

Prirodno-matematički fakultet
Društvo matematičara i fizičara Crne Gore

OLIMPIJADA ZNANJA 2024.

Rješenja zadataka iz HEMIJE
za I razred srednje škole

1. c)

2. b)

3. a)

4. d)

5. d)

6. d)

7. $1 \text{ mol} \rightarrow N_A \text{ jona} \rightarrow 7,8 \cdot 10^{24} \text{ p}^+$

$1 \text{ jon} \rightarrow 13 \text{ p}^+$

$1 \text{ mol} \rightarrow N_A \text{ jona} \rightarrow 6 \cdot 10^{24} \text{ e}$

$1 \text{ jon} \rightarrow 10 \text{ e}^-$

X^{3+}

8. U molekulu vodonika javlja se nepolarna vodonična veza kao i u molekulu kiseonika. Kako ovi molekuli nisu polarizovani između njih se **ne uspostavlja vodonična veza**. Osim toga vodonična veza se uspostavlja između molekula u kojima je vodonik vezan sa elektronegativnim elementom, dakle, u kome je veza već jako polarizovana.

9. $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$

$v_1 = k[\text{N}_2][\text{H}_2]^3 \quad v_2 = 16v_1$

10. A: $w(\text{K}) = 27\% (0,27)$; $w(\text{Cr}) = 35\% (0,35)$; $w(\text{O}) = 38\% (0,38)$;

$i(\text{K}) : i(\text{Cr}) : i(\text{O}) = 27/39 : 35/52 : 38/16 = 0,69 : 0,67 : 2,375 = 1 : 1,3,5 = 2 : 2 : 7 \text{ (} \text{K}_2\text{Cr}_2\text{O}_7 \text{)}$

B: $w(\text{K}) = 40\% (0,40)$; $w(\text{Cr}) = 27\% (0,27)$; $w(\text{O}) = 33\% (0,33)$;

$i(\text{K}) : i(\text{Cr}) : i(\text{O}) = 40/39 : 27/52 : 33/16 = 1,02 : 0,52 : 2,06 = 2 : 1 : 3,4 = 2 : 1 : 4 \text{ (} \text{K}_2\text{CrO}_4 \text{)}$

11. $\Delta m'(\text{KNO}_3) = 17,58 \text{ g}$

$\Delta m(\text{KNO}_3) = R_1 - R_2 = 116,5 \text{ g}$

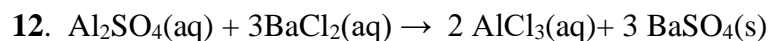
$m(r-ra)_1 = m(\text{H}_2\text{O}) + m(\text{KNO}_3) = 238,0 \text{ g}$

$$m(r-ra)_2 = m(H_2O) + m(KNO_3) = 121,5 \text{ g}$$

$$m'(r-ra) = m(r-ra)_1 \times \Delta m'(KNO_3) / \Delta m(KNO_3) = 238 \times 17,58 / 116,5 = 35,91 \text{ g}$$

$$m'(KNO_3) = m(KNO_3) \times m'(r-ra) / m(r-ra)_1 = 138 \times 35,91 / 238 = 20,82 \text{ g}$$

$$m'(KNO_3)_2 = m'(KNO_3) - \Delta m'(KNO_3) = 20,82 - 17,58 = 3,24 \text{ g}$$



$$n(BaSO_4) = m(BaSO_4) / M(BaSO_4) = 0,030 \text{ mol}$$

$$n(Al_2(SO_4)_3) = n(BaSO_4) / 3 = 0,010 \text{ mol}$$

$$c(Al_2(SO_4)_3) = n(Al_2(SO_4)_3) / V = 0,10 \text{ mol/dm}^3$$

$$m(Al_2(SO_4)_3) = n(Al_2(SO_4)_3) \times M(Al_2(SO_4)_3) = 3,42 \text{ g}$$

$$w(Al_2(SO_4)_3) = m(Al_2(SO_4)_3) / m(r-ra) = m(Al_2(SO_4)_3) / (V\rho) = \mathbf{0,031}$$

13. $n_{pr}(N_2) = n_{pr}(O_2) = x$

$$n_r(N_2) = n_r(O_2) = 1-x$$

$$n_r(NO) = 2x$$

$$K = \frac{[NO]^2}{[N_2]x[O_2]}$$

$$K = \frac{(2x)^2}{(1-x)^2} = 1 \times 10^{-4}$$

$$X = 4,98 \times 10^{-3} \text{ mol}$$

$$[O_2]_r = [N_2]_r = n_r(N_2) / V = (1-x) / V = \mathbf{4 \times 10^2 \text{ mol/m}^3}$$

$$[NO]_r = n_r(NO) / V = 2x / V = \mathbf{4 \text{ mol/m}^3}$$

14. 49,1 mL

15. $m(KBr) + m(NH_4Cl) = x+y$

$$0,3925 = x/x+y$$

$$y = 1,548x$$

$$0,3015 = y/x+y+3,15$$

$$0,6985(1,548x) - 0,3015x = 0,9497$$

$$x = 1,218$$

$$y = 1,548 \cdot 1,218 = 1,885$$

$$m(\text{NH}_4\text{Cl}) = 1,885\text{g}$$

$$m(\text{smj.}) = 1,218 + 1,885 = \mathbf{3,105\text{ g}}$$

