SOME (NOT ALL) Practice Problems for Chapter 4 and 5 – Updated Oct 11, 2010

1. What is the oxidation number of each sulfur atom in the compound, $Rb_2S_2O_4$?

a. -2
b. +1
! c. +3
d. +5
e. +6

2. What is the oxidation number of each sulfur atom in the $S_2O_8^{2-}$ ion?

a. -2
b. +1
c. +3
d. +5
! e. +7

3. The CrO_4^{2-} ion was involved in a chemical reaction during which it was transformed into Cr^{3+} ions. What is the change in oxidation number of the chromium atom?

a. increase by 5 units
b. decrease by 5 units
c. increase by 1 unit
! d. decrease by 3 units
e. decrease by 4 units

4. Which one of the following processes represents an oxidation?

a. $Ba^{2+}(aq) + CrO_4^{2-}(aq) \rightarrow BaCrO_4(s)$
b. $2\ H^{+}(aq) + CO_3^{2-}(aq) \rightarrow H_2O(l) + CO_2(g)$
c. $Fe^{3+}(aq) \rightarrow Fe^{2+}(aq)$
! d. $MnO_2(s) \rightarrow MnO_4^{-}(aq)$
e. $2\ CrO_4^{2-}(aq) + 2\ H^{+}(aq) \rightarrow Cr_2O_7^{2-}(aq) + H_2O(l)$

5. What is the change in oxidation number of each nitrogen atom in the process,

$$HNO_3 \rightarrow NO$$

a. +3
b. -6
c. -1
! d. -3
e. +5

6. The sulfite ion(SO_3^{2-}) was involved in a chemical reaction in which it underwent oxidation. Based on the change in oxidation numbers, which one of the products listed below is a possible oxidation product of the sulfite ion?

a. $S_2O_3^{2-}(aq)$
b. $SO_2(g)$
c. $S^{2-}(aq)$
d. $S(s)$
! e. $SO_4^{2-}(aq)$

7. In the reaction, $C_4H_{10}(l) + Cr_2O_7^{2-}(aq) + H^+(aq) \rightarrow H_6C_4O_4(s) + Cr^{3+}(aq) + H_2O(l)$
the change in the oxidation number of the chromium atom is

a. -6
! b. -3
c. +3
d. +5
e. +8

8. Which one of the following compounds produces 4 ions by dissociation (ionization) when dissolved in water?

a. NaCl
b. $Mg(OH)_2$
! b. $Al(NO_3)_3$
d. $NaBrO_3$
e. Na_2SO_4

9. In the reaction, $K_2SO_4(aq) + Ba(NO_3)_2(aq) \rightarrow BaSO_4(s) + 2\ KNO_3(aq)$, which ions are the spectator ions?

a. Ba^{2+} and SO_4^{2-}
b. Ba^{2+} and K^+
c. Ba^{2+} and NO_3^-
d. K^+ and SO_4^{2-}
! e. K^+ and NO_3^-

10. Which one of the following compounds is insoluble in water?

a. KNO_3
b. $Pb(NO_3)_2$
c. Na_2SO_4
! d. $PbSO_4$
e. $MgCl_2$

11. According to the Arrhenius theory of Acids and Bases, acids are substances which

a. exhibit a sour taste
b. react with all metals to release hydrogen gas
c. react with all metals to release carbon dioxide gas
! d. release hydrogen ions when dissolved in water to form a solution

12. Which one of the following bases is NOT a known strong base?

a. $Ca(OH)_2(aq)$
b. $Ba(OH)_2(aq)$
c. $KOH(aq)$
d. $NaOH(aq)$
! e. $NH_3(aq)$

13. 66.7 mL of 18.0 molar sulfuric acid solution was dissolved in enough water to make 500 mL of solution. The molarity of the <u>diluted</u> mixture is

! a. 2.40 molar
b. 0.135 molar
c. 36.0 molar
d. 9.00 molar
e. 0.00741 molar

14. Sodium acetate, $NaC_2H_3O_2$, has a formula weight of 82.034. What is the molar concentration of a solution prepared by dissolving 4.10 grams of sodium acetate in enough water to prepare 250 mL of the solution?

! a. 0.200 molar
b. 1.025 molar
c. 1.345 molar
d. 5.00 molar
e. 16.4 molar

15. How many mL of 0.200 molar $Na_2SO_4(aq)$ solution are required to completely react with 3.23 grams of $BaCl_2$ (formula weight = 208.2) to form products as shown below? (Reaction is NOT balanced)

$$BaCl_2(s) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + NaCl(aq)$$

a. 0.0155 ml
b. 0.0776 ml
c. 15.5 ml
d. 31.0 ml
! e. 77.6 ml

16) What volume of 0.305 M aqueous solution of $AgNO_3$ is required to react exactly with 155.0 mL of 0.274 M aqueous solution of Na_2SO_4 solution? Hint: you will want to write a balanced reaction.

A) 581 mL
B) 173 mL
C) 345 mL
D) 139 mL
E) 278 mL

Answer: E

17) Determine the concentration of a solution prepared by diluting 25.0 mL of a concentrated 0.188 M $Ca(NO_3)_2$ solution to 150.0 mL.

A) 1.13 M
B) 0.0887 M
C) 0.0313 M
D) 0.0199 M
E) 0.0501 M

Answer: C

18) Determine the limiting reactant (LR) and the mass (in g) of nitrogen that can be formed from 50.0 g N_2O_4 and 45.0 g N_2H_4.

$$N_2O_4(1) + 2\ N_2H_4(1) \rightarrow 3\ N_2(g) + 4\ H_2O(g)$$

A) LR = N_2H_4, 59.0 g N_2 formed
B) LR = N_2O_4, 105 g N_2 formed
C) LR = N_2O_4, 45.7 g N_2 formed
D) LR = N_2H_4, 13.3 g N_2 formed
E) No LR, 45.0 g N_2 formed

Answer: C

19) What pressure (in atm) will 0.44 moles of CO_2 exert in a 2.6 L container at 25°C?

A) 0.35 atm
B) 4.1 atm
C) 4.7 atm
D) 8.6 atm
E) 3.6 atm
Answer: B

20) How many moles of CO are contained in a 5.00 L tank at 155°C and 2.80 atm?

A) 0.399 moles
B) 1.10 moles
C) 2.51 moles
D) 0.455 moles
E) 0.289 moles

21) What temperature must a balloon, initially at 25 °C and 2.00 L, be heated to in order to have a volume of 6.00 L?

A) 993 K
B) 403 K
C) 75 K
D) 655 K
E) 894 K

22) A large balloon is initially filled to a volume of 25.0 L at 353 K and a pressure of 2575 mm Hg. What volume of gas will the balloon contain at 1.35 atm and 253 K?

A) 22.2 L
B) 87.5 L
C) 11.4 L
D) 45.0 L
E) 58.6 L
Answer: D

23) Which of the following samples will have the greatest average speed at 355 K?

A) Ne
B) C_2H_4
C) Cl_2
D) CH_4
E) All of these samples will have the same average speed at the same T.
Answer: D

24) A 0.334 g sample of an unknown halogen occupies 109 mL at 398 K and 1.41 atm. What is the identity of the halogen?

A) Br_2
B) F_2
C) Cl_2
D) I_2
E) Ge
Answer: C

25) A mixture of 0.220 moles CO, 0.350 moles H_2 and 0.640 moles He has a total pressure of 2.95 atm. What is the partial pressure of H_2?

A) 1.17 atm
B) 0.853 atm
C) 1.03 atm
D) 0.969 atm
E) 0.649 atm

Answer: B

26) A mixture of 10.0 g of Ne and 10.0 g Ar have a total pressure of 1.6 atm. What is the partial pressure of Ne?

A) 1.1 atm
B) 0.80 atm
C) 0.54 atm
D) 0.40 atm
E) 1.3 atm
Answer: A

27) Determine the volume of O_2 (at STP) formed when 50.0 g of $KClO_3$ decomposes according to the following reaction. The molar mass for $KClO_3$ is 122.55 g/mol.

$$2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$$

A) 9.14 L
B) 8.22 L
C) 12.3 L
D) 13.7 L
E) 14.6 L

Answer: D

28. a) 760 mmHg equals how many atm? _____

b) The combined gas law is a combination of what two laws? _____ & _____

c) The oxidation number of Mn in $KMnO_4$ is _____

d) In the following equation, which is the oxidizing agent?

$$Co_{(s)} + Cl_{2\ (g)} \rightarrow CoCl_{2\ (s)}$$

e) True or False. All molecules of a particular gas (e.g., O_2) travel at exactly the same speed when T, P and V are held constant

f). What is the difference between a barometer and manometer? (4 points)

29. It takes 44 seconds for a sample of $N_2(g)$ to effuse through a tiny orifice. Determine the molecular mass of the gas whose effusion time under exactly the same conditions is 75 seconds. (4 points)

30. How can differentiate between a ppt reaction, an acid base reaction, and a REDOX, just by looking at the balance chemical equation. List all 'tell tale' signs for each!