

Državna matura Kemija 2016./17.

INČICA B (30)

Ispitna knjižica 1

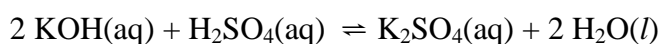
Zadatak	Točan odgovor	Zadatak	Točan odgovor
1	C	26	C
2	D	27	A
3	D	28	B
4	B	29	D
5	D	30	C
6	A	31	B
7	C	32	C
8	B	33	A
9	B	34	A
10	B	35	D
11	D	36	A
12	D	37	C
13	B	38	C
14	B	39	A
15	B	40	B
16	B	41	A
17	A	42	D
18	B	43	C
19	C	44	B
20	C	45	C
21	A		
22	B		
23	D		
24	A		
25	A		

Ispitna knjižica 2

1.1. kalijev metanoat

1.2. NaHS

2.1. $c(\text{KOH}) = 0,005925 \text{ mol dm}^{-3}$



$$V(\text{H}_2\text{SO}_4) = 35,55 \text{ mL} = 0,03555 \text{ dm}^3$$

$$n(\text{KOH}) = 2n(\text{H}_2\text{SO}_4)$$

$$c(\text{KOH}) \cdot V(\text{KOH}) = 2 \cdot c(\text{H}_2\text{SO}_4) \cdot V(\text{H}_2\text{SO}_4)$$

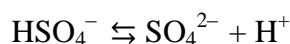
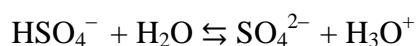
$$c(\text{KOH}) = \frac{2 \cdot 0,0025 \text{ mol/dm}^3 \cdot 0,03555 \text{ dm}^3}{0,030 \text{ dm}^3} = 0,006 \text{ mol dm}^{-3}$$

2.2. $\text{pH} = 2,3$

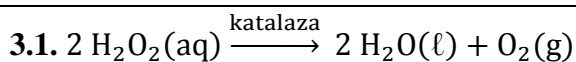
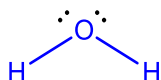
$$c(\text{H}_2\text{SO}_4) = 0,0025 \text{ mol dm}^{-3}$$

$$c(\text{H}^+) = 2 c(\text{H}_2\text{SO}_4) = 0,005 \text{ mol dm}^{-3}$$

$$\text{pH} = -\log(c(\text{H}^+)/\text{mol dm}^{-3}) = -\log(5 \times 10^{-3}/\text{mol dm}^{-3}) = 2,3$$



2.4.



3.2. Bezbojan plin, netopljiv u vodi (ili slabo topljiv u vodi), ne reagira s vodom, manje gustoće od tekuće vode (potrebno je navesti dva svojstva za 1 bod)

3.3. $\rho = 0,906 \text{ kg m}^{-3}$

$$p V = n R T = \frac{m}{M} R T$$

$$p M = \frac{m}{V} R T$$

$$p M = \rho R T$$

$$\rho = \frac{p M}{R T} = \frac{61665 \text{ Pa } 32,00 \text{ g mol}^{-1}}{8,31 \text{ J K}^{-1} \text{ mol}^{-1} 262 \text{ K}} = 906,3 \text{ g m}^{-3} = 0,906 \text{ kg m}^{-3}$$

3.4. željezov(III) oksid ili Fe_2O_3

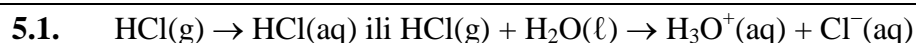
$$4.1. \nu = - \frac{\Delta c(A)}{2 \Delta t} = - \frac{\Delta c(B)}{\Delta t} = \frac{\Delta c(C)}{2 \Delta t}$$

$$4.2. \text{od } 0,00105 \text{ do } 0,00145 \text{ mol dm}^{-3} \text{ s}^{-1}$$

$$\nu(A) = - \frac{\Delta c(A)}{\Delta t} = - \frac{c_2(A) - c_1(A)}{(t_2 - t_1)} = - \frac{0,09 \text{ mol dm}^{-3} - 0,14 \text{ mol dm}^{-3}}{80 \text{ s} - 40 \text{ s}} = 0,00125 \text{ mol dm}^{-3} \text{ s}^{-1}$$

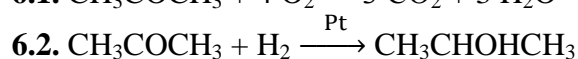
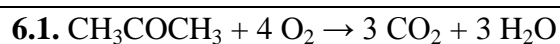
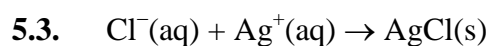
4.3. Reakcija će se zaustaviti. Brzina reakcije će biti 0.

4.4. Povećava se broj uspješnih (povoljnih) sudara među molekulama reaktanata.



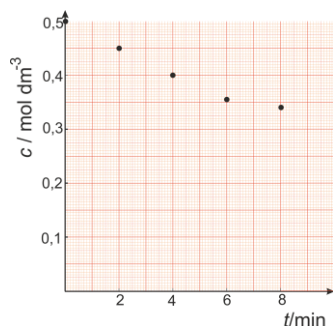
$$5.2. c(\text{HCl}) = 11,6 \text{ mol dm}^{-3}$$

$$c(\text{HCl(aq)}) = \frac{\rho(\text{HCl(aq)}) \cdot w(\text{HCl(aq)})}{M(\text{HCl})} = \frac{1,18 \text{ g cm}^{-3} \cdot 0,36}{36,51 \text{ g mol}^{-1}} = 0,0116 \text{ mol cm}^{-3}$$



6.3. adicija

7.1.



$$7.2. p = p(\text{Cl}_2) + p(\text{H}_2\text{O}) \quad p(\text{Cl}_2) = x(\text{Cl}_2) \cdot p \quad p(\text{H}_2\text{O}) = x(\text{H}_2\text{O}) \cdot p$$

$$x(\text{Cl}_2) = \frac{n(\text{Cl}_2)}{n(\text{Cl}_2) + n(\text{H}_2\text{O})} = \frac{1}{3}$$

$$x(\text{H}_2\text{O}) = 1 - 1/3 = 2/3$$

$$p(\text{H}_2\text{O}) = 2/3 \cdot 1,5 \times 10^5 \text{ Pa} = 100\,000 \text{ Pa}$$

$$p(\text{Cl}_2) = 1/3 \cdot 1,5 \times 10^5 \text{ Pa} = 50\,000 \text{ Pa}$$

7.3. Tyndallov fenomen, raspršenje svjetlosti

8.1. Brzina kemijske reakcije se povećava.

8.2. $K_p = \frac{p^2(\text{SO}_2)}{p^3(\text{O}_2)}$

9.1. $N(\text{C}) = 4,4 \times 10^{21}$

$m(\text{CH}_3\text{COONa} \cdot 3 \text{ H}_2\text{O}) = 500 \text{ mg} = 0,5 \text{ g}$

$M(\text{CH}_3\text{COONa} \cdot 3 \text{ H}_2\text{O}) = 136,09 \text{ g mol}^{-1}$

$n(\text{CH}_3\text{COONa} \cdot 3 \text{ H}_2\text{O}) = \frac{m}{M} = \frac{0,5 \text{ g}}{136,09 \text{ g/mol}} = 0,00367 \text{ mol} = 3,67 \times 10^{-3} \text{ mol}$

$n(\text{C}) = 2 \cdot n(\text{CH}_3\text{COONa} \cdot 3 \text{ H}_2\text{O}) = 2 \cdot 3,67 \times 10^{-3} \text{ mol} = 7,34 \times 10^{-3} \text{ mol}$

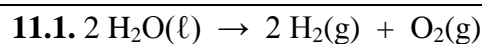
$N(\text{C}) = n \cdot L = 7,34 \times 10^{-3} \text{ mol} \cdot 6,02 \times 10^{23} \text{ mol}^{-1} = 4,4 \times 10^{21}$

9.2. CH_3COOH , octena kiselina, etanska kiselina

10.1. $-393 \text{ 510 J mol}^{-1}$

$\Delta_r H(\text{CO}_2, \text{g}) = \frac{\Delta H}{\Delta \xi} = \frac{-393,51 \text{ kJ}}{1 \text{ mol}} = -393,51 \text{ kJ mol}^{-1} = -393510 \text{ J mol}^{-1}$

10.2. egzotermna reakcija



11.2. 120 mL

$n(\text{H}_2) = \frac{1}{2} n(e^-)$

$\frac{V(\text{H}_2)}{V_m} = \frac{1}{2} \cdot \frac{Q}{F} \quad V(\text{H}_2) = 0,5 \cdot \frac{690 \text{ C} \cdot 22,4 \text{ L mol}^{-1}}{96 \text{ 500 C mol}^{-1}} = 0,08 \text{ L}$

$n(\text{O}_2) = \frac{1}{4} n(e^-)$

$\frac{V(\text{O}_2)}{V_m} = \frac{1}{4} \cdot \frac{Q}{F} \quad V(\text{O}_2) = 0,25 \cdot \frac{690 \text{ C} \cdot 22,4 \text{ L mol}^{-1}}{96 \text{ 500 C mol}^{-1}} = 0,04 \text{ L}$

$V(\text{H}_2 + \text{O}_2) = 0,08 \text{ L} + 0,04 \text{ L} = 0,120 \text{ L} = 120 \text{ mL}$



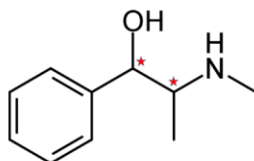
13.1. $K_p = 3,4 \text{ bar}^{-2}$

$K_p = \frac{p^2(\text{NH}_3)}{p(\text{N}_2) \cdot p^3(\text{H}_2)} = \frac{(960 \text{ bar})^2}{10 \text{ bar} \cdot (30 \text{ bar})^3} = 3,4 \text{ bar}^{-2}$

13.2. Smanjenjem tlaka ravnoteža se pomiče u smjeru nastajanja reaktanata.

14.1. C₁₀H₁₅NO

14.2.



15.1. Hlađenjem ili zagrijavanjem; promjenom temperature

15.2. $b = 2,2 \text{ mol kg}^{-1}$

$$m(\text{H}_2\text{O}) = m(\text{otopine}) - m(\text{KCl})$$

$$m(\text{H}_2\text{O}) = 170 \text{ g} - 24 \text{ g} = 146 \text{ g} = 0,146 \text{ kg}$$

$$n(\text{KCl}) = \frac{m(\text{KCl})}{M(\text{KCl})} = \frac{24 \text{ g}}{74,6 \text{ g mol}^{-1}} = 0,32 \text{ mol} \quad b = \frac{n(\text{KCl})}{m(\text{H}_2\text{O})} = \frac{0,32 \text{ mol}}{0,146 \text{ kg}} = 2,2 \text{ mol kg}^{-1}$$

16.1. $V = 100 \text{ mL}$

$$n(\text{KMnO}_4) = \frac{m(\text{KMnO}_4)}{M(\text{KMnO}_4)}$$

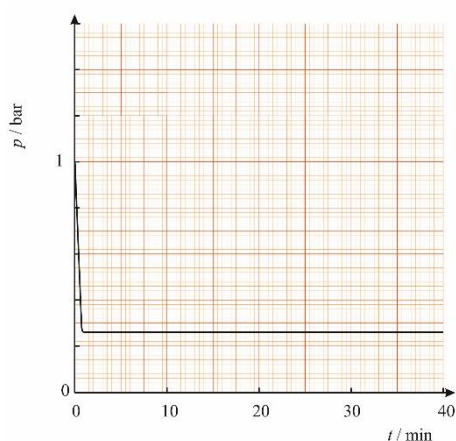
$$c(\text{KMnO}_4) = \frac{n(\text{KMnO}_4)}{V(\text{KMnO}_4, \text{aq})} \Rightarrow n(\text{KMnO}_4) = c(\text{KMnO}_4) \cdot V(\text{KMnO}_4, \text{aq})$$

$$\frac{m(\text{KMnO}_4)}{M(\text{KMnO}_4)} = c(\text{KMnO}_4) \cdot V(\text{KMnO}_4, \text{aq})$$

$$V(\text{KMnO}_4, \text{aq}) = \frac{m(\text{KMnO}_4)}{M(\text{KMnO}_4) \times c(\text{KMnO}_4)} = \frac{0,158 \text{ g}}{158 \text{ g mol}^{-1} \times 0,01 \text{ mol L}^{-1}} = 0,1 \text{ L} = 100 \text{ mL}$$

16.2 $V(\text{Na}_2\text{S}_2\text{O}_3, \text{aq}) = 27,75 \text{ mL}$

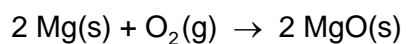
17.1.



17.2. $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$

18.1. $2 \text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2 \text{MgO(s)}$

18.2. Mjerodavni reaktant je Mg (magnezij), a reaktant u suvišku O_2 (kisik)



$$n(\text{Mg}) = \frac{m(\text{Mg})}{M(\text{Mg})} = \frac{2,0 \text{ g}}{24,3 \text{ g mol}^{-1}} = 0,08 \text{ mol}$$

$$n(\text{O}_2) = \frac{m(\text{O}_2)}{M(\text{O}_2)} = \frac{1,6 \text{ g}}{32 \text{ g mol}^{-1}} = 0,05 \text{ mol}$$

$$\frac{n(\text{Mg})}{2} = 0,04 \text{ mol} \Rightarrow \text{mjerodavni reaktant}$$

$$\frac{n(\text{O}_2)}{1} = 0,05 \text{ mol} \Rightarrow \text{reaktant u suvišku}$$