

Hall Ticket No: 

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Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES  
(AUTONOMOUS)**

B. Tech II Semester Regular Examinations May - 2016  
**(Regulations: R15)**

**PHYSICAL CHEMISTRY  
(CHEMICAL)**

Date:

Time: 3 hours

Max Marks: 60

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

**UNIT-I**

1. a) What do you understand by isothermal and adiabatic changes? Derive the equation for work of expansion in reversible adiabatic process 6M
- b) Define Heat of combustion. The standard enthalpies of formation of  $C_6H_6(l)$ ,  $CO_2(g)$  and  $H_2O(l)$  at 298K are +49.04,-393.5 and -285.85 KJ/mol respectively. Calculate the heat of combustion of benzene. 6M

**OR**

2. a. i) Explain the term entropy. What are its units? 2M  
      ii) State Second law of Thermodynamics. 2M
- b) Deduce free energy function for isothermal conditions. What is the physical significance of Gibbs free energy 8M

**UNIT-II**

3. a) State law of mass action. Derive the equation for equilibrium constant for manufacturing of sulphur trioxide by contact process 6M  
      b) Derive the relationship between  $K_P$  and  $K_C$  6M

**OR**

4. a) State Lechatlier Principle. Explain the various optimum conditions required in the manufacturing process of Ammonia by Haber's process 8M  
      b) Write a note on effect of temperature on Equilibrium. 4M

**UNIT-III**

5. a) What is vapour pressure? Explain the effect of temperature on vapour pressure. 4M  
      b) Describe the process of determination of viscosity of a liquid by Ostwald's method 8M

**OR**

6. a) i) Define the terms Eutectic composition and Eutectic temperature 2M  
      ii) Determine the values of F, C, P for the reaction decomposition of  $CaCO_3(s)$  in a closed vessel 2M  
      b) Describe the application of phase rule to the water system 8M

### **UNIT-IV**

7. a) What is a First order reaction? Give examples. Derive the first order rate equation 8M  
b) A first order reaction is 30% complete in 40 minutes. Calculate the half life of the reaction 4M

**OR**

8. a) Define the term catalysis. Explain the mechanism of Heterogeneous catalysis with illustrations 8M  
b i) Distinguish between order and molecularity. 2M  
ii) Hydrolysis of ester is a pseudo first order reaction. Justify. 2M

### **UNIT-V**

9. a) Write a note on conductometric titrations. 8M  
b) The specific conductance of water at 298K is  $0.58 \times 10^{-7} \text{ cm}^{-1}$ . Calculate the degree of dissociation of water. Equivalent conductance of water at 298K is  $548.6 \text{ Scm}^2 \text{ eq}^{-1}$  and density of water =  $0.997 \text{ gcm}^{-3}$  4M

**OR**

10. a) State Kohlarsauch's law. Give its applications 6M  
b) What do you understand by the term transport number? How is the transport number of  $\text{Ag}^+$  and  $\text{NO}_3^-$  ions determined experimentally by Hittorff's method? 6M

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**UNIT-I**

1. a) State and Explain Hess law of Constant heat summation. 4M
- b) Explain First law of thermodynamics and derive the mathematical form of first law of thermodynamics 8M

**OR**

2. a) Define the term Entropy. Mention its Physical Significance. 6M
- b) The heat of combustions of  $\text{CH}_4(\text{g})$ ,  $\text{H}_2(\text{g})$  and carbon(s) are -890.99KJ, -285.84KJ and -393.81KJ respectively. Calculate the heat of formation of methane at 298K 6M

**UNIT-II**

3. a) Explain Reversible reactions with suitable illustrations. 4M
- b) Explain the process of producing sulphur trioxide by contact process by following Lechatlier principle. 8M

**OR**

4. a) Define the term Equilibrium. Discuss the factors that influence Equilibrium. 8M
- b) 2g molecules of  $\text{PCl}_5$  are heated in a closed two litre vessel. When equilibrium is attained, the pentachloride is 40% dissociated into  $\text{PCl}_3$  and  $\text{Cl}_2$ . Calculate the Equilibrium constant. 4M

**UNIT-III**

5. a) How Surface tension of a liquid is determined by Capillary rise method. 4M
- b) Discuss the variation of vapour pressure of liquid with temperature. Derive clausius-Claypreyton Equation 8M

**OR**

6. a) Derive the expression for Gibb's Phase rule. 4M
- b) Describe the application of phase rule for silver lead system. 8M

**UNIT-IV**

7. a) Derive the expression for rate equation for second order reaction of the type  $2\text{A} \longrightarrow \text{X}$  6M
- b) What is Enzyme catalysis? Discuss the various reactions in which enzymes are used as catalysts. 6M

**OR**

8. a) Explain the various methods for determination of order of a reaction. 8M  
b) What is influence of temperature on rate of the reaction? Explain 4M

### UNIT-V

9. a) Explain the terms specific conductance and Equivalent conductance. Mention their units.  
Explain the effect of dilution on them 8M  
b) Write a note on measurement of electrical conductivity. 4M

### OR

10. a) How does Kohlarsauch's law of independent migration of ions help in determining Equivalent conductivity of weak electrolyte at infinite dilution? 8M  
b) Ionic conductance's of  $\text{Na}^+$  and  $\text{Cl}^-$  ions at infinite dilution are 50.11 and  $76.32 \text{ S cm}^{-2}$  respectively. Estimate the transport numbers of  $\text{Na}^+$  and  $\text{Cl}^-$  ions.