

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2123)

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B. Tech 1st Semester Examination

Applied Chemistry (O.S.)

AS-1004

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question from each Sections A, B, C and D. Section E (question 9) is compulsory. (Each question carry marks 20)

SECTION - A

1. (a) Derive Clapeyron-Clansius equation. Discuss three applications of this equation. (10)
- (b) State second law of thermodynamics in terms of entropy and express it mathematically. Derive Gibbs-Helmholz equation and also give significance of this equation. (10)
2. (a) Draw and label the phase diagram for water system. Explain the significance of areas, curves and triple points. (10)
- (b) State phase rule and its significance. Discuss its applications and limitations. (5)
- (c) Write short note on following:
 - (i) Eutetic point and its characteristics.
 - (ii) Degree of freedom.
 - (iii) Metastable equilibrium in sulphur system. (2+1+2=5)

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[P.T.O.]

SECTION - B

3. (a) Explain briefly:
- (i) Disposal radioactive wastes.
 - (ii) Aerobic and anaerobic oxidation.
 - (iii) Green house effect.
 - (iv) Temporary and permanent hardness.
 - (v) Phosphate conditioning. **(2×5=10)**
- (b) What are major disadvantages of hard water when used for (i) domestic purposes (ii) industrial purposes and (iii) steam generation in boilers? **(10)**
4. (a) What is meant by corrosion? Distinguish between dry and wet corrosion. Describe the mechanism of electrochemical corrosion by (i) hydrogen evolution (ii) oxygen absorption. **(10)**
- (b) Explain the following:
- (i) Stress corrosion.
 - (ii) Effect of pH and temperature on rate of corrosion.
 - (iii) Sacrificial anode protection method.
 - (iv) Electroplating process.
 - (v) Anodic and cathodic inhibitors. **(2×5=10)**

SECTION - C

5. (a) What is the criteria for a good lubricant? Discuss the classification and compositions of lubricants. Explain the mechanism of hydrodynamic and extreme pressure lubrication. **(10)**
- (b) Explain the following:
- (i) Cloud point and pour point.

- (ii) Viscosity and viscosity index.
 - (iii) Lubricating emulsions.
 - (iv) Functions of lubricant.
 - (v) Saponification and iodine number. **(2×5=10)**
6. (a) How is coal formed? Explain the different types of coal and their carbon content? Explain proximate and ultimate analysis of coal and also write their significance. **(10)**
- (b) Explain the following:
- (i) Characteristics of a good fuel.
 - (ii) Distinguish between octane and cetane number.
 - (iii) Breeder reactor.
 - (iv) Essential components of biogas plant and their function.
 - (v) Catalytic reforming. **(2×5=10)**

SECTION - D

7. (a) Define spectroscopy. Explain the principle of NMR and IR spectroscopy. Also explain the applications of these techniques to organic compounds. **(10)**
- (b) Explain the following:
- (i) Application of UV-visible spectroscopy.
 - (ii) Nuclear Overhauser effect.
 - (iii) Nitrogen rule and metastable peaks.
 - (iv) Fundamental and overtone vibrations.
 - (v) Molecular ion peak and McLaffery rearrangement. **(2×5=10)**

[P.T.O.]

8. (a) What is meant by catalysts? Distinguish heterogenous catalysis from homogenous catalysis with suitable examples. Explain adsorption theory of catalysis. **(10)**
- (b) Explain the following:
- (i) Enzyme catalysis.
 - (ii) Positive and negative catalysis.
 - (iii) Band theory of solids.
 - (iv) Semiconductors and insulators.
 - (v) Effect of temperature on conductance of metals.
- (2×5=10)**

SECTION - E

9. (a) Why does conjugated butadiene require less energy for $\pi-\pi$ transition as compared to unconjugated ethylene?
- (b) Distinguish between nuclear fission and nuclear fusion.
- (c) Iron corrodes in contact with copper, but not with zinc. Explain.
- (d) Explain caustic embrittlement in boilers.
- (e) Which pollutants are responsible for causing acid rain? What are its deleterious effects on material and terrestrial ecosystem?
- (f) What is entropy? How does entropy change in a reversible and irreversible process?
- (g) What is break point chlorination? State its significance.
- (h) Biogas production should be encouraged. Explain.
- (i) Explain the scale formation in boiler units. How it can be prevented?
- (j) Chloramine is better disinfectant compared to chlorine and bleaching powder. Justify the statement. **(2×10=20)**