Student id: 20192350

Name: Kobilov Ilkhomjon

Question 1 a)

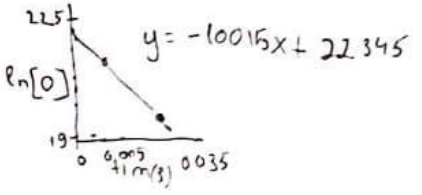
From the equation it is evident that reaction rate is directly proportional to concentration of the reactant. Here k is the proportionality constant which is nothing but rate constant.
Differential rate law is the one that shows how the rate depends on the concentration. ~~the~~ Where as integrated rate law shows how concentration depends on time.

b) Question 1 b)

I) $\ln[O] = -kt + \ln[O]_0$

$\frac{1}{[O]} = kt + \frac{1}{[O]_0}$

$[O] = -kt + [O]_0$



Since the graph between ln[O] and t gives a straight line. the reaction is first order with respective to Oxygen is 1

II) question 1 B) II)

Rate = $k[O][NO_2]$ Rate = $k[O]$

$k = k[NO_2]$

$$\text{slope} = \frac{\Delta \ln[O]}{\Delta t} = \frac{(21.36 - 15.33)}{(1.0\times10^{-2}\,s) - (3.0\times10^{-2}\,s)} = -101.4\,s^{-1}$$

pseudo rate constant (k') is

$101.4\,s^{-1}$

Question 3 a)

Second law of thermodynamics states that for any spontaneous process there is always an increase in the entropy.

Question 3 B)

$$\text{Boiling point} = \frac{\text{enthalpy of vaporization}}{\text{entropy of vaporization}} =$$

$$= \frac{58.51\ \frac{kJ}{mol} \times 10^3\ \frac{J}{kJ}}{92.92\ \frac{J}{K}\cdot mol} = 629.68\ \text{kelvin}$$

Question 2 a)

1) $HBr(g) \rightleftharpoons \frac{1}{2} H_2(g) + \frac{1}{2} Br_2(g)$

$$K_{p_1} = \frac{(P'_{H_2})^{\frac{1}{2}} \cdot (P'_{Br_2})^{\frac{1}{2}}}{P'_{HBr}} = \frac{1}{\sqrt{K_p}}$$

$$\boxed{K_{p_1} = \frac{1}{\sqrt{K_p}}}$$

2) $2HBr(g) \rightleftharpoons H_2(g) + Br_2(g) \quad K_{p_2}$

$$K_{p_2} = \frac{P'_{H_2} \cdot P'_{Br_2}}{(P'_{HBr})^2} = \frac{1}{K_p}$$

$$K_{p_2} = \frac{1}{K_p}$$

answer ↑

3) $\frac{1}{2} H_2(g) + \frac{1}{2} Br_2(g) \rightleftharpoons HBr(g) \quad K_{p_3}$

$$K_{p_3} = \frac{P'_{HBr}}{(P'_{H_2})^{\frac{1}{2}} \cdot (P'_{Br_2})^{\frac{1}{2}}} = \sqrt{K_p}$$

$$K_{p_3} = \sqrt{K_p}$$

answer ↑

B) Question 2 B)

The equilibrium constant is equal to the rate constant for the forward reaction divided by the rate constant for the reverse reaction

Question 4 b)

$^{240}_{95}Am + {}^{4}_{2}He \longrightarrow {}^{243}_{97}Bk + {}^{1}_{0}n$

$^{238}_{92}U + {}^{12}_{6}C \longrightarrow {}^{244}_{98}Cf + 6\,{}^{1}_{0}n$

$^{249}_{98}Cf + {}^{15}_{7}N \longrightarrow {}^{260}_{105}Db + 4\,{}^{1}_{0}n$

$^{249}_{98}Cf + {}^{10}_{5}B \longrightarrow {}^{257}_{103}Lr + 2\,{}^{1}_{0}n$

Question 4 a)

Redox reactions are reactions in which one atom undergoes oxidation and same or other atom undergoes reduction.

A galvanic cell is an electrochemical cell that derives electical energy from chemical reactions taking place within the cell. An electrolytic cell decomposes chemical compounds by means of electrical energy. An electrolytic cell uses the same metal instead of two different metals