Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	CHEMISTRY FOR BIODIVERSITY AND CONSERVATION
COURSE CODE	:	BWJ 10303
PROGRAMME CODE	:	BWW
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) (i) Define chemistry.

(2 marks)

(ii) Discuss the importance of chemistry in our daily lives.

(8 marks)

(b) Explain **FIVE (5)** factors affecting the rate of enzymatic reaction in chemical catalysis process.

(10 marks)

Q2 (a) (i) The peroxydisulfate ion $S_2O_8^{2-}$ is a potent oxidizing agent that reacts rapidly with iodide ion in water:

$$S_2O_8^{2-}{}_{(aq)} + 3I^-{}_{(aq)} \rightarrow 2\,SO_4^{2-}{}_{(aq)} + I_3^-{}_{(aq)}$$

Table **Q2(a)(i)** below lists kinetics data for this reaction at 25 °C. Determine the rate law and the rate constant of this reaction.

Table Q2(a)(i)

Experiment	$[S_2O_8^{2-}]$	$[I^-]$	Initial Rate
1	0.27	0.38	2.05
2	0.40	0.38	3.06
3	0.40	0.22	1.76

(6 marks)

(ii) The thermal decomposition of phosphine (PH_3) into phosphorus and molecular hydrogen is a first-order reaction:

$$4\,PH_{3\,(g)} \rightarrow P_{4\,(g)} + 6\,H_{2\,(g)}$$

The half-life of the reaction is 35.0s at 680°C. Calculate the 1st order rate constant for the reaction.

(2 marks)

(b) Consider the reaction:

$$H_{2\,(g)} + Cl_{2\,(g)} \rightarrow 2\,HCl_{(g)} \qquad \Delta H = -184.6\ kJ/mol$$

If 3 moles of H_2 reacts with 3 moles of Cl_2 to form HCl against a pressure of 1 atm at 25°C, what is the ΔE for this reaction? Assume the reaction goes to completion. (Given that R= 8.314 J/K·mol)

(4 marks)

(c) The decomposition of a certain insecticide in water follows first-order kinetics with a rate constant of 1.45 yr^{-1} at 12°C. A quantity of this insecticide is washed into a lake on 4th of January, leading to a concentration of 5.0 x 10^{-7} g/cm^3. Assume that the average temperature is 12°C.

(i) Calculate the concentration of the insecticide on 4th of January of the following year.

(4 marks)

(ii) Estimate how long it will take for the concentration of the insecticide to decrease to 3.0 x 10^{-7} g/cm^3.

(4 marks)

Q3 (a) Draw the structure of each of the following compounds.

(i) 4-aminobutanoic acid
(ii) Cyclopenta-1,3-diene
(iii) Ethene
(iv) 2-methylbuta-1,3-diene
(v) 2,5-dimethylhexa-1,5-diene

(10 marks)

(b) 3-bromopentanoic acid reacted with an organic compound A with the aid of an acid catalyst B producing ethyl 3-bromopentanoate and water.
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(i) Identify acid catalyst B.

(2 marks)

(ii) Illustrate the organic reaction occurs and give the systematic nomenclature of A.

(8 marks)

Q4 (a) Describe **FIVE (5)** importance of water to many biological activities.

(10 marks)

(b) (i) SO_2 and NO_2 gases play an important role in the formation of acid precipitation in the environment. Determine if these gases are primary or secondary pollutant and state the chemical reactions of these gases with water.

(6 marks)

(ii) Acid precipitation may cause adverse effect to the environment. Identify the effect of acid precipitation towards the environment.

(4 marks)

Q5 (a) Photosynthesis is often considered the most important chemical reaction for life on earth.

(i) Write down the chemical equation for photosynthesis process.

(2 marks)

(ii) Discuss **FOUR (4)** reasons why photosynthesis is necessary for our survival.

(8 marks)

(b) Explain the cleaning action of soap and detergent towards grease.

(10 marks)

- END OF QUESTIONS -

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List of formula:

$$r = k\,[A]^x\,[B]^y$$

$$\ln [A]_t = -kt + \ln [A]_0$$

$$1/[A]_t = 1/[A]_0 + kt$$

$$\text{rate} = k[A]^2$$

$$\text{rate} = k[A]$$

$$t_{1/2} = 0.693/k$$

$$t_{1/2} = 1/k[A]_0$$