

# ФИЗИЧКА ХЕМИЈА

## ГАСНИ ЗАКони

1) 1

**Решење: в**

$$p_1/T_1 = p_2/T_2 \quad (0,5)$$

већа температура  $\Rightarrow$  већи притисак  $(0,5)$

2) 1

**Решење: 313°C**

$$p_1/T_1 = p_2/T_2 \quad T_2 = p_2 \cdot T_1 / p_1 \quad (0,5)$$

$$T_2 = 2 \cdot 10^5 \cdot 293 / 1 \cdot 10^5 = 586 \text{ K} \quad t = 313^\circ \text{C} \quad (0,5)$$

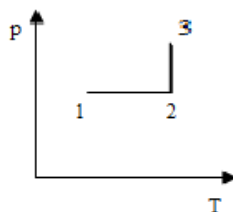
3) 0,5

**Решење: б**

4) 1

**Решење:**

$$p_2 V_2 = p_3 V_3 \quad (0,5)$$



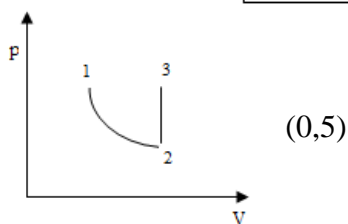
$(0,5)$

5) 1

**Решење:**

линија 1-2

линија 2-3  $(0,5)$



$(0,5)$

6) 1

**Решење: 1190,5kg**

$$pV = nRT \quad m = MpV/RT \quad (0,5)$$

$$m = 0,029 \cdot 10^5 \cdot (5 \cdot 200) / (8,314 \cdot 293) = 1190,5 \text{ kg} \quad (0,5)$$

7) 1

**Решење: 1,407 bar**

$$pV = nRT \quad p = mRT/MV \quad (0,5)$$

$$p = 25 \cdot 8,314 \cdot 298 / (44 \cdot 10 \cdot 10^{-3}) = 1,407 \cdot 10^5 \text{ Pa} \quad p = 1,407 \text{ bar} \quad (0,5)$$

8) 2

**Решење: в**

$$p_1 V = n_1 RT \quad p_2 V = n_2 RT \quad (0,5)$$

запремина и температура су константне  $\Rightarrow p_1/p_2 = n_1/n_2 \quad (0,5)$

$$n_1 = 3 \text{ mol (1 mol CH}_4 \text{ i 2 mol O}_2) \quad n_2 = 1 \text{ mol (1 mol CO}_2 \text{ а вода је кондензовала)} \quad (0,5)$$

$$p_1/p_2 = 3/1 \quad \text{притисак у суду се смањи три пута} \quad (0,5)$$

9) 2

**Решење: Cl<sub>2</sub>**

$$pV = nRT \quad pV = (m/M) RT \Rightarrow pM = \rho RT \Rightarrow \rho = pM/RT \quad (0,5)$$

$$p, R, T \text{ је const.} \Rightarrow \rho_1 : \rho_2 : \rho_3 = M_1 : M_2 : M_3 \quad (0,5)$$

$$4 \text{ g/mol} : 71 \text{ g/mol} : 17 \text{ g/mol} \quad (0,5)$$

$$\text{He} \quad \text{Cl}_2 \quad \text{NH}_3 \quad \text{хлор има највећу густину} \quad (0,5)$$

10) 2

Решење: 75%

$$pV=nRT \quad V=nRT/p \quad RT/p = \text{const.} \quad (0,5)$$

$$V_1:V_2=n_1:n_2 \quad (0,5)$$

$$V_1:V_2=1,5\text{mol H}_2:0,5\text{mol N}_2 \quad (0,5)$$

$$(1,5+(0,5) : 1,5 = 100\% : x \quad x=75\% \quad (0,5)$$

11) 1,5

Решење: 1,146 m<sup>3</sup>

$$p \cdot V = n \cdot R \cdot T \quad (0,5)$$

$$p \cdot V = \frac{m}{M} \cdot R \cdot T \quad V = \frac{m \cdot R \cdot T}{p \cdot M} \quad (0,5)$$

$$V = 1,85\text{kg} \cdot 8,314\text{Jmol}^{-1}\text{K}^{-1} \cdot 298\text{K} / (250 \cdot 10^3\text{Pa} \cdot 16 \cdot 10^{-3}\text{kgmol}^{-1}) = 1,146 \text{ m}^3 \quad (0,5)$$

12) 1,5

Решење: 2,49 · 10<sup>22</sup> молекула

$$p \cdot V = n \cdot R \cdot T \quad (0,5)$$

$$n = p \cdot V / (R \cdot T) = 10^5 \cdot 943,4 \cdot 10^{-6} / (8,314 \cdot 273) = 0,04156\text{mol} \quad (0,5)$$

$$N = n \cdot N_A = 0,04156\text{mol} \cdot 6 \cdot 10^{23} \text{ mol}^{-1} = 2,49 \cdot 10^{22} \quad (0,5)$$

13) 2

Решење: m=0,32g ρ= 1,4285 kg/m<sup>3</sup>

$$pV = nRT \quad (0,5)$$

$$pV = (m/M)RT \quad m = pVM/RT \quad (0,5)$$

$$\text{или } p = \rho RT/M \quad \rho = pM/RT \quad (0,5)$$

$$m = 101325 \cdot 224 \cdot 10^{-6} \cdot 32 \cdot 10^{-3} / (8,314 \cdot 273) = 0,32\text{g} \quad (0,5)$$

$$\rho = 101325 \cdot 32 \cdot 10^{-3} / (8,314 \cdot 273) = 1,4285 \text{ kg/m}^3 \quad (0,5)$$

$$\rho = m/V = 0,32 / (224 \cdot 10^{-6}) = 1,4285 \text{ kg/m}^3 \quad (0,5)$$

$$m = \rho V \quad m = 1428,5 \cdot 224 \cdot 10^{-6} = 0,32\text{g} \quad (0,5)$$

## ДИСПЕРЗНИ СИСТЕМИ

14) 1

Решење: а) 1 (0,5) б) 2 (0,5)

15) 2

Решење: а) да (0,5) б) 60%А 40%В (0,5) в) 60°C (0,5) 40%А 60%В (0,5)

16) 2

Решење: а) 20% (0,5) б) 20%НCl 80%Н<sub>2</sub>О (0,5) азеотропска смеша (0,5) в) не (0,5)

17) 1,5

Решење: в

$$2,303\log(p/p^0) = (\Delta H_{\text{isp}}/R)(1/T^0) - (1/T) \quad (0,5)$$

$$2,303\log(p/101325) = (30000/8,314) \cdot (1/342 - 1/333) \quad (0,5)$$

$$P = 76032,6\text{Pa} = 76,0\text{KPa} \quad (0,5)$$

18) 1

Решење:

није тачан (0,5)

Напон паре течности зависи само од природе течности и температуре,

а не зависи од количине течности. (0,5)

19) 1

**Решење:  $\Delta p = 12,389 \text{ Pa}$**

$$\Delta p = p_0 \cdot x_M \quad (0,5)$$

$$x_M = (54,1/182,2) / [(54,1/182,2) + (1000/18)] = 0,00532$$

$$\Delta p = 2338,082 \cdot 0,00532 = 12,389 \text{ Pa} \quad (0,5)$$

20) 1,5

**Решење:  $M_g = 179 \text{ g/mol}$**

$$p = p_v^0 \cdot x_v \quad (0,5)$$

$$p = p_v^0 \cdot n_v / (n_v + n_g)$$

$$\Rightarrow n_g = n_v \cdot (p_v^0 - p) / p = (108/18) \cdot (101325 - 98775,3) / 98775,3 = 0,151 \text{ mol} \quad (0,5)$$

$$M_g = m_g / n_g = 27 \text{ g} / 0,151 \text{ mol} = 178,81 \text{ g/mol} \quad (0,5)$$

21) 2

**Решење:  $p = 8290,02 \text{ Pa}$**

$$x_m = 2 / (3+2) = 0,4 \quad x_e = 3 / (3+2) = 0,6 \quad (0,5)$$

$$p_A = p_A^0 \cdot x_A \quad (0,5)$$

$$p_m = 11825,7 \cdot 0,4 = 4730,28 \text{ Pa} \quad p_e = 5932,9 \cdot 0,6 = 3559,74 \text{ Pa} \quad (0,5)$$

$$p = p_m + p_e = 4730,28 + 3559,74 = 8290,02 \text{ Pa} \quad (0,5)$$

22) 2

**Решење:  $b = 1,134 \text{ mol/kg}$**

$$p = p_v^0 \cdot x_v$$

$$p = p_v^0 \cdot n_v / (n_v + n) \quad (0,5)$$

$$n_v = 1 \text{ kg} / 18 \text{ g/mol} = 55,56 \text{ mol} \quad (0,5)$$

$$\text{ако се са } 100 \text{ означаи } p_v^0, \text{ тада је } p = (100 - 2) = 98$$

$$\text{или } x_v = p / p_v^0 = 98 / 100 = 0,98 \Rightarrow 0,98 = 55,56 / (55,56 + n) \quad (0,5)$$

$$n = n_v \cdot (p_v^0 - p) / p_v^0 = 55,56 \cdot (100 - 98) / 98 \quad \text{или } n = 55,56 \cdot (1 - 0,98) / 0,98$$

$$n = 1,134 \text{ mol у } 1 \text{ kg воде; } b = 1,134 \text{ mol/kg} \quad (0,5)$$

23) 2

**Решење:  $m_v = 675,46 \text{ g}$**

$$p_a = p_v + p_{ug} \quad (0,5)$$

$$p_v = p_a - p_{ug} = 101325 - 21320 = 80005 \text{ Pa}$$

$$n_{ug} = m / M = 1000 / 100 = 10 \text{ mol}$$

$$n_{ug} / n_v = p_{ug}^0 / p_v^0 \quad (0,5)$$

$$n_v = 10 \cdot 80005 / 21320 = 37,53 \text{ mol} \quad (0,5)$$

$$m_v = 37,53 \text{ mol} \cdot 18 \text{ g/mol} = 675,46 \text{ g} \quad (0,5)$$

24) 2,5

**Решење:  $M_t = 139,17 \text{ g/mol}$   $\delta M_t = 2,16\%$**

$$m_v / m_t = w_v / w_t = 0,43 / 0,57 = 0,75$$

$$m_v / m_t = n_v M_v / n_t M_t = 0,75 \quad (0,5)$$

$$m_v / m_t = p_v M_v / p_t M_t = 0,75 \quad (0,5)$$

$$M_t = 8,64 \cdot 10^4 \cdot 18 / (1,49 \cdot 10^4 \cdot 0,75) = 139,17 \text{ g/mol} \quad (0,5)$$

$$\Delta M_t = 139,17 \text{ g/mol} - 136,23 \text{ g/mol} = 2,94 \text{ g/mol} \quad (0,5)$$

$$\delta M_t = 100\% \cdot (2,94 \text{ g/mol} / 136,23 \text{ g/mol}) = 2,16\% \quad (0,5)$$

25) 1

**Решење: a**

26) 1,5

Решење:

удео NaCl у смеши	t[°C]	искристалисаће само вода	искристалисаће цео раствор
10%	0	да	не
повећава се	од 0 до -21,2	да	не
22,4%	-21,2	не	да

сваки ред по 0,5      3x0,5

27) 2,5

Решење: 3

$$\Delta T_f = K_f \cdot n_A / m \quad (0,5)$$

$$\Delta T_{f(V)} = K_{f(V)} \cdot (m/M_A) / m_V$$

$$\Delta T_{f(B)} = K_f \cdot (m/M_A) / m_B \quad (0,5)$$

$$\Delta T_{f(V)} / \Delta T_{f(B)} = K_{f(V)} \cdot (m/M_A) / m_V / K_f \cdot (m/M_A) / m_B \quad (0,5)$$

$$\Delta T_{f(V)} / \Delta T_{f(B)} = K_{f(V)} \cdot M_A / K_f \cdot M_A \quad (0,5)$$

$$M_{AV} / M_{AB} = 1,395 \cdot 5,12 / 1,280 \cdot 1,86 = 3 \quad (0,5)$$

28) 1,5

Решење: 9,89 g

$$\Delta T_f = K_f \cdot n_g / m_v \quad (0,5)$$

$$\Delta T_f = K_f \cdot (m_g/M_g) / m_v$$

$$m_g = \Delta T_f \cdot m_v \cdot M_g / K_f \quad (0,5)$$

$$m_g = 2K \cdot 0,1 \text{kg} \cdot 0,92 \text{kg/mol} / 1,86 \text{Kkg/mol} = 0,00982 \text{kg} = 9,89 \text{g} \quad (0,5)$$

29) 2,5

Решење:  $\alpha = 85\%$

$$\Delta T_f = K_f \cdot n / m_v \quad (0,5)$$

$$\Delta T_f = K_f \cdot (m/M) / m_v$$

$$M = K_f \cdot m / (\Delta T_f \cdot m_v) = 1,86 \cdot 0,00276 / (0,5 \cdot 0,25) = 0,041069 \text{kg/mol} = 41,069 \text{g/mol} \quad (0,5)$$



$$i = 1 + \alpha \cdot (z-1) = 1 + 2\alpha \quad (0,5)$$

$$i = M/M \quad (0,5)$$

$$1 + 2\alpha = 111 / 41,069 \Rightarrow \alpha = 0,85 = 85\% \quad (0,5)$$

30) 1

Решење: 355,52K

$$\Delta T_b = K_b \cdot n / m = 2,67 \text{Kkg/mol} \cdot (1 \text{g} / 123 \text{g/mol}) / 0,01 \text{kg} = 2,17 \text{K} \quad (0,5)$$

$$t = 80,2^\circ\text{C} + 2,17^\circ\text{C} = 82,37^\circ\text{C} \quad T = 355,52 \text{K} \quad (0,5)$$

## ТЕРМОДИНАМИКА

31) 1

Решење:  $\Delta H = -301 \text{kJ/mol}$

$$\Delta H = 2 \cdot \Delta H_f^\circ(\text{SO}_3(\text{g})) - [2 \cdot \Delta H_f^\circ(\text{SO}_2(\text{g})) + \Delta H_f^\circ(\text{O}_2(\text{g}))] \quad (0,5)$$

$$\Delta H_f^\circ(\text{SO}_2(\text{g})) = (2 \cdot (-395,2) - (-188,4)) / 2 = -301 \text{kJ/mol} \quad (0,5)$$

32) 2

**Решење:**  $\Delta Q = 15,135 \text{ kJ/mol}$

$$Q = (mc + C_k) \cdot \Delta t \quad (0,5)$$

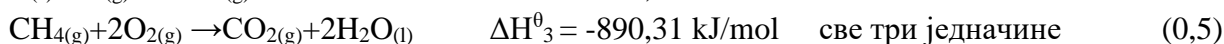
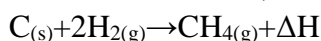
$$Q = (1,47 + 528,5) \cdot 4,109 + 232,24 \cdot 0,17 = 408,65 \text{ J} \quad (0,5)$$

$$n = \frac{m}{M} = \frac{1,47}{53,5} = 0,027 \text{ mol} \quad (0,5)$$

$$\Delta H = Q/n = -408,65/0,027 = 15135 \text{ J/mol} \quad (0,5)$$

33) 1,5

**Решење:**  $\Delta H = -65,98 \text{ KJ/mol}$



$$\Delta H = 2 \Delta H^{\theta}_1 + \Delta H^{\theta}_2 - \Delta H^{\theta}_3 \quad (0,5)$$

$$\Delta H = 2(-286,39) + (-383,51) - (-890,31) = -65,98 \text{ KJ/mol} \quad (0,5)$$

34) 1,5

**Решење:**  $Q = 14,13 \text{ kJ}$

$$M(C_2H_4) = 28 \text{ g/mol} \quad n = 10 \text{ mol} \quad (0,5)$$

$$1 \text{ mol: } 1412,9 \text{ J} = 10 \text{ mol: } Q \quad \text{или} \quad Q = n \cdot \Delta H = 10 \text{ mol} \cdot 1412,9 \text{ J/mol} \quad (0,5)$$

$$Q = 14129 \text{ J} \quad (0,5)$$

35) 1

**Решење:**  $Q = 127,5 \text{ GJ}$

$$1 \text{ dm}^3 : 25,5 \text{ MJ} = 5000 \text{ dm}^3 : Q \quad (0,5) \quad Q = 127500 \text{ MJ} \quad (0,5)$$

36) 2

**Решење:**  $Q = 90,28 \text{ GJ}$

$$n = 5000000 \text{ g} / 17 \text{ g/mol} = 294117,65 \text{ mol}$$

$$\text{прва фаза: } 4 \text{ mol} : 904 \text{ kJ} = 294117,65 \text{ mol} : Q_1 \quad Q_1 = 66,5 \text{ GJ} \quad (0,5)$$

$$\text{друга фаза: } 4 \text{ mol} : 2 \cdot 113 \text{ kJ} = 294117,65 \text{ mol} : Q_2 \quad Q_2 = 16,62 \text{ GJ} \quad (0,5)$$

$$\text{трећа фаза: } 4 \text{ mol} : 4/3 \cdot 73 \text{ kJ} = 294117,65 \text{ mol} : Q_3 \quad Q_3 = 7,16 \text{ GJ} \quad (0,5)$$

$$\text{Укупно: } Q = Q_1 + Q_2 + Q_3 = 90,28 \text{ GJ} \quad (0,5)$$

37) 1,5

**Решење:**  $t = 34^{\circ}\text{C}$

$$Q = mc\Delta t \quad Q_1 = Q_2 \quad (0,5)$$

$$42 \cdot \rho \cdot c \cdot (60 - t) = 78 \cdot \rho \cdot c \cdot (t - 20) \quad (0,5)$$

$$t = (42 \cdot 60 + 78 \cdot 20) / (42 + 78) = 34^{\circ}\text{C} \quad (0,5)$$

38) 2

**Решење:**  $t = 40^{\circ}\text{C}$

$$Q = mc\Delta t \quad (0,5)$$

$$Q_1 = Q_2 + 0,15 Q_1 \quad (0,5)$$

$$60 \cdot c \cdot (90 - t) = 150 \cdot c \cdot (t - 23) + 0,15 \cdot 60 \cdot c \cdot (90 - t) \quad (0,5)$$

$$60 \cdot 90 - 60t = 150 \cdot t - 150 \cdot 23 + 0,15 \cdot 60 \cdot 90 - 0,15 \cdot 60t$$

$$t = 8040 / 201 = 40^{\circ}\text{C} \quad (0,5)$$

39) 1,5

Решење: 6

$$Q_1 + Q_2 = Q_3$$

$$m_1 c_1 (t_k - t_1) + m_2 c_2 (t_k - t_2) = m_3 c_3 (t_3 - t_k) \quad (0,5)$$

$$0,4 \cdot 4,19 \cdot 10^3 \cdot 8,4 + 0,06 \cdot 0,92 \cdot 10^3 \cdot 8,4 = 0,5 \cdot c_3 \cdot 76,6 \quad (0,5)$$

$$c_3 = 0,38 \cdot 10^3 \text{ J/kg K} \quad (0,5)$$

40) 2

Решење: 600J

изобарски процес  $V_1/T_1 = V_2/T_2$  (0,5)

$$V_2 = 12 \cdot 10^{-3} \cdot 450/300 = 18 \cdot 10^{-3} \text{ m}^3 \quad (0,5)$$

$$w = -p \cdot \Delta V = -p(V_2 - V_1) \quad (0,5)$$

$$w = -100 \cdot 10^3 \text{ Pa} \cdot 6 \cdot 10^{-3} \text{ m}^3 = -600 \text{ J} \quad (0,5)$$

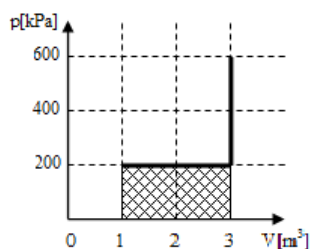
41) 1,5

Решење:  $w = -4 \cdot 10^5 \text{ J}$  или  $w = +4 \cdot 10^5 \text{ J}$

$$w = -p \cdot \Delta V$$

$$w = -200000 \cdot 2 \text{ J}$$

(0,5)



(1)

42) 3,5

Решење:  $w = -p \cdot \Delta V$  или  $w = +p \cdot \Delta V$

назив процеса 3x0,5 рад 4x0,5

промена	назив процеса	рад [ J ]
1-2	изобарски	$-6 \cdot 10^5$
2-3	изохорски	0
3-4	изобарски	$-4 \cdot 10^5$
циклус: укупни рад		$-1 \cdot 10^6$

43) 2

Решење:

промена	T [K]		рад [kJ]	$\Delta U$ [kJ]	Q [kJ]
	стање 1	стање 2			
1-2	стање 1	481	0	120	120
	стање 2	1443			

$$20000 \cdot 2 = 10 \text{ mol} \cdot 8,314 \text{ Jmol}^{-1} \text{ K}^{-1} \cdot T_1$$

$$60000 \cdot 2 = 10 \text{ mol} \cdot 8,314 \text{ Jmol}^{-1} \text{ K}^{-1} \cdot T_2 \quad \text{или за изохорски процес } 20/481 = 60/T_2 \quad (0,5)$$

за изохорски процес

$$\Delta U = n C_V \Delta T = 10 \cdot (3/2) \cdot 8,314 \cdot (1443 - 481) = 119971,02 \text{ J} = 120 \text{ kJ} \quad (0,5)$$

$$Q = \Delta U \quad (0,5)$$

$$w = 0 \text{ J} \quad \text{или} \quad A = p \cdot \Delta V = 40000 \cdot 0 = 0 \text{ J} \quad (0,5)$$

44) 1

Решење:  $\eta = 80\%$

$$\eta = w/Q \quad \text{или} \quad \eta = (Q_1 - Q_2)/Q_1 \quad (0,5)$$

$$\eta = (4/5Q)/Q = 0,8 \quad (0,5)$$

45) 2

**Решење:**  $\eta=33,3\%$   $T_1=420\text{ K}$

$$\eta=w/Q \quad (0,5)$$

$$\eta=(1/3Q)/Q=0,333 \quad (0,5)$$

$$\eta=(T_1-T_2)/T_1 \quad (0,5)$$

$$0,333=(T_1-280)/T_1$$

$$T_1=280/0,667=420\text{ K} \quad (0,5)$$

46) 1,5

**Решење:**  $m=60\text{ kg}$

$$\eta=Q/Q_u \quad (0,5)$$

$$Q_u=0,36\text{ GJ}/0,20=1,8\text{ GJ} \quad (0,5)$$

$$m=1,8\text{ GJ}/30\text{ MJ/kg}=1,80 \cdot 10^9\text{ J}/30 \cdot 10^6\text{ J/kg}=60\text{ kg} \quad (0,5)$$

47) 1,5

**Решење:**  $\Delta S$

$$\Delta S_{\text{систем}}=41\text{ J/molK}-63\text{ J/molK}=-22\text{ J/molK} \quad (0,5)$$

$$\Delta S_{\text{околна}}=6000\text{ J/mol}/273\text{ K}=+22\text{ J/molK} \quad (0,5)$$

$$\Delta S_{\text{укупно}}=-22\text{ J/molK}+20\text{ J/molK}=0\text{ J/molK} \quad \text{систем је у равнотежи,}$$

лед и течна вода могу да буду у равнотежи неограничено дуго  $(0,5)$

48) 2

**Решење:**

	Процес	повећава/смањује неуређеност система	процес је/није спонтан
1.	кристализација плавог камена	смањује	није спонтан
2.	стварање пене на пиву	повећава	је спонтан
3.	растварање шећера у води	повећава	је спонтан
4.	топљење коцкица леда у чаши са водом	повећава	је спонтан

сваки ред тачан  $4 \times (0,25+0,25)$

49) 1

**Решење:**  $2865\text{ kJ}$

$$\Delta G^0=\Delta H^0-T\Delta S^0=-2808\text{ kJ mol}^{-1}-(310\text{ K}) \cdot (182,4\text{ J K}^{-1}\text{ mol}^{-1})=-2865\text{ kJ mol}^{-1}$$

50) 1,5

**Решење:** да

$$\text{прва реакција } \Delta G^0=(-743)+4 \cdot (-300)-(2 \cdot (-160)+0)=-1623\text{ kJ} \quad (0,5)$$

$$\text{друга реакција } \Delta G^0=(-745+2 \cdot (-78,9)+0)-(-534)+2 \cdot (-4,6)+(-237)=-122,6\text{ kJ} \quad (0,5)$$

$$\text{обе реакције су спонтане } (\Delta G^0 < 0) \quad (0,5)$$

## ХЕМИЈСКА КИНЕТИКА

51) 1

**Решење:**  $k=0,050\text{ min}^{-1}$

$$k_1=\frac{2,303}{t} \log \frac{c_0}{c}=\frac{2,303}{t} \log \frac{\alpha_0-\alpha_\infty}{\alpha_t-\alpha_\infty} \quad (0,5)$$

$$k_1=\frac{2,303}{17,6} \log \frac{[25,16-(-8,38)]}{[5,48-(-8,38)]}=0,050\text{ min}^{-1} \quad (0,5)$$

52) 1

Решење:  $K=4$

$$K = \frac{x_{EA} \cdot x_{H_2O}}{x_{SK} \cdot x_E} \quad (0,5)$$

$$K = \frac{\frac{0,667}{2} \cdot \frac{0,667}{2}}{\left(\frac{1-0,667}{2}\right) \cdot \left(\frac{1-0,667}{2}\right)} = 4 \quad (0,5)$$

53) 2

Решење: да

$$k = (2,303/\tau) \cdot \log(C_0/C_\tau) \quad (0,5)$$

$$k_1 = (2,303/15) \cdot \log(25/9,8) = 0,0624 \text{ min}^{-1} \quad (0,5)$$

$$k_2 = (2,303/30) \cdot \log(25/3,8) = 0,0627 \text{ min}^{-1} \quad (0,5)$$

$$k_1 \approx k_2 \text{ значи да је реакција првог реда} \quad (0,5)$$

54) 1,5

Решење: 81

$$v_1 = k \cdot [H_2]^3 \cdot [N_2] \quad (0,5)$$

$$v_2 = k \cdot (3 \cdot [H_2])^3 \cdot (3 \cdot [N_2]) = 81 \cdot k \cdot [H_2]^3 \cdot [N_2] \quad (0,5)$$

$$v_2 = 81 v_1 \quad (0,5)$$

или

$$v_1 = k \cdot p_{(H_2)}^3 \cdot p_{(N_2)} \quad (0,5)$$

$$v_2 = k \cdot (3 \cdot p_{(H_2)})^3 \cdot (3 \cdot p_{(N_2)}) = 81 \cdot k \cdot p_{(H_2)}^3 \cdot p_{(N_2)} \quad (0,5)$$

$$v_2 = 81 v_1 \quad (0,5)$$

55) 1,5

Решење: 271 s

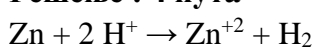
$$k = (2,303/\tau) \cdot \log(c_0/c_\tau) \quad (0,5)$$

$$k = (2,303/60) \cdot \log(100/70) = 0,00594s^{-1} \quad (0,5)$$

$$\tau = (2,303/k) \cdot \log(c_0/c_\tau) = (2,303/0,00594) \cdot \log(100/20) = 271s \quad (0,5)$$

56) 2,5

Решење : 4 пута



$$v = k \cdot [H^+]^2 \quad (0,5)$$

$$v_p = k \cdot 0,2^2 = 0,04 k \quad (0,5)$$

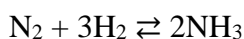
$$v^* = k \cdot 0,1^2 = 0,01 k \quad (0,5)$$

$$v^*/v = 0,01/0,04 = 0,25 \quad (0,5)$$

$$v^* = v/4 \quad (0,5)$$

57) 1,5

Решење: а



$$c(N_2) = 0,1 \text{ mol}/0,5 \text{ dm}^3 = 0,2 \text{ mol}/\text{dm}^3 = c(H_2)$$

$$c^*(H_2) = 0,3 \text{ mol}/0,5 \text{ dm}^3 = 0,6 \text{ mol}/\text{dm}^3 \quad (0,5)$$

$$v = k(0,2)^3(0,2) \quad v^* = k(0,6)^3(0,2) \quad (0,5)$$

$$v^*/v = 27 \quad (0,5)$$

58) 2

Решење: а)  $10^{29}$  б)  $10^{29}$  в)  $5 \cdot 10^{28}$  ( $0,5 \cdot 10^{29}$ ) г) не (4x(0,5))



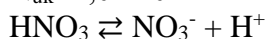
59) 2,5

Решење:  $\alpha = 70\%$

$$V = 1000 \mu\text{l} = 10^{-3} \text{dm}^3$$

$$n = cV = 10^{-3} \text{mol} \quad N_p = 10^{-3} \cdot 6 \cdot 10^{23} = 6 \cdot 10^{20} \quad (0,5)$$

$$N_{\text{uk}} = 1,02 \cdot 10^{21}$$



$$N_p - N_{\text{dis}} \quad N_{\text{dis}} \quad N_{\text{dis}} \quad (0,5)$$

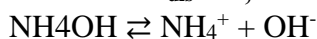
$$N_p - N_{\text{dis}} + N_{\text{dis}} + N_{\text{dis}} = N_{\text{uk}} \quad N_{\text{dis}} + 6 \cdot 10^{20} = 1,02 \cdot 10^{21} \quad (0,5)$$

$$N_{\text{dis}} = 4,2 \cdot 10^{20} \text{ молекула дисосовало} \quad (0,5)$$

$$\alpha = N_{\text{dis}}/N_p = 4,2 \cdot 10^{20} / 6 \cdot 10^{20} = 0,7 = 70\% \quad (0,5)$$

60) 1,5

Решење:  $K_{\text{dis}} = 1,8 \cdot 10^{-5} \text{mol} \cdot \text{dm}^{-3}$



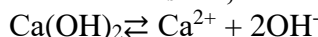
$$K_{\text{dis}} = [\text{NH}_4^+] \cdot [\text{OH}^-] / [\text{NH}_4\text{OH}] \quad (0,5)$$

$$K_{\text{dis}} = (\alpha c) \cdot (\alpha c) / c \cdot (1 - \alpha) \quad (0,5)$$

$$K_{\text{dis}} = 0,18 \text{mol} \cdot \text{dm}^{-3} \cdot 0,01^2 / (1 - 0,01) = 1,8 \cdot 10^{-5} \text{mol} \cdot \text{dm}^{-3} \quad (0,5)$$

61) 1,5

Решење:  $K_s = 7,9 \cdot 10^{-6} \text{mol}^3/\text{dm}^9$



$$K_s = [\text{Ca}^{2+}] \cdot [\text{OH}^-]^2 \quad (0,5)$$

$$K_s = 1,255 \cdot 10^{-2} \text{mol}/\text{dm}^3 \cdot (2 \cdot 1,255 \cdot 10^{-2} \text{mol}/\text{dm}^3)^2 \quad (0,5)$$

$$K_s = 7,9 \cdot 10^{-6} \text{mol}^3/\text{dm}^9 \quad (0,5)$$

62) 1

Решење:  $K_p = 51,5$

$$K_p = K_c \cdot (RT)^{\Delta n} \quad (0,5)$$

$$K_p = 51,5 \cdot (8,314 \cdot 713)^{2-2} = K_c \quad \Delta n = 2 - 2 = 0 \quad (0,5)$$

63) 2,5

Решење:  $K_c = 4,21 \cdot 10^{-4} \text{mol}/\text{dm}^3$

$$\text{изреаговало } 5\% \text{ молекулског хлора } 0,04 \cdot 0,05 = 0,002 \text{mol}/\text{dm}^3 \quad (0,5)$$

$$\text{равнотежна концентрација } [\text{Cl}] = 2 \cdot 0,002 = 0,004 \text{mol}/\text{dm}^3 \quad (0,5)$$

$$\text{равнотежна концентрација } [\text{Cl}_2] = 0,04 - 0,002 = 0,038 \text{mol}/\text{dm}^3 \quad (0,5)$$

$$K_c = [\text{Cl}]^2 / [\text{Cl}_2] \quad (0,5)$$

$$K_c = [0,004]^2 / [0,038] = 4,21 \cdot 10^{-4} \text{mol}/\text{dm}^3 \quad (0,5)$$

64) 2

Решење:

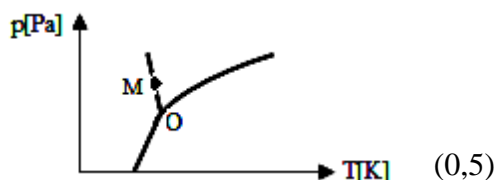
	Концентрације водоника се
повиси температура реакционе посуде	повећала
дода одређена количина азота	смањила
уклони део амонијака из посуде	смањила
дода хелијум без промене запремине система	не мења

4x0,5

65) 1

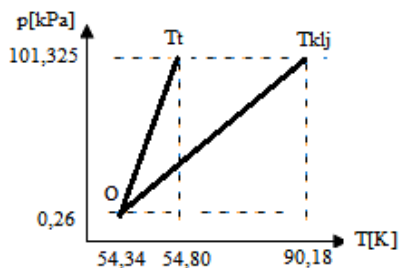
Решење:

$$S + F = K + 2 \quad S = 1 + 2 - 2 = 1 \quad (0,5)$$



66) 1,5

Решење:



### ТЕХНОЛОШКЕ ОПЕРАЦИЈЕ

67) 0,5

Решење: б

68) 0,5

Решење: в

69)  $4 \times 0,25 = 1$

Физичка величина	Вискозност је важна особина реалних флуида. Симболима $\uparrow, \downarrow, -$ обележи врсту промене код:	
	ГАСОВА	ТЕЧНОСТИ
Пораст температуре	$\uparrow$	$\downarrow$
Снижење притиска	$-$	$-$

70) 0,5

Решење: б

71)  $4 \times 0,25 = 1$

Решење: Температура 3 Притисак 6 Густина 2,5 Проток 4

72) 0,5

Решење: б

73) 0,5

Решење: б

74) 1

Решење: в)  $P = h \cdot \rho \cdot g = 100,062 \text{ kPa}$  (одговор се не признаје без поступка)

75) 0,5

Решење: б

76)  $0,5 \times 2 = 1$

Решење: Запремински проток б) Притисак у флуиду ђ)

77) 1

(уколико се не напише израз нема бодова)

Решење: б израз:  $Sv = \text{const}$

78) 0,5

Решење: в

79) 0,5

Решење: а

80)  $2 \times 0,5 = 1,0$

Решење: б, д

81) 0,5

Решење: б

82) 0,5

Решење: а

83) 0,5

Решење: а

84) 0,5

Решење: в

85) 0,5

Решење: в

86) 0,5

Решење: а

87) 0,5

Решење: б

88) 0,5

Решење: в

89) 0,5

Решење: в

90) 0,5

Решење: б

91) 1,5 (3 x 0,5)

Решење: а, г, њ

Сваки тачан одговор 0,5

92) 1,5 (3x 0,5)

Решење: б, г, д

Сваки тачан одговор 0,5

93) 1,0 (2 x 0,5)

Решење: а, њ

Сваки тачан одговор 0,5

94) 3

**Решење:**  $p = 134451,249 \text{ Pa}$  или  $p = 1,34 \text{ bar}$

$$\Delta h = 256 \text{ mm} = 256 \cdot 10^{-3} \text{ m} \quad (0,5)$$

$$p_o = 1003 \text{ mbar} = 100300 \text{ Pa} \quad (0,5)$$

$$\rho_{\text{Hg}} = 13600 \text{ kg/m}^3; \rho_{\text{ваз}} = 1,293 \text{ kg/m}^3$$

$$p = ?$$

$$p = p_o + \Delta p \quad (0,5)$$

$$\Delta p = \Delta h [\rho_{\text{Hg}} - \rho_{\text{ваз}}] g \quad (0,5)$$

$$\Delta p = 34151,2499 \text{ Pa} \quad (0,5)$$

$$p = 134451,249 \text{ Pa} \text{ или } p = 1,34 \text{ bar} \quad (0,5)$$

95) 3

**Решење:**  $p = 82089,502 \text{ Pa}$  или  $p = 0,82 \text{ bar}$

$$\Delta h = 15 \text{ cm} = 15 \cdot 10^{-2} \text{ m} \quad (0,5)$$

$$p_o = 1021 \text{ mbar} = 102100 \text{ Pa} \quad (0,5)$$

$$\rho_{\text{Hg}} = 13600 \text{ kg/m}^3; \rho_{\text{ваз}} = 1,293 \text{ kg/m}^3$$

$$p = ?$$

$$p = p_o - \Delta p \quad (0,5)$$

$$\Delta p = \Delta h [\rho_{\text{Hg}} - \rho_{\text{ваз}}] g \quad (0,5)$$

$$\Delta p = 20010,498 \text{ Pa} \quad (0,5)$$

$$p = 82089,502 \text{ Pa} \text{ или } p = 0,82 \text{ bar} \quad (0,5)$$

96) 2

**Решење:**  $q_v = 0,07 \cdot 10^{-3} \text{ m}^3/\text{s}$

$$\tau = 2h = 7200 \text{ s} \quad (0,5)$$

$$V = 504 \text{ l} = 504 \cdot 10^{-3} \text{ m}^3 \quad (0,5)$$

$$q_v = ?$$

$$q_v = V/\tau \quad (0,5)$$

$$q_v = 0,07 \cdot 10^{-3} \text{ m}^3/\text{s} \quad (0,5)$$

97) 2

**Решење:**  $V = 3,024 \text{ m}^3$

$$\tau = 8 \text{ h} = 28800 \text{ s} \quad (0,5)$$

$$q_v = 6,3 \text{ l/min} = 0,105 \cdot 10^{-3} \text{ m}^3/\text{s} \quad (0,5)$$

$$V = ?$$

$$V = q_v \cdot \tau \quad (0,5)$$

$$V = 3,024 \text{ m}^3 \quad (0,5)$$

98) 2

**Решење:**  $\tau = 25,64 \cdot 10^3 \text{ s}$  или  $\tau = 7 \text{ h } 7 \text{ min } 20 \text{ s}$

$$V = 2 \text{ m}^3$$

$$q_v = 0,078 \text{ l/s} = 0,078 \cdot 10^{-3} \text{ m}^3/\text{s} \quad (0,5)$$

$$\tau = ?$$

$$q_v = V/\tau \quad (0,5)$$

$$\tau = V/q_v \quad (0,5)$$

$$\tau = 25,64 \cdot 10^3 \text{ s} \quad (0,5)$$

99) 4

**Решење:**  $p_1 - p_2 = 553444,45 \text{ Pa}$  или  $p_1 - p_2 = 553,44 \text{ kPa}$

$$q_v = 10 \text{ dm}^3/\text{s} = 10 \cdot 10^{-3} \text{ m}^3/\text{s} \quad (0,5)$$

$$r_1 = 4 \text{ cm} = 4 \cdot 10^{-2} \text{ m} \quad r_2 = 1 \text{ cm} = 1 \cdot 10^{-2} \text{ m} \quad (0,5)$$

$$S_1 = \frac{d_1^2 \pi}{4} = \frac{(0,04)^2 \cdot \pi}{4} = 0,005m^2 \quad (0,25)$$

$$S_1 = \frac{d_1^2 \pi}{4} = \frac{(0,01)^2 \cdot \pi}{4} = 0,0003m^2 \quad (0,25)$$

$$p_1 + \frac{\rho \cdot v_1^2}{2} = p_2 + \frac{\rho \cdot v_2^2}{2} \quad (0,5)$$

$$v_1 = \frac{q_v}{S_1} \quad (0,25)$$

$$v_2 = \frac{q_v}{S_2} \quad (0,25)$$

$$v_1 = 2m/s \quad v_2 = 33,33m/s \quad (0,5)$$

$$p_1 - p_2 = \frac{\rho \cdot v_2^2}{2} - \frac{\rho \cdot v_1^2}{2} \quad (0,5)$$

$$p_1 - p_2 = 553444,45Pa \quad (0,5)$$

100) 5

**Решење:  $p_2 = 82751,25Pa$**

$$d_1 = 5cm = 0,05m \quad (0,5)$$

$$d_2 = 2,5cm = 0,025m$$

$$p_1 = 330kPa = 300000Pa \quad (0,5)$$

$$p_1 + \frac{\rho v_1^2}{2} + \rho g h_1 = p_2 + \frac{\rho v_2^2}{2} + \rho g h_2 \quad (0,5)$$

$$S_1 v_1 = S_2 v_2 \Rightarrow v_2 = (S_1 v_1) / S_2 \quad (0,5)$$

$$S = (d^2 \pi) / 4 \quad (0,5)$$

$$S_1 = 0,00196m^2 \quad S_2 = 0,00049m^2 \quad (0,5)$$

$$v_2 = 2m/s \quad (0,5)$$

$$h_1 = 0 \quad (0,5)$$

$$p_2 = p_1 + \frac{\rho v_1^2}{2} - \frac{\rho v_2^2}{2} - \rho g h \quad (0,5)$$

$$p_2 = 330000 + \frac{1000 \cdot 0,05^2}{2} - \frac{1000 \cdot 2^2}{2} - 1000 \cdot 9,81 \cdot 25$$

$$p_2 = 82751,25Pa \quad (0,5)$$

101) 3

**Решење:  $v_2 = 12m/s$**

$$p + \frac{\rho \cdot v_1^2}{2} + \rho g h = p_0 + \frac{\rho \cdot v_2^2}{2} \quad (0,5)$$

$$v_1^2 \ll v_2^2 \Rightarrow v_1^2 \text{ се занемарује} \quad (0,5)$$

$$\frac{\rho \cdot v_2^2}{2} = p - p_0 + \rho g h \quad (0,5)$$

$$v_2 = \sqrt{\frac{2}{\rho} (p - p_0 + \rho g h)} \quad (0,5)$$

$$v_2 = \sqrt{\frac{2}{1000 \frac{kg}{m^3}} (152000Pa - 101000Pa + 1000 \frac{kg}{m^3} 9,81 \frac{m}{s^2} 2m)} \quad (0,5)$$

$$v_2 = 12m/s \quad (0,5)$$

102) 3

**Решење: максимална висина је  $h_2 = 7,34m$**

$$p_1 + \frac{\rho v_1^2}{2} + \rho g h_1 = p_2 + \frac{\rho v_2^2}{2} + \rho g h_2 \quad (0,5)$$

$$h_1 = 0 \quad (0,5)$$

$$p_1 = p_2 \text{ атмосферски притисци} \quad (0,5)$$

$$\text{како је } d_1 \gg d_2 \text{ брзина } v_1 \text{ се може занемарити према } S_1 v_1 = S_2 v_2 \quad (0,5)$$

$$h_2 = \frac{\rho v_2^2}{2 \cdot g} \quad (0,5)$$

$$h_2 = \frac{1000 \cdot 12^2}{2 \cdot 9,81}$$

$$h_2 = 7,34\text{m} \quad (0,5)$$

103) 5

**Решење:  $q_m = 0,00225 \text{ kg/s}$**

$$\rho = 980 \text{ g/dm}^3 = 980 \cdot 10^{-3} \text{ kg/} 10^{-3} \text{ m}^3 = 980 \text{ kg/m}^3 \quad (0,5)$$

$$\tau = 0,75 \text{ h} = 0,75 \cdot 3600 \text{ s} = 2700 \text{ s} \quad (0,5)$$

$$L = 500 \text{ cm} = 500 \cdot 10^{-2} \text{ m} = 5 \text{ m} \quad (0,5)$$

$$d = 2 \text{ cm} \rightarrow D = 2 \cdot 2 \text{ cm} = 4 \text{ cm} = 4 \cdot 10^{-2} \text{ m} \quad (0,5)$$

$$q_m = \rho \cdot q_v \quad (0,5)$$

$$q_v = A \cdot w \quad (0,5)$$

$$w = L/\tau$$

$$w = 5\text{m}/2700 \text{ s} = 0,00185 \text{ m/s} \quad (0,5)$$

$$A = \frac{D^2 \cdot \pi}{4}$$

$$A = \frac{(4 \cdot 10^{-2} \text{ m})^2 \cdot 3,14}{4} = 0,00125 \text{ m}^2 \quad (0,5)$$

$$q_v = A \cdot w = 0,00125 \text{ m}^2 \cdot 0,00185 \text{ m/s} = 2,3 \cdot 10^{-6} \text{ m}^3/\text{s} \quad (0,5)$$

$$q_m = \rho \cdot q_v = 980 \text{ kg/m}^3 \cdot 2,3 \cdot 10^{-6} \text{ m}^3/\text{s} = 0,00225 \text{ kg/s} \quad (0,5)$$

104) 4

**Решење:  $25,5 \text{ m/s}$**

$$p_1 = 505 \text{ kPa} = 505000 \text{ Pa} \quad (0,5)$$

$$p_a = 101 \text{ kPa} = 101000 \text{ Pa}$$

$$h_2 = 8000 \text{ cm} = 8 \text{ m} \quad (0,5)$$

$$p_1 + \frac{\rho v_1^2}{2} + \rho g h_1 = p_2 + \frac{\rho v_2^2}{2} + \rho g h_2 \quad (0,5)$$

$$h_1 = 0 \quad (0,5)$$

$$\frac{\rho v_2^2}{2} = p_1 - p_2 - \rho g h_2 \quad (0,5)$$

$$v_2 = \sqrt{\frac{2(p_1 - p_a - \rho g h)}{\rho}} \quad (1,0)$$

$$v_2 = \sqrt{\frac{2(505000 - 101000 - 1000 \cdot 9,81 \cdot 8)}{1000}} \quad (0,5)$$

$$v_2 = 25,5 \text{ m/s}$$

105) 3

**Решење:  $q_m = 1,92 \text{ kg/s}$**

$$D = 25 \text{ mm} = 25 \cdot 10^{-3} \text{ m} \quad (0,25)$$

$$w = 31,5 \text{ dm/s} = 31,5 \cdot 10^{-1} \text{ m/s} = 3,15 \text{ m/s} \quad (0,25)$$

$$\rho = 1,239 \text{ g/cm}^3 = 1,239 \cdot 10^{-3} \text{ kg/} 10^{-6} \text{ m}^3 = 1,239 \cdot 10^3 \text{ kg/m}^3 \quad (0,5)$$

$$q_m = q_v \cdot \rho \quad (0,5)$$

$$q_v = A \cdot w \quad (0,5)$$

$$A = \frac{D^2 \cdot \pi}{4}$$

$$A = \frac{(25 \cdot 10^{-3} \text{ m})^2 \cdot 3,14}{4} = 490,625 \cdot 10^{-6} \text{ m}^2 \quad (0,5)$$

$$q_v = A \cdot w = 490,625 \cdot 10^{-6} \text{ m}^2 \cdot 3,15 \text{ m/s} = 1545,47 \cdot 10^{-6} \text{ m}^3/\text{s} = 0,00155 \text{ m}^3/\text{s} \quad (0,25)$$

$$q_m = q_v \cdot \rho = 0,00155 \text{ m}^3/\text{s} \cdot 1,239 \cdot 10^3 \text{ kg/m}^3 = 1,92 \text{ kg/s} \quad (0,25)$$

106) 2,5

**Решење: Re = 11135,17**

$$D=28 \text{ mm}= 28 \cdot 10^{-3} \text{ m} \quad (0,5)$$

$$w=19 \text{ m/min}= 19/60 \text{ m/s}= 0,3167 \text{ m/s}$$

$$\rho = 0,879 \text{ g/cm}^3 = 879 \text{ kg/m}^3 \quad (0,5)$$

$$Re = ?$$

$$Re = \frac{D \cdot w \cdot \rho}{\mu} \quad (0,5)$$

$$Re=11135,17 \quad (0,5)$$

Режим струјања је турбулентан (0,5)

107) 2

**Решење: D = 20,85 · 10<sup>-3</sup> m**

$$Re=15134$$

$$w=8 \cdot 10^{-1} = 0,8 \text{ m/s} \quad (0,5)$$

$$D=?$$

$$Re = \frac{D \cdot w \cdot \rho}{\mu} \quad (0,5)$$

$$D = \frac{Re \cdot \mu}{w \cdot \rho} \quad (0,5)$$

$$D = 20,85 \cdot 10^{-3} \text{ m} \quad (0,5)$$

108) 4

**Решење: Re = 1211,20 режим је ламинаран**

$$D = 2,1 \text{ cm} = 2,1 \cdot 10^{-2} \text{ m} \quad (0,5)$$

$$q_v = 1200 \text{ ml/min}$$

$$Re = \frac{D \cdot w \cdot \rho}{\mu} \quad (0,5)$$

$$q_v = 1200 \text{ ml/min} = 1200 \cdot 10^{-3} / 60 \text{ s} = 1200 \cdot 10^{-3} \cdot 10^{-3} \text{ m}^3 / 60 \text{ s} = 20 \cdot 10^{-6} \text{ m}^3 / \text{s} \quad (0,5)$$

$$A = D^2 \cdot \pi / 4 = (2,1 \cdot 10^{-2} \text{ m})^2 \cdot 3,14 / 4 = 3,462 \cdot 10^{-4} \text{ m}^2 \quad (0,5)$$

$$q_v = w \cdot A \quad (0,5)$$

$$w = q_v / A \quad (0,5)$$

$$w = \frac{20 \cdot 10^{-6} \frac{\text{m}^3}{\text{s}}}{3,462 \cdot 10^{-4} \text{ m}^2} = 0,0578 \text{ m/s} \quad (0,5)$$

$$Re = 121,120 \cdot 10$$

Re = 1211,20 режим је ламинаран (0,5)

109) 2

**Решење: w = 0,663 m/s**

$$Re=19800$$

$$D=24 \text{ mm}= 24 \cdot 10^{-3} \text{ m} \quad (0,5)$$

$$w=?$$

$$Re = \frac{D \cdot w \cdot \rho}{\mu} \quad (0,5)$$

$$w = \frac{Re \cdot \mu}{D} \quad (0,5)$$

$$w = 0,663 \text{ m/s} \quad (0,5)$$

110) 3

**Решење:**  $w_{\max} = 0,3788 \text{ m/s}$

$$D = 50 \text{ cm} = 50 \cdot 10^{-2} \text{ m} \quad (0,5)$$

$$\rho = 0,85 \text{ g/cm}^3 = 0,85 \cdot 10^{-3} / 10^{-6} \text{ kg/m}^3 = 0,85 \cdot 10^3 \text{ kg/m}^3 \quad (0,5)$$

$$\mu = 0,035 \text{ Pa}\cdot\text{s}$$

$$Re = 2300$$

$$w_{\max} = ?$$

$$Re = \frac{D \cdot w_{sr} \cdot \rho}{\mu}$$

$$w_{sr} = \frac{Re \cdot \mu}{D \cdot \rho} \quad (0,5)$$

$$w_{sr} = 0,1894 \text{ m/s} \quad (0,5)$$

$$w_{sr} = 0,5 \cdot w_{\max} \quad (0,5)$$

$$w_{\max} = w_{sr} / 0,5$$

$$w_{\max} = 0,3788 \text{ m/s} \quad (0,5)$$

111) 2,5

**Решење:**  $q = 320 \text{ J}$

$$q = \frac{\lambda}{x} A \Delta T \quad (0,5)$$

$$A = (100/100) \times (200/100) = 2 \text{ m}^2 \quad (0,5)$$

$$\Delta T = 21 \text{ }^\circ\text{C} - (-11 \text{ }^\circ\text{C}) = 32 \text{ }^\circ\text{C} \quad (0,5)$$

$$x = 100 / 1000 = 0,1 \text{ m} \quad (0,5)$$

$$q = \frac{0,5}{0,1} \cdot 2 \cdot 32$$

$$q = 320 \text{ J} \quad (0,5)$$

112) 3,5

**Решење:**  $\lambda = 0,03499 \text{ J/m}\cdot\text{K}\cdot\text{s} = 0,035 \text{ J/m}\cdot\text{K}\cdot\text{s}$

$$Q = 58,2 \text{ kJ} = 58,2 \cdot 10^3 \text{ J} \quad (0,5)$$

$$\tau = 1 \text{ h} = 3600 \text{ s} \quad (0,5)$$

$$\delta = 40 \text{ cm} = 40 \cdot 10^{-2} \text{ m} \quad (0,5)$$

$$t_2 = 20^\circ\text{C} = 293 \text{ K} \quad (0,5)$$

$$t_1 = -2 \text{ }^\circ\text{C} = 271 \text{ K} \quad (0,5)$$

$$A = 8,4 \text{ m}^2$$

$$\lambda = \frac{Q \cdot \delta}{(t_2 - t_1) \cdot A \cdot \tau} \quad (0,5)$$

$$\lambda = 0,03499 \text{ J/m}\cdot\text{K}\cdot\text{s} = 0,035 \text{ J/m}\cdot\text{K}\cdot\text{s} \quad (0,5)$$

113) 0,5

**Решење:** адсорпција

114) 0,5

**Решење:** проток

115) 0,5

**Решење:** гранични

116) 1

**Решење:** запремину, притиска.

Сваки тачан одговор (0,5).



117) 0,5

Решење : величини новонастале површине

118) 1

Решење:

Величине комада који се добијају	Назив уређаја
грубим дробљењем материјала: 100-150 mm	Конусна дробилица
средњим дробљењем материјала: 30-40 mm	Дробилице на ваљке
финим дробљењем: до 5 mm	Млин са ваљцима
мљењем: до 0,01 mm	Центрифугални млин

Сваки тачан одговор (0,25).

119) 1,5

Решење: обртно, осцилаторно и вибрационо

Сваки тачан одговор (0,5).

120) 1

Решење:  $\leq 2300$ ,  $\geq 10000$

Сваки тачан одговор (0,5).

121) 1 (2 x 0,5)

Решење: вакуум / натпритисак

122) 1,5

Решење:

Ланчасти б) Пужасти а) Пнеуматски в)

Сваки тачан одговор (0,5).

123) 0,5

Решење: брзину

124) 1

Решење:  $-5^{\circ}\text{C}$

125) 1

Решење: Келвин, К

Сваки тачан одговор (0,5).

126) 0,5

Решење: дестилација

127) 1 (2 x 0,5)

У КЉУЧУ ПРИЗНАТИ РЕШЕЊА: парна фаза или крива кондензације и течна фаза или крива кључања

Сваки тачан одговор (0,5).

128) 0,5

Решење: фазног

129) 1

Решење: водена пара

130) 0,5

Решење: исти

131) 1,5

Решење: провођење (кондукција), мешање (конвекција), зрачење (радијација)

Сваки тачан одговор (0,5).

132) 1,5

Решење: температура, притисак, природа течности

Сваки тачан одговор (0,5).

133) 1

Решење: б

134) 3

Решење: 6, 5, 2, 1, 4, 3

Сваки тачан одговор (0,5).

135) 3

Решење: 1, 2, 1, 3, 3, 2

Сваки тачан одговор (0,5).

136) (5 X 0,5) 2,5

Решење: 5,1,2,3,4

Сваки тачан одговор (0,5).

137) 1,5

Решење: 3, 1, 2

Сваки тачан одговор (0,5).

138) 1,5

Решење: 1,4,3

Сваки тачан одговор (0,5).

139) 3

Решење: 2, 2, 1, 2, 2, 1

Сваки тачан одговор (0,5).

140) 1

Решење: 1, 4

Сваки тачан одговор (0,5).

141) 1,5

Решење: 3, 1, 2

Сваки тачан одговор (0,5).

## ХЕМИЈСКА ТЕХНОЛОГИЈА

### НЕОРГАНСКА ХЕМИЈСКА ТЕХНОЛОГИЈА

#### ТЕХНОЛОГИЈА ВОДЕ - ПИТАЊА

142) 1

Решење: б, д

(2×0,5)

143) 1,5

Решење: а, б, д

(3×0,5)

144) 1

Решење:  $2\text{Fe}(\text{HCO}_3)_2 + 1/2\text{O}_2 + \text{H}_2\text{O} \rightarrow 2\text{Fe}(\text{OH})_3 + 4\text{CO}_2$

(1)

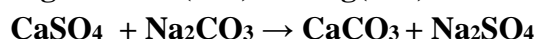
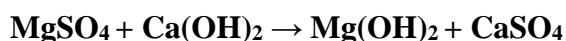
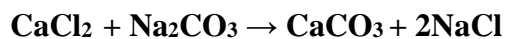
145) 2

Решење: 4, 2, 1, 5, 3

(потпуно тачан одговор 2бода, непотпун 0бодова)

146) 1,5

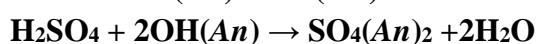
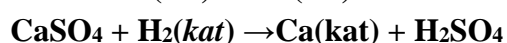
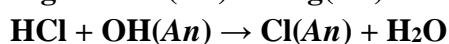
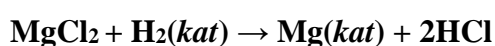
Решење:



(3×(0,5))

147) 2

Решење:



(4×0,5)

148) 2,5

Решење: 3, 5, 1, 2, 4

(5×0,5)

149) 2,5

Решење: 1,3,4  $\text{Na}_2\text{CO}_3$

2, 5  $\text{Ca}(\text{OH})_2$

(5×0,5)

150) 2

Решење : апсорпције

оксидацију

$\text{Fe}^{2+}$

$\text{Mn}^{2+}$

(4×0,5)

151) 1

Решење :  $3\text{CaSO}_4 + 2\text{Na}_3\text{PO}_4 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + 3\text{Na}_2\text{SO}_4$

(1)

### ТЕХНОЛОГИЈА ВОДЕ – ЗАДАЦИ

152) 3

Решење : 3,64 °n, 4,55 °e, 6,5 °f

$$U_T = 65\text{mgCaCO}_3/\text{dm}^3\text{H}_2\text{O}$$

$$U_T(^{\circ}\text{N}) = ?$$

$$U_T(^{\circ}\text{F}) = ?$$

$$U_T(^{\circ}\text{E}) = ?$$

$$1^{\circ}\text{n} = 10\text{mgCaO}/\text{dm}^3$$

$$1^{\circ}\text{f} = 10\text{mgCaCO}_3/\text{dm}^3\text{H}_2\text{O}$$

$$1^{\circ}\text{e} = 10\text{mgCaCO}_3/0,7\text{dm}^3\text{H}_2\text{O}$$

(3×0,5)

$$M(\text{CaCO}_3) = 100\text{g/mol}$$

$$M(\text{CaO}) = 56\text{g/mol}$$

$$65\text{mg} \quad x\text{mg}$$



$$100\text{g} \quad 56\text{g}$$

$$m(\text{CaO}) = 36,40\text{mg}$$

$$U_T = 3,64^{\circ}\text{N}$$

(0,5)

(0,25)

$$U_T = 65\text{mgCaCO}_3/\text{dm}^3\text{H}_2\text{O} \cdot 0,7\text{dm}^3\text{H}_2\text{O}$$

$$U_T = 45,5\text{mgCaCO}_3/0,7\text{dm}^3\text{H}_2\text{O}$$

$$U_T = 4,55^{\circ}\text{E}$$

$$U_T = 6,5^{\circ}\text{F}$$

(0,5)

(0,25)

153) 3

**Решење: PA=14 MA=120**

Узорка H<sub>2</sub>O = 25cm<sup>3</sup>

V(HCl)<sub>ff</sub> = 0,35cm<sup>3</sup>

V(HCl)<sub>mo</sub> = 3cm<sup>3</sup>

c(HCl) = 0,0998mol/ dm<sup>3</sup>

PA(cm<sup>3</sup>0,1mol/dm<sup>3</sup> HCl/ dm<sup>3</sup> H<sub>2</sub>O) = ?

MA(cm<sup>3</sup>0,1mol/dm<sup>3</sup> HCl/ dm<sup>3</sup> H<sub>2</sub>O) = ?

$$V_1 \cdot c_1 = V_2 \cdot c_2$$

$$V_{ff} \cdot c = p \cdot 0,1$$

$$V_{mo} \cdot c = m \cdot 0,1$$

$$p = \frac{V_{ff} \cdot c}{0,1}$$

$$m = \frac{V_{mo} \cdot c}{0,1}$$

(2×0,5)

$$p = 0,3493 \text{ cm}^3$$

$$m = 2,994 \text{ cm}^3$$

$$PA = \frac{1000 \text{ cm}^3}{25 \text{ cm}^3} \cdot 0,3493 \text{ cm}^3 = 13,97 \text{ cm}^3 \approx 14 \text{ cm}^3 \text{ 0,1 mol/dm}^3 \text{ HCl/dm}^3 \text{ H}_2\text{O} \quad (1)$$

$$MA = \frac{1000 \text{ cm}^3}{25 \text{ cm}^3} \cdot 2,994 \text{ cm}^3 = 119,76 \text{ cm}^3 \approx 120 \text{ cm}^3 \text{ 0,1 mol/dm}^3 \text{ HCl/dm}^3 \text{ H}_2\text{O} \quad (1)$$

154) 5

**Решење: m(HCO<sub>3</sub><sup>-</sup>) = 145,67 mg/dm<sup>3</sup> m(CO<sub>3</sub><sup>2-</sup>) = 274,62 mg/dm<sup>3</sup>**

m(CO<sub>3</sub><sup>2-</sup>) = 273.25 mg/dm<sup>3</sup>

Узорка H<sub>2</sub>O = 100 cm<sup>3</sup>

V(HCl)<sub>ff</sub> = 4,6 cm<sup>3</sup>

V(HCl)<sub>mo</sub> = 11,6 cm<sup>3</sup>

c(HCl) = 0,0995mol/dm<sup>3</sup>

m(HCO<sub>3</sub><sup>-</sup>) = ?

m(CO<sub>3</sub><sup>2-</sup>) = ?

$$V_1 \cdot c_1 = V_2 \cdot c_2$$

$$V_{ff} \cdot c = p \cdot 0,1$$

$$V_{mo} \cdot c = m \cdot 0,1$$

$$p = 4,577 \text{ cm}^3$$

$$m = 11,542 \text{ cm}^3$$

(2×0,5)

Из табеле :

$$V(\text{HCl})\text{CO}_3^{2-} = 2p$$

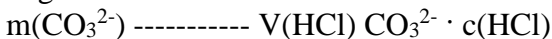
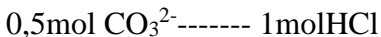
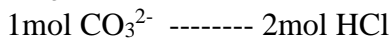
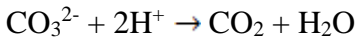
$$V(\text{HCl})\text{HCO}_3^- = m - 2p$$

$$V(\text{HCl})\text{CO}_3^{2-} = 9,154 \text{ cm}^3$$

$$V(\text{HCl})\text{HCO}_3^- = 2,388 \text{ cm}^3$$

(2×0,5)

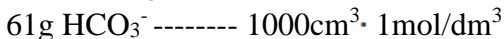
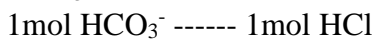
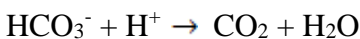
(0,5)



$$M(\text{CO}_3^{2-}) = 60 \text{ g/mol}$$

$$m(\text{CO}_3^{2-}) = \frac{9,154 \text{ cm}^3 \cdot 0,1 \frac{\text{mol}}{\text{dm}^3} \cdot 30 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{100 \text{ cm}^3}$$

$$m(\text{CO}_3^{2-}) = 274,62 \text{ mg/dm}^3 \text{ H}_2\text{O} \quad (1)$$



$$M(\text{HCO}_3^-) = 61 \text{ g/mol}$$

$$m(\text{HCO}_3^-) = \frac{2,388 \text{ cm}^3 \cdot 0,1 \frac{\text{mol}}{\text{dm}^3} \cdot 61 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{100 \text{ cm}^3}$$

$$m(\text{HCO}_3^-) = 145,76 \text{ mg/dm}^3 \text{ H}_2\text{O} \quad (1)$$

155) 3

**Решење: 13,93°n**

KT(°N) = ?

Узорка H<sub>2</sub>O = 50 cm<sup>3</sup>

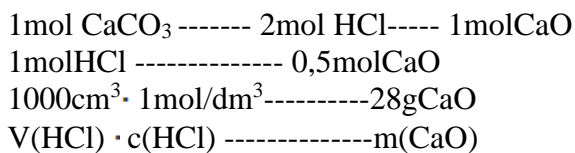
V(HCl) = 2,5cm<sup>3</sup>



$$C(\text{HCl}) = 0,0995 \text{ mol/dm}^3$$

$$M(\text{CaO}) = 56 \text{ g/mol}$$

$$1^\circ \text{N} = 10 \text{ mgCaO/dm}^3 \quad (0,5)$$



$$m(\text{CaO}) = \frac{2,5 \text{ cm}^3 \cdot 0,0995 \frac{\text{mol}}{\text{dm}^3} \cdot 28 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{50 \text{ cm}^3} \quad (1)$$

$$m(\text{CaO}) = 139,3 \text{ mg/dm}^3 \quad \text{KT} = 13,93^\circ \text{N} \quad (0,5)$$

156) 3

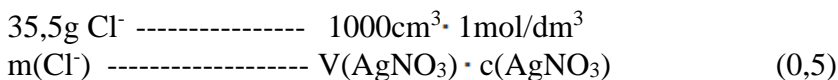
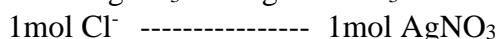
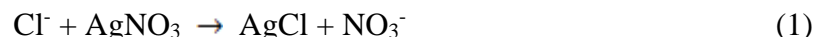
**Решење: 301 mgCl<sup>-</sup>/dm<sup>3</sup> воде**

$$V_{\text{узорка H}_2\text{O}} = 25 \text{ cm}^3$$

$$V(\text{AgNO}_3) = 21,20 \text{ cm}^3$$

$$c(\text{AgNO}_3) = 0,0100 \text{ mol/dm}^3$$

$$M(\text{Cl}^-) = 35,5 \text{ g/mol}$$



$$\frac{m(\text{Cl}^-)}{1 \text{ dm}^3} = \frac{21,20 \text{ cm}^3 \cdot 0,01 \frac{\text{mol}}{\text{dm}^3} \cdot 35,5 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{25 \text{ cm}^3} \quad (1)$$

$$\gamma(\text{Cl}^-) = 301 \text{ mg/dm}^3 \text{ H}_2\text{O} \quad (0,5)$$

157) 4

**Решење: 7,4 mg Ca(OH)<sub>2</sub>**

$$p = 8 \text{ cm}^3$$

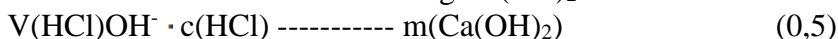
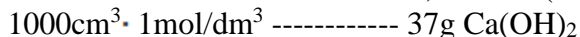
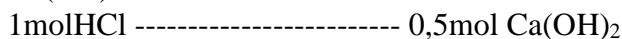
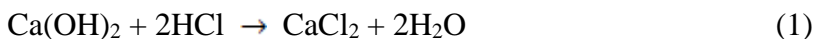
$$m = 14 \text{ cm}^3$$

$$c(\text{HCl}) = 0,1 \text{ mol/dm}^3$$

$$m(\text{Ca(OH)}_2)/100 \text{ cm}^3 \text{H}_2\text{O} = ?$$

$$M(\text{Ca(OH)}_2) = 74 \text{ g/mol}$$

Вода садржи смешу хидроксида и карбоната.  
Из табеле :  $V(\text{HCl})\text{OH}^- = 2p - m = 2 \text{ cm}^3$  (1)



$$\frac{m(\text{Ca(OH)}_2)}{100 \text{ cm}^3} = \frac{2 \text{ cm}^3 \cdot 0,1 \frac{\text{mol}}{\text{dm}^3} \cdot 37 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \quad (1)$$

$$m(\text{Ca(OH)}_2)/100 \text{ cm}^3 \text{H}_2\text{O} = 7,4 \text{ mg} \quad (0,5)$$

158) 4

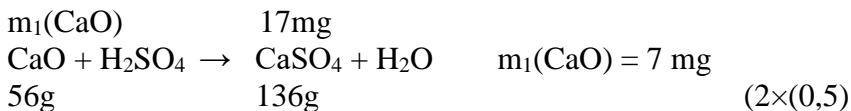
**Решење: 5,54 °n**

$$m(\text{CaSO}_4) = 17 \text{ mg}$$

$$m(\text{Mg(NO}_3)_2) = 21 \text{ mg}$$

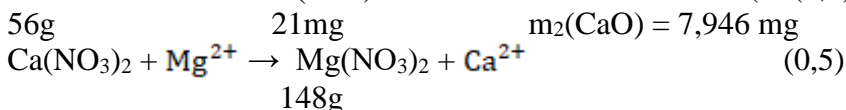
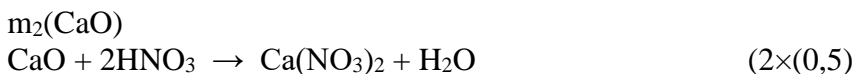
$$UT(^\circ \text{N}) = ?$$

$$M(\text{CaO}) = 56 \text{ g/mol}$$



$$M(\text{CaSO}_4) = 136 \text{ g/mol}$$

$$M(\text{Mg(NO}_3)_2) = 148 \text{ g/mol}$$



$$m(\text{CaO}) = m_1 + m_2 = 14,946 \text{ mg} \quad (0,5)$$

$$1 \text{ } (^{\circ}\text{N}) = 10\text{mgCaO} / \text{dm}^3 \text{H}_2\text{O} \quad m(\text{CaO})/\text{dm}^3\text{H}_2\text{O} = 14,946\text{mg} \cdot \frac{1000\text{cm}^3}{270\text{cm}^3} \quad (0,5)$$

$$m(\text{CaO})/\text{dm}^3 \text{H}_2\text{O} = 55,36\text{mg} \\ \text{UT} = 5,54 \text{ } ^{\circ}\text{N} \quad (0,5)$$

159) 4

**Решење: 3,75 cm<sup>3</sup>**

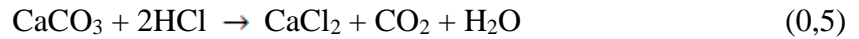
$$\gamma (\text{CaCO}_3) = 300\text{mg}/800 \text{cm}^3\text{H}_2\text{O}$$

$$V_{\text{узорка H}_2\text{O}} = 50 \text{cm}^3$$

$$c(\text{HCl}) = 0,1\text{mol} / \text{dm}^3$$

$$V(\text{HCl}) = ?$$

$$M(\text{CaCO}_3) = 100\text{g/mol}$$



$$\begin{array}{l} 0,5 \text{ mol CaCO}_3 \text{ ----- } 1\text{mol HCl} \\ 50\text{g CaCO}_3 \text{ ----- } 1000\text{cm}^3 \cdot 1\text{mol/dm}^3 \\ 375\text{mg CaCO}_3 \text{ ----- } V(\text{HCl}) \cdot c(\text{HCl}) \end{array} \quad (1)$$

$$300\text{mg CaCO}_3 \text{ ----- } 800 \text{cm}^3\text{H}_2\text{O}$$

$$\frac{m(\text{CaCO}_3)}{m(\text{CaCO}_3)} \text{ ----- } \frac{1000\text{cm}^3\text{H}_2\text{O}}{1000\text{cm}^3\text{H}_2\text{O}}$$

$$m(\text{CaCO}_3) = 375\text{mg} \quad (0,5)$$

$$\text{аликвотни број} = \frac{1000\text{cm}^3}{50\text{cm}^3} = 20 \quad (0,5)$$

$$V(\text{HCl}) = \frac{375\text{mg} \cdot 1000\text{cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}}{50\text{g} \cdot 1000 \frac{\text{mg}}{\text{g}} \cdot 0,1 \frac{\text{mol}}{\text{dm}^3} \cdot 20} \quad (1)$$

$$V(\text{HCl}) = 3,75 \text{cm}^3 \quad (0,5)$$

160) 4

**Решење: 83, 46kgNa<sub>3</sub>PO<sub>4</sub>**

$$\gamma (\text{CaCO}_3) = 450\text{mg}/11 \text{H}_2\text{O}$$

$$\gamma (\text{MgSO}_4) = 376\text{mg}/11 \text{H}_2\text{O}$$

$$m(\text{Na}_3\text{PO}_4)/100\text{m}^3\text{H}_2\text{O} = ?$$

$$M(\text{CaCO}_3) = 100\text{g/mol}$$

$$M(\text{MgSO}_4) = 120\text{g/mol}$$

$$M(\text{Na}_3\text{PO}_4) = 164\text{g/mol}$$

$$450\text{mg CaCO}_3 \text{ ----- } 10^{-3}\text{m}^3 \text{H}_2\text{O}$$

$$m(\text{CaCO}_3) \text{ ----- } 100\text{m}^3 \text{H}_2\text{O}$$

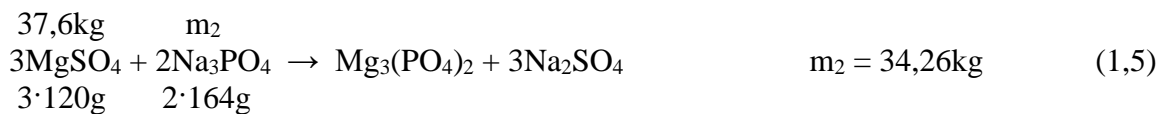
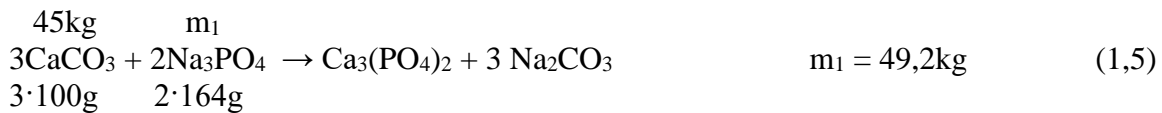
$$m(\text{CaCO}_3) = 45\text{kg}$$

$$376\text{mg MgSO}_4 \text{ ----- } 10^{-3}\text{m}^3 \text{H}_2\text{O}$$

$$m(\text{MgSO}_4) \text{ ----- } 100\text{m}^3 \text{H}_2\text{O}$$

$$m(\text{MgSO}_4) = 37,6\text{kg}$$

$$(2 \times 0,25)$$



$$m(\text{Na}_3\text{PO}_4) = 83,46\text{kg} \quad (0,5)$$

161) 5

**Решење: 10,86 mg/dm<sup>3</sup>**



$$V_{\text{воде}} = 300 \text{cm}^3$$

$$V_{\text{реагенаса}} = 6 \text{cm}^3$$

$$V(\text{Na}_2\text{S}_2\text{O}_3) = 8 \text{cm}^3$$

$$C(\text{Na}_2\text{S}_2\text{O}_3) = 0,0499 \text{mol/dm}^3$$

$$M(\text{O}_2) = 32 \text{g/mol}$$

$$\text{из 1. реакције: } 2\text{mol MnO}(\text{OH})_2 \text{ ----- } 1\text{mol O}_2$$

$$\text{из 2. реакције: } 2\text{mol MnO}(\text{OH})_2 \text{ ----- } 2\text{mol J}_2$$

$$1\text{mol O}_2 \text{ ----- } 2\text{mol J}_2 \quad (0,75)$$

$$V_{\text{узорка воде}} = 300 \text{ cm}^3 - 6 \text{ cm}^3$$

$$V_{\text{узорка воде}} = 294 \text{ cm}^3$$

из 3. реакције:  $1 \text{ mol J}_2 \text{-----} 2 \text{ mol Na}_2\text{S}_2\text{O}_3 \text{-----} \frac{1}{2} \text{ mol O}_2$

$$\frac{n(\text{O}_2)}{n(\text{Na}_2\text{S}_2\text{O}_3)} = \frac{\frac{1}{2}}{2} = \frac{1}{4} \quad (0,75)$$

$$n(\text{O}_2) = \frac{1}{4} \cdot n(\text{Na}_2\text{S}_2\text{O}_3)$$

$$\frac{n(\text{O}_2)}{n(\text{Na}_2\text{S}_2\text{O}_3)} = \frac{1}{4} \cdot V(\text{Na}_2\text{S}_2\text{O}_3) \cdot C(\text{Na}_2\text{S}_2\text{O}_3) \quad (0,5)$$

$$m(\text{O}_2) = \frac{1}{4} \cdot V(\text{Na}_2\text{S}_2\text{O}_3) \cdot C(\text{Na}_2\text{S}_2\text{O}_3) \cdot M(\text{O}_2)$$

$$m(\text{O}_2) = \frac{1}{4} \cdot 8 \cdot 10^{-3} \text{ dm}^3 \cdot 0,0499 \frac{\text{mol}}{\text{dm}^3} \cdot 32 \cdot 10^3 \frac{\text{mg}}{\text{mol}} \quad (0,5)$$

$$m(\text{O}_2) = 3,19 \text{ mg} \quad (\text{у испитиваном узорку воде}) \quad (0,5)$$

$$m(\text{O}_2) / \text{dm}^3 \text{ H}_2\text{O} = 3,19 \text{ mg} \cdot \frac{1000 \text{ cm}^3}{294 \text{ cm}^3}$$

$$\underline{m(\text{O}_2) / \text{dm}^3 \text{ H}_2\text{O} = 10,86 \text{ mg} / \text{dm}^3} \quad (0,5)$$

162) 4

**Решење:**  $UT = 16,8^\circ \text{N}$ ,  $UT = 300 \text{ mg CaCO}_3 / \text{dm}^3$

$$V_{\text{узорка H}_2\text{O}} = 100 \text{ cm}^3$$

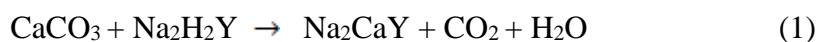
$$V(\text{K}_{\text{III}}) = 30 \text{ cm}^3$$

$$c(\text{K}_{\text{III}}) = 0,01 \text{ mol} / \text{dm}^3$$

$$UT = ?$$

$$M(\text{CaCO}_3) = 100 \text{ g} / \text{mol}$$

$$M(\text{CaO}) = 56 \text{ g} / \text{mol}$$



(признаје се и реакција измене Na)

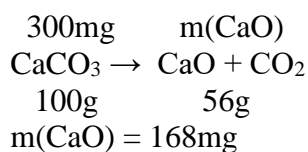
$$1 \text{ mol CaCO}_3 \text{-----} 1 \text{ mol K}_{\text{III}}$$

$$100 \text{ g CaCO}_3 \text{-----} 1000 \text{ cm}^3 \cdot 1 \text{ mol} / \text{dm}^3$$

$$m(\text{CaCO}_3) \text{-----} V(\text{K}_{\text{III}}) \cdot c(\text{K}_{\text{III}})$$

$$m(\text{CaCO}_3) = \frac{30 \text{ cm}^3 \cdot 0,01 \frac{\text{mol}}{\text{dm}^3} \cdot 100 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{100 \text{ cm}^3} \quad (1)$$

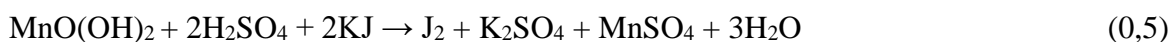
$$m(\text{CaCO}_3) = 300 \text{ mg} \quad UT = 300 \text{ mg CaCO}_3 / \text{dm}^3 \text{ H}_2\text{O}$$



$$UT = 16,8^\circ \text{N}$$

163) 5

**Решење:**  $6,30 \text{ cm}^3$



$$V_{\text{воде}} = 300 \text{ cm}^3$$

$$V_{\text{реагенаса}} = 4 \text{ cm}^3$$

$$c(\text{Na}_2\text{S}_2\text{O}_3) = 0,05 \text{ mol} / \text{dm}^3$$

$$\gamma(\text{O}_2) = 8,53 \text{ mg} / \text{dm}^3$$

$$M(\text{O}_2) = 32 \text{ g} / \text{mol}$$

$$V_{\text{узорка воде}} = 300 \text{ cm}^3 - 4 \text{ cm}^3$$

$$V_{\text{узорка воде}} = 296 \text{ cm}^3$$

$$2 \text{ mol MnO}(\text{OH})_2 \text{-----} 1 \text{ mol O}_2$$

$$2 \text{ mol MnO}(\text{OH})_2 \text{-----} 2 \text{ mol J}_2$$

$$1 \text{ mol O}_2 \text{-----} 2 \text{ mol J}_2 \quad (0,5)$$

$$1 \text{ mol J}_2 \text{-----} 2 \text{ mol Na}_2\text{S}_2\text{O}_3 \text{-----} 0,5 \text{ mol O}_2$$

$$0,5 \text{ mol O}_2 \text{-----} 2 \text{ mol Na}_2\text{S}_2\text{O}_3 \quad (0,5)$$

$$16 \text{ g O}_2 \text{-----} 1000 \text{ cm}^3 \cdot 2 \text{ mol} / \text{dm}^3$$

$$8,53 \text{ mg O}_2 \text{-----} V(\text{Na}_2\text{S}_2\text{O}_3) \cdot c(\text{Na}_2\text{S}_2\text{O}_3) \quad (1)$$

$$V(\text{Na}_2\text{S}_2\text{O}_3) = \frac{8,53 \text{ mg} \cdot 1000 \text{ cm}^3 \cdot 2 \frac{\text{mol}}{\text{dm}^3} \cdot 296 \text{ cm}^3}{16 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}} \cdot 0,05 \frac{\text{mol}}{\text{dm}^3} \cdot 1000 \text{ cm}^3} \quad (1)$$

$$V(\text{Na}_2\text{S}_2\text{O}_3) = 6,30 \text{ cm}^3 \quad (0,5)$$

164) 3

**Решење:** Други узорак има мању тврдоћу за 5,28 °N

$$UT_1 = 12^\circ\text{F} \quad 12^\circ\text{F} = 120 \text{ mg CaCO}_3 / \text{dm}^3 \text{H}_2\text{O}$$

$$UT_2 = 12^\circ\text{N} \quad 12^\circ\text{N} = 120 \text{ mg CaO} / \text{dm}^3 \text{H}_2\text{O} \quad (2 \times (0,5))$$



$$100 \text{ g} \quad 56 \text{ g}$$

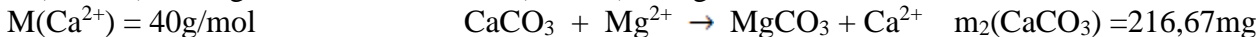
$$120 \text{ mg} - 67,2 \text{ mg} = 52,8 \text{ mg} \quad UT = 5,28^\circ\text{N} \quad (1)$$

165) 3

**Решење:**  $UT = 416,67 \text{ mg CaCO}_3 / \text{dm}^3$  воде

$$\begin{array}{ccc} \gamma(\text{Ca}^{2+}) = 80 \text{ mg/dm}^3 & m_1(\text{CaCO}_3) = 80 \text{ mg} & \\ \gamma(\text{Mg}^{2+}) = 52 \text{ mg/dm}^3 & \text{CaCO}_3 \rightarrow \text{Ca}^{2+} + \text{CO}_3^{2-} & m_1(\text{CaCO}_3) = 200 \text{ mg} \\ UT(\text{mg CaCO}_3 / \text{dm}^3 \text{H}_2\text{O}) = ? & 100 \text{ g} \quad 40 \text{ g} & (1) \end{array}$$

$$M(\text{CaCO}_3) = 100 \text{ g/mol} \quad m_2(\text{CaCO}_3) = 52 \text{ mg}$$



$$M(\text{Mg}^{2+}) = 24 \text{ g/mol} \quad 100 \text{ g} \quad 24 \text{ g} \quad (1)$$

$$\begin{array}{ccc} m(\text{CaCO}_3) = m_1(\text{CaCO}_3) + m_2(\text{CaCO}_3) & & \\ m(\text{CaCO}_3) = 416,67 \text{ mg} & UT = 416,67 \text{ mg CaCO}_3 / \text{dm}^3 \text{H}_2\text{O} & (1) \end{array}$$

166) 2

**Решење:** 89,2 mg CaCO<sub>3</sub>

$$KT = 20^\circ\text{n} \quad 20^\circ\text{n} = 200 \text{ mg CaO} / \text{dm}^3 \text{H}_2\text{O} \quad (0,25)$$

$$V_{\text{узорка H}_2\text{O}} = 250 \text{ cm}^3$$

$$\begin{array}{ccc} m(\text{CaCO}_3) = ? & x \text{ g CaCO}_3 = 200 \text{ mg} & \\ \text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2 & & x \text{ g CaCO}_3 = 357,14 \text{ mg} \\ 100 \text{ g} & 56 \text{ g} & (0,75) \end{array}$$

$$\begin{array}{ccc} 357,14 \text{ mg CaCO}_3 & \text{-----} & 1000 \text{ cm}^3 \\ m(\text{CaCO}_3) & \text{-----} & 250 \text{ cm}^3 \end{array}$$

$$m(\text{CaCO}_3) = 89,2 \text{ mg} \quad (1)$$

167) 5

**Решење:** 2,8 °n

$$V_1 \text{ узорка H}_2\text{O} = 200 \text{ cm}^3 \quad \text{CaCO}_3 + \text{Na}_2\text{H}_2\text{Y} \rightarrow \text{Na}_2\text{CaY} + \text{CO}_2 + \text{H}_2\text{O} \quad (1)$$

$$V_1(\text{K}_{\text{III}}) = 40 \text{ cm}^3 \quad \text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2 \quad (0,5)$$

$$c_1(\text{K}_{\text{III}}) = 0,01 \text{ mol/dm}^3 \quad (\text{признаје се и реакција измене Na})$$

$$V_2 \text{ узорка H}_2\text{O} = 100 \text{ cm}^3 \quad 1 \text{ mol CaO} \text{ ----- } 1 \text{ mol K}_{\text{III}}$$

$$\begin{array}{ccc} V_2(\text{K}_{\text{III}}) = 25 \text{ cm}^3 & 56 \text{ g CaO} & \text{-----} & \text{-----} & 1000 \text{ cm}^3 \cdot 1 \text{ mol/dm}^3 \\ c_2(\text{K}_{\text{III}}) = 0,01 \text{ mol/dm}^3 & m_1(\text{CaO}) & \text{-----} & V(\text{K}_{\text{III}}) \cdot c(\text{K}_{\text{III}}) & (1) \end{array}$$

$$MgT = ?$$

$$m_1(\text{CaO}) = \frac{40 \text{ cm}^3 \cdot 0,01 \frac{\text{mol}}{\text{dm}^3} \cdot 56 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{200 \text{ cm}^3}$$

$$m_1(\text{CaO}) = 112 \text{ mg/dm}^3 \text{H}_2\text{O} \quad CaT = 11,2^\circ\text{N} \quad (1)$$



$$m_2(\text{CaO}) = \frac{25 \text{ cm}^3 \cdot 0,01 \frac{\text{mol}}{\text{dm}^3} \cdot 56 \text{ g} \cdot 1000 \frac{\text{mg}}{\text{g}}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot \frac{1000 \text{ cm}^3}{100 \text{ cm}^3}$$

$$m_2(\text{CaO}) = 140 \text{ mg/dm}^3 \text{ H}_2\text{O} \quad \text{UT} = 14 \text{ }^\circ\text{N} \quad (1)$$

$$\text{MgT} = \text{UT} - \text{CaT} \quad \text{MgT} = 2,8 \text{ }^\circ\text{N} \quad (0,5)$$

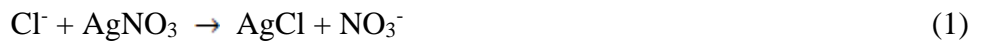
168) 3

**Решење: 0,133 mol/dm<sup>3</sup>**

$$n(\text{Cl}^-) = 2 \cdot 10^{-3} \text{ mol}$$

$$V(\text{AgNO}_3) = 15 \text{ cm}^3$$

$$c(\text{AgNO}_3) = ?$$



$$\text{mol Cl}^- \text{ ----- } 1 \text{ mol AgNO}_3 \text{ ----- } 1000 \text{ cm}^3 \cdot 1 \text{ mol/dm}^3$$

$$n(\text{Cl}^-) \text{ ----- } V(\text{AgNO}_3) \cdot c(\text{AgNO}_3)$$

---


$$(1)$$

$$c(\text{AgNO}_3) = \frac{2 \cdot 10^{-3} \text{ mol} \cdot 1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}}{15 \text{ cm}^3 \cdot 1 \text{ mol}}$$

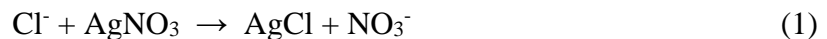
$$c(\text{AgNO}_3) = 0,1333 \text{ mol/dm}^3 \quad (1)$$

169) 3

**Решење: 14,66 cm<sup>3</sup>**

$$n(\text{Cl}^-) = 0,002 \text{ mol}$$

$$c(\text{AgNO}_3) = 0,15 \text{ mol/dm}^3$$



$$V(\text{AgNO}_3) = ?$$

$$1 \text{ mol Cl}^- \text{ ----- } 1 \text{ mol AgNO}_3 \text{ ----- } 1000 \text{ cm}^3 \cdot 1 \text{ mol/dm}^3$$

$$n(\text{Cl}^-) \text{ ----- } V(\text{AgNO}_3) \cdot c(\text{AgNO}_3)$$

$$V(\text{AgNO}_3) = \frac{0,002 \text{ mol} \cdot 1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}}{0,15 \frac{\text{mol}}{\text{dm}^3} \cdot 1 \text{ mol}}$$

$$V(\text{AgNO}_3) = 13,33 \text{ cm}^3 \quad (1)$$

$$13,33 \text{ cm}^3 \cdot 1,1 = 14,66 \text{ cm}^3 \quad V(\text{AgNO}_3) = 14,66 \text{ cm}^3 \quad (1)$$

## ТЕХНОЛОГИЈА МИНЕРАЛНИХ КИСЕЛИНА

### СУМПОРНА КИСЕЛИНА

#### СУМПОРНА КИСЕЛИНА - ПИТАЊА

170) 2

**Решење: 450<sup>0</sup>C – 600<sup>0</sup>C**, ваздуха, катализатор, V<sub>2</sub>O<sub>5</sub>

Сваки тачан одговор (0,5)

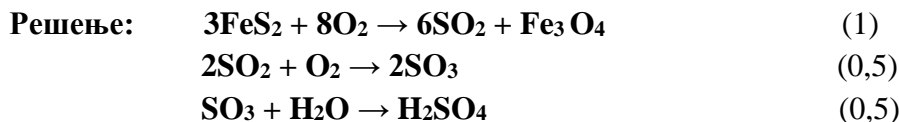
171) 4

**Решење: маглу H<sub>2</sub>SO<sub>4</sub>**, спречава (ономогућује), олеумски, 100% H<sub>2</sub>SO<sub>4</sub>,

20-30% олеум, киселински, 98% H<sub>2</sub>SO<sub>4</sub>, 100% H<sub>2</sub>SO<sub>4</sub>

Сваки тачан одговор (0,5)

172) 2

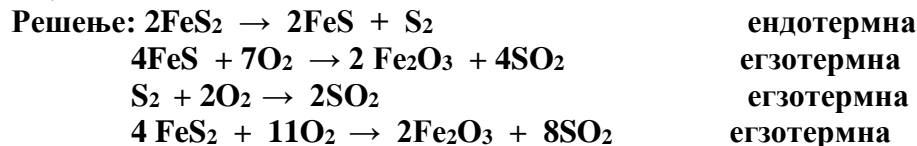


173) 3

Решење: 4 1 2 3 6 5

Сваки тачан одговор (0,5)

174) 4



Сваки тачан одговор (0,5)

### СУМПОРНА КИСЕЛИНА - ЗАДАЦИ

175) 3

Решење: 9,375 t FeS<sub>2</sub>



$120\text{kg FeS}_2 : 128\text{kg SO}_2 = x\text{kg FeS}_2 : 8000\text{kg SO}_2$  x=7500 kg FeS<sub>2</sub> (1,5)

$7,5\text{ t FeS}_2 : 80\% = x\text{ t FeS}_2 : 100\%$  x = 9,375 t FeS<sub>2</sub> (1)

176) 4

Решење: 1069,4 m<sup>3</sup> ваздуха



$3 \cdot 120\text{ kg FeS}_2 : 8 \cdot 22,4\text{ m}^3\text{ O}_2 = 100\text{ kg FeS}_2 : x\text{ m}^3\text{ O}_2$  x = 49,78 m<sup>3</sup> na N.U. (1)

из  $\frac{V}{T} = const$   $V = 49,78 \cdot \frac{1173}{273} = 213,88\text{ m}^3\text{ O}_2$  (0,5)

са вишком 5%:

$213,88\text{ m}^3\text{ O}_2 : 100\% = x\text{ m}^3\text{ O}_2 : 105\%$  x = 224,57 (1)

ваздух:

$100\text{ m}^3\text{ ваздуха} : 21\text{ m}^3\text{ O}_2 = x\text{ m}^3\text{ ваздуха} : 224,57\text{ m}^3\text{ O}_2$  (1)

x = 1069,4 m<sup>3</sup> ваздуха

177) 3

Решење: 234,23 dm<sup>3</sup> SO<sub>2</sub>



$32\text{ g S} : 22,4\text{ dm}^3\text{ SO}_2 = 400\text{ g S} : x\text{ dm}^3\text{ SO}_2$  x= 280 dm<sup>3</sup> SO<sub>2</sub> (1)

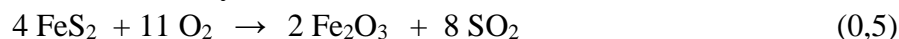
из

$\frac{P \cdot V}{T} = const$  (0,5)

$V = \frac{P_0 \cdot V_0 \cdot T}{T_0 \cdot P} = \frac{101325 \cdot 280 \cdot 293}{273 \cdot 130000} = 234,23\text{ dm}^3\text{ SO}_2$  (1)

178) 5

Решење: V(SO<sub>2</sub>) = 40.6 m<sup>3</sup>      V(ваздуха) = 265,82 m<sup>3</sup>



$4 \cdot 120\text{ kg FeS}_2 : 8 \cdot 22,4\text{ m}^3\text{ SO}_2 = 100\text{ kg FeS}_2 : x\text{ m}^3\text{ SO}_2$  x = 37,33 m<sup>3</sup> SO<sub>2</sub> (н.у.) (1)

$$\frac{P \cdot V}{T} = const \quad V = \frac{P_0 \cdot V_0 \cdot T}{T_0 \cdot P} = \frac{101325 \cdot 37,33 \cdot 293}{273 \cdot 100000} = 40,6 \text{ m}^3 \text{ SO}_2 \quad (1)$$

$$4 \cdot 120 \text{ kg FeS}_2 : 11 \cdot 22,4 \text{ m}^3 \text{ O}_2 = 100 \text{ kg FeS}_2 : x \text{ m}^3 \text{ O}_2 \quad x = 51,33 \text{ m}^3 \text{ O}_2 \text{ (н.у.)} \quad (1)$$

$$\frac{P \cdot V}{T} = const \quad V = \frac{P_0 \cdot V_0 \cdot T}{T_0 \cdot P} = \frac{101325 \cdot 51,33 \cdot 293}{273 \cdot 100000} = 55,82 \text{ m}^3 \text{ O}_2 \quad (1)$$

$$55,81 \text{ m}^3 : 21 \% = x \text{ m}^3 : 100 \% \quad x = 265,82 \text{ m}^3 \text{ ваздуха} \quad (0,5)$$

179) 2

**Решење: 2,38 dm<sup>3</sup> vazduha**



$$2 \text{ dm}^3 \text{ SO}_2 : 1 \text{ dm}^3 \text{ O}_2 = 1 \text{ dm}^3 \text{ SO}_2 : x \text{ dm}^3 \text{ O}_2 \quad x = 0,5 \text{ dm}^3 \text{ O}_2 \quad (1)$$

$$21 \% : 0,5 \text{ dm}^3 \text{ O}_2 = 100 \% : x \text{ dm}^3 \text{ vazduha} \quad x = 2,38 \text{ dm}^3 \text{ vazduha} \quad (0,5)$$

180) 2

**Решење: 291 m<sup>3</sup> SO<sub>3</sub>**



$$2 \text{ m}^3 \text{ SO}_2 : 1 \text{ m}^3 \text{ O}_2 = x \text{ m}^3 \text{ SO}_2 : 150 \text{ m}^3 \text{ O}_2 \quad x = 300 \text{ m}^3 \text{ SO}_3 \quad (1)$$

$$300 \text{ m}^3 \text{ SO}_3 : 100\% = x \text{ m}^3 \text{ SO}_3 : 97\% \quad x = 291 \text{ m}^3 \text{ SO}_3 \quad (0,5)$$

181) 3

**Решење: 128 g SO<sub>2</sub>, 160 g O<sub>2</sub>**



$$\text{настало је } 2 \cdot X \text{ mola SO}_3 \quad 2 \cdot X = 6 \text{ mol} \quad X = 3 \text{ mol} \quad (0,5)$$

$$\text{смеша садржи} \quad 8 - 2X \quad 2 \text{ mol SO}_2 \quad \text{односно } 2 \cdot 64 = 128 \text{ g SO}_2 \quad (1)$$

$$8 - X \quad 5 \text{ mol O}_2 \quad \text{односно } 5 \cdot 32 = 160 \text{ g O}_2 \quad (1)$$

182) 4

**Решење: P<sub>1</sub> = 1,25 P<sub>2</sub>**

$$\text{Утрошено } 80 \% \text{ SO}_2 \text{ односно } 8 \text{ mola} \quad 2 \cdot X \text{ mola SO}_3 \quad 2 \cdot X = 8 \text{ mol} \quad X = 4 \text{ mol} \quad (0,5)$$



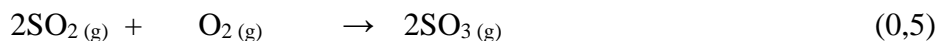
$$\text{број мола:} \quad \text{пре почетка:} \quad 10 \quad 10 \quad \text{укупно: } 20 \quad (1)$$

$$\text{у равнотежи} \quad 10 - 2X = 2 \quad 10 - X = 6 \quad 2X = 8 \quad \text{укупно: } 16 \quad (1)$$

$$V = const \quad \frac{P_1}{P_2} = \frac{n_1}{n_2} = \frac{20}{16} = 1,25 \quad P_1 = 1,25 P_2 \quad (1)$$

183) 3

**Решење: 1,68 · 10<sup>-3</sup>  $\frac{\text{dm}^3}{\text{mol}}$**



$$\text{број мола:} \quad \text{пре почетка:} \quad 5 \quad 5 \quad 2X = 3,5 \quad (0,5)$$

$$\text{у равнотежи} \quad 5 - 2X = 1,5 \quad 5 - X = 3,25 \quad 2X = 3,5 \quad (1)$$

$$K = \frac{C_{\text{SO}_3}^2}{C_{\text{SO}_2}^2 \cdot C_{\text{O}_2}} = \frac{(3,5 \cdot 10^{-3})^2}{(1,5 \cdot 10^{-3})^2 \cdot (3,25 \cdot 10^{-3})} = 1,68 \cdot 10^{-3} \frac{\text{dm}^3}{\text{mol}} \quad (1)$$

184) 2

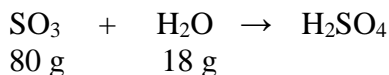
**Решење: 18,99 t SO<sub>3</sub>**



$$80 \text{ t SO}_3 : 98 \text{ t H}_2\text{SO}_4 = 15,5 \text{ t SO}_3 : x \text{ t H}_2\text{SO}_4 \quad x = 18,99 \text{ t} \quad (1,5)$$

185) 4

Решење: 18,80 %



18 g H<sub>2</sub>O (1000-982) је реаговало са 80 грама SO<sub>3</sub> преостало је 330 - 80 = 250 g SO<sub>3</sub> укупна маса олеума је 1000 + 330 g

$$1330 \text{ g} : 100 \% = 250 \text{ g} : x \% \quad x = 18,80 \%$$

186) 4

Решење: 13,56 kg H<sub>2</sub>O

80 kg : 100 % = x kg : 60 %    x = 48 kg    преосталих 32 kg је SO<sub>3</sub>    (1)



80 kg SO<sub>3</sub> : 18 kg H<sub>2</sub>O = 32 kg SO<sub>3</sub> : x kg H<sub>2</sub>O    x = 7,2 kg H<sub>2</sub>O сада имамо    (1)

48 + 32 + 7,2 = 87,2 kg 100% H<sub>2</sub>SO<sub>4</sub>    што након разблажења чини 93,2 %    (0,5)

87,2 kg : 93,2 % = x kg : 100 %    x = 93,56 kg    (0,5)

додато је 93,56 - 80 = 13,56 kg H<sub>2</sub>O    (0,5)

187) 5

Решење: 25,76 kg 60 % H<sub>2</sub>SO<sub>4</sub>    94,24 олеума

процент SO<sub>3</sub>: (нпр 95 % киселина у 100 kg има 95 kg чисте H<sub>2</sub>SO<sub>4</sub> односно SO<sub>3</sub>)

у 95 % H<sub>2</sub>SO<sub>4</sub>    98 : 80 = 95 : x    x = 77,55 % SO<sub>3</sub>    (1)

у 60 % H<sub>2</sub>SO<sub>4</sub>    98 : 80 = 60 : x    x = 48,98 % SO<sub>3</sub>    (1)

у 100 kg 20 % олеума 20 kg SO<sub>3</sub> и 80 kg 100% H<sub>2</sub>SO<sub>4</sub>, а SO<sub>3</sub>    98 : 80 = 80 : x    x = 65,36 kg

односно 20 + 65,36 = 85,36 % SO<sub>3</sub>    (1)

звезда:

$$\begin{array}{r} 85,36 \quad 28,57 \\ \quad 77,55 \\ \hline 48,98 \quad 7,81 \\ \hline \quad 36,38 \end{array} \quad (1)$$

потребно 60 % H<sub>2</sub>SO<sub>4</sub>    36,38 kg : 7,81 = 120 kg : x    x = 25,76 kg    (0,5)

преостало до 120 = 94,24 kg олеум    (0,5)

188) 3

Решење: 45,3 kg S

маса S у SO<sub>3</sub>    130 kg : 100 % = x kg : 30 %    x = 39 kg SO<sub>3</sub>    (1)

32 kg S : 80 kg SO<sub>3</sub> = x kg S : 39 kg SO<sub>3</sub>    x = 15,6 kg S    (0,5)

маса S у H<sub>2</sub>SO<sub>4</sub>    130 - 39 = 91 kg H<sub>2</sub>SO<sub>4</sub>    (0,5)

32 kg S : 98 kg SO<sub>3</sub> = x kg S : 91 kg SO<sub>3</sub>    x = 29,7 kg S    (0,5)

укупно: 45,3 kg S    (0,5)

189) 3

Решење: 104,5 %

у 100 g    80 g H<sub>2</sub>SO<sub>4</sub> и    20 g SO<sub>3</sub>    (0,5)

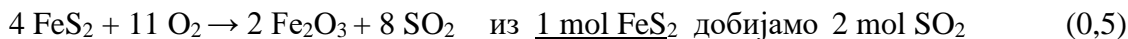


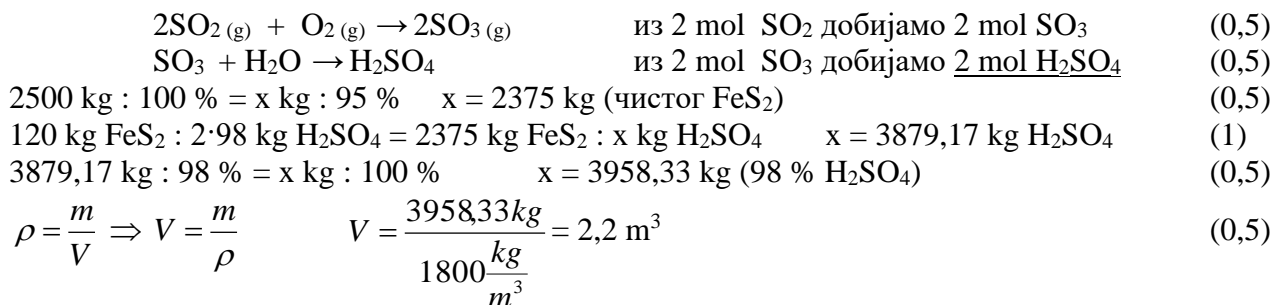
80 g SO<sub>3</sub> : 98 g H<sub>2</sub>SO<sub>4</sub> = 20 g SO<sub>3</sub> : x g H<sub>2</sub>SO<sub>4</sub>    x = 24,5 g    (1)

концентрација олеума (рачунато на H<sub>2</sub>SO<sub>4</sub>) = 104,5 %    (1)

190) 4

Решење: 2,2 m<sup>3</sup>



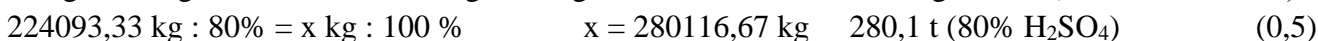
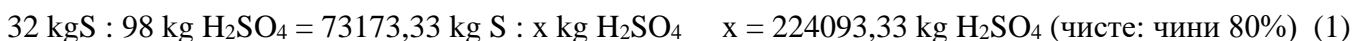
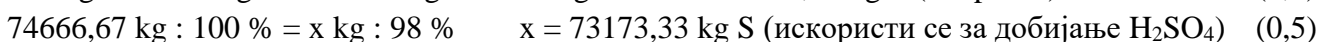
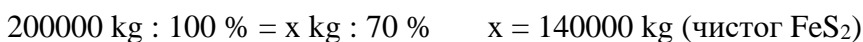


191) 4

**Решење: 280116,67 kg 280,1 t (80% H<sub>2</sub>SO<sub>4</sub>)**

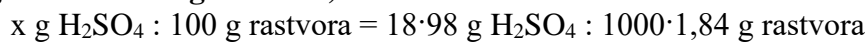


односно из 1 mol S добијамо 1 mol H<sub>2</sub>SO<sub>4</sub>



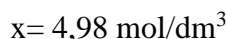
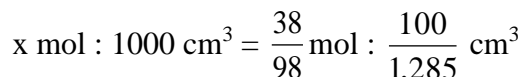
192) 3

**Решење: 95,87 % (g H<sub>2</sub>SO<sub>4</sub> u 100 g rastvora)**



193) 3

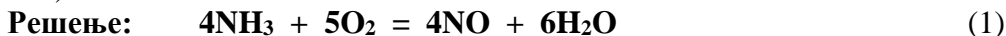
**Решење: 4,98 mol/dm<sup>3</sup>**



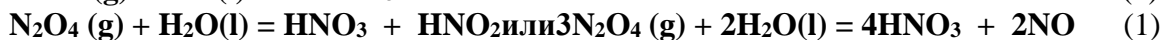
## АЗОТНА КИСЕЛИНА

### АЗОТНА КИСЕЛИНА - ПИТАЊА

194) 3



195) 3



196) 2

**Решење:** нитрозних, соде, кречног млека, каталитичким разлагањем  
(0,5) + (0,5) + (0,5) + (0,5)

197) 2

**Решење:** јаког дехидратационог средства, концентрована сумпорна киселина, хидрати сумпорне киселине, 100% азотне киселине

$$(0,5) + (0,5) + (0,5) + (0,5)$$

### АЗОТНА КИСЕЛИНА – ЗАДАЦИ

198) 4

**Решење:** 0,2 mol/dm<sup>3</sup>

$$m(\text{HNO}_3) = 1,5 \text{ g}$$

$$V_r = 100 \text{ cm}^3$$

$$z = 1$$

$$\alpha = 92\%$$

$$c(\text{NO}_3^-) = ?$$



$$n = m/M = 1,5 \text{ g} / 63 \text{ g/mol} = 0,0238 \text{ mol} \quad (1)$$

$$c = n/V = 0,0238 \text{ mol} / 0,1 \text{ dm}^3$$

$$c = 0,238 \text{ mol/dm}^3 \quad (1)$$

$$c(\text{NO}_3^-) = c \cdot \alpha$$

$$c(\text{NO}_3^-) = 0,238 \text{ mol/dm}^3 \cdot 0,92 = 0,2 \text{ mol/dm}^3 \quad (1)$$

199) 3

**Решење:** б

$$V(\text{NH}_3) + V(\text{O}_2) = 35 \text{ dm}^3$$

$$V(\text{O}_2) = 7,5 \text{ dm}^3$$

$$35 \text{ dm}^3 - 7,5 \text{ dm}^3 \text{O}_2 = 27,5 \text{ dm}^3 \text{NH}_3 \text{ и } \text{O}_2 = V_{\text{полазне смеше}}$$



$$4x + 7x = 27,5 \text{ dm}^3$$

$$11x = 27,5 \text{ dm}^3$$

$$x = 2,5 \text{ dm}^3 \quad (1)$$

$$V(\text{NH}_3) = 4 \cdot 2,5 = 10 \text{ dm}^3 \quad (0,5)$$

$$V(\text{O}_2) = 7 \cdot 2,5 = 17,5 \text{ dm}^3 + 7,5 \text{ dm}^3 = 25 \text{ dm}^3 \quad (0,5)$$

200) 4

**Решење:** а

$$N = 1,505 \cdot 10^{29} \text{ молекула NaNO}_3$$



$$n = N/N_A = 1,505 \cdot 10^{29} / 6,02 \cdot 10^{23} \text{ 1/mol} = 250000 \text{ mol} \quad (1)$$

$$M(\text{NaNO}_3) = 85 \text{ g/mol}$$

$$m(\text{NaNO}_3) = n \cdot M = 21250000 \text{ g} \quad (1)$$

$$85 \text{ g} : 63 \text{ g} = 21250000 \text{ g} : m(\text{HNO}_3) \rightarrow$$

$$m(\text{HNO}_3) = 15750000 \text{ g} = 15,75 \text{ t} \quad (1)$$

201) 5

**Решење:** 351,83 kg

$$V(\text{HNO}_3) = 1 \text{ m}^3$$

$$\omega = 60\%$$

$$\rho = 1,3667 \text{ g/cm}^3$$

$$g_{\text{ubitak}}(\text{NH}_3) = 6\%$$

$$\rho = m/V$$

$$m = \rho \cdot V = 1366,7 \text{ kg/m}^3 \cdot 1 \text{ m}^3$$

$$m = 1366,7 \text{ kg HNO}_3 \quad (1)$$

$$m_{rs} = \frac{1366,7 \cdot 60\%}{100}$$

$$m_{rs} = 820,02 \text{ kg HNO}_3 \quad (1)$$

$$12 \text{ mol NH}_3 : 12 \text{ mol NO} : 12 \text{ mol NO}_2 : 8 \text{ mol HNO}_3 \quad /:4$$

$$3 \text{ mol NH}_3 : 2 \text{ mol HNO}_3 \quad (1)$$

$$3 \cdot 17 \text{ g NH}_3 : 2 \cdot 63 \text{ g HNO}_3 = m(\text{NH}_3) : 820,02 \text{ kg}$$

$$m(\text{NH}_3) = 331,91 \text{ kg} \quad (1)$$

$$m(\text{NH}_3) = 331,91 \text{ kg} + 0,06 \cdot 331,91 \text{ kg} = 351,83 \text{ kg} \quad (1)$$

202) 5

**Решење: 31,47%**

$$V(\text{NO}_2) = 50 \text{ m}^3 \quad 3\text{NO}_2 + \text{H}_2\text{O} \rightarrow 2\text{HNO}_3 + \text{NO} \quad (0,5)$$

$$t = 20 \text{ }^\circ\text{C} \quad 3 \cdot 22,4 \quad 18 \quad 2 \cdot 63$$

$$p = 5 \text{ bar}$$

$$m_1(\text{H}_2\text{O}) = 1000 \text{ kg}$$

$$V(\text{H}_2\text{O}) = 1 \text{ m}^3$$

$$\rho = 1000 \text{ kg/m}^3$$

$$\omega(\text{HNO}_3) = ?$$

$$\frac{P \cdot V}{T} = \frac{P_0 \cdot V_0}{T_0}$$

$$V_0 = \frac{500000 \text{ Pa} \cdot 50 \text{ m}^3 \cdot 273 \text{ K}}{101325 \text{ Pa} \cdot 293 \text{ K}}$$

$$V_0 = 229,889 \text{ m}^3 = 229,889 \cdot 10^3 \text{ dm}^3 \quad (1)$$

$$3 \cdot 22,4 \text{ dm}^3 : 18 \cdot 10^{-3} \text{ kg} = 229,889 \cdot 10^3 \text{ dm}^3 : m_2(\text{H}_2\text{O}) \quad (1)$$

$$m_2(\text{H}_2\text{O}) = 61,57 \text{ kg} \text{ (потрошено за стварање HNO}_3) \quad (1)$$

$$3 \cdot 22,4 \text{ dm}^3 : 2 \cdot 63 \text{ g} = 229,889 \cdot 10^3 \text{ dm}^3 : m(\text{HNO}_3) \quad (1)$$

$$m(\text{HNO}_3) = 431041,875 \text{ g} = 431,04 \text{ kg} \quad (1)$$

$$m(\text{H}_2\text{O}) = m_1(\text{H}_2\text{O}) - m_2(\text{H}_2\text{O})$$

$$m(\text{H}_2\text{O}) = 1000 \text{ kg} - 61,57 \text{ kg} = 938,43 \text{ kg} \text{ (остало за апсорпцију)} \quad (0,5)$$

$$m_r = 431,04 \text{ kg} + 938,43 \text{ kg} = 1369,47 \text{ kg} \quad (0,5)$$

$$\omega(\text{HNO}_3) = \frac{m_{rs}}{m_r} \cdot 100 = \frac{431,04 \text{ Kg}}{1369,47 \text{ Kg}} \cdot 100 = 31,47 \% \quad (0,5)$$

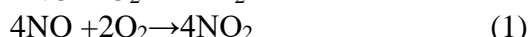
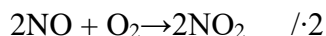
203) 3

**Решење: 1 mol NO, 3 mola O<sub>2</sub>**



$$n(\text{NO}) = ?$$

$$n(\text{O}_2) = ?$$

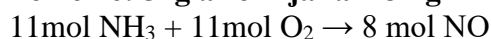


$$n = 5 \text{ mol} - 4 \text{ mol} = 1 \text{ mol NO} \quad (1)$$

$$n = 5 \text{ mol} - 2 \text{ mol} = 3 \text{ mol O}_2 \quad (1)$$

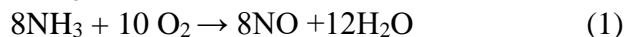
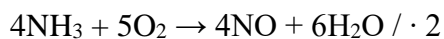
204) 3

**Решење: 51g амонијака и 32 g кисеоника**



$$m(\text{NH}_3) = ?$$

$$m(\text{NO}) = ?$$



$$\begin{aligned}n(\text{NH}_3) &= 11 - 8 = 3 \text{ mol} && (0,5) \\m(\text{NH}_3) &= 3 \text{ mol} \cdot 17 \text{ g/mol} = 51 \text{ g NH}_3 && (0,5) \\n(\text{O}_2) &= 11 - 10 = 1 \text{ mol} && (0,5) \\m(\text{O}_2) &= 1 \text{ mol} \cdot 32 \text{ g/mol} = 32 \text{ g O}_2 && (0,5)\end{aligned}$$

205) 2

**Решење: 9,6%**

1 mol NH<sub>3</sub> + 5 mol O<sub>2</sub>

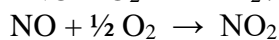
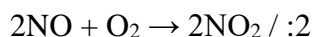
m(NH<sub>3</sub>)=?

$$m(\text{смеше}) = 17 \text{ g} + 5 \cdot 32 \text{ g} = 17 + 160 = 177 \text{ g} \quad (1)$$

$$\omega(\text{NH}_3) = \frac{17 \text{ g}}{177 \text{ g}} \cdot 100 = 9,6\% \quad (1)$$

206) 4

**Решење: 60% кисеоника, 40% азот(IV)-оксида**



Вишак 1,5 mol O<sub>2</sub>

$$V(\text{O}_2) = 1,5 \text{ mol} \cdot 22,4 \text{ dm}^3/\text{mol} = 33,6 \text{ dm}^3 \quad (0,75)$$

$$V = 1 \text{ mol NO}_2 + 1,5 \text{ mol O}_2 = 2,5 \text{ mol} \cdot 22,4 \text{ dm}^3/\text{mol} = 56 \text{ dm}^3 \quad (0,75)$$

$$\Psi(\text{O}_2) = \frac{33,6 \text{ dm}^3}{56 \text{ dm}^3} \cdot 100 = 60\% \quad (0,75)$$

$$\Psi(\text{NO}_2) = \frac{22,4 \text{ dm}^3}{56 \text{ dm}^3} \cdot 100 = 40\% \quad (0,75)$$

207) 4

**Решење: 4,17 mol**

V(HNO<sub>3</sub>) = 1 dm<sup>3</sup>

ω(HNO<sub>3</sub>) = 42%

ρ(HNO<sub>3</sub>) = 1,25 g/cm<sup>3</sup>

n(Ca(OH)<sub>2</sub>) = ?

$$m_r = 100 \text{ g} \quad m_{rs} = 42 \text{ g}$$

$$\rho = m/V$$

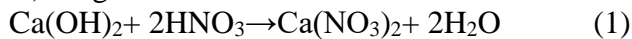
$$V = m/\rho = 100 \text{ g} / 1,25 \text{ g/cm}^3 = 80 \text{ cm}^3 \quad (0,75)$$

$$80 \text{ cm}^3 : 42 \text{ g} = 1000 \text{ g} : x$$

$$m(\text{HNO}_3) = 525 \text{ g} \quad (0,75)$$

$$n(\text{HNO}_3) = 525 \text{ g} / 63 \text{ g/mol} = 8,33 \text{ mol} \quad (0,75)$$

M(HNO<sub>3</sub>) = 63 g



$$1 \text{ mol} : 2 \text{ mol} = n(\text{Ca(OH)}_2) : 8,33 \text{ mol}$$

$$n(\text{Ca(OH)}_2) = 4,17 \text{ mol} \quad (0,75)$$

208) 3

**Решење: 0,8 mol/dm<sup>3</sup>**

V<sub>1</sub>(HNO<sub>3</sub>) = 120 cm<sup>3</sup>

C<sub>1</sub>(HNO<sub>3</sub>) = 0,5 mol/dm<sup>3</sup>

V<sub>2</sub>(HNO<sub>3</sub>) = 30 cm<sup>3</sup>

C<sub>2</sub>(HNO<sub>3</sub>) = 2,0 mol/dm<sup>3</sup>

$$V_r = 120 + 30 = 150 \text{ cm}^3 \quad (0,5)$$

$$n_{r1} = c \cdot v = 0,5 \text{ mol/dm}^3 \cdot 0,120 \text{ dm}^3 = 0,06 \text{ mol} \quad (0,5)$$

$$n_{r2} = 2 \text{ mol/dm}^3 \cdot 0,03 \text{ dm}^3 = 0,06 \text{ mol} \quad (0,5)$$

$$n_{rs} = 0,12 \text{ mol} \quad (0,5)$$

$$C_3(\text{HNO}_3) = 0,12 \text{ mol} / 0,15 \text{ dm}^3 = 0,8 \text{ mol/dm}^3 \quad (1)$$

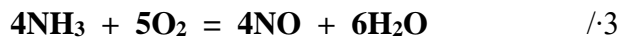


209) 3

**Решење: 1562.5 kg**

$$V(\text{NH}_3) = 500 \text{ m}^3$$

$$m(\text{HNO}_3) = ?$$



(1) све три једначине

12 NH<sub>3</sub> daje 8HNO<sub>3</sub> однос NH<sub>3</sub> : HNO<sub>3</sub> је 3 : 2

$$3 \cdot 22,4 \text{ dm}^3 \text{NH}_3 : 2 \cdot 63 \text{ g HNO}_3 = 500000 \text{ dm}^3 \text{NH}_3 : x \text{ g HNO}_3$$

$$m(\text{HNO}_3) = 937500 \text{ g} = 937,5 \text{ kg} \quad (1)$$

$$937,5 \text{ kg HNO}_3 : 60 \% = x \text{ kg HNO}_3 : 100 \%$$

$$m(60\% \text{ HNO}_3) = 1562,5 \text{ kg} \quad (1)$$

210) 4

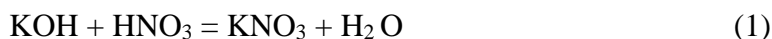
**Решење: 2,8g/dm<sup>3</sup>**

$$V(\text{HNO}_3) = 50 \text{ cm}^3 = 0,05 \text{ dm}^3$$

$$V(\text{KOH}) = 19,85 \text{ cm}^3 = 0,01985 \text{ dm}^3$$

$$C(\text{KOH}) = 0,1121 \text{ mol/dm}^3$$

$$\gamma(\text{HNO}_3) = ?$$



$$n(\text{KOH}) = C \cdot V = 0,1121 \text{ mol/dm}^3 \cdot 0,01985 \text{ dm}^3 = 22,25 \cdot 10^{-4} \text{ mol} \quad (1)$$

$$n(\text{HNO}_3) = n(\text{KOH})$$

$$m(\text{HNO}_3) = n \cdot M = 22,25 \cdot 10^{-4} \text{ mol} \cdot 63 \text{ g/mol} = 0,1402 \text{ g} \quad (1)$$

$$\gamma(\text{HNO}_3) = m/V = 0,1402 \text{ g} / 0,05 \text{ dm}^3 = 2,8 \text{ g/dm}^3 \quad (1)$$

211) 4

**Решење: 1,3 t**

$$\omega(\text{HNO}_3) = 60\%$$

$$m(\text{NaNO}_3) = 1,20 \text{ t}$$

$$\omega(\text{NaNO}_3) = 88\%$$

$$m(60\% \text{ HNO}_3) = ? \text{ t}$$



$$100 \text{ t} : 88 \text{ t} = 1,20 \text{ t} : m(\text{NaNO}_3)$$

$$m(\text{NaNO}_3) = 1,056 \text{ t} \quad (1)$$

$$85 \cdot 10^{-6} \text{ t} : 63 \cdot 10^{-6} \text{ t} = 1,056 \text{ t} : m(\text{HNO}_3)$$

$$m(\text{HNO}_3) = 0,7823 \text{ t} \quad (1)$$

$$100 : 60 = x : 0,7823 \text{ t} \Rightarrow m(60\% \text{ HNO}_3) = 1,3 \text{ t} \quad (1)$$

212) 5

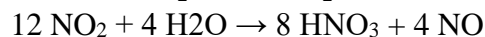
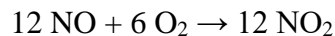
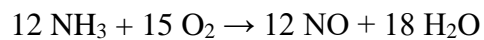
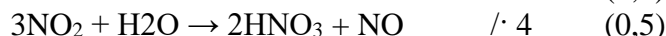
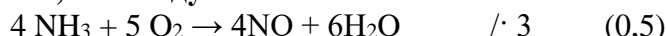
**Решење: 4373,44m<sup>3</sup> NH<sub>3</sub>, 38267,6 m<sup>3</sup> ваздуха**

$$V(\text{HNO}_3) = 10 \text{ m}^3$$

$$\omega(\text{HNO}_3) = 60\%$$

$$\rho = 1,3667 \text{ g/cm}^3$$

$$\psi(\text{O}_2) = 0,2$$



$$m_r = \rho \cdot V = 1,3667 \text{ g/cm}^3 \cdot 10 \cdot 10^6 \text{ cm}^3 = 13667000 \text{ g} \quad (0,5)$$

$$60\% = \frac{m(\text{HNO}_3)}{13667000 \text{ g}} \cdot 100\%$$

$$m(\text{HNO}_3) = 8200200 \text{ g} \quad (0,5)$$

$$3 \text{ mol NH}_3 : 2 \text{ mol HNO}_3 \quad (0,5)$$

$$3 \cdot 22,4 \text{ dm}^3 : 2 \cdot 63 \text{ g HNO}_3 = V(\text{NH}_3) : 8200200 \text{ g}$$

$$V(\text{NH}_3) = 4373440 \text{ dm}^3 = 4373,44 \text{ m}^3 \quad (0,5)$$

$$21 \text{ mol O}_2 : 8 \text{ mol HNO}_3$$

$$21 \cdot 22,4 \text{ dm}^3 : 504 \text{ g HNO}_3 = V(\text{O}_2) : 8200200 \text{ g}$$

$$V(O_2) = 7653520 \text{ dm}^3 = 7653,52 \text{ m}^3 \quad (0,5)$$

$$\psi(O_2) = \frac{V(O_2)}{V_{(vazduh)}} \cdot 100\%$$

$$V(vazduh) = 7653,52 \text{ m}^3 \cdot 100 / 20\%$$

$$V(vazduh) = 38267,6 \text{ m}^3 \quad (1)$$

213) 5

**Решење: 3,91 m<sup>3</sup>**

$$\omega(H_2SO_4) = 75\%$$

$$M(NaNO_3) = 85 \text{ g/mol}$$

$$\rho(H_2SO_4) = 1,6692 \text{ g/cm}^3 \quad M(H_2SO_4) = 98 \text{ g/mol}$$

$$m(NaNO_3) = 10 \text{ t}$$

$$\omega(NaNO_3) = 85\%$$

$$V(H_2SO_4) = ?$$

$$85\% = \frac{m(NaNO_3)}{10 \text{ t}} \cdot 100\%$$

$$m(NaNO_3) = 8,5 \text{ t} \quad (1)$$



$$2 \cdot 85 \text{ g} : 98 \text{ g} = 8,5 \cdot 10^6 \text{ g} : m(H_2SO_4)$$

$$m(H_2SO_4) = 4900000 \text{ g} \quad (1)$$

$$75\% = \frac{4900000 \text{ g}}{m_r} \cdot 100\%$$

$$m_r = 6533333,333 \text{ g} \quad (1)$$

$$V = m/\rho = 6533333,333 \text{ g} / 1,6692 \text{ g/cm}^3 = 3,91 \text{ m}^3 \quad (1)$$

214) 2

**Решење: 945 kg**

$$m(NO_2) = 690 \text{ kg}$$

$$m(HNO_3) = ? \text{ kg}$$



$$2 \cdot 46 \text{ g } NO_2 : 2 \cdot 63 \text{ g } HNO_3 = 690 \cdot 10^6 \text{ g} : m(HNO_3)$$

$$m(HNO_3) = 945000 \text{ g} = 945 \text{ kg} \quad (1)$$

215) 3

**Решење: 1,1845 g/cm<sup>3</sup>**

$$m(\text{пикнометар}) = 23,1234 \text{ g}$$

$$m(\text{киселина и пикнометар}) = 81,9406 \text{ g}$$

$$m(\text{дест. вода и пикнометар}) = 72,6912 \text{ g}$$

$$\rho(\text{дест. воде}) = 0,99823 \frac{\text{g}}{\text{cm}^3}$$

**I начин**

$$V = \frac{72,6912 \text{ g} - 23,1234 \text{ g}}{0,99823 \frac{\text{g}}{\text{cm}^3}} = 49,6557 \text{ cm}^3 \quad (1,5)$$

$$\rho = \frac{81,9406 \text{ g} - 23,1234 \text{ g}}{49,6557 \text{ cm}^3} = 1,1845 \frac{\text{g}}{\text{cm}^3} \quad (1,5)$$

**II начин**

$$\rho_r = \frac{\rho_k}{\rho_{H_2O}} = \frac{\frac{m_k}{V_k}}{\frac{m_{H_2O}}{V_{H_2O}}} = \frac{m_k}{m_{H_2O}} V_k = V_{H_2O}$$

$$\rho_r = \frac{81,9406 \text{ g} - 23,1234 \text{ g}}{72,6912 \text{ g} - 23,1234 \text{ g}} = 1,1866 \quad (1,5)$$

$$\rho_k = \rho_{H_2O} \cdot \rho_r$$

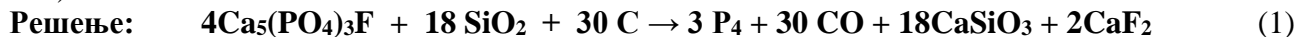
$$\rho_k = 1,1866 \cdot 0,99823 \frac{\text{g}}{\text{cm}^3}$$

$$\rho_k = 1,1845 \frac{\text{g}}{\text{cm}^3} \quad (1,5)$$

## ФОСФОРНА КИСЕЛИНА

### ФОСФОРНА КИСЕЛИНА – ПИТАЊА

216) 3



217) 1

**Решење:** 3 2 1

### ФОСФОРНА КИСЕЛИНА - ЗАДАЦИ

218) 2

**Решење:** б

$m(\text{H}_3\text{PO}_4) = 320\text{ g}$

$V(\text{H}_3\text{PO}_4) = 2\text{ dm}^3$

$\rho(\text{H}_3\text{PO}_4) = 1,2542\text{g/cm}^3$

$\omega(\text{H}_3\text{PO}_4) = ?\%$

$\rho = m/V$

$m = \rho \cdot V = 1,2542\text{g/cm}^3 \cdot 2000\text{ cm}^3 = 2508,4\text{ g}$  (1)

$\omega(\text{H}_3\text{PO}_4) = \frac{320\text{ g}}{2508,4\text{ g}} \cdot 100\% = 12,76\%$  (1)

219) 3

**Решење:** m=1,77g

$V(\text{HNO}_3) = 25\text{ cm}^3$

$C(\text{HNO}_3) = 3,8\text{ mol/dm}^3$

$m(\text{P}) = ?$

$n(\text{HNO}_3) = C \cdot V = 0,025\text{ dm}^3 \cdot 3,8\text{ mol/dm}^3 = 0,095\text{ mol}$   
 $m(\text{HNO}_3) = n \cdot M = 0,095\text{ mol} \cdot 63\text{g/mol} = 5,985\text{g}$  (1)



$3 \cdot 124\text{ g P} : 20 \cdot 63\text{g HNO}_3 = m(\text{P}) : 5,985\text{g}$   
 $m(\text{P}) = 1,77\text{g}$  (1)

220) 4

**Решење:** 37,97t

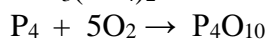
$\omega(\text{Ca}_3(\text{PO}_4)_2) = 60\%$

$V(\text{H}_3\text{PO}_4) = 10\text{ m}^3$

$\omega(\text{H}_3\text{PO}_4) = 90\%$

$\rho(\text{H}_3\text{PO}_4) = 1,6\text{ g/cm}^3$

$m(\text{Ca}_3(\text{PO}_4)_2) = ?\text{ t}$



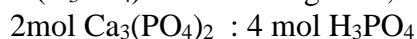
све три тачне (1)

$\rho = m/V$

$m = \rho \cdot V = 1,6\text{ g/cm}^3 \cdot 10 \cdot 10^6\text{ cm}^3 = 1,6 \cdot 10^7\text{ g}$

$90\% = \frac{m_{\text{H}_3\text{PO}_4}}{1,6 \cdot 10^7} \cdot 100\%$

$m(\text{H}_3\text{PO}_4) = 14400000\text{g} = 14,4\text{ t}$  (1)



$$2 \cdot 310 \text{ g} : 4 \cdot 98 \text{ g} = m(\text{Ca}_3(\text{PO}_4)_2) : 14,4 \cdot 10^6 \text{ g}$$

$$m(\text{Ca}_3(\text{PO}_4)_2) = 22,78 \text{ t} \quad (1)$$

$$60\% = \frac{22,78 \text{ t}}{mr} \cdot 100\%$$

$$m(60\% \text{ Ca}_3(\text{PO}_4)_2) = 37,97 \text{ t} \quad (1)$$

221) 5

**Решење: 20662,45kg Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>, 3999,18kg C, 11997,5 kg SiO<sub>2</sub>**

$$V(\text{H}_3\text{PO}_4) = 10 \text{ m}^3$$

$$\omega(\text{H}_3\text{PO}_4) = 80\%$$

$$\rho = 1,633 \text{ g/cm}^3$$

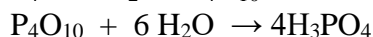
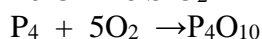
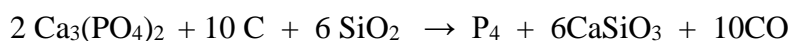
$$m(\text{Ca}_3(\text{PO}_4)_2) = ? \text{ kg}$$

$$m(\text{SiO}_2) = ? \text{ kg}$$

$$m(\text{C}) = ? \text{ kg}$$

$$mr = \rho \cdot V = 10 \cdot 10^6 \text{ cm}^3 \cdot 1,633 \text{ g/cm}^3 = 16,33 \cdot 10^6 \text{ g}$$

$$m(\text{H}_3\text{PO}_4) = \frac{16,33 \cdot 10^6 \text{ g} \cdot 80\%}{100\%} = 13064 \cdot 10^3 \text{ g} \quad (1)$$



(1) све три тачне

$$2 \cdot 310 \text{ g Ca}_3(\text{PO}_4)_2 : 4 \cdot 98 \text{ g H}_3\text{PO}_4 = m(\text{Ca}_3(\text{PO}_4)_2) : 13064 \cdot 10^3 \text{ g}$$

$$m(\text{Ca}_3(\text{PO}_4)_2) = 20662,45 \cdot 10^3 \text{ g} = 20662,45 \text{ kg} \quad (1)$$

$$10 \cdot 12 \text{ g C} : 4 \cdot 98 \text{ g H}_3\text{PO}_4 = m(\text{C}) : 13064 \cdot 10^3 \text{ g}$$

$$m(\text{C}) = 3999183,673 \text{ g} = 3999,18 \text{ kg} \quad (1)$$

$$6 \cdot 60 \text{ g SiO}_2 : 4 \cdot 98 \text{ g H}_3\text{PO}_4 = m(\text{SiO}_2) : 13064 \cdot 10^3 \text{ g}$$

$$m(\text{SiO}_2) = 11997551,02 \text{ g} = 11997,5 \text{ kg} \quad (1)$$

222) 4

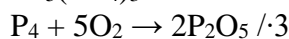
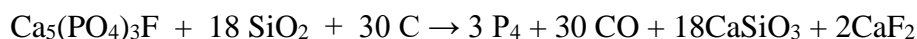
**Решење: 18,45%, 8,45 mol, 5,07 · 10<sup>24</sup> атома P**

$$m(\text{P}_2\text{O}_5) = 600 \text{ g}$$

$$\omega(\text{P})\% = ?$$

$$n(\text{P}) = ?$$

$$N(\text{P}) =$$



$$M(\text{Ca}_5\text{F}(\text{PO}_4)_3) = 504 \text{ g/mol}$$

$$M(\text{P}_2\text{O}_5) = 142 \text{ g/mol} \quad 2 \text{ mol Ca}_5\text{F}(\text{PO}_4)_3 : 3 \text{ mol P}_2\text{O}_5$$

$$M(\text{P}) = 31 \text{ g/mol} \quad 2 \cdot 504 \text{ g Ca}_5\text{F}(\text{PO}_4)_3 : 3 \cdot 142 \text{ g P}_2\text{O}_5 = m(\text{Ca}_5\text{F}(\text{PO}_4)_3) : 600 \text{ g}$$

$$m(\text{Ca}_5\text{F}(\text{PO}_4)_3) = 1419,72 \text{ g}$$

$$504 \text{ g Ca}_5\text{F}(\text{PO}_4)_3 : 3 \cdot 31 \text{ g P} = 1419,72 \text{ g} : m(\text{P})$$

$$m(\text{P}) = 261,97 \text{ g}$$

$$\omega(\text{P}) = \frac{261,97 \text{ g}}{1419,72 \text{ g}} \cdot 100 = 18,45\% \quad (1)$$

$$n(\text{P}) = m/M = 261,97 \text{ g} / 31 \text{ g/mol} = 8,45 \text{ mol} \quad (1)$$

$$N(\text{P}) = n \cdot N_A = 8,45 \text{ mol} \cdot 6 \cdot 10^{23} / \text{mol} = 5,07 \cdot 10^{24} \text{ атома P} \quad (1)$$

223) 5

**Решење: а) 2,93 g, б) 3,93%**

$$\text{а) } m(\text{P}) = 1,28 \text{ g}$$



$$m(\text{P}_4\text{O}_{10}) = ?$$

$$284\text{g P}_4\text{O}_{10} : 4 \cdot 31\text{g P} = m(\text{P}_4\text{O}_{10}) : 1,28\text{g}$$

$$m(\text{P}_4\text{O}_{10}) = 2,93\text{ g} \quad (1)$$

$$\text{b) } V(\text{H}_2\text{O}) = 100\text{g} \quad \text{P}_4\text{O}_{10} + 6\text{H}_2\text{O} \rightarrow 4\text{H}_3\text{PO}_4 \quad (1)$$

$$\omega(\text{H}_3\text{PO}_4) = ?$$

$$m_r = 100\text{g} + 2,93\text{g} = 102,93\text{g}$$

$$284\text{g P}_4\text{O}_{10} : 4 \cdot 98\text{g H}_3\text{PO}_4 = 2,93\text{g} : m(\text{H}_3\text{PO}_4)$$

$$m(\text{H}_3\text{PO}_4) = 4,04\text{ g} \quad (1)$$

$$\omega(\text{H}_3\text{PO}_4) = \frac{4,04\text{ g}}{102,93\text{ g}} \cdot 100 = 3,93\% \quad (1)$$

224) 4

**Решење: 248 kg фосфора, 1120 m<sup>3</sup> ваздуха**

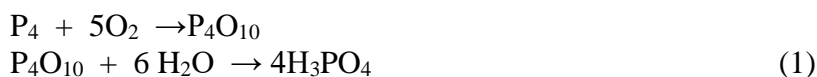
$$m(\text{H}_3\text{PO}_4) = 980\text{ kg}$$

$$\omega(\text{H}_3\text{PO}_4) = 80\%$$

$$\psi(\text{O}_2) = 0,2$$

$$V(\text{vazduh}) = ?\text{ m}^3$$

$$m(\text{P}) = ?\text{ kg} \quad m_{rs} = \frac{980\text{ kg} \cdot 80\%}{100\%} = 784\text{ kg}$$



$$4 \cdot 98\text{g H}_3\text{PO}_4 : 4 \cdot 31\text{g P} = 784\text{ kg} : m(\text{P})$$

$$m(\text{P}) = 248\text{kg} \quad (1)$$

$$4 \cdot 98\text{g H}_3\text{PO}_4 : 5 \cdot 22,4\text{ dm}^3 \text{O}_2 = 784 \cdot 10^3\text{g} : V(\text{O}_2)$$

$$V(\text{O}_2) = 224000\text{dm}^3 = 224\text{ m}^3 \quad (1)$$

$$\psi(\text{O}_2) = \frac{V(\text{O}_2)}{V(\text{ваздух})}$$

$$V(\text{ваздух}) = \frac{224\text{m}^3}{0,2} = 1120\text{ m}^3 \quad (1)$$

225) 2

**Решење: 17,67 %**

$$m(\text{P}_4\text{O}_{10}) = 22\text{ g}$$

$$m(\text{H}_3\text{PO}_4) = 25\text{g}$$

$$\omega(\text{примеса}) = ?\%$$



$$284\text{ g P}_4\text{O}_{10} : 4 \cdot 98\text{g H}_3\text{PO}_4 = m(\text{P}_4\text{O}_{10}) : 25\text{g}$$

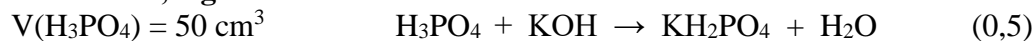
$$m(\text{P}_4\text{O}_{10}) = 18,11\text{g} \quad (1)$$

$$\omega(\text{P}_4\text{O}_{10}) = \frac{18,11\text{ g}}{22\text{ g}} \cdot 100\% = 82,33\%$$

$$\omega(\text{примеса}) = 100\% - 82,33\% = 17,67\% \quad (0,5)$$

226) 3

**Решење: 3,29g/dm<sup>3</sup>**



$$V(\text{KOH}) = 17,50\text{ cm}^3 n(\text{H}_3\text{PO}_4) = n(\text{KOH})$$

$$c(\text{KOH}) = 0,0960\text{ mol/dm}^3$$

$$n(\text{KOH}) = c \cdot V = 0,0175\text{ dm}^3 \cdot 0,0960\text{ mol/dm}^3 = 0,00168\text{ mol} \quad (0,5)$$

$$m(\text{H}_3\text{PO}_4) = n \cdot M = 0,00168\text{ mol} \cdot 98\text{g/mol} = 0,16464\text{ g} \quad (1)$$

$$\gamma(\text{H}_3\text{PO}_4) = m/V = 0,16464\text{ g}/0,05\text{dm}^3 = 3,29\text{g/dm}^3 \quad (1)$$

227) 2

**Решење: 7,158 mol/dm<sup>3</sup>**

$$\rho(\text{H}_3\text{PO}_4) = 1,1224 \text{ g/cm}^3$$

$$\omega(\text{H}_3\text{PO}_4) = 62,5\%$$

$$C(\text{H}_3\text{PO}_4) = ? \text{ mol/dm}^3$$

$$m_r = 100 \text{ g} \quad m_{rs} = 62,5 \text{ g} \quad (0,5)$$

$$V = 100 \text{ g} / 1,1224 \text{ g/cm}^3 = 89,09 \text{ cm}^3 \quad (0,5)$$

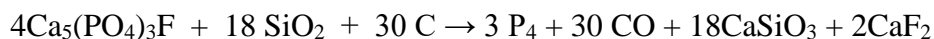
$$n = 62,5 \text{ g} / 98 \text{ g/mol} = 0,6378 \text{ mol} \quad (0,5)$$

$$C = 0,6378 \text{ mol} / 89,09 \text{ cm}^3 = 0,007158 \text{ mol/cm}^3 = 7,158 \text{ mol/dm}^3 \quad (0,5)$$

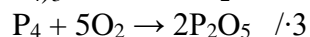
228) 5

**Решење: 106 t**

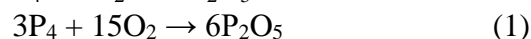
$$1,3 \text{ t P}_2\text{O}_5/\text{h}$$



$$\text{Губитак фосфогипса} = 16\%$$



$$m(\text{фосфогипса}) = ? \text{ t}$$



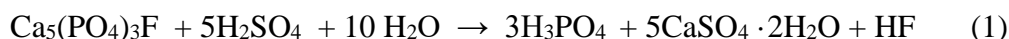
$$M(\text{CaSO}_4 \cdot 2\text{H}_2\text{O}) = 172 \text{ g/mol}$$

$$M(\text{Ca}_5(\text{PO}_4)_3\text{F}) = 504 \text{ g/mol}$$

$$2 \text{ mol Ca}_5(\text{PO}_4)_3\text{F} : 3 \text{ mol P}_2\text{O}_5$$

$$2 \cdot 504 \text{ g апатит} : 3 \cdot 142 \text{ g P}_2\text{O}_5 = m(\text{апатит}) : 1,3 \cdot 10^6 \text{ g P}_2\text{O}_5$$

$$m(\text{апатит}) = 3076056,338 \text{ g} = 3,08 \text{ t} \quad (1)$$



$$504 \text{ t апатит} : 5 \cdot 172 \text{ g гипс} = 3,08 \text{ т апатит} : m(\text{гипс})$$

$$m(\text{гипс}) = 5,26 \text{ t} \quad (1)$$

$$m(\text{гипс}) = 5,26 - 0,16 \cdot 5,26 = 4,42 \text{ t/h} \quad (0,5)$$

$$\text{дневно: } 4,42 \text{ t} \cdot 24 = 106 \text{ t гипса} \quad (0,5)$$

229) 4

**Решење: а) 0,2159 , б) 8,73 mol/dm<sup>3</sup> , в) 855,56 g/dm<sup>3</sup> г) 15,305 mol/kg**

$$\omega(\text{H}_3\text{PO}_4) = 60\%$$

$$\rho(\text{H}_3\text{PO}_4) = 1,426 \text{ g/cm}^3$$

$$\text{а) } X = n(\text{H}_3\text{PO}_4) / n_r$$

$$m_r = 100 \text{ g} = 60 \text{ g rs} + 40 \text{ g H}_2\text{O}$$

$$m_{rs} = 60 \text{ g}$$

$$n(\text{H}_3\text{PO}_4) = 60 \text{ g} / 98 \text{ g/mol} = 0,6122 \text{ mol}$$

$$n(\text{H}_2\text{O}) = 40 \text{ g} / 18 \text{ g/mol} = 2,2222 \text{ mol}$$

$$n_r = 2,2222 \text{ mol} + 0,6122 \text{ mol} = 2,8344 \text{ mol}$$

$$X = 0,6122 \text{ mol} / 2,8344 \text{ mol} = 0,2159$$

$$\text{б) } C(\text{H}_3\text{PO}_4) = n/V = 0,6122 \text{ mol} / 70,1262 \cdot 10^{-3} \text{ dm}^3 = 8,7299 \text{ mol/dm}^3$$

$$V = m/\rho = 100 \text{ g} / 1,426 \text{ g/cm}^3 = 70,1262 \text{ cm}^3$$

$$\text{в) } \gamma(\text{H}_3\text{PO}_4) = m/V = 60 \text{ g} / 70,1262 \cdot 10^{-3} \text{ dm}^3 = 855,6 \text{ g/dm}^3$$

$$\text{г) } b = n / m(\text{H}_2\text{O}) = 0,6122 \text{ mol} / 40 \cdot 10^{-3} \text{ kg} = 15,305 \text{ mol/kg}$$

230) 4

**Решење: 312,5 dm<sup>3</sup> првог раствора и 187,5 dm<sup>3</sup> другог раствора**

$$\gamma_1 = 0,02 \text{ g/dm}^3$$

$$\gamma_2 = 0,50 \text{ g/dm}^3$$

$$\gamma_3 = 0,20 \text{ g/dm}^3$$

$$V_3 = 500 \text{ dm}^3$$

$$V_1 = ?$$

$$V_2 = ?$$

$$0,02 \text{ g/dm}^3 \quad 0,30 \text{ dm}^3$$

$$0,50 \text{ g/dm}^3 \quad 0,20 \text{ g/dm}^3$$

$$\hline 0,50 \text{ g/dm}^3 \quad 0,18 \text{ dm}^3$$

$$\hline 0,48 \text{ dm}^3 \quad (1)$$

$$0,48 \text{ dm}^3 : 0,3 \text{ dm}^3 = 500 \text{ dm}^3 : x$$

$$V_1(0,02 \text{ g/dm}^3) = 312,5 \text{ dm}^3 \quad (1,5)$$

$$0,48 \text{ dm}^3 : 0,18 \text{ dm}^3 = 500 \text{ dm}^3 : x$$

$$V_2(0,5 \text{ g/dm}^3) = 187,5 \text{ dm}^3 \quad (1,5)$$

Признаје се задатак урађен коришћењем пропорције.

231) 4

**Решење: 200 g воде, маса раствора је 1200 g**

$$m_{1r}(\text{H}_3\text{PO}_4) = 1000 \text{ g}$$

$$\omega_1(\text{H}_3\text{PO}_4) = 60 \%$$

$$\omega_3(\text{H}_3\text{PO}_4) = 50 \%$$

$$m(\text{H}_2\text{O}) = ?$$

$$m_{2r}(\text{H}_3\text{PO}_4) = ?$$

$$60\% \qquad 50\% \qquad 50 \text{ g}$$

$$50\%$$

$$0\% \qquad 10 \text{ g}$$

$$\hline 60 \text{ g}$$

(1)

$$50 \text{ g (60 \%)} : 10 \text{ g (H}_2\text{O)} = 1000 \text{ g} : x$$

$$m(\text{H}_2\text{O}) = 200 \text{ g} \quad (2)$$

$$m_r = 1000 \text{ g} + 200 \text{ g} = 1200 \text{ g} \quad (1)$$

Признаје се задатак урађен коришћењем пропорције.

232) 5

**Решење: 21,23 cm<sup>3</sup>**

$$C(\text{NaOH}) = 0,1023 \text{ mol/dm}^3$$

$$V(\text{H}_3\text{PO}_4)_{\text{al}} = 25 \text{ cm}^3$$

$$V(\text{H}_3\text{PO}_4) = 5 \text{ cm}^3$$

$$\omega(\text{H}_3\text{PO}_4) = 35 \%$$

$$\rho(\text{H}_3\text{PO}_4) = 1,216 \text{ g/cm}^3$$

$$V(\text{H}_3\text{PO}_4)_{\text{or}} = 250 \text{ cm}^3$$

$$V(\text{NaOH}) = ?$$

$$m_r = \rho \cdot V = 1,216 \text{ g/cm}^3 \cdot 5 \text{ cm}^3 = 6,08 \text{ g} \quad (0,5)$$

$$m_{rs} = \frac{\omega \cdot m_r}{100\%} = \frac{35\% \cdot 6,08 \text{ g}}{100\%} = 2,128 \text{ g} \quad (0,5)$$

250 cm<sup>3</sup> раствора садржи 2,128g H<sub>3</sub>PO<sub>4</sub>

$$250 \text{ cm}^3 : 2,128 \text{ g H}_3\text{PO}_4 = 25 \text{ cm}^3 : m(\text{H}_3\text{PO}_4)$$

$$m(\text{H}_3\text{PO}_4) = 0,2128 \text{ g} \quad (0,5)$$



$$98 \text{ g} : 40 \text{ g} = 0,2128 \text{ g} : m(\text{NaOH})$$

$$m(\text{NaOH}) = 0,08686 \text{ g} \quad (1)$$

$$n(\text{NaOH}) = m/M = 0,08686 \text{ g} / 40 \text{ g/mol} = 0,00217 \text{ mol} \quad (0,5)$$

$$V(\text{NaOH}) = n/C = 0,00217 \text{ mol} / 0,1023 \text{ mol/dm}^3 \quad (0,5)$$

$$V(\text{NaOH}) = 0,02123 \text{ dm}^3 = 21,23 \text{ cm}^3 \quad (0,5)$$

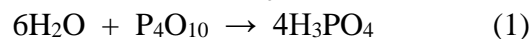
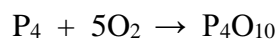
233) 3

**Решење: 1,7 m<sup>3</sup>**

$$m(\text{P}) = 2 \text{ t}$$

$$\rho(\text{H}_2\text{O}) = 0,99823 \text{ g/cm}^3$$

$$V(\text{H}_2\text{O}) = ? \text{ m}^3$$



$$4 \cdot 31 \text{ g P} : 6 \cdot 18 \text{ g H}_2\text{O} = 2 \text{ t} : m(\text{H}_2\text{O})$$

$$m(\text{H}_2\text{O}) = 1,74 \text{ t} \quad (1)$$

$$V(\text{H}_2\text{O}) = m/\rho = 1,74 \cdot 10^6 \text{ g} / 0,99823 \text{ g/cm}^3 = 1743085,26 \text{ cm}^3 = 1,7 \text{ m}^3 \quad (1)$$

234) 5

Решење: 35%

$$\rho(\text{H}_3\text{PO}_4) = 1,1529 \text{ g/cm}^3$$

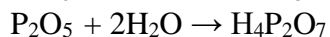
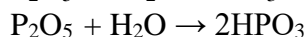
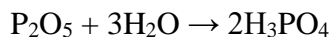
$$V(\text{H}_3\text{PO}_4) = 1 \text{ dm}^3$$

$$m(\text{H}_3\text{PO}_4) = 500 \text{ g}$$

$$m(\text{HPO}_3) = 25 \text{ g}$$

$$m(\text{H}_4\text{P}_2\text{O}_7) = 25 \text{ g}$$

$$\omega(\text{P}_2\text{O}_5) = ?$$



све три тачне (1)

$$2 \cdot 98 \text{ g}(\text{H}_3\text{PO}_4) : 142 \text{ g}(\text{P}_2\text{O}_5) = 500 \text{ g} : m_1(\text{P}_2\text{O}_5)$$
$$m_1(\text{P}_2\text{O}_5) = 362,2448 \text{ g} \quad (1)$$

$$2 \cdot 80 \text{ g} \text{ HPO}_3 : 142 \text{ g} \text{ P}_2\text{O}_5 = 25 \text{ g} : m_2(\text{P}_2\text{O}_5)$$
$$m_2(\text{P}_2\text{O}_5) = 22,1875 \text{ g} \quad (1)$$

$$178 \text{ g} \text{ H}_4\text{P}_2\text{O}_7 : 142 \text{ g} \text{ P}_2\text{O}_5 = 25 \text{ g} : m_3(\text{P}_2\text{O}_5)$$
$$m_3(\text{P}_2\text{O}_5) = 19,9438 \text{ g} \quad (1)$$

$$m(\text{P}_2\text{O}_5) = 19,9438 \text{ g} + 22,1875 \text{ g} + 362,2448 \text{ g}$$
$$m(\text{P}_2\text{O}_5) = 404,3761 \text{ g} \quad (0,5)$$

$$m_r = 1,1529 \text{ g/cm}^3 \cdot 1000 \text{ cm}^3 = 1152,9 \text{ g}$$

$$\omega(\text{P}_2\text{O}_5) = \frac{404,3761 \text{ g}}{1152,9 \text{ g}} \cdot 100\% = 35\% \quad (0,5)$$

235) 3

Решење: 16%

$$m(\text{сирови апатит}) = 60 \text{ g}$$

$$m(\text{H}_3\text{PO}_4) = 29,4 \text{ g}$$

$$\omega(\text{примеса}) = ?$$



$$504 \text{ g} \text{ Ca}_5(\text{PO}_4)_3\text{F} : 3 \cdot 98 \text{ g} \text{ H}_3\text{PO}_4 = m(\text{апатит}) : 29,4 \text{ g}$$

$$m(\text{апатит}) = 50,4 \text{ g} \quad (1)$$

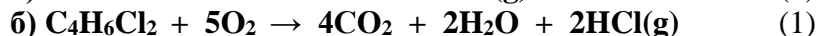
$$m(\text{примеса}) 60 - 50,4 = 9,6 \text{ g}$$

$$\omega(\text{примеса}) = \frac{9,6 \text{ g}}{60 \text{ g}} \cdot 100\% = 16\% \quad (1)$$

## ХЛОРОВОДОНОЧНА КИСЕЛИНА

### ХЛОРОВОДОНОЧНА КИСЕЛИНА - ПИТАЊА

236) 2



237) 2

Решење: 1) изотермски, стална температура, топлота се непрестано одводи хлађењем водом (1)

2) адијабатски, без размене топлоте, киселина се хлади по изласку из апсорбера. (1)

### ХЛОРОВОДОНИЧНА КИСЕЛИНА - ЗАДАЦИ

238) 2

Решење: 61,37 dm<sup>3</sup>

$$36,5 \text{ gHCl} : 22,4 \text{ dm}^3 = 100 \text{ gHCl} : x \quad x = 61,37 \text{ dm}^3$$



239) 2

Решење: **16,67 mol/dm<sup>3</sup>**

$$\begin{aligned} 24 \text{ dm}^3 : 1 \text{ mol} &= 600 \text{ dm}^3 : x & x &= 25 \text{ mol} \\ 25 \text{ mol} : 1,5 \text{ dm}^3 &= x \text{ mol} : 1 \text{ dm}^3 & x &= 16,67 \end{aligned}$$

240) 3

Решење: **258,46 m<sup>3</sup>** **m = 688,32 kg 82% H<sub>2</sub>SO<sub>4</sub>** **689,49**

чист NaCl : 750 kg · 0,9 = 675 kg



$$58,5 \text{ kg NaCl} : 22,4 \text{ m}^3 \text{ HCl} = 675 \text{ kg NaCl} : x \text{ m}^3 \text{ HCl} \quad x = 258,46 \text{ m}^3 \quad (1)$$

$$2 \cdot 58,6 \text{ kg NaCl} : 98 \text{ kg H}_2\text{SO}_4 = 675 \text{ kg NaCl} : x \text{ kg H}_2\text{SO}_4 \quad x = 564,42 \text{ kg H}_2\text{SO}_4 \quad (1)$$

$$564,42 \text{ kg H}_2\text{SO}_4 : 82\% = x \text{ kg H}_2\text{SO}_4 : 100\% \quad x = 688,32 \text{ kg 82\% H}_2\text{SO}_4 \quad (0,5)$$

241) 2

Решење: **89,6 dm<sup>3</sup>**



$$1 \text{ mol H}_2(\text{или Cl}_2) : 2 \cdot 22,4 \text{ dm}^3 \text{ HCl} = 2 \text{ mol H}_2(\text{или Cl}_2) : x \text{ dm}^3 \text{ HCl} \quad x = 89,6 \text{ dm}^3 \text{ HCl}$$

242) 2

Решење: **4 mol HCl, водоник, 1 mol**



H<sub>2</sub> и Cl<sub>2</sub> реагују у односу 1 : 1, у вишку је водоник 1 mol (0,5)

$$1 \text{ mol H}_2(\text{или Cl}_2) : 2 \text{ mol HCl} = 2 \text{ mol H}_2(\text{или Cl}_2) : x \text{ mol HCl} \quad x = 4 \text{ mol HCl} \quad (1)$$

243) 2

Решење: **22,176 dm<sup>3</sup>**

$$1 \text{ dm}^3 : 0,55 \text{ mol} = 1,8 \text{ dm}^3 : x \text{ mol} \quad x = 0,99 \text{ mol} \quad (1)$$

$$1 \text{ mol} : 22,4 \text{ dm}^3 = 0,99 \text{ mol} : x \text{ dm}^3 \quad x = 22,176 \text{ dm}^3 \quad (1)$$

244) 3

Решење: **82,58 dm<sup>3</sup>**



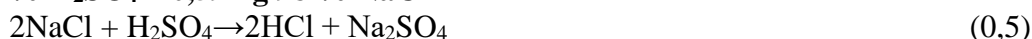
$$1 \text{ mol H}_2 : 2 \cdot 22,4 \text{ dm}^3 \text{ HCl} = 2,5 \text{ mol H}_2 : x \text{ dm}^3 \text{ HCl} \quad x = 112 \text{ dm}^3 \text{ HCl (н.у.)} \quad (1)$$

$$\frac{P_0 \cdot V_0}{T_0} = \frac{P_1 \cdot V_1}{T_1} \Rightarrow V_1 = \frac{P_0 \cdot V_0 \cdot T_1}{T_0 \cdot P_1} \quad (1)$$

$$V_1 = \frac{101325 \cdot 0,112 \cdot 298}{273 \cdot 150000} = 0,08258 \text{ m}^3 = 82,58 \text{ dm}^3 \quad (0,5)$$

245) 3

Решење: **0,50 kg 96 % H<sub>2</sub>SO<sub>4</sub> и 0,59 kg 98 % NaCl**



$$98 \text{ kg H}_2\text{SO}_4 : 73 \text{ kg HCl} = x \text{ kg H}_2\text{SO}_4 : 0,36 \text{ kg HCl} \quad x = 0,483 \text{ kg H}_2\text{SO}_4 \quad (1)$$

$$0,497 \text{ kg H}_2\text{SO}_4 : 96\% = x \text{ kg H}_2\text{SO}_4 : 100\% \quad x = 0,50 \text{ kg H}_2\text{SO}_4 (96\%) \quad (0,5)$$

$$58,5 \text{ kg NaCl} : 36,5 \text{ kg HCl} = x \text{ kg NaCl} : 0,36 \text{ kg HCl} \quad x = 0,577 \text{ kg NaCl} \quad (0,5)$$

$$0,577 \text{ kg NaCl} : 98\% = x \text{ kg NaCl} : 100\% \quad x = 0,59 \text{ kg NaCl} (98\%) \quad (0,5)$$

246) 3

Решење: **10,25 % нечистоћа**



$$58,5 \text{ kg NaCl} : 36,5 \text{ kg HCl} = x \text{ kg NaCl} : 700 \text{ kg HCl} \quad x = 1121,92 \text{ kg NaCl} \quad (1)$$

$$1250 \text{ kg NaCl} : 100\% = 1121,92 \text{ kg NaCl} : x\% \quad x = 89,75\% \text{ NaCl} \quad (1)$$

$$\text{односно } 100 - 89,75 = 10,25\% \text{ нечистоћа} \quad (0,5)$$

247) 2

Решење:  $C = 0,115 \text{ mol/dm}^3$

$$V_1 \cdot C_1 = V_2 \cdot C_2 \Rightarrow C_{\text{HCl}} = C_{\text{KOH}} \cdot \frac{V_{\text{KOH}}}{V_{\text{HCl}}} \quad (1)$$

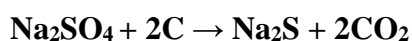
$$C_{\text{HCl}} = 0,1 \cdot \frac{34,5}{30} = 0,115 \text{ mol/dm}^3 \quad (1)$$

## СОДА И КАУСТИЧНА СОДА

### СОДА И КАУСТИЧНА СОДА - ПИТАЊА

248) 3

Решење:  $2\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{HCl}$



249) 2

Решење:  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$



250) 2

Решење:  $\text{Na}_2\text{CO}_3 + \text{Ca(OH)}_2 \rightarrow 2\text{NaOH} + \text{CaCO}_3$



251) 1

Решење:  $2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{Cl}_2 + \text{H}_2$

(1)

252) 2

Решење: Катодни и анодни простор морају бити раздвојени да не би дошло до непожељне реакције између  $\text{Cl}_2$  и  $\text{NaOH}$ :  $\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaCl} + \text{NaClO} + \text{H}_2\text{O}$  (2×1)

### СОДА И КАУСТИЧНА СОДА- ЗАДАЦИ

253) 3

Решење:  $1,176 \text{ mol NH}_4\text{Cl}$      $0,588 \text{ mol Ca(OH)}_2$      $1,176 \text{ mol NH}_3$

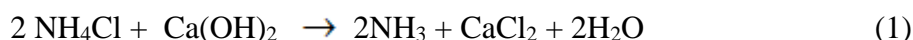
$$m(\text{NH}_3) = 20\text{g}$$

$$n(\text{NH}_3) = ?$$

$$n(\text{NH}_4\text{Cl}) = ?$$

$$n(\text{Ca(OH)}_2) = ?$$

$$n(\text{NH}_4\text{Cl}) \quad n(\text{Ca(OH)}_2) \quad 20\text{g}$$



$$n(\text{NH}_3) : n(\text{NH}_4\text{Cl}) : n(\text{Ca(OH)}_2) = 1 : 1 : 0,5 \quad (1)$$

$$n(\text{NH}_3) = \frac{m}{M} = \frac{20\text{g}}{17\text{g}} \quad (0,25)$$

$$n(\text{NH}_3) = 1,176 \text{ mol} \quad (0,25)$$

$$n(\text{NH}_4\text{Cl}) = 1,176 \text{ mol} \quad (0,25)$$

$$n(\text{Ca(OH)}_2) = 0,588 \text{ mol} \quad (0,25)$$

254) 2

**Решење: 297 cm<sup>3</sup>**

$$c(\text{NaHCO}_3) = 0,5 \text{ mol/dm}^3$$

$$m(\text{NaHCO}_3) = 12,5 \text{ g}$$

$$V(\text{NaHCO}_3) = ?$$

$$M(\text{NaHCO}_3) = 84 \text{ g/mol}$$

$$0,5 \text{ mol NaHCO}_3 = 42 \text{ g NaHCO}_3 \quad (0,5)$$

$$42 \text{ g NaHCO}_3 \text{ ----- } 1000 \text{ cm}^3 \text{ раствора}$$

$$12,5 \text{ g NaHCO}_3 \text{ ----- } V(\text{cm}^3) \text{ раствора} \quad (1)$$

---

$$V(\text{cm}^3) \text{ раствора} = 297 \text{ cm}^3 \quad (0,5)$$

255) 3

**Решење: 2,688 m<sup>3</sup>**

$$m(\text{CaCO}_3) = 15 \text{ kg}$$

$$80 \% \text{ CaCO}_3$$

$$V(\text{CO}_2) = ?$$

$$15 \text{ kg} \cdot 0,8 = 12 \text{ kg CaCO}_3 \quad (0,5)$$

$$n(\text{CaCO}_3) = \frac{m}{M} = \frac{12 \cdot 10^3 \text{ g}}{100 \frac{\text{g}}{\text{mol}}} = 120 \text{ mol} \quad (0,5)$$

$$M(\text{CaCO}_3) = 100 \text{ g/mol}$$

$$V_m = 22,4 \text{ dm}^3/\text{mol}$$



$$1 \text{ mol CaCO}_3 \text{ ----- } 1 \text{ mol CO}_2 \quad (0,5)$$

$$n(\text{CO}_2) = 120 \text{ mol} \quad (0,5)$$

$$V(\text{CO}_2) = 120 \text{ mol} \cdot 22,4 \text{ dm}^3/\text{mol}$$

$$V(\text{CO}_2) = 2,688 \text{ m}^3 \quad (0,5)$$

256) 3

**Решење: 40,47 %**

$$\omega(\text{Na}_2\text{CO}_3) = 15 \%$$

$$\omega(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}) = ?$$

$$M(\text{Na}_2\text{CO}_3) = 106 \text{ g/mol}$$

$$M(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}) = 286 \text{ g/mol}$$

$$\begin{array}{l} 286 \text{ g Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} \text{ ----- } 106 \text{ g Na}_2\text{CO}_3 \\ m(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}) \text{ ----- } 15 \text{ g Na}_2\text{CO}_3 \end{array} \quad (1)$$

$$m(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}) = 40,47 \text{ g} \quad (0,5)$$

$$\omega(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}) = \frac{40,47 \text{ g}}{100 \text{ g}} \cdot 100 \quad (1)$$

$$\omega(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}) = 40,47 \% \quad (0,5)$$

257) 3

**Решење: 71,79 kg NaHCO<sub>3</sub>**

$$m(\text{NaCl}) = 50 \text{ kg}$$

$$m(\text{NaHCO}_3) = ?$$

$$m(\text{NH}_4\text{Cl}) = ?$$

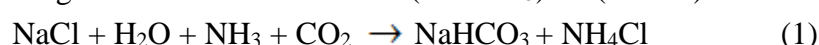
$$M(\text{NaCl}) = 58,5 \text{ g/mol}$$

$$M(\text{NaHCO}_3) = 84 \text{ g/mol}$$

$$M(\text{NH}_4\text{Cl}) = 53,5 \text{ g/mol}$$

**45,73 kg NH<sub>4</sub>Cl**

$$50 \text{ kg}$$



$$58,5 \text{ g}$$

$$84 \text{ g} \quad 53,5 \text{ g}$$

$$m(\text{NaHCO}_3) = 71,79 \text{ kg} \quad (1)$$

$$m(\text{NH}_4\text{Cl}) = 45,73 \text{ kg} \quad (1)$$

258) 2

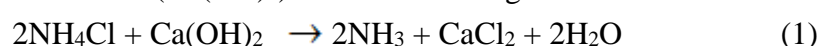
**Решење: 33,33 kg Ca(OH)<sub>2</sub>**

$$m(\text{CaCl}_2) = 50 \text{ kg}$$

$$M(\text{Ca(OH)}_2) = 74 \text{ g/mol}$$

$$M(\text{CaCl}_2) = 111 \text{ g/mol}$$

$$m(\text{Ca(OH)}_2) \quad 50 \text{ kg}$$



$$74 \text{ g} \quad 111 \text{ g}$$

$$m(\text{Ca(OH)}_2) = 33,33 \text{ kg} \quad (1)$$

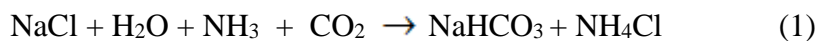
259) 5

**Решење: 845,28 m<sup>3</sup> NH<sub>3</sub> 507,17 m<sup>3</sup> CO<sub>2</sub>**

m(Na<sub>2</sub>CO<sub>3</sub>) = 2t

V(NH<sub>3</sub>) V<sub>1</sub>(CO<sub>2</sub>)

80 % CO<sub>2</sub> се враћа у процес



V(NH<sub>3</sub>) = ?

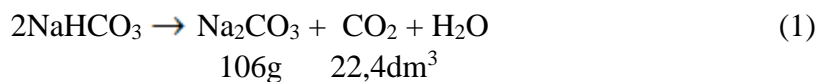
44,8dm<sup>3</sup> 44,8dm<sup>3</sup>

V(CO<sub>2</sub>) = ?

M(Na<sub>2</sub>CO<sub>3</sub>) = 106g/mol

2t V<sub>2</sub>(CO<sub>2</sub>)

V<sub>m</sub> = 22,4 dm<sup>3</sup>/mol



Из (2) → 1mol Na<sub>2</sub>CO<sub>3</sub> ----- 2mol NaHCO<sub>3</sub> ----- 1mol CO<sub>2</sub>

Из (1) → 1mol NaHCO<sub>3</sub> ----- 1mol NH<sub>3</sub> ----- 1molCO<sub>2</sub> (0,5)

106g Na<sub>2</sub>CO<sub>3</sub> ----- 44,8dm<sup>3</sup> NH<sub>3</sub>  
 $\frac{2 \cdot 10^6 \text{g Na}_2\text{CO}_3}{106} \text{ ----- } V(\text{NH}_3)$

$$V(\text{NH}_3) = 845,28 \text{ m}^3 \quad (0,5)$$

$$V(\text{NH}_3) = V_1(\text{CO}_2) \quad V_1(\text{CO}_2) = 845,28 \text{ m}^3 \quad (0,5)$$

106g Na<sub>2</sub>CO<sub>3</sub> ----- 22,4dm<sup>3</sup> CO<sub>2</sub>  
 $\frac{2 \cdot 10^6 \text{g Na}_2\text{CO}_3}{106} \text{ ----- } V_2(\text{CO}_2)$

$$V_2(\text{CO}_2) = 422,64 \text{ m}^3 \quad (0,5)$$

$$V(\text{CO}_2) = V_1(\text{CO}_2) - 0,8 \cdot V_2(\text{CO}_2) \quad (0,5)$$

$$V(\text{CO}_2) = 845,28 \text{ m}^3 - 0,8 \cdot 422,64 \text{ m}^3$$

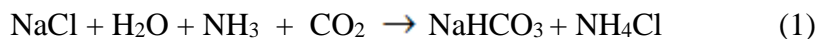
$$V(\text{CO}_2) = 507,17 \text{ m}^3 \quad (0,5)$$

260) 5

**Решење: 8,28 m<sup>3</sup> NaCl 2113,2 m<sup>3</sup> NH<sub>3</sub> 1056,6 m<sup>3</sup> CO<sub>2</sub>**

V(NH<sub>3</sub>) V<sub>1</sub>(CO<sub>2</sub>)

V(NaCl) = ?



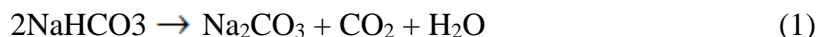
V(NH<sub>3</sub>) = ?

44,8dm<sup>3</sup> 44,8dm<sup>3</sup>

V(CO<sub>2</sub>) = ?

5t V<sub>2</sub>(CO<sub>2</sub>)

m(Na<sub>2</sub>CO<sub>3</sub>) = 5t



γ(NaCl) = 500g/dm<sup>3</sup>

106g 22,4dm<sup>3</sup>

3/4 раствора NaCl

се преводи у Na<sub>2</sub>CO<sub>3</sub>

1mol NaCl ----- 0,5mol Na<sub>2</sub>CO<sub>3</sub>

100% CO<sub>2</sub> се враћа у процес

58,5g NaCl ----- 53g Na<sub>2</sub>CO<sub>3</sub>

M(Na<sub>2</sub>CO<sub>3</sub>) = 106g/mol

$\frac{m(\text{NaCl})}{58,5} \text{ ----- } \frac{5 \cdot 10^6 \text{g Na}_2\text{CO}_3}{106}$

M(NaCl) = 58,5g/mol

$$m(\text{NaCl}) = 5,52 \text{ t NaCl} \quad (0,25)$$

500g NaCl ----- 1dm<sup>3</sup> раствора NaCl

$\frac{5,52 \cdot 10^6 \text{g NaCl}}{500} \text{ ----- } V(\text{NaCl})$

$$V(\text{NaCl}) = 11,04 \text{ m}^3 \quad V(\text{NaCl}) = 11,04 \text{ m}^3 \cdot 3/4 = 8,28 \text{ m}^3 \quad (2 \times 0,25)$$

Из (2) → 1mol Na<sub>2</sub>CO<sub>3</sub> ----- 2mol NaHCO<sub>3</sub> ----- 1mol CO<sub>2</sub>

Из (1) → 1mol NaHCO<sub>3</sub> ----- 1mol NH<sub>3</sub> ----- 1molCO<sub>2</sub> (2×0,5)

106g Na<sub>2</sub>CO<sub>3</sub> ----- 44,8dm<sup>3</sup> NH<sub>3</sub>

$$\frac{5 \cdot 10^6 \text{g Na}_2\text{CO}_3}{106} \text{ ----- } V(\text{NH}_3)$$

$$V(\text{NH}_3) = 2113,2 \text{ m}^3 \quad V(\text{NH}_3) = V_1(\text{CO}_2)$$

106g Na<sub>2</sub>CO<sub>3</sub> ----- 22,4dm<sup>3</sup> CO<sub>2</sub>

$$\frac{5 \cdot 10^6 \text{g Na}_2\text{CO}_3}{106} \text{ ----- } V_2(\text{CO}_2)$$

$$V_2(\text{CO}_2) = 1056,6 \text{ m}^3 \quad (2 \times 0,5)$$

$$V(\text{CO}_2) = V_1(\text{CO}_2) - V_2(\text{CO}_2)$$

$$V(\text{CO}_2) = 1056,6 \text{ m}^3 \quad (0,25)$$

261) 2

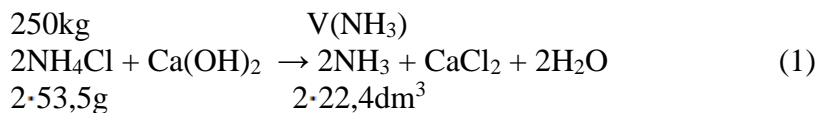
Решење: 104,67 m<sup>3</sup> NH<sub>3</sub>

V(NH<sub>3</sub>) = ?

m(NH<sub>4</sub>Cl) = 250kg

M(NH<sub>4</sub>Cl) = 53,5g/mol

Vm = 22,4 dm<sup>3</sup>/mol



$$V(\text{NH}_3) = 104,67 \text{ m}^3 \quad (1)$$

262) 4

Решење: 178,36 kg CaCl<sub>2</sub>

m(CaCl<sub>2</sub>) = ?

V<sub>r</sub>(NaCl) = 700 m<sup>3</sup>

ρ = 1,0743kg/m<sup>3</sup>

ω (NaCl) = 25 %

M(NaCl) = 58,5g/mol

M(CaCl<sub>2</sub>) = 111g/mol

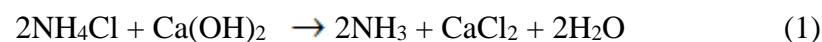
m = ρ · V

m = 1,0743kg/m<sup>3</sup> · 700m<sup>3</sup>

m = 752,01 kg раствора

25g NaCl ----- 100g раствора  
m(NaCl) ----- 752,01 kg раствора

$$m(\text{NaCl}) = 188 \text{ kg} \quad (1)$$



$$\begin{array}{l} 58,5 \text{ g NaCl} \text{ ----- } 55,5 \text{ g CaCl}_2 \\ 188\text{kg NaCl} \text{ ----- } m(\text{CaCl}_2) \\ \hline m(\text{CaCl}_2) = 178,36 \text{ kg} \end{array} \quad (1)$$

263) 4

Решење: 88,57 %

ω (Na<sub>2</sub>CO<sub>3</sub>) = ?

m<sub>u</sub> = 3,912g

250cm<sup>3</sup>/50cm<sup>3</sup> = 5

V(HCl) = 13,85 cm<sup>3</sup>

C(HCl) = 0,9440mol/dm<sup>3</sup>

M(Na<sub>2</sub>CO<sub>3</sub>) = 106g/mol



1 mol Na<sub>2</sub>CO<sub>3</sub> ----- 2 mol HCl

0,5mol Na<sub>2</sub>CO<sub>3</sub>----- 1 mol HCl

53g Na<sub>2</sub>CO<sub>3</sub>----- 1000 cm<sup>3</sup> HCl · 1 mol/dm<sup>3</sup> HCl

x g Na<sub>2</sub>CO<sub>3</sub>----- V(cm<sup>3</sup>) HCl · c(mol/dm<sup>3</sup>) HCl (1)

$$x \text{ g Na}_2\text{CO}_3 = \frac{13,85\text{cm}^3 \cdot 0,9440 \frac{\text{mol}}{\text{dm}^3} \cdot 53\text{g}}{1000\text{cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot 5 \quad (1)$$

$$x \text{ g Na}_2\text{CO}_3 = 3,465\text{g} \quad (0,5)$$

$$\omega(\text{Na}_2\text{CO}_3) = \frac{x \text{ g Na}_2\text{CO}_3}{m_u} \cdot 100\%$$

$$\omega(\text{Na}_2\text{CO}_3) = \frac{3,465 \text{ g}}{3,912 \text{ g}} \cdot 100\%$$

$$\omega(\text{Na}_2\text{CO}_3) = 88,57 \% \quad (0,5)$$

264) 4

Решење: 73,53 %

ω(Na<sub>2</sub>CO<sub>3</sub>) = ?

m<sub>u</sub> = 1,5g

V(HCl) = 19,8 cm<sup>3</sup>

C(HCl) = 1,051 mol/dm<sup>3</sup>

M(Na<sub>2</sub>CO<sub>3</sub>) = 106g/mol



1 mol Na<sub>2</sub>CO<sub>3</sub> ----- 2 mol HCl

0,5mol Na<sub>2</sub>CO<sub>3</sub>----- 1 mol HCl

53g Na<sub>2</sub>CO<sub>3</sub>----- 1000 cm<sup>3</sup> HCl 1 mol/dm<sup>3</sup> HCl

x g Na<sub>2</sub>CO<sub>3</sub>----- V(cm<sup>3</sup>) HCl · c(mol/dm<sup>3</sup>) HCl (1)

$$x \text{ g Na}_2\text{CO}_3 = \frac{19,8 \text{ cm}^3 \cdot 1,051 \frac{\text{mol}}{\text{dm}^3} \cdot 53 \text{ g}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \quad (1)$$

$$x \text{ g Na}_2\text{CO}_3 = 1,10 \text{ g}$$

$$\omega(\text{Na}_2\text{CO}_3) = \frac{x \text{ g Na}_2\text{CO}_3}{m_u} \cdot 100\%$$

$$\omega(\text{Na}_2\text{CO}_3) = 73,53\% \quad (1)$$

265) 3

**Решење: 7,14 g NaOH**

$$50 \text{ g } 20\% \text{ NaOH} + x \text{ g NaOH} \rightarrow 30\% \text{ NaOH} \quad 00 \text{ g раствора} - 30 \text{ g NaOH} = 70 \text{ g H}_2\text{O} \quad (0,25)$$

20g NaOH ----- 100g раствора

Xg NaOH ----- 50g раствора

$$X = 10 \text{ g NaOH} \quad (0,75)$$

$$50 \text{ g раствора} - 10 \text{ g NaOH} = 40 \text{ g H}_2\text{O} \quad (0,75)$$

30g NaOH----- 70g H<sub>2</sub>O

Yg NaOH ----- 40g H<sub>2</sub>O

$$Y = 17,14 \text{ g NaOH} \quad (0,75)$$

$$17,14 \text{ g} - 10 \text{ g} = 7,14 \text{ g NaOH} \quad (0,5)$$

$$m(\text{NaOH}) = 7,14 \text{ g}$$

266) 3

**Решење: 504,6 kg NaOH**

$$m(\text{NaCl}) = 1 \text{ t} = 1000 \text{ kg}$$

$$\omega(\text{NaCl}) = 82\%$$

$$h = 90\%$$

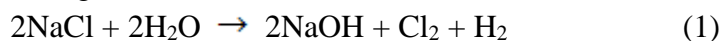
$$M(\text{NaCl}) = 58,5 \text{ g/mol}$$

$$M(\text{NaOH}) = 40 \text{ g/mol}$$

$$m(\text{NaOH}) = ?$$

$$1000 \text{ kg} \cdot 0,82 = 820 \text{ kg} \quad (0,5)$$

$$820 \text{ kg} \quad m(\text{NaOH})$$



$$117 \text{ g} \quad 80 \text{ g}$$

$$m(\text{NaOH}) = 560,68 \text{ kg} \quad (1)$$

$$560,68 \text{ kg} \cdot 0,9 = 504,6 \text{ kg} \quad (0,5)$$

$$m(\text{NaOH}) = 504,6 \text{ kg}$$

267) 2

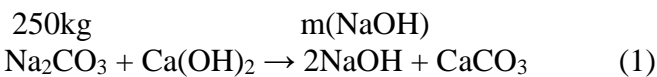
**Решење: 188 68 kg NaOH**

$$m(\text{Na}_2\text{CO}_3) = 250 \text{ kg}$$

$$m(\text{NaOH}) = ?$$

$$M(\text{NaOH}) = 40 \text{ g/mol}$$

$$M(\text{Na}_2\text{CO}_3) = 106 \text{ g/mol}$$



$$106 \text{ g} \quad 80 \text{ g}$$

$$m(\text{NaOH}) = 188,68 \text{ kg} \quad (1)$$

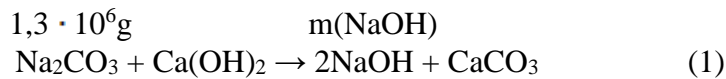
268) 3

**Решење: 863,39 kg NaOH**

$$m(\text{Na}_2\text{CO}_3) = 2 \text{ t} = 2 \cdot 10^6 \text{ g} \quad 2 \cdot 10^6 \text{ g} \cdot 0,65 = 1,3 \cdot 10^6 \text{ g} \quad (0,5)$$

$$\omega = 65\%$$

$$h = 88\%$$



$$106 \text{ g} \quad 2 \cdot 40 \text{ g}$$

$$m(\text{NaOH}) = 981,13 \text{ kg} \quad (1)$$

$$981,13 \cdot 0,88 = 863,39 \text{ kg} \quad (0,5)$$

$$m(\text{NaOH}) = 863,39 \text{ kg}$$

269) 3

**Решење: 223,38 kg NaOH**

$$m(\text{NaOH}) = ?$$

$$m_r(\text{NaCl}) = 825\text{kg}$$

$$\omega(\text{NaCl}) = 45\%$$

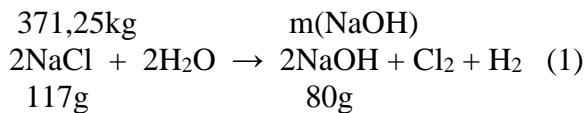
$$h = 88\%$$

$$M(\text{NaCl}) = 58,5\text{g/mol}$$

$$M(\text{NaOH}) = 40\text{g/mol}$$

$$\begin{array}{l} 45\text{g NaCl} \text{ -----} 100\text{g раствора} \\ \underline{m(\text{NaCl}) \text{ -----} 825\text{kg раствора}} \end{array} \quad (0,5)$$

$$m(\text{NaCl}) = 371,25\text{kg}$$



$$m(\text{NaOH}) = 253,85\text{kg} \quad (1)$$

$$253,85\text{kg} \cdot 0,88 = 223,38\text{kg} \quad (0,5)$$

$$m(\text{NaOH}) = 223,38\text{kg}$$

270) 4

**Решење: 94,27 %**

$$m_u = 3\text{g}$$

$$V_1 = 28,25\text{cm}^3$$

$$V_2 = 0,6\text{cm}^3$$

$$c(\text{HCl}) = 0,5114\text{mol/dm}^3$$

$$250\text{cm}^3/50\text{cm}^3=5$$

$$\omega(\text{NaOH}) = ?$$



$$\begin{array}{l} 1\text{mol NaOH} \text{ -----} 1\text{mol HCl} \\ 40\text{g NaOH} \text{ -----} 1000\text{cm}^3 \text{HCl} \cdot 1\text{mol/dm}^3 \text{HCl} \\ \underline{m(\text{NaOH}) \text{ -----} V_{\text{HCl}}(\text{NaOH}) (\text{cm}^3) \text{HCl} \cdot c(\text{mol/dm}^3) \text{HCl}} \end{array}$$

$$M(\text{NaOH}) = 40\text{g/mol}$$

$$m(\text{NaOH}) = \frac{27,65\text{cm}^3 \cdot 0,5114 \frac{\text{mol}}{\text{dm}^3} \cdot 40\text{g}}{1000\text{cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot 5 \quad (1)$$

$$V_1 = V_{\text{HCl}}(\text{NaOH}) + \frac{1}{2} \cdot V_{\text{HCl}}(\text{Na}_2\text{CO}_3) \quad (1) \quad (0,5)$$

$$V_2 = \frac{1}{2} \cdot V_{\text{HCl}}(\text{Na}_2\text{CO}_3) \quad (2) \quad (0,5)$$

$$m(\text{NaOH}) = 2,828\text{g}$$

$$\text{из (2)} : V_{\text{HCl}}(\text{Na}_2\text{CO}_3) = 2 \cdot V_2 \quad (0,5)$$

$$\omega(\text{NaOH}) = \frac{m(\text{NaOH})}{m_u} \cdot 100\%$$

$$\text{из (1)} : V_{\text{HCl}}(\text{NaOH}) = V_1 - V_2 \quad (0,5)$$

$$\omega(\text{NaOH}) = 94,27\% \quad (0,5)$$

271) 5

**Решење: 94,61 % NaOH    5,39 % Na<sub>2</sub>CO<sub>3</sub>**

$$m_u = 1,96\text{g}$$

$$V_1 = 9,5\text{cm}^3$$

$$V_2 = 0,2\text{cm}^3$$

$$c(\text{HCl}) = 0,4985\text{mol/cm}^3$$

$$\text{аликвотни број : 10}$$

$$M(\text{NaOH}) = 40\text{g/mol}$$

$$M(\text{Na}_2\text{CO}_3) = 106\text{g/mol}$$



$$\begin{array}{l} 1\text{mol NaOH} \text{ -----} 1\text{mol HCl} \\ 40\text{g NaOH} \text{ -----} 1000\text{cm}^3 \text{HCl} \cdot 1\text{mol/dm}^3 \text{HCl} \\ \underline{m(\text{NaOH}) \text{ -----} V_{\text{HCl}}(\text{NaOH}) (\text{cm}^3) \text{HCl} \cdot c(\text{mol/dm}^3) \text{HCl}} \end{array}$$

$$m(\text{NaOH}) = \frac{9,3\text{cm}^3 \cdot 0,4985 \frac{\text{mol}}{\text{dm}^3} \cdot 40\text{g}}{1000\text{cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot 10 \quad (1)$$

$$V_1 = V_{\text{HCl}}(\text{NaOH}) + \frac{1}{2} \cdot V_{\text{HCl}}(\text{Na}_2\text{CO}_3) \quad (0,5)$$

$$V_2 = \frac{1}{2} \cdot V_{\text{HCl}}(\text{Na}_2\text{CO}_3) \quad (0,5)$$

$$m(\text{NaOH}) = 1,85\text{g}$$

$$\text{из (2)} : V_{\text{HCl}}(\text{Na}_2\text{CO}_3) = 2 \cdot V_2 \quad (0,5)$$

$$\omega(\text{NaOH}) = \frac{m(\text{NaOH})}{m_u} \cdot 100\%$$

$$\text{из (1)} : V_{\text{HCl}}(\text{NaOH}) = V_1 - V_2 \quad (0,5)$$

$$\omega(\text{NaOH}) = 94,61\% \quad (0,25)$$



$$\begin{array}{l} 1 \text{ mol Na}_2\text{CO}_3 \text{ ----- } 2 \text{ mol HCl} \\ 0,5 \text{ mol Na}_2\text{CO}_3 \text{ ----- } 1 \text{ mol HCl} \\ 53 \text{ g Na}_2\text{CO}_3 \text{ ----- } 1000 \text{ cm}^3 \text{ HCl} \cdot 1 \text{ mol/dm}^3 \text{ HCl} \\ \underline{m(\text{Na}_2\text{CO}_3) \text{ ----- } V_{\text{HCl}}(\text{Na}_2\text{CO}_3)(\text{cm}^3) \text{HCl} \cdot c(\text{mol/dm}^3) \text{HCl}} \end{array}$$

$$m(\text{Na}_2\text{CO}_3) = \frac{0,4 \text{ cm}^3 \cdot 0,4985 \frac{\text{mol}}{\text{dm}^3} \cdot 53 \text{ g}}{1000 \text{ cm}^3 \cdot 1 \frac{\text{mol}}{\text{dm}^3}} \cdot 10 \quad (1)$$

$$m(\text{Na}_2\text{CO}_3) = 0,1056 \text{ g}$$

$$\omega(\text{Na}_2\text{CO}_3) = \frac{m(\text{Na}_2\text{CO}_3)}{m_u} \cdot 100\%$$

$$\omega(\text{Na}_2\text{CO}_3) = 5,39\% \quad (0,25)$$

## ОРГАНСКА ХЕМИЈСКА ТЕХНОЛОГИЈА

### ТЕХНОЛОГИЈА МАСТИ И УЉА

#### МАСТИ И УЉА - ПИТАЊА

272) 0,5

Решење: а

273) 0,5

Решење: б

274) 0,5

Решење: б

275) 1,5

Решење: уља органског растварача мисцела.

276) 1

Решење: естарски сапонификационом

277) 1

Решење: антиоксидансе аутооксидације

278) 2

Решење: 4 1 2 3

279) 2

Решење: 3 4 2 1

280) 2,5

Решење: 5 4 2 3 1



281) 2,5

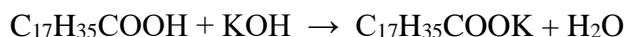
Решење: 2 1 5 3 4

### МАСТИ И УЉА - ЗАДАЦИ

282) 5

Решење: 30,4 mg стеаринске киселине у 1 g масти

$$m = 2,8 \text{ g} \quad V = 3 \text{ cm}^3 \quad c = 0,1 \text{ mol/dm}^3$$



$$1 \text{ mol} : 56 \text{ g} = 0,1 \text{ mol} : X \\ X = 5,6 \text{ g.}$$

$$1000 \text{ cm}^3 : 5,6 \text{ g} = 3 \text{ cm}^3 : Y \\ Y = 0,0168 \text{ g} = 16,8 \text{ mg KOH}$$

$$284 \text{ g стеаринске киселине} : 56 \text{ g KOH} = X : 0,0168 \text{ g} \\ X = 85,2 \text{ mg стеаринске киселине у } 2,8 \text{ g масти}$$

$$2800 \text{ mg масти} : 85,2 \text{ mg} = 1000 \text{ mg} : Y \\ Y = 30,43 \text{ mg стеаринске киселине}$$

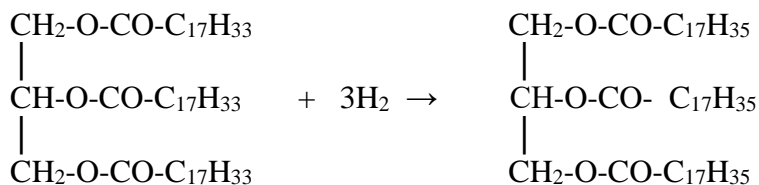
За тачно написану хемијску једначину 1 бод и за тачно урађен задатак 4 бода. Укупно 5 бодова.

283) 4

Решење: 89,43 dm<sup>3</sup>

$$V(\text{H}_2) = ? \quad m = 1 \text{ kg} = 1000 \text{ g}$$

$$M(\text{C}_{57}\text{H}_{104}\text{O}_6) = 884 \text{ g/mol}$$



$$884 \text{ g} : (3 \cdot 22,4) \text{ dm}^3 = 1000 \text{ g} : X \\ X = 76,02 \text{ dm}^3 \text{ водоника}$$

$$76,02 \text{ dm}^3 : 85\% = Y : 100\%$$

$$Y = 89,43 \text{ dm}^3 \text{ водоника}$$

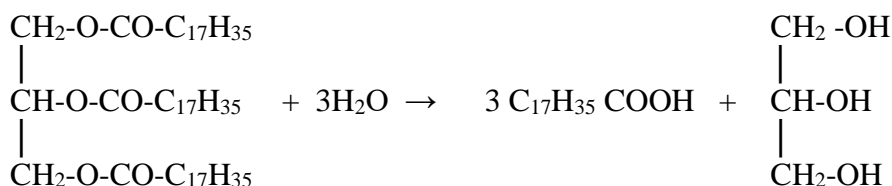
Тачно урађен задатак 4 бода. Тачно написана једначина а нетачно урађен прорачун 2 бода.

Тачно урађен задатак без хемијске једначине 0 бодова.

284) 5

Решење: 55,523 kg стеаринске киселине и 5,99 kg глицерола

$$m = 72,5 \text{ kg.} \quad M(\text{C}_{57}\text{H}_{110}\text{O}_6) = 890 \text{ g/mol} \quad M(\text{C}_3\text{H}_8\text{O}_3) = 92 \text{ g/mol} \quad M(\text{C}_{17}\text{H}_{35}\text{COOH}) = 284 \text{ g/mol}$$



$$72,5 \text{ kg} : 100\% = X : 80\%$$

$$X = 58,0 \text{ kg тристеарата се налази у масноћи}$$

$$890\text{g} : (3 \cdot 284)\text{g} = 58000\text{g} : X$$

$$X = 55,523\text{ kg стeаринске киселине}$$

$$890\text{g} : 92\text{g} = 58000\text{g} : Y$$

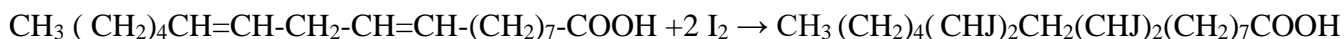
$$Y = 5,99\text{ kg глицерола}$$

Тачно урађен задатак 5 бодова. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова.

285) 3

**Решење: 160 mg**

$$m = 290\text{ mg I}_2 \quad M(\text{C}_{18}\text{H}_{32}\text{O}_2) = 280\text{ g/mol} \quad M(\text{J}_2) = 254\text{ g/mol}$$



$$280\text{g} : (2 \cdot 254)\text{g} = X : 290\text{ mg}$$

$$X = 159,8\text{ mg линолне киселине}$$

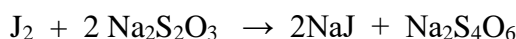
За тачно урађен задатак са написаном хемијском реакцијом 3 бода.

286) 5

**Решење: 49,37 g J<sub>2</sub> u 100g масти**

$$m = 0,8\text{ g}$$

$$V_1 = 44,5\text{ cm}^3 \quad V_2 = 13,4\text{ cm}^3 \quad c = 0,1000\text{ mol/dm}^3$$



$$n(\text{J}_2) : n(\text{Na}_2\text{S}_2\text{O}_3) = 1 : 2$$

$$m(\text{J}_2) = \frac{1}{2} \cdot c(\text{Na}_2\text{S}_2\text{O}_3) \cdot V(\text{Na}_2\text{S}_2\text{O}_3) \cdot M(\text{J}_2)$$

$$m(\text{J}_2) = \frac{1}{2} \cdot 0,100\text{ mol/dm}^3 \cdot (44,5 - 13,4) \cdot 10^{-3}\text{ dm}^3 \cdot 254\text{ g/mol}$$

$$m(\text{J}_2) = 0,3950\text{ g}$$

$$J_b = \frac{m(I_2) \cdot 100}{m(\text{узорка})}$$

$$J_b = 0,3950\text{g} / 0,8\text{ g} \cdot 100$$

$$J_b = 49,37\text{ g I}_2 \text{ u } 100\text{ g масти}$$

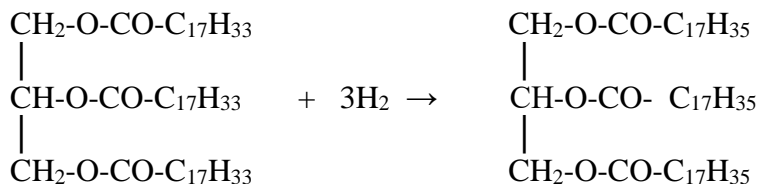
Тачно урађен задатак 5 бодова. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова.

287) 3

**Решење: 2,66 dm<sup>3</sup> H<sub>2</sub>**

$$V(\text{H}_2) = ? \quad m = 35\text{ g}$$

$$M(\text{C}_{57}\text{H}_{104}\text{O}_6) = 884\text{ g/mol}$$



$$884\text{g} : (3 \cdot 22,4)\text{dm}^3 = 35\text{g} : X$$

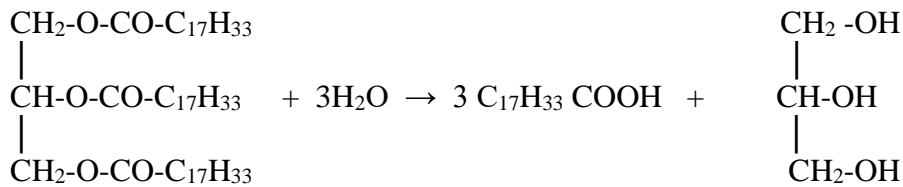
$$X = 2,66\text{ dm}^3$$

За тачно написану хемијску реакцију 2 бода и за тачно решење задатка 1 бод. Укупно 3 бода.

288) 3

**Решење: 957 g олеинске киселине**

$$m = 1\text{ kg} = 1000\text{ g} \quad M(\text{C}_{17}\text{H}_{33}\text{COOH}) = 282\text{ g/mol} \quad M(\text{C}_{57}\text{H}_{104}\text{O}_6) = 884\text{ g/mol}$$



$$884\text{g} : (3 \cdot 282)\text{g} = 1000\text{g} : X$$

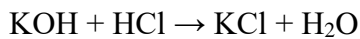
$$X = 957\text{g} \text{ олеинске киселине}$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 1 бод. Укупно 3 бода.

289) 5

**Решење: 187,79 mgKOH/g**

$$m = 2,4005\text{ g} \quad V_1 = 33,2\text{ cm}^3 \quad V_2 = 17,1\text{ cm}^3 \quad c = 0,5\text{ mol/dm}^3$$



$$n(\text{KOH}) = n(\text{HCl})$$

$$m(\text{KOH}) = c(\text{HCl}) \cdot V(\text{HCl}) \cdot M(\text{KOH})$$

$$m(\text{KOH}) = 0,5\text{ mol/dm}^3 \cdot (33,2 - 17,1) \cdot 10^{-3}\text{ dm}^3 \cdot 56\text{ g/mol}$$

$$m(\text{KOH}) = 0,4508\text{ g}$$

$$S_b = \frac{m(\text{KOH})}{m(\text{узорка})}$$

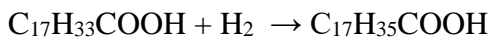
$$S_b = 0,4508\text{ g} / 2,4005\text{ g} = 0,18779\text{g} = 187,79\text{ mg KOH/g}$$

За тачно написану хемијску реакцију 1 бод и за тачно урађен прорачун 4 бода. Укупно 5 бодова.

290) 3

**Решење: 41,96%**

$$m = 1500\text{g} \quad V_1 = 50\text{ dm}^3 \quad M(\text{C}_{17}\text{H}_{33}\text{COOH}) = 282\text{g/mol} \quad V_{\text{n.u.}} = 22,4\text{dm}^3$$



$$282\text{g} : 22,4\text{ dm}^3 = X : 50\text{ dm}^3$$

$$X = 629,46\text{g}$$

$$1500\text{g} : 100\% = 629,46\text{g} : Y$$

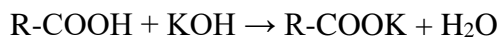
$$Y = 41,96\%$$

За тачно написану хемијску реакцију 1 бод и за тачно урађен задатак 2 бода. Укупно 3 бода.

291) 5

**Решење: 0,96 mg KOH/g**

$$m = 3\text{g} \quad V = 0,5\text{cm}^3 \quad c = 0,1030\text{mol/dm}^3$$



$$n(\text{RCOOH}) = n(\text{KOH})$$

$$m(\text{KOH}) = c(\text{KOH}) \cdot V(\text{KOH}) \cdot M(\text{KOH})$$

$$m(\text{KOH}) = 0,1030\text{ mol/dm}^3 \cdot 0,5 \cdot 10^{-3}\text{ dm}^3 \cdot 56\text{ g/mol}$$

$$m(\text{KOH}) = 0,002884\text{ g}$$

$$K_b = 0,002884\text{ g} / 3\text{g}$$

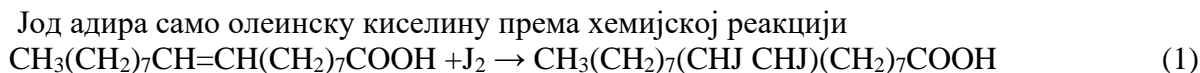
$$K_b = 0,96\text{ mgKOH/g}$$

За тачно написану хемијску реакцију 1 бод и за тачно урађен прорачун 4 бода. Укупно 5 бодова.

292) 3

**Решење: 63,84%**

$$m = 2\text{ g} \quad m(\text{J}_2) = 1,15\text{ g} \quad M(\text{C}_{18}\text{H}_{34}\text{O}_2) = 282\text{ g/mol} \quad M(\text{J}_2) = 254\text{ g/mol}$$



$$282 \text{ g} : 254 \text{ g} = \text{X} : 1,15 \text{ g}$$

$$\text{X} = 1,2768 \text{ g} \quad (1)$$

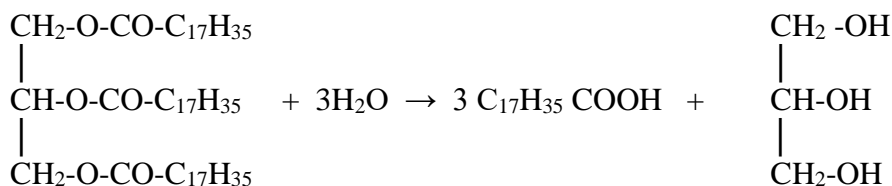
$$2\text{g} : 1,2768 \text{ g} = 100 : \text{Y}$$

$$\text{Y} = 63,84 \% \quad (1)$$

293) 4

**Решење: 203,905 kg стеаринске киселине 22,017 kg глицерола**

$$m = 213 \text{ kg} \quad M(\text{C}_{57}\text{H}_{110}\text{O}_6) = 890 \text{ g/mol} \quad M(\text{C}_3\text{H}_8\text{O}_3) = 92 \text{ g/mol} \quad M(\text{C}_{17}\text{H}_{35}\text{COOH}) = 284 \text{ g/mol}$$



$$890 \text{ g} : (3 \cdot 284) \text{ g} = 213000 \text{ g} : \text{X}$$

$$\text{X} = 203905 \text{ g} = 203,905 \text{ kg} \text{ стеаринске киселине}$$

$$890 \text{ g} : 92 \text{ g} = 213000 \text{ g} : \text{Y}$$

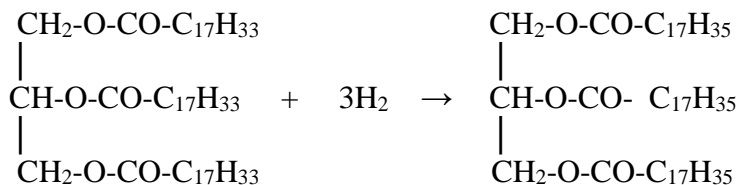
$$\text{Y} = 22017 \text{ g} = 22,017 \text{ kg} \text{ глицерола}$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 2 бода. Укупно 4 бода.

294) 4

**Решење: m = 239,1 kg**

$$m(\text{C}_{57}\text{H}_{104}\text{O}_6) = 250 \text{ kg} \quad M(\text{C}_{57}\text{H}_{104}\text{O}_6) = 884 \text{ g/mol} \quad M(\text{C}_{57}\text{H}_{110}\text{O}_6) = 890 \text{ g/mol}$$



$$250 \text{ kg} : 100 \% = \text{X} : 95 \%$$

$$\text{X} = 237,5 \text{ kg} \text{ чистог триглицерида олеинске киселине}$$

$$884 \text{ g} : 890 \text{ g} = 237,5 \text{ kg} : \text{Y}$$

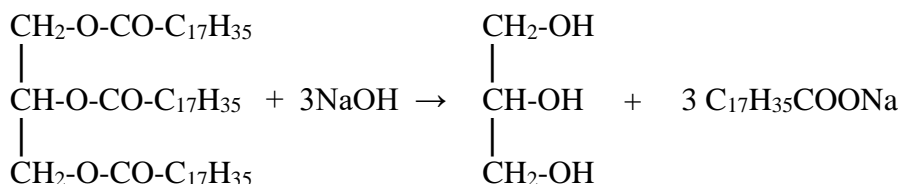
$$\text{Y} = 239,11 \text{ kg} \text{ триглицерида стеаринске киселине}$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 2 бода. Укупно 4 бода.

295) 4

**Решење: 80%**

$$m(\text{C}_{57}\text{H}_{110}\text{O}_6) = 500 \text{ kg.} \quad M(\text{C}_{57}\text{H}_{110}\text{O}_6) = 890 \text{ g/mol} \quad M(\text{C}_{17}\text{H}_{35}\text{COONa}) = 306 \text{ g/mol}$$



$$890\text{g} : (3 \cdot 306)\text{g} = 500\text{kg} : X$$

$$X = 515,73\text{kg}$$

$$515,73\text{kg} : 100\% = 412,6\text{kg} : Y\%$$

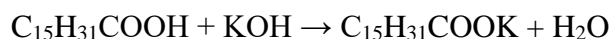
$$Y = 80\%$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 2 бода. Укупно 4 бода.

296) 5

**Решење: 16 mg**

$$M(\text{C}_{16}\text{H}_{32}\text{O}_2) = 256\text{ g/mol}$$



$$1\text{mol} : 56\text{g} = 0,1\text{mol} : X$$

$$X = 5,6\text{g}$$

$$1000\text{cm}^3 : 5,6\text{g} = 5\text{cm}^3 : Y$$

$$Y = 0,028\text{g.KOH}$$

$$256\text{g} : 56\text{g} = X_1 : 0,028\text{g}$$

$$X_1 = 0,128\text{g палмитинске киселине}$$

$$8\text{g} : 0,128\text{g} = 1\text{g} : Z$$

$$Z = 0,016\text{g} = 16\text{mg слободне палмитинске киселине}$$

За тачно написану хемијску реакцију 1 бод и за тачно урађен задатак 4 бода. Укупно 5 бодова.

297) 4

**Решење: 559,36 kg олеинске киселине**

$$M(\text{C}_{17}\text{H}_{33}\text{COOH}) = 282\text{ g/mol} \quad M(\text{C}_{17}\text{H}_{33}\text{COONa}) = 304\text{ g/mol}$$



$$670\text{kg} : 100\% = X : 90\%$$

$$X = 603\text{kg чистог сапуна}$$

$$(2 \cdot 282)\text{g} : (2 \cdot 304)\text{g} = Y : 603\text{kg}$$

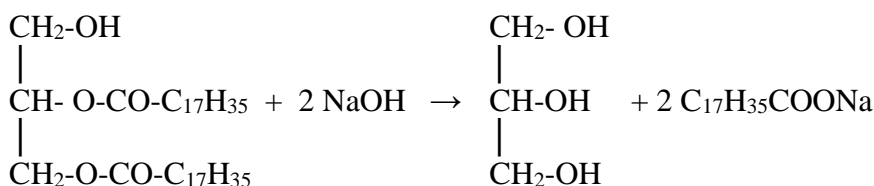
$$Y = 559,36\text{kg олеинске киселине}$$

За тачно написану хемијску једначину и тачно урађен задатак 4 бода.

298) 4

**Решење: 126,05 g глицерола**

$$M(\text{gl}) = 92\text{ g/mol} \quad M(\text{C}_{39}\text{H}_{76}\text{O}_5) = 624\text{ g/mol}$$



$$624\text{g} : 92\text{g} = 950\text{g} : X$$

$$X = 140,06\text{g глицерола}$$

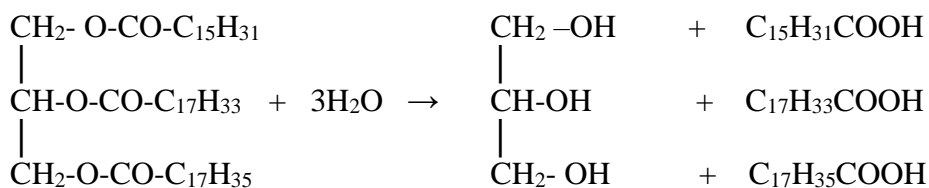
$$140,06\text{g} : 100\% = Y\text{g} : 90\%$$

$$Y = 126,05\text{g глицерола}$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 2 бода. Укупно 4 бода.

299) 3

Решење: 2 mol



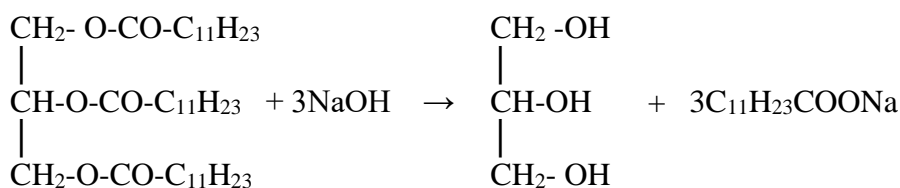
$$1 \text{ mol палмитоолеостеарата} : 1 \text{ mol глицерола} = 2 \text{ mol} : X \quad X = 2 \text{ mol}$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 1 бод. Укупно 3 бода.

300) 5

Решење: 90,09%

$$M(\text{C}_{11}\text{H}_{23}\text{COONa}) = 222 \text{ g/mol}$$



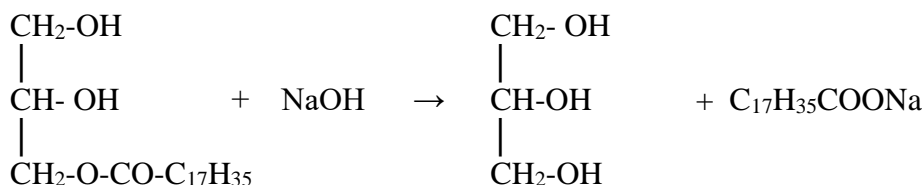
$$\begin{array}{l}
 6 \cdot 10^{23} \text{ молекула} : 3 \cdot 222 \cdot 10^{-3} \text{ kg} = 3 \cdot 10^{26} : X \\
 X = 333 \text{ kg сапуна}
 \end{array}
 \quad
 \begin{array}{l}
 333 \text{ kg} : 100 \% = 300 \text{ kg} : Y \% \\
 Y = 90,09\%
 \end{array}$$

За тачно написану хемијску реакцију 2 бода и за тачно урађен задатак 3 бода. Укупно 5 бодова.

301) 3

Решење: 162,8 g глицерола

$$M(\text{gl}) = 92 \text{ g/mol} \quad M(\text{msg}) = 358 \text{ g/mol}$$



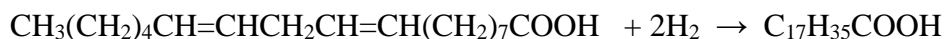
$$\begin{array}{l}
 358 \text{ g} : 92 \text{ g} = 704 \text{ g} : X \\
 X = 180,9 \text{ g глицерола}
 \end{array}
 \quad
 \begin{array}{l}
 180,9 \text{ g} : 100\% = Y : 90\% \\
 Y = 162,8 \text{ g глицерола}
 \end{array}$$

За написану хемијску реакцију 1 бод и за прорачун 2 бода. Укупно 3 бода.

302) 2

Решење: 8,0 dm<sup>3</sup> H<sub>2</sub>

$$M(\text{Л.К}) = 280 \text{ g/mol}$$



$$\begin{array}{l}
 280 \text{ g} : (2 \cdot 22,4) \text{ dm}^3 = 50 \text{ g} : X \\
 X = 8,0 \text{ dm}^3 \text{ H}_2
 \end{array}$$

За написану хемијску реакцију 1 бод и за прорачун 1 бод. Укупно 2 бода.

303) 3

Решење: 47,5 kg

$$30\text{kg} : 100\% = x : 95\%$$

$$x = 28,5 \text{ kg}$$

$$28,5 \text{ kg} : 60\% = y : 100\%$$

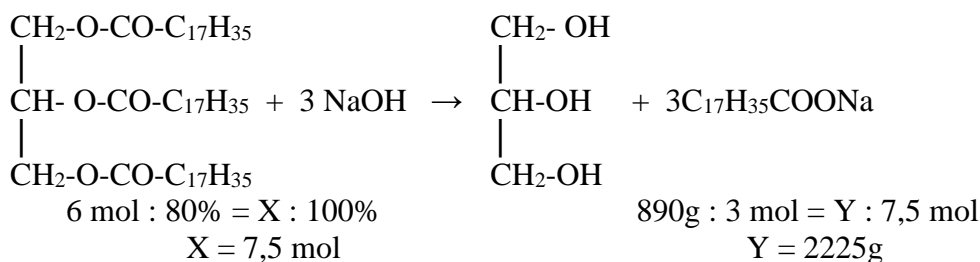
$$y = 47,5\text{kg}$$

За тачно урађен задатак 3 бода.

304) 4

Решење: 2225g

$$M(C_{57}H_{110}O_6) = 890\text{g/mol}$$



Тачно урађен задатак 4 бода. Тачно написана једначина, а нетачно урађен задатак 2 бода.  
Тачно урађен задатак без једначине 0 бодова.

## ТЕХНОЛОГИЈА СРЕДСТАВА ЗА ПРАЊЕ

### СРЕДСТВА ЗА ПРАЊЕ - ПИТАЊА

305) 0,5

Решење: в)

306) 1

Решење: биолошка, микроорганизама

307) 1

Решење: зелених и плавозелених алги, фосфорних

308) 1

Решење :а) тензиди (површински активне материје) б) распршивањем.

309) 3,5

Решење: 4 3 2 1 5 7 6

310) 0,5

Решење: површински напон

311) 1

Решење: а) анјонским б)  $\text{SO}_3^- \text{Na}^+$

312) 0.5

Решење: а

313) 3

Решење: 1 - смеша SO<sub>3</sub> и ваздуха  
2 - вода за хлађење  
3 - LAB  
4 - алкил-бензенсулфонска киселина  
5 - NaOH  
6 - LAS

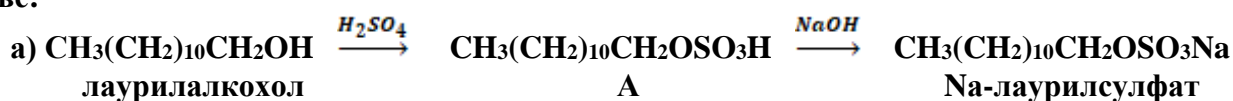
314) 2

Решење: А-сировине-детергентска маса  
Б-врео ваздух  
В-перле детрента  
Г-водена пара и ваздух

### СРЕДСТВА ЗА ПРАЊЕ – ЗАДАЦИ

315) 4

Решење:



б)  $m(\text{C}_{12}\text{H}_{25}\text{OSO}_3\text{Na}) = 204,39 \text{ kg}$

$M(\text{C}_{12}\text{H}_{25}\text{OH}) = 186 \text{ g/mol}$       $M(\text{C}_{12}\text{H}_{25}\text{OSO}_3\text{Na}) = 288 \text{ g/mol}$

$$186 \text{ g} : 288 \text{ g} = 150 \text{ kg} : x \quad x = 232,26 \text{ kg}$$

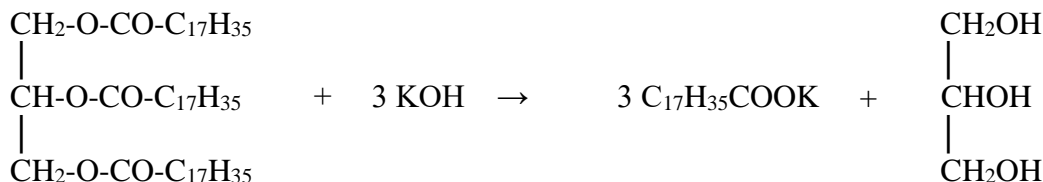
$$232,26 \text{ kg} : 100\% = y : 88\% \quad y = 204,39 \text{ kg}$$

За тачно написане хемијске реакције 2 бода и за тачно решен задатак 2 бода. Укупно 4 бода.

316) 5

Решење: 575,83kg C<sub>57</sub>H<sub>110</sub>O<sub>6</sub>    108,69kg KOH

$M(\text{C}_{57}\text{H}_{110}\text{O}_6) = 890 \text{ g/mol}$       $M(\text{KOH}) = 56 \text{ g/mol}$       $M(\text{C}_{18}\text{H}_{35}\text{O}_2\text{K}) = 322 \text{ g/mol}$



$$500 \text{ kg} : 80\% = x : 100\% \quad x = 625 \text{ kg}$$

$$890 \text{ g} : (3 \cdot 322) \text{ g} = y : 625 \text{ kg} \quad y = 575,83 \text{ kg C}_{57}\text{H}_{110}\text{O}_6$$

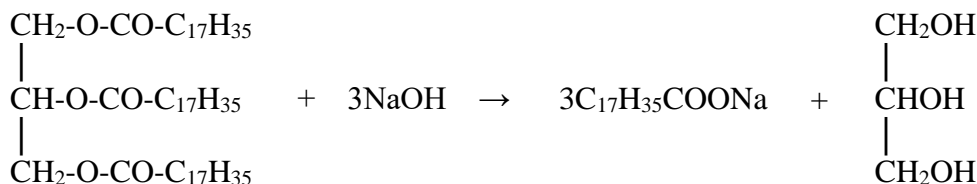
$$(3 \cdot 56) \text{ g} : (3 \cdot 322) \text{ g} = Y : 625 \text{ kg} \quad Y = 108,69 \text{ kg KOH}$$

Тачно урађен задатак 5 бодова. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова

317) 4

Решење: 26,15kg NaOH

$M(\text{C}_{57}\text{H}_{110}\text{O}_6) = 890 \text{ g/mol}$       $M(\text{NaOH}) = 40 \text{ g/mol}$





$$202 \text{ kg} : 100 \% = x : 96 \% \quad x = 193,92 \text{ kg}$$

$$890 \text{ g} : (3 \cdot 40) \text{ g} = 193,92 \text{ kg} : y \quad \underline{y = 26,15 \text{ kg NaOH}}$$

Тачно урађен задатак 4 бода. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова.

318) 4

**Решење: 40 kg воде 34,8 %**

База: 500 kg сапуна са 40 % воде

Присутно воде:  $500 \cdot 0,4 = 200 \text{ kg}$

Испарено воде:  $200 \cdot 0,2 = 40 \text{ kg}$

Преостало воде:  $200 - 40 = 160 \text{ kg}$

Маса исушеног сапуна:  $500 - 40 = 460 \text{ kg}$

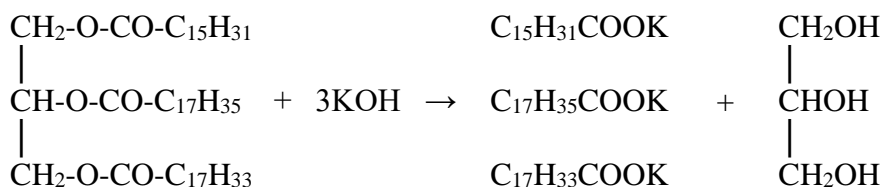
$$\% \text{ преостале воде} = \frac{160}{460} \cdot 100 = \underline{34,8 \%}$$

За тачно решен задатак 4 бода.

319) 3

**Решење: 840 kg KOH**

$$M(C_{55}H_{104}O_6) = 860 \text{ g/mol} \quad M(KOH) = 56 \text{ g/mol}$$



$$860 \text{ g} : (3 \cdot 56) \text{ g} = 4300 \text{ kg} : x \quad \underline{x = 840 \text{ kg KOH}}$$

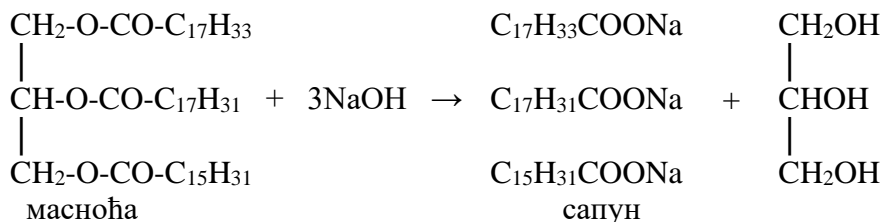
Тачно урађен задатак 3 бода. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова.

320) 4

**Решење: 413,08 kg сапуна**

$$M(C_{55}H_{100}O_6) = 856 \text{ g/mol} \quad M(C_{18}H_{33}O_2Na) = 304 \text{ g/mol} \quad M(C_{18}H_{31}O_2Na) = 302 \text{ g/mol}$$

$$M(C_{16}H_{31}O_2Na) = 278 \text{ g/mol}$$



$$856 \text{ g} : 884 \text{ g} = 500 \text{ kg} : x \quad x = 516,35 \text{ kg}$$

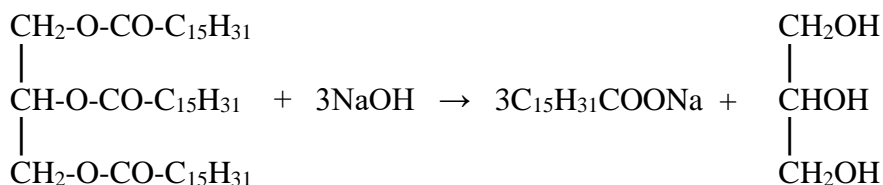
$$516,35 \text{ kg} : 100 \% = y : 80 \% \quad \underline{y = 413,08 \text{ kg сапуна}}$$

Тачно урађен задатак 4 бода. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова.

321) 5

Решење: 0,05dm<sup>3</sup>

M(C<sub>51</sub>H<sub>98</sub>O<sub>6</sub>)=806g/mol M(NaOH)=40g/mol



$$806 \text{ g} : (3 \cdot 40)\text{g} = 40,3 \text{ g} : x \quad x=6 \text{ g NaOH}$$

$$n = \frac{m}{M} \quad n = \frac{6\text{g}}{40\text{g/mol}} = 0,15 \text{ mol NaOH}$$

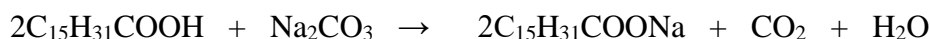
$$c = \frac{n}{V} \quad V = \frac{n}{c} \quad V = \frac{0,15\text{mol}}{3\text{mol/dm}^3} = 0,05 \text{ dm}^3$$

Тачно урађен задатак 5 бодова. Тачно написана једначина а нетачно урађен прорачун 2 бода. Тачно урађен задатак без хемијске једначине 0 бодова.

322) 3

Решење: 29,81 kg Na<sub>2</sub>CO<sub>3</sub>

M(C<sub>16</sub>H<sub>32</sub>O<sub>2</sub>)=256 g/mol M(Na<sub>2</sub>CO<sub>3</sub>)=106 g/mol



$$150 \text{ kg} : 100 \% = x : 96 \% \quad x=144 \text{ kg чисте палмитинске киселине}$$

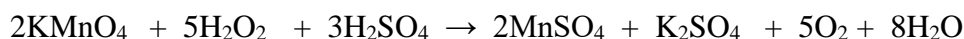
$$(2 \cdot 256) \text{ g} : 106 \text{ g} = 144 \text{ kg} : y \quad y=29,81 \text{ kg Na}_2\text{CO}_3$$

За тачно написану хемијску реакцију 1 бод и за тачан прорачун 2 бода. Укупно 3 бода.

323) 5

Решење: 0,9093% [O]

M(O<sub>2</sub>) = 32 g/mol



$$n(\text{KMnO}_4) : n(\text{O}_2) = 2 : 5$$

$$n(\text{O}_2) = 5/2 \cdot n(\text{KMnO}_4)$$

$$m(\text{O}_2) = 5/2 \cdot V(\text{KMnO}_4) \cdot c(\text{KMnO}_4) \cdot M(\text{O}_2)$$

$$m(\text{O}) = 1/2 \cdot m(\text{O}_2)$$

$$m(\text{O}) = 5/4 \cdot V(\text{KMnO}_4) \cdot c(\text{KMnO}_4) \cdot M(\text{O}_2)$$

$$\% (\text{O}) = \frac{m(\text{O}) \cdot 100}{m(\text{узорка})}$$

$$\% (\text{O}) = \frac{\frac{5}{4} \cdot V(\text{KMnO}_4) \cdot c(\text{KMnO}_4) \cdot M(\text{O}_2) \cdot 100}{m(\text{узорка})}$$

$$\% (\text{O}) = \frac{\frac{5}{4} \cdot 34,1 \cdot 10^{-3} \text{ dm}^3 \cdot 0,02 \cdot \frac{\text{mol}}{\text{dm}^3} \cdot 32 \frac{\text{g}}{\text{mol}} \cdot 100}{3 \text{ g}}$$

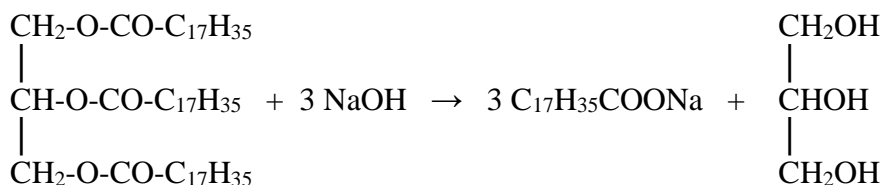
$$\% (\text{O}) = 0,9093$$

Тачно урађен задатак 5 бодова. Тачно написане једначине а нетачно урађен прорачун 2 бода. Тачно урађен задатак без хемијских једначина 0 бодова.

324) 4

**Решење: 798,35 kg сапуна**

$M(C_{57}H_{110}O_6)=890\text{g/mol}$       $M(C_{18}H_{35}O_2Na)=306\text{g/mol}$



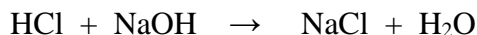
$$\begin{aligned} 890\text{g} : (3 \cdot 306)\text{g} &= 900\text{kg} : x && x=928,31\text{kg} \\ 928,31\text{g} : 100\% &= y : 86\% && y=\underline{798,35\text{kg сапуна}} \end{aligned}$$

Тачно урађен задатак 4 бода. Тачно написана једначина а нетачно урађен прорачун 2 бода.  
Тачно урађен задатак без хемијске једначине 0 бодова.

325) 5

**Решење: % NaOH=15,99**

$M(\text{NaOH}) = 40\text{g/mol}$



$$\begin{aligned} n(\text{NaOH}) &= n(\text{HCl}) \\ m(\text{NaOH}) &= V(\text{HCl}) \cdot c(\text{HCl}) \cdot M(\text{NaOH}) \end{aligned}$$

$$\% \text{NaOH} = \frac{m(\text{NaOH}) \cdot 100}{m(\text{узорка})}$$

$$\% \text{NaOH} = \frac{V(\text{HCl}) \cdot c(\text{HCl}) \cdot M(\text{NaOH}) \cdot 100}{m(\text{узорка})}$$

$$\% \text{NaOH} = \frac{72,8 \cdot 10^{-3} \text{ dm}^3 \cdot 0,5018 \frac{\text{mol}}{\text{dm}^3} \cdot 40 \frac{\text{g}}{\text{mol}} \cdot 100}{9,14 \text{ g}}$$

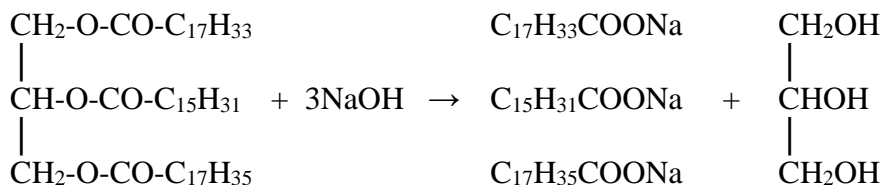
$$\underline{\% \text{NaOH}=15,99}$$

За тачно написану хемијску реакцију 1 бод и за тачан прорачун 4 бода. Укупно 5 бодова.

326) 3

**Решење: x=37,44g глицерола**

$M(C_{55}H_{104}O_6)=860\text{g/mol}$       $M(C_3H_8O_3)=92\text{g/mol}$



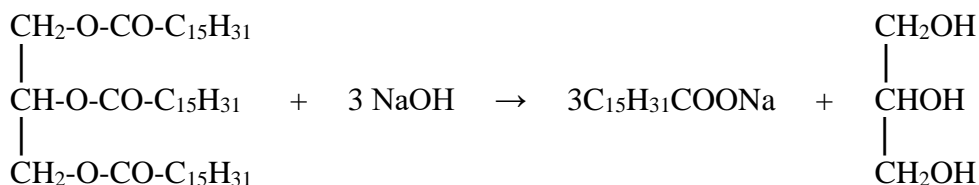
$$860\text{g} : 92\text{g} = 350\text{g} : x \quad x=\underline{37,44\text{g глицерола}}$$

За тачно написану хемијску реакцију 2 бода и за тачан прорачун 1 бод. Укупно 3 бода.

327) 4

Решење: 68,9 t

$M(C_{51}H_{98}O_6)=806 \text{ g/mol}$        $M(C_3H_8O_3)=92 \text{ g/mol}$



$$7t : 89 \% = x : 100 \% \quad x=7,865 \text{ t}$$

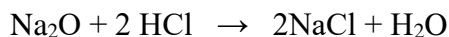
$$806 \text{ g} : 92 \text{ g} = y : 7,865 \text{ t} \quad \underline{y=68,9 \text{ t}}$$

За тачно написану хемијску реакцију 2 бода и за тачан прорачун 2 бода. Укупно 4 бода.

328) 5

Решење: 15,5 %Na<sub>2</sub>O

$M(\text{Na}_2\text{O})=62 \text{ g/mol}$



$$n(\text{Na}_2\text{O}) : n(\text{HCl}) = 1 : 2$$

$$m(\text{Na}_2\text{O}) = 1/2 \cdot V(\text{HCl}) \cdot c(\text{HCl}) \cdot M(\text{Na}_2\text{O})$$

$$\% \text{ Na}_2\text{O} = \frac{m(\text{Na}_2\text{O}) \cdot 100}{m(\text{узорка})}$$

$$\% \text{ Na}_2\text{O} = \frac{\frac{1}{2} \cdot V(\text{HCl}) \cdot c(\text{HCl}) \cdot M(\text{Na}_2\text{O}) \cdot 100}{m(\text{узорка})}$$

$$\% \text{ Na}_2\text{O} = \frac{\frac{1}{2} \cdot 150 \cdot 10^{-3} \text{ dm}^3 \cdot 0,1 \frac{\text{mol}}{\text{dm}^3} \cdot 52 \frac{\text{g}}{\text{mol}} \cdot 100}{3 \text{ g}}$$

$$\% \text{ Na}_2\text{O} = 15,5$$

За тачно написану хемијску реакцију 1 бод и за тачан прорачун 4 бода. Укупно 5 бодова.

329) 4

Решење:  $y=42,92 \text{ kg Na}_2\text{CO}_3$      $9,07 \text{ m}^3 \text{ CO}_2$

$M(C_{17}H_{35}\text{COOH})=284 \text{ g/mol}$

$M(\text{Na}_2\text{CO}_3)=106 \text{ g/mol}$



$$250 \text{ kg} : 100 \% = x : 92 \%$$

$$(2 \cdot 284) \text{ g} : 106 \text{ g} = 230 \text{ kg} : y$$

$$x=230 \text{ kg чисте стеаринске киселине}$$

$$\underline{y=42,92 \text{ kg Na}_2\text{CO}_3}$$

$$(2 \cdot 284) \text{ g} : 22,4 \text{ dm}^3 = 230000 \text{ g} : Y$$

$$Y=9070 \text{ dm}^3 = \underline{9,07 \text{ m}^3 \text{ CO}_2}$$

За тачно написану хемијску реакцију 1 бод и за тачан прорачун 3 бода. Укупно 4 бода.