

Kemija na državnoj maturi 2016. – inačica 026

Ključ za odgovore - ispitna knjižica 1

1.	A
2.	C
3.	B
4.	A
5.	C
6.	B
7.	C
8.	B
9.	B
10.	D
11.	A
12.	C
13.	C
14.	A
15.	C
16.	A
17.	B
18.	B
19.	B
20.	A
21.	D
22.	D
23.	A

24.	D
25.	B
26.	C
27.	C
28.	C
29.	B
30.	C
31.	C
32.	B
33.	B
34.	D
35.	A
36.	A
37.	B
38.	C
39.	A
40.	D
41.	C
42.	A
43.	D
44.	C
45.	A

Ključ za odgovore - ispitna knjižica 2

1.1. propan-2-ol, izopropanol

1.2. $\text{Ca}(\text{HCO}_3)_2$

1 BOD za svaki točan odgovor

2.1. 360 g

$$w(\text{H}_2\text{O}) = 100 \% - 10 \% = 90 \%$$

$$w(\text{H}_2\text{O}) = m(\text{H}_2\text{O}) / m(\text{otopina})$$

$$m(\text{H}_2\text{O}) = w(\text{H}_2\text{O}) \cdot m(\text{otopina})$$

$$m(\text{H}_2\text{O}) = 0,900 \cdot 400 \text{ g} = 360 \text{ g}$$

$$\text{ili: } w(\text{C}_6\text{H}_{12}\text{O}_6) = m(\text{C}_6\text{H}_{12}\text{O}_6) / m(\text{otopina})$$

$$m(\text{C}_6\text{H}_{12}\text{O}_6) = w(\text{C}_6\text{H}_{12}\text{O}_6) \cdot m(\text{otopina})$$

$$m(\text{C}_6\text{H}_{12}\text{O}_6) = 0,100 \cdot 400 \text{ g} = 40 \text{ g}$$

$$m(\text{H}_2\text{O}) = 400 \text{ g} - 40 \text{ g} = 360 \text{ g} \quad 1 \text{ BOD}$$

2.2. 0,32 K

$$\Delta T = b(\text{C}_6\text{H}_{12}\text{O}_6) \cdot K_b(\text{H}_2\text{O}) \cdot i$$

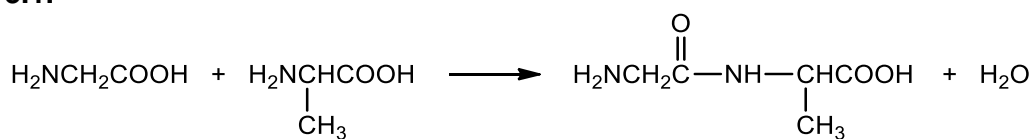
$$= m(\text{C}_6\text{H}_{12}\text{O}_6) \cdot K_b(\text{H}_2\text{O}) \cdot i / (M(\text{C}_6\text{H}_{12}\text{O}_6) \cdot m(\text{H}_2\text{O}))$$

$$= 40 \text{ g} \cdot 0,52 \text{ K kg mol}^{-1} \cdot 1 / (180 \text{ g mol}^{-1} \cdot 0,360 \text{ kg}) = 0,32 \text{ K}$$

(priznati i račun i s 10 g glukoze i 90 g vode)

1 BOD

3.1.



1 BOD

(priznati i zwitterionski prikaz aminokiselina i dipeptida, te svaki strukturni prikaz u kojem je istaknuta peptidna veza)

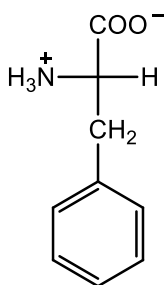
3.2. 165,11

$$M_r = 9 \cdot \text{Ar}(\text{C}) + 2 \cdot \text{Ar}(\text{O}) + \text{Ar}(\text{N}) + 11 \cdot \text{Ar}(\text{H})$$

$$M_r = 9 \cdot 12,0 + 2 \cdot 16,0 + 14,0 + 11 \cdot 1,01 = 165,11$$

1 BOD

3.3.

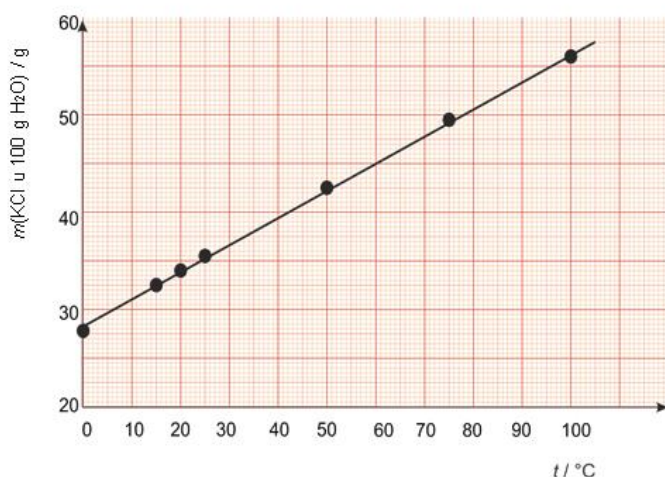


1 BOD

3.4. Proteini (bjelančevine)

1 BOD

4.1.



1 BOD

4.2. 0,29 (± 0,01)

$$w(\text{KCl}) = \frac{m(\text{KCl})}{m(\text{KCl}) + m(\text{H}_2\text{O})} = \frac{40 \text{ g}}{40 \text{ g} + 100 \text{ g}} = 0,29 \times 100 = 29,0 \%$$

1 BOD

4.3. Prezasićena

$$b(\text{KCl}) = \frac{n(\text{KCl})}{m(\text{H}_2\text{O})} \Rightarrow n(\text{KCl}) = b(\text{KCl}) \times m(\text{H}_2\text{O})$$

$$m(\text{KCl}) = n(\text{KCl}) \times M(\text{KCl}) = b(\text{KCl}) \times m(\text{H}_2\text{O}) \times M(\text{KCl})$$

$$m(\text{KCl}, 70^\circ\text{C}) = 6,8 \text{ mol kg}^{-1} \times 0,1 \text{ kg} \times 74,6 \text{ g mol}^{-1} = 50,73 \text{ g}$$

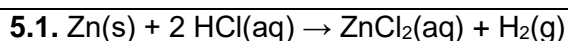
$$m(\text{KCl}, 70^\circ\text{C}) = 50,73 \text{ u } 100 \text{ g H}_2\text{O}$$

Otopina je prezasićena. (priznati i druge načine rješavanja)

1 BOD

4.4. Temperatura će se smanjiti

1 BOD



(agregacijska stanja stanja se ne boduju)

1 BOD

5.2. 1,36 g (± 0,01)

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

$$n(\text{ZnCl}_2) = n(\text{Zn}) = 0,01 \text{ mol}$$

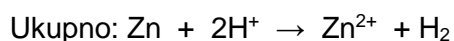
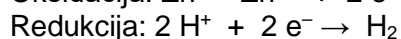
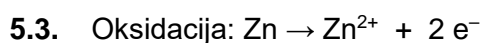
$$n(\text{Zn}) = \frac{0,65 \text{ g}}{65,4 \text{ g mol}^{-1}}$$

$$m(\text{ZnCl}_2) = 0,01 \text{ mol} \times 136,4 \text{ g mol}^{-1}$$

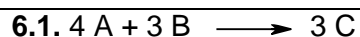
$$n(\text{Zn}) = 0,01 \text{ mol}$$

$$m(\text{ZnCl}_2) = 1,36 \text{ g}$$

1 BOD



1 BOD



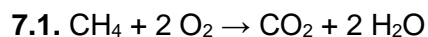
1 BOD

6.2. Tvar D je katalizator

1 BOD

6.3. $K_p = p(\text{H}_2) p(\text{Br}_2) / p^2(\text{HBr})$

1 BOD



1 BOD

7.2. 0,75

$$n(\text{CH}_4) = n(\text{CO}_2)_{\text{najviše}} = 0,20 \text{ mol}$$

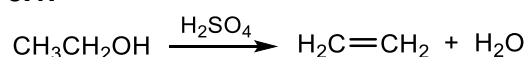
MJERODAVNI REAKTANT JE CH_4

$$\eta = \frac{n(\text{CO}_2)_{\text{nastalo}}}{n(\text{CO}_2)_{\text{najviše}}} = \frac{0,15 \text{ mol}}{0,20 \text{ mol}} = 0,75 = 0,75 \times 100\% = 75,0\%$$

$$\eta = 0,75 = 75,0\%$$

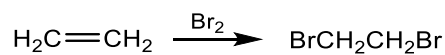
1 BOD

8.1.



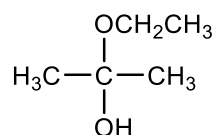
1 BOD

8.2.



1 BOD

8.3.

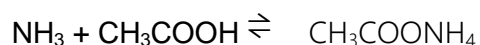
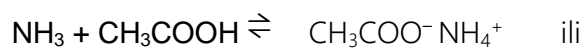


1 BOD

8.4. Vodena otopina kalijeva permanganata, jodna voda, klorna voda

1 BOD

9.1.



1 BOD

9.2. Povećanje koncentracije etanske kiseline dovest će do povećanja količine produkta.

1 BOD

10.1. $K_2\overset{IV}{S}O_3$	1 BOD
10.2. $SO_3^{2-} + H_2O \longrightarrow SO_4^{2-} + 2e^- + 2H^+$ $(SO_3^{2-} + 3H_2O \longrightarrow SO_4^{2-} + 2e^- + 2H_3O^+)$	1 BOD

11.1. U smjeru reaktanata, u lijevo	1 BOD
11.2. U smjeru reaktanta, u lijevo	1 BOD

12.1. I_2	1 BOD
12.2. $Cu^{2+}(aq) + Mg(s) \rightarrow Cu(s) + Mg^{2+}(aq)$ (agregacijska stanja nije potrebno pisati)	1 BOD

13.1. $Br_2(aq) + HCOOH(aq) \rightarrow 2 Br^-(aq) + 2 H^+(aq) + CO_2(g)$ ili $Br_2(aq) + HCOOH(aq) \rightarrow 2 HBr(aq) + CO_2(g)$ (agregacijska stanja nije potrebno pisati)	1 BOD
13.2. $0,029 \text{ mol dm}^{-3} \text{ s}^{-1}$	1 BOD
$v(Br_2) = -\frac{\Delta c(Br_2)}{\Delta t} = -\frac{4,8 \text{ mol dm}^{-3} - 12,0 \text{ mol dm}^{-3}}{250 \text{ s} - 0 \text{ s}} = 0,029 \text{ mol dm}^{-3} \text{ s}^{-1}$	

14.1. 0,03 mol

$$\frac{n(\text{C}_2\text{H}_2\text{O}_4)}{n(\text{NaOH})} = \frac{1}{2} \Rightarrow n(\text{C}_2\text{H}_2\text{O}_4) = \frac{n(\text{NaOH})}{2}$$
$$n(\text{C}_2\text{H}_2\text{O}_4) = \frac{c(\text{NaOH}) \times V(\text{NaOH})}{2} = \frac{0,6 \text{ mol dm}^{-3} \times 0,1 \text{ dm}^3}{2} = 0,03 \text{ mol}$$

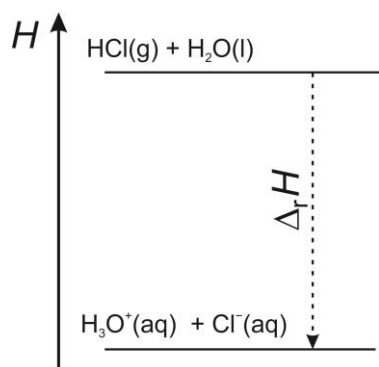
1 BOD

14.2.

konjugirana kiselina	tvar	konjugirana baza
HOOC–COOH	HOOC–COO [−]	[−] OOC–COO [−]

1 BOD

15.1.

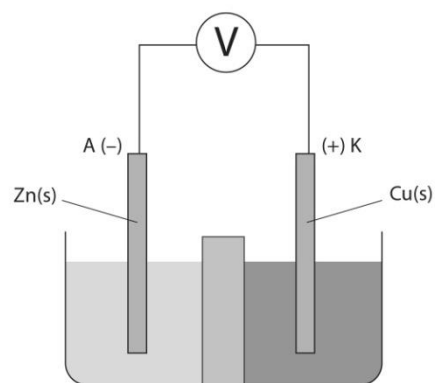
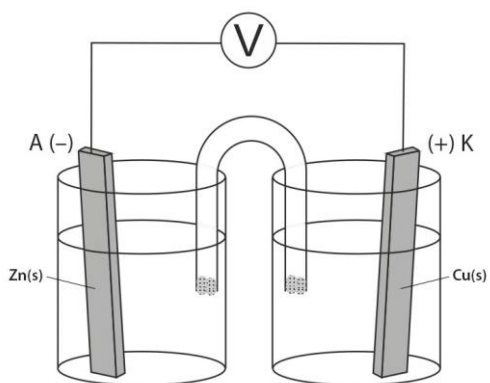


1 BOD

15.2. Smanjenje temperature, povećanje parcijalnog tlaka HCl, povećanje ukupnog tlaka

1 BOD

16.1.



ili

(Priznaje se bilo koja ispravna skica uređaja s označenom anodom i katodom (s ili bez agregacijskog stanja metala.)

1 BOD

16.2. 1,1 V

$$E_{\text{čl}} = E(\text{katoda}) - E(\text{anoda}) = E(\text{Cu}^{2+}/\text{Cu}) - E(\text{Zn}^{2+}/\text{Zn}) = 0,337 \text{ V} - (-0,763 \text{ V})$$

$$E_{\text{čl}} = 1,1 \text{ V}$$

1 BOD

17.1. 11,2 dm³

$$Q = z \cdot \frac{V(\text{H}_2)}{V_m} \cdot F$$

$$V(\text{H}_2) = \frac{Q \cdot V_m}{z \cdot F} = \frac{96500 \text{ C} \cdot 22,4 \text{ dm}^3 \text{ mol}^{-1}}{2 \cdot 96500 \text{ C mol}^{-1}} = 11,2 \text{ dm}^3$$

1 BOD

17.2. 12,5 %

$$P = \frac{|x_i - x_t|}{x_t} \cdot 100\% = \frac{|9,8 \text{ dm}^3 - 11,2 \text{ dm}^3|}{11,2 \text{ dm}^3} \cdot 100\% = 12,5\%$$

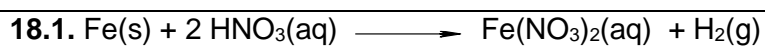
1 BOD

17.3. 0,39 mol

$$pV = nRT$$

$$n(\text{H}_2) = \frac{p \cdot V}{R \cdot T} = \frac{99800 \text{ Pa} \cdot 9,8 \cdot 10^{-3} \text{ m}^3}{8,314 \text{ J K}^{-1} \text{ mol}^{-1} \cdot 300,15 \text{ K}} = 0,39 \text{ mol}$$

1 BOD



1 BOD

18.2. Brzina reakcije će se povećati

1 BOD