HSC STYLE HOMEWORK

NAME: .....

SEMINAR DAY & TIME: .....

TALENT100
HSC Success. Simplified.

www.talent-100.com.au 1300 999 100

HSC Chemistry

Equilibrium and Acid Reactions III

General Instructions

- Reading time – 5 minutes
- Working time – 45 minutes
- Write using black or blue pen
- Draw diagrams in pencil
- Board-approved calculators may be used
- All necessary working should be shown in every question

Total marks – 25

Section III – Extended Response

25 Marks

- Attempt all questions
- Write on the lines provided

Section I (Multiple Choice) and Section II (Single Response) must be submitted on My Mentor.

Section III
25 marks

Allow about 45 minutes for this part

---

17 Silver ions react with thiosulfate ions to produce a silver complex according to the equation

$$Ag^{+}_{(aq)} + 2S_2O_3^{2-}{}_{(aq)} \leftrightharpoons Ag(S_2O_3)_2^{3-}{}_{(aq)} \quad , K_{eq} = 10^{13}$$

(a) Are reactants or products favoured in this reaction? Why? **(1 mark)**

.....

(b) Write an expression for the equilibrium constant. **(1 mark)**

.....

(c) If the equilibrium concentrations of thiosulfate and silver complex are 1.0×10^{-4} M and 1.0 M respectively, what is the concentration of the silver ions in solution? **(4 marks)**

.....

.....

.....

.....

.....

.....

.....

(d) What will be the concentration of free silver ions in a litre of solution in which 0.010 mol of $Na_3Ag(S_2O_3)_2$ was dissolved? **(3 marks)**

.....

.....

.....

.....

.....

.....

.....

(e) What will concentration of silver ions be if 0.010 mol of silver nitrate is added to a litre of the above $Na_3Ag(S_2O_3)_2$ solution? Explain. **(2 marks)**

.....

.....

.....

.....

.....

19

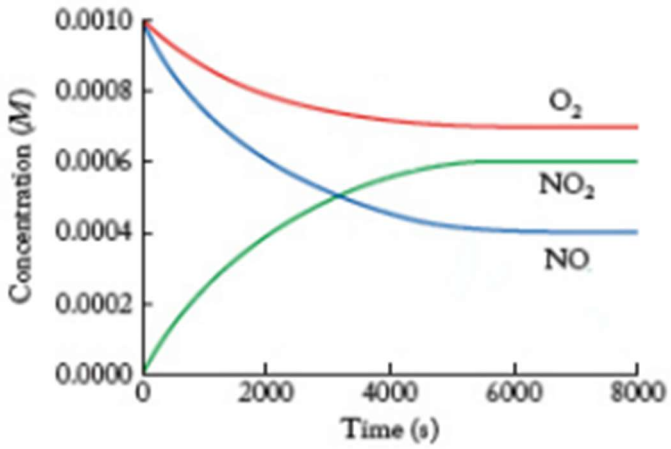
(a) Determine the expression for the equilibrium constant for the following reaction.

(1 mark)

$2NO_{(g)} + O_{2(g)} \leftrightharpoons 2NO_{2(g)}$

.....

(b) Estimate the equilibrium constant from the data in the graph below **(3 marks)**



.....

.....

.....

.....

.....

.....

.....

.....

(c) How will the concentrations of the three gases qualitatively change if the volume of the reaction vessel is squeezed to a tenth of its size in the questions above? Why? **(2 marks)**

.....

.....

.....

.....

.....

20 One mole of ethyl octanoate and one mole of water are produced when one mole of ethanol reacts completely with one mole octanoic acid.

(a) Write a balanced word equation for this reaction **(1 mark)**

.....

(b) Write the expression for the equilibrium constant for the above equation. **(1 mark)**

.....

(c) The equilibrium constant for this reaction is approximately 2 and $\Delta H = 0$ $kJmol^{-1}$. What does that tell you about this reaction? **(1 mark)**

.....

.....

(d) Rearrange the above equation and value of "2" for the equilibrium constant to provide an expression for the ratio of [ethyl octoate]/[octanoic acid]. **(1 mark)**

.....

.....

(e) Determine the ratio of ethanol to water concentrations to achieve 95% conversion of octanoic acid to ethyl octanoate. **(1 mark)**

.....

.....

.....

(f) Octanoic acid is an expensive reactant and the reaction to turn it into ethyl octanoate needs to be driven to near completion (> 95%) to avoid wastage and unnecessary expense. Provide two approaches that could be used together achieve this outcome. **(3 marks)**

.....

.....

.....

.....

.....

.....

Section I (Multiple Choice) and Section II (Single Response) must be submitted on My Mentor.

Please contact Student Services if you have any issues.

End of paper