UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	CHEMISTRY
COURSE CODE	:	BWD 10803
PROGRAMME CODE	:	BWD
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1   (a)   Rutherford was a noble prize winner in 1908 regarding his experiment, 'measuring scattering of α particles by a thin metal foil'. State **TWO (2)** discoveries made by Rutherford from this experiment.

(2 marks)

(b)   Discuss the trend of atomic radius of elements across Period 3 of the Periodic Table.

(8 marks)

Q2   (a)   State the 'Law of the Conservation of Matter'.

(1 mark)

(b)   Name and give examples of **TWO (2)** types of chemical reactions that comply with the law stated in **Q2(a)**.

(6 marks)

(c)   Explain how to prepare 60 ml of 0.2 M HNO_3 from a stock solution of 3 M HNO_3.

(3 marks)

Q3   (a)   Define acids and bases according to Lewis theory.

(2 marks)

(b)   Identify the Lewis base in the following reaction. Explain your answer.

$B(OH)_3(aq) + H_2O\ (aq) \rightarrow B(OH)_4^-\ (aq) + H^+(aq)$

(2 marks)

(c)   Explain the following statement:
'Water can act as a Bronsted base and a Lewis base, but it cannot act as a Lewis acid'.

(6 marks)

Q4   (a)   Indicate the relationship between pKa, pKb and pKw, by considering the equilibrium reaction of ethanoic acid and its conjugate base.

(7 marks)

(b)   A research chemist adds a measured amount of HCl gas to pure water at 25°C and obtains a solution with $[H_3O^+] = 3.0 \times 10^{-14}$ M. Determine whether the solution neutral, acidic or basic?.

(3 marks)

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Q5   (a)   Define calorimetry.

(2 marks)

(b)   Determine the function of bomb calorimeter.

(2 marks)

(c)   Tabulate the differences between exothermic and endothermic reaction.

(6 marks)

Q6   (a)   State Hess's Law.

(2 marks)

(b)   Calculate ΔH at 25 °C for the following reaction,

C (graphite) + $2H_2O$ (g) $\rightarrow$ CH_4 (g)

Given,

$$C \text{ (graphite)} \ + \ O_2 \text{ (g)} \ \rightarrow \ CO_2 \text{ (g)} \qquad \Delta H^o = -393.5 \text{kJ/mol}$$
$$H_2 \text{ (g)} \ + \ \tfrac{1}{2}O_2 \text{ (g)} \ \rightarrow \ H_2O \text{ (l)} \qquad \Delta H^o = -285.8 \text{kJ/mol}$$
$$CH_4 \text{ (g)} \ + \ 2O_2 \text{ (g)} \ \rightarrow \ CO_2 \text{ (g)} \ + \ 2H_2O \text{ (l)} \qquad \Delta H^o = -890.3 \text{kJ/mol}$$

(8 marks)

Q7   (a)   Describe the Arrhenius Collision Theory.

(6 marks)

(b)   Draw the energy profile of the exothermic reaction as follows;

$\cdot CH_3$ + $CHCl_3$ $\rightarrow$ CH_4 + $\cdot CCl_3$

(4 marks)

Q8   (a)   State the Equilibrium Law.

(2 marks)

(b)   When 1.0 mol of ethanoic acid and 1.0 mol of ethanol are allowed to achieve equilibrium at 30°C, 0.67 mol of ester is produced.

(i)   Write Kc expression for the reaction.

(2 marks)

(ii)   Calculate the equilibrium constant for the reaction.

(6 marks)

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Q9 In chemical industries, where processes are reversible, conditions are chosen so as to shift the equilibrium reactions in the direction of forming the products. By referring to Le Chatelier's Principle, discuss **THREE (3)** factors that influence equilibrium system. Choose a suitable chemical reaction to discuss the effect of each factor.

(10 marks)

Q10 The properties of polymer are very much related to the presence of intermolecular forces between molecules. By choosing any related polymer molecules, explain **THREE (3)** intermolecular forces that may present. Draw and name the chemical structure related to each force.

(10 marks)

– **END OF QUESTIONS** –

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