AP Chem Final Practice Questions (Set #1)

1. Which gas is least soluble in water?

(A) H_2
(B) CO_2
(C) NH_3
(D) SO_2

2. Identify every process that is a chemical change.
1. cooling 2. evaporating 3. rusting

(A) 1 only
(B) 3 only
(C) 1 and 2 only
(D) 1,2, and 3

3. Which element is expected to have the lowest melting point and the lowest density?

(A) Ag
(B) K
(C) Co
(D) Al

4. Which compound is not expected to be colored?

(A) $CuCl_2$
(B) $K_2Cr_2O_7$
(C) MnO_2
(D) TiO_2

5. Which pair of substances can dissolve in water to give 0.1 M solutions and will produce a precipitate when they are mixed?

(A) NaOH and $BaCl_2$
(B) Na_2CO_3 and $HClO_4$
(C) $MgSO_4$ and $Pb(NO_3)_2$
(D) $CaCl_2$ and $Zn(C_2H_3O_2)_2$

6. Calculate the density of a gold coin from the given data.

Table of Data	
Mass of the gold coin	13.5243 g
Volume of the coin and water	22.9 mL
volume of the water alone	22.2 mL

(A) 19.32 g mL^{-1}
(B) 19.3 g mL^{-1}
(C) 19 g mL^{-1}
(D) 2 x 10^1 g mL^{-1}

7. A typical silicon chip such as those in electronic calculators weighs 2.3 x 10^{-4}g. How many silicon atoms are in such a chip?

(A) 4.9 x 10^{18}
(B) 1.4 x 10^{20}
(C) 3.9 x 10^{21}
(D) 2.6 x 10^{27}

8. What is the coefficent for oxygen when this equation is balanced?
___$H_2S(g)$ +___$O_2(g)$ ---> ___$SO_3(g)$ +___$H_2O(l)$

(A) 2
(B) 3
(C) 4
(D) 5

9. The first step in the Ostwald process for producing nitric acid, HNO_3, from ammonia is represented by this equation.

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

What volume of oxygen is needed to produce each liter of NO?

(A) 0.80 L
(B) 1.20 L
(C) 5.00 L
(D) 22.4 L

10. Antimony reacts with sulfur according to this equation.

$$2Sb(s) + 3S(s) \text{ ---> } Sb_2S_3(s)$$

The molar mass of Sb_2S_3 is 339.7 g mol^{-1}
What is the percentage yield for a reaction in which 1.40 g of Sb_2S_3 is obtained from 1.73 g of antimony and a slight excess of sulfur?

(A) 80.9%
(B) 58.0%
(C) 40.5%
(D) 29.0%

11. The limiting reagent in a particular reaction can be recognized because it is the reagent.

(A) with the smallest coefficient in the balanced equation.
(B) that has the lowest mass in the reaction mixture.
(C) that is present in the smallest molar quantity.
(D) that would be used up first.

12. What mass of oxygen is present in 50.0 g of copper(II) sulfate pentahydrate, $CuSO_4 \cdot 5H_2O$? The molar mass of $CuSO_4 \cdot 5H_2O$ is 249.68 g mol^{-1}

(A) 12.8 g
(B) 16.0 g
(C) 20.0 g
(D) 28.8 g

13. What mass of calcium chloride hexahydrate must be disolved in sufficient water to prepare 200 mL of a solution with a chloride ion concentration of 0.50M? The molar mass of $CaCl_2 \cdot 6H_2O$ is 219 g mol^{-1}

(A) 5.6 g
(B) 11 g
(C) 22 g
(D) 44 g

14. The major commercial source for bromine is deep brine wells in Arkansas where the concentration of bromide ion can be as high as 5000 parts per million by mass. What is this concentration when expressed as a mass percentage?

(A) 0.005%
(B) 0.05%
(C) 0.5%
(D) 5%

16. A certain solid is insoluble in water. It does not conduct electricity in the solid state but does conduct electricity when melted. What type of solid is it?

(A) ionic
(B) metallic
(C) molecular
(D) network covalent

17. During the part of the cycle when heat is removed from the food compartment of an electric refrigerator, the refrigerant undergoes a change from a

(A) liquid to a gas.
(B) gas to a liquid.
(C) liquid to a solid.
(D) solid to a liquid.

18. When the substances CCl_4, CF_4, and CH_4 are arranged in order of increasing boiling point (with the lowest boiling substance first), what is the correct order?

(A) $CCl_4 < CF_4 < CH_4$
(B) $CH_4 < CF_4 < CCl_4$
(C) $CF_4 < CCl_4 < CH_4$
(D) $CF_4 < CH_4 < CCl_4$

19. 30.0 mL of water at 10. °C is mixed with 50.0 mL of water at 60. °C. What is the final temperature of the mixture?

(A) 31 °C
(B) 35 °C
(C) 41 °C
(D) 46 °C

20. A mixture of several gases is prepared for a series of photosynthesis experiments. If the mixture contains 0.060 mol of $O_2(g)$, 0.30 mol of $N_2(g)$, 0.030 mol of $CO_2(g)$, and 0.010 mol of $H_2O(g)$ and exerts a total pressure of 1.20 atm, what is the partial pressure of CO_2 in this mixture?

(A) 1.2 atm
(B) 0.36 atm
(C) 0.090 atm
(D) 0.075 atm

21. The molar mass of a volatile liquid is to be determined by adding a sample of it to a pre-weighed 125 mL a conical flask covered with a piece of aluminum foil with a pinhole in it. After heating the flask in a boiling water bath to vaporize the liquid, the outside of the flask is dried and the flask is reweighed. What is the molar mass of the volatile liquid?

Table of Data	
Mass of empty flask	63.427 g
Mass of flask with vapor	63.768 g
Atmospheric pressure	748 mm Hg

(A) 44.0 g mol^{-1}
(B) 670 g mol^{-1}
(C) 84.9 g mol^{-1}
(D) 166 g mol^{-1}

22. Consider two 1.0 L flasks at the same temperature. One flask contains ammonia gas and the second contains an equal number of moles of sulfur dioxide gas. Which of these characteristics will be the same for both gases?
1. average molecular velocity
2. density
3. pressure

(A) 1 only
(B) 3 only
(C) 1 and 2 only
(D) 1 and 3 only

23. The compound C_2F_4HCl is currently being considered as a replacement for $CBrF_3$ as a fire extinguishing agent because C_2F_4HCl does not deplete ozone. What are the most probable products if a molecule of C_2F_4HCI is bombarded with high energy photons?

Bond	Bond Energy kJ mol^{-1}
C-C	346
C-Cl	327
C-F	485
C-H	411

(A) CF_3 + CFHCl
(B) C_2F_3HCl + F
(C) C_2F_4H + Cl
(D) C_2F_4Cl + H

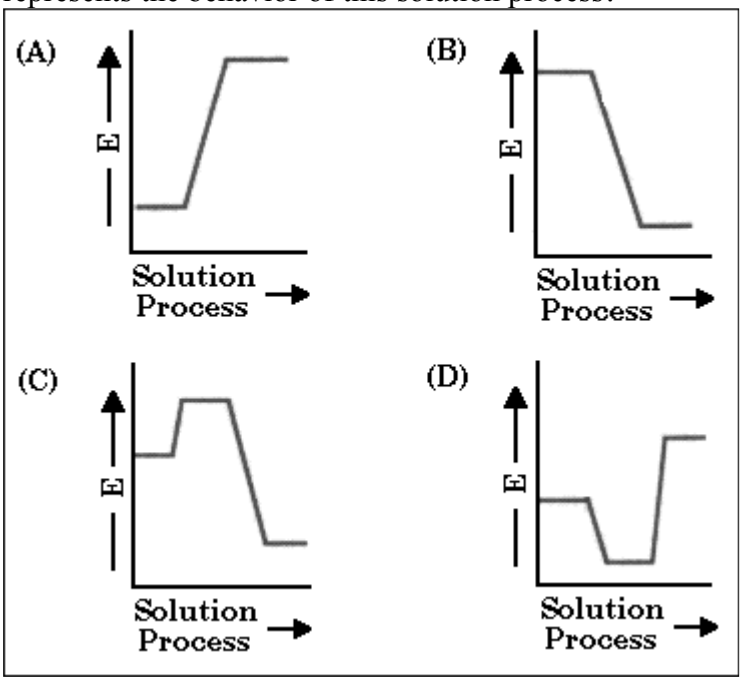
24 What is the value of $\Delta H°$ for this reaction?

$Fe_2O_3(s) + 3H_2O(l) \rightarrow 2Fe(OH)_3(s)$

Substance	$\Delta H°_f$ kJ mol^{-1}
$Fe_2O_3(s)$	-824.2
$Fe(OH)_3(s)$	-823.0
$H_2O(l)$	-285.8

(A) 35.6 kJ
(B) 286 kJ
(C) 858.6kJ
(D) -536 KJ

25. When $Na_2S_2O_3 \cdot 3H_2O$ dissolve in water, the solution gets cold. Which energy diagram best represents the behavior of this solution process?



27. A plot of reactant concentration versus time gives a straight line. What is the order of the reaction for this reactant?

(A) zero
(B) first
(C) second
(D) some other value

28. Which change does not increase the value of the rate constant for a reaction?

(A) decreasing the activation energy
(B) raising the temperature
(C) adding a catalyst
(D) increasing the concentration of reactants

29. A certain reaction has a $\Delta H = -75$ kJ and an activation energy of 40 kJ. A catalyst is found that lowers the activation energy of the forward reaction by 15 kJ. What is the activation energy of the reverse reaction in the presence of this same catalyst?

(A) 25 kJ
(B) 60 kJ
(C) 90 kJ
(D) 100 kJ

30. Nitrogen(II) oxide and hydrogen react to form nitrogen and water according to this equation.

$$2NO(g) + 2H_2 \text{ ---> } N_2(g) + 2H_2O(g)$$

According to these experimental results, what are the orders for NO and H_2O?

[NO]	[H_2]	Rate ($M\ min^{-1}$)
0.015	0.020	0.60
0.015	0.040	1.20
0.030	0.020	2.40

	Order,NO	Order,H_2
(A)	1	1
(B)	1	2
(C)	2	1
(D)	2	2

31. At a certain temperature the first-order decomposition of hydrogen peroxide exhibits these data.

time (seconds, s)	[H_2O_2] ($mol\ L^{-1}$)
0	2.0
15	1.0

At what time will the [H_2O_2] = 0.50 $mol\ L^{-1}$?

(A) 30. s
(B) 25 s
(C) 22 s
(D) 20. s

32. What is the relationship between the equilibrium constant (K_c) of a reaction and the rate constants for the foward (k_f) and backward (k_b) steps?

(A) $K_c = k_f\, k_b$
(B) $K_c = k_b / k_f$
(C) $K_c = k_f / k_b$
(D) $K_c = 1 / (k_f k_b)$

33. Xenon tetrafluoride, XeF_4, can be prepared by heating Xe and F_2 together according to this equation.

$$Xe(g) + 2F_2(g) \text{ <===> } XeF_4(g)$$

What is the equilibrium expression for this reaction?

(A) $K = [XeF_4] / ([Xe]\, [F_2])$
(B) $K = [XeF_4] / (2[Xe]\, [F_2])$
(C) $K = [XeF_4] / ([Xe]\, [F_2]^2)$
(D) $K = ([Xe]\, [F_2]) / [XeF_4]$

40. Which product(s) would be formed when saturated solutions of calcium hydroxide and ammonium chloride are mixed?
1. ammonia gas
2. calcium chloride precipitate
3. calcium diammine ion

(A) 1 only
(B) 2 only
(C) 1 and 2 only
(D) 1 and 3 only

41. An aqueous solution containing KF, KBr and KI is treated with chlorine water. Which product(s) would be formed?

(A) fluorine only
(B) bromine only
(C) bromine and iodine
(D) fluorine and iodine

43. What is the function of H_2O_2 in this reaction?

$$6\ H^+ + 2\ MnO_4^- + 5\ H_2O_2 \text{ ---> } 2\ Mn^{2+} + 5\ O_2 + 8\ H_2O$$

(A) catalyst
(B) reducing agent
(C) oxidizing agent
(D) inhibitor

44. How much hydrogen is produced from the electrolysis of water in the same time that 2.2 L of oxygen is formed?

(A) 0.14 L
(B) 1.1 L
(C) 2.2 L
(D) 4.4 L

46. In which pair are the two species both isoelectronic and isotopic?

(A) $^{40}_{20}Ca^{2}$ and $^{40}_{18}Ar$
(B) $^{39}_{19}K^{+}$ and $^{40}_{19}K^{+}$
(C) $^{24}_{12}Mg^{2+}$ and $^{25}_{12}Mg$
(D) $^{56}_{26}Fe^{2+}$ and $^{57}_{26}Fe^{3+}$

47. Which emission line in the hydrogen spectrum occurs at the highest frequency?

(A) n = 3 ---> n = 1
(B) n = 5 ---> n = 2
(C) n = 7 ---> n = 5
(D) n = 10 ---> n = 8

48. Which species has this electron arrangement? $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$
(A) Ni
(B) Ni^{2+}
(C) Zn
(D) Zn^{2+}

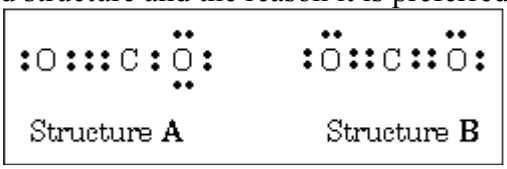
49. When the species Ar, Cl^{-}, and K^{+} are arranged in order of increasing size (with the smallest species first), what is the correct order?

(A) $Cl^{-} < Ar < K^{+}$
(B) $K^{+} < Cl^{-} < Ar$
(C) $K^{+} < Ar < Cl^{-}$
(D) $Ar < K^{+} < Cl^{-}$

50. Which species contains ***both*** covalent and ionic bonds?

(A) NH_3BF_3
(B) H_3O^{+}
(C) NaKS
(D) $Mg(CN)_2$

51. These two electron dot formulas for carbon dioxide both satisfy the octet rule but one is preferred over the other. Which of the statements below identifies the preferred structure and the reason it is preferred?



(A) Structure **A** is preferred because the triple bond is stronger than a double bond.
(B) Structure **A** is preferred because there is a greater formal charge on the atoms.
(C) Structure **B** is preferred because the formal charges on the atoms are zero.
(D) Structure **B** is preferred because the bonds are equal.

52. Which molecule is polar?

(A) $AsCl_5$
(B) $SiCl_4$
(C) ClF_3
(D) SF_6

53. How many sigma and pi bonds are present in CH_2CHCO_2H?

(A) 10 sigma
(B) 8 sigma, 2 pi
(C) 7 sigma, 2 pi
(D) 6 sigma, 2 pi

54. What is the hydridization of nitrogen in dinitrogen tetroxide, N_2O_4?

(A) sp^3
(B) sp^2
(C) sp
(D) dsp^2

55. When the carbon-carbon bonds in ethane (C_2H_6), ethene (C_2H_4), and benzene (C_6H_6) are arranged in order of increasing length (shortest bond first), what is the correct order?

(A) $C_2H_6 < C_2H_4 < C_6H_6$
(B) $C_2H_4 < C_2H_6 < C_6H_6$
(C) $C_6H_6 < C_2H_4 < C_2H_6$
(D) $C_2H_4 < C_6H_6 < C_2H_6$