Printed Page:-04 **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 (2024 - 2025)

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. Choose the incorrect statement from the following. A good fuel is one which: (CO1,K1) 1

(a) is readily available

(b) Produces a large amount of heat.

(c) Leaves behind many undesirable substances

(d) burns easily in air at a moderate speed

1-b. The lubrication used in high-load & high-speed operation is (CO1,K1) 1

(a) Thick film lubrication

(b) Thin film lubrication

(c) Extreme pressure lubrication

(d) Enzyme lubrication

1-c. How many phases exist when $CaCO_3$ is heated ?(CO 2,K2) 1

(a) 1

(b) 2

(c) 3

(d) 4

1-d. Chemical formula of Lime and soda?(CO2 ,K1) 1

(a) CaO and NaOH

(b) $Ca(OH)_2$ and Na_2CO_3

.

(c) $CaCO_3$ and H_2CO_3

(d) $CaCl_2$ and $CaCO_3$

1-e. What is the total number of cells present in a 12-volt battery? (CO 3,K2) 1

(a) 5

(b) 6

(c) 3

(d) 4

1-f. Electronation is also called as _____ electrode (CO 3,K1) 1

(a) Oxidation

(b) Electrifying

(c) Reduction

(d) Electro chemical cell

1-g. Name the polymer which is used for making ropes. (CO 4,K1) 1

(a) Polypyrrole

(b) Polyester

(c) Polystyrene

(d) None of the above

1-h. The fibre obtained by the step polymerization of hexa methylene diamine & adipic acid (CO 4,K2) 1

(a) terylene

(b) Nylon 6,6

(c) Nylon 6

(d) Bakelite

1-i. NMR is the study of absorption of _____ by nuclei in a magnetic field. (CO 5,K1) 1

(a) Radioactive radiation

(b) IR radiation

(c) Radio frequency radiation

(d) Microwaves

1-j. Signal splitting in NMR arises from? (CO 5,K1) 1

(a) Shielding

(b) Spin-spin decoupling

(c) Spin-spin coupling

(d) Deshielding

2. Attempt all parts:-

2.a. Write the formula to calculate NCV of fuel. (CO1,K1) 2

2.b. 1 degree Clarke = 1 part of CaCO3 per _____ parts of water. (CO2,K1) 2

2.c. Standard oxidation potential of Cd/Cd^{2+} and Pb/Pb^{2+} elactrodes is -0.40 and -0.13 2

.

V respectively. State whether the following cell is feasible and give its cell potential. (CO 3,K2)

2.d. Give the preparation reaction of Urea formaldehyde polymers. (CO 4,K2) 2

2.e. The shifting of NMR signal due to Shielding or Deshielding is called _____. (CO 5,K1) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Define calorific value of a fuel. The following data is obtained in a Bomb Calorimeter experiment:- 6

Weight of Crucible = 3.649 gm
Weight of crucible + Fuel = 4.687 gm
Water equivalent of calorimeter = 570 gm
Water taken in calorimeter = 2200 gm
Observed rise in temperature = 2.3 ^{o}C
Cooling Correction = 0.047 ^{o}C
Acid correction = 62.6 calories
Fuse wire correction = 3.8 calories
Cotton thread correction = 1.6 calories

Calculate the gross calorific value of the fuel sample. If the fuel contains 6.5% hydrogen then, determine the net colorific value.(CO 1,K3)

3-b. Write steps involve in ultimate analysis. The ultimate analysis of a coal(moist basis in %): C 69.8 , H 4.6 , N 1.4, O 8.5, S 2.5, H_2O 4.5 and ash 8.7. Calculate, the gross calorific value of the coal by using Dulong's formula.(CO 1,K3) 6

3-c. Why does soap do not give lather with hard water? write the involve reactions (CO 2 ,K3) 6

3-d. State the phase rule .Explain the terms involve in it. (CO 2 ,K3) 6

3.e. Write a balanced chemical equation for reaction in the airbag gas generator (CO 3,K3) 6

3.f. What are the properties and applications of composite materials? (CO 4,K2) 6

3.g. What is Fullerene? Explain its structure .(CO 5,K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Write the compositions of biogas ? How biogas is prepare in biogas plant . (CO1 ,K3) 10

4-b. What do you understand with Emission Standards? What are advantages of BS-VI Over BS-IV? (CO1,K3) 10

5. Answer any one of the following:-

5-a. Discuss the hot Lime-Soda process for the treatment of hard water with its advantages over cold Lime-Soda process. (CO 2 K3) 10

5-b. what is coagulant ? A water sample using $FeSO_4$ as a coagulant at the rate of 278 ppm, gave following data on analysis for raw water: 10

Ca^{2+} = 240 ppm; Mg^{2+} = 96 ppm; CO_2 = 44 ppm HCO_3^- = 732 ppm,

Calculate the lime and soda required to soften 250,000 litres of water. (CO 2,K3)

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

6-a. Explain sacrificial anodic and impressed cathodic current protection method for prevention of corrosion. (CO3,K3) 10

6-b. With the help of Band theory, classify the materials with respective diagrams(CO 3 K3) 10

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

7-a. Comment on "blending will improve the properties of the molecule", Give suitable example. (CO 4 K3) 10

7-b. Give five commercially available polymer blends and their uses. (CO 4 K3) 10

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

8-a. What is principle of Raman Spectroscopy ? Discuss five Applications of Raman spectroscopy.(CO 5,K3) 10

8-b. Write short notes on properties and applications of Fullerene. (CO 5 K2) 10

.