National Forensic Science University Delhi Campus
B. Tec-M.Tec Integrated
Paper-I (Chemistry)
Exam-1

Maximum Marks: 25

Q1) Classify the following change of matter into physical and chemical 5

a) Hydrolysis of Heroin into Morphine and 6 acetyl Morphine c

b) Ammonium nitrate change their crystal forms with increase of temperature p

c) Rusting of Iron c

d) Change of milk to curd c

Q2) 6.448g of lead combine directly with 1.002g oxygen to form lead peroxide. Lead peroxide is also produced by heating lead nitrate and it was found that the percentage of oxygen present in lead peroxide is 13.38%. Use these data to illustrate the law of definite proportion. 5

Q3) : Chlorine has two isotopes with atomic masses 34.97 u and 36.97 u respectively. The relative abundance of the two isotopes are 0.755 and 0.245 respectively. Calculate the average mass of chlorine. 5

Q4) Explain the method of Separation of Mixtures 5

Q5) a) : In a reaction, 0.5 mol of aluminium is required. Calculate the amount of aluminium required in grams? (atomic mass of Al = 27 amu)

b) A sample of nitrogen gas consists of 4.22×10^{23} molecules of nitrogen. How many moles of nitrogen gas are there? 5

Enrolment No. 102CTBTCSE21022038

NATIONAL FORENSIC SCIENCES UNIVERSITY, DELHI CAMPUS
B.Tec-M.Tec - Semester - 2 - May-2022
MID-SEMESTER EXAMINATION

Subject Code: CTBTCSE-SII-P1 **Date: 11.05.2022**

Subject Name: Engineering Chemistry

Time: 11:00-12:30 PM (90 minutes) **Total Marks: 50**

Q1) a) What is buffer Solution? Discuss Types of Buffer solutions. 5

b) A buffer solution is prepared by dissolving 1.51 g of NH_3 and 3.85 g of $(NH_4)_2SO_4$ in 0.500L of solution. What is pH of this solution ($K_b=1.8x1o^{-5}$) 5

Or

b) How to classify Organic Compounds.

Q2) a) Calculate the percentage Composition of photographic Hypo ($Na_2S_2O_3$). 5

b) Define Isomerism? What is the difference between Stereoisomerism and Constitutional Isomerism? 5

Q3) a) A Sample of the black mineral haematite an oxide of iron found in many iron ores, contains 34.97 g of iron and 15.03 g of Oxygen. What is empherical formulae of haematite. 5

b) What is Plane Polarized Light. Discuss briefly Specific rotation. 5

Q4) a) What is composition Stoichiometry? How to calculate Stoichiometry for following reaction $Fe+O_2$------Fe_2O_3. 5

b) What is pH? How to calculate pH of 0.1 M HCl. Discuss about the pH Scale. 5

Q5) a) What is the Difference between Configuration and Conformational isomerism. Explain with example 5

Or

a) What do you understand by enantiomeric pairs explain with an example.

b) i) Calculate the number of molecules in 0.25 mole of Cl_2 Gas 2.5

(ii) In a metallic piece of magnesium, 8.46×10^{24} atoms present. Calculate the amount of magnesium in moles.

Seat No.: 2819 Enrolment No. 102CTBMCS21 22030

NATIONAL FORENSIC SCIENCES UNIVERSITY

B.Tec-M.Tec. (Five year integrated) - Semester - II - August-2022

Subject Code: CTBTCSE SII P1 **Date: 01/08/2022**

Subject Name: Engineering Chemistry

Time: 11:00 to 2:00 pm **Total Marks: 100**

Instructions:

1. **Write down each question on separate page.**
2. **Attempt all questions.**
3. **Make suitable assumptions wherever necessary.**
4. **Figures to the right indicate full marks.**
5. **Calculator is allowed in the exam.**

			Marks
Q.1	(a)	**Answer the following questions. (Any Two)**	10
	1	What do you understand by mole concept? Calculate the number of molecules present in 100g of NH_3?	
	2	i) In a combustion reaction of wood, 2.5 mole of CO_2 were produced. What volume would it occupy at STP (273 K, 1 bar)? ii) A sample of nitrogen gas consists of 4.22 × 1023 molecules of nitrogen. How many moles of nitrogen gas are there?	
	3	Calculate the percentage composition, by mass, of Al(NO3)3 aluminum nitrate.	
	(b)	**Answer the following questions. (Any Two)**	08
	1	What is Buffer Solution? Discuss various types of Buffer Solutions	
	2	A sample of the black mineral hematite, an oxide of iron found in many iron ores, contains 34.97 g of iron and 15.03 g of oxygen. What is the empirical formula of hematite?	
	3	Calculate the empirical formulas for the compounds with the 28.7% K, 1.5% H, 22.8 % P, 47.0% O.	
Q.2	(a)	Draw out the structure of following IUPAC nomenclature (**Any Three**) a) 3,4-dimethyl hexane b) 2-fluoro-1,1,-dimethylcyclohexane c) E-4-chloro-3-heptene d) N,N-diethylbut-3-en-2-amine	06
	(b)	Discuss various laws of Chemical Combination.	04
	(c)	Briefly Discuss about the following (**Any Three**) a) Enantiomers b) Diastereomers c) Chirality d) Plane of Symmetry	06

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Q.3	**(a)**	**Answer the following questions. (Any Two)**	**16**
	1	What do you understand by racemic mixture? Discuss the methods of resolution.	
	2	Briefly discuss about the following: a) Optical Isomerism b) specific Rotation	
	3	What is symmetry? Discuss in detail any four Symmetry elements.	
Q.4	**(a)**	**Answer the following questions. (Any Two)**	**10**
	1	Draw the orbitals of p and d subshell. How many subshells and orbitals are contained within the principal shell with n = 4?	
	2	i) What do you understand by pH Scale? Calculate the pH of 0.01M of HCl. ii) What is the ratio of the concentration of acetic acid and acetate ions required to prepare a buffer with pH 5.20? The pKa of acetic acid is 4.76.	
	3	What is the pH of the following solution? a. pOH= 5.55 b. [OH-]= 10^-8 M	
	(b)	Briefly discuss the following rules for filling the orbital. a) Aufbau's Principle and its limitation b) Pauli's Exclusive Principle c) Hund's Rule of Maximum Multiplicity	**07**
Q.5	**(a)**	**Answer the following questions. (Any Two)**	**10**
	1	Analysis of a 12.04-g sample of a liquid compound composed of carbon, hydrogen, and nitrogen showed it to contain 7.34 g C, 1.85 g H, and 2.85 g N. What is the percent composition of this compound?	
	2	Define Huckel rule of aromatic compounds. What are benzenoid and nonbenzenoid aromatic compounds? Give examples.	
	3	Write a note on the naming of aromatic compounds with examples.	
	(b)	Derive the de-Broglie equation and Heisenberg uncertainty Principle.	**07**
Q.6	**(a)**	**Answer the following questions. (Any Two)**	**16**
	1	What are cycloalkanes? Discuss the various conformations and its stability of cyclo-hexanes. Discuss key points of Bayer Strain Theory to explain the stability of cyclo-hexanes.	
	2	Discuss salient features of molecular orbital theory. Explain with Energy level diagram. Identify the Bond Order of Oxygen molecule.	
	3	What are the advantages of MO theory? Discuss MO theory of H_2 Molecule.	

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