10007 **B**

Reg. No.:_____ Name:_____

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2016

Course Code: CY100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100 Duration: 3 Hours

Part A

Answer all questions, each question carries 2 marks

1. The absorbance of a 0.01M dye solution in ethanol is 0.62 in a 2cm cell for light of wavelength 5000 A^0. If the path length of light through the sample is doubled and the concentration is made half, what will be the value of absorbance?
2. A zinc wire is dipped in silver nitrate solution taken in beaker A and a silver wire is dipped in zinc sulphate solution taken in beaker B. Predict in which beaker the ions present will get reduced. Given that the standard reduction potential of zinc and silver are -0.76V and 0.80V respectively.
3. Write the essential components of gas chromatography equipment.
4. What is poly aniline? Give its structure and two applications.
5. What is cetane number?
6. Write two examples of solid lubricants. Compare their structure.
7. Hard water does not produce much lather with soaps or detergents. Give reason.
8. Write the significance of BOD.

(8 x 2 = 16 Marks)

Part B

Answer all questions, each question carries 3 marks

9. Write three points of comparison between UV and IR spectrum.
10. Write three advantages of hydrogen - oxygen fuel cell.
11. Define the term cell constant.The specific conductivity of a 0.3N KCl solution at 27^0C is 0.028 S cm^{-1}. Resistance of the cell containing this solution is 300 ohms. Determine cell constant.
12. What is the nature of bonding in carbon nanotubes? Write two applications of carbon nanotubes (CNTs).
13. Write the composition and uses of natural gas.
14. What is viscosity index (V.I)? Oils having high viscosity need not necessarily have high V.I Comment.
15. Give three points of difference between aerobic oxidation and anaerobic oxidation.
16. What are ion exchange resins? Give examples for cation and anion exchange resins.

(8 x 3 = 24 Marks)

Part C

Each question carries 10 marks

17. (a) Why does a signal for a particular set of protons split into a multiplet? Give number of signals, peak ratio and multiplicity of different sets of protons in the NMR spectrum of 1-bromopropane.
(b) Give a neat and labelled sketch of instrumentation of UV-visible spectrometer.
(c) Write a note on vibrational modes of carbon dioxide molecule. State which of these modes are IR active; andgive reason for their activity. (4+3+3)

OR

18. (a) What is chemical shift? Write the cause of chemical shift.
(b) CO molecule absorbs at $2140cm^{-1}$. Calculate the force constant of the molecule, given atomic masses of C and O are 12u and 16 u respectively $1u = 1.67 \times 10^{-27}kg$.
(c) What are the various energy transitions possible in a molecule? Why does electronic spectrum appear broad? (4+3+3)

19. (a) Design a reversible cell for the reaction;
$2Al(s) + 3Fe^{2+}_{(aq)} \rightarrow 2Al^{3+}_{(aq)} + 3Fe_{(s)}$. Derive Nernst equation for the cell.
(b)Explain the variation of emf of Daniel cell with respect to temperature and concentration. (5+5)

OR

20. (a)Draw a well labelled diagram of calomel electrode. Write electrode reaction and representation of the electrode.
(b) Find the potential of hydrogen electrode at 25°C for solution of pH=0 and pH=14
(c)Why Aluminium metal when reacts with acid and base liberates H_2 gas; whereas Fe metal can liberate H_2 only from acids. E^0Al^{3+}/Al=-1.66V and E^0Fe^{2+}/Fe=-0.44V (4+3+3)

21. (a)Explain the principle and instrumentation of HPLC.
(b)Differentiate between DTA thermogramand TGAthermogram graphically. Give one important application of each type. (5+5)

OR

22. (a)Give a comparison of GSC and GLC.
(b)Write the working of TLC. List the important applications. (5+5)

23. (a)Give the classification of conducting polymers and write the mechanism of conduction in them.
(b)Write structural formulae and important uses of the polymers Kevlar and ABS. (6+4)

OR

24. (a) Write the preparation and important properties of silicone rubber.
(b) Write the sol- gel method for the synthesis of nanomaterials. (5+5)

25. (a) What are greases? Write a brief note on their classification.
(b)The temperature of 1000g of water was increased from 26.5°C to 29.2°C on burning 0.80g of a solid fuel in a bomb calorimeter. Water equivalent of calorimeter and latent heat of steam are 385 g and 587 cal/g respectively. If fuel contains 0.7% hydrogen calculate its gross and net calorific value. (6+4)

OR

26. (a)Calculate the net and gross calorific value of a coal sample having following composition:C=82%, H=8%, O=5%, N=1.4% and ash=3.6 %.
(b) Define the properties of a liquid lubricant which are useful for their evaluation under the following conditions (i) fire hazards (ii) very low temperature.
(c)What is biodiesel? List its environmental advantages. (4+3+3)

27. (a) Give the theory of EDTA method for estimating the hardness of water.
(b) 2.8g of $CaCO_3$ was dissolved in HCl and the solution diluted to one litre. 100 mL of this solution required 28 mL of EDTA solution, while 100 ml of the hard water required 35 mL of the same EDTA solution. On the otherhand 100 mL of the boiled sample water when titrated against EDTA required 10 mL of EDTA solution. Calculate the temporary and permanent hardness of water? (4+6)

OR

28. (a)With the help of a neat diagram outline the reverse osmosis process.
(b)A sample of water is found to contain 48.6 mg/L $Ca(HCO_3)_2$, 43.8 mg/L $Mg(HCO_3)_2$, 24.0 mg/L $MgSO_4$, 27.2 mg/L $CaSO_4$ and 16.8 mg/L $NaHCO_3$. Calculate the carbonate and non-carbonate hardness of water. (5 +5)

(6x10=60 marks)