CHEM 118, Spring 2014

In-Class Worksheet

1. The most common oxidation state for ions of the transition elements is

A) +2 B) +3 C) +4 D) +5 E) +6

Ans: _____ A

2. The ground state electron configuration of Zn^{2+} is:

A) $[Ar]4s^2 3d^8$ B) $[Ar]4s^2 3d^{10}$ C) $[Ar]4s^1 3d^9$ D) $[Ar]3d^{10}$ E) $[Ar]3d^8$

Ans: _____D

3. Which of the following is considered a bidentate ligand?

A) cyanide, CN^- D) nitrite, NO_2^-

B) thiocyanate, SCN^- E) hydroxide, OH^-

C) oxalate, $C_2O_4^{2-}$

Ans: _____C

4. What is the coordination number of cobalt in the complex ion $[Co(en)Cl_4]^-$? (en = ethylenediamine)

A) 1 B) 2 C) 4 D) 6 E) 8

Ans: _____ D

5. In the compound $[Ni(en)_2(H_2O)_2]SO_4$ (where en = ethylenediamine) the oxidation number and coordination number of nickel are, respectively:

A) 2 and 6 B) 4 and 6 C) 6 and 6 D) 2 and 4 E) 4 and 4

Ans: _____A

6. Give the systematic name for $[Cu(NH_3)_4]Cl_2$ and for $[CoCl_3(H_2O)]^-$.

tetraamminecopper(II) chloride aquatrichlorocobaltate(II)

7. The compound $K_3[Fe(CN)_6]$ is used in calico printing and wool dyeing. Give its systematic name.

potassium hexacyanoferrate(III)

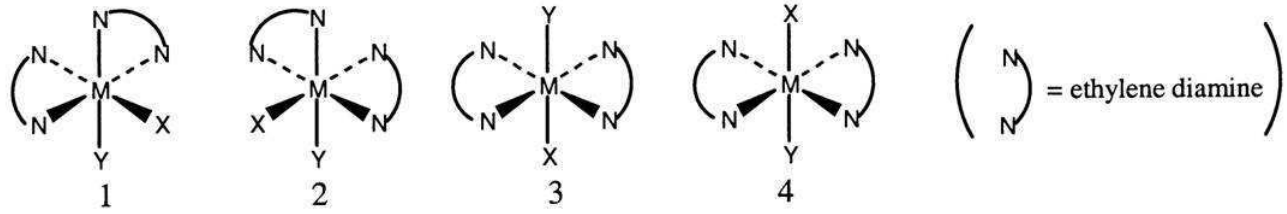
8. Write the formula for
diamminedichloroethylenediaminecobalt(III) bromide

$[CoCl_2(en)(NH_3)_2]Br$

sodium tetracyanonickelate(II)

$Na_2[Ni(CN)_4]$

9. Consider the following octahedral complex structures, each involving ethylene diamine and two different, unidentate ligands X and Y.



Which, if any, of the following pairs are optical isomers?

A) 1 and 2 D) 3 and 4
B) 1 and 3 E) None of these choices is correct.
C) 1 and 4

Ans: _____A

10. The crystal field splitting energy, Δ,

A) is larger for tetrahedral complexes than for octahedral complexes.
B) depends on the metal but not on the ligand.
C) determines the color of a complex.
D) is larger for ionic ligands like chloride than for molecular ligands like carbon monoxide, CO.
E) determines the charge of a complex.

Ans: _____ C

11. Which of the following ions could exist in either the high-spin or low-spin state in an octahedral complex?

A) Sc^{3+} B) Ni^{2+} C) Mn^{2+} D) Ti^{4+} E) Zn^{2+}

Ans: _____ C

12. Which of the following octahedral complexes should have the largest crystal field splitting energy, Δ?

A) $[Cr(H_2O)_6]^{3+}$ D) $[Cr(CN)_6]^{3-}$
B) $[Cr(SCN)_6]^{3-}$ E) $[Cr(en)_3]^{3+}$ (en = ethylenediamine)
C) $[Cr(NH_3)_6]^{3+}$

Ans: _____ D

13. If a solution absorbs green light, what is its likely color?

A) red B) violet C) orange D) yellow E) blue

Ans: _____A

14. Why is the +2 oxidation state so common among transition elements?

The outermost (ns^2) electrons are easily lost, producing the +2 oxidation state.

15. Give the oxidation number of the metal, the number of *d* electrons, the metal orbitals that are hybridized, the type of hybridization and the molecular geometry of $Ni(CN)_4^{2-}$ complex ion.