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TCH–101

B. TECH. (FIRST SEMESTER)
END SEMESTER
EXAMINATION, Jan., 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) Differentiate between bonding and antibonding molecular orbitals. Write the electronic configuration, bond order and magnetic behavior of NO, NO^+ and NO^-.

(CO1)

P. T. O.

(b) (i) Explain conductivity in conductors, semi-conductors and insulators.

(ii) Explain why p-nitrophenol is more soluble than o-nitrophenol in water. (CO1)

(c) Discuss the basic principle and application of UV-Vis spectroscopy. (CO1)

2. (a) Discuss the Ion Exchange method for water softening with the help of appropriate reactions. (CO2)

(b) Write detail notes on following : (CO2)

(i) Hardness in terms of $CaCO_3$ Equivalents.

(ii) Zeolite method for softening of water

(c) Calculate the temporary and permanent hardness of a water sample, which on analysis give the following data :

$Mg(HCO_3)_2$ = 23.2 mg/L; $Ca(HCO_3)_2$ = 9.8 mg/L; $CaSO_4$ = 9.4 mg/L; $MgSO_4$ = 17.4 mg/L; $CaCl_2$ = 11.1 mg/L. (CO2)

3. (a) What is polymer ? Discuss about the functionality of monomer with appropriate examples. Write the preparation and applications of Nylon 6,6. (CO3)

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

   (i) Conducting polymer

   (ii) Biodegradable polymer

   (c) Differentiate between Thermoplastics and Thermosetting polymers. Write the preparation, properties and applications of PVC. (CO3)

4. (a) What do you mean by Fuels ? Classify the fuels with examples. With the help of a diagram, explain bio-gas plant. (CO4)

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

   (i) Characteristics of a good fuel

   (ii) CNG

   (c) Discuss construction and working of bomb calorimeter. (CO4)

   The following data is obtained in the bomb calorimeter experiment;

   Weight of fuel = 0.92 gm, water equivalent of calorimeter = 550 gm, water taken in the calorimeter = 1700 gm, observed rise in temp = 2.3°C, acid

correction = 60 calorie, fuse wire correction = 10 calorie.

Calculate the gross and net calorific value of the fuel sample. If the fuel contains 6% hydrogen. (latent heat of condensation = 587 cal/gm)

5. (a) Define the term Electrode Potential and the factors affecting the electrode potential. Write the significances of electrochemical series. (CO5)

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

(i) Electrochemical theory of corrosion

(ii) Fuel cells

(c) Calculate the cell potential for the cell containing 0.1M Ag+ and 4.0 M Cu++ at 298 K temperature. Given, $E^{\circ}_{Ag+/Ag} = +0.80$ V; $E^{\circ}_{Cu2+/Cu} = +0.34$ V. ($\log_{10} 4 = 0.6020$). (CO5)