

**CHY101/201**

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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE - 560 054

SEMESTER END EXAMINATIONS - JANUARY 2015**Course & Branch : B.E.:- (Common to All Branches)****Semester : I/II****Subject : Engineering Chemistry****Max. Marks : 100****Subject Code : CHY101/201****Duration : 3 Hrs****Instructions to the Candidates:**

- Answer one full question from each unit.

UNIT - I

1. a) What is (i) Galvanic cell (ii) Ion selective electrode (iii) Reference electrode? (05)
Give an example each.
 - b) Write the electrode reactions and calculate the voltage generated by a cell that consists of a rod of iron immersed in 1.5 M solution of FeSO_4 and a rod of manganese in 0.15M solution of MnSO_4 at 25°C . Given (05)
 $E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$ and $E^\circ_{\text{Mn}^{2+}/\text{Mn}} = -1.18 \text{ V}$.
 - c) With a suitable example each differentiate between primary, secondary and reserve batteries. (05)
 - d) Write the half cell reaction taking place at anode and cathode during discharge in the following batteries: (05)
 - i) Ni-Cd battery
 - ii) Metal-hydride
 - iii) Lithium- MnO_2 .
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2. a) Write the procedure for the determination of single electrode potential using a secondary reference electrode. (05)
 - b) For the cell, $\text{Fe}|\text{Fe}^{2+}(0.014\text{M})||\text{Ag}^+(0.1\text{M})|\text{Ag}$, write the electrode reactions (05) and calculate the e.m.f of the cell at 298 K, if $E^\circ_{\text{Fe}^{2+}/\text{Fe}}$ and $E^\circ_{\text{Ag}^+/\text{Ag}}$ are -0.44 V and 0.8 V respectively.
 - c) With relevant mathematical expression explain the following battery (05) characteristics (i) Capacity (ii) Percentage energy efficiency.
 - d) Describe the construction and working of zinc-air battery. Give reason for the (05) fact that zinc-air battery possesses high energy density.

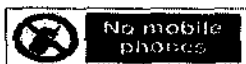


UNIT – II

3. a) Explain the type of corrosion taking place in the following (i) Ship sailing in water corrodes below the water line. (ii) Bolts and nuts made different metals are brought in contact with each others. (05)
- b) Explain the corrosion inhibition action of cathodic inhibitors with relevant reactions. (05)
- c) Justify the statement that fuel cells are energy conversion devices and not energy storage devices. Mention anode, cathode and electrolyte used in: (i) Molten carbonate fuel cells (ii) Solid polymer electrolyte fuel cells. (05)
- d) With a neat graph describe the application of potentiometry for estimation of ferrous ammonium sulphate using potassium dichromate solution. (05)
4. a) Account for the following: (05)
- i) Nickel coated on iron articles should not have pores
- ii) Zinc strips are attached to ship hulls.
- b) Explain the corrosion occurring in the following cases (i) Accumulation of dust particles on the surface of a metal for a long time (ii) Steel vessel fitted with copper bolts. (05)
- c) With a neat sketch describe the construction and working of methanol-oxygen fuel cell. (05)
- d) With a neat graph explain the variation in conductance in the following conductometric titration: (05)
- i) Sulphuric acid against sodium hydroxide solution
- ii) Mixture of Sulphuric acid and acetic acid against sodium hydroxide solution.

UNIT – III

5. a) Distinguish between bulk polymerization and solution polymerization techniques. Mention the advantages and disadvantages of solution polymerization over bulk polymerization. (05)
- b) Write the name and structure of the monomers used for the synthesis of (i) Phenol-formaldehyde resin (ii) Butyl rubber. Mention important uses of each of these polymers. (05)



CHY101/201

- c) Give reason for the following:
- i) Glass transition temperature of nylon 6,6 is 57°C and that of polypropylene is -18°C . (05)
 - ii) Glass transition temperature of polyethylene is -110°C and that of polystyrene is 100°C . (05)
- d) Describe the hydrothermal method for synthesis of nano materials. (05)
6. a) Give a brief account of suspension polymerization technique. Mention the advantages of this technique. (05)
- b) How are the following polymers synthesized? (i) Teflon (ii) Epoxy resin. Mention important applications of each of these polymers. (05)
- c) What are conducting polymers? Explain the mechanism of conduction when polyacetylene doped with an oxidizing agent. (05)
- d) Describe the sol-gel method for synthesis of nano materials. (05)

UNIT - IV

7. a) Explain: (05)
- i) Why do we express hardness of water in terms of CaCO_3 equivalent?
 - ii) Buffer is added during the determination of hardness of water using EDTA.
 - iii) Why hard water fails to produce lather with soap solution.
- b) Write the experimental procedure for the determination of nitrate by spectrophotometric method. (05)
- c) Give a brief account of sewage treatment by secondary treatment. (05)
- d) What is potable water? Describe the purification of water by ion-exchange method. (05)
8. a) List the salts responsible for temporary hardness and permanent hardness. Explain the determination of total hardness of water. (05)
- b) What is the experimental procedure for the determination of chemical oxygen demand (COD) of a waste water sample? (05)
- c) Write the experimental procedure for the determination of chloride by argentometric method. (05)
- d) Define the terms biological oxygen demand and chemical oxygen demand. Explain why the value of chemical oxygen demand is always higher than biological oxygen demand. (05)



CHY101/201

UNIT - V

9. a) Define the term calorific value of a fuel. Distinguish between gross calorific value and net calorific value. (05)
- b) Define the terms : (05)
- i) Octane number
 - ii) Cracking
 - iii) Knocking
- c) Give an account of unleaded petrol. (05)
- d) Explain the molecular ordering in the following liquid crystals: (05)
- i) Nematic phase
 - ii) Smectic phase.
10. a) Describe the experimental procedure for the determination of calorific value of a solid fuel using Bomb-calorimeter. (05)
- b) With a neat sketch describe fluidized bed catalytic cracking of petroleum. (05)
- c) What is reforming of petrol? Explain any three chemical reactions taking place during reforming. (05)
- d) With a neat figure distinguish between smectic liquid crystals and chiral nematic liquid crystals. (05)
