

# END TERM EXAMINATION

FIRST SEMESTER [B.TECH] JANUARY 2024

Paper Code: BS-103

Subject: Applied Chemistry

Time: 3 Hours

Maximum Marks: 60

Note: Attempt five questions in all including Q. No.1 which is compulsory. Internal Choice is indicated. Assume missing data, if any.

Q1

Attempt all questions:-

(2.5x8=20)

- Calculate the LCV of a fuel which has 9% hydrogen & HCV is 6250 cal/g. Given the latent heat of steam is 587 cal/g.
- Write a short note on proximate analysis.
- Explain the term component. How many components are present in the following system?
  - Water  $\rightleftharpoons$  water vapour
  - KCl + Water  $\rightleftharpoons$  KCl hydrate
- Give the mechanism of addition & condensation polymerization.
- Determine the  $\text{CaCO}_3$  equivalent of 83 mg of  $\text{Mg}(\text{HCO}_3)_2$ . (Mol. Weight = 146).
- What is Calgon conditioning? How scale formation can be prevented by using this internal water treatment method?
- Impure metal corrode faster than pure metal under identical conditions. Give reason.
- Define Zero Waste technology with a suitable example.

Q2

Attempt any one part between I & II.

I

- Give an account of the determination of calorific value of gaseous fuel by Boy's gas calorimeter with the help of a neat diagram. (4)
- How is compressed natural gas (CNG) different from the liquified natural gas (LPG). (3)
- Out of straight-chain hydrocarbons & aromatics, which one would have high anti-knocking properties? (3)

OR

II

- A sample of coal containing 92% C, 5% H, 3% ash, when coal was tested in the laboratory for its calorific value in bomb calorimeter, the following data were obtained:- (6)  
Weight of coal burnt = 0.95 gm, Weight of water taken = 700 gm,  
Water equivalent of bomb & calorimeter = 2000 gm  
Rise in temperature =  $2.48^\circ\text{C}$ , Cooling correction =  $0.2^\circ\text{C}$ ,  
Fuse wire correction = 10 cal, Acid correction = 60.0 cal  
Calculate the gross & net calorific values of the coal in cal/gm. (Latent heat of condensation of steam as 580 cal/gm).
- Describe the manufacture of metallurgical coke by Otto Hoffmann process. (4)

Q3

Attempt any one part between I & II.

I

- State phase rule & define the terms involved. Explain Sulphur system based on phase rule. (4)
- Write the structural unit & two important applications of each of the following:- (3)
  - Urea-formaldehyde
  - Nylon 6,6
  - PVC
- What is ultra-thin molecular weight polythene? Write their unique properties & applications. (3)

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OR

- II (a) Define conducting polymer, their types & applications of conducting polymer in engineering. (6)  
 (b) Give an example of a two-component system which form compound with congruent melting point. (4)

Q4 Attempt any one part between I & II.

- I (a) Calculate the amount of Lime (92% pure) & Soda (98% pure) required for the treatment of 50,000 liter of water whose analysis is as follows: (4)  
 $\text{Ca(HCO}_3\text{)} = 42.5\text{ ppm}$ ,  $\text{Mg(HCO}_3\text{)} = 36.5\text{ ppm}$ ,  $\text{MgSO}_4 = 30\text{ ppm}$ ,  
 $\text{CaSO}_4 = 34.0\text{ ppm}$ ,  $\text{CaCl}_2 = 27.75\text{ ppm}$ ,  $\text{NaCl} = 10.0\text{ ppm}$   
 (b) Write the important steps involved in the defluoridation of water. (3)  
 (c) How the hardness of water is determined by EDTA titration method? (3)

OR

- II (a) Explain with reactions & diagram, the ion-exchange resins process for the softening of water. How can they be regenerated after getting exhausted? (6)  
 (b) A sample of water was alkaline both phenolphthalein and methyl - orange alkalinity. 100 ml of this water sample required 20 mL of 50  $\text{H}_2\text{SO}_4$  for the phenolphthalein endpoint and 15 mL for complete neutralization. Calculate the type of alkalinity in ppm. (4)

Q5 Attempt any one part between I & II

- I (a) Explain the mechanism of hydrogen evolution & oxygen absorption in electrochemical corrosion. (4)  
 (b) Discuss the Atom economy concept. Calculate atom economy in an addition reaction. (3)  
 (c) Discuss the sacrificial anodic protection. What is the condition for a metal to act as a sacrificial anode to iron? (3)

OR

- II (a) Explain the underlying principles of the BET method and how it measures the surface area of nanoparticles. Explain the applications of Nanotechnology in different fields. (6)  
 (b) What are the twelve principles of green chemistry, and how do they guide sustainable chemical practices? (4)

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