END TERM EXAMINATION

FIRST SEMESTER [B.TECH] MARCH 2023

Paper Code: BS-103	Subject: Applied Chemistry
Time: 3 Hours	Maximum Marks: 75

Note: *Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit.*

Q1 **Attempt any three parts:-** (15)
(Atomic masses of Na=23, Mg= 24, O=16, C= 12, Ca=40, Cl-35.5, S=32 a.m.u.)

(a) (i) Distinguish between permanent and temporary hardness of water. How can temporary and permanent hardness of water be removed?

(ii) A sample of water is found to contain following analytical data in milligrams per litre $Mg(HCO_3)_2$ = 14.6, $MgCl_2$ = 9.5, $MgSO_4$ – 6.0, $Ca(HCO_3)_2$ = 16.2 and $NaCl$ = 5.0. Calculate temporary, permanent and total hardness of water in parts per million (ppm) and Degree French. (2+3=5)

(b) (i) Discuss the mechanism of free radical and cationic polymerization using a suitable example.

(ii) Explain the mechanisms of lubrication. (2+3=5)

(c) (i) Explain Lambert-Beer's Law. The absorption coefficient of a glycogen-iodine complex is 0.20 at light of 450 nm. What is the concentration when the transmission is 40 % in a cuvette of 2 cm?

(ii) Depict the molecular vibrations of water molecule. (3+2=5)

(d) (i) Explain two approaches for the synthesis of nanoparticles.

(ii) 1-chlorohexane can be prepared by the following substitution reaction:

$$CH_3(CH_2)_4CH_2OH + SOCl_2 \longrightarrow CH_3(CH_2)_4CH_2Cl + SO_2 + HCl$$

Calculate the % atom economy for the synthesis of 1-chlorohexane. (3+2=5)

(e) (i) Derive and explain Kirchhoff's equation.

(ii) The enthalpy of reaction (ΔHr) for the formation of ammonia according to the reaction:

$$N_2 + 3H_2 \longrightarrow 2NH_3; \text{ at } 27 \text{ °C is } \Delta Hr = -91.94 \text{ kJ}$$

What will be the enthalpy of reaction at (ΔH_r) 50 °C? The molar heat capacities at constant pressure at 27 °C for N_2, H_2 and NH_3 are 28.45, 28.32 and 37.07 J, respectively. (2+3=5)

UNIT-I

This unit contains 2 questions. Attempt any 1 question. (15)

Q2 (a) Define calorific value of a fuel. Differentiate between gross and net calorific value. (2)

(b) On burning 0.96 g of a fuel in a bomb calorimeter, the temperature of 4400 g of water increased from 25.1 °C to 29.7 °C; water equivalent of calorimeter and latent heat of steam are 484 and 587 cal/g, respectively. Fuel contains 0.9% H, calculate gross calorific value and net calorific value. (3)

P.T.O.

UNIT-IV

This unit contains 2 questions. Attempt any 1 question. (15)

Q8   (a) Explain the role of enzymes as biocatalysts.   (3)

    (b) What are zero-, one-, two- and three- dimensional nanostructures. Explain with examples.   (3)

    (c) Write short notes on the following methods of synthesis of nanoparticles: (any three).   (3)
- (i) sol-gel method
- (ii) milling method
- (iii) hydrothermal method
- (iv) chemical reduction method

    (d) Highlight the applications of nanomaterials in:-   (4)
- (i) medicine
- (ii) electronics

    (e) What is biodiesel? What are its applications?   (2)

Q9   (a) Explain morphological, optical and size characterization methods for nanomaterials.   (5)

    (b) Explain fermentation process. Illustrate this process during cellular respiration.   (5)

    (c) What is Green Chemistry? Discuss the principles of Green chemistry with suitable examples.   (5)

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