

Subject Code: R13104/R13

Set No - 1

I B. Tech I Semester Regular/Supple. Examinations Nov./Dec. - 2015

**ENGINEERING CHEMISTRY**

(Common to CE,ME,CSE,PCE,IT,Chem E,Aero E,AME,Min E,PE,Metal E,Textile Engg.)

Time: 3 hours

Max. Marks: 70

Question Paper Consists of **Part-A** and **Part-B**  
Answering the question in **Part-A** is Compulsory,  
Three Questions should be answered from **Part-B**

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**PART-A**

- (a) Differentiate between scale and sludge.  
(b) What is galvanic series? In which way is it different from electrochemical series.  
(c) Explain differential aeration corrosion.  
(d) Write notes on p-type conducting polymers.  
(e) Find HCV and LCV of a coal sample containing: 75% C; 10% H<sub>2</sub>; 8% O<sub>2</sub>; 5% N<sub>2</sub> and 2% S and remaining is ash. Assume latent heat of steam.

[3+5+4+5+5]

**PART-B**

- (a) Discuss caustic embrittlement and boiler corrosion and how they can be avoided.  
(b) Explain the charging and discharging of lead acid-battery.  
(c) Discuss organic surface coatings. [6+6+4]
- (a) Discuss the preparation and properties of Bakelite.  
(b) Explain proximate analysis of coal and their significance.  
(c) Describe with a neat sketch cold lime soda process. [6+6+4]
- (a) Explain Kohlrausch law and its applications.  
(b) Discuss sterilization and disinfection of water.  
(c) Write notes on biodegradable polymers. [6+6+4]
- (a) Explain dry theory of corrosion.  
(b) Explain the compression and injection moulding techniques of plastics.  
(c) Discuss standard hydrogen electrode. [6+6+4]
- (a) Discuss green house effect.  
(b) Write notes on electroplating and hot dipping.  
(c) Write notes on cetane number and natural gas. [6+6+4]
- (a) With a neat sketch, explain fixed bed catalytic cracking.  
(b) Explain any two methods of synthesis of carbon nanotubes.  
(c) Differentiate between thermosetting and thermoplastics. [6+6+4]

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**PART-A**

- (a) Write notes on turbine deposits.  
(b) Why are galvanized utensils not used for storing food stuffs?  
(c) The percentage composition of a sample of anthracite coal is C = 90; H = 3.5; O = 3; N = 2; S = 0.5 and remainder is ash. Estimate the minimum weight of air required for combustion of 1 Kg of this fuel and the composition of the dry products of combustion by volume if 50% excess air is supplied. Assume latent heat of condensation of steam.  
(d) Discuss the preparation, properties and uses of polyethylene.  
(e) Write any three engineering applications of liquid crystals and nanomaterials.

[3+2+5+6+6]

**PART-B**

- (a) Explain with a neat sketch zeolite process for softening of hard water.  
(b) Derive Nernst equation of an electrochemical cell.  
(c) Discuss the constituents of paints and its functions. [6+6+4]
- (a) Discuss the preparation, properties and uses of thiokol.  
(b) With a neat sketch, explain fluid bed catalytic cracking.  
(c) Define temporary and permanent hardness of water. Mention the units of hardness of water. [6+6+4]
- (a) Explain the construction of glass electrode and calomel cell.  
(b) Discuss electro dialysis method for desalination of water.  
(c) Write notes on fullerenes. [6+6+4]
- (a) Discuss electrochemical theory of corrosion.  
(b) With the help of free radical, explain addition polymerization.  
(c) Write notes on potentiometric titrations. [6+6+4]
- (a) Explain the chemical reactions that take place during setting and hardening of cement.  
(b) Explain any two metallic coating methods to protect base metal.  
(c) Discuss fractional distillation of petroleum. [6+6+4]
- (a) Discuss the merits and demerits of liquid fuels.  
(b) Discuss any two methods for green synthesis.  
(c) Discuss stereospecific polymers and its significance. [6+6+4]

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Time: 3 hours

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**PART-A**

- (a) Plasticized PVC is soft and flexible, while Bakelite is hard and rigid. Explain.  
(b) Discuss the characteristics of potable water.  
(c) A gas has the following composition by volume: CO= 40%; H<sub>2</sub> = 17%; CO<sub>2</sub> =5%,  
CH<sub>4</sub> =3% and N<sub>2</sub> = 35%. What will be the composition of dry flue gas, if 50% excess air  
was used for burning 100m<sup>3</sup> of the gas.  
(d) Write notes on (i) fluoride electrode (ii) solar reflectors (iii) Pilling Bedworth rule  
[3+5+5+9]

**PART-B**

- (a) Explain reverse osmosis and its advantages.  
(b) Discuss conductometric titrations of (i) strong acid versus strong base (ii) weak acid and  
weak base.  
(c) Explain how corrosion is minimized by proper design of material. [6+6+4]
- (a) Discuss compounding of plastics.  
(b) Explain how carbon, hydrogen and ash are determined by ultimate analysis.  
(c) Discuss the effect of CO<sub>2</sub> and dissolved O<sub>2</sub> on boiler corrosion and how they can be  
removed. [6+6+4]
- (a) Write notes on single electrode potential and galvanic cell.  
(b) Discuss the reactions occurring in lime-soda process.  
(c) Write notes on the decay of cement concrete. [6+6+4]
- (a) Write notes on (i) Impressed current cathodic protection (ii) galvanizing and tinning  
(b) Discuss the preparation, properties and uses of BUNA S.  
(c) Explain how to differentiate between strong and weak electrolytes from molar  
conductance at different dilutions. [6+6+4]
- (a) Discuss on conducting polymers.  
(b) Discuss the influence of temperature, pH and humidity on corrosion.  
(c) Differentiate between gross calorific value and net calorific value. [6+6+4]
- (a) Write notes on diesel knocking and CNG.  
(b) Explain the need of green chemistry.  
(c) With a neat sketch explain extrusion moulding technique of plastics. [6+6+4]

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**PART-A**

- (a) Why hardness is expressed in terms of  $\text{CaCO}_3$  equivalents.  
(b) Differentiate between anodic and cathodic coatings.  
(c) Discuss the mechanical properties of polymers.  
(d) Explain how sulphur and nitrogen are determined by ultimate analysis.  
(e) Calculate the potential of Ag-Zn cell at 298 K if the concentration of  $\text{Ag}^{+2}$  and  $\text{Zn}^{+2}$  are  $4.5 \times 10^{-4} \text{ M}$  and  $1.5 \times 10^{-2} \text{ M}$  respectively.  $E^0$  of the cell at 298 K is 1.5V.

[3+4+5+5+5]

**PART-B**

- (a) Explain ion-exchange process for softening of hard water.  
(b) Explain concentration cells with a suitable example.  
(c) Discuss electroless plating and cladding. [6+6+4]
- (a) What are the limitations of natural rubber and explain how to improve the properties of rubber?  
(b) Write notes on CNG and LPG.  
(c) Discuss priming and foaming and how can they be avoided. [6+6+4]
- (a) Write the anodic, cathodic and net reactions of Ni-Cd battery and dry cell.  
(b) Discuss the principle of complexometric estimation of hardness of a water sample.  
(c) Write the working of the photovoltaic cells. [6+6+4]
- (a) Write notes on cathodic protection.  
(b) Discuss the preparation, properties and uses of PVC.  
(c) Write notes on fuel cells. [6+6+4]
- (a) Discuss fiber reinforced plastics.  
(b) Explain the factors that affect the rate of corrosion.  
(c) Calculate the weight and volume of air required for the combustion of 2 kg of carbon. [6+6+4]
- (a) Discuss refining of petroleum.  
(b) Discuss the types of liquid crystals.  
(c) Differentiate between addition and condensation polymerization. [6+6+4]

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