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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)

$Mg(HCO_3)_2 = 8.3$ mg/L;

$Ca(HCO_3)_2 = 13.4$ mg/L;

$CaSO_4 = 12.4$ mg/L;

$MgCl_2 = 8.4$ mg/L;

$CaCl_2 = 22.2$ mg/L;

$NaCl = 50$ 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)

$Cr \mid Cr^{+3}(0.1M) \parallel Fe^{+2}(0.01\,M) \mid Fe$

Given :

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

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