

Roll No.

OLE-24005
B. Tech. 1st Semester
(Common for All Branches)
Examination – April, 2021

ENGINEERING CHEMISTRY

Paper : CH-101-F

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in total selecting at least *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Answer the following : 2 × 10

- (i) How can we select proper wavelength for solution of a given species ?
- (ii) Name three substances used for sterilisation of water.

- (iii) Why is Bakelite used in electrical appliances and why is Teflon highly chemical resistant ?
- (iv) What is a promoter? Can it alone act as catalyst ?
- (v) How does the entropy of the system changes when; (a) a solid is melted, (b) a gas is liquefied, (c) H₂O is frozen ?
- (vi) Why additives are used in lubricants ?
- (vii) Calculate the number of components, number of phases and degree of freedom for the following equilibria : Solid carbon in equilibrium with gaseous CO, CO₂ and O₂ at 373 K.
- (viii) Why is Teflon highly chemical resistant ?
- (ix) A solution of thickness 4 cm. transmits 60% incident light. Calculate the concentration of the solution, given $\epsilon = 6000 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1}$.
- (x) Define stress corrosion.

SECTION – A

2. (a) Explain the differences among melting, eutectic and triple point. Give example. 5

- (b) Justify the statement, "The eutectic is a mixture and not a compound" 5
- (c) In the phase diagram of water, the melting curve is almost a straight line, and it slopes slightly backwards. Does an increase in pressure increase or decrease the melting point of ice? 5
- (d) What are the number of phases in closed beaker partially filled with (a) benzene and water, (b) acetone and water? 3
- (e) If there is no triple point in the diagram of one-component system, then what inference do you draw? 2
- 3.** (a) How many phases are present in the following systems? 4
- (i) Finely ground mixture of graphite, sulphur and sodium chloride?
- (ii) An iceberg floating on clear sea water in presence of clean air.
- (b) What are enzymes? How do they behave as catalysts? 8

- (c) Explain Shape selective catalysis and Negative catalysis with examples. 4
- (d) Discuss the effect of pressure on : 4
- (i) Transition temperature of rhombic sulphur, and
- (ii) Melting point of ice.

SECTION – B

4. (a) What are the requirements of boiler feed water ? 4
- (b) How is hardness of water expressed ? Prove that mg/L is the same as hardness in ppm of water. 4
- (c) How is the exhausted resing regenerated in ion exchange method ? 4
- (d) Distinguish between softening and demineralisation of water. Explain any two methods of demineralization of water. 8
5. (a) Why is hard water unsuitable for boilers ? 4
- (b) Explain caustic embrittlement in boiler. How does it affect the efficiency of boilers and how can it be avoided ? 8

- (c) Why does magnesium bicarbonate require double amount of lime for softening ? 4
- (d) Explain why is the indicator EBT added in estimation of hardness of water by EDTA method ? 4

SECTION – C

6. (a) Though aluminium has high E^0_{ox} (standard oxidation potential) than iron, yet aluminium corrodes to a much small extent. Explain. 4
- (b) What happens, and why, if 4 × 4
- (i) Iron sheets riveted with copper rivets.
 - (ii) An iron pole is partly buried under earth.
 - (iii) A zinc article is under strain
 - (iv) Zinc plate fixed under the ship
7. (a) Mention the role of antioxidants and antichlor agents in lubrication process. 4
- (b) Explain clearly the importance of the following in selecting a lubricating oil for a particular use
- (i) viscosity (ii) flash point (iii) Acidity (iv) Carbon residue. 8

- (c) Explain with scientific reasons, whether the following statement is true or false: "Thin film lubricants can be used in road rollers". 2
- (d) Distinguish between : 3 + 3
- (i) Cloud Point and pour point,
- (ii) Thin film lubricants and emulsions.

SECTION – D

8. (a) Virgin rubber is useless as pure gold. Give reason. 3
- (b) Teflon is an addition polymer but it behaves somewhat like a thermosetting polymer. Give reason. 3
- (c) Explain chain terminators in polymerisation. 3
- (d) What type of material is rubber ? What are different types of rubber ? What is the basic chemical unit present in natural rubber and what happens when the configuration of it changes to its geometrical isomer ? Mention important differences between natural and synthetic rubber. 7

- (e) PVC is soft and flexible: whereas Bakelite is hard and brittle. Give reason. 4
9. (a) Why spectroscopic methods are better than the classical methods ? 3
- (b) Define thermometric studies. Explain the working of DT A with the help of suitable block diagram. How is it different from DSC ? 2, 4, 2
- (c) HCl is both IR and Raman active, but H₂ and Cl₂ are not. Explain. 3
- (d) Why molecules absorb in UV-Visible region ? What are the types of electronic transitions that can occur in a molecule ? Discuss by giving examples. 6
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