

Subject Code: R13104/R13

Set No - 1

I B. Tech I Semester Supplementary Examinations Aug. - 2015

ENGINEERING CHEMISTRY

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

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**

PART-A

- 1.(a) Explain why hard water is not fed into boilers.
- (b) Give reasons why gasoline mixed with anti-knocking agents is used as fuel in internal combustion engine.
- (c) Explain the importance of vulcanization of natural rubber.
- (d) Differentiate between galvanic cell and concentration cell.
- (e) Write notes on (i) Galvanizing and tinning (ii) biodegradable Polymers

[4+3+4+3+8]

PART-B

- 2.(a) Write a note on sterilization and disinfection of water.
- (b) Find the emf of the following cell
 $Zn/Zn^{2+} (0.002M) // Fe^{2+} (0.001M) / Fe$, given that $E_{CELL}^0 : 1.2$ volt.
- (c) Discuss differential aeration corrosion. [6+5+5]
- 3.(a) What are elastomers? Explain the preparation and uses of styrene butadiene rubber.
- (b) With a neat labeled diagram explain any one method of desalination of water.
- (c) Write notes on CNG and LPG. [6+5+5]
- 4.(a) What is Kohlraush Law. Discuss its applications.
- (b) Give any five engineering applications of liquid crystals.
- (c) Discuss how water is softened by cold lime soda process. [6+5+5]
5. (a) Write notes on metallic coatings.
- (b) Explain the construction and working of concentration cell.
- (c) Discuss the mechanical properties of polymers. [6+5+5]
- 6.(a) A sample of coal was analyzed as follows: 3.0 g was weighed into a silica crucible. After heating to one hour at $110^{\circ}C$, the residue was 2.845 g. The crucible next was covered with a vented lid and strongly heated exactly 7 min at $950 + 20^{\circ}C$. The residue weighed 2.235g. The crucible was heated without the cover, until constant weight was obtained. The last residue was found to be 0.355g. Calculate the % results of the above analysis.
- (b) Discuss chemical theory of corrosion.
- (c) Describe supercritical fluid extraction method for green synthesis. [6+5+5]
- 7.(a) Discuss the working of photovoltaic cells and solar reflectors.
- (b) Discuss fixed bed catalytic cracking method for synthesis of gasoline.
- (c) Describe a moulding process for fabrication of thermosetting plastics. [6+5+5]

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Set No - 2

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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**

PART-A

- 1.(a) Write down the chemical reactions that are taking place in removal of temporary and permanent hardness by lime soda treatment.
- (b) Define the units (British thermal unit and centigrade unit) of heat and their interconversion
- (c) Why plasticizers, fillers and stabilizers are used during moulding of plastics? Give examples for each of them.
- (d) Define specific and equivalent conductance, mention their units.
- (e) Explain the need of green chemistry.
- (f) Explain how corrosion of iron is prevented by galvanization.

[4+2+5+3+4+4]

PART-B

- 2.(a) Discuss the formation of scales and sludges in boilers. Explain how they can be removed.
 - (b) Explain the construction and working of calomel electrode.
 - (c) Explain the role of metal oxide film in dry corrosion and classify them.
- [5+6+5]
- 3.(a) Write the structures of (i) Thiokol (ii) PVC (iii) BUNA-S (iv) Bakelite
 - (b) Discuss the requirements of potable water.
 - (c) Discuss the fractional distillation of petroleum.
- [6+5+5]
- 4.(a) Explain the variations in conductance during titrations between (i) strong acid vs weak base and (ii) weak acid and weak base
 - (b) Explain the influence of CO₂ and SO₂ deterioration of cement concrete.
 - (c) Discuss the advantages of permutit process over lime soda process.
- [6+5+5]
- 5.(a) What are paints? Discuss its constituents and their functions.
 - (b) Discuss with a labeled diagram the construction and working of H₂-O₂ cell.
 - (c) Give any five applications of elastomers.
- [6+5+5]
- 6.(a) Explain petrol knocking and diesel knocking.
 - (b) Explain how proper design and material selection minimize the metallic corrosion.
 - (c) Discuss any one preparation method of carbon nanotubes.
- [6+5+5]
- 7.(a) Discuss the types of liquid crystals.
 - (b) Calculate gross and net calorific value of coal having the following composition: C = 83%; H = 7.5%; S = 3%, N = 5% remaining ash. Assume latent heat of steam.
 - (c) Discuss the preparation and properties of poly ethylene.

[6+5+5]

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Set No - 3

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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**

PART-A

- 1.(a) What is buffer solution? Why is it used in the determination of hardness of water by EDTA method.
- (b) Discuss the preparation of Thiokol and write its applications.
- (c) Explain how specific and equivalent conductance varies with dilution.
- (d) Write notes on conducting polymers.
- (e) Discuss gross and net calorific value.

[4+4+4+5+5]

PART-B

- 2.(a) Describe the principle and procedure involved in zeolite process for treatment of water.
 - (b) Discuss the anodic, cathodic and net reactions occurred in methanol - oxygen fuel cell.
 - (c) Explain electrochemical theory of wet corrosion.
- [6+5+5]
- 3.(a) Explain how natural rubber is obtained from latex and mention its disadvantages.
 - (b) Write notes on boiler corrosion.
 - (c) A gas has the following composition by volume: $H_2 = 38\%$, $CH_4 = 17\%$, $N_2 = 32\%$, $O_2 = 12\%$. If 25 % excess air is used, find the volume of air required for complete combustion of 1 m^3 of gaseous fuel.
- [6+5+5]
- 4.(a) Explain potentiometric titrations.
 - (b) Discuss the preparation of Kevlar and its engineering applications.
 - (c) What are anionic and cationic exchange resins? Give examples and write their structures.
- [6+5+5]
- 5.(a) Explain the following factors that influence the rate of corrosion
(i) Over voltage (ii) ratio of anodic and cathodic area (iii) passive character of metal
 - (b) Explain the determination of pH of a solution by using glass electrode.
 - (c) Describe moulding technique for fabrication of thermoplastic materials.
- [6+5+5]
- 6.(a) Explain refining of petroleum.
 - (b) Distinguish between anodic and cathodic coatings.
 - (c) Discuss the properties of fullerenes.
- [6+5+5]
- 7.(a) Discuss the principles of green chemistry.
 - (b) Explain the preparation and properties of Bakelite.
 - (c) Discuss the advantages of gaseous fuels.
- [6+5+5]

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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**

PART-A

- 1.(a) Explain why hardness of water is expressed in terms of calcium carbonate.
- (b) Mention any five characteristics of a good coal.
- (c) Write the differences between addition and condensation polymerization.
- (d) Write the mathematical expression of Nernst equation for the potential of the cell
 $Zn(s)/Zn(aq)//Ag^{2+}(aq)/Ag(s)$
- (e) Discuss sacrificial anodic and impressed current cathodic protection.
- (f) Write notes on fiber reinforced plastics.

[2+4+5+2+4+5]

PART-B

- 2.(a) What are temporary and permanent hardness. Explain how hardness can be removed by ion-exchange method.
- (b) What are secondary batteries? Explain the construction and working (charging and discharging) of lead acid storage battery. [8+8]
- 3.(a) Discuss (i) ion-selective electrode (ii) electrochemical series
- (b) Describe Orsat process for analysis of flue gases. [8+8]
- 4.(a) Discuss hot dipping and electroless plating methods for protection of metal from corrosion.
- (b) Write notes on (i) caustic embrittlement (ii) Priming and foaming [8+8]
- 5.(a) Write notes on (i) stereospecific polymers (ii) Physical properties of polymers.
- (b) Describe setting and hardening of cement. [8+8]
- 6.(a) Write briefly about ultimate analysis of coal.
- (b) Explain compounding of plastics. [8+8]
- 7.(a) Describe phase transfer and aqueous phase methods for green synthesis.
- (b) Explain the following factors affecting rate of corrosion:
(i) Humidity of air
(ii) Presence of impurities in atmosphere
(iii) nature of surface film [8+8]

