

Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

2022 SCHEME

USN

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Course Code

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First / Second Semester B.E. Degree Examinations, February 2025

CHEMISTRY FOR MECHANICAL ENGINEERING STREAM

Duration: 3 hrs

Max. Marks: 100

- Note:**
1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Use of Chemistry Formula Handbook is permitted.
 3. Missing data, if any, may be suitably assumed.

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
<u>Module-1</u>			
1.	a. What are fuel cells? Explain the construction, working, and applications of Methanol-Oxygen fuel cell.	06	(2:1:1.2.1)
	b. What is biodiesel? Explain the synthesis and advantages of biodiesel.	06	(2:1:1.2.1)
	c. Define calorific value. Illustrate the determination of calorific value of solid or liquid fuel using bomb calorimeter.	08	(3:1:1.2.1)
(OR)			
2.	a. Write a note on power alcohol.	06	(2:1:1.2.1)
	b. Explain the construction, working and applications of Li-ion battery.	06	(2:1:1.2.1)
	c. A coal sample of 0.95 g which is burnt in a bomb calorimeter, the temperature of 2800 g of water in the calorimeter was raised to 3.5 °C. Water equivalent of calorimeter is 960 g. Specific heat of water 4.187 kJ/kg/°C. Latent heat of steam is 2457 kJ/kg. If the fuel contains 4% of hydrogen, calculate gross and net calorific value.	08	(3:1:1.2.1)
<u>Module-2</u>			
3.	a. Explain the steps involved in the process of galvanization.	06	(2:2:1.2.1)
	b. What is electroless plating? Explain the electroless plating of nickel.	06	(2:2:1.2.1)
	c. Define corrosion. Apply electrochemical theory to explain the corrosion of iron.	08	(3:2:1.2.1)
(OR)			
4.	a. Explain differential metal corrosion.	06	(2:2:1.2.1)
	b. What is cathodic protection? Explain sacrificial anode method.	06	(2:2:1.2.1)
	c. Calculate the Corrosion penetration rate (CPR) in both mpy and mmy for a thick steel sheet of area 280 inch ² which experiences a weight loss of 2500 g after one year. The density of the steel sheet is 4.9 g/cm ³ . (Given, K value is 87.6 and 534 in mmy and mpy respectively.)	08	(3:2:1.2.1)
<u>Module-3</u>			
5.	a. Discuss the synthesis, properties and industrial applications of polyester.	06	(2:3:1.2.1)
	b. Explain the synthesis, properties and industrial applications of polyvinylchloride (PVC)	06	(2:3:1.2.1)
	c. Illustrate the condensation and addition methods of polymerization with reactions.	08	(3:3:1.2.1)

(OR)

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)

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| 6. | a. | What are lubricants? Discuss the properties and applications of lubricants. | 06 | (2:3:1.2.1) |
| | b. | Explain the synthesis, properties and industrial applications of Teflon. | 06 | (2:3:1.2.1) |
| | c. | Calculate number average and weight average molecular weight of a polymer sample consisting of 1,3,6,7 polymer chains of molecular weights of 2×10^4 , 4×10^4 , 6×10^4 , 8×10^4 , respectively. | 08 | (3:3:1.2.1) |

Module-4

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| 7. | a. | Define the following terms:
(i) Phase (ii) Components (iii) Degree of freedom | 06 | (2:4:1.2.1) |
| | b. | Explain the principle and instrumentation of potentiometric sensors. | 06 | (2:4:1.2.1) |
| | c. | Explain the construction of glass electrode and apply for the determination of pH of beverages. | 08 | (3:4:1.2.1) |

(OR)

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| 8. | a. | List out the advantages and limitations of instrumental methods of analysis. | 06 | (2:4:1.2.1) |
| | b. | Explain the principle and instrumentation of optical sensors (colorimetry). | 06 | (2:4:1.2.1) |
| | c. | Apply the phase diagram for two component-lead-silver system. | 08 | (3:4:1.2.1) |

Module-5

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| 9. | a. | List out the composition, properties and applications of solder. | 06 | (2:5:1.2.1) |
| | b. | Explain the size-dependent properties of nanomaterial
(i) Surface area (ii) Catalytical and (iii) Thermal | 06 | (2:5:1.2.1) |
| | c. | Apply sol-gel method for the synthesis of nanoparticles. | 08 | (3:5:1.2.1) |

(OR)

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| 10. | a. | List out the properties and applications of perovskites (CaTiO_3). | 06 | (2:5:1.2.1) |
| | b. | List out the composition, properties and applications of brass. | 06 | (2:5:1.2.1) |
| | c. | What are ceramics? Give the classification of ceramics based on composition. | 08 | (3:5:1.2.1) |

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