

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

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First Semester B.E. Degree Examinations, May 2022

ENGINEERING CHEMISTRY

(Common to all Branches)

Duration: 3 hrs

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.**2. Missing data, if any, may be suitably assumed*

Q. No	Question	Marks	(RBTL:CO:PI)
<u>Module - 1</u>			
1	a What is single electrode potential? Derive the Nernst equation for single electrode.	08	(2:1 : 1.2.1)
	b For the cell $\text{Fe} \text{Fe}^{+2}(0.01\text{M}) \text{Ag}^+(0.1) \text{Ag}$. Write the cell reaction and calculate the e.m.f of the cell at 298 ⁰ k, If standard potential of Fe and Ag electrodes are -0.44 V and +0.8 V respectively.	06	(3:1 : 1.2.1)
	c What are secondary batteries? Explain the construction and working of Lithium - ion battery.	06	(2:1 : 1.2.1)
(OR)			
2	a Explain the construction and working of Calomel electrode and mention its applications.	08	(2:1 : 1.2.1)
	b What are concentration cells? The cell potential of copper concentration cell $\text{Cu} \text{CuSO}_4(0.005\text{M}) \text{CuSO}_4(\text{X}) \text{Cu}$ is 0.0295 V at 25°C Calculate the value of x.	06	(3:1 : 1.2.1)
	c Explain primary, secondary and reserve batteries with example.	06	(2:1 : 1.2.1)
<u>Module - 2</u>			
3	a Define corrosion. Describe the electrochemical theory of corrosion taking rusting of iron as example.	08	(2:2 : 1.2.1)
	b Explain (i) the ratio of anodic to cathode area (ii) nature of corrosion products.	06	(2:2 : 1.2.1)
	c Define the terms (i) Polarization,(ii) Decomposition potential and (iii) Over voltage.	06	(2:2 : 1.2.1)
(OR)			
4	a What is meant by metal finishing? Mention the technological importance of metal finishing.	08	(2:2 : 1.2.1)
	b What is cathodic protection? Explain (i) sacrificial anodic and (ii) impressed current method.	06	(2:2 : 1.2.1)
	c What is Electroless-plating? Explain electroless plating of copper.	06	(2:2 : 1.2.1)
<u>Module-3</u>			
5	a Define calorific value of fuel. Explain the experimental determination of calorific value of solid / liquid fuel using Bomb calorimeter.	08	(2:3 : 1.2.1)
	b What are fuel cells? Describe the construction and working of Solid Oxide Fuel Cell.	06	(2:3 : 1.2.1)

- c What are solar cells? Explain the construction and working of photovoltaic cell. 06 (2:3 : 1.2.1)

(OR)

- 6 a 0.85 g of coal sample (carbon 90%, H₂ 5% and ash 5%) was subjected to combustion in a Bomb calorimeter. Mass of water taken in the calorimeter was 2000 g and the water equivalent of calorimeter was 600 g. The rise in temperature was found to be 3.5°C. Calculate gross and net calorific values of the sample. Latent heat of steam =2457 KJ/Kg. 08 (3:3 : 1.2.1)
- b Write a note on power alcohol. 06 (2:3 : 1.2.1)
- c What are fuel cells? Describe construction and working of methanol-oxygen fuel cell. 06 (2:3 : 1.2.1)

Module-4

- 7 a Explain the free radical mechanism for polymerization by taking polymerization of ethylene as an example. 06 (2:4 : 1.2.1)
- b What is conducting polymer? Explain the mechanism of conduction in polyacetylene. 06 (2:4 : 1.2.1)
- c Explain the synthesis, properties and applications of epoxy resin. 08 (2:4 : 1.2.1)

(OR)

- 8 a Explain the synthesis, properties and applications of Kevlar. 06 (2:4 : 1.2.1)
- b Write the synthesis and properties of silicon rubber. 06 (2:4 : 1.2.1)
- c Explain the synthesis, properties and applications of polylactic acid. 08 (2:4 : 1.2.1)

Module-5

- 9 a Explain the theory, instrumentation and any one application of Conductometry. 08 (2:5 : 1.2.1)
- b Explain the theory, instrumentation and applications of potentiometry. 06 (2:5 : 1.2.1)
- c Define COD. In a COD test 30.2 cm³ and 14.5 cm³ of 0.05 N FAS solution are required for blank and sample titration respectively. The volume of the test sample used was 25 cm³. Calculate the COD of the sample solution. 08 (3:5 : 1.2.1)

(OR)

- 10 a Explain the softening of water by ion exchange method. 06 (2:5 : 1.2.1)
- b Explain the theory and instrumentation of Colorimetry and mention the applications. 06 (2:5 : 1.2.1)
- c Explain the scale and sludge formation of boilers. 08 (2:5 : 1.2.1)
