

Розв'язання олімпіадних задач з хімії 2 тур

1. $D_{CH_4}(SO_2) = \frac{M(SO_2)}{M(CH_4)} = \frac{64}{16} = 4$
2. $m_{\text{зар}}(Al) = 3 \text{ г.}$
 $V(H_2) = 3,36 \text{ л.}$
 $W(\text{дом.}) - ?$
 $2Al + 2NaOH + 6H_2O \rightarrow 2Na[Al(OH)_4] + 3H_2$
 $\nu(H_2) = \frac{3,36}{22,4} = 0,15 \text{ моль}$
 $\nu(Al) = \frac{0,15 \cdot 2}{3} = 0,1 \text{ моль}$
 $m(Al) = 27 \cdot 0,1 = 2,7 \text{ г.}$
 $W(Al) = \frac{2,7}{0,3} = 0,9$
 $W(\text{дом.}) = 0,1 = 10\%$

3. $M(Mg+Ca) = 24 \text{ г.}$
 $\nu(H_2) = 0,64 \text{ моль}$
 $W(Mg) - ?$

$x \text{ моль}$		$x \text{ моль}$
Mg	$+ 2HCl \rightarrow$	$MgCl_2 + H_2$
$(0,64-x) \text{ моль}$		$(0,64-x) \text{ моль}$

 $Ca + 2HCl \rightarrow CaCl_2 + H_2$
 $m(Mg) = 24x$
 $m(Ca) = 40(0,64 - x)$
 $24x + 25,6 - 40x = 24$
 $1,6 = 16x$
 $x = 0,1$
 $m(Mg) = 0,1 \cdot 24 = 2,4 \text{ г.}$
 $W(Mg) = \frac{2,4}{24} = 0,1 = 10\%$

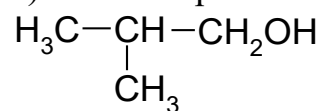
4. $2C_nH_{2n+1}OH + 2Na \rightarrow 2C_nH_{2n+1}ONa + H_2$
 $\nu(H_2) = \frac{1,12}{22,4} = 0,05 \text{ моль}$
 $\nu(\text{спирту}) = 2 \cdot 0,05 = 0,1 \text{ моль}$
 $M(\text{спирту}) = \frac{7,4}{0,1} = 74 \text{ г/моль}$
 $14n + 18 = 74$
 $14n = 56$
 $n = 4.$

6 ізомерів:

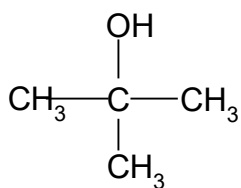
1) $CH_3-CH_2-CH_2-CH_2-OH$ бутан-1-ол

2) $CH_3-CH_2-CH(OH)-CH_3$ бутан-2-ол

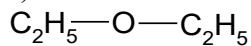
3) 2-метилпропан-1-ол



4) 2-метилпропан-2-ол

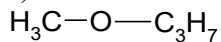


5)



Диетиловий етер

6)



Метилпропіловий етер

5. $M(\text{He} + \text{O}_2) = 9 \cdot 2 = 18 \text{ г/моль}$

$$M(\text{He} + \text{O}_2) = M(\text{He})\varphi(\text{He}) + M(\text{O}_2)\varphi(\text{O}_2)$$

$$\varphi(\text{He}) = x$$

$$\varphi(\text{O}_2) = 1 - x$$

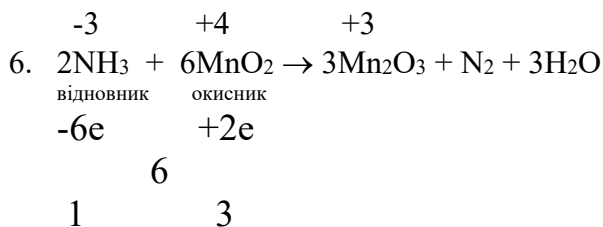
$$18 = 4x + 32(1 - x)$$

$$18 = 4x + 32 - 32x$$

$$28x = 14$$

$$x = \frac{14}{28} = 0,5$$

$$\varphi(\text{He}) = 0,5 = 50\%$$



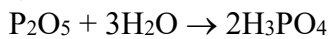
7. $v(\text{P}_2\text{O}_5) = 0,5 \text{ моль}$

$$W(\text{H}_3\text{PO}_4) = 0,2$$

$$M(\text{H}_2\text{O}) - ?$$

$$0,5 \text{ моль}$$

$$1 \text{ моль}$$



$$m(\text{H}_3\text{PO}_4) = 1 \cdot 98 = 98 \text{ г.}$$

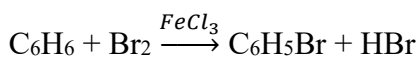
$$0,2 = \frac{98}{m(\text{p-н})}$$

$$m(\text{p-н}) = \frac{98}{0,2} = 490 \text{ г}$$

$$m(\text{H}_2\text{O}) = 490 - 0,5 \cdot 142 = 419 \text{ г}$$

8. $v(\text{Br}_2) = \frac{240}{160} = 1,5 \text{ моль надлишок}$

$$v(\text{C}_6\text{H}_6) = \frac{78}{78} = 1 \text{ моль}$$



$$v(C_6H_5Br) = 1 \text{ моль}$$

$$m(C_6H_5Br) = 1 \cdot (6 \cdot 12 + 5 + 80) = 157 \text{ г}$$

9. $v(C_xH_yO_z) = 6 \text{ г}$

$$v(CO) = \frac{8,8}{44} = 0,2 \text{ моль}$$

$$v(H_2O) = \frac{3,6}{18} = 0,2 \text{ моль}$$

$$m(C) = 12 \cdot 0,2 = 2,4 \text{ г}$$

$$v(H) = 2 \cdot 0,2 = 0,4 \text{ моль}$$

$$m(H+C) = 2,8 \text{ г}$$

$$m(O) = 6 - 2,8 = 3,2 \text{ г}$$

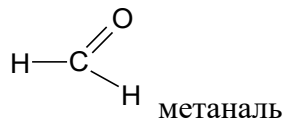
$$v(O) = \frac{3,2}{16} = 0,2 \text{ моль}$$

$$M(C_xH_yO_z) = 15 \cdot 2 = 30 \text{ г/моль}$$

$$v(C_xH_yO_z) = \frac{6}{30} = 0,2 \text{ моль}$$

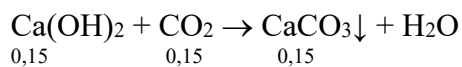
$$x:y:z = \frac{0,2}{0,2} : \frac{0,4}{0,2} : \frac{0,2}{0,2} = 1:2:1$$

$$CH_2O$$



10. $v(C) = \frac{2,4}{0,2} = 0,2 \text{ моль} = v(CO_2)$

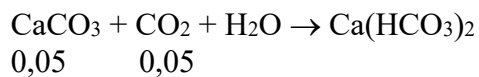
$$C + O_2 \rightarrow CO_2$$



$$v(Ca(OH)_2) = \frac{11,1}{40+34} = \frac{11,1}{74} = 0,15 \text{ моль}$$

CO₂ у надлишку

$$v_{\text{надл}}(CO_2) = 0,2 - 0,15 = 0,05 \text{ моль}$$



$$v_{\text{осад}}(CaCO_3) = 0,15 - 0,05 = 0,1 \text{ моль}$$

Отже, маса осаду:

$$m(CaCO_3) = 0,1 \cdot 100 = 10 \text{ г}$$