Printed Page:- **Subject Code:- AAS0102**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2022 - 2023)

Subject: Engineering Chemistry

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **20**

1. Attempt all parts:-

1-a. Which stage of vehicle emission norms presently applicable in India in Internal combustion engine? (CO1) 1

(a) Bharat Stage III

(b) Bharat Stage V

(c) Bharat Stage VI

(d) Bharat Stage IV

1-b. Choose the correct statement about inflammable substances from the following. They have (CO1) 1

(a) Low ignition temperature and cannot catch fire easily

(b) High ignition temperature and can catch fire easily

(c) Low ignition temperature and can catch fire easily.

(d) High ignition temperature and cannot catch fire easily

1-c. Hardness of water is conventionally expressed in terms of equivalent amount of _____ (CO2) 1

(a) H_2CO_3

(b) $MgCO_3$

(c) $CaCO_3$

(d) $Na_2\ CO_3$

1-d. The degree of freedom at triple point for water system_____. (CO 2) 1

(a) 0

(b) 1

(c) 2

(d) 3

1-e. Which of the following is false regarding galvanic cells? (CO3) 1

(a) It converts chemical energy into electrical energy

(b) The electrolytes taken in the two beakers are different

(c) The reactions taking place are non-spontaneous

(d) To set up this cell, a salt bridge is used

1-f. Which among following can NOT be used for Sacrificial Coating of Iron? (CO3) 1

(a) Zinc

(b) Magnesium

(c) Silver

(d) Aluminium

1-g. Which of the following is a copolymer? (CO4) 1

(a) PVC

(b) Polyethylene

(c) Urea formaldehyde

(d) Teflon

1-h. Soda bottles are made up of (CO 4) 1

(a) Polyethylene Terephthalate

(b) Polyester

(c) Polystyrene

(d) Poly Styrene Butadiene

1-i. Which of the following absorb IR radiation: (CO 5) 1

(a) Homonuclear diatomic molecule

(b) Heteronuclear diatomic molecule

(c) Both A and B

(d) Diatomic molecules will not absorb IR

1-j. The elastic scattering of photons is called as _____ (CO5) 1

(a) Atmospheric scattering

(b) Rayleigh Scattering

(c) Conserved Scattering

(d) Raman Scattering

2. Attempt all parts:-

2.a. What is Dulong's Formula? (CO1) 2

2.b. Why Ion Exchange process is better than Zeolite process? (CO 2) 2

2.c. Give the conditions in which Wet corrosion occurs? (CO 3) 2

2.d. Why is bakelite used in electrical appliences ? (CO4) 2

2.e. What do you mean by Frankel defect? (CO 5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. The ultimate analysis of a coal(moist basis in %): C 69.8 , H 4.6 , N 1.4, O 8.5, S 2.5, H2O 4.5 and ash 8.7 Calculate, by means of the Dulong's formula, the gross calorific value, of the coal. (CO1) 6

3-b. Differentiate between HCV and LCV and write the relationship between both. (CO1) 6

3-c. What are the different units of hardness of water? Write relationship between them. (CO 2) 6

3-d. A sample of water has been found to contain the following salts: $Ca(HCO_3)_2$ = 10.5 ppm; $Mg(HCO_3)_2$ = 12.5 ppm; $CaCl_2$ = 8.2 ppm; $MgSO_4$ = 2.6 ppm; $CaSO_4$ = 7.5 ppm. 6

Calculate temporary, permanent, and total hardness of water in ppm, ^oFr and ^{o} Cl. (CO2)

3.e. What do you mean by battery? Give reactions of charging and discharging of Lithium ion battery. (CO 3) 6

3.f. Give the preparation, properties and application of following polymers: Buna-S, Terylene, Nylon 6. (CO4) 6

3.g. What do you understand with Fullerenes give its structure and applications? (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Discuss Bomb calorimeter method for determination of calorific value of solid fuel. Give various corrections. (CO1) 10

4-b. What is rank of coal? Describe proximate and ultimate analysis of coal. (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a. State the Zeolite process for the removal of hardness of water. Discuss its merits over lime-soda process. A Zeolite softener was 80% exhausted, when 10,000L of hard water was passed through it. The softer required 200L of NaCl solution of strength 50 gmNaCl / L of solution. What is the hardness of water? (CO 2) 10

5-b. Calculate the quantities of Lime(74%) and soda (92%) required for cold softening of 125,000 L of water with the following analysis, using 10 ppm of $NaAlO_2$ as coagulant. 10

Analysis of Raw water: Ca^{+2} = 160ppm, Mg^{+2} = 48ppm, CO_2 = 66ppm, HCO_3^- = 264ppm, H^+ = 20ppm, NaCl = 4.7ppm

Analysis of Treated water : CO_3^{-2} = 45ppm, OH^- = 68ppm (CO2)

6. Answer any <u>one</u> of the following:-

6-a. What is corrosion? Explain electrochemical theory of corrosion. (CO3) 10

6-b. What are liquid crystals? Briefly describe the different types of liquid crystals. (CO 3) 10

7. Answer any <u>one</u> of the following:-

7-a. Write short note on: Conducting Polymers, Biodegradable Polymers (CO4) 10

7-b. Give the example of some polymeric composite materials with their commercial application (CO 4) 10

8. Answer any <u>one</u> of the following:-

8-a. How many types of electronic transition shown by the molecule in UV-visible spectroscopy? (CO5) 10

8-b. How many NMR signals do you expect from each of the following compounds : CH_3OCH_3; $CH_3OCH_2CH_3$; CH_3CH_2OH; CH_3CHBr_2? (CO 5) 10