

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(Autonomous Institution – UGC, Govt. of India)**  
**UG Model question paper**  
**Engineering Chemistry**

**Time: 3 hours**

**Max Marks: 70**

**Note:** This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**Section-I**

- 1 a) What are Reference electrodes? Explain the construction and working of Saturated Calomel electrode with the help of a neat sketch. [7M]
- b) Derive Nernst equation and its applications [4M]
- c) Define conductance, equivalent and molar conductance. Give their units. [3M]

**OR**

- 2 a) Sort out the differences between primary and secondary batteries [2M]
- b) Explain the construction and working of Lead-Acid storage cell with neat sketch. [6M]
- c) Explain the construction and working of Alkaline fuel cell with neat sketch. [6M]

**Section-II**

- 3 a) Explain the various factors affecting corrosion [7M]
- b) What is electrochemical corrosion. Explain the mechanism of electrochemical corrosion by evolution of hydrogen and absorption of oxygen? [7M]

**OR**

- 4 a) Define Cathodic protection. Explain sacrificial anodic protection and impressed current cathodic protection method with applications [7M]
- b) Define Hot Dipping. Explain the process of galvanization and Tinning with the help of a neat sketch [7M]

**Section-III**

- 5 a) Define natural rubber, classification. Explain the process of vulcanization of rubber [7M]
- b) Explain the preparation, properties and applications of Bakelite, Teflon and polyethylene? [7M]

**OR**

- 6 a) What are conducting polymers. Explain the classification and mechanism of conducting polymers [7M]
- b) Write a note on (i) flash and fire point (ii) cloud and pour point [7M]

**Section-IV**

- 7 a) Write a note on (i) Scales and sludges (ii) Caustic embrittlement (iii) priming and foaming [7M]
- b) Explain zeolite process with the help of a neat sketch [7M]

**OR**

- 8 a) What is desalination of brackish water? Explain Reverse Osmosis and its significance. [4M]
- b) Explain about break point chlorination [4M]
- c) Explain Ion Exchange process with the help of a neat sketch. [6M]

**Section-V**

- 9 a) Explain the proximate analysis of coal with its significance. [7M]  
b). Define petroleum. Explain refining of petroleum by fractional distillation [7M]

**OR**

- 10 a) Define cracking. Explain the process of fixed bed catalytic cracking with a neat sketch. [7M]  
b) Define calorific value, HCV, LCV. Explain the calorific value of gaseous fuel by Junkers gas calorimeter [7M]

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**SECTION-I**

- 1 a) Explain the construction and working of calomel electrode with neat sketch. [6M]
- b) Explain the construction and working of Galvanic cell. [4M]
- c) Define specific, molar and equivalent conductance. Give their units. [4M]

**OR**

- 2 a) Explain the construction and working of Lead-Acid storage cell with neat sketch [9M]
- b) Explain the construction and working of H<sub>2</sub>-O<sub>2</sub> fuel cell with neat sketch. [5M]

**SECTION-II**

- 3 a) What is electrochemical corrosion. Explain the mechanism of electrochemical corrosion by evolution of hydrogen and absorption of oxygen? [10M]
- b) Define Galvanising, Tinning and Metal Cladding with examples. [4M]

**OR**

- 4 a) What is cathodic protection. Explain both sacrificial anodic protection and impressed current cathodic protection method? [14M]

**SECTION-III**

- 5 a) Explain the Zeolite process for softening of hard water? [9M]
- b) Write a short note on Scales and Sludges. [5M]

**OR**

- 6 a) Explain the Reverse Osmosis and its significance. [4M]
- b) Explain break point chlorination with a neat sketch. [5M]
- c) Give a brief note on phosphate, calgon and colloidal conditioning. [5M]

**SECTION-IV**

- 7 a) Explain the proximate analysis of coal with its significance. [9M]
- b) Explain the ultimate analysis of coal with respect to nitrogen. [5M]

**OR**

- 8 a) Define cracking. Explain the process of fixed bed catalytic cracking with a neat sketch. [8M]
- b) Define Calorific value, HCV and LCV of a fuel. [3M]
- c) Give a brief note on octane and cetane number. [3M]

**SECTION-V**

- 9 a) Difference between Addition polymerization and Condensation polymerization? [5M]
- b) Explain the preparation, properties and applications of Bakelite, Teflon and polyethylene? [9M]

**OR**

- 10 a) What are conducting polymers. Explain the mechanism of conduction in polyacetylene? [9M]
- b) write a short note on Biodegradable polymers.

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**Section-I**

- 1 a) Explain the construction and working of Lead-Acid storage cell with neat sketch. [9M]  
b) Explain the construction and working of H<sub>2</sub>-O<sub>2</sub> fuel cell with neat sketch. [5M]

**OR**

- 2 a) Explain the construction and working of calomel electrode with neat sketch. [6M]  
b) Explain the construction and working of Galvanic cell. [4M]  
c) Define specific, molar and equivalent conductance. Give their units. [4M]

**Section-II**

- 3 a) what is cathodic protection. Explain both sacrificial anodic protection and impressed current cathodic protection method? [14M]

**OR**

- 4 a) what is electrochemical corrosion. Explain the mechanism of electrochemical corrosion by evolution of hydrogen and absorption of oxygen? [10M]  
b) Define Galvanising, Tinning and Metal Cladding with examples. [4M]

**Section-III**

- 5 a) Explain the Reverse Osmosis and its significance. [4M]  
b) Explain break point chlorination with a neat sketch. [5M]  
c) Give a brief note on phosphate, calgon and colloidal conditioning. [5M]

**OR**

- 6 a) Explain the Zeolite process for softening of hard water? [9M]  
b) Write a short note on Scales and Sludges. [5M]

**Section-IV**

- 7 a) Explain the proximate analysis of coal with its significance. [9M]  
b) Explain the ultimate analysis of coal with respect to nitrogen. [5M]

**OR**

- 8 a) Define cracking. Explain the process of fixed bed catalytic cracking with a neat sketch. [8M]  
b) Define Calorific value, HCV and LCV of a fuel. [3M]  
c) Give a brief note on octane and cetane number. [3M]

**Section-V**

- 9 a) What are conducting polymers. Explain the mechanism of conduction in polyacetylene? [9M]  
b) write a short note on Biodegradable polymers. [5M]

**OR**

- 10 a) Difference between Addition polymerization and Condensation polymerization? [5M]  
b) Explain the preparation, properties and applications of Bakelite, Teflon and polyethylene? [9M]

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**Answer all the questions**

**SECTION-I**

1. a) Explain the construction of calomel electrode. [7M]
- b) Define equivalent conductance and its unit. [2M]
- c) Define galvanic series. [2M]
- d) Explain galvanic cell. [3M]

OR

2. a) Explain the construction of hydrogen oxygen fuel cell. [7M]
- b) Define secondary batteries with Lead acid cells. [4M]
- c) Derive Nernst equation. [3M]

**SECTION-II**

3. a). Explain electrochemical corrosion. [ 7M]
- b) Write about factors affecting rate of corrosion: [3M]  
(i) Temperature (ii) Passivity (iii) Humidity
- c) Write short notes on: [4M]  
(i) Stable layer (ii) Unstable layer (iii) Volatile layer (iv) Porous layer

OR

4. a) Explain the process of galvanizing and tinning. [7M]
- b) Describe the method of cathodic protection . [7M]

**SECTION-III**

5. a) Write a note on fabrication of plastics. [4M]
- b) Define elastomers. Give the preparation and application of [4M]  
(i) Buty rubber (ii) Buna-S
- c) Define conducting polymer [2M]
- d) Explain addition polymerization [3M]

OR

6. a) Explain the difference between thermoplastics & thermosetting plastics. [4M]
- b) Outline the preparation properties and uses of [4M]

- (i) Bakelite (ii) Nylon-6,6 (iii) PVC
- c) Define condensation polymerization [2M]
- d) Explain compounding of plastics [3M]

**SECTION-IV**

7. a) Explain break point chlorination. [4M]
- b) Describe the lime soda process for softening of hard water. [4M]
- c) Explain reverse osmosis [2M]
- d) Write short note on: [3M]
- (i) Scales (ii) Colloidal Conditioning (iii) Calgon Conditioning

OR

8. a) Explain softening of water by zeolite process. [4M]
- b) Define caustic embrittlement with reaction. How can this be prevented? [4M]
- c) Write short note on: [3M]
- (i) Priming (ii) Phosphate Conditioning (iii) Sludge
- d) Explain sterilization of water by chlorination. [2M]

**SECTION-V**

9. a) Describe the Fischer Tropsch's process of synthetic petrol. [5M]
- b) Define cracking. Discuss any one method of catalytic cracking. [5M]
- c) Define octane number [4M]

OR

10. a) Explain knocking in internal combustion engine & prevention of knocking. [5M]
- b) Define petroleum. How is it refined by fractional distillation? Write various fractions with boiling range. [5M]
- c) Define cetane number [4M]

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**SECTION-I**

- 1 a) Write Nernst equation and give its applications. [3M]  
b) Give a detailed account on the Lead –Acid cell with appropriate chemical reactions. [6M]  
c) Explain the construction and working of a Galvanic cell. [5M]

OR

- 2 a) Explain the construction and functioning of H<sub>2</sub>-O<sub>2</sub> fuel cell. Give the advantages and applications of fuel cells. [6M]  
b) What is reference electrode. Explain the construction and working of Glass electrode. [6M]  
c) What is an electrochemical series. Write two important applications. [2M]

**SECTION-II**

- 3 a) Explain rusting of iron with the help of electrochemical theory of corrosion. [7M]  
b) Explain the processes of Galvanising and Tinning. [7M]

OR

- 4 a) What is cathodic protection. Explain methods of cathodic protection. [6M]  
b) Discuss how nature of metal and nature of environment affect the rate of corrosion [4M]  
c) Explain Electroless plating. [4M]

**SECTION-III**

- 5 a) Differentiate thermoplastic resins and thermoset resins. [2M]  
b) Write the preparation properties and applications of PVC, Teflon and Bakelite. [7M]  
c) Give the characteristics of a good lubricant and explain flash and fire points. [5M]

OR

- 6 a) What are conducting polymers. Explain the mechanism of conduction in polyacetylene. [6M]  
b) Explain vulcanization of rubber. Write the preparation, properties and applications of butyl rubber. [5M]  
c) Distinguish between addition and condensation polymerization. [3M]

**SECTION-IV**

- 7 a) Write a note on caustic embrittlement, priming and foaming. [7M]  
b) How municipal water is disinfected by chlorination and ozonisation. Explain breakpoint chlorination. [7M]

OR

- 8 a) Explain Zeolite process for softening of water. How exhausted zeolites are regenerated. [7M]  
b) Explain how scales and sludges are formed in boilers. Write about Phosphate and Calgon conditioning for prevention of scales. [7M]

**SECTION-V**

- 9 a) Define HCV and LCV. [3M]  
b) Explain ultimate analysis and give its significance. [6M]  
c) Describe with a neat sketch the manufacturing of Fisher –Tropsch’s process. [5M]

OR

- 10 a) What is cracking. Explain in detail about fixed bed catalytic cracking with a neat sketch. [6M]  
b) Give brief note on octane and cetane rating. [6M]  
c) What are the characteristics of a good fuel. [2M]