KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 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: 1/10/2021 **TIME: 11:00-1:00AM**

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

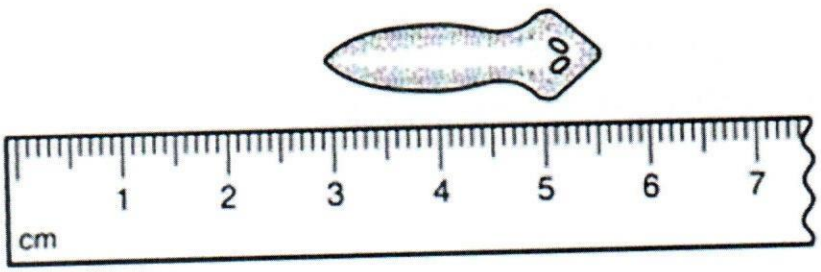
This paper consists of **4** printed pages. Please Turn Over

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 -

vii. Define back titration [2 Marks]

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 $BaCl_2.2H_2O$ and NaCl was heated at 110 °C and cooled then reweighed. The final mass was 1.973 g.

a. Write the balanced equation for this reaction [2 Marks]
b. Determine the % of hydrate in the mixture. [2 Marks]

ii. Sketch the titration curves for each of the following reactions [16 Marks]

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