24,92°C den 28,33°C ye çıkarılır. İsi kapasitesi 4,90 kJ/°C olan sakkarozun molar yanma ıslisi kaçtır? ($M_{A_{sak}} = 342,3\text{ g/mol}$)

$$Q_{kal} = 4,90 \text{ kJ/}^{\circ}\text{C} \times (28,33^{\circ}\text{C} - 24,92^{\circ}\text{C}) = 16,7 \text{ kJ}$$

$$Q_{TEP} = -Q_{kal} \quad Q_{TEP} = -16,7 \text{ kJ}$$

$$Q_{TEP(\text{mol})} = \frac{-16,7 \text{ kJ/}^{\circ}\text{C}}{1,010\text{g}} \times \frac{342,3\text{ g/mol}}{1\text{ mol}} = -5,60 \times 10^3 \text{ kJ/mol}$$

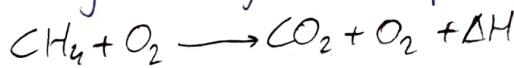
$\Rightarrow 1,013\text{g } C_8H_{18}O_3$ (Vansan) kalorimetre kabında yakalması sonucu sıcaklığı 24,88°C den 30,09°C ye yükseliyor. Kalorimetre kabının isi seğası 4,90 kJ/°C olduğundan göre, yanma ıslisi kaç kJ/mol dur? ($M_{A_{van}} = 152,08\text{ g/mol}$)

$$\begin{aligned} Q_{kal} &= C\Delta t \\ &= 4,90 \text{ kJ/}^{\circ}\text{C} \times (30,09^{\circ}\text{C} - 24,88^{\circ}\text{C}) \\ &= 25,48 \text{ kJ} \end{aligned}$$

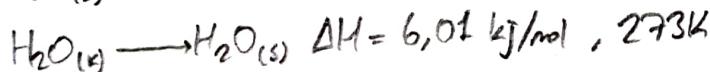
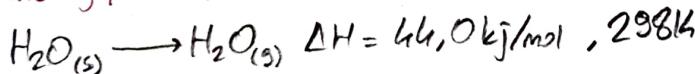
$$Q_{TEP} = -Q_{kal} \quad Q_{TEP} = -25,48 \text{ kJ}$$

$$Q_{TEP(\text{mol})} = \frac{-25,48 \text{ kJ}}{1,013\text{g}} \times \frac{152,08\text{ g/mol}}{1\text{ mol}} = -9,82 \times 10^3 \text{ kJ/mol}$$

Kimyasal Enerji ve Entalpi



Haldeşimi: $KOH \rightleftharpoons SIVI \rightleftharpoons GAZ$



$\Rightarrow 10^{\circ}\text{C} \text{ deki } 50\text{gr } H_2O \text{ un sıvı halden } 25^{\circ}\text{C} \text{ deki gaz haline geçmesi için gereken entalpi miktarı kaç kJ dur?}$

$$? \text{kJ} = 50\text{g} \times 4,184 \text{ J/g}^{\circ}\text{C} \times (25,0^{\circ}\text{C} - 10,0^{\circ}\text{C}) \cdot \frac{1 \text{ kJ}}{1000 \text{ J}} = 3,14 \text{ kJ}$$

NOT: $1 \text{ kcal} = 1000 \text{ J}$

$$\text{Su'dan Gaz'a} = \frac{1 \text{ kcal}}{9^{\circ}\text{C}} = \frac{4,184 \text{ J}}{9^{\circ}\text{C}}$$

$$? \text{kJ} = 50\text{g Su} \times \frac{1 \text{ mol Su}}{18,015\text{g}} \times \frac{44,0 \text{ kJ}}{1 \text{ mol Su}} = 122 \text{ kJ}$$

$$\Delta H = 122 \text{ kJ} + 3,14 \text{ kJ} = 125,14 \text{ kJ}$$

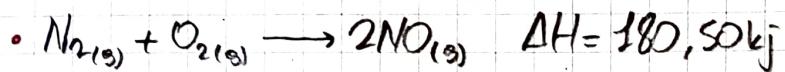
Standart Haller ve Standart Entalpiler!

ΔH° → Standart entalpi değişimsi

$$\Delta H = H_{\text{son hali}} - H_{\text{ilk hali}}$$

($-\Delta H \rightarrow$ Ürünlerin entalpisi, oğrenmelerinden kurtul)

$$= H_{\text{ürünler}} - H_{\text{reaktanzlar}}$$

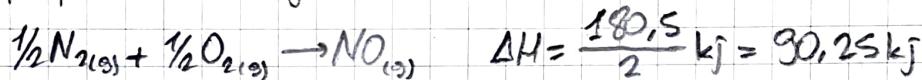


$$\Delta H_{N_2} = \Delta H_{O_2} = 0 \quad \text{Elementlerin standart entalpisi sıfırdır.}$$

Hess Konusu:

Bir reaksiyonun entalpisi geçtiği borsamlarla bağlı, değişildir. Reaksiyonların toplamlarına bağlıdır.

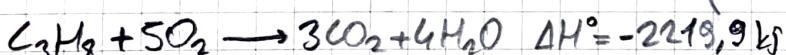
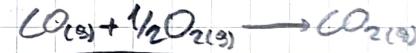
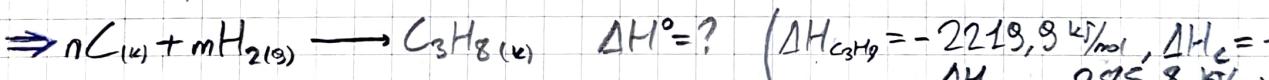
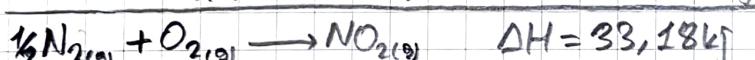
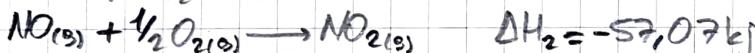
1- Kapasite özelliği



2- Bir teplamının yano değişince işaret değişir



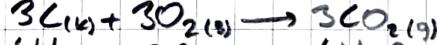
3- İki reaksiyon toplandığında, entalpilerde toplanır



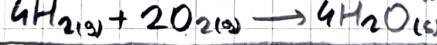
$$\Delta H_{H_2} = -285,8 \text{ kJ/mol}$$



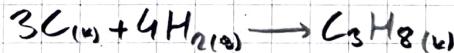
$$\Delta H^\circ = 2219,9 \text{ kJ}$$

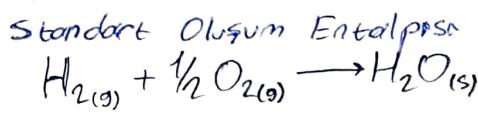


$$\Delta H^\circ = 3 \times (-393,5 \text{ kJ})$$



$$\Delta H^\circ = 4 \times (-285,8 \text{ kJ})$$





$$\Delta H_{H_2} = \Delta H_{O_2} = 0$$



$$\Delta H_{\text{ol}}^\circ = 1,9 \text{ kJ}$$



$$\Delta H_{\text{ol}}^\circ = 30,91 \text{ kJ}$$



$$\Delta H_{\text{ol}}^\circ = -17 \text{ kJ}$$

298K'de basıtı bulusık klemm kJ/mol cinsinden oluşum entalpisini:

$$\Delta H_{CO} = -110,5 \text{ kJ/mol} \quad \Delta H_{CH_3OH} = -238,7 \text{ kJ/mol} \quad \Delta H_{H_2O_{(l)}} = -285,8 \text{ kJ/mol}$$

$$\Delta H_{CO_2} = -393,5 \text{ kJ/mol} \quad \Delta H_{HF} = -271 \text{ kJ/mol} \quad \Delta H_{NH_3} = -46,11 \text{ kJ/mol}$$

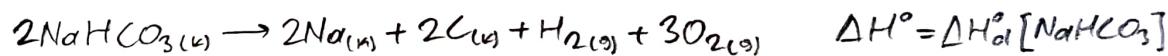
$$\Delta H_{CH_4} = -74,81 \text{ kJ/mol} \quad \Delta H_{HCl} = -92 \text{ kJ/mol} \quad \Delta H_{NO} = +90,25 \text{ kJ/mol}$$

$$\Delta H_{C_2H_6} = -84,68 \text{ kJ/mol} \quad \Delta H_{HBr} = -36,4 \text{ kJ/mol} \quad \Delta H_{N_2O} = +82,05 \text{ kJ/mol}$$

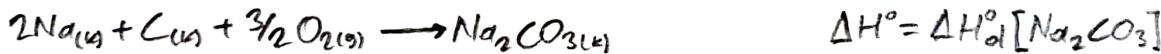
$$\Delta H_{C_2H_4} = +52,26 \text{ kJ/mol} \quad \Delta H_{HI} = +26,48 \text{ kJ/mol} \quad \Delta H_{SO_2} = -296,8 \text{ kJ/mol}$$

$$\Delta H_{C_2H_2} = +226,7 \text{ kJ/mol} \quad \Delta H_{H_2O_{(g)}} = -242,8 \text{ kJ/mol} \quad \Delta H_{SO_3} = -395,7 \text{ kJ/mol}$$

$\Rightarrow 2NaHCO_3_{(s)} \rightarrow Na_2CO_3_{(s)} + CO_{2(g)} + H_2O_{(l)}$ denkleminin oluşum entalpisini nedir?



$$\Delta H^\circ = \Delta H_{\text{ol}}^\circ [NaHCO_3]$$



$$\Delta H^\circ = \Delta H_{\text{ol}}^\circ [Na_2CO_3]$$



$$\Delta H^\circ = \Delta H_{\text{ol}}^\circ [H_2O]$$



$$\Delta H^\circ = \Delta H_{\text{ol}}^\circ [CO_2]$$



$$\Delta H^\circ = \Delta H_{\text{ol}}^\circ [Na_2CO_3] + \Delta H_{\text{ol}}^\circ [CO_2] + \Delta H_{\text{ol}}^\circ [H_2O] - 2 \Delta H_{\text{ol}}^\circ [NaHCO_3]$$

$\Rightarrow C_2H_6_{(g)} + \frac{7}{2}O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$ denkleminin oluşum entalpisini kaçıtır?

$$\Delta H_{\text{ol}}^\circ [C_2H_6] = -84,68 \text{ kJ}$$

$$\Delta H_{\text{ol}}^\circ [O_2] = 0$$

$$\Delta H^\circ = H_{\text{ürün}}^\circ - H_{\text{reaksiyon}}^\circ$$

$$\Delta H_{\text{ol}}^\circ [CO_2] = -393,5 \text{ kJ}$$

$$\Delta H^\circ = [2 \times \Delta H^\circ [CO_2] + 3 \times \Delta H^\circ [H_2O]] - \Delta H^\circ [C_2H_6]$$

$$\Delta H_{\text{ol}}^\circ [H_2O] = -285,8 \text{ kJ}$$

$$\Delta H^\circ = [2 \times (-393,5 \text{ kJ}) + 3 \times (-285,8 \text{ kJ})] - (-84,68 \text{ kJ})$$

$$\Delta H^\circ = -1569,72 \text{ kJ}$$