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Roll No.

TCH-201

**B. TECH. (SECOND SEMESTER)
END SEMESTER
EXAMINATION, July/August, 2022
ENGINEERING CHEMISTRY**

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among
(a), (b) and (c) in each main question.

(iii) Total marks in each main question are
twenty.

(iv) Each sub-question carries 10 marks.

1. (a) Draw the molecular orbital diagram of N_2 molecule and also discuss the bond order and magnetic behavior of this molecule.

(CO1)

P. T. O.

- (b) Discuss the basis principle and application of spectroscopy. (CO1)
- (c) What is hydrogen bonding ? Differentiate between intermolecular and intramolecular hydrogen bonding. Explain why ice floats on water ? (CO1)
2. (a) Discuss the lime-soda process for softening of water. (CO2)
- (b) A water sample has the following analysis : (CO2)

$$\text{Mg}(\text{HCO}_3)_2 = 8.3 \text{ mg/L};$$

$$\text{Ca}(\text{HCO}_3)_2 = 13.4 \text{ mg/L};$$

$$\text{CaSO}_4 = 12.4 \text{ mg/L};$$

$$\text{MgCl}_2 = 8.4 \text{ mg/L};$$

$$\text{CaCl}_2 = 22.2 \text{ mg/L};$$

$$\text{NaCl} = 50 \text{ mg/L}.$$

Calculate the temporary and permanent hardness of water.

- (c) Write detail notes on the following : (CO2)
- (i) Sludge and scale formation in boilers
- (ii) Reverse osmosis method for softening of water.

3. (a) What is Polymer ? Discuss the preparation and applications of PVC and bakelite.

(CO3)

- (b) What do you mean by conducting polymer ? Discuss the classification of conducting polymer with examples. (CO3)

- (c) Write notes on the following : (CO3)

(i) Nylon-66

(ii) Biodegradable polymer

4. (a) Discuss the construction and working of Bomb calorimeter with neat and clean diagram. (CO4)

- (b) Write notes on the following : (CO4)

(i) LPG

(ii) Biogas

- (c) Define the term GCV and NCV of a fuel. The following data is obtained in the bomb calorimeter experiment : (CO4)

Wt. of crucible = 3.649 gm, weight of crucible + fuel = 4.678, water equivalent of calorimeter = 570 gm, water taken in calorimeter = 2200 gm, observed rise in

temp. = 2.3°C , cooling correction = 0.0047°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, determine the net calorific value. (latent heat of condensation = 580 cal/gm).

5. (a) Define the term corrosion and discuss the electrochemical theory of corrosion.

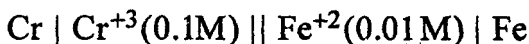
(CO5)

- (b) Write notes on the following : (CO5)

(i) Concentration cell

(ii) Fuel cells

- (c) Calculate the potential of the cell : (CO5)



Given :

$$E^{\circ}_{\text{Cr}^{+3}/\text{Cr}} = -0.74 \text{ V}$$

$$E^{\circ}_{\text{Fe}^{+2}/\text{Fe}} = -0.44 \text{ V}$$