THE OPEN UNIVERSITY OF SRI LANKA
DIPLOMA IN SCIENCE IN LABORATORY TECHNOLOGY- DSLT
CYD3601 - LABORATORY TECHNIQUES IN CHEMISTRY
FINAL EXAM (THEORY) 2024/2025

Question no	Marks
1	
2	
3	
4	
5	
6	
Total	
%	

Date: 10th May 2025

Time: 9.30 am-11.30 am

Duration: 2 hours

Instructions to candidates

- This question paper consists of **six structured** type questions. Answer any **four** questions in the **space provided**
- Take some time to Read and Understand the questions.
- **Mobile phones** and any other electronic equipment are **NOT ALLOWED.**
- Marks will be awarded for writing down all the steps where relevant.

Index Number .....

01) (a) (i) Name two organizations where the purity standards of the chemicals required for the different industries have been defined . **(5 marks)**

(ii) Name two types each for common and speciality chemical grades . **(10 marks)**

(iii) Name two key information that can be extracted from the MSDS. **(10 marks)**

(iv) Name two advantages of having a proper chemical storage area. **(10 marks)**

(v) Give three important columns that needs to be included in a proper chemical inventory. **(15 marks)**

(b) (i) Name two different types of fire extinguishers and explain their differences. **(10 marks)**

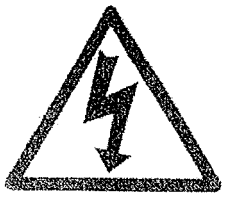
(ii) What type of fire extinguisher/**s** can be used to control a fire that has caused due to flammable gas? **(4 marks)**

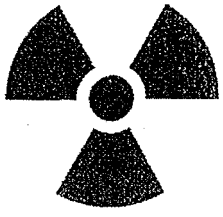
(iii) A student suggests arranging chemicals in a lab according to the **alphabetical order**. Do you agree with his suggestion? Explain giving reasons. **(10 marks)**

(iv) What is a pyrophoric material? Explain how you can store pyrophoric materials and water-reactive chemicals safely. **(10 marks)**

(c) (i) Identify the following safety symbols. **(8 marks)**

1. 

2. 

3. 

4. 

(ii) Name the color codes of the following hazard classes according to the NFPA 704 Hazard signal system. **(8 marks)**

1. Health hazard
2. Fire hazard
3. Instability hazard
4. Specific hazard

02)

(a) Three chemists (A, B and C) have analyzed the Sulphur percentage (w/w) of a solid mineral sample separately. Their results have been summarized in the following table. The actual percentage of Sulphur (w/w) in this sample was 1.29 %.

Chemist	Experimental Nitrogen percentage (%w/w) ()
A	1.25
B	1.31
C	1.34

(i) Find the absolute errors of the results of these three chemists (A, B and C) separately. **(9 marks)**

(ii) What is the significance of the sign of the absolute error. **(6 marks)**

(iii) Who has reported the most accurate results out of these three chemists. Justify your answer. **(5 marks)**

(iv) Compare two differences between random errors and systematic errors. **(10 marks)**

(b) (i) Compare three differences between class A and class B glassware. **(6 marks)**

(ii) Write down the names of the most suitable glassware for the following tasks (I to III). **(6 marks)**

I- protecting any light-sensitive chemicals without degradation.

II- a volumetric glassware used to measure out and transfer a known volume of solutions into the titration flask during the titration.

III- to grow microorganisms in the laboratory.

(iii) What is the primary standard? **(6 marks)**

(iv) Name four properties of a primary standard. **(12 marks)**

(c) (i) Define pH. **(5 marks)**

(ii) The H^+ ion concentration of two acid samples A & B are 0.0001 M and 0.001 M respectively at 25 °C. Find the pH value of these two samples separately at 25 °C. Which solution has the highest acidity? **(15 marks)**

(iii) Find the pOH of sample A at the same temperature. **(10 marks)**

(iv) Explain the standard procedure of storing the pH meter when not in use. **(10 marks)**

03)

(a) (i) Briefly explain the two types of water hardness. **(10 marks)**

(ii) Why is it not recommended to drink distilled or deionized water? **(6 marks)**

(iii) The water hardness is commonly assessed using a titrimetric method. Name the titrant, indicator and endpoint color change with respect to this titration. **(6 marks)**

(iv) Name any two (2) tests that can be carried out in a general chemistry laboratory to distinguish between deionized water and hard water. **(8 marks)**

(b) (i) Compare the difference between molarity and molality. **(10 marks)**

(ii) Calculate the **molarity** and **molality** separately of a strong acid having the purity 70.4 % (w/w) and density 1.42 g/ml. The molecular weight of this acid is 63.0 g/mol. **(20 marks)**

(iii) Briefly explain, , how you dilute a concentrated analytical grade acid solution in the laboratory highlighting the relevant glassware and safety measures to be undertaken. **(10 marks)**

(c) A 10.00 mL of 0.01 M sulphuric acid is titrated with an unknown sodium hydroxide solution. The endpoint was determined and was reported as 12.50 ml.

(i) Write down the balanced chemical equation for the above reaction. **(6 marks)**

(ii) Give a suitable indicator for this titration **(4 marks)**

(iii) Calculate the unknown sodium hydroxide concentration used for the reaction. **(10 marks)**

(iv) Name the simplest spot test to distinguish sulphuric acid and sodium hydroxide in the general chemistry laboratory. **(10 marks)**

04)

(a) (i) Name **four (04)** factors that need to be considered when you select the filtering medium. **(15 marks)**

(ii) Washing the precipitate is an important step after the filtration. Write down **three (03)** characteristics of the ideal washing liquid. **(15 marks)**

(b) (i) Select **the most suitable** separation method for the following operations (1 to 4). **(20 marks)**

1. Filtration of purified crystals -
2. Filtration of small volume of mixtures -
3. Separation of serum from blood sample -
4. Separation of cinnamon oil in aqueous layer-

(ii) Write down **three (3)** possible errors related to the solvent extraction. **(15 marks)**

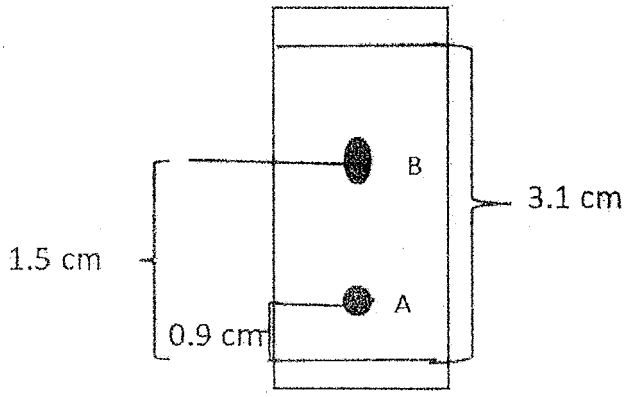
(c) (i)Write down **four (4)** advantages and disadvantages of filtration as a separation technique. **(15 marks)**

(ii) Write down **four (4)** limitations of solvent extraction technique. **(20 marks)**

05)

(a) (i). Name the stationary phase and the mobile phase in Thin-Layer Chromatography. **(10 marks)**

(b) The following diagram shows the results of a thin-layer chromatographic experiment.



(i) Calculate Rf for each spot A and B **(20 marks)**
(ii) If the mobile phase is methanol which spot should be the most polar? Justify your answer. **(05 + 15 marks)**

(iii) Name **three (3)** visualizing methods of spots that appeared in TLC plate. **(15 marks)**

(c) (i) Write down one possible reason for each of the following problems arising in TLC. **(20 marks)**

A. Streaking of spot
B. Spots are close to the baseline
C. Stops are overlapping each other
D. Spots are close to the solvent front.

(ii) Name **five (5) common** properties of the mobile phase to use for chromatographic techniques. **(15 marks)**

06)

(a) What is the difference between precipitation and recrystallization? **(12 marks)**

(b) A student performed a recrystallization to purify a crude sample from a reaction. He collected 10.25 g of crude material from the reaction and after the purification, the student collected 5.15 g of pure material.

(i). Calculate the percent recovery of the desired material. **(10 marks)**

(ii). Write down **two (02)** possible reasons to reduce the percentage recovery during the recrystallization. **(12 marks)**

(iii). Name 4 properties which should be satisfied by a good recrystallization solvent. **(20 marks)**

(c) (i)Write down two (2) limitations in recrystallization. **(10 marks)**

(ii). Differentiate between melting point and freezing point. **(12 marks)**

(iii) Briefly explain the impact of impurities on the melting point of a particular compound. **(24 marks)**