



PERIODNI SUSTAV ELEMENATA

17 18

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H 1.00797	2 He 4.0026	3 Li 6.939	4 Be 9.0122	5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183	11 Na 22.9898	12 Mg 24.312	13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	†89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

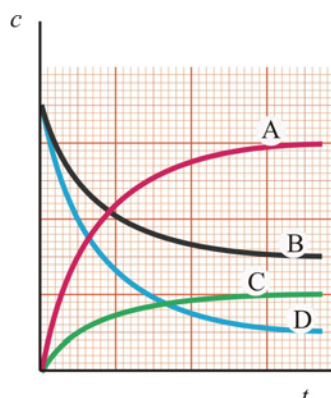
Lantanidi

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97
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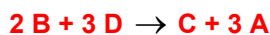
Aktinidi

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)
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1. Na crtežu je prikazana ovisnost koncentracije reaktanata i produkata reakcije o vremenu.



a) Napišite jednadžbu kemijske reakcije.



b) Koji je mjerodavni reaktant? **D**

ostv max

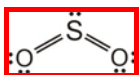
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2. Napišite Lewisove strukturne formule sljedećih jedinaka, opišite im geometriju (piramidalna, oktaedarska, planarna, tetraedarska, linearna, nelinearna, itd.) i navedite jesu li polarne:

a) SO<sub>2</sub>

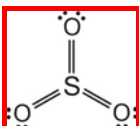


nelinearna

polarna

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b) SO<sub>3</sub>

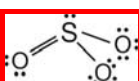


planarna

nepolarna

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c) SO<sub>3</sub><sup>2-</sup>

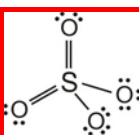


piramidalna

polarna

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d) SO<sub>4</sub><sup>2-</sup>

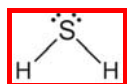


tetraedarska

nepolarna

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e) H<sub>2</sub>S



nelinearna

polarna

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po 0,5 boda za formulu, za geometriju i polarlost

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UKUPNO BODOVA NA STRANICI 1:

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- 3.** U litri vode otopljeno je po 2 grama natrijeva klorata ( $\text{NaClO}_3$ ), natrijeva sulfata ( $\text{Na}_2\text{SO}_4$ ) i natrijeva fosfata ( $\text{Na}_3\text{PO}_4$ ) i otopina je nadopunjena vodom do ukupnog volumena od 2 litre. Kolika je koncentracija natrijevih iona u otopini?

$\text{NaClO}_3$ :  $M = 106,5 \text{ g/mol}$ ;  $n_1 = \frac{m}{M} = \frac{2}{106,5} \text{ mol} = 18,8 \text{ mmol}$

$\text{Na}_2\text{SO}_4$ :  $M = 142 \text{ g/mol}$ ;  $n_2 = \frac{m}{M} = \frac{2}{142} \text{ mol} = 14,1 \text{ mmol}$

$\text{Na}_3\text{PO}_4$ :  $M = 164 \text{ g/mol}$ ;  $n_3 = \frac{m}{M} = \frac{2}{164} \text{ mol} = 12,2 \text{ mmol}$

$c(\text{Na}^+) = \frac{n_1 + 2n_2 + 3n_3}{V} = \frac{18,8 + 2 \cdot 14,1 + 3 \cdot 12,2}{2} \cdot \frac{\text{mmol}}{\text{L}} = 41,8 \frac{\text{mmol}}{\text{L}}$

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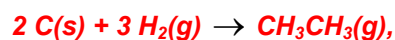
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- 4.** Na temelju standardne entalpije izgaranja etana ( $-2220 \text{ kJ/mol}$ ), ugljika ( $-393,5 \text{ kJ/mol}$ ) i vodika ( $-285,8 \text{ kJ/mol}$ ) izračunajte standardnu entalpiju stvaranja etana.



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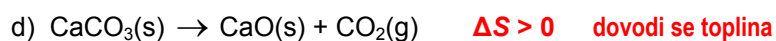
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- 5.** Odredite predznake promjene entropije uz kratko obrazloženje za sljedeće procese:



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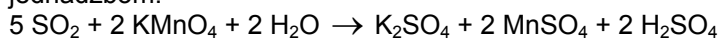
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pola boda za predznak, pola za objašnjenje

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6. Reakcija sumporova dioksida s kalijevim permanganatom opisana je jednačbom:



Kolika će biti koncentracija sumporne kiseline ako se kroz 250 mL otopine  $\text{KMnO}_4$  propuhivalo 10 litara zraka pri tlaku od 110 kPa i 22 °C koji sadrži  $\text{SO}_2$  u volumnom udjelu od 0,02 %?

$$V(\text{SO}_2) = \varphi(\text{SO}_2) \cdot V(\text{zrak}) = 2 \times 10^{-4} \cdot 10 \text{ L} = 2 \text{ mL}$$

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$$n(\text{SO}_2) = \frac{pV}{RT} = \frac{1,10 \times 10^5 \text{ Pa} \cdot 2 \times 10^{-6} \text{ m}^3}{8,31 \text{ J K}^{-1} \text{ mol}^{-1} \cdot 295 \text{ K}} = 90 \text{ } \mu\text{mol}$$

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$$n(\text{H}_2\text{SO}_4) = \frac{2}{5} \cdot n(\text{SO}_2) = \frac{2}{5} \cdot 90 \text{ } \mu\text{mol} = 36 \text{ } \mu\text{mol}$$

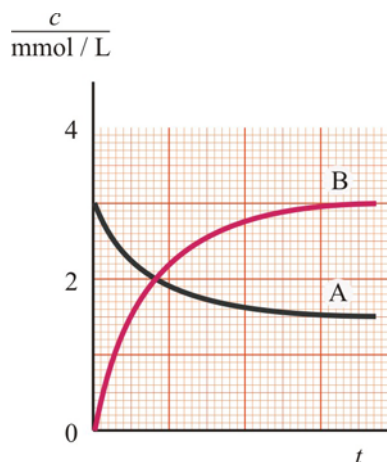
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$$c(\text{H}_2\text{SO}_4) = \frac{n}{V} = \frac{36 \text{ } \mu\text{mol}}{0,25 \text{ L}} = 144 \text{ } \mu\text{mol/L}$$

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7. Na crtežu je prikazana ovisnost koncentracije reaktanta i produkta reakcije o vremenu. Napišite jednačbu kemijske reakcije. Koliko iznosi koncentracijska konstanta ravnoteže?



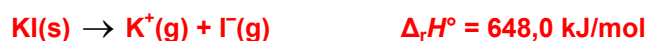
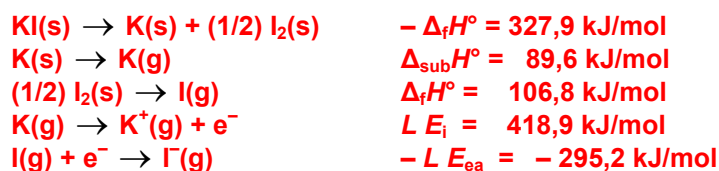
$$K_c = \frac{c_B^2}{c_A} = \frac{3^2}{1,5} \frac{\text{mmol}}{\text{L}} = 6 \text{ mmol/L}$$

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8. Izračunajte standardnu entalpiju kristalne rešetke kalijeva jodida na temelju sljedećih podataka:  $\Delta_{\text{sub}}H^\circ(\text{K}) = 89,6 \text{ kJ/mol}$ ,  $\Delta_f H^\circ(\text{I}, \text{g}) = 106,8 \text{ kJ/mol}$ ,  $\Delta_f H^\circ(\text{KI}, \text{s}) = -327,9 \text{ kJ/mol}$ ,  $E_i(\text{K}) = 4,341 \text{ eV}$ ,  $E_{\text{ea}}(\text{I}) = 3,059 \text{ eV}$ .  
( $\text{eV} = 1,602 \times 10^{-19} \text{ J}$ )



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/0,5  
/1  
/1,5  
/1,5

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9. Koliko će biti sniženje ledišta vode, ako u 400 mL vode otopimo 2,93 grama kuhinjske soli i 6,84 grama šećera (saharoze,  $M_r = 342$ )? Krioskopska konstanta vode je  $1,86 \text{ K kg mol}^{-1}$ .

$$\Delta T = (i_1 b_1 + i_2 b_2) K_{\text{kr}} = \frac{i_1 n_1 + i_2 n_2}{m_w} \cdot K_{\text{kr}} = \frac{i_1 (m_1 / M_1) + i_2 (m_2 / M_2)}{m_w} \cdot K_{\text{kr}}$$

$$\Delta T = \frac{\left( 2 \cdot \frac{2,93}{58,5} \text{ mol} + 1 \cdot \frac{6,84}{342} \text{ mol} \right)}{0,4 \text{ kg}} \cdot 1,86 \text{ K kg mol}^{-1} = 0,559 \text{ K}$$

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1. stranica

2. stranica

3. stranica

4. stranica

Ukupni bodovi

	+		+		+		=	50
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UKUPNO BODOVA NA STRANICI 4:

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