Nacionalni centar za vanjsko vrednovanje obrazovanja

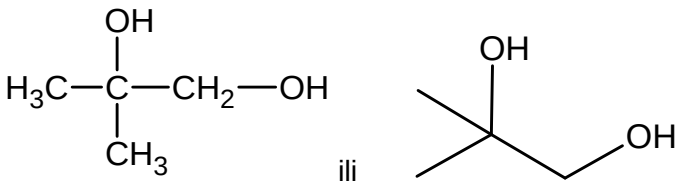
RJEŠENJA PROBNOG ISPITA DRŽAVNE MATURE IZ KEMIJE

DM 2022./2023.

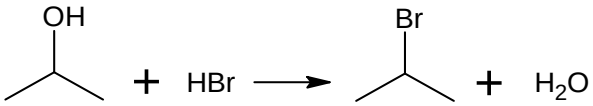
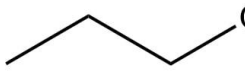
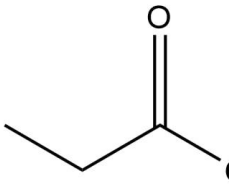
ISPITNA KNJIŽICA 1

Redni broj zadatka	ODGOVOR
1.	**B**
2.	**D**
3.	**B**
4.	**C**
5.	**C**
6.	**C**
7.	**A**
8.	**D**
9.	**C**
10.	**B**
11.	**A**
12.	**A**
13.	**D**
14.	**D**
15.	**C**
16.	**C**
17.	**A**
18.	**C**
19.	**B**
20.	**B**
21.	**D**
22.	**B**
23.	**C**
24.	**C**
25.	**A**
26.	**C**
27.	**A**
28.	**C**
29.	**D**
30.	**D**
31.	**C**
32.	**D**
33.	**C**
34.	**B**
35.	**A**

ISPITNA KNJIŽICA 2

Redni broj zadatka	ODGOVOR	BOD
1.1.	 ili bilo koji točan prikaz strukturne formule	**1 BOD**
1.2.	PCl_5	**1 BOD**
2.	$b(\text{NaCl}) = \frac{n(\text{NaCl})}{m(\text{H}_2\text{O})} = \frac{m(\text{NaCl})}{M(\text{NaCl}) \cdot m(\text{H}_2\text{O})} = \frac{10^5\ \text{g}}{58{,}5\ \text{g mol}^{-1} \cdot 1000\ \text{kg}} = 1{,}71\ \text{mol kg}^{-1}$ $\Delta T = \text{i} \cdot K_\text{f} \cdot b = 2 \cdot 1{,}86\ \text{K kg mol}^{-1} \cdot 1{,}71\ \text{mol kg}^{-1} = 6{,}4\ \text{K}$ $t_L = 0\ °\text{C} - 6{,}4\ °\text{C} = -6{,}4\ °\text{C}$ $T_L = 273\ \text{K} - 6{,}4\ \text{K} = 266{,}6\ \text{K}$ $t_\text{L} = -6{,}4\ °\text{C}$, $T_\text{L} = 266{,}6\ \text{K}$	**1 BOD** za točno izračunatu molalnost NaCl **1 BOD** za točno izračunato ledište
3.	$n(\text{A}) = n(\text{B})$ $n(\text{A}) = \frac{pV}{RT} = \frac{pm(\text{A})}{RT\rho(\text{A})} = \frac{101000\ \text{Pa} \cdot 7\ \text{g}}{8{,}31\ \text{J K}^{-1}\ \text{mol}^{-1} \cdot 273\ \text{K} \cdot 1{,}25 \times 1000\ \text{g m}^{-3}} = 0{,}249\ \text{mol}$ $m(\text{B}) = \frac{n(\text{B})RT\rho(\text{B})}{p} = \frac{0{,}249\ \text{mol} \cdot 8{,}31\ \text{J K}^{-1}\ \text{mol}^{-1} \cdot 273\ \text{K} \cdot 1{,}43 \times 1000\ \text{g m}^{-3}}{101000\ \text{Pa}} =$ $m(\text{B}) = 8\ \text{g}$	**1 BOD** za točno izračunatu množinsku koncentraciju plina **A** **1 BOD** za točno izračunatu masu plina **B**
4.1.	od srebra	**1 BOD**
4.2.	$\text{Al} \mid \text{Al}^{3+} \parallel \text{Ag}^{+} \mid \text{Ag}$	**1 BOD**
5.	$\frac{n(\text{C}_2\text{H}_4)}{1} : \frac{n(\text{O}_2)}{3} = 0{,}2\ \text{mol} : 0{,}1\ \text{mol}$ O_2- mjerodavni reaktant $n(\text{O}_2) : n(\text{H}_2\text{O}) = 3 : 2$ $n(\text{teorijski H}_2\text{O}) = \frac{2}{3} n(\text{O}_2) = 0{,}2\ \text{mol}$ $\eta = \frac{n(\text{dobiveno H}_2\text{O})}{n(\text{teorijski H}_2\text{O})} = \frac{0{,}15\ \text{mol}}{0{,}2\ \text{mol}} = 0{,}75$ $\eta = 0{,}75 = 75\ \%$	**1 BOD** za točno određen mjerodavni reaktant **1 BOD** za točno izračunato iskorištenje kemijske reakcije
6.1.	$(\text{C}_8\text{H}_7\text{O}_2\text{COO})_2\text{Ca}$	**1 BOD**

6.2.	$n(C_8H_7O_2COOH) = \frac{m}{M} = \frac{55{,}6\times10^{-3}\text{g}}{180{,}08\ \text{g mol}^{-1}} = 3{,}09\times10^{-4}\ \text{mol}$ $c(C_8H_7O_2COOH) = \frac{n}{V} = \frac{3{,}09\times10^{-4}\ \text{mol}}{0{,}25\ \text{dm}^3} = 1{,}24\times10^{-3}\ \text{mol dm}^{-3}$ $c(H^+) = \sqrt{K_a \cdot c(C_8H_7O_2COOH)} = 6{,}3\times10^{-4}\ \text{mol dm}^{-3}$ $\text{pH} = -\log\left(c(H^+)/\text{mol dm}^{-3}\right) = 3{,}2$	**1 BOD** za točno izračunatu množinsku koncentraciju acetilsalicilne kiseline **1 BOD** za točno izračunatu pH vrijednost vodene otopine acetilsalicilne kiseline
7.1.	$A_r(X) = \frac{m_a(X)}{u} = \frac{3{,}816\times10^{-26}\ \text{kg}}{1{,}66\times10^{-27}\ \text{kg}} = 22{,}99 \approx 23$	**1 BOD**
7.2.	$E = h\cdot\nu = \frac{h\cdot c_0}{\lambda} \Rightarrow \lambda = \frac{h\cdot c_0}{E} = \frac{6{,}63\times10^{-34}\ \text{J s}\cdot 3{,}00\times10^{8}\ \text{m s}^{-1}}{3{,}37\times10^{-19}\ \text{J}} =$ $\frac{1{,}989\times10^{-25}\ \text{J m}}{3{,}37\times10^{-19}\ \text{J}} = 5{,}90\times10^{-7}\ \text{m} = 590\ \text{nm}$ Valna duljina emitirane svjetlosti je 590 nm.	**1 BOD**
7.3.	$m(X_3Y) = 3\cdot3{,}816\times10^{-23}\ \text{g} + 5{,}146\times10^{-23}\ \text{g}$ $= 1{,}145\times10^{-22}\ \text{g} + 5{,}146\times10^{-23}\ \text{g} = 1{,}66\times10^{-22}\ \text{g}$ $w(X,X_3Y) = \frac{1{,}145\times10^{-22}\ \text{g}}{1{,}66\times10^{-22}\ \text{g}} = 0{,}69 = 0{,}69\cdot100 = 69\ \%$ Maseni udio elementa **X** u spoju **X_3Y** iznosi 69%.	**1 BOD**
8.1.	2, 8, 4	**1 BOD**
8.2.	$N(Ge) = n(Ge)\cdot N_A = 0{,}02\ \text{mol}\cdot6{,}02\times10^{23}\ \text{mol}^{-1} = 1{,}2\times10^{22}$ $N(Si) = 4\cdot N(Ge) = 4{,}8\times10^{22}$	**1 BOD**
8.3.	$w(\text{Ge, čip}) = \frac{A_r(Ge)}{A_r(Ge) + 4\,A_r(Si)} = \frac{72{,}6}{72{,}6 + 4\cdot28{,}1} = 0{,}392\ = 39{,}2\ \%$	**1 BOD**
9.1.	$K_p = \frac{p^2(CO)}{p(CO_2)}$	**1 BOD**
9.2.	grafita	**1 BOD**
9.3.	$K_p = \frac{p^2(CO)}{p(CO_2)}$ $10\ \text{bar} = \frac{p^2(CO)}{0{,}17\ \text{bar}}$ $p(CO) = \sqrt{10\ \text{bar}\cdot0{,}17\ \text{bar}} = 1{,}3\ \text{bar}$	**1 BOD**
9.4.	dijamant ili fuleren ili amorfni ugljik (čađa)	**1 BOD**

10.1.	$c_1(\text{HCl}) = \frac{w(\text{HCl}) \cdot \rho(\text{HCl})}{M(\text{HCl})} = \frac{0{,}36 \cdot 1{,}18 \text{ g cm}^{-3}}{36{,}51 \text{ g mol}^{-1}} = 0{,}01164 \text{ mol cm}^{-3} = 11{,}64 \text{ mol dm}^{-3}$ $c_1(\text{HCl}) \cdot V_1(\text{HCl}) = c_2(\text{HCl}) \cdot V_2(\text{HCl}) \Rightarrow$ $V_1(\text{HCl}) = \frac{c_2(\text{HCl}) \cdot V_2(\text{HCl})}{c_1(\text{HCl})} = \frac{0{,}1000 \text{ mol dm}^{-3} \cdot 500 \text{ cm}^3}{11{,}64 \text{ mol dm}^{-3}} = 4{,}30 \text{ cm}^3$ $V(\text{HCl}) = 4{,}30 \text{ cm}^3$	**1 BOD** za točno izračunatu množinsku koncentraciju c_1 **1 BOD** za točno izračunat volumen V_1
10.2.	$V(\text{HCl}) = 25 \text{ mL}$	**1 BOD**
10.3.	$c(\text{NaOH}) = \frac{c(\text{HCl})V(\text{HCl})}{V(\text{NaOH})} = \frac{0{,}1 \text{ mol L}^{-1} \cdot 25 \text{ mL}}{20 \text{ mL}} = 0{,}125 \text{ mol L}^{-1}$	**1 BOD**
11.1.	$CH_3CH(OH)CH_3 + HBr \rightarrow CH_3CH(Br)CH_3 + H_2O$ ili 	**1 BOD**
11.2.	$\bar{v} = -\frac{\Delta c(\text{HBr})}{\Delta t} = -\frac{(0{,}24 - 0{,}7) \text{ mol dm}^{-3}}{600 \text{ s}} = 7{,}67 \times 10^{-4} \text{ mol dm}^{-3} \text{ s}^{-1}$ ili $\bar{v} = 4{,}6 \times 10^{-2} \text{ mol dm}^{-3} \text{ min}^{-1}$	**1 BOD**
11.3.	$CH_3CH_2CH_2OH$	**1 BOD**
11.4.	vodikova veza	**1 BOD**
12.1.	 ili $CH_3CH_2CH_2OH$	**1 BOD**
12.2.	 ili CH_3CH_2COOH	**1 BOD**
12.3.	nukleofilna adicija ili adicija	**1 BOD**
12.4.	Tollensov reagens ili Fehlingov reagens ili Trommerov reagens	**1 BOD**