Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **16CH2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Atomic Structure, Thermodynamics, and Electrochemistry** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain Rutherford’s model of atom. | CO1 | 8 |
| b. | If the mass of an electron is 10-27 kg and the uncertainty in position is equal to 10-11 m, find the uncertainty in velocity. | CO1 | 2 |
| c. | Discuss quantum numbers. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Discuss matter waves and derive deBroglie relation for matter waves. | CO1 | 8 |
| b. | The kinetic energy of an electron is 13.6 eV. Calculate its deBroglie wavelength. | CO1 | 4 |
| c. | Discuss briefly: Uncertainty principle. | CO1 | 4 |
|  | d. | Mention any two postulates of quantum mechanics. | CO1 | 4 |
|  | | | | |
| 3. | a. | Define specific conductance. | CO2 | 2 |
|  | b. | Define (i) electrolysis and (ii) equivalent conductance. | CO2 | 6 |
|  | c. | Briefly explain Daniell cell. | CO2 | 4 |
|  | d. | Explain the applications of the measurement of electrode potential. | CO2 | 8 |
| **(OR)** | | | | |
| 4. | a. | Give the statement of the Faradays first law of electrolysis. | CO2 | 2 |
|  | b. | What is meant by molar conductance? | CO2 | 2 |
|  | c. | Define Kohlrausch’s law. Explain the applications of Kohlrausch’s law. | CO2 | 8 |
|  | d. | Derive Nernst equation for electrode potential. | CO2 | 8 |
|  | | | | |
| 5. | a. | What is meant by mechanical equilibrium? | CO3 | 4 |
|  | b. | Mention any three advantages of phase rule. | CO3 | 4 |
|  | c. | What is chemical equilibrium? Show that the value of chemical potential is the same in every phase of a system in equilibrium at constant T and P. | CO3 | 10 |
|  | d. | Define: thermal equilibrium. | CO3 | 2 |
| **(OR)** | | | | |
| 6. | a. | Define (i) phase rule (ii) phase and (iii) component | CO3 | 6 |
|  | b. | Explain with a neat phase diagram the water system. | CO3 | 10 |
|  | c. | Write the number of phases and components in the following equilibria:   1. CaCO3 (s) ⇆ CaO (s) + CO2 (g) 2. NH4Cl (l) ⇆ NH3 (s) + HCl (l) | CO3 | 4 |
|  | | | | |
| 7. | a. | Give the statements of the first law of thermodynamics. | CO2 | 2 |
|  | b. | Define specific heat capacity. What is its unit? | CO2 | 2 |
|  | c. | A gas starts with 200 J of internal energy. While you add 180 J of heat to the gas, the gas does 70 J of work. What is the **final** internal energy of the gas? | CO2 | 5 |
|  | d. | Derive the general expression for Maxwell’s thermodynamic relations. | CO2 | 7 |
|  | e. | Give the expression for the efficiency of Carnot’s cycle. | CO2 | 4 |
| **(OR)** | | | | |
| 8. | a. | Classify the following as extensive and intensive properties: density, pressure, entropy, enthalpy, freezing point, viscosity. | CO2 | 2 |
|  | b. | Give the statements of the second law of thermodynamics. | CO2 | 2 |
|  | c. | 60 J of work is done on a gas, and the gas loses 150 J of heat to the surroundings. What is the change in internal energy? | CO2 | 4 |
|  | d. | Explain the reasons why the second law of thermodynamics was needed to be introduced. | CO2 | 8 |
|  | e. | Define Cp and Cv. | CO2 | 4 |
|  | | | | |
|  | | **Compulsory:** |  |  |
| 9. | a. | Derive the relationship between Kp and Kc in chemical equilibrium. | CO3 | 5 |
|  | b. | Derve the law of mass action from chemical potential. | CO3 | 8 |
|  | c. | Derive Van’t Hoff reaction isotherm. | CO3 | 7 |

ALL THE BEST