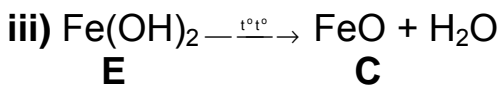
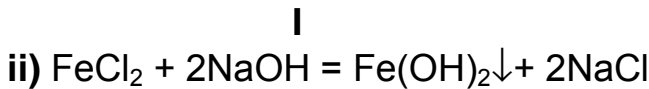
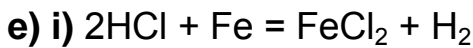


**2000/2001 õa keemiaolümpiaadi piirkondliku vooru
ülesannete lahendused
9. klass**

1. a) $\Sigma \$ = 4,50 \cdot 10^9 \text{ aastat} \cdot \frac{365,25 \text{ päeva}}{\text{aastas}} \cdot \frac{24 \text{ tundi}}{\text{päevas}} \cdot \frac{3,6 \cdot 10^3 \text{ sekundit}}{\text{tunnis}} \cdot \frac{10^6 \$}{\text{sekundis}} = 1,42 \cdot 10^{23} \text{ 4}$
- b) $\%(\text{kulutamata}) = \frac{6,02 \cdot 10^{23} - 1,42 \cdot 10^{23}}{6,02 \cdot 10^{23}} \cdot 100 = 76,4 \quad 2$
- c) $\Sigma \$ = 1 \text{ aasta} \cdot \frac{365,25 \text{ päeva}}{\text{aastas}} \cdot \frac{24 \text{ tundi}}{\text{päevas}} \cdot \frac{3,6 \cdot 10^3 \text{ sekundit}}{\text{tunnis}} \cdot \frac{1 \$}{\text{sekundis}} = 31\,558\,000 \quad \underline{4}$
- 10 p**
2. a) $0,33 = \frac{5,7 \text{ dm}^3 \cdot 1052 \text{ g/dm}^3 \cdot 0,080 + V \cdot 1834 \text{ g/dm}^3 \cdot 0,95}{5,7 \text{ dm}^3 \cdot 1052 \text{ g/dm}^3 + V \cdot 1834 \text{ g/dm}^3}$
 $0,33 \cdot (5996 \text{ g} + V \cdot 1834 \text{ g/dm}^3) = 479,7 \text{ g} + V \cdot 1742 \text{ g/dm}^3$
 $1499 = V \cdot 1137 \cdot 1/\text{dm}^3$
V(95% H₂SO₄) = 1,32 dm³ ≈ 1,3 dm³ 5
- b) $m(8,0\% \text{ H}_2\text{SO}_4) = 5,7 \text{ dm}^3 \cdot 1052 \text{ g/dm}^3 = 5996 \text{ g}$
 $m(95\% \text{ H}_2\text{SO}_4) = 1,32 \text{ dm}^3 \cdot 1834 \text{ g/dm}^3 = 2421 \text{ g}$
 $m(\text{akuhape}) = 8417 \text{ g}$
V(akuhape) = 8417 g · $\frac{1 \text{ dm}^3}{1243 \text{ g}}$ = 6,77 dm³ ≈ 6,8 dm³ 4,5
- c) Kontsentreeritud hape tuleb peenikese joana valada lahjendatud happesse. Lahust segada ja jahutada. 1,5
- 11 p**
3. a) **A** – Fe₂O₃, raud(III)oksiid; **B** – Al₂O₃, alumiiniumoksiid; **C** – FeO, raud(II)oksiid;
D – Fe₃O₄, raud(II)diraud(III)oksiid; **E** – Fe(OH)₂, raud(II)hüdroksoid;
F – Fe(OH)₃, raud(III)hüdroksoid; **G** – Al(OH)₃, alumiiniumhüdroksoid;
H – AlCl₃, alumiiniumkloriid; **I** – FeCl₂, raud(II)kloriid; **J** – FeCl₃, raud(III)kloriid. 5
- b) x -II
 $\text{Fe}_3\text{O}_4 \quad 3x + 4 \cdot (-2) = 0 \quad x = 8/3 \quad 1$
- c) i) $4\text{Fe} + 3\text{O}_2 = 2\text{Fe}_2\text{O}_3$ 0,5
A
- ii) $\text{Fe}_2\text{O}_3 + 2\text{Al} = \text{Al}_2\text{O}_3 + 2\text{Fe}$ 0,5
A **B**
- iii) $4\text{Fe}(\text{OH})_2 + \text{O}_2 + 2\text{H}_2\text{O} = 4\text{Fe}(\text{OH})_3$ 1,5
E **F**
- iv) $12\text{HCl} + 3\text{O}_2 + 4\text{Fe} = 4\text{FeCl}_3 + 6\text{H}_2\text{O}$ 1,5
J
- d) i) $6\text{HCl} + 2\text{Al} = 2\text{AlCl}_3 + 3\text{H}_2$ 1
H
- ii) $\text{AlCl}_3 + 3\text{NaOH} = \text{Al}(\text{OH})_3 \downarrow + 3\text{NaCl}$ 0,5
H **G**
- iii) $2\text{Al}(\text{OH})_3 \xrightarrow{\text{t}^\circ} \text{Al}_2\text{O}_3 + 3\text{H}_2\text{O}$ 0,5
G **B**

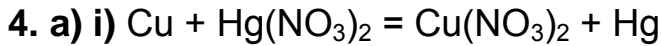


1,5

f) i) FeCl_2 ja FeCl_3 võetakse vahekorras 1 : 2. Leelise ($\text{NH}_3 \cdot \text{H}_2\text{O}$, NaOH , KOH) toimel moodustuvad sademena samas vahekorras vastavad hüdroksiidid. 0,5

ii) Sade filtreeritakse, pestakse ja kuumatatakse.

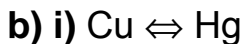
1.
15 p



Vaskplaadile moodustub elavhõbeda kiht, milles elavhõbeda hulk võrdub "lahustunud" vase hulga.

ii) Kuumatamisel elavhõbe aurustub.

2



$$\Delta m = n(\text{Hg}) \cdot M(\text{Hg}) - n(\text{Cu}) \cdot M(\text{Cu})$$

Et $n(\text{Hg}) = n(\text{Cu})$, siis

$$4,11 \text{ g} = n(\text{Cu}) \cdot [200,6 \text{ g/mol} - 63,6 \text{ g/mol}]$$

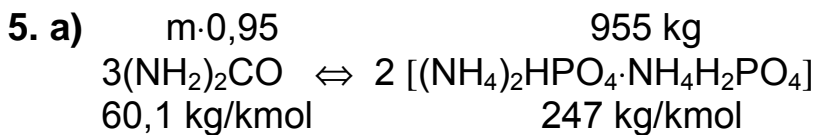
$$n(\text{Cu}) = n(\text{Hg}) = 4,11 \text{ g} \cdot \frac{1 \text{ mol}}{137,0 \text{ g}} = \mathbf{0,0300 \text{ mol}}$$

ii) $\Delta m(\text{Cu}) = -0,0300 \text{ mol} \cdot 63,6 \text{ g/mol} = \mathbf{-1,91 \text{ g}}$

$\Delta m(\text{Hg}) = +0,0300 \text{ mol} \cdot 200,6 \text{ g/mol} = \mathbf{6,02 \text{ g}}$

c) $m(\text{plaat}) = 54,11 \text{ g} - 6,02 \text{ g} = \mathbf{48,09 \text{ g}}$

6
1.
9 p



$$m(\text{karbamiidväetis}) = \frac{3}{2} \cdot 955 \text{ kg} \cdot \frac{1 \text{ kmol}}{247 \text{ kg}} \cdot 60,1 \text{ kg/kmol} \cdot \frac{1}{0,95} \approx \mathbf{367 \text{ kg}}$$

5

b) $(\text{NH}_4)_2\text{HPO}_4$ – ammooniumvesinikfosfaat; diammooniumvesinikfosfaat
гидрофосфат аммония; моногидрофосфат аммония.

$\text{NH}_4\text{H}_2\text{PO}_4$ – ammooniumdivesinikfosfaat; дигидрофосфат аммония

1.
6 p



Kloor on nii oksüdeerija kui redutseerija



Fluor on oksüdeerija, hapniku aatom vee molekulis on redutseerija.

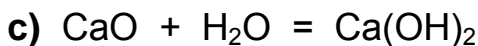
4

b) i) O_2 – hapnik (dihapnik); O_3 – osoon (trihapnik)

ii) $\frac{M(\text{O}_3)}{M(\text{O}_2)} = \frac{48}{32} = 1,5$ **Avogadro seadus:** võrdsetel tingimustel võrdsed

ruumalad sisaldavad võrdse arvu molekule.

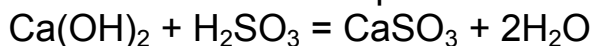
2



oksiid oksiid alus



oksiid oksiid hape



alus hape sool oksiid

3.
9 p