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**University Examinations 2016/2017**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE CHEMISTRY AND BACHELOR OF EDUCATION SCIENCES

**SCH 3300: CHEMISTRY OF D-BLOCK ELEMENTS**

**DATE: December, 2016 TIME: HOURS**



**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions .*

**QUESTION ONE - (30 MARKS)**

1. Define the following terms as used in coordination chemistry. . (4 Marks)
2. Coordination number
3. Coordination complex
4. Chelate
5. Effective atomic number
6. How would you account for the irregular variation in atomic radii across the first series of the transition elements? (3 Marks)
7. Give the reasons for the tendency of transition metals to exhibit a variety of oxidation state in their compounds. (2 Marks)
8. Give a brief account of the higher melting point and boiling points observed in transition metals. (2 Marks)
9. Which of the ;
10. Ions between Cu2+ and Cu+ ions would you expect to be coloured? Explain

(2 Marks)

1. Complexes between and is diamagnetic? Explain

(3 Marks)

1. Calculate in B.M, magnetic moment expected for the following complex ions;
2. (2 Marks)
3. (2 Marks)
4. Although Cu+, Ag+ and Au+ have configuration, Cu, Ag and Au are transition elements. Explain (2 Marks)
5. Write down the systematic names of the following coordination compounds.
6. [Co (NH3)4 Cl2] Cl (1 Mark)
7. Ni(CO)4 (1 Mark)
8. K4 (1 Mark)
9. ( NH4)3 (1 Mark)
10. [Cr (en)3 ] Cl3 (1 Mark)
11. What type of hybridization is present in central atom/ion in each of the following species? (3 Marks)
12. 3+ ( diamagnetic)
13. ( paramagnetic)
14. (diamagnetic)

**QUESTION TWO (20 MARKS)**

1. Distinguish between hand metals from soft metals and give an example in each case.

(3 Marks)

1. What do you understand by;
2. Crystal field theory
3. Valence bond theory
4. High spin complexes
5. Strong field ligends
6. Explain three main factors that influence crystal splitting and give an example in each case. (9 Marks)

**QUESTION THREE (20 MARKS)**

1. Potassium permanganate (KMnO4) has an intense purple colour despite the electronic distribution of Mn(VII) being 3d. (3 Marks)
2. Give the possible isomer for the following compounds and identify the type of isomerism involved in each case. (10 Marks)
3. Pt (NH3)2 Cl2
4. Two bottles containing solutions of either [Cr (H2O)6]Cl3 or [ Cr (H2O)3 Cl3] have lost their labels. Describe a simple test that distinguishes the two. (3 Marks)
5. Draw the molecular orbital energy level diagram for F2 molecule. Label all orbitals specifically. (4 Marks)

**QUESTION FOUR (20 MARKS)**

|  |  |  |
| --- | --- | --- |
|  | 0/ |  |
| [Mn (H2O)6]3+ | 250 | 300 |
| [Re (H2O)6]3+ | 400 | 180 |

1. Write down an expression for the crystal field stabilization energy for a high spin and low spin complex in terms of and P, the pairing energy. Use these expressions together with the data below to predict whether [ Mn (H2O)6)]3+ and [ Re (H2O)6]3+ form high spin or low spin complexes.
2. Na2 [ Ni (CN)4] is diamagnetic , not paramagnetic. Use this information to determine the geometry of the complex ion(i.e anion) (4 Marks)
3. What will be the final concentration of Nickel (II) hydrated ion if 50ml of 2M ethylene diamine (en) solution are added to 50ml of 0.2M Ni2+ solution? ( ) (5 Marks)
4. The most fundamental reaction a complex can undergo is legand substitution.
5. What is meant by legand substitution? (1 Mark)
6. Describe three classes of nucleophilic substitution mechanisms. (6 Marks)