



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2021/2022**

COURSE NAME : GENERAL CHEMISTRY  
COURSE CODE : BWD 11403  
PROGRAMME CODE : BWD  
EXAMINATION DATE : JANUARY / FEBRUARY 2022  
DURATION : 3 HOURS  
INSTRUCTION : 1. ANSWER ALL QUESTIONS.  
2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**

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

- Q1** Mass and volume are extensive properties of substances, or properties that depend on sample size of the substances. A sample of vegetable oil has a density of 0.916 g/mL. For each of your answer in **Q1(a)** and **Q1(b)**, discuss how you would determine the units of respected properties and whether your answer is reasonable or not.
- (a) the mass in grams of 225 mL of the oil. (5 marks)
- (b) the volume in milliliters which are occupied by 45.0 g of the oil. (5 marks)
- Q2** The arrangement of electrons around the nucleus of an atom is important as the electronic configuration determines the chemical properties of an atom or element. The energy of the electronic shells increases as the orbits distance from the nucleus increases.
- (a) The 4s and 4p orbitals in most of atoms have the same energy but the 4s and 4p orbitals in hydrogen atom does not have the same energy. Explain why the energy of these orbitals differ in many other atoms but not in the hydrogen atom. (4 marks)
- (b) Describe the electronic configuration of the nitrogen atom base on the three rules of Aufbau, Pauli and Hund. (6 marks)
- Q3** Lithium, sodium, potassium, rubidium and caesium are the elements located in Group 1 of the periodic table.
- (a) Explain the trend of the first ionization energy from lithium to caesium. (5 marks)
- (b) Discuss the trend of melting points when descending the group. (5 marks)
- Q4** The combustion of magnesium thin wire in an atmosphere of pure oxygen produces an intense light of a flashbulb. After the reaction, a thin film of magnesium oxide is seen inside of the bulb.
- (a) Write the chemical formula of each compound specified in the statement above. (3 marks)
- (b) Write a balanced chemical equation of the revealed reaction. (4 marks)
- (c) Give **THREE (3)** stoichiometric equivalencies could be extracted from the equation in **Q4(b)**. (3 marks)

**Q5** Silver bromide, AgBr can be prepared by using precipitation reaction that involves of mixing two solutions of water-soluble compounds which are, 0.15 M silver nitrate, AgNO<sub>3</sub> and 0.125 M calcium bromide, CaBr<sub>2</sub>.

(a) If there is 0.20 M AgNO<sub>3</sub> in a reagent bottle, explain what steps should be taken to prepare 50 mL of 0.15 M AgNO<sub>3</sub> before the experiment can be conducted. (3 marks)

(b) Describe how to determine the approximate quantity of silver bromide in grams that will be precipitated in the reaction. (7 marks)

**Q6** (a) Demonstrate a diagram to depict the interaction occurs when a molecule of phosphine and hydrochloric acid are attracted together. (2 marks)

(b) By referring to the guideline procedures for writing the Lewis structure of molecules, determine plausible structures for the compounds listed below:

(i) nitrosyl bromide, BrNO (4 marks)

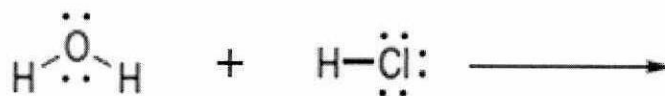
(ii) hydroxylamine, H<sub>3</sub>NO (4 marks)

**Q7** Determine the molecular geometry for the following compounds:

(a) AsF<sub>3</sub> (5 marks)

(b) H<sub>2</sub>O<sub>2</sub> (5 marks)

**Q8** (a) Based from the following reaction:

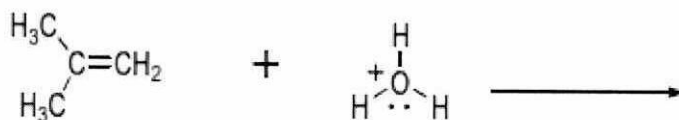


(i) Determine the conjugate acid and conjugate base. (2 marks)

(ii) Show the mechanism of the deprotonation reaction occurs using arrows. (3 marks)

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(b) Given a reaction as below:



(i) Illustrate the polyatomic ion structure that will be produced. (2 marks)

(ii) Show the mechanism of the acid-base reaction occurs using arrows. (3 marks)

**Q9** (a) Explain the following statement: 'Water can act as a Bronsted base and a Lewis base, but it cannot act as a Lewis acid'. (4 marks)

(b) An unknown solution contains  $5.6 \times 10^{-6}$  M of  $\text{OH}^-$ . Find:

- (i)  $[\text{H}^+]$
  - (ii) pH
  - (ii) pOH
- (6 marks)

**Q10** The pH of  $1.00 \times 10^{-2}$  M of cyanic acid (HOCN) is 2.50 at 25 °C. Calculate  $K_a$  for HOCN. (10 marks)

- END OF QUESTIONS -

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