Chem1612	**Sample Quiz 3 (i)**	**Last update: 13/10/17**

Questions 1 & 2 refer to the solubility of lead chromate, $PbCrO_4$:

$$PbCrO_4(s) \rightleftharpoons Pb^{2+}(aq) + CrO_4^{2-}(aq)$$

1. The K_{sp} for $PbCrO_4$ is 2.0×10^{-16} at 25 °C. What is the solubility of $PbCrO_4$ in mol L^{-1}?

a) 1.4×10^{-8} b) 2.8×10^{-8} c) 2.0×10^{-16} d) 7.1×10^{7} e) 5.0×10^{15}

2. If 5.0 mL of 1.0×10^{-5} M $Pb(NO_3)_2$ is added to 5.0 mL of a solution of 1.0×10^{-10} M K_2CrO_4, which statement is correct?

a) The ionic product is 1.0×10^{-15} and $PbCrO_4$(s) precipitates.
b) The ionic product is 2.5×10^{-16} and $PbCrO_4$(s) does not precipitate.
c) The ionic product is 1.0×10^{-15} and $PbCrO_4$(s) does not precipitate.
d) The ionic product is 2.5×10^{-16} and $PbCrO_4$(s) precipitates.
e) none of the above

3. What is the electronic configuration of Mn^{2+}?

a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^1$
b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^2$
c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$
d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$
e) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^9$

4. What is the systematic name for the coordination compound, $K_2[Mn(OH_2)_2(CN)_4]$?

a) potassium tetracyanidodiaquamanganate (III)
b) potassium tetracyanidodiaquamanganate (II)
c) potassium diaquatetracyanidomanganate (III)
d) dipotassium diaquatetracyanidomanganate (II)
e) potassium diaquatetracyanidomanganate (II)

5. The K_{sp} for silver chloride is 1.8×10^{-10} at 25 °C. What is the solubility of silver chloride (in mol L^{-1}) in 0.025 M tin(IV) chloride solution?

a) 8.5×10^{-5} b) 6.7×10^{-8} c) 7.2×10^{-9} d) 1.8×10^{-9} e) 1.3×10^{-5}

6. What is the concentration of Zn^{2+}(aq) ions in the solution made by adding water to zinc nitrate (0.10 mol) and ammonia (3.0 mol) so that the final volume of solution is 1.5 L?
The K_{stab} of $[Zn(NH_3)_4]^{2+}$ is 7.8×10^8

a) 4.9×10^{-11} M

b) 9.5×10^{-12} M

c) 6.1×10^{-12} M

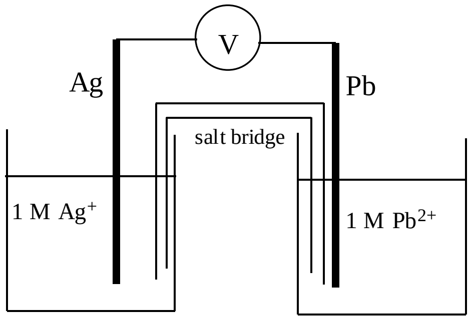
d) 2.8×10^{-12} M

e) 2.3×10^{-13} M

7. How many different stereoisomers (*i.e.* geometrical and optical isomers) of the complex $[Co(en)_3]^{3+}$ are possible? en = ethane-1,2-diamine = ethylenediamine = $NH_2CH_2CH_2NH_2$

a) 1 b) 2 c) 3 d) 4 e) 5

8. Consider the following galvanic cell and standard reduction potentials:



$Ag^+(aq) + e^- \rightarrow Ag(s)$ $E^o = 0.80$ V

$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$ $E^o = -0.13$ V

Which one of the following statements is TRUE?

a) The cell on the left containing Ag^+(aq) is the anode.

b) The initial reading on the voltmeter would be 0.67 V.

c) Oxidation occurs in the cell on the right containing Pb^{2+}(aq).

d) Negative charges will flow through the salt bridge from right to left.

e) The silver electrode dissolves as the reaction proceeds.

9. Consider the following equation. Relevant standard reduction potentials are given in Q8.

$$2Ag^+ + Pb \rightleftharpoons 2Ag + Pb^{2+}$$

Which of the following is nearest to the equilibrium constant, *K*, at 298 K for this reaction?

a) 9.8×10^5 b) 8.6×10^6 c) 5.4×10^{15} d) 1.1×10^{22} e) 2.9×10^{31}

10. How much gold is deposited in 4.00 hours by the electrolysis of a solution of $Na[AuCl_4]$ by a constant current of 0.37A?

a) 10.9 g b) 5.44 g c) 3.63 g d) 2.72 g e) 2.18 g

Correct answers: 1A, 2D, 3D, 4E, 5D, 6B, 7B, 8C, 9E, 10C

Chem1612	Sample Quiz 3 (ii)	Last update: 13/10/17

Questions 1 & 2 refer to the solubility of iron(II) phosphate, $Fe_3(PO_4)_2$:

$$Fe_3(PO_4)_2(s) \rightleftharpoons 3Fe^{2+}(aq) + 2PO_4^{3-}(aq)$$

1. The K_{sp} for $Fe_3(PO_4)_2(s)$ is 1.0×10^{-36} at 25 °C. What is the solubility of $Fe_3(PO_4)_2$ in mol L^{-1}?

a) 2.5×10^{-8} b) 3.1×10^{-8} c) 6.3×10^{-8} d) 1.0×10^{-7} e) 4.0×10^{-7}

2. If 25.0 mL of 2.0×10^{-5} M $FeSO_4$ is added to 25.0 mL of a solution of 1.0×10^{-10} M K_3PO_4, which statement is correct?

a) The ionic product is 8.0×10^{-35} and $Fe_3(PO_4)_2(s)$ precipitates.
b) The ionic product is 2.5×10^{-36} and $Fe_3(PO_4)_2(s)$ precipitates.
c) The ionic product is 8.0×10^{-35} and $Fe_3(PO_4)_2(s)$ does not precipitate.
d) The ionic product is 2.5×10^{-36} and $Fe_3(PO_4)_2(s)$ does not precipitate.
e) none of the above

3. What is the electronic configuration of Mn^{4+}?

a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^1$
b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^2$
c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$
d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$
e) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^9$

4. What is the systematic name for the coordination compound, $[Mo(NH_3)_3(OH_2)_3]Cl_3$?

a) triaquatriamminemolybdenum(VI) trichloride
b) triaquatriamminemolybdenum(III) trichloride
c) triamminetriaquamolybdenum(III) trichloride
d) triaquatriamminemolybdenum(III) chloride
e) triamminetriaquamolybdenum(III) chloride

5. The K_{sp} for barium sulfate is 1.1×10^{-10} at 25 °C. What is the solubility of barium sulfate (in mol L^{-1}) in 0.1 M iron(III) sulfate solution?

a) 1.1×10^{-10} b) 2.2×10^{-10} c) 3.7×10^{-10} d) 5.5×10^{-10} e) 1.0×10^{-5}

6. What is the concentration of Co^{2+}(aq) ions in the solution made by adding water to cobalt(II) nitrate (0.50 mol) and ethylenediamine (3.0 mol) so that the final volume of solution is 3.0 L? The K_{stab} of $[Co(en)_3]^{2+}$ is 1.0×10^{14}

a) 1.3×10^{-14} M

b) 1.5×10^{-15} M

c) 2.9×10^{-15} M

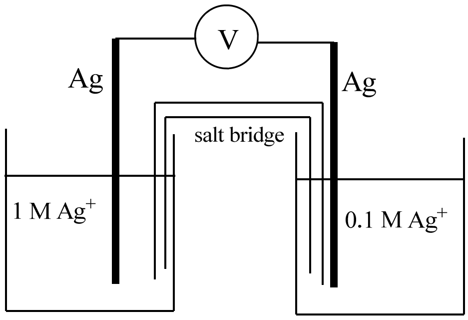
d) 3.3×10^{-15} M

e) 8.7×10^{-16} M

7. How many different stereoisomers (*i.e.* geometrical and optical isomers) of the complex $[Co(en)BrCl(CN)F]^-$ are possible? en = ethylenediamine = $NH_2CH_2CH_2NH_2$

a) 4 b) 6 c) 8 d) 12 e) 16

8. Consider the following concentration cell.



$Ag^+(aq) + e^- \rightarrow Ag(s)$ $E° = 0.80$ V

Which one of the following statements is TRUE?

a) The electrode on the left containing 1 M Ag^+(aq) is the anode.

b) Equilibrium occurs when the $[Ag^+(aq)]$ in both cells is equal.

c) The initial reading on the voltmeter would be 0.80 V.

d) Negative charges will flow through the salt bridge from right to left.

e) Reduction occurs in the cell on the right containing 0.1 M Ag^+(aq).

9. Consider the following equation.

$$Cr + 3VO_2^+ + 6H^+ \rightleftharpoons Cr^{3+} + 3VO^{2+} + 3H_2O \qquad E° = 1.74 \text{ V}$$

Which of the following is nearest to the equilibrium constant, *K*, at 300 K for this reaction?

a) 5.0×10^{87} b) 1.9×10^{88} c) 5.5×10^{55} d) 1.7×10^{29} e) 2.7×10^{29}

10. How much bismuth is deposited in 1.60 hours by the electrolysis of a solution of $NaBiO_3$ by a constant current of 0.55A?

a) 6.86 g b) 3.43 g c) 2.29 g d) 1.72 g e) 1.37 g

Correct answers: 1A, 2B, 3C, 4E, 5C, 6A, 7D, 8B, 9A, 10E