

AK2 - seminar 6

Zadatok 1.

A: $a = 7,5988 \text{ \AA}$

$c = 22,400 \text{ \AA}$

$Z = 3$

$\rho = 1,961 \text{ g cm}^{-3}$

$$V = a^2 \cdot c = (7,5988 \cdot 10^{-8} \text{ cm})^2 \cdot 22,400 \cdot 10^{-8} \text{ cm}$$

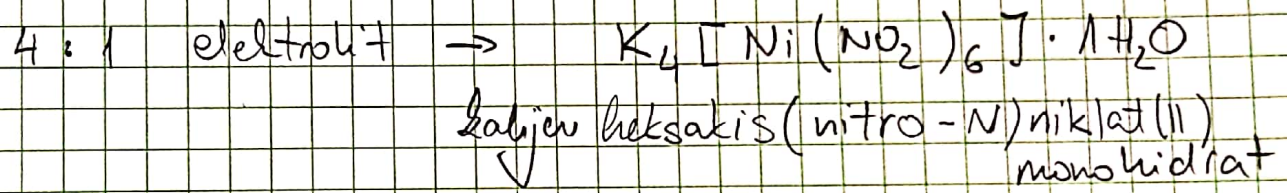
$$= 1,2934 \cdot 10^{-21} \text{ cm}^3$$

$$M = \frac{V \cdot \rho \cdot N_A}{Z} = 509,13 \text{ g mol}^{-1}$$

$w(\text{H}_2\text{O}) = 3,54\%$

$w(\text{H}_2\text{O}) = 509,13 \text{ g} \cdot 0,0354 = 18,023 \text{ g}$

$w(\text{H}_2\text{O}) = \frac{18,023 \text{ g}}{18,015 \text{ g mol}^{-1}} \approx 1 \text{ mol}$



C: $a = 7,240 \text{ \AA}$

$b = 10,946 \text{ \AA}$

$c = 7,120 \text{ \AA}$

$\beta = 98,086$

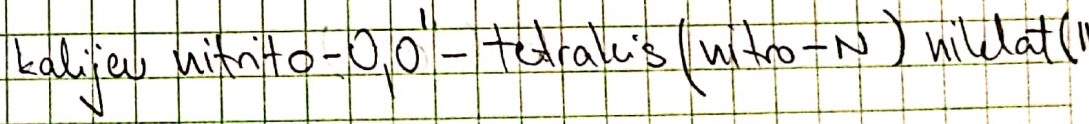
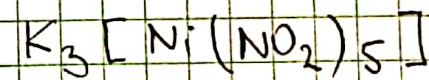
$Z = 2$

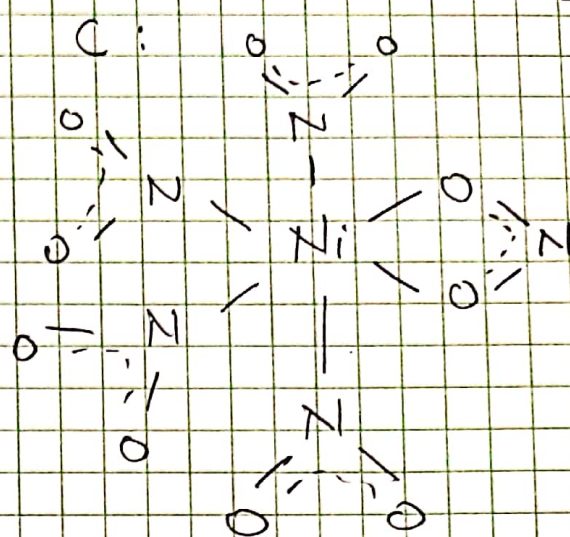
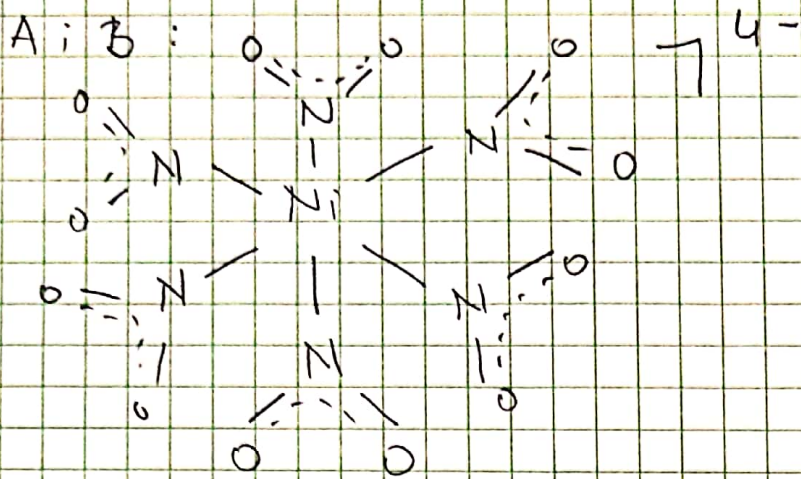
$\rho = 2,41 \text{ g cm}^{-3}$

$$V = 7,240 \cdot 10^{-8} \text{ cm} \cdot 10,946 \cdot 10^{-8} \text{ cm} \cdot 7,120 \cdot 10^{-8} \text{ cm} \cdot \sin 98,086^\circ$$

$$= 5,586 \cdot 10^{-22} \text{ cm}^3$$

$$M = \frac{V \cdot \rho \cdot N_A}{Z} = 405,35 \text{ g mol}^{-1}$$





Određivanje nikla: Kompleks se razoni otapanjem u klorovodičnoj kiselini te se otopina razrijedi, zagrije te se u otopinu doda alkoholna otopina dimeetilglioksima. Talog se ofiltrira, suši i važe.

Određivanje kalija: U filtrat izostao nakon određivanja nikla se doda otopina natrijova tetrafenilborata, talog se suši i važe.

Zadatok 2.

A:

$$m(\text{urosal}) = 0,2657 \text{ g}$$

$$V(\text{HCl}) = 70 \text{ mL}$$

$$c(\text{HCl}) = 0,1000 \text{ mol dm}^{-3}$$

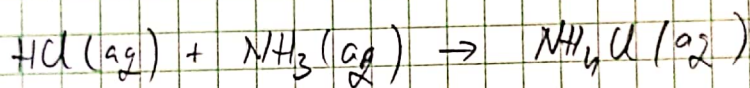
$$V(\text{NaOH}) = 1,24 \text{ mL}$$

$$c(\text{NaOH}) = 0,1000 \text{ mol dm}^{-3}$$

$$n(\text{HCl})_{\text{ute.}} = 70 \cdot 10^{-3} \text{ dm}^3 \cdot 0,1000 \text{ mol dm}^{-3} = 7 \cdot 10^{-3} \text{ mol}$$

$$n(\text{HCl})_{\text{sum.}} = n(\text{NaOH}) = 1,24 \cdot 10^{-3} \text{ dm}^3 \cdot 0,1000 \text{ mol dm}^{-3} = 1,24 \cdot 10^{-4} \text{ mol}$$

$$n(\text{HCl})_{\text{reag.}} = n(\text{HCl})_{\text{ute.}} - n(\text{HCl})_{\text{sum.}} = 7 \cdot 10^{-3} \text{ mol} - 1,24 \cdot 10^{-4} \text{ mol} = 6,876 \cdot 10^{-3} \text{ mol}$$



$$n(\text{NH}_3) = n(\text{HCl})_{\text{reag.}} = 6,876 \cdot 10^{-3} \text{ mol}$$

$$m(\text{NH}_3) = 6,876 \cdot 10^{-3} \text{ mol} \cdot 17,0307 \text{ g mol}^{-1} = 0,1171 \text{ g}$$

$$w(\text{NH}_3) = 44,07 \%$$

$$m(\text{urosal}) = 0,3125 \text{ g}$$

$$m(\text{Ni}(\text{C}_4\text{H}_7\text{O}_2\text{N}_2)_2) = 0,3895 \text{ g}$$

$$n(\text{Ni}) = n(\text{Ni}(\text{dmg})_2) = \frac{0,3895 \text{ g}}{288,2156 \text{ g mol}^{-1}} = 1,3481 \cdot 10^{-3} \text{ mol}$$

$$m(\text{Ni}) = 1,3481 \cdot 10^{-3} \text{ mol} \cdot 58,693 \text{ g mol}^{-1} = 0,07912 \text{ g}$$

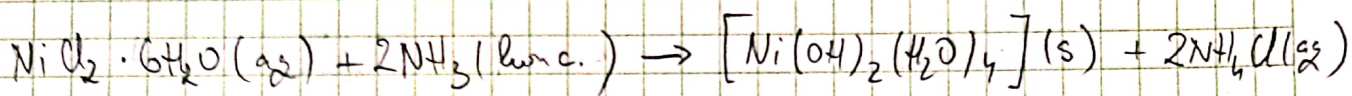
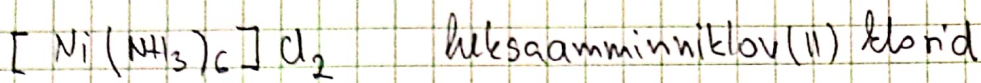
$$w(\text{Ni}) = 25,32 \%$$

$$w(\text{Cl}) = 30,61 \%$$

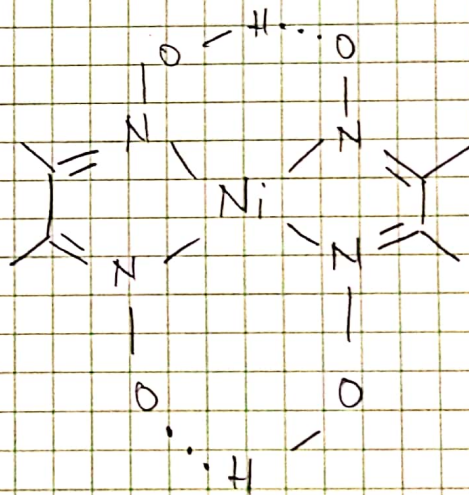
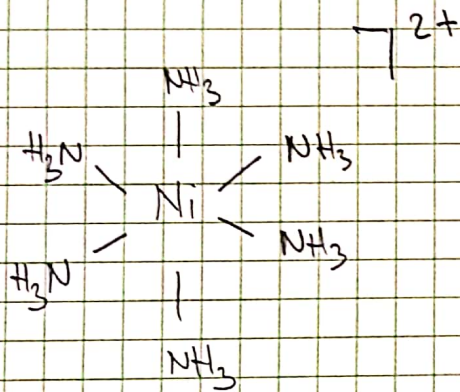
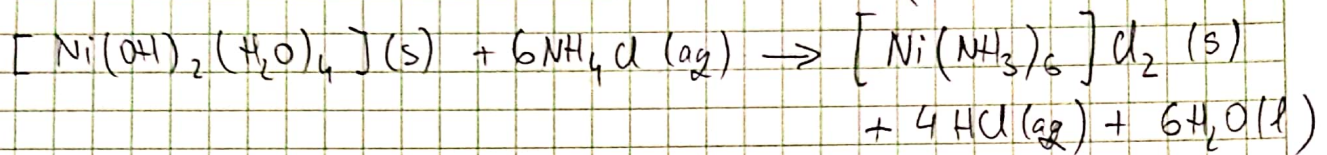
$$\frac{25,32 \text{ g}}{58,693 \text{ g mol}^{-1}} : \frac{44,07 \text{ g}}{17,0307 \text{ g mol}^{-1}} : \frac{30,61 \text{ g}}{35,45 \text{ g mol}^{-1}}$$

$$0,4314 \text{ mol} : 2,5877 \text{ mol} : 0,8635 \text{ mol} \quad / : 0,4314 \text{ mol}$$

$$1 : 6 : 2$$



↑
B (niklov hidroksid)



Zadatok 3.

$$a = 16,032 \text{ \AA}$$

$$b = 15,510 \text{ \AA}$$

$$c = 11,756 \text{ \AA}$$

$$z = 4$$

$$\rho = 2,44 \text{ g cm}^{-3}$$

$$V = 16,032 \cdot 10^{-8} \text{ cm} \cdot 15,510 \cdot 10^{-8} \text{ cm} \cdot 11,756 \cdot 10^{-8} \text{ cm}$$

$$= 2,923 \cdot 10^{-21} \text{ cm}^3$$

$$M = \frac{V \cdot \rho \cdot N_A}{z} = 1073,8 \text{ g mol}^{-1}$$

$$w(C) = 22,28\%$$

$$w(H) = 1,87\%$$

$$w(Cl) = 23,57\%$$

$$w(I) = 47,08\%$$

$$w(N) = 5,2\%$$

$$\frac{22,28 \text{ g}}{12,011 \text{ g mol}^{-1}} : \frac{1,87 \text{ g}}{1,0079 \text{ g mol}^{-1}} : \frac{23,57 \text{ g}}{63,546 \text{ g mol}^{-1}} : \frac{47,08 \text{ g}}{126,90 \text{ g mol}^{-1}} : \frac{5,2 \text{ g}}{14,007 \text{ g mol}^{-1}}$$

$$1,8549 \text{ mol} : 1,8553 \text{ mol} : 0,3709 \text{ mol} : 0,3710 \text{ mol} : 0,3712 \text{ mol}$$

$$5 : 5 : 1 : 1 : 1$$



$$\frac{1073,8 \text{ g mol}^{-1}}{269,54 \text{ g mol}^{-1}} = 4 \quad [\text{CuI}(\text{py})]_4$$

Zadatok 6.

$$a = 4,659 \text{ \AA}$$

$$b = 11,118 \text{ \AA}$$

$$c = 7,007 \text{ \AA}$$

$$\beta = 100,7^\circ$$

$$z = 2$$

$$\rho = 2,60 \text{ g cm}^{-3}$$

$$V = 4,659 \cdot 10^{-8} \text{ cm} \cdot 11,118 \cdot 10^{-8} \text{ cm} \cdot 7,007 \cdot 10^{-8} \text{ cm} \cdot \sin 100,7^\circ$$
$$= 3,56 \cdot 10^{-22} \text{ cm}^3$$

$$M = \frac{V \cdot \rho \cdot N_A}{z} = 279,2 \text{ g mol}^{-1}$$

NO^+ kation

$$m(\text{uvoral}) = 10,250 \text{ mg}$$

$$m(\text{CuO}) = 2,950 \text{ mg}$$

$$n(\text{Cu}) = n(\text{CuO}) = \frac{2,950 \text{ mg}}{79,545 \text{ g mol}^{-1}} = 3,71 \cdot 10^{-5} \text{ mol}$$

$$m(\text{Cu}) = 3,71 \cdot 10^{-5} \text{ mol} \cdot 63,546 \text{ g mol}^{-1} = 2,3566 \text{ mg}$$

$$w(\text{Cu}) = \frac{2,3566 \text{ mg}}{10,250 \text{ mg}} = 22,99\%$$

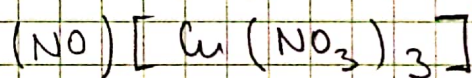
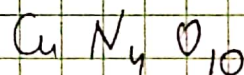
$$w(\text{N}) = 20,07\%$$

$$w(\text{O}) = 56,94\%$$

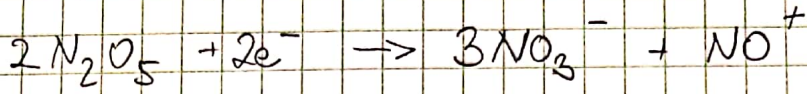
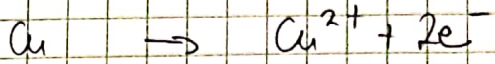
$$\frac{22,99 \text{ g}}{63,546 \text{ g mol}^{-1}} : \frac{20,07 \text{ g}}{14,007 \text{ g mol}^{-1}} : \frac{56,94 \text{ g}}{15,999 \text{ g mol}^{-1}}$$

$$0,3618 \text{ mol} : 1,4328 \text{ mol} : 3,5589 \text{ mol} / : 0,3618 \text{ mol}$$

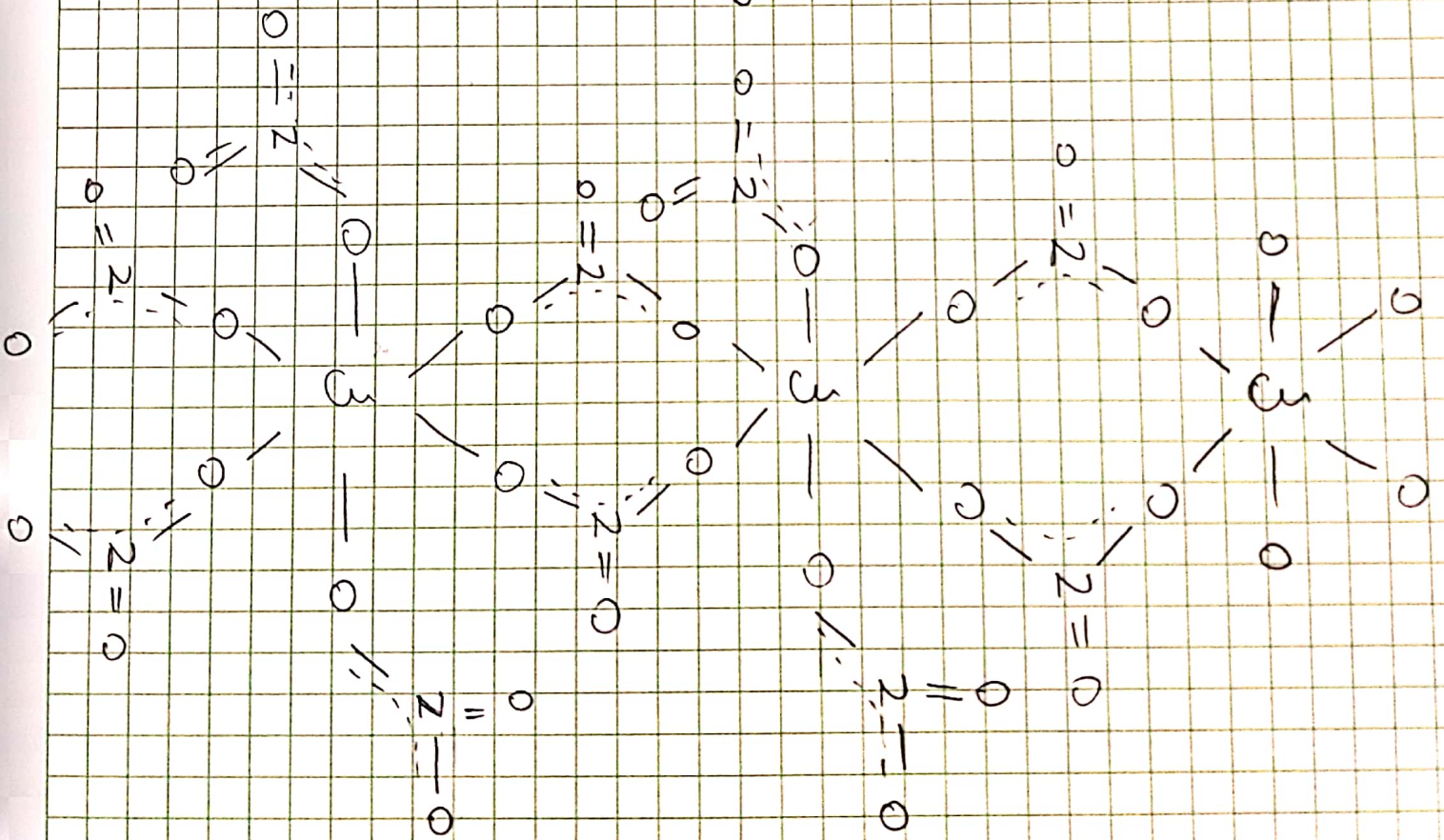
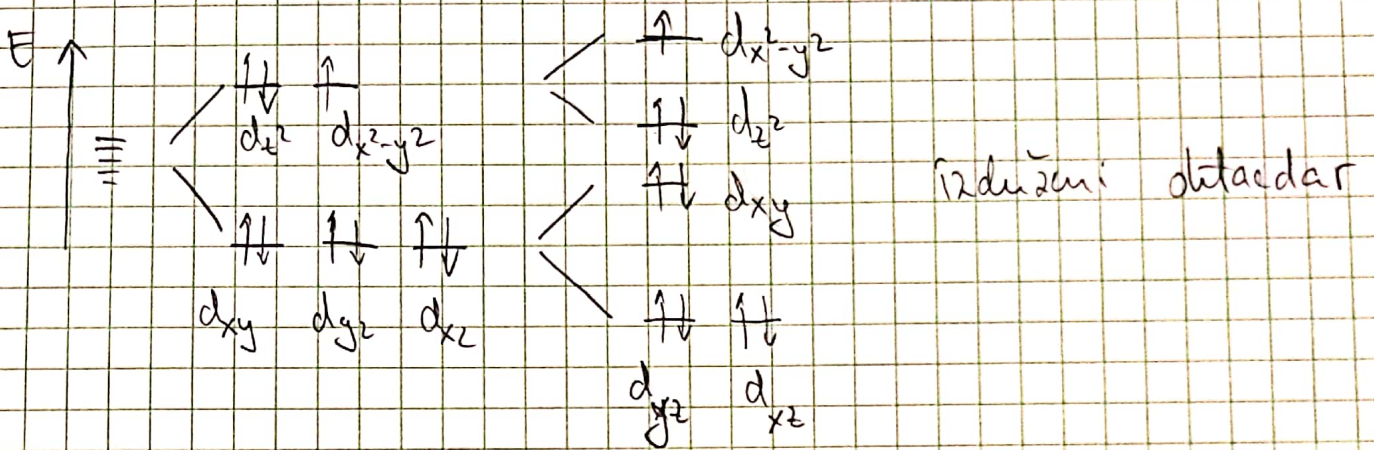
$$1 : 4 : 10$$



nitroilov tri(s(μ -nitrato)kupaat (II))



Jahn-Tellerov efekt (Cu(II)) - oktaedrska geometrija



Zadanie 7.

$a = 16,65 \text{ \AA}$

$\rho = 1,902 \text{ g cm}^{-3}$

$Z = 8$

$V = (16,65 \cdot 10^{-8} \text{ cm})^3 = 4,65 \cdot 10^{-21} \text{ cm}^3$

$M = \frac{V \cdot \rho \cdot N_A}{Z} = 637,12 \text{ g mol}^{-1}$

