

Reg No : Name :

**MAR ATHANASIOUS COLLEGE OF ENGINEERING, KOTHAMANGALAM**

(Govt. Aided Autonomous Institution)

Second Semester B.Tech. Degree Examination, May, 2026

Course Code: B24CY1T01A

Course Name: Engineering Chemistry (A)

(Common to ME & EEE Branches)

Max. Marks: 100

Duration: 3 Hours

PART - A: 30 Marks (10 Qns x 3 Marks)**Answer all questions**

1. Why are nanomaterials better catalysts than bulk materials?
2. What is agglomeration? Give one example each for reducing agent and capping agent used to prevent agglomeration.
3. Explain why saturated compounds generally do not show absorption in the visible region.
4. Define absorbance and give its mathematical expression. What is the unit of absorbance?
5. Write the cell reaction and calculate E_{cell}^0 for the following cell, $\text{Mg}/\text{Mg}^{2+} // \text{Ag}^+/\text{Ag}$. Given that $E_{\text{Ag}^+/\text{Ag}}^0 = 0.8 \text{ V}$, $E_{\text{Mg}^{2+}/\text{Mg}}^0 = -2.36 \text{ V}$.
6. What is pitting corrosion?
7. What are supercapacitors? Give any two applications.
8. What are the challenges associated with hydrogen as a fuel?
9. What are actuators?
10. Explain forward bias in diodes.

PART - B: 70 Marks (5 Qns x 14 Marks)**Answer any One full question from each module.****Module 1**

11. a. Explain mechanical milling for the synthesis of nanomaterials. Discuss the factors (8 Marks) in mechanical milling that affect the properties of nanomaterials.
b. Discuss the classification of nanomaterials based on the dimension and give one (6 Marks) example for each.

OR

12. a. What are quantum dots? Discuss the composition of quantum dots. Explain two (8 Marks) important properties.
- b. Explain the structure of graphene and single walled carbon nanotube (SWNT). (6 Marks)

Module 2

13. a. What is the criteria for IR activity? Give two examples of IR active and inactive (8 Marks) molecules. Calculate and draw the vibrational modes of H₂O molecule.
- b. Explain the different regions of the IR spectrum. (6 Marks)

OR

14. a. What is the principle of SEM? Discuss the instrumentation and working of SEM (8 Marks) with a neat diagram.
- b. Write the possible electronic transitions in C₂H₅OH, C₂H₄ and CH₃COCH₃. Give (6 Marks) any three applications of UV-visible spectroscopy.

Module 3

15. a. What are reference electrodes? Explain the construction and working of calomel (8 Marks) electrode with a neat sketch.
- b. Define electrochemical series. List any four important applications. (6 Marks)

OR

16. a. What is anodizing? How is anodizing of aluminium carried out? (8 Marks)
- b. Define electroplating and electroless plating. Give two advantages of electroless (6 Marks) plating over electroplating.

Module 4

17. a. Illustrate the construction and working of Li-ion battery. List any two applications. (8 Marks)
- b. Distinguish primary and secondary cells with example. Give any two advantages of Na-ion (6 Marks) battery.

OR

18. a. Discuss the construction and reactions of PEMFC and alkaline fuel cell. (8 Marks)
- b. List any three advantages of fuel cell and comment on the different operating (6 Marks) temperatures of different types of fuel cells.

Module 5

19. a. Explain the construction and working of OLEDs with a neat diagram. (8 Marks)
- b. How do thermo responsive materials work, and how can they be integrated into (6 Marks) building design to improve energy efficiency?

OR

20. a. What is doping in conducting polymers? Explain how polyacetylene is doped using a Lewis acid and Lewis base? (8 Marks)
- b. Explain band theory. Draw the band structure for polyaniline, silicon and bakelite. (6 Marks)
