Pabna University of Science & Technology

Department of Electrical & Telecommunication Engineering

B. Sc. Engineering 1st Year 1st Semester Examination-2017

Course Title : Physical and Inorganic Chemistry

Course No : CHEM 1101

Time 3.00 hours Full Marks : 70 (35+35)

N. B: (i) Answer any three questions out of four for the each part.

(ii) Separate Answer script must be used for answering the questions of Part-A & Part-B.

(iii) Figures in the right margin indicate marks.

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| 1. | (a)  (b)  (c)  (d) | Deduce the rate expression for second order reaction where both the concentration terms are same. What a half-life period of a second order reaction?  If the half life of a first order is 2 min, how long will it take to reach 25% of its initial concentration.  Explain with examples : (i) Parallel reactions (ii) Consecutive reactions  Calculate activation energy of a reaction whose reaction rate at 27 oC gets doubled for 10 oC rise in temperature. | 4.67  2  3  2 |
| 2. | (a)  (b)  (c)  (d) | Define equilibrium constant and show that it can have two different values depending on how you express concentration. Derive relationship between these two values.  Discuss the law of chemical equilibrium for the synthesis of Ammonia.  State law of Mass Action. Why chemical equilibrium is called a dynamic equilibrium?  At 500°C, the reaction between N2 and H2 to form ammonia has Kc = 6.0 × 10-2. What is the numerical value of Kp for the reaction? | 3  3  2.67  3 |
| 3. | (a)  (b)  (c)  (d) | What is electrolysis? Describe the mechanism of electrolysis.  Write down the Faradays laws of electrolysis.  What is electrochemical cell? How a redox reaction can produce an electrical current?  Explain what is meant by Molarity and Molality of solutions? Which of these two is temperature dependent? | 3  3  3  2.67 |
| 4. | (a)  (b)  (c)  (d) | What do you understand by the colloidal state of matter? Bring out the difference between a colloidal solution and a true solution.  What is electrophoresis? How does this phenomenon provide information about the sign of charge on particles?  Explain the use of dialysis and electro-dialysis in the purification of colloidal solutions.  Define and explain the term “Solution”. Describe different types of solution. | 3.67  3  3  2 |

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| 5. | (a)  (b)  (c)  (d) | Derive the equation for calculating the total energy of an electron in an orbit.  What do you understand by the term, “ Quantum number”. How many quantum numbers has an electron in an orbital? Explain the significance of each quantum number.  Which of the orbitals namely 1p, 2s, 2p, 3f are not possible? Give reason for your answer.  Draw the sketches of d orbitals showing the directional characteristics. | 4  4.67  2  1 |
| 6. | (a)  (b)  (c)  (d) | What is meant by an ionic bond? What are the conditions for the formation of this type of bond.  In what way does Pauli’s exclusion principle help us in understanding the electronic arrangement in an atom?  Explain why solid NaCl does not conduct electricity whereas molted NaCl does?  Show that carbon tetrachloride and ammonia contain covalent linkages among their respective atoms? | 4  2  1.67  4 |
| 7.  8. | (a)  (b)  (c)  (d)  (a)  (b)  (c)  (d) | Draw the molecular orbital energy level diagram and calculate bond order for F2, O2- molecule.  Discuss sp, sp3d and sp3d2 types of hybridization, giving one example of each.  What is hydrogen bonding? How do inter-molecular and intra-molecular H-bonding influence the physical properties of the compounds.  How NaF and MgO shows isomorphism?  How does the size of atoms vary from left to right in a period and on descending a group in the periodic table? What are the reasons for these changes?  Explain the following giving suitable reasons:  (i) The first ionization energy of B is less than of Be.  (ii) Diagonal relationship  (iii) In each period electron affinity values of alkali metals are low while those of halogens are high.  Why most of the transition metals form coloured compounds.  How do d-block elements differ from f-block elements? | 4.67  3  3  1  4  3  2.67  2 |