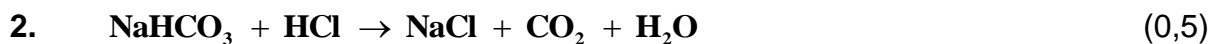
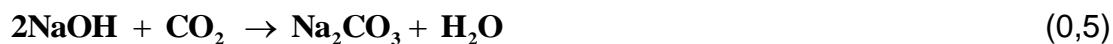


## Ülesannete lahendused\*

### 10. klass

Tallinna XVII koolinoorte keemiaolümpiaadi koolivoor 2016/ 2017 õ.a

#### 1. (10p)



3.  $m(\text{NaOH})_{\text{lahus}} = 60,73\text{cm}^3 \times 1,0538 \frac{\text{g}}{\text{cm}^3} = 64,00\text{g}$

$m(\text{NaOH}) = 64,00\text{g} \times 0,0500 = 3,20\text{g}$

$n(\text{NaOH}) = \frac{3,20\text{g}}{40 \frac{\text{g}}{\text{mol}}} = \mathbf{0,0800 \text{ mol}}$  (1)

4.

**A - NaHCO<sub>3</sub> – naatriumvesinikkarbonaat, гидрокарбонат натрия** (0,5)

**B - Na<sub>2</sub>CO<sub>3</sub> – naatriumkarbonaat, карбонат натрия** (0,5)

x – NaHCO<sub>3</sub> moolide arv

y – Na<sub>2</sub>CO<sub>3</sub> moolide arv

$$\frac{x}{y} = \frac{3}{3}$$

$$x + 2y = 0,0800$$

**x = 0,0200 mol, y = 0,0300 mol** (1)

5.

$$n(\text{HCl}) = 0,0200\text{mol} + 0,0600\text{mol} = 0,0800\text{mol}$$

$$V(\text{HCl}) = \frac{0,0800\text{mol}}{1,0800 \frac{\text{mol}}{\text{l}}} = 0,07407 \text{ l} = \mathbf{74,07\text{ml}}$$
 (1)

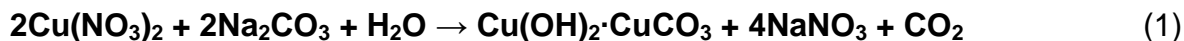
6.

$$n(\text{CO}_2) = 0,0200\text{mol} + 0,0300\text{mol} = \mathbf{0,0500\text{mol}}$$
 (1)

$$V(\text{CO}_2) = 0,0500\text{mol} \times 22,4\text{l/mol} = 1,12 \text{ l}$$

$$P_v(\text{CO}_2) = \left( \frac{1,12\text{l}}{28,0\text{l}} \right) \times 100\% = \mathbf{4,00\%}$$
 (1)

7.



$$n(\text{Na}_2\text{CO}_3) = 0,0300\text{mol}$$

$$m(\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3) = 0,0150\text{mol} \times 222\text{g/mol} = \mathbf{3,33\text{g}}$$
 (1)

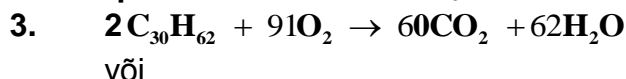
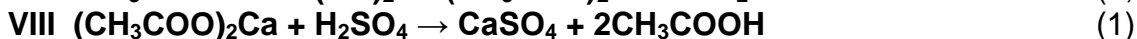
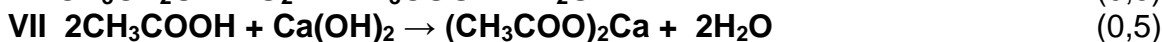
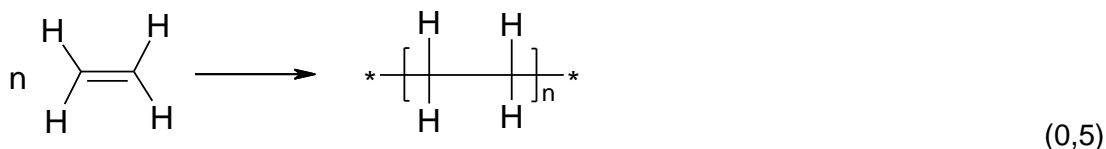
## 2. (10p)

- A- etaan (0,5)  
 B- eteen (0,5)  
 C- polüetüleen (0,5)  
 D- etanool (0,5)  
 E- glükoos (0,5)  
 F- etaanhape, äädikhape (0,5)  
 G- kaltsiumetanaat, kaltsiumatsetaat (0,5)

2.



II



**10p**

## 3. (10)

1. Mittemetallilise elemendi **X** tuvastamisega seotud arvutused 1,5p. Ühendi **A** valemi koostamine 0,5p. Kokku 2p.

(2)

Elemendi **X** tuvastamine lähtuvalt vesiniku aatomite arvust ühendi **A** molekulis:

võimalik vesiniku aatomite arv				
1	2	3	4	5
M(A)=11,3 g/mol; M(X)=10,3 g/mol	M(A)=22,7 g/mol; M(X)=20,7 g/mol	M(A)=34,0 g/mol M(X)=31,0 g/mol <b>X on fosfor P</b>	M(A)=45,4 g/mol M(X)=41,4 g/mol	M(A)=56,7 g/mol M(X)=51,7 g/mol



2. Iga ühendi (**B–D**) valemi tuvastamine 1p. Kokku 3p. (3)

Fosfori minimaalne o.a on –III. Binaarse ühendi teine element on tähistatud **Y**.

Ühend	Metallilise elemendi o.a			
	I	II	III	IV
üldkuju	Y <sub>3</sub> P	Y <sub>3</sub> P <sub>2</sub>	YP	Y <sub>3</sub> P <sub>4</sub>
<b>B</b>	M( <b>B</b> )=129,0 g/mol; M( <b>Y</b> )=32,7g/mol	M( <b>B</b> )=258,1 g/mol; M( <b>Y</b> )=65,4 g/mol Element on <b>Zn</b>	M( <b>B</b> )=129,0 g/mol M( <b>Y</b> )=98,1 g/mol	M( <b>B</b> )=516,2 g/mol M( <b>Y</b> )=130,8 g/mol
<b>C</b>	M( <b>C</b> )=58,0 g/mol; M( <b>Y</b> )=9,01 g/mol	M( <b>C</b> )=116,0 g/mol; M( <b>Y</b> )=18,0 g/mol	M( <b>C</b> )=58,0 g/mol M( <b>Y</b> )=27,0 g/mol Element on <b>Al</b>	M( <b>C</b> )=232,0 g/mol M( <b>Y</b> )=36,0 g/mol
<b>D</b>	M( <b>D</b> )=91,1 g/mol; M( <b>Y</b> )=20,0g/mol	M( <b>D</b> )= 182,2 g/mol; M( <b>Y</b> )=40,1 g/mol Element on <b>Ca</b>	M( <b>D</b> )=91,1 g/mol M( <b>Y</b> )=60,1 g/mol	M( <b>D</b> )=364,4 g/mol M( <b>Y</b> )=80,2 g/mol

- B** – Zn<sub>3</sub>P<sub>2</sub>  
**C** – AlP  
**D** – Ca<sub>3</sub>P<sub>2</sub>

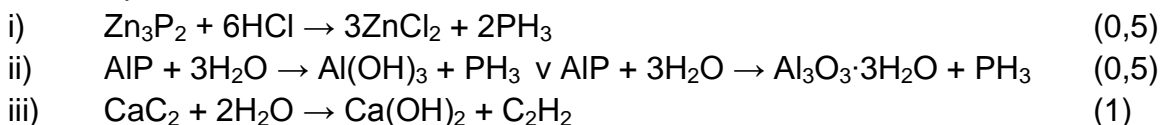
3. Ühendi **E** valemi tuvastamine 1p. (1)

Kaltsiumi o.a ühendites on II. Teine element on tähistatud **Z**.

Teise elemendi o.a			
-I	-II	-III	-IV
CaZ <sub>2</sub>	CaZ	Ca <sub>3</sub> Z <sub>2</sub>	Ca <sub>2</sub> Z
M( <b>E</b> )=64,1 g/mol; M( <b>Z</b> )=12,0g/mol Element on <b>C</b>	M( <b>E</b> )=64,1 g/mol; M( <b>Z</b> )=24,0 g/mol	M( <b>E</b> )=192,4 g/mol M( <b>Z</b> )=36,1 g/mol	M( <b>E</b> )=128,3 g/mol M( <b>Z</b> )=48,1 g/mol

- E** – CaC<sub>2</sub>

4. Kokku 2p.



5. Iga nimetus 0,5p. Kokku 2p.

**A** – fosfaan (lugeda õigeks ka fosfiin)

B – tsink(II)fosfiid (lugeda õigeks ka tsinkfosfiid)

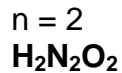
E – kaltsiumkarbiid

F – etüün

(2)  
10p

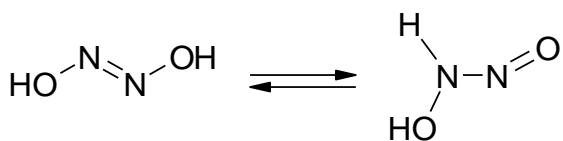
4. (10)

$$1. 2 + 14n + 16n = \frac{2 \times 100\%}{3,2258\%};$$



(3)

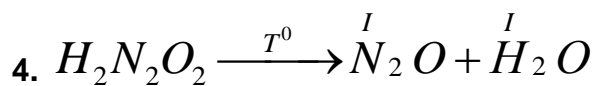
2.



(2)

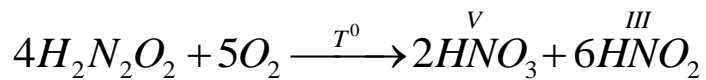
3. 12e

(1)



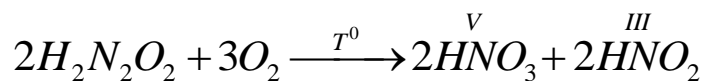
(1)

5.



(1)

või



6. A (HNO<sub>3</sub>) – lämmastikhape, азотная кислота;

(0,5)

B (HNO<sub>2</sub>) – lämmastikushape, азотистая кислота.

(0,5)

7.

A - 10e

(0,5)

B - 8e

(0,5)

10p

\* Keemiaolümpiaadi koolivooru komisjon võib iseseisvalt hinnata võimalikke alternatiivseid lahendusvariante.