



# CAMBRIDGE INSTITUTE OF TECHNOLOGY

K.R. PURAM, BENGALURU-560036

## Department of Basic Sciences

Program: B.E. ☒ M.Tech. ☐ Specialization:

### Preparatory Examination - Even Semester 2018-19

Sub. Name: Engineering Chemistry

Sub. Code: 18CHE22

Semester: II

Date: 10-06-2019

Time: 9.00am to 12.00pm

Duration: 3 Hours

Max. Marks: 100

[Instructions: Answer any five full questions, choosing one from each module; each full question carries maximum 20 marks]

Sl. No	QUESTIONS	COs	RBT Levels	Marks
<b>Module I</b>				
1.	a) Define single electrode potential. Derive Nernst equation for single electrode potential.	CO1	L1	04
	b) Explain the construction and working of lithium ion battery with a neat labeled diagram.	CO1	L2	08
	c) Find the emf and write the cell reactions for the cell $\text{Fe} \text{Fe}^{2+}(0.001\text{M})  \text{Ag}^+(0.01\text{M}) \text{Ag}$ , if standard electrode potential of Fe and Ag electrodes are -0.44V and 0.8V at 298 K.	CO1	L3	08
<b>OR</b>				
2.	a) Define battery. Record the classification of batteries with suitable examples.	CO1	L1	04
	b) Explain the construction and working of glass electrode, give its application in determination of pH of a given solution.	CO1	L2	08
	c) Define concentration cell. The emf of a cell $\text{Zn} \text{ZnSO}_4(0.015\text{M})  \text{ZnSO}_4(\text{X}) \text{Zn}$ found to be 0.25 V at 298 K. Write the cell reactions and find the value of X.	CO1	L3	08

Module II					
3.	a)	What is polarization and over voltage?	CO2	L1	04
	b)	What is cathodic protection? Explain i) sacrificial anode and ii) impressed current method.	CO2	L2	08
	c)	Explain electro plating of Cr with reactions.	CO2	L3	08
OR					
4.	a)	Explain differential metal corrosion and waterline corrosion with suitable examples.	CO2	L1	04
	b)	Define corrosion. List the steps involved in electrochemical theory of corrosion.	CO2	L2	08
	c)	Explain electroless plating of Cu with reactions.	CO2	L3	08
Module III					
5.	a)	What is calorific value? How the calorific value of solid fuel is determined using Bomb Calorimeter?	CO3	L1	04
	b)	Explain the mechanism of knocking in petrol engine with reactions. What are its ill effects? How it can be controlled?	CO3	L2	08
	c)	Discuss the construction and working of solid oxide fuel cell and mention the differences between batteries and fuel cell.	CO3	L3	08
OR					
6.	a)	What is PV Cell? Give the construction and working of PV cell with neat diagram.	CO3	L1	04
	b)	On burning $0.85 \times 10^{-3}$ kg of a solid fuel in a bomb calorimeter, the temperature of 3kg of water increased from 26°C to 30°C. The water equivalent of calorimeter and latent heat of steam are 0.4kg and 2454 kJ/Kg respectively. If the fuel contains 2% hydrogen, determine the value of gross and net calorific values. Sp: heat of water = 4.187kJ/kg/°C	CO3	L2	08
	c)	Discuss the production of solar grade Si by union carbide process and mention the advantages and disadvantages of PV cell.	CO3	L3	08
Module IV					
7.	a)	What are the sources, ill effects and control of oxides of Nitrogen?	CO4	L1	04
	b)	Explain the following methods i) Fluoride ion in water sample using colorimeter. ii) Activated sludge treatment of sewage water.	CO4	L2	08
	c)	Discuss the causes (sources) effects and disposal of solid waste.	CO4	L3	08

<b>OR</b>					
8.	a)	What is desalination? Write a note on reverse osmosis with a neat a labeled diagram.	CO4	L1	04
	b)	Explain i) the formation, ill effects and control of scale and sludge. ii) boiler corrosion due to $MgCl_2$ , DO and $CO_2$	CO4	L2	08
	c)	Define COD and BOD. An effluent sample of $25\text{ cm}^3$ requires $12\text{ cm}^3$ of $0.001M\text{ K}_2\text{Cr}_2\text{O}_7$ for oxidation. Calculate COD of waste water.	CO4	L3	08
<b>Module V</b>					
9.	a)	Write the steps involved in the preparation of nanomaterial by Sol-gel method.	CO5	L1	04
	b)	Describe the theory, instrumentation and application of flame photometric estimation of Na or K.	CO5	L2	08
	c)	Discuss the theory, instrumentation and applications of potentiometric titrations.	CO5	L3	08
<b>OR</b>					
10.	a)	Record the steps of CVD method of preparing nano material with an example.	CO5	L1	04
	b)	Explain the properties and applications of graphene and CNTs.	CO5	L2	08
	c)	Discuss the theory, instrumentation and application of atomic absorption spectroscopy.	CO5	L3	08