

Prirodno-matematički fakultet
Društvo matematičara i fizičara Crne Gore

OLIMPIJADA ZNANJA 2023.

Rješenja zadataka iz HEMIJE

za I razred srednje škole

1. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$

Odgovor pod B i C

2. Da bi atom imao pozitivan oksidacioni broj on treba da bude vezan za elektronegativniji atom. Jedini atom elektronegativniji od kiseonika je ($\gamma=3,5$) je fluor ($\gamma=4,0$). Tako da kiseonik ne može da ima pozitivan oksidacioni broj ni u jednom od ovih molekula.

Odgovor pod D

3. C) Na, Mg, Al, Si

4. $M_r(\text{CuSO}_4 \times 5\text{H}_2\text{O}) = 249,68$

$M_r(\text{CuSO}_4) = 159,61$

14% od 70,5 g ($\text{CuSO}_4 \times 5\text{H}_2\text{O}$) je 10,152 g (masa uklonjene vode)

$n(\text{CuSO}_4 \times 5\text{H}_2\text{O}) = n(\text{CuSO}_4) = 70,5 \text{ g } (\text{CuSO}_4 \times 5\text{H}_2\text{O}) / 249,68 = 0,282 \text{ mol,}$

dok je $n(\text{H}_2\text{O}) = 5 \times 0,282 = 1,412 \text{ mol}$

$n(\text{H}_2\text{O}) = 10,152 / 18 = 0,564 \text{ mol (izgubljene vode)}$

$n(\text{H}_2\text{O}) \text{ ostalo u molek} = 1,412 - 0,564 = 0,848 \text{ mol}$

$0,282 : 0,848 = 1:3$ **$\text{CuSO}_4 \times 3\text{H}_2\text{O}$**

Uklonjeno je 10,152 g ili 0,564 mol vode

5. $M_r(\text{AlCl}_3) = 133,33$; $M_r(\text{CrCl}_3) = 158,35$; $M_r(\text{AgCl}) = 143,32$.

$$n(\text{AgCl}) = 10,144 / 143,32 = 70,78 \text{ mmol.}$$

Ukupni molovi AlCl_3 i CrCl_3 su $1/3$ a to je: $70,78/3 = 23,59 \text{ mmol}$

Označavajući sa k mmol AlCl_3 , proizilazi da su mmoli CrCl_3 : $23,59 - k$

Maseni bilans je: $m(\text{AlCl}_3) + m(\text{CrCl}_3) = 3556 \text{ mg}$

$$133,33k + 158,35(23,59 - k) = 3556 \text{ mg}$$

$$133,33k - 158,35k = 3556 - 3735,48$$

$$25,02k = 179,48$$

$$k = 7,17 \text{ mmol AlCl}_3. \quad m(\text{AlCl}_3) = 7,17 \cdot 133,33 = \mathbf{0,956 \text{ g}}; \quad m(\text{CrCl}_3) = \mathbf{2,6 \text{ g}}$$

6. U 100 g jedinjenja : $n(\text{S}) = 43,88/32 = 1,37 \text{ mol}$; $n(\text{H}) = 1,38/1,008 = 1,37 \text{ mol}$.

Masa kiseonika je: $100 - 43,88 - 1,38 = 54,74 \text{ g}$. $n(\text{O}) = 54,74/16 = 3,42 \text{ mol}$.

$n(\text{H}):n(\text{S}):n(\text{O}) = 1,37:1,37:3,42 / 1,37$ (Dijeljenjem sa manjim brojem dobija se :

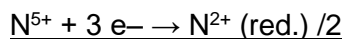
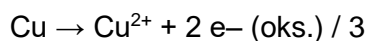
$$n(\text{H}):n(\text{S}):n(\text{O}) = 1:1: 2,5$$

Množenjem sa dva dobiju se mali cijeli brojevi: $2 : 2 : 5$. Formula je $\mathbf{H_2S_2O_5}$.

7. Uklanjanjem vode iz 100 g gline ostaje 90 g suve gline.

SiO_2 % se dobija iz proporcije: $45 : 90 = x : 100$ odakle je: $\mathbf{x = 50\%}$

8. Dvije polureakcije su:

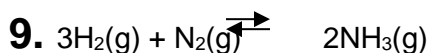


$$n(\text{NO}) = 33,6/22,4 = 1,5 \text{ mol.}$$

$$M_r(\text{Cu}(\text{NO}_3)_2) = 187,55$$

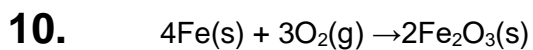
$$n(\text{Cu}(\text{NO}_3)_2) = 1,5 \cdot 3/2 = 2,25 \text{ mol.}$$

$$\mathbf{m(\text{Cu}(\text{NO}_3)_2 = 2,25 \cdot 187,55 = 422 \text{ g.}}$$



$$K = \frac{[\text{NH}_3]^2}{[\text{H}_2]^3 x [\text{N}_2]}$$

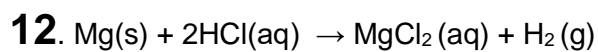
- a) Prema proizvodu
- b) Prema reaktantima
- c) Opada
- d) Raste



$$n(\text{Fe}_2\text{O}_3) = 0,5 \text{ mol}$$

$$\Delta H = 413 \text{ kJ}$$

11. $V_x = 0,6 \text{ dm}^3$; $\Delta V = V(\text{H}_2\text{O}) = 0,6 \text{ dm}^3$



$$m(\text{HCl (aq)}) = \rho \cdot V = 660 \text{ g}$$

$$Mr(\text{HCl}) = 36,5; \quad Mr(\text{MgCl}_2) = 95,3$$

$$73:95,3 = x:190$$

$$X = 145,54 \text{ g HCl (reagovalo)}$$

$$145,54:660 = x:1$$

$$x = 0,22 \text{ (22\% HCl)}$$

$$c = n/V$$

$$c = (145,54/36,5) \text{ mol} / 0,6 \text{ dm}^3$$

$$c = 6,646 \text{ mol/dm}^3$$

13. $v = k [\text{A}] [\text{B}]^2$