



NARASIMHA REDDY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad

Accredited by NAAC with A Grade, Accredited by NBA

QUESTION BANK

Course Title : Engineering Chemistry

Course Code : 23CH102

Regulation : NR23

Course Objectives:

- ❖ To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- ❖ To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion and its control to protect the structures.
- ❖ To provide fundamental knowledge on properties and applications of polymers & to learn about polymers in a particular application area.
- ❖ To impart knowledge about various types of fuels and their combustion.
- ❖ To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes (CO's)

- ❖ The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
- ❖ Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
- ❖ Classify and characterize different polymer engineering materials and apply its knowledge to select suitable materials for specific applications.
- ❖ To be able to understand various types of fuels and the advantages of alternate fuels over conventional sources.
- ❖ They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT-I

Water & It's Treatment

| S.No | Questions | BT | CO | PO |
|--|--|----|----|----|
| Part – A (Short Answer Questions) | | | | |
| 1 | Write the chemical reactions involved in the regeneration of exhausted resins. | L2 | 1 | 1 |
| 2 | Mention the common units used for expressing hardness of water. | L2 | 1 | 1 |
| 3 | Why is the calgon method better than other internal treatment methods? | L2 | 1 | 1 |
| 4 | Why does hard water consume a lot of soap? | L4 | 1 | 1 |
| 5 | Why is the presence of even a small amount of silica dangerous to the boilers? | L4 | 1 | 1 |
| 6 | Why do we express hard water in terms of calcium carbonate equivalents? | L2 | 1 | 1 |
| 7 | What happens when temporary hard water is boiled? | L2 | 1 | 1 |
| 8 | Why is calgon conditioning better than phosphate conditioning? | L3 | 1 | 1 |
| 9 | Differentiate between scale and sludge. | L2 | 1 | 1 |
| 10 | Why should water from natural sources not be fed to boilers? | L2 | 1 | 1 |

| Part – B (Long Answer Questions) | | | | | |
|---|----|---|----|---|---|
| 11 | a) | Write a short note on caustic embrittlement. | L1 | 1 | 1 |
| | b) | Summarize the specifications for safe drinking water given by WHO. How does municipal water treatment meet the given specifications? | L3 | 1 | 1 |
| 12 | a) | Justify why the ion-exchange process is also called deionisation process. | L3 | 1 | 1 |
| | b) | Identify the hardness causing salts and calculate the total, temporary and permanent hardness: H ₂ SO ₄ - 24.09 mg/L NaHCO ₃ - 124.56 mg/L Ca(HCO ₃) ₂ - 102.69 mg/L MgNO ₃ - 109.07 mg/L MgSO ₄ - 124.34 mg/L CaCl ₂ - 208.08 mg/L K ₂ SO ₄ - 275.67 mg/L CaSO ₄ - 206.89 mg/L Mg(HCO ₃) ₂ - 189.11 mg/L NaCl - 231.09 mg/L | L2 | 1 | 1 |
| 13 | a) | Reverse osmosis is the finest filtration known. Justify | L3 | 1 | 1 |
| | b) | How can you determine if you are past breakpoint chlorination? | L2 | 1 | 1 |
| 14 | a) | What are the causes and problems due to scales and sludges? Discuss the methods for treatment of scales and sludges | L2 | 1 | 1 |
| | b) | What is the principle of the EDTA method? Describe the estimation of hardness of water by EDTA method. | L1 | 1 | 1 |
| 15 | a) | Explain different internal treatment methods used for boiler feed water. | L1 | 1 | 1 |
| | b) | What is carbonate and noncarbonate hardness of water? List out various disadvantages of using hard water. | L1 | 1 | 1 |

UNIT-II

Battery Chemistry & Corrosion

| | | | | |
|----|---|----|---|---|
| 1. | How does fuel cell differ from battery. | L2 | 2 | 1 |
| 2 | What are the four components of a lithium ion battery? | L2 | 2 | 1 |
| 3 | Differentiate between primary battery and secondary battery. | L2 | 2 | 1 |
| 4 | Formation of which types of metal oxide film causes rapid and continuous corrosion. | L2 | 2 | 1 |
| 5 | What is galvanic corrosion? | L1 | 2 | 1 |
| 6 | What is the effect of pH on corrosion? | L2 | 2 | 1 |
| 7 | What are the basic requirements for commercial batteries? | L2 | 2 | 1 |
| 8 | What are the applications of lithium ion batteries to electric vehicles? | L2 | 2 | 1 |
| 9 | Corrosion of water filled steel tanks occurs below the waterline . Give a reason. | L2 | 2 | 1 |
| 10 | What is the pilling bedworth rule? | L1 | 2 | 1 |
| 11 | Write a short note on solar cells. | L1 | 2 | 1 |

| | | | | | |
|---|-----|---|----|---|---|
| 1 | a). | What is a battery? Explain the construction and working of zinc air batteries. | L1 | 2 | 1 |
| | b). | Lithium ion batteries are the future of energy storage. Justify | L3 | 2 | 1 |
| 2 | a) | Explain the working principle of hydrogen- oxygen fuel cells with reactions. | L1 | 2 | 1 |
| | b) | Describe how iron or steel can be made corrosion resistant by cathodic protection methods. | L2 | 2 | 1 |
| 3 | a) | Explain various factors affecting the rate of corrosion. | L1 | 2 | 1 |
| | b) | Define fuel cell. Explain the construction and working of solid oxide fuel cells. Mention its advantages. | L2 | 2 | 1 |
| 4 | a) | Define corrosion of metals. What are different types of corrosion? Explain the electrochemical theory of wet corrosion, giving its mechanism. | L1 | 2 | 1 |
| | b) | Microbial fuel cells are considered as a source of sustainable energy. Explain? | L3 | 2 | 1 |
| 5 | a) | Define corrosion. Explain oxidation corrosion and its mechanism. Discuss the role of nature of metal oxide formed in oxidation corrosion. | L1 | 2 | 1 |
| | b) | How is steel protected cathodically? Discuss with impressed current cathodic protection method. | L2 | 2 | 1 |

UNIT-III

Polymeric materials

| S.No | Questions | BT | CO | PO |
|--|--|----|----|----|
| Part – A (Short Answer Questions) | | | | |
| 1 | Why thermosetting plastics cannot be reused and reshaped? | L3 | 3 | 1 |
| 2 | What is the need for vulcanisation of raw rubber? | L3 | 3 | 1 |
| 3 | List out the monomers of nylon 6:6. | L2 | 3 | 1 |
| 4 | Teflon is an addition polymer, but it behaves somewhat like a thermosetting polymer. Give a reason. | L2 | 3 | 1 |
| 5 | List out the applications of conducting polymers. | L2 | 3 | 1 |
| 6 | List out the commonly used fibers in the following: a) GFRP b) CFRP c) AFRP | L1 | 3 | 1 |
| 7 | What are dopants in conducting polymers. Give examples. | L2 | 3 | 1 |
| 8 | What are biodegradable polymers used for? | L2 | 3 | 1 |
| 9 | State the monomers used in making the following: a) PVC b) Teflon | L2 | 3 | 1 |
| 10 | PVC is soft and flexible whereas bakelite is hard and brittle. Give reasons. | L3 | 3 | 1 |
| Part – B (Long Answer Questions) | | | | |
| 11 | a) Write a note on classification of polymers. | L1 | 3 | 1 |
| | b) Explain the conduction mechanism of trans polyacetylene. | L1 | 3 | 1 |
| 12 | a) Differentiate between addition and condensation polymerisation with suitable examples. | L2 | 3 | 1 |
| | b) Describe the method of preparation, properties and applications of the following a) Buna S b) Thiokol rubber | L1 | 3 | 1 |
| 13 | a) What is natural rubber? Explain why natural rubber needs vulcanisation. How it is carried out. | L2 | 3 | 1 |
| | b) Define the term plastic. Explain the properties and applications of the following a) PVC b) Teflon c) Bakelite | L2 | 3 | 1 |
| 14 | a) What are fiber reinforced plastics? Mention its types and applications. | L1 | 3 | 1 |
| | b) What are biodegradable polymers? Explain the advantages and applications of a) Poly lactic acid | L1 | 3 | 1 |

| | | | | | |
|----|----|--|----|---|---|
| | | b) Poly vinyl alcohol | | | |
| 15 | a) | What is fiber? Explain the properties and engineering applications of the following a) Nylon 6:6 b) Terylene | L2 | 3 | 1 |
| | b) | Explain free radical addition polymerisation mechanism with suitable example. | L1 | 3 | 1 |

UNIT-IV

Energy Sources

| S.No | Questions | BT | CO | PO | |
|--|---|---|----|----|---|
| Part – A (Short Answer Questions) | | | | | |
| 1 | What is meant by the calorific value of a fuel? | L2 | 4 | 1 | |
| 2 | What are the characteristics of good quality of coal? | L2 | 4 | 1 | |
| 3 | Gasoline containing tetraethyl lead is used in internal combustion engines. Give reasons. | L2 | 4 | 1 | |
| 4 | Why are gaseous fuels more advantageous than solid fuels? | L2 | 4 | 1 | |
| 5 | What is the cracking of petroleum? | L1 | 4 | 1 | |
| 6 | What are the advantages of biodiesel? | L2 | 4 | 1 | |
| 7 | What is cetane value of a diesel fuel? | L2 | 4 | 1 | |
| 8 | What are the different alternate fuels used? Why do we need alternative fuels? | L2 | 4 | 1 | |
| 9 | Distinguish gross and net calorific value of a fuel. | L2 | 4 | 1 | |
| 10 | What is LPG? What are its advantages? | L1 | 4 | 1 | |
| Part – B (Long Answer Questions) | | | | | |
| 11 | a) | What are fuels? Give complete classification of fuels with suitable examples. | L1 | 4 | 1 |
| | b) | What is meant by cracking of petroleum? Explain the moving bed catalytic cracking method of obtaining gasoline. | L1 | 4 | 1 |
| 12 | a) | Explain the proximate analysis of coal? How is it carried out? Mention its significance. | L1 | 4 | 1 |
| | b) | What is the significance of ultimate analysis of coal? How is this analysis carried out in the laboratory? | L2 | 4 | 1 |
| 13 | a) | Describe the manufacture of gasoline by Fischer-Tropsch method. | L1 | 4 | 1 |
| | b) | What is biodiesel? Explain the production of biodiesel from the transesterification process. Mention the applications of biodiesel. | L2 | 4 | 1 |

| | | | | | |
|----|----|---|----|---|---|
| 14 | a) | What is the principle of refining petroleum? Describe the fractional distillation process for refining petroleum. What are various fractions obtained from petroleum? | L2 | 4 | 1 |
| | b) | Explain the term knocking in an IC engine? How is it related to chemical constitution? Explain octane number and cetane number. | L2 | 4 | 1 |
| 15 | a) | Explain the advantages and applications of the following a) LPG | L1 | 4 | 1 |

| | | | | |
|----|---|----|---|---|
| | b) CNG | | | |
| b) | What is calorific value? What is the relationship between HCV and LCV? How calorific value can be calculated by Dulong's formula. | L2 | 4 | 1 |

UNIT-V

| S.No | Questions | BT | CO | PO |
|--|--|----|----|----|
| Part – A (Short Answer Questions) | | | | |
| 1 | State the significance of the pour point of lubricants. | L2 | 5 | 1 |
| 2 | Why is lubricant needed? | L2 | 5 | 1 |
| 3 | What should be the flash point of a good lubricant? | L2 | 5 | 1 |
| 4 | What type of lubricants are suitable for thick film lubrication? | L2 | 5 | 1 |
| 5 | Define the soundness of a cement. | L2 | 5 | 1 |
| 6 | Who discovered cement and why it is called portland cement. | L2 | 5 | 1 |
| 7 | What is the role of gypsum in setting and hardening? | L2 | 5 | 1 |
| 8 | What is thermo responsive material? | L1 | 5 | 1 |
| 9 | What are the advantages of excess lime during manufacturing of cement? | L2 | 5 | 1 |
| 10 | What are shape memory materials? | L1 | 5 | 1 |
| Part – B (Long Answer Questions) | | | | |
| 11 | a) Discuss the important properties of lubricants and indicate the significance of these properties. | L2 | 5 | 1 |
| | b) What is cement? Explain the composition of Portland cement. | L1 | 5 | 1 |
| 12 | a) Write the chemical reactions that take place during setting and hardening of portland cement | L1 | 5 | 1 |
| | b) Explain how lubricants work. Explain the mechanism of lubrication in detail | L2 | 5 | 1 |
| 13 | a) Define the term lubricant. Write a detailed note on classification of lubricants with suitable examples. | L1 | 5 | 1 |
| | b) Explain the term setting and hardening of cement. What are the compounds which contribute to the hardening? | L2 | 5 | 1 |
| 14 | a) What are shape memory materials? What are the applications of polyurethanes? | L1 | 5 | 1 |
| | b) What are thermoresponsive materials? Discuss the applications of polyacrylamide and poly vinyl amides. | L1 | 5 | 1 |

* **Blooms Taxonomy Level (BT)** (L1 – Remembering; L2 – Understanding; L3 – Applying; L4 – Analyzing; L5 – Evaluating; L6 – Creating)

Course Outcomes (CO)

Program Outcomes (PO)

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