UNIVERSITY OF JAFFNA, SRI LANKA
BACHELOR OF PHARMACY
FIRST YEAR SECOND SEMESTER EXAMINATION – Jan 2013
PHACH 1206 PHARMACEUTICAL CHEMISTRY I

Date: 12.02.2013 **Time: 03 hours**

ANSWER ALL SIX QUESTIONS

Answer Part A and Part B in separate books.

Part A

1. The velocity of an electron that is emitted from a metallic surface by a photon is 3.6×10^3 km. s^{-1}, h = 6.62608 x 10^{-34} JS.

1.1 1.1.1 What is the wavelength of the ejected electron? (15 Marks)

1.1.2 No electrons are emitted from the surface of the metal until the frequency of the radiation reaches 2.50×10^{16} Hz. How much energy is required to remove the electron from the metal surface? (15 Marks)

1.1.3 What is the wavelength of the radiation that caused photoejection of the electron? (20 Marks)

1.2 Predict the ground-state electron configuration of

1.2.1 a vanadium atom (10 Marks)

1.2.2 a lead atom. (10 Marks)

Atomic number of vanadium is 23 and lead is 82

1.3 Sketch the molecular orbital energy level diagram for HF.
Is HF likely to have a shorter bond length than HF^+? Explain (30 Marks)

2.

2.1 2.1.1 Sketch the shape of the boundary surfaces corresponding to 1s, 2p and 3d orbitals. (20 Marks)

2.1.2 What is meant by node? How many radial nodes does each orbital have? (15 Marks)

2.1.3 Describe the difference in orientation of the d_{xy} and the $d_x{}^2{}_{-y}{}^2$ orbitals with respect to the reference Cartesian axes. (15 Marks)

2.2 Using the Lewis structures and VSEPR, give the VSEPR formula for each of the following molecules and predict its shape.

2.2.1 PCl_4^+ (10Marks)

2.2.2 SO_3^{2-} (10Marks)

2.2.3 BF_3 (10Marks)

2.2.4 SF_4 (10Marks)

2.2.5 NH_3 (10Marks)

3.

3.1 Indicate with the aid of diagrams, the types of isomerisms possible in each of the following compounds.

3.1.1 $[Co(NH_3)_5(NO_2)]Cl_2$ (15 Marks)

3.1.2 $[Co_2(NH_3)_6(OH)_2Cl_2]SO_4$ (15 Marks)

3.1.3 Give the **IUPAC** names of all the isomers in each case. (20 Marks)

3.2 Discuss the crystal field splitting of d-orbitals that arise from a tetrahedral arrangement of ligands around a transition metal ion. (50 Marks)

4.

4.1 4.1.1 Explain the bonding in $[Co(NH3)6]^{3+}$ using the crystal field model. (20 Marks)

4.1.2 Calculate the crystal field stabilization energy of the following complexes.

4.1.2.1 $[Fe(H2O)6]^{2+}$ (10 Marks)

4.1.2.2 $[Fe(CN)6]^{4-}$ (10 Marks)

4.1.2.3 $[Mn(CN)6]^{4-}$ (10 Marks)

4.2 Calculate the spin only magnetic moment values for the following complexes.

4.2.1 $[CrF6]^{3-}$ (octahedral) (10 Marks)

4.2.2 $[Co(CN)6]^{3-}$ (octahedral) (10 Marks)

4.2.3 $[CoCl4]^{2-}$ (Tetrahedral) (10 Marks)

4.2.4 $[Fe(H2O)6]^{2+}$ (octahedral) (10 Marks)

4.3. Explain by giving reasons whether there will be any difference in the observed magnetic moment values and the spin only magnetic moment values for these complexes.
(Atomic numbers of Cr, Fe and Co are 24, 26 and 27 respectively) (10 Marks)

PartB

5.

5.1 Define antioxidant. (10 Marks)

5.2 Name the various compounds which are used as antioxidants in pharmaceuticals. (20 Marks)

5.3 Explain the various criteria for selection of inorganic antioxidant in pharmaceuticals. (40 Marks)

5.4 Explain why hypophosporus acid is used as an antioxidant. (30 Marks)

6.

6.1 List the sources of impurities of pharmaceutical products. (20 Marks)

6.2 Explain the consequences of impurities of pharmaceutical products. (40 Marks)

6.3 Name the tests which are carried to ensure the purityof a pharmaceutical substance. (40 Marks)