U.S.N

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Second Semester, B.E. - Semester End Examination; October - 2022
Engineering Chemistry
(Common to All Branches)

Time: 3 hrs   *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Recollect the fundamental Definitions or Laws of Chemistry relevant to Engineering field.

CO2: Discuss the various Properties and Applications by understanding the course topics pertaining to Engineering field.

CO3: Explain various Concepts and Principles used in the topics to understand the theory related to Engineering field.

CO4: Describe the Synthesis and applications of materials in the engineering field.

CO5: Solve the numerical problems by applying proper solutions to verify the theoretical concepts related to engineering.

*Note: I) PART - A is compulsory. **Two** marks for each question.*

   *II) PART - B: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Write the electrode reactions of calomel electrode.	2	L1	CO1	PO1
b.	Why, corrosion is more at anodic area?	2	L1	CO1	PO1
c.	Write the synthesis of poly lactic acid.	2	L1	CO1	PO1
d.	How many number of pentagons and hexagons are present in C_{60} (Fullerene) molecule?	2	L1	CO1	PO1
e.	COD is always greater than BOD. Give reason.	2	L1	CO1	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	I) Discuss the following characteristics of battery: i) Voltage ii) Cycle life	4	L2	CO2	PO1
	II) Explain the construction, working and applications of Li-ion battery.	5			
b.	i) What is knocking in IC engine? Explain its mechanism with chemical reaction and mention its ill effects.	7	L2	CO3	PO1
	ii) Give the advantages of power alcohol.	2			
c.	Write the cell representation, cell reaction. Calculate the EMF and ΔG of Cd-Cu cell, in which cadmium is in contact with 0.002M $CdSO_4$ and copper in contact with 0.02M $CuSO_4$ solution. The standard electrode potential of Cd and Cu are -0.4 V and $+0.34$ V respectively.	9	L3	CO5	PO2

UNIT - II	**18**			

3 a. Discuss the following types of corrosion:

   i) Differential metal corrosion

   ii) Pitting corrosion — 9 — L2 — CO2 — PO1

   iii) Waterline corrosion

   b. i) What is anodizing? Explain the anodizing process of aluminium. — 6

   ii) Discuss the tinning process in corrosion control. — 3 — L2 — CO3 — PO1

   c. What is electroless plating? Discuss the process of electroless plating of copper on PCB. — 9 — L2 — CO2 — PO1

UNIT - III	**18**			

4 a. i) What are hybrid composites? How they are classified? Mention their applications. — 5

   ii) Illustrate the characteristics of fiber reinforced composites and list their applications. — 4 — L2 — CO3 — PO1

   b. i) Illustrate the function of lubricants. — 5

   ii) Summarize the raw materials used in cement and discuss shrinkage property of cement. — 4 — L2 — CO3 — PO1

   c. Discuss the synthesis and applications of the following:
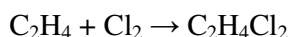
   i) Polycarbonate   ii) Epoxy resin   iii) Kelvar — 9 — L2 — CO2 — PO1

UNIT - IV	**18**			

5 a. i) Explain the green method synthesis of adipic acid and paracetamol. — 6

   ii) Calculate the atom economy for the formation of 1, 2, dichloro ethane in the following reaction; — 3 — L2 — CO3 — PO1

   $$C_2H_4 + Cl_2 \rightarrow C_2H_4Cl_2$$

   b. Outline the basic principles of green chemistry. — 9 — L2 — CO3 — PO1

   c. Describe the sol-gel process of synthesizing nanomaterials with advantages. — 9 — L2 — CO4 — PO1

UNIT - V	**18**			

6 a. Differentiate temporary and permanent hardness. Explain ion-exchange process of water softening. — 9 — L2 — CO3 — PO1

   b. Explain the experimental determination of amount of acid mixture by conductometer. — 9 — L2 — CO3 — PO1

   c. Distinguish between Thermotropic and Lyotropic liquid crystals and mention their applications of electronic devices. — 5 / 4 — L4 — CO3 — PO1

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