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TCH–201

B. TECH. (SECOND SEMESTER)
END SEMESTER
EXAMINATION, June, 2023

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) Why UV-Visible spectroscopy is called as electronic spectroscopy. Discuss the electronic transitions involved and how solvent polarity affect. (CO1)

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(b) Draw the MOT diagram of O_2 molecule. Arrange the O_2, O_2^+, O_2^- and O_2^{-2} in increasing order of bond length. (CO1)

(c) Write a detailed note on Hydrogen bonding. Also write the conditions for its formation and significance. (CO1)

2. (a) Explain the lime-soda process used for softening the hard water. (CO2)

(b) Differentiate between temporary and permanent hardness of water. Calculate the temporary and permanent hardness of water whose analysis is a as follows :

$Mg(HCO_3)_2$ = 7.3 ppm, $MgSO_4$ = 3.0 ppm, $CaSO_4$ = 3.40 ppm and $CaCl_2$ = 27.75 ppm. (CO2)

(c) Discuss ion exchange method for water softening with reactions involved. (CO2)

3. (a) Differentiate between addition and condensation polymerization with suitable examples and write the mechanism of addition polymerization. (CO3)

(b) Write short notes on the following : (CO3)

(i) Biodegradable polymer

(ii) Conducting polymers.

(c) Write the preparation, properties and uses of (i) Bakelite (ii) Dacron.

4. (a) What is Biogas ? Explain the working of Biogas plant with a neat and labelled diagram. (CO4)

(b) What is the basic principle of Bomb Calorimeter ? Explain its construction, working and corrections. (CO4)

(c) Define the terms Gross and Net Calorific value of a fuel. Calculate the GCV of the coal in cal/gm, when tested in the laboratory for its calorific value in the bomb calorimeter, the following data were obtained :

Weight of coal burnt = 0.95 gm, weight of water taken = 500 gm, Weight of water equivalent of bomband calorimeter = 2000 gm, Rise in temperature = 2.48°C, Cooling Correction = 0.02°C, Fuse wire correction = 10 cal, Acid correction = 60 cal, H = 5.5%, C = 82.3% and latent heat of condensation of steam 580 = cal/gm. (CO4)

5. (a) (i) Write a short note on concentration cells.

(ii) Write down the mechanism involved in electrochemical corrosion. (CO5)

(b) Calculate the cell potential of the given cell at 25 degrees centigrade. (R = 8.31 J/K/mol; F = 96500 C/mol). (CO5)

$Ni(s)/Ni^{+2}(0.01\ M)//Cu^{+2}(0.1M)/Cu(s)$

Given $E^{\circ}_{Cu^{+2}/Cu} = 0.34$ V;

$E^{\circ}_{Ni^{+2}/Cu} = -0.25$ V

(c) Write short notes on the following : (CO5)

(i) Fuel cells

(ii) Electrochemical series.