Printed Page:- Subject Code:- AAS0202

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (2021 - 2022)

Subject: Engineering Chemistry

Time: 3 Hours Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. 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. In Calculation of GCV using Bomb Calorimeter: Which correction value is not subtracted from the calories obtained? (CO1) 1

(a) Cooling Correction

(b) Acid Correction

(c) Fuse Wire Correction

(d) Cotton Thread Correction

1-b. Which of the following is NOT Secondary Fuel? (CO1) 1

(a) Petrol

(b) Diesel

(c) Natural Gas

(d) Kerosene

1-c. What is the Critical pressure in phase diagram of Water system? (CO2) 1

(a) 213 atm

(b) 318 atm

(c) 218 atm

(d) 208 atm

1-d. How many grams of CaCO3 dissolved per litre gives 50 ppm hardness? (CO 2) 1

(a) 70.56 mg/L

(b) 48.23 mg/L

(c) 81.49mg/L

(d) None

1-e. Which of the following is the correct reaction at Cathode in Daniel cell? (CO 3) 1

(a) $Zn \rightarrow Zn^{2+} + 2e^-$

(b) $Zn \rightarrow Zn^{+} + e^-$

(c) $Cu^{+2} + 2e^- \rightarrow Cu$

(d) $Cu^{+} + e^- \rightarrow Cu$

1-f. According to the convention, the Daniel cell is represented as _____(CO 3) 1

(a) $Zn \mid ZnSO_4 \parallel CuSO_4 \mid Cu$, E = 1.1 volt

(b) $Zn \mid ZnSO_4 \parallel Cu \mid CuSO_4$, E = 1.1 volt

(c) $Zn \mid ZnS \parallel CuSO_4 \mid Cu$, E = 1.1 volt

(d) None

1-g. Phenol formaldehyde resin is commercially known as (CO 4) 1

(a) PVC

(b) Bakelite

(c) Nylon

(d) Teflon

1-h. Identify the condensation polymer (CO 4) 1

(a) Polyethene

(b) Teflon

(c) BuNa-S

(d) Terylene

1-i. Beer Lambert's law gives the relation between which of the following (CO 5) 1

(a) Reflected radiation and concentration

(b) Scattered radiation and concentration

(c) Energy absorption and concentration

(d) Energy absorption and reflected radiation

1-j. Frankel defect is observed in crystals when _____. (CO 5) 1

(a) some cations move from their lattice site to interstitial sites.

(b) some lattice sites are occupied by electrons

(c) the equal number of cations and anions are missing from the lattice

(d) some impurity is present in the lattice

2. Attempt all parts:-

2.a. Give the formula to calculate NCV of fuel (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. Write the name and structures of the monomers of the following polymers: (CO4) 2

A) Nylon 6.6 B) Neoprene

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

SECTION B 30

3. Answer any five of the following:-

3-a. A coal has the following composition by weight : C 90%, O = 4%, N = 1%, S = 0.5% and Ash = 5%. The NCV of the fuel was found to be 8480cal/g. Calculate the percentage of hydrogen and High calorific value. (CO1) 6

3-b. If HCV of the coal sample is 7500 cal/gm and % H= 5. Calculate its LCV. Given that latent heat of condensation of steam = 580 cal/gm. (CO1) 6

3-c. Water sample was found to contains following salts: $CaCl_2$ = 55.5 mg/l, $MgSO_4$ =48 mg/l, $Ca(HCO_3)_2$ = 82.6 mg/l and $Mg(HCO_3)_2$ = 43.8 mg/l. Calculate Temporary, Permanent and Total hardness of water in $CaCO_3$ Equivalents. (CO2) 6

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

3.e. Comment on the Chemistry of airbags working in automobiles? (CO 3) 6

3.f. What are Biodegradable Polymers? Write their types & its applications. (CO4) 6

3.g. Explain why metals are malleable and Ductile? (CO 5) 6

50

4. Answer any one of the following:-

4-a. What do you understand with the term sanitizers and disinfectants? How they differ from Sterilization? Give composition of alcohol based sanitizers. (CO1) 10

4-b. Calculate Gross and Net Calorific Value of Bituminous and Anthracite Coal. The 10

composition are : Anthracite coal: C 85, H 1.9, O 4, N 0.6, S 2.3, Ash 5.2, Moisture rest Bituminous Coal: C 79, H 5, O 4.5, N 1.2, S 2.7, Ash 7.5, Moisture rest (CO1)

5. Answer any one of the following:-

5-a. Explain with equations and calculate the quantity of lime and soda ash required to soften 10,000 litres of water containing: 10
(i) 219 ppm of magnesium bicarbonate and 234 ppm of sodium chloride:
(ii) 36 pm of Mg^{2+} and 18.3 of HCO_3^-
(iii) 1.5 ppm of the free acids, 144 ppm of sulphate ions and 71 ppm of chloride ions. (CO2)

5-b. Discuss the Ion-Exchange or deionization or demineralization process for the treatment of hard water with its advantages and disadvantages. (CO 2) 10

6. Answer any one of the following:-

6-a. What are liquid crystals? Briefly describe the different types of liquid crystals &its applications(CO3)10

6-b. What do you understand by Secondary Batteries.? Explain the working of Lead accumulated battery with the help of a neat diagram. (CO 3) 10

7. Answer any one of the following:-

7-a. Comment on "blending will improve the properties of the molecule", Describe with suitable examples? (CO 4) 10

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

8. Answer any one of the following:-

8-a. Describe the different types of Fundamental Vibrational Modes in Infra Red Spectroscopy (IR) and also comment on Fingerprint Region in IR.? (CO 5) 10

8-b. Explain Band Theory of Metals and also discuss the formation of p and n type semiconductors as per MOT with their application? (CO 5) 10