

2001/2002 õa keemiaolümpiaadi lõppvooru ülesannete lahendused
12. klass

1. a) $\Delta H^\circ = \Sigma \Delta H_f^\circ(\text{saadused}) - \Sigma \Delta H_f^\circ(\text{lähteained})$

$$\Delta H^\circ = 1 \text{ mol} \cdot (-110 \text{ kJ/mol}) - 1 \text{ mol} \cdot (-242 \text{ kJ/mol}) - 1 \text{ mol} \cdot (-75 \text{ kJ/mol}) = 207 \text{ kJ}$$

b) i) $\Delta G^\circ = \Delta H^\circ - T \cdot \Delta S^\circ$

$$\Delta S^\circ = \Sigma S^\circ(\text{saadused}) - \Sigma S^\circ(\text{lähteained})$$

$$\Delta S^\circ = 3 \text{ mol} \cdot 131 \text{ J/(mol}\cdot\text{K)} + 1 \text{ mol} \cdot 197 \text{ J/(mol}\cdot\text{K)} - 1 \text{ mol} \cdot 189 \text{ J/(mol}\cdot\text{K)} - 1 \text{ mol} \cdot 186 \text{ J/(mol}\cdot\text{K)} = 215 \text{ J/K} = 0,215 \text{ kJ/K}$$

$$\Delta G^\circ = 207 \text{ kJ} - 298 \text{ K} \cdot 0,215 \text{ kJ/K} = 207 \text{ kJ} - 64 \text{ kJ} = 143 \text{ kJ}$$

ii) Otsesuunaline reaktsioon ei saa toimuda.

c) $K_t = e^{-\frac{\Delta G}{RT}}$

$$K_t = e^{-\frac{143000}{8,314 \cdot 298}} = e^{-57,7} = 8,73 \times 10^{-26}$$

d) i) Tasakaalu korral $\Delta G = 0$

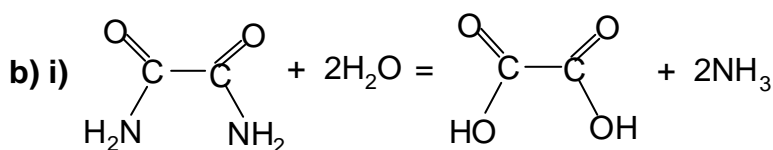
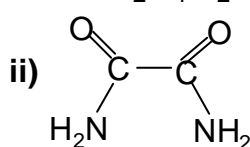
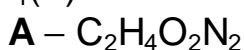
ii) $0 = \Delta H - T \cdot \Delta S$

$$T = 207 \text{ kJ} \cdot \frac{\text{K}}{0,215 \text{ kJ}} = 963 \text{ K}$$

$$t = T - 273 = 963 - 273 = 690 \text{ }^\circ\text{C}$$

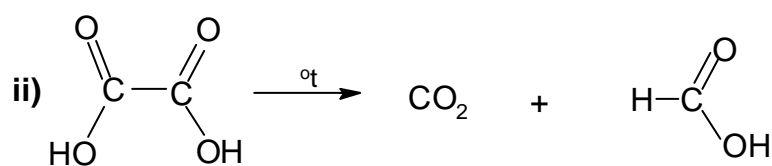
2. a) i) Elementide aatomite arv ei saa olla üks, sest siis oleks neid kõiki võrdselt ($3 \cdot 1 - 2 = 1$). Kui süsiniku, hapniku ja lämmastiku aatomite arv on kaks, siis vesiniku aatomeid peab olema neli ($3 \cdot 2 - 2 = 4$).

$$M_r(A) = 2 \cdot 12 + 4 \cdot 1 + 2 \cdot 16 + 2 \cdot 14 = 88$$



A – oksamiid

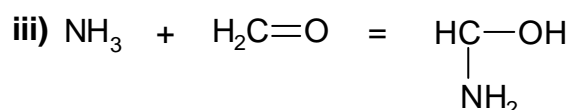
C – oblikhape **B** – ammoniaak

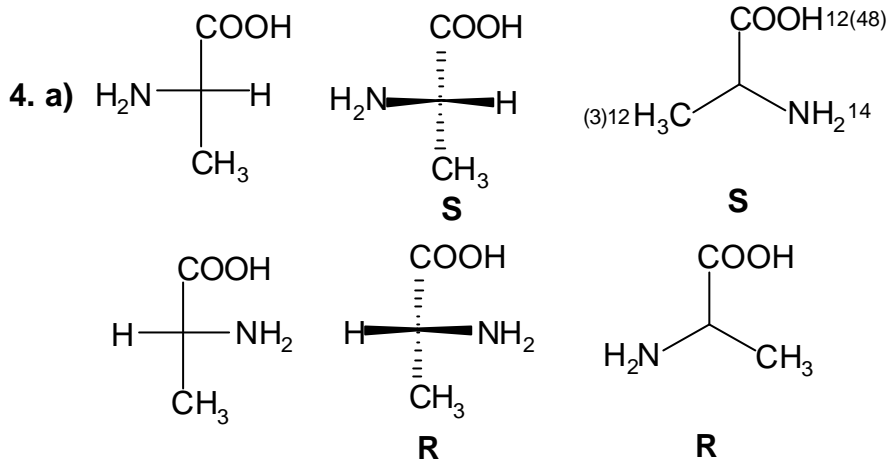


C

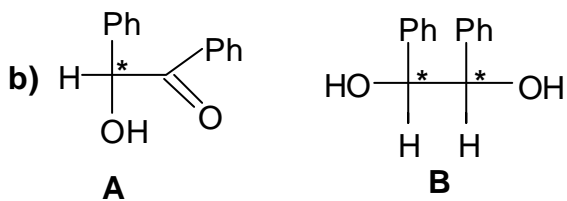
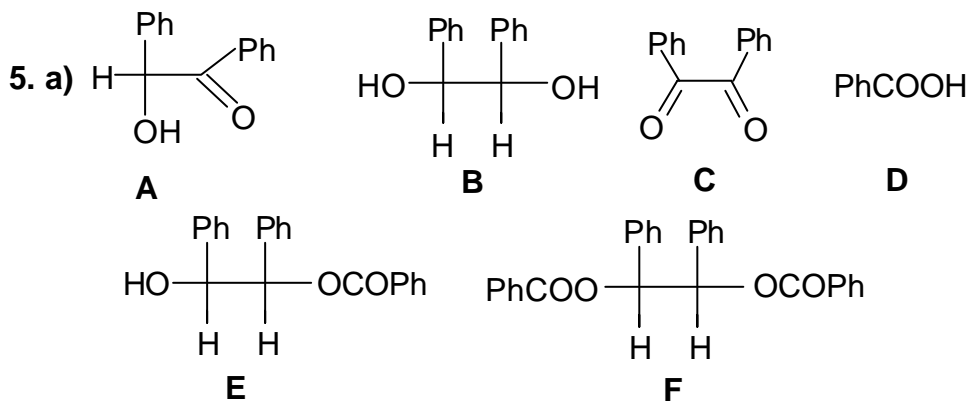
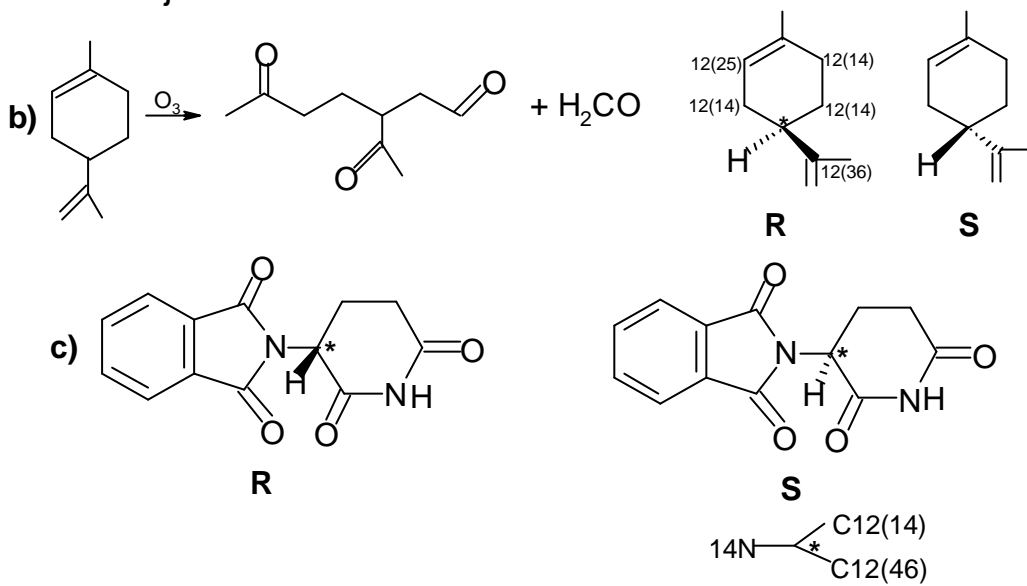
D – süsihappegaas

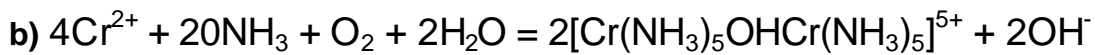
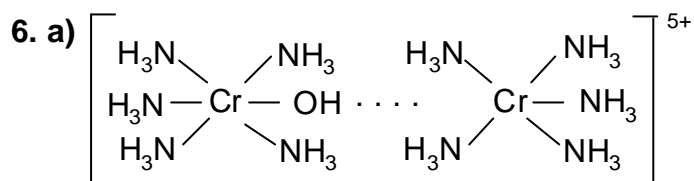
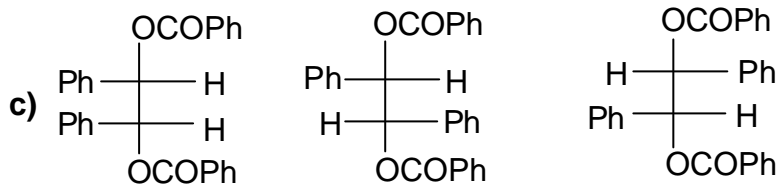
E – metaanhape



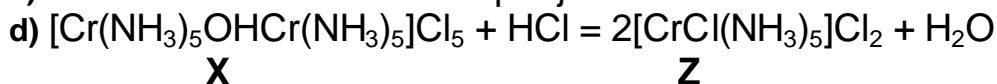


Kui on märkimata, millised rühmitused on ees, siis Fischeri projekt-sioonis ei saa **S** ja **R** enantiomeere määrata

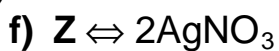




c) Kloriidioonide suur ülehulk põhjustab hüdroksiidi asemel kloriidi moodustumise.



e) Pentaammiinklorokroom(2+)kloriid.



$$V(\text{AgNO}_3) = \frac{2}{1} \cdot \frac{10 \text{ cm}^3 \cdot 0,05 \text{ mol/dm}^3}{0,1 \text{ mol/dm}^3} = 10 \text{ cm}^3$$

Komplekskatioon ei dissotsieeru.