Clasa IX Test

1) $CaO + H_2O = Ca(OH)_2 + Q \Rightarrow$ exotermă ⓑ | ⓑ

② $2Fe + 3Cl_2 = 2FeCl_3$; $\nu Fe = \dfrac{6 \cdot 2}{3} = 4$; $N(Fe) = 6,02 \cdot 10^{23} \cdot 4 =$
$= 24,08 \cdot 10^{23} \Rightarrow$ ⓒ | ⓒ

③ $\overset{+2}{Cr_2}O_3 + 3Na\overset{+5}{N}O_3 + 4KOH = 2K_2CrO_4 + 3Na\overset{+3}{N}O_2 + 2H_2O$

$2\overset{+3}{Cr} \xrightarrow{-6\bar{e}} 2\overset{+6}{Cr} \Big| 6 \Big| 1$

oxidant $\underline{\underline{N^{+5}}}$ $\xrightarrow{+2\bar{e}} \overset{+3}{N} \Big| \Big| 3$ $\quad$ suma: 15 $\Rightarrow$ ⓐ | ⓐ

④ a) $K\overset{+3}{N}O_2$ b) $\overset{-1}{N}\overset{+1}{H_2}\overset{-2}{O}\overset{+1}{H}$ c) $\overset{-2}{N_2}\overset{+1}{H_4}$ d) $\overset{-3}{N}\overset{+}{H_4}\overset{-1}{Br}$ ⓓ | ⓓ

⑤ $Cr(OH)_3 + 3HCl = CrCl_3 + 3H_2O$
$Cr(OH)_3 + KOH \Rightarrow KCrO_2 + 2H_2O$ sau $K_3[Cr(OH)_6]$ ⓑ | ⓑ

⑥ $\dfrac{x\,g}{x+100} = 0,0365$; $x = 0,0365 + 3,65$
$0,9635x = 3,65$
$x = 3,788\,g\ (0,104\ mol)$
$V(HCl) = 0,104 \cdot 22,4 = 2,33\,\ell \Rightarrow$ ⓐ | ⓐ

⑦ $[CO_3]^{2-}$ $\quad C\ O_3$
$6p \quad 8 \cdot 3 = 24p$ $\Big\} \Rightarrow 6 + 24 = 30p^+$
$6\bar{e} \quad 8 \cdot 3 = 24\bar{e}$ $\quad (6+24) + 2\bar{e} = 32\bar{e}$ ⓐ | ⓐ

⑧ ⓒ $\quad Cu,\ Ni,\ Fe$ | ⓒ

⑨ a) $\dfrac{28+32}{2} = 30$ b) $\dfrac{38+44}{2} = 41$ c) $\dfrac{20+16}{2} = \underline{18}$ d) $\dfrac{14+44}{2} = 29$ ⓒ | ⓒ

⑩ $m_1(NaOH) = 200 \cdot 0,05 = 10\,g$; $m_2\,sol = \dfrac{10 \cdot 100}{8} = 125\,g$ ⓑ | ⓑ
$m(H_2O) = 200 - 125 = 75\,g$

1b 2c 3a 4d 5b 6a 7a 8c 9c 10b

Clasa IX Problema 1

① $2Al + 6HCl = 2AlCl_3 + 3H_2$ ②p

② $Mg + 2HCl = MgCl_2 + H_2$ ②p   ④p

- $V(H_2) = 19,663/22,4 = 0,878$ ①p   ①p
  606.

③ $AlCl_3 + 4NaOH = NaAlO_2 + 3NaCl + 2H_2O$ ④p

④ $MgCl_2 + 2NaOH = Mg(OH)_2\downarrow + 2NaCl$ ②p   ⑧p
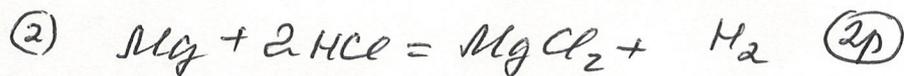
⑤ $Mg(OH)_2 \overset{t^o}{=} MgO + H_2O$ ②p
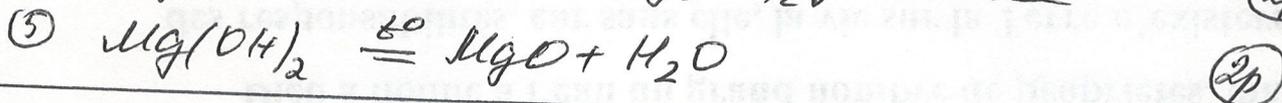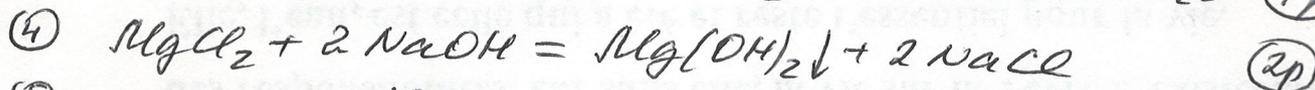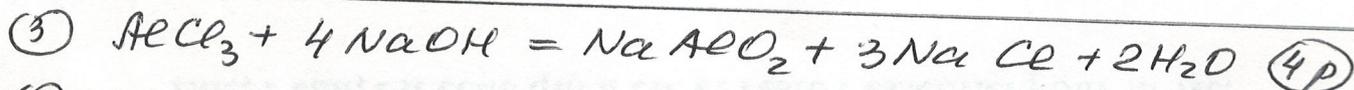
- $m(MgO) = 1,333g (0,033 mol)$ ①p
- $V(MgO) = V(Mg(OH)_2 = V MgCl_2 = V Mg = 0,033 mol$ ②p   ④p
  - $m(Mg) = 0,033 \cdot 24 = \underline{0,8g}$ ①p

- $V(H_2) = V(Mg) = 0,033 mol$ ①p
  din Mg
- $V(H_2)_{din Al} = 0,878 - 0,033 = 0,845 mol$ ①p
- $V(Al) = \dfrac{0,845 \cdot 2}{3} = 0,563 mol$ ①p   ④p
- $m(Al) = 0,563 \cdot 27 = 15,2g$ ①p

- $m(proba) = m(Mg) + m(Al) = 0,8 + 15,2 = 16g$ ①p ①p
- $w\%(Al) = \dfrac{15,2}{16} \cdot 100\% = 95\%$ ①p $w\%(Mg) = 5\%$ ①p ②p

⑥ $2Al + 2NaOH + 2H_2O = 2NaAlO_2 + 3H_2$ ②p
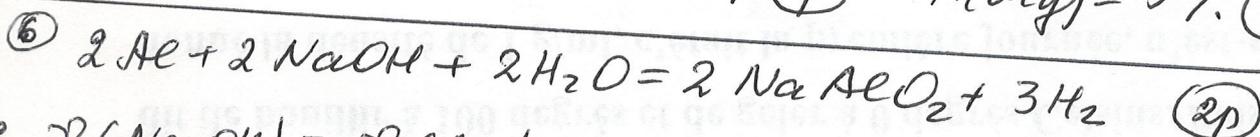
- $V(NaOH) = V(Al) = 0,563 mol$ ①p
- $m(NaOH) = 0,563 \cdot 40 = 22,52g$ ①p   ⑥p
- $m(sol) = 22,52/0,25 = 90,08g$ ①p
- $V(sol) = 90,08/1,275 = 70,651 ml$ ①p

Total: 30p

Clasa 9 Problema 2

1) $2NaCl + 2H_2O \xrightarrow{el-za} Cl_2 + H_2 + 2NaOH$ (2p)   (2p)
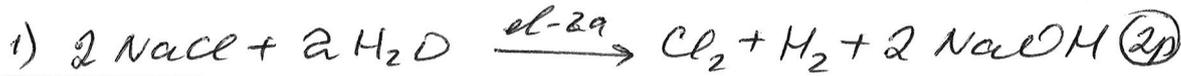
- $m\, sol = \rho \cdot V = 1,193 \cdot 500 = 596,5\, g$ (1p)   (2p)
- $m(NaCl) = 596,5 \cdot 0,25 = 149,125\, g$ (1p)

- La electroliza soluției se consumă și $NaCl$ și H_2O.
- Fie $\nu(NaCl)_{inter} = x\, mol \Rightarrow$ (1p) (1p) (1p)   (5p)
  $\nu(H_2O) = x\, mol$; $\nu(Cl_2) = \nu(H_2) = 0,5x$; $\nu(NaOH) = x$
- $m(NaCl)_{consum.} = 58,5x \Rightarrow m(NaCl)_{rămas} = (149,125 - 58,5x)\, g$ (1p)   (1p)

- $m(H_2)\uparrow = 0,5x \cdot 2 = x(g)$ $m(Cl_2)\uparrow = 0,5x \cdot 71 = 35,5x$ (2p)
  $m(H_2) + m(Cl_2) = x + 35,5x = 36,5x$ (2p)

- $m(sol)\, finale = (596,5 - 36,5x)\, g$ (1p)
- $18\% = \dfrac{(149,125 - 58,5x)}{(596,5 - 36,5x)} \cdot 18\%$ (5p)

  $149\,125 - 585x = 596,5 - 36,5x$
  $\underline{x = 1,631}$ (4p)

- $\nu(H_2) = 0,5x = 1,631 \cdot 0,5 = 0,8155\, mol$
  $V(H_2) = 0,8155 \cdot 22,4 = 18,2672\, L$ (1p)   (3p)
- $\nu(Cl_2) = \nu(H_2) = 18,2672\, L$ (1p)
  $V Cl_2 + V(H_2) = 18,2672 \cdot 2 = 36,5344\, L$ (1p)

- $\nu(NaOH) = x = 1,631 \Rightarrow m(NaOH) = 40 \cdot 1,631 =$
  $= 65,24\, g$ (1p)   (3p)
- $m\, sol.\, finale = 596,5 - \dfrac{36,5 \cdot 1,631}{59,53} = 536,97$ (1p)
- $\omega\%(NaOH) = \dfrac{65,24}{536,97} \cdot 100\% = 12,15\%$ (1p)

Total: 22p

Clasa 9 Problema 3

- (A) $\Rightarrow$ vitriol $\Rightarrow$ H_2SO_4 (1p)   (1p)
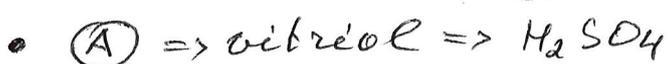
- (A*) conține tot H, S, și O; Elem. cu 6ē pe stratul M $\Rightarrow$ 2+8+6ē = 16ē $\Rightarrow$ S (1p)

  H – 1,754%   O – 70,175%   S – 28,071% (1p)

  $H_x S_y O_z \Rightarrow x:y:z = \dfrac{1,754}{1} : \dfrac{28,071}{32} : \dfrac{70,175}{16} = 1,754 : 0,877 : 4,386 =$

  $= 2:1:5 \Rightarrow$ A* este $\underline{H_2SO_5}$ (5p)   (8p)

$$\begin{array}{c} H-O \\ H-O-O \end{array} \diagdown S \diagup{\!}^{\displaystyle O}_{\displaystyle O}$$ (1p)

---

a) $H_2SO_4 + H_2O_2 = H_2SO_5 + H_2O$ (2p)

     (A)   (A*)

(A) – acid sulfuric   (A*) – a. peroxisulfuric   (4p)
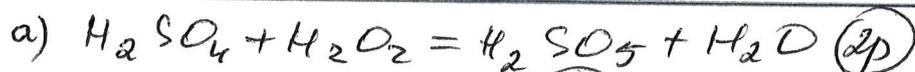
        (1p)   (persulfuric) (1p)

б) $H_2SO_5 + K_2CO_3 = KHSO_5 + CO_2 + H_2O$ (3p)
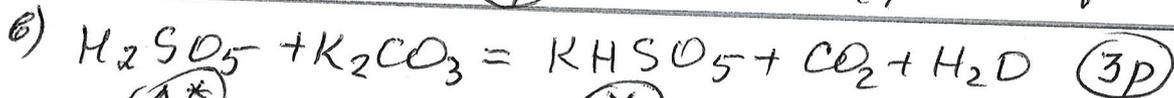
     (A*)   (X)

- (X) este sare acidă, deoarece interacț. cu KOH: $KHSO_5 + KOH \Rightarrow K_2SO_5 + H_2O$ (4p)

(X) – hidrogenopersulfat de potasiu (1p)

    (peroximonosulfat de potasiu)

---

c) $KHSO_5 + 2HCl = KHSO_4 + Cl_2 + H_2O$ (2p)

     (X)   (Y)   (3p)
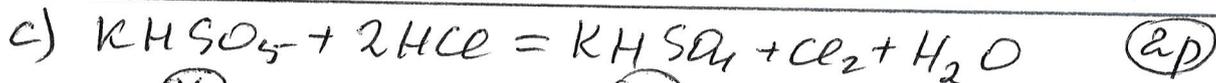
(Y) – hidrogenosulfat de potasiu (1p)

---

d) $KHSO_4 + KOH = K_2SO_4 + H_2O$ (2p)

    (Y)   (Z)   (3p)

(Z) sulfat de potasiu (1p)

---

e) $K_2SO_4 + H_2SO_4 = 2KHSO_4$ (2p)

    (Z)   (A)   (Y)   (2p)

OXONE: $2KHSO_5 \cdot KHSO_4 \cdot K_2SO_4$ (1p)
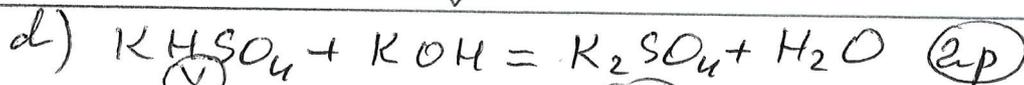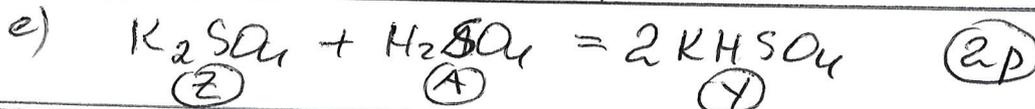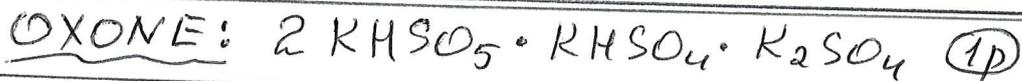
- $KHSO_5 \Rightarrow$ determină propr. oxidante.   (1p)

$\omega\%(KHSO_5) = \dfrac{2 \cdot 152 \cdot 100\%}{(2\cdot152 + 136 + 174)} = \dfrac{304 \cdot 100}{614} = 49,51\%$ (1p)   (2p)

Total: 28p