

RJEŠENJA ISPITA IZ KEMIJE NA JESENSKOM ROKU DRŽAVNE MATURE

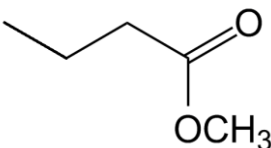
Školska godina 2018./2019.

Rujan, 2019.

Ispitna knjižica 1

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

Ispitna knjižica 2

1.	
1.1. Kalijev fosfat 1 BOD	1.2.  1 BOD

2.

2.1. Plošno-centrirana kubična ćelija. 1 BOD

2.2. Rješenje: $1,26 \times 10^7 \text{ pm}^3 = 1,26 \times 10^{-29} \text{ m}^3$ 1 BOD (tačno rješenje i postupak)

Postupak (priznaju se i drugi tačni postupci):

$$V(\text{j.ć.}) = a^3 = (409 \text{ pm})^3 = 6,84 \times 10^7 \text{ pm}^3 = 6,84 \times 10^{-29} \text{ m}^3$$

$$\text{Broj atoma u jediničnoj ćeliji: } Z = 8 \cdot \frac{1}{8} + 6 \cdot \frac{1}{2} = 1 + 3 = 4$$

$$\begin{aligned} V(\text{atoma srebra}) &= \varphi \cdot V(\text{j. ć.}) / Z \\ &= 0,74 \cdot 6,84 \times 10^7 \text{ pm}^3 / 4 \\ &= 1,26 \times 10^7 \text{ pm}^3 = \mathbf{1,26 \times 10^{-29} \text{ m}^3} \end{aligned}$$

3.

3.1. Rješenje: $2,4 \times 10^{25}$ 1 BOD (tačno rješenje i postupak)

Postupak (priznaju se i drugi tačni postupci):

$$N(\text{Fe}_2\text{O}_3) = n(\text{Fe}_2\text{O}_3) \cdot L = 1,2 \times 10^{25}$$

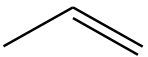
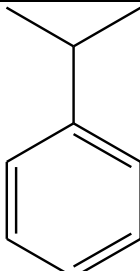
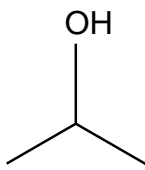
$$N(\text{Fe}^{3+}) = 2N(\text{Fe}_2\text{O}_3) = 2,4 \times 10^{25}$$

3.2. Rješenje: 1344 L 1 BOD (tačno rješenje i postupak)
priznaju se rješenja izražena i u drugim mjernim jedinicama za volumen ako su tačna

Postupak (priznaju se i drugi tačni postupci):

$$n(\text{CO}) = 3n(\text{Fe}_2\text{O}_3) = 3 \cdot 20 \text{ mol} = 60 \text{ mol}$$

$$V(\text{CO}) = V_m \cdot n = 22,4 \text{ L mol}^{-1} \cdot 60 \text{ mol} = 1344 \text{ L}$$

4.		
	SPOJ	STRUKTURNA FORMULA SPOJA
4.1.	A	 ili svaka prihvatljiva strukturna formula 1 BOD
4.2.	B	 ili svaka prihvatljiva strukturna formula 1 BOD
4.3.	C	 ili svaka prihvatljiva strukturna formula 1 BOD
4.4. supstitucija, elektrofilna supstitucija, elektrofilna aromatska supstitucija		1 BOD

5.	
5.1. halogenim elementima	1 BOD
5.2. $2 \text{ Fe(s)} + 3 \text{ Cl}_2\text{(g)} \rightarrow 2 \text{ FeCl}_3\text{(s)}$	1 BOD
5.3. $\text{Cl}_2\text{(g)} + 2 \text{ OH}^-\text{(aq)} \rightarrow \text{ClO}^-\text{(aq)} + \text{Cl}^-\text{(aq)} + \text{H}_2\text{O(l)}$ ili $\text{Cl}_2\text{(g)} + 2 \text{ NaOH(aq)} \rightarrow \text{NaClO(aq)} + \text{NaCl(aq)} + \text{H}_2\text{O(l)}$	1 BOD
5.4. I_2 , (prihvatiti i odgovor I_3^-)	1 BOD

6.	
6.1. Rješenje: 95 000 Pa = 95 kPa = 0,95 bar Postupak (priznaju se i drugi točni postupci): $n_{\text{uk}} = n(\text{N}_2) + n(\text{CO}) + n(\text{H}_2\text{O}) = 25 \text{ mmol} + 5 \text{ mmol} + 10 \text{ mmol} = 40 \text{ mmol}$ $x(\text{N}_2) = \frac{n(\text{N}_2)}{n_{\text{uk}}} = \frac{25 \text{ mmol}}{40 \text{ mmol}} = 0,625$ 1 BOD (točno rješenje i postupak) $p_{\text{uk}} = \frac{p(\text{N}_2)}{x(\text{N}_2)} = \frac{59\,375 \text{ Pa}}{0,625} = 95\,000 \text{ Pa}$ 1 BOD (točno rješenje i postupak)	
6.2. Prosječna kinetička energija gibanja čestica će se povećati 1 BOD	

7.



7.2. Rješenje: **13,4 h = 804,2 min = 48 250 s** **1 BOD (tačno rješenje i postupak)**

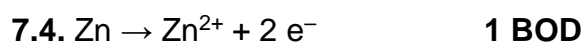
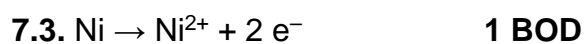
Postupak (priznaju se i drugi tačni postupci):

$$n(\text{Cu}) = \frac{m(\text{Cu})}{M(\text{Cu})} = \frac{31,75 \text{ g}}{63,5 \text{ g mol}^{-1}} = 0,5 \text{ mol}$$

$$Q = I \cdot t$$

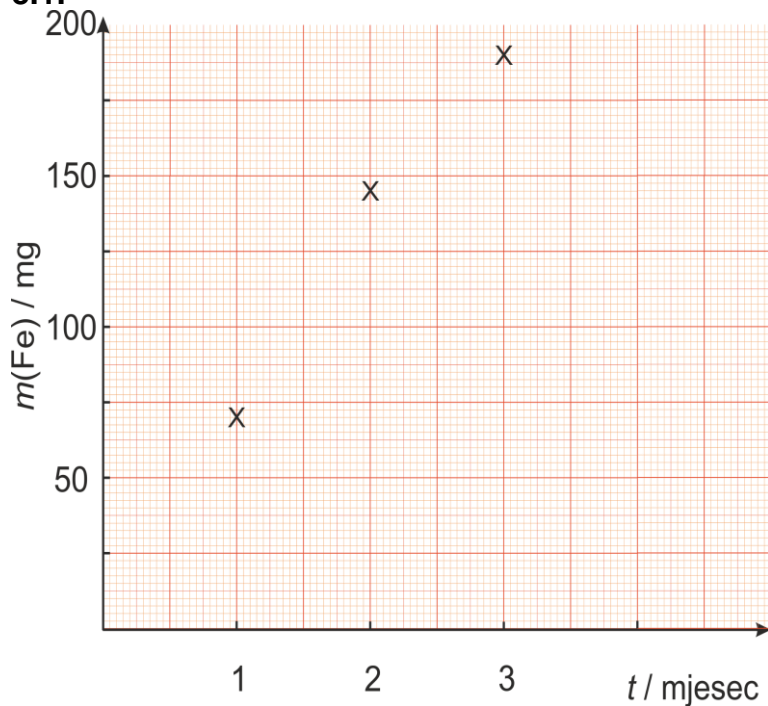
$$Q = znF$$

$$t = \frac{znF}{I} = \frac{2 \cdot 0,5 \text{ mol} \cdot 96\,500 \text{ C mol}^{-1}}{2 \text{ A}} = 48\,250 \text{ s} = 804,2 \text{ min} = 13,4 \text{ h}$$



8.

8.1.



1 BOD Za tačno nacrtan graf (označene osi, označene vrijednosti na osima, ucrtane točke)

8.2. brzina korozije željeza se smanjuje, bila bi manja

1 BOD

9.

9.1. Rješenje: $t > 50\text{ }^{\circ}\text{C}$ 1 BOD (točno rješenje i postupak)

Postupak (priznaju se i drugi točni postupci):

$$w = \frac{m_{\text{sol}}}{m_{\text{sol}} + m_{\text{vode}}} \quad 0,3 = \frac{m_{\text{sol}}}{m_{\text{sol}} + 100\text{ g}} \quad m_{\text{sol}} = (42,8 \pm 0,1)\text{ g}$$

Očitano iz grafa za kalijev klorid: $t > 50\text{ }^{\circ}\text{C}$

9.2. Rješenje: 150 g 1 BOD (točno rješenje i postupak):

Postupak (priznaju se i drugi točni postupci):

Očitavanje iz grafa: pri $41\text{ }^{\circ}\text{C} \rightarrow m(\text{KNO}_3 \text{ u } 100\text{ g vode}) = 60\text{ g}$

$$\begin{aligned} m(\text{KNO}_3 \text{ u } 250\text{ g vode}) &= \frac{m(\text{KNO}_3 \text{ u } 100\text{ g vode}) \cdot 250\text{ g}}{100\text{ g}} = \\ &= \frac{60\text{ g} \cdot 250\text{ g}}{100\text{ g}} = 150\text{ g} \end{aligned}$$

10.

Izraz za konstantu ravnoteže:

$$K_a = \frac{c(\text{H}_3\text{O}^+) \cdot c(\text{F}^-)}{c(\text{HF})} \text{ ili } K_a = \frac{[\text{H}_3\text{O}^+] \cdot [\text{F}^-]}{[\text{HF}]} \quad \mathbf{1\text{ BOD Točno napisan izraz za konstantu}}$$

ravnoteže

Postupak (priznaju se i drugi točni postupci):

$$\text{pH} = -\log(c(\text{H}_3\text{O}^+) / \text{mol dm}^{-3})$$

$$c(\text{H}_3\text{O}^+) = 10^{-\text{pH}} \text{ mol dm}^{-3}$$

$$\text{pH} = 3$$

$$c(\text{H}_3\text{O}^+) = 0,001 \text{ mol dm}^{-3}$$

$$c(\text{HF, disocirano}) = c(\text{F}^-) = c(\text{H}_3\text{O}^+) = 0,001 \text{ mol dm}^{-3}$$

$$c(\text{HF, nedisocirano}) = c_{\text{uk}}(\text{HF}) - c(\text{F}^-) = 0,004 \text{ mol dm}^{-3} - 0,001 \text{ mol dm}^{-3} = 0,003 \text{ mol dm}^{-3}$$

1 BOD Točno izračunata vrijednost $c(\text{HF, nedisocirano})$

Vrijednost konstante ravnoteže :

$$K_a = \frac{c(\text{H}_3\text{O}^+)^2}{c(\text{HF, nedisocirano})} = \frac{(0,001 \text{ mol dm}^{-3})^2}{0,003 \text{ mol dm}^{-3}} = 3,33 \times 10^{-4} \text{ mol dm}^{-3} \quad \mathbf{1\text{ BOD Točno}}$$

izračunata vrijednost konstante ravnoteže

11.

11.1. Oksidacija: $\text{Zn} \rightarrow \text{Zn}^{2+} + 2 \text{e}^-$ **1 BOD**

11.2. Redukcija: $\text{NO}_3^- + 8 \text{e}^- + 10 \text{H}^+ \rightarrow \text{NH}_4^+ + 3 \text{H}_2\text{O}$ **1 BOD**

11.3. Reakcija:

$4 \text{Zn(s)} + 10 \text{HNO}_3(\text{aq}) \rightarrow 4 \text{Zn(NO}_3)_2(\text{aq}) + \text{NH}_4\text{NO}_3(\text{aq}) + 3 \text{H}_2\text{O(l)}$ **1 BOD**

12.

12.1. $\text{H}_2\text{SO}_4(\text{aq}) + \text{Na}_2\text{SO}_3(\text{s}) \rightarrow \text{SO}_2(\text{g ili aq}) + \text{Na}_2\text{SO}_4(\text{aq}) + \text{H}_2\text{O(l)}$ **1 BOD**

12.2. Rješenje:

Mjerodavni reaktant je H_2SO_4 . 1 BOD (uz postupak)

Množina neizreagiranog reaktanta je 0,17 mol

1 BOD (točna vrijednost i postupak)

Postupak (priznaju se i drugi točni postupci):

$n(\text{Na}_2\text{SO}_3) = m(\text{Na}_2\text{SO}_3) / M(\text{Na}_2\text{SO}_3) = 46,7 \text{ g} / 126,1 \text{ g mol}^{-1} = 0,37 \text{ mol}$

$n(\text{H}_2\text{SO}_4) = c(\text{H}_2\text{SO}_4) \times V(\text{H}_2\text{SO}_4) = 2,0 \text{ mol dm}^{-3} \times 0,1 \text{ dm}^3 = 0,2 \text{ mol}$

1 BOD (za točno izračunate obje množine tvari)

$n(\text{Na}_2\text{SO}_3, \text{ neizreagirano}) = n(\text{Na}_2\text{SO}_3, \text{ početno}) - n(\text{Na}_2\text{SO}_3, \text{ izreagirano})$

$= 0,37 \text{ mol} - 0,2 \text{ mol} = 0,17 \text{ mol}$