Printed Page:- Subject Code:- AAS0102

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow

B.Tech

SEM: I - THEORY EXAMINATION (2021 - 2022)

Subject: Engineering Chemistry

Time: 03:00 Hours Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- 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

1. Cooling Correction
2. Acid Correction
3. Fuse Wire Correction
4. Cotton Thread Correction

1-b. The amount of heat liberated by the complete combustion of unit quantity of fuel and combustion products are allowed to escape, is called_____ (CO1) 1

1. Total Calorific Value
2. Gross Calorific Value
3. Net Calorific Value
4. Thermal Calorific Value

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

1. $H_2CO_3$
2. $MgCO_3$
3. $CaCO_3$
4. $Na_2 CO_3$

1-d. Which of the following is not a result of the excess of impurity in boiler-feed? (CO2) 1

1. Priming
2. Caustic Embrittlement
3. Calgon conditioning
4. Sludge

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

1. It converts chemical energy into electrical energy
2. The electrolytes taken in the two beakers are different

3. The reactions taking place are non-spontaneous
4. 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

1. Zinc
2. Magnesium
3. Silver
4. Aluminium

1-g. Which one of the following polymer is used in special packaging, orthopedic devices and controlled release of drugs? (CO4) 1

1. Buna -N
2. Nylon 6
3. PHBV
4. Dacron

1-h. Phenol formaldehyde resin is commercially known as (CO4) 1

1. PVC
2. Bakelite
3. Nylon
4. Teflon

1-i. Select the wavelength range corresponding to UV-visible region.(CO5) 1

1. 400-800 nm
2. 200-800 nm
3. 25 μm-2.5 μm
4. 2.5 μm – 1mm

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

1. Atmospheric scattering
2. Rayleigh Scattering
3. Conserved Scattering
4. Raman Scattering

2. Attempt all parts:-

2-a. Give the formula to calculate % of S & N by ultimate analysis. (CO1) 2

2-b. What is an invariant system? (CO2) 2

2-c. What are anode and cathode in Lithium ion battery? (CO3) 2

2-d. What are thermosetting and thermoplastic polymers? Give examples for each. (CO4) 2

2-e. Explain the term Schottky defect. (CO5) 2

## SECTION B 30

3. Answer any five of the following:-

3-a. Explain how BSES standards are playing important role to minimize air pollution? (CO1) 6

3-b. A sample of Coal containing 80% C, 15% H and 5% Ash is tested in bomb calorimeter. The following results were obtained. 6

Weight of Coal burnt = 0.98 gm

Weight of water taken = 1000 gm

Water equivalent of calorimeter = 2500 gm

Rise in temperature = 2.5 $^{o}$C

Cooling Correction = 0.02 $^{o}$C

Acid correction = 50.0 calories

Fuse wire correction = 8.0 calories

Assuming the latent heat of condensation of steam as 580 cal/gm, calculate the (i) higher (ii) Lower calorific value of the fuel. (CO1)

3-c. What do you mean by boiler feed water? Explain the calgon conditioning method of descaling. (CO2) 6

3-d. 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-e. What is fuel cell? Describe $H_2$-$O_2$ Fuel Cell in brief. (CO3) 6

3-f. Differentiate between addition polymers and condensation polymers with suitable examples. (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 with corrections of solid fuel. (CO1) 10

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

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

5 Draw neat and labeled phase diagram of water system and explain it (CO2) 10

5 Discuss the Ion-Exchange or deionization or demineralization process for the treatment of hard water with its advantages and disadvantages. (CO2) 10

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

6-a. What is corrosion? Discuss in brief the electrochemical theory of corrosion. (CO3) 10

6-b. The Lithium Batteries are important for future vehicles. Support the statement with working of lithium ion batteries. (Give the reactions involved in charging and discharging.) (CO3) 10

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

7-a. Write the structure, preparation, and applications of following polymers: Nylon-6,6; Terylene, Bakelite (CO4) 10

7-b. Write short note on: Conducting Polymers, Biodegradable Polymers (CO4) 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. What are stokes and anti-stokes lines? Give difference between IR and Raman spectroscopy. (CO5) 10