Name _____ AP Chemistry ___/___/___

Chapter 7 HW 6: Due 1/22/16 Complete the following multiple choice questions. All will be graded. Write your answer clearly on the line in front of the question.

1. A Equal numbers of moles of He(g), Ar(g), and Ne(g) are placed in a glass vessel at room temperature. If the vessel has a pinhole-sized leak, which of the following will be true regarding the relative values of the partial pressures of the gases remaining in the vessel after some of the gas mixture has effused?
(A) $P_{He} < P_{Ne} < P_{Ar}$ (B) $P_{He} < P_{Ar} < P_{Ne}$ (C) $P_{Ne} < P_{Ar} < P_{He}$
(D) $P_{Ar} < P_{He} < P_{Ne}$ (E) $P_{He} = P_{Ar} = P_{Ne}$

2. A Which of the following compounds is NOT appreciably soluble in water but is soluble in dilute hydrochloric acid?
(A) $Mg(OH)_2(s)$ (B) $(NH_4)_2CO_3(s)$ (C) $CuSO_4(s)$
(D) $(NH_4)_2SO_4(s)$ (E) $Sr(NO_3)_2(s)$

3. E What is the molar solubility in water of Ag_2CrO_4? (The K_{sp} for Ag_2CrO_4 is 8×10^{-12}.)
(A) 8×10^{-12} M (B) 2×10^{-12} M (C) $(4 \times 10^{-12}\ M)^{1/2}$
(D) $(4 \times 10^{-12}\ M)^{1/3}$ (E) $(2 \times 10^{-12}\ M)^{1/3}$

4. C What is the final concentration of barium ions, $[Ba^{2+}]$, in solution when 100. mL of 0.10 M $BaCl_2(aq)$ is mixed with 100. mL of 0.050 M $H_2SO_4(aq)$?
(A) 0.00 M (B) 0.012 M (C) 0.025 M (D) 0.075 M (E) 0.10 M

5. A When 100 mL of 1.0 M Na_3PO_4 is mixed with 100 mL of 1.0 M $AgNO_3$, a yellow precipitate forms and $[Ag^+]$ becomes negligibly small. Which of the following is a correct listing of the ions remaining in solution in order of increasing concentration?
(A) $[PO_4^{3-}] < [NO_3^-] < [Na^+]$ (B) $[PO_4^{3-}] < [Na^+] < [NO_3^-]$ (C) $[NO_3^-] < [PO_4^{3-}] < [Na^+]$
(D) $[Na^+] < [NO_3^-] < [PO_4^{3-}]$ (E) $[Na^+] < [PO_4^{3-}] < [NO_3^-]$

6. B In a qualitative analysis for the presence of Pb^{2+}, Fe^{2+}, and Cu^{2+} ions in a aqueous solution, which of the following will allow the separation of Pb^{2+} from the other ions at room temperature?
(A) Adding dilute $Na_2S(aq)$ solution (B) Adding dilute HCl(aq) solution
(C) Adding dilute NaOH(aq) solution (D) Adding dilute $NH_3(aq)$ solution
(E) Adding dilute $HNO_3(aq)$ solution

7. B After completing an experiment to determine gravimetrically the percentage of water in a hydrate, a student reported a value of 38 percent. The correct value for the percentage of water in the hydrate is 51 percent. Which of the following is the most likely explanation for this difference?
(A) Strong initial heating caused some of the hydrate sample to spatter out of the crucible.
(B) The dehydrated sample absorbed moisture after heating.
(C) The amount of the hydrate sample used was too small.
(D) The crucible was not heated to constant mass before use.
(E) Excess heating caused the dehydrated sample to decompose.

8. D The volume of distilled water that should be added to 10.0 mL of 6.00 M HCl(aq) in order to prepare a 0.500 M HCl(aq) solution is approximately
(A) 50.0 mL (B) 60.0 mL (C) 100. mL (D) 110. mL (E) 120. mL

9. A Which of the following gases deviates most from ideal behavior?
(A) SO_2 (B) Ne (C) CH_4 (D) N_2 (E) H_2

10. B Commercial vinegar was titrated with NaOH solution to determine the content of acetic acid, $HC_2H_3O_2$. For 20.0 milliliters of the vinegar 26.7 milliliters of 0.600-molar NaOH solution was required. What was the concentration of acetic acid in the vinegar if no other acid was present?
(A) 1.60 M (B) 0.800 M (C) 0.600 M (D) 0.450 M (E) 0.200 M

11. E $2\ H_2O + 4\ MnO_4^- + 3\ ClO_2^- \rightarrow 4\ MnO_2 + 3\ ClO_4^- + 4\ OH^-$
Which species acts as an oxidizing agent in the reaction represented above?
(A) H_2O (B) ClO_4^- (C) ClO_2^- (D) MnO_2 (E) MnO_4^-

12. B In which of the following compounds is the mass ratio of chromium to oxygen closest to 1.62 to 1.00 ?
(A) CrO_3 (B) CrO_2 (C) CrO (D) Cr_2O (E) Cr_2O_3

13. D . . . Ag+ + . . . $AsH_3(g)$ + . . . OH^- ---> . . . Ag(s) + . . . $H_3AsO_3(aq)$ + . . . H_2O
When the equation above is balanced with lowest whole-number coefficients, the coefficient for OH^- is
(A) 2 (B) 4 (C) 5 (D) 6 (E) 7

14. C A sample of 0.010 mole of oxygen gas is confined at 127 °C and 0.80 atmosphere. What would be the pressure of this sample at 27 °C and the same volume?
(A) 0.10 atm (B) 0.20 atm (C) 0.60 atm (D) 0.80 atm (E) 1.1 atm

15. D
$H_2(g) + (1/2)\ O_2(g)$ ---> $H_2O(l)$ $\Delta H° = -286$ kJ
$2\ Na(s) + (1/2)\ O_2(g)$ ---> $Na_2O(s)$ $\Delta H° = -414$ kJ
$Na(s) + (1/2)\ O_2(g) + (1/2)\ H_2(g)$ ---> NaOH(s) $\Delta H° = -425$ kJ
Based on the information above, what is the standard enthalpy change for the following reaction?
$Na_2O(s) + H_2O(l) \rightarrow 2\ NaOH(s)$
(A) -1,125 kJ (B) -978 kJ (C) -722 kJ (D) -150 kJ (E) +275 kJ

16. C Which of the following sets of quantum numbers (n, l, m_l, m_s) best describes the valence electron of highest energy in a ground-state gallium atom (atomic number 31) ?
(A) 4, 0, 0, ½ (B) 4, 0, 1, ½ (C) 4, 1, 1, ½ (D) 4, 1, 2, ½ (E) 4, 2, 0, ½

17. D A strip of metallic scandium, Sc, is placed in a beaker containing concentrated nitric acid. A brown gas rapidly forms, the scandium disappears, and the resulting liquid is brown-yellow but becomes colorless when warmed. These observations best support which of the following statements?
(A) Nitric acid is a strong acid.
(B) In solution scandium nitrate is yellow and scandium chloride is color less.
(C) Nitric acid reacts with metals to form hydrogen.
(D) Scandium reacts with nitric acid to form a brown gas.
(E) Scandium and nitric acid react in mole proportions of 1 to 3.

18. D
Mass of an empty container = 3.0 grams
Mass of the container plus the solid sample = 25.0 grams
Volume of the solid sample = 11.0 cubic centimeters
The data above were gathered in order to determine the density of an unknown solid. The density of the sample should be reported as
(A) 0.5 g/cm^3 (B) 0.50 g/cm^3 (C) 2.0 g/cm^3
(D) 2.00 g/cm^3 (E) 2.27 g/cm^3

19. A $PCl_3(g) + Cl_2(g) <====> PCl_5(g)$ + energy
Some PCl_3 and Cl_2 are mixed in a container at 200 °C and the system reaches equilibrium according to the equation above. Which of the following causes an increase in the number of moles of PCl_5 present at equilibrium?
I. Decreasing the volume of the container II. Raising the temperature III. Adding a mole of He gas at constant volume
(A) I only (B) II only (C) I and III only
(D) II and III only (E) I, II, and III

20. C Samples of F_2 gas and Xe gas are mixed in a container of fixed volume. The initial partial pressure of the F_2 gas is 8.0 atmospheres and that of the Xe gas is 1.7 atmospheres. When all of the Xe gas reacted, forming a solid compound, the pressure of the unreacted F_2 gas was 4.6 atmospheres. The temperature remained constant. What is the formula of the compound?
(A) XeF (B) XeF_3 (C) XeF_4 (D) XeF_6 (E) XeF_8

21. D What is the $H^+(aq)$ concentration in 0.05 M HCN (aq) ? (The K_a for HCN is 5.0×10^{-10})
(A) 2.5×10^{-11} (B) 2.5×10^{-10} (C) 5.0×10^{-10} (D) 5.0×10^{-6} (E) 5.0×10^{-4}

22. C A hydrocarbon gas with an empirical formula CH_2 has a density of 1.88 grams per liter at 0 °C and 1.00 atmosphere. A possible formula for the hydrocarbon is
(A) CH_2 (B) C_2H_4 (C) C_3H_6 (D) C_4H_8 (E) C_5H_{10}