



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**FIRST YEAR SECOND SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS**

FOR THE DEGREE OF BSC CHEMISTRY

COURSE CODE: SCH 123

COURSE TITLE: LABORATORY TECHNIQUES II

DATE: 28/07/2022

TIME: 11:00AM-1:00PM

INSTRUCTIONS TO CANDIDATES:

- Answer **Question ONE (Compulsory)** and any other **TWO (2)** questions
- Indicate answered questions on the front cover
- Start each question on a new page and make sure the question's number is written on each page

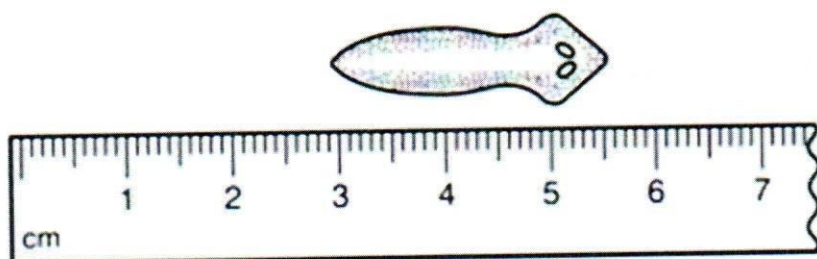
TIME: 2 Hours

This paper consists of **5** printed pages. Please Turn Over 

KIBU observes **ZERO** tolerance to examination cheating

Question 1 [30 Marks]

- i. Water acts as a universal solvent due to its [2 Marks]
- A. polarity
 - B. hydrogen bonding
 - C. strong dipole dipole interaction
 - D. polarity and hydrogen bonding
- ii. What is the approximate length in mm of the biological specimen in the diagram [2 Marks]



- A. 30 mm
 - B. 40 mm
 - C. 25 mm
 - D. 35 mm
- iii. When an acid reacts with metal carbonate, the products are [2 Marks]
- A. salt
 - B. water
 - C. carbon dioxide
 - D. all the above
- iv. Which of the following salts is coagulated in the Volhard method? [2 Marks]
- A. Silver chloride
 - B. Silver bromide
 - C. Silver iodide
 - D. Silver cyanide
- v. Back titration of EDTA is used in all of the following conditions EXCEPT [2 Marks]
- A. Insoluble complexes
 - B. Titrations that require heating
 - C. Analytes that form inert complexes
 - D. When no metal ion indicator is available

- vi. Normal body temperature and room temperature are commonly accepted as 37.0 °C and 25.0 °C. Determine these temperatures in Kelvins (K) and Fahrenheit (°F) [4 Marks]
- 37.0 °C -
- 25.0 °C - [2 Marks]
- vii. Define back titration
- viii. Zebra finches are small black-and-white birds that lay eggs about the size of a bean seed. Which unit of measurement is best for accurately measuring the length of these eggs? [2 Marks]
- ix. List 3 laboratory safety rules to be adhered to while working in the laboratory [3 Marks]
- x. Name the types of titration reactions [4 Marks]
- xi. Describe the correct procedure for transferring liquids [5 Marks]

Question 2 [20 Marks]

- i. A sample weighing 2.200 g containing $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ and NaCl was heated at 110 °C and cooled then reweighed. The final mass was 1.973 g. [2 Marks]
- a. Write the balanced equation for this reaction [2 Marks]
- b. Determine the % of hydrate in the mixture. [16 Marks]
- ii. Sketch the titration curves for each of the following reactions
- a. Nitric acid and Sodium hydroxide
- b. Ethanoic acid and Potassium hydroxide
- c. Phosphoric acid and Lithium hydroxide

Question 3 [20 Marks]

3 groups of students performed a synthesis experiment and recorded the mass of the obtained products as 9.22 g, 9.23 g and 9.26 g. The theoretical mass of the product from that reaction is 9.10 g.

- i. Determine the accuracy of each group [6 Marks]
- ii. Can the measurements be classified as accurate or inaccurate? Explain [2 Marks]
- iii. Determine the precision of the results [6 Marks]
- iv. Discuss three possible causes for the deviation of the results from the true value [6 Marks]

Question 4 [20 Marks]

- i. With examples explain the following terms [10 Marks]
 - a. simple distillation
 - b. fractional distillation
 - c. filtration
 - d. crystallisation
 - e. paper chromatography
- ii. Explain the experimental procedure for crystallization [5 Marks]
- iii. With the aid of a diagram explain the experimental procedure for filtration [5 Marks]

Millimeters	Centimeters	Meters	Kilometers	Inches	Feet	Yards	Miles
mm	cm	m	km	in	ft	yd	mi
1	0.1	0.001	0.000001	0.03937	0.003281	0.001094	6.21e-07
10	1	0.01	0.00001	0.393701	0.032808	0.010936	0.000006
1000	100	1	0.001	39.37008	3.28084	1.093613	0.000621
1000000	100000	1000	1	39370.08	3280.84	1093.613	0.621371
25.4	2.54	0.0254	0.000025	1	0.083333	0.027778	0.000016
304.8	30.48	0.3048	0.000305	12	1	0.333333	0.000189
914.4	91.44	0.9144	0.000914	36	3	1	0.000568
1609344	160934.4	1609.344	1.609344	63360	5280	1760	1

Centimeter cube	Meter cube	Liter	Inch cube	Foot cube	US gallons	Imperial gallons	US barrel (oil)
cm ³	m ³	ltr	in ³	ft ³	US gal	Imp. gal	US brl
1	0.000001	0.001	0.061024	0.000035	0.000264	0.00022	0.000006
1000000	1	1000	61024	35	264	220	6.29
1000	0.001	1	61	0.035	0.264201	0.22	0.00629
16.4	0.000016	0.016387	1	0.000579	0.004329	0.003605	0.000103
28317	0.028317	28.31685	1728	1	7.481333	6.229712	0.178127
3785	0.003785	3.79	231	0.13	1	0.832701	0.02381
4545	0.004545	4.55	277	0.16	1.20	1	0.028593
158970	0.15897	159	9701	6	42	35	1

Densities of common substances

Solids	Liquids	Gases (at 25 °C and 1 atm)
ice (at 0 °C) 0.92 g/cm ³	water 1.0 g/cm ³	dry air 1.20 g/L
oak (wood) 0.60–0.90 g/cm ³	ethanol 0.79 g/cm ³	oxygen 1.31 g/L
iron 7.9 g/cm ³	acetone 0.79 g/cm ³	nitrogen 1.14 g/L
copper 9.0 g/cm ³	glycerin 1.26 g/cm ³	carbon dioxide 1.80 g/L
lead 11.3 g/cm ³	olive oil 0.92 g/cm ³	helium 0.16 g/L
silver 10.5 g/cm ³	gasoline 0.70–0.77 g/cm ³	neon 0.83 g/L
gold 19.3 g/cm ³	mercury 13.6 g/cm ³	radon 9.1 g/L