CYM12

RAMAIAH
Institute of Technology

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(Autonomous Institute, Affiliated to VTU)
(Approved by AICTE, New Delhi & Govt. of Karnataka)
Accredited by NBA & NAAC with 'A+' Grade

SEMESTER END EXAMINATIONS – MAY 2023

Program	: **B.E. –Common to ME / IM / CH**	**Semester**	: **I**
Course Name	: **Engineering Chemistry**	**Max. Marks**	: **100**
Course Code	: **CYM12**	**Duration**	: **3 Hrs**

Instructions to the Candidates:
- Answer one full question from each unit.

UNIT - I

1.	a)	What are the reference electrodes? Describe the construction and working of calomel electrode.	CO1	(08)
	b)	Define single electrode potential? Derive the Nernst equation for single electrode.	CO1	(08)
	c)	What are batteries? Mention the characteristics of commercial batteries	CO1	(04)
2.	a)	What are lithium batteries? Explain the construction and working of lithium ion batteries.	CO1	(08)
	b)	Define modern batteries? Explain the construction and working of nickel-metal hydride battery.	CO1	(08)
	c)	Calculate the cell potential of the following concentration cell $Cu/Cu^{2+}(0.015M)//Cu^{2+}(0.23M)/Cu$. Comment on the spontaneity of the cell.	CO1	(04)

UNIT - II

3.	a)	Elaborate on the cathodic metal coating with example. Mention its disadvantage.	CO2	(08)
	b)	Explain the following factors which affect the rate of corrosion: i) Nature of corrosion product ii) Hydrogen over voltage iii) pH of the medium.	CO2	(06)
	c)	Give reason: i) Aluminum is preferred for aircraft applications but not iron. ii) Partially immersed pure iron rod in sea water corrodes faster than fully immersed one. iii) Nut and bolt made of different metals is not preferred in practice.	CO2	(06)
4.	a)	Define anodizing. Outline the process of anodization of aluminum by electrochemical method.	CO2	(08)
	b)	Elaborate on the corrosion inhibition by anodic inhibitors with example. Why sufficient quantity of anodic inhibitors are to be added?	CO2	(06)
	c)	Underground iron pipes and storage tanks are protected from corrosion by connecting to Magnesium blocks. Name the method of protection and explain in detail.	CO2	(06)

UNIT - III

5.	a)	List out the advantages and disadvantages of instrumental methods over conventional methods. Explain the determination of Iron by potentiometric sensor method.	CO3	(08)
	b)	Explain synthesis of nanomaterials by solution combustion method.	CO3	(06)
	c)	List out the any five applications of Nanomaterials.	CO3	(06)

6.	a)	Define nanoparticles. Explain the Hydrothermal method for synthesis of nanoparticles.	CO3	(08)
	b)	Define and explain the working principle of colorimetry.	CO3	(06)
	c)	Elaborate the determination of pH of beverages using pH meter.	CO3	(06)

UNIT- IV

7.	a)	What is hard water? How to determine the total hardness of water by EDTA method?	CO4	(08)
	b)	Explain the estimation of dissolved oxygen content of water sample by Winkler's method.	CO4	(06)
	c)	i) Why COD is higher than BOD? ii) 25 ml of waste water was mixed with 25ml of $K_2Cr_2O_7$, acidified and boiled. The unreacted $K_2Cr_2O_7$ required 8.2 ml of 0.2N FAS. In blank titration, 25ml of $K_2Cr_2O_7$ required 16.4 ml of the same FAS. Solve for the COD.	CO4	(06)
8.	a)	Describe the spectrophotometric method of determination of nitrate content in water with principle.	CO4	(08)
	b)	50 ml of water sample required 21.2 ml of M/50 EDTA salt solution using EBT as indicator. 17 ml of same EDTA salt solution was used for 50 ml of the same water sample after removing the temporary hardness. Calculate the total and permanent hardness in terms of $CaCO_3$ equivalents.	CO4	(06)
	c)	Describe the Reverse osmosis process of desalination of water.	CO4	(06)

UNIT - V

9.	a)	Outline the synthesis, properties and applications of PMMA.	CO5	(08)
	b)	Calculate gross and net calorific values for the sample of coke of 0.795×10^{-3} Kg was burned at the raise in temperature of 2.5Kg of water at 1.8 K. The water equivalent of calorimeter is 1.3 Kg, specific heat of water is 4.187kJ/Kg/K. Given the latent heat of steam is 2450kJ/Kg and the % of hydrogen in coke is 2.5.	CO5	(06)
	c)	What is Knocking of petrol? Explain in detail about the mechanism of knocking.	CO5	(06)
10.	a)	Define calorific value. How to determine calorific value of solid fuel by bomb calorimeter.	CO5	(08)
	b)	Define Tg. Explain any two factors affecting the Tg.	CO5	(06)
	c)	What is conducting polymer? Explain in detail about the mechanism of conduction in polyacetylene.	CO5	(06)

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