CHY101 / CHY201

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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)
BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JANUARY 2016

Course & Branch	:	**B.E- Common to All Branches**	**Semester**	:	**I/II**
Subject	:	**Engineering Chemistry**	**Max. Marks**	:	**100**
Subject Code	:	**CHY101 / CHY201**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:
- Answer ***one*** full question from each unit.

UNIT – I

1.	a)	Define the term single electrode potential. Derive Nernst equation for single electrode potential.	CO1 & CO2	(05)
	b)	Two copper electrodes placed in copper sulphate solutions of equal concentration are connected to form a concentration cell. What is the cell voltage? One of the solutions is diluted until the concentration of Cu^{2+} ions is $1/5^{th}$ of its original value. What is the cell voltage after dilution?	CO1 & CO2	(05)
	c)	How do the following battery characteristics determine the suitability of a battery? (i) Cycle life (ii) Energy efficiency.	CO1 & CO2	(05)
	d)	Write the half cell reactions taking place at anode and cathode of (i) Ni-Cd battery (ii) Nickel-metal hydride battery and (iii) Li-MnO_2 battery.	CO1 & CO2	(05)
2.	a)	What is a (i) Galvanic cell (ii) Reference electrode? Give an example each.	CO1 & CO2	(05)
	b)	Write the electrode reactions and Calculate the voltage of the cell, $Mg\|Mg^{++}(aq)\|Cd^{++}(aq)\|Cd$ at 25° C, when $[Cd^{++}] = 7.0x10^{-11}M$, $[Mg^{++}] = 1.0M$ and $E^0_{cell} = 1.97$ V.	CO1 & CO2	(05)
	c)	Draw a neat sketch of a battery and label the principal components. Distinguish between primary batteries and secondary batteries.	CO1 & CO2	(05)
	d)	Give an account of the construction of zinc-air battery with relevant reactions occurring during discharging and charging. Give reason for the fact that Zinc-air battery has a high energy density.	CO1 & CO2	(05)

UNIT – II

3.	a)	(i) A pure metal rod half-immersed vertically in water starts corroding at the bottom. Justify (ii) A steel screw in a brass marine hardware corrodes. Justify.	CO1 & CO3	(05)
	b)	What is cathodic protection? Explain cathodic protection given to iron exposed to corrosion environment.	CO1 & CO3	(05)
	c)	Explain the effect of the following factors on the rate of metallic corrosion: (i) pH of the surrounding (ii) Nature of the corrosion product.	CO1 & CO3	(05)
	d)	Give an account of application of nanomaterials in the field of electronics and composite materials.	CO1 & CO3	(05)
4.	a)	What is metallic corrosion? Explain the corrosion of iron based on electrochemical theory.	CO1 & CO3	(05)
	b)	Explain (i) A piece of impure zinc and pure zinc are placed in a salt solution. Which will corroded faster and Why? (ii) Aluminium articles are self-protected against corrosion in air, while iron articles are not.	CO1 & CO3	(05)
	c)	What is anodising ? Describe in brief anodising of aluminium.	CO1 & CO3	(05)
	d)	Describe the synthesis of nano-materials by sol-gel method.	CO1 & CO3	(05)

UNIT – III

5.	a)	Appraise the mechanism of knocking of petroleum with relevant reactions.	CO4	(05)
	b)	How is bio-diesel prepared? Mention two important advantages over diesel?	CO4	(05)
	c)	Calculate the gross and net calorific values of a coal sample from the following data obtained from the Bomb calorimeter experiment. Weight of a coal = 0.73 g, Weight of water taken in calorimeter = 1500 g, Water equivalent of calorimeter = 470 g, Initial temperature, t_1 = 25.0°C, Final temperature, t_2 = 27.3°C, Percentage of hydrogen in coal sample = 2.5%, Latent heat of steam = 2457.18kJ/kg, Specific heat of water = 4.18 kJ kg^{-1} $°C^{-1}$.	CO4	(05)
	d)	With a neat sketch, distinguish between nematic liquid crystals and chiral nematic liquid crystals.	CO4	(05)

6. a) With a neat sketch illustrate fluidized bed catalytic cracking of petroleum. CO4 (05)
   b) Define the terms (i) Reforming of petrol (ii) Unleaded petrol. CO4 (05)
   c) How is bio-ethanol prepared? Mention two important advantages over petrol? CO4 (05)
   d) Distinguish between lyotropic liquid crystals and thermotropic liquid crystals. Give an example each. CO4 (05)

UNIT – IV

7. a) Write the experimental procedure for the determination of total hardness of water by EDTA method. CO5 (05)
   b) Calculate the COD of the effluent sample when 25 ml of an effluent requires 8.3 ml of 0.001N $K_2Cr_2O_7$ for oxidation. Given blank titre value= 15.0 ml. CO5 (05)
   c) Define the terms COD and BOD of sewage water. What is the unit of COD. Give reason for the fact that, for a given sample of sewage water COD value always greater than BOD value. CO5 (05)
   d) Why is reverse osmosis method preferred for potable water? Describe the purification of water reverse osmosis method. CO5 (05)

8. a) What is meant by hard water? How is it classified? Mention the salts responsible for hardness in each type of hard water. CO5 (05)
   b) Describe the experimental procedure for the determination of nitrate using phenol disulphonic acid. CO5 (05)
   c) With neat diagram, describe the secondary treatment of sewage water by activated sludge method. CO5 (05)
   d) What are ion exchange resins? How is it useful for demineralization of hard water? CO5 (05)

UNIT – V

9. a) Give an account of free radical mechanism of addition polymerization taking ethylene as an example. CO6 (05)
   b) What is glass transition temperature of a polymer? With an examples, explain how cross-linking of polymer chains and molecular weight affect glass transition temperature of a polymer. CO6 (05)
   c) Identify the name and structure of the monomers used for the synthesis of (i) Polyurethane (ii) Epoxy resin. Mention any one important properties and use of each of these polymers. CO6 (05)
   d) Distinguish between bulk polymerization and suspension polymerization. CO6 (05)

a)	What are conducting polymers? Explain the mechanism of conduction of polyacetylene.	CO6	(05)
b)	Give reason for the following (i) Polyacetylene can be converted to conducting polymer but not polymethylmethacrylate. (ii) Polyethylene can be recycled but not baeklite (ii) Molecular weight of condensation polymer is exactly not equal to sum of molecular weights of monomers.	CO6	(05)
c)	Identify the name and structure of the monomer(s) used for the synthesis of (i) PMMA (ii) Butyl rubber. Mention any one important properties and use of each of these polymers.	CO6	(05)
d)	Give reason for the following (i) Glass transition temperature of nylon 6,6 is 57°C and that of polypropylene is -18°C. (ii) Glass transition temperature of polyethylene is -110°C and that of polystsyrene is 100°C.	CO6	(05)

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