

Kemijski elementi i njihovi spojevi

Maseni udio elemenata u spoju i formula spoja

1. Izračunaj maseni udio vodika i fosfora u fosfornoj kiselini H_3PO_4 .

$A_r(H)=1,008$	$M_r(H_3PO_4)=3A_r(H) + A_r(P)+4A_r(O)$	$w(H; H_3PO_4)= \frac{A_r(H) \cdot 3}{M_r(H_3PO_4)}$
$A_r(P)=30,97$	$M_r(H_3PO_4)=3 \cdot 1,008 + 30,97 + 4 \cdot 16,00$	
$A_r(O)=16,00$	$M_r(H_3PO_4)=3,024+30,97+64$	$w(H; H_3PO_4)= \frac{1,008 \cdot 3}{97,994} = 0,031$
$w(H; H_3PO_4)=?$	$M_r(H_3PO_4)=97,994$	
$w(P; H_3PO_4)=?$		$w(H; H_3PO_4)= \frac{A_r(P)}{M_r(H_3PO_4)}$
		$w(H; H_3PO_4)= \frac{30,97}{97,994} = 0,316$

2. Izračunaj maseni udio klora u amonijevom kloridu NH_4Cl i rezultat izrazi postotkom.

$A_r(N)=14,01$	$M_r(NH_4Cl)=A_r(N) + 4A_r(H)+A_r(Cl)$	$w(Cl; NH_4Cl) = \frac{A_r(Cl)}{M_r(NH_4Cl)} \cdot 100$
$A_r(H)=1,008$	$M_r(NH_4Cl)=14,01 + 4 \cdot 1,008 + 35,45$	
$A_r(Cl)=35,45$	$M_r(NH_4Cl)=14,01 + 4,032 + 35,45$	$w(H; H_3PO_4) = \frac{35,45}{53,492} \cdot 100$
$w(Cl; NH_4Cl)=?$	$M_r(NH_4Cl)=53,492$	
		$w(H; H_3PO_4) = 66,272\%$

3. Formula gorke soli je $MgSO_4 \cdot 7H_2O$. Izračunaj maseni udio vode u gorkoj soli, a rezultat izrazi postotkom.

$A_r(Mg)=24,31$	$M_r(H_2O)=2A_r(H) + A_r(O)$	$M_r(MgSO_4 \cdot 7H_2O)=A_r(Mg) + A_r(S) + 4A_r(O)+7M_r(H_2O)$
$A_r(S)=32,07$	$M_r(H_2O)=2 \cdot 1,008 + 16,00$	$M_r(MgSO_4 \cdot 7H_2O)=24,31+32,07+4 \cdot 16,00+7 \cdot 18,016$
$A_r(O)=16,00$	$M_r(H_2O)=2,016 + 16,00$	$M_r(MgSO_4 \cdot 7H_2O)=24,31+32,07+64+126,112$
$A_r(H)=1,008$	$M_r(H_2O)=18,016$	$M_r(MgSO_4 \cdot 7H_2O)=246,492$
$w(H_2O; MgSO_4 \cdot 7H_2O)=?$		
	$w(H_2O; MgSO_4 \cdot 7H_2O) = \frac{M_r(H_2O) \cdot 7}{M_r(MgSO_4 \cdot 7H_2O)} \cdot 100$	
	$w(H_2O; MgSO_4 \cdot 7H_2O) = \frac{18,016 \cdot 7}{246,492} \cdot 100$	
	$w(H_2O; MgSO_4 \cdot 7H_2O) = \frac{126,112}{246,492} \cdot 100 = 0,51163 \cdot 100 = 51,163\%$	

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4. Formula zelene galice je $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. Izračunaj maseni udio željeza u zelenoj galici, a rezultat izrazi postotkom.

$A_r(\text{Fe})=55,85$	$M_r(\text{FeSO}_4 \cdot 7\text{H}_2\text{O})=A_r(\text{Fe}) + A_r(\text{S})+4A_r(\text{O})+7M_r(\text{H}_2\text{O})$
$A_r(\text{S})=32,07$	$M_r(\text{FeSO}_4 \cdot 7\text{H}_2\text{O})=55,85+32,07+4 \cdot 16,00+7 \cdot 18,016$
$A_r(\text{O})=16,00$	$M_r(\text{FeSO}_4 \cdot 7\text{H}_2\text{O})=55,85+32,07+64+126,112$
$A_r(\text{H})=1,008$	$M_r(\text{FeSO}_4 \cdot 7\text{H}_2\text{O})=278,032$
$w(\text{Fe}; \text{FeSO}_4 \cdot 7\text{H}_2\text{O})=?$	$w(\text{Fe}; \text{FeSO}_4 \cdot 7\text{H}_2\text{O})= \frac{A_r(\text{Fe})}{M_r(\text{FeSO}_4 \cdot 7\text{H}_2\text{O})} \cdot 100$
$M_r(\text{H}_2\text{O})=18,016$	$w(\text{Fe}; \text{FeSO}_4 \cdot 7\text{H}_2\text{O})= \frac{55,85}{278,032} = 0,20088 \cdot 100 = 20,088\%$

5. Empirijska formula benzena je CH. Odredi molekulsku formulu benzena, ako je njegova relativna molekulska masa 78,108.

$M_r = 78,108$	<i>Izračunamo omjer relativne molekulske mase i mase empirijske jedinke i odredimo koliko je puta broj atoma ugljika i vodika veći u molekularnoj formuli u odnosu na empirijsku formulu.</i>
$E_r = 13,018$	
	$\frac{M_r}{E_r} = \frac{78,108}{13,018} = 6$
	<i>Molekulska formula benzena je: C_6H_6</i>

6. Neki spoj sadrži 56,34% fosfora i 43,66% kisika. Odredi empirijsku formulu tog spoja. Koja je molekulska formula tog spoja, ako je molekulska masa spoja 219,88.

$w(\text{P}) = 56,34\% = 0,5634$	$n(\text{P}) : n(\text{O}) = \frac{w(\text{P})}{A_r(\text{P})} : \frac{w(\text{O})}{A_r(\text{O})}$	<i>Empirijska formula je P_2O_3.</i>
$w(\text{O}) = 43,66\% = 0,4366$		$M_r = 219,88$
$A_r(\text{P}) = 30,97$	$n(\text{P}) : n(\text{O}) = \frac{0,5634}{30,97} : \frac{0,4366}{16,00}$	$E_r = ?$
$A_r(\text{O}) = 16,00$	$n(\text{P}) : n(\text{O}) = 0,018192 : 0,02729$	$E_r = 2A_r(\text{P}) + 3A_r(\text{O})$
$n(\text{P}) : n(\text{O}) = ?$	$n(\text{P}) : n(\text{O}) = 1 : 1,5 \quad / \cdot 2$	$E_r = 2 \cdot 30,97 + 3 \cdot 16,00$
	$n(\text{P}) : n(\text{O}) = 2 : 3$	$E_r = 61,94 + 48 = 109,94$
		$\frac{M_r}{E_r} = \frac{219,88}{109,94} = 2$
		<i>Molekulska formula je: P_4O_6 fosforov(III) oksid</i>