Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Science

End Sem (Even) Examination May-2022

FS3EG04 Chemistry

Programme: B.Sc. (FS) Branch/Specialisation: Forensic Science

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The formula which expresses the actual number of each kind of atom present in the molecule of compound is called: **1**

(a) Empirical Formula (b) Molecular Formula

(c) Structural Formula (d) None of these

ii. What indicates the actual number of constituent atoms in a molecule? **1**

(a) Empirical formula (b) Molecular formula

(c) Empirical mass (d) Molecular mass

iii. The octet rule is not valid for the molecule: **1**

(a) CO_2 (b) H_2O (c) O_2 (d) CO

iv. The rate of reaction of organic compounds is slow due to: **1**

(a) Ionic bonding (b) Amphoteric nature

(c) Covalent bonding (d) Coordinate covalent bonding

v. The group 1 elements are named as alkali metals because: **1**

(a) Their oxides are basic

(b) Their oxide and hydroxides are water soluble

(c) Both (a) and (b)

(d) They are found in the earth

vi. Carbonates of lithium are not stable like that of sodium due to: **1**

(a) Low electro-negativity (b) Low electro-positivity

(c) Low charge density (d) Not known yet

vii. Which of the following phenomena will occur when a small amount of acid is added to water? **1**

(a) Dilution (b) Neutralization

(c) Salt formation (d) Ionization

P.T.O.

viii. Which of the following species can act as Lewis Base? **1**
(a) Negatively charged species or anions and neutral species with one lone pair of electrons
(b) Positively charged species or cations and neutral species with one lone pair of electrons
(c) Molecules in which the central atom has incomplete octet
(d) Simple cations

ix. Any substance that can conduct electricity is called: **1**
(a) Acid (b) Electrolyte
(c) Hydrolyzed (d) Base

x. A solution that maintains the pH when acids or bases are added in it, known as: **1**
(a) Neutral solution (b) Acidic solution
(c) Buffer (d) Basic solution

Q.2 i. What is molecular formula and empirical formula? **2**

ii. Write a brief note on quantitative elemental analysis. **3**

iii. How many methods of purification are there? Explain methods of purification of: **5**
(a) Organic compounds (b) Solid
(c) Liquid

OR iv. A compound of carbon, hydrogen, and nitrogen contains the three elements in the respective ratio of 9:1:3.5. Calculate the empirical formula. If the molecular weight of the compound is 108, what is its molecular formula? **5**

Q.3 i. Why do group one elements have the lowest ionisation enthalpy? **2**

ii. (a) How do atoms form covalent bonds? What is the easiest way to distinguish a covalent bond from an ionic bond? **8**
(b) What is the measure of strength of an acid and base? Give two examples of salts whose aqueous solutions are basic. Give two examples of salts whose aqueous solutions are acidic.

OR iii. What are the main postulates of valence shell electron pair repulsion VSEPR theory? How can the VSEPR Theory be used to predict the shapes of molecules? **8**

Q.4 i. What are the general characteristics and gradation in properties of alkali metals? Why do alkali metals only show one oxidation state? **3**

ii. What are the general characteristics of alkaline earth metals? What is the biological importance of magnesium and calcium? **7**

OR iii. (a) What are p-block elements write five characteristic properties of p-block elements? Why do p blocks have 6 groups? **7**
(b) What are the anomalous character of carbon which makes it different from the rest of the group?

Q.5 i. How can you distinguish between a salt hydrolysis and a buffer? **3**

ii. What is a pKa value acids and bases? What is the basic difference between Lewis concept and Brønsted-Lowry concept? **7**

OR iii. Explain Lewis acid-base theory with suitable example. Why is Lewis concept more useful than Brønsted-Lowry concept? Classify the following species into Lewis acids and Lewis bases and show these act as Lewis acid / base. **7**
(a) OH (b) F (c) H' (d) BCI

Q.6 Attempt any two:

i. What is solubility product and its application? What is buffer solution? How do you write Henderson- Hasselbalch equation? **5**

ii. What is physical properties & solvent properties of water? Draw the structure of water & explain ionic product of water. **5**

iii. What is the relationship between the strength of the weak acid and the pH of the solution at the equivalence point? **5**

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Marking Scheme
FS3EG04 Chemistry

Q.1	i.	The formula which expresses the actual number of each kind of atom present in the molecule of compound is called: (b) Molecular Formula		**1**
	ii.	What indicates the actual number of constituent atoms in a molecule? (b) Molecular formula		**1**
	iii.	The octet rule is not valid for the molecule: (d) CO		**1**
	iv.	The rate of reaction of organic compounds is slow due to: (c) Covalent bonding		**1**
	v.	The group 1 elements are named as alkali metals because: (c) Both (a) and (b)		**1**
	vi.	Carbonates of lithium are not stable like that of sodium due to: (b) Low electro-positivity		**1**
	vii.	Which of the following phenomena will occur when a small amount of acid is added to water? (a) Dilution		**1**
	viii.	Which of the following species can act as Lewis Base? (a) Negatively charged species or anions and neutral species with one lone pair of electrons		**1**
	ix.	Any substance that can conduct electricity is called: (b) Electrolyte		**1**
	x.	A solution that maintains the pH when acids or bases are added in it, known as: (c) Buffer		**1**
Q.2	i.	Molecular formula	1 mark	**2**
		Empirical formula	1 mark	
	ii.	Definition	2 mark	**3**
		Example	1 mark	
	iii.	Methods of purification	2 marks	**5**
		(a) Organic compounds	1 mark	
		(b) Solid	1 mark	
		(c) Liquid	1 mark	
OR	iv.	As per solution		**5**
Q.3	i.	Element	1 mark	**2**
		Reason	1 mark	
	ii.	(a) Covalent bonds	2 marks	**8**
		Distinguish a covalent bond from an ionic bond	2 marks	
		(b) Measure of strength of an acid and base	2 marks	
		Two examples of salts whose aqueous solutions are basic	1 mark	
		Give two examples of salts whose aqueous solutions are acidic	1 mark	
OR	iii.	As per explanation		**8**
Q.4	i.	Characteristics and gradation in properties of alkali metals	2 marks	**3**
		alkali metals only show one oxidation state	1 marks	
	ii.	Characteristics of alkaline earth metals	3 marks	**7**
		Biological importance of magnesium	2 marks	
		Biological importance of calcium	2 marks	
OR	iii.	(a) As per explanation	4 marks	**7**
		(b) As per explanation	3 marks	
Q.5	i.	Salt hydrolysis	2 marks	**3**
		Buffeer	1 marks	
	ii.	pKa value acids and bases	3 marks	**7**
		Lewis concept	2 marks	
		Brønsted-Lowry concept	2 marks	
OR	iii.	Lewis acid-base theory with suitable example	3 marks	**7**
		Lewis concept more useful	2 marks	
		Classification	2 marks	
Q.6		Attempt any two:		
	i.	Solubility product and its application	2 marks	**5**
		Buffer solution	2 marks	
		Henderson- Hasselbalch equation	1 marks	
	ii.	Physical & solvent properties	2 marks	**5**
		Structure of water	2 marks	
		Ionic product of water	1 mark	
	iii.	Relationship with explanation	3 marks	**5**
		Equivalence point	2 marks	

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