

Tallinna XII koolinoorte keemiaolümpiaadi koolivoor
2011/ 2012 õ.-a.

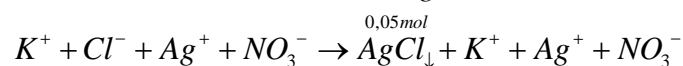
Ülesannete lahendused

9. klass

1.(10)

$$\text{a. } n[K]^+ = n[Cl]^- = \frac{47g \times 0,08 \times 1mol}{74,5g} = 0,05mol \quad (1)$$

$$n[Ag]^+ = n[NO_3]^- = \frac{149g \times 0,08 \times 1mol}{170g} = 0,07mol \quad (1)$$



$$n[K]^+ = \mathbf{0,05mol} \quad (0,5)$$

$$n[Ag]^+ = 0,07mol - 0,05mol = \mathbf{0,02mol} \quad (0,5)$$

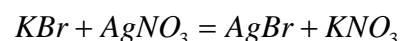
$$n[NO_3]^- = \mathbf{0,07mol} \quad (0,5)$$

$$n[Cl]^- = 0,00mol \quad (0,5)$$

b.

$$Ag^+ + Br^- \rightarrow AgBr_{\downarrow}, m(KBr) = 0,02mol \times 119 \frac{g}{mol} = \mathbf{2,38g} \quad (1)$$

c.

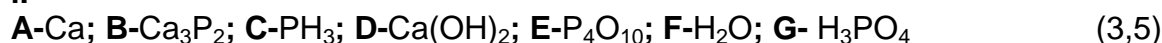


$$\text{d. } m(\text{lah.}) = 47g + 149g + 2,38g - 0,05mol \times 143,5 \frac{g}{mol} - 0,02mol \times 188 \frac{g}{mol} = 187,4 \sim \mathbf{187g}$$

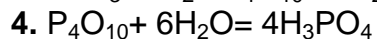
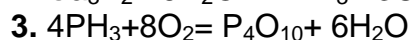
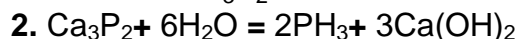
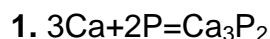
(2)
10p

2. (10)

i.

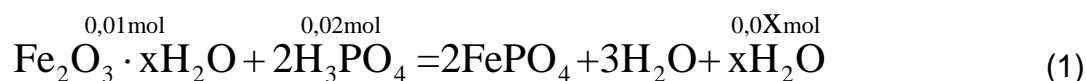


ii.



iii.

$$n(H_3PO_4) = \frac{1,96g}{98 \frac{g}{mol}} = 0,02mol$$



$$X = \frac{1,96g - 0,01mol \times 160 \frac{g}{mol}}{0,01mol \times 18 \frac{g}{mol}}$$

$$\mathbf{X=2}$$

(0,5)
10p

3.(10)

a. $2,07\text{ mol} - 0,52\text{ mol} = 1,55\text{ mol}$. (1)

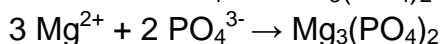
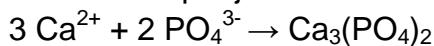
b. MgCl_2 – magneesiumkloriid (1)

MgSO_4 – magneesiumsulfaat (1)



d. $m(\text{CaCO}_3) = \frac{1}{1} \times 3,5\text{ m}^3 \times 1,55\text{ mol/m}^3 \times 0,9 \times 100\text{ g/mol} = 488,3\text{ g} \approx 490\text{ g}$ (3)

e. Karedust põhjustavate katioonide ja fosfaatioonide moolsuhe reaktsioonis on 3:2.



$$m(\text{Na}_3\text{PO}_4\text{lahus}) = \frac{3,5\text{ m}^3 \times 2\text{ mol} \times 0,52\text{ mol} \times 164\text{ g}}{1\text{ mol} \times 1\text{ m}^3 \times 3\text{ mol} \times 0,23} = 865,2\text{ g} \approx 870\text{ g}$$

(3)

10p**4.(10)**

a. $5\text{ L} = 5000\text{ cm}^3$, $m(\text{vesi}) = 5000\text{ cm}^3 \times 1\text{ g/cm}^3 = 5000\text{ g}$

$$m(\text{keedusool}) = \frac{5000\text{ g} \times 0,06}{0,94} = 319\text{ g}$$
 (2)

b. $2000\text{ cm}^3 \times 1,042\text{ g/cm}^3 \times 0,06 = (2000\text{ cm}^3 \times 1,042\text{ g/cm}^3 + m(\text{vesi})) \times 0,04$

$$m(\text{vesi}) = 1042\text{ g}$$

$$V(\text{vesi}) = \frac{1042\text{ g}}{1\text{ g/cm}^3} = 1042\text{ cm}^3$$
 (2)

c. $p = \frac{35,8\text{ g}}{135,8\text{ g}} \times 100\% = 26,4\%$ (1)

d. $m(100\% \text{ äädikhape}) = 3000\text{ cm}^3 \times 1,004\text{ g/cm}^3 \times 0,04 = 120,5\text{ g}$

$$m(30\% \text{ äädikhape}) = \frac{120,5}{0,3} = 401,7\text{ g}$$

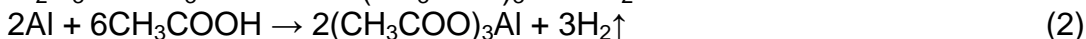
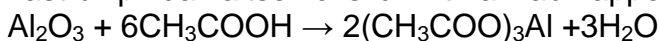
$$V(30\% \text{ äädikhape}) = \frac{401,7\text{ g}}{1,038\text{ g/cm}^3} = 387\text{ cm}^3$$

$$m(\text{lahus}) = 3000\text{ cm}^3 \times 1,004\text{ g/cm}^3 = 3012\text{ g}$$

$$m(\text{vesi}) = 3012\text{ g} - 387\text{ g} = 2625\text{ g}$$

$$V(\text{vesi}) = \frac{2625\text{ g}}{1\text{ g/cm}^3} = 2625\text{ cm}^3$$
 (2)

e. Kastruli pinda kaitsev oksiidikiht hakkab happe lahuses lahustuma.



f. Alumiiniumiühendid võivad inimorganismis põhjustada närvisüsteemi häireid.

(1)

10p