

**BOWEN UNIVERSITY, IWO, OSUN STATE**  
**COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE**  
**INDUSTRIAL CHEMISTRY PROGRAMME**  
**2022/2023 B.SC DEGREE FIRST SEMESTER EXAMINATION**

**Course Code:** CHM 203      **Course Title:** Chemistry Practical I      **Credit:** 1  
**Date:** Monday, 20/02/2023      **Time Allowed:** 1 hr

---

**INSTRUCTIONS:** (a) Answer all questions.  
(b) Answer each main question on a fresh page in your booklet.

---

1. (a) Describe/explain experimentally, how you would confirm or identify the following anions and cations in a sample of inorganic salts:
- |                        |                              |
|------------------------|------------------------------|
| (i) $\text{SO}_4^{2-}$ | <b>2<sup>1/2</sup> marks</b> |
| (ii) $\text{Cl}^-$     | <b>2<sup>1/2</sup> marks</b> |
| (iii) $\text{Cu}^{2+}$ | <b>2<sup>1/2</sup> marks</b> |
| (iv) $\text{Fe}^{2+}$  | <b>2<sup>1/2</sup> marks</b> |
2. (a) i) What is gravimetric analysis? **2 marks**  
ii) Define analyte. **1 mark**  
(b) i) An experiment on application of gravimetric analysis in the estimation of sulphate ion in  $\text{g/dm}^3$  of the given solution was carried out in the laboratory. Enumerate **four major** processes or steps involved in getting your product during the experiment. **4 marks**  
ii) State the gravimetric factor and calculate the weight of sulphate ion, given that the constant weight of your precipitate (Barium sulphate) was 0.79g. [ Ba = 137.3; S = 32.0; O = 16.0] **3 marks**
3. In an experiment to determine the equilibrium constant of the ester formation, in which the temperature of the reaction system is kept at 80 °C, one mole of ethanoic acid was allowed to react with one mole of ethanol until equilibrium was established. The total volume of the system was 20.0  $\text{cm}^3$ . It was found that after the titration, 0.33 mole of ethanoic acid was present at equilibrium. Use the information given to answer the following questions:
- |  |                |
|--|----------------|
| (i) State with reason, what would be the initial volume of the starting materials. | <b>1 mark</b>  |
| (ii) Write a balanced equation of the reaction.                                    | <b>2 marks</b> |
| (iii) What is equilibrium constant?  | <b>2 marks</b> |
| (iv) Calculate the equilibrium constant of the reaction at the same temperature.   | <b>5 marks</b> |
4. An experiment on investigation of the behaviour of non-ideal solutions was carried out in order to estimate intermolecular forces strength. Answer the following questions based on that.
- |  |                |
|--|----------------|
| i) Name one example of non-ideal solutions.  | <b>2 marks</b> |
| ii) What could be the effect of this liquid-mixture on the intermolecular forces.          | <b>2 marks</b> |
| iii) What law is related to the principle of this liquid mixture. Hence, State the law.    | <b>3 marks</b> |
| iv) Give an expression for the calculation of mole ratio; suppose the liquids are A and B. | <b>2 marks</b> |

v) What type of solutions would form from pairs of liquids having dissimilar structures? 1 **mark**