Name: _____ **Class:** _____ **Date:** _____ **ID: A**

AP Chem Chapter 12 Random Study Guide

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1) A saturated solution
Ⓐ contains more solute than solvent.
Ⓑ contains more solvent than solute.
Ⓒ contains equal moles of solute and solvent.
Ⓓ contains the maximum amount of solute that will dissolve in that solvent at that temperature.

____ 2) The heat of solution
Ⓐ is never positive ($\Delta H°_{soln} \leq 0$), because the solute-solvent attraction is never weaker than the combination of the solute-solute attraction and solvent-solvent attraction.
Ⓑ is always positive ($\Delta H°_{soln} > 0$), because the solute-solvent attraction is always weaker than the combination of the solute-solute attraction and solvent-solvent attraction.
Ⓒ is always zero ($\Delta H°_{soln} = 0$), because the solute-solvent attraction is defined as the average of the solute-solute attraction and solvent-solvent attraction.
Ⓓ may be positive, zero, or negative, depending on the relative strength of the solute-solvent, solute-solute, and solvent-solvent attractive forces.

____ 3) In which of the following solvents would you expect KBr to be most soluble?
Ⓐ C_6H_{14} (hexane)
Ⓑ CH_3CH_2OH (ethanol)
Ⓒ C_6H_6 (benzene)
Ⓓ CCl_4 (carbon tetrachloride)

____ 4) Which of the following liquids would make a good solvent for iodine, I_2?
Ⓐ HCl
Ⓑ H_2O
Ⓒ CH_3OH
Ⓓ CS_2

____ 5) Which of the following compounds should be soluble in CCl_4?
Ⓐ NaCl
Ⓑ H_2O
Ⓒ NaOH
Ⓓ C_8H_{18}

____ 6) An endothermic solution process is described by which of the following?
Ⓐ $\Delta H > 0$, solution feels cold
Ⓑ $\Delta H > 0$, solution feels hot
Ⓒ $\Delta H < 0$, solution feels cold
Ⓓ $\Delta H < 0$, solution feels hot

____ 7) An exothermic solution process is described by which of the following?
Ⓐ $\Delta H > 0$, solution feels cold
Ⓑ $\Delta H > 0$, solution feels hot
Ⓒ $\Delta H < 0$, solution feels cold
Ⓓ $\Delta H < 0$, solution feels hot

____ 8) Calculate the mole fraction of KI in a solution made by dissolving 3.4 g of KI in 5.8 g of water.
Ⓐ 0.060
Ⓑ 0.064
Ⓒ 0.37
Ⓓ 0.59

____ 9) The solubility of gases in water usually increases with
Ⓐ increasing pressure and increasing temperature
Ⓑ increasing temperature and decreasing pressure
Ⓒ decreasing temperature and increasing pressure
Ⓓ decreasing temperature and decreasing pressure

____ 10) Which of the following gases is expected to have a higher solubility in water than what is predicted using Henry's law?
Ⓐ N_2
Ⓑ CH_4
Ⓒ Ar
Ⓓ NH_3

____ 11) Oxygen gas makes up 21 % of the atmosphere by volume. What is the solubility of $O_2(g)$ in water at 25°C if the atmospheric pressure is 741 mmHg? The Henry's law constant for oxygen gas at 25°C is 1.3×10^{-3} mol/L·atm.
Ⓐ 2.7×10^{-4} M
Ⓑ 1.3×10^{-3} M
Ⓒ 6.2×10^{-3} M
Ⓓ 9.6×10^{-3} M

____ 12) The solubility of nitrogen gas at 25°C and a nitrogen pressure of 522 mmHg is 4.7×10^{-4} mol/L. What is the value of the Henry's Law constant in mol/L atm?
Ⓐ 9.0×10^{-7} mol/L atm
Ⓑ 3.2×10^{-4} mol/L atm
Ⓒ 4.7×10^{-4} mol/L atm
Ⓓ 6.8×10^{-4} mol/L atm

____ 13) The solubility of oxygen in lakes high in the Rocky Mountains is affected by the altitude. If the solubility of O_2 from the air is 2.67×10^{-4} M at sea level and 25°C, what is the solubility of O_2 at an elevation of 12,000 ft where the atmospheric pressure is 0.657 atm? Assume the temperature is 25°C, and that the mole fraction of O_2 in air is 0.209 at both 12,000 ft and at sea level.

Ⓐ 3.66×10^{-5} M
Ⓑ 1.75×10^{-4} M
Ⓒ 2.67×10^{-4} M
Ⓓ 4.06×10^{-4} M

____ 14) At 10°C one volume of water dissolves 3.10 volumes of chlorine gas at 1.00 atm pressure. What is the Henry's Law constant in mol/L·atm?

Ⓐ 0.043
Ⓑ 0.13
Ⓒ 3.1
Ⓓ 3.8

Short Answer

15) What is the concentration of $O_2(g)$ in water at 25°C exposed to a partial pressure of oxygen of 325 mmHg? The Henry's law constant for oxygen gas at 25°C is 1.3×10^{-3} mol/L·atm.

16) The concentration of nitrogen in water at 25°C was determined to be 7.2×10^{-6} M. Calculate the partial pressure of nitrogen at the surface of the water in mmHg. The Henry's law constant for nitrogen gas at 25°C is 6.8×10^{-4} mol/L·atm?

17) Calculate the mass of solute in the following solution: 50.0 mL of 0.0300 M $C_{12}H_{22}O_{11}$.

18) The term "proof" is defined as twice the percent by volume of pure ethanol in solution. A solution that is 95% ethanol is 190 proof. What is the molarity of ethanol in a 92-proof ethanol/water solution? (Given: density of ethanol = 0.80 g/cm^3; density of water = 1.0 g/cm^3)

19) Plasma is the fluid portion of blood. The concentration of acetylsalicylic acid (aspirin, $C_9H_8O_4$, molar mass = 180. g/mol) in your plasma is found to be 2.99×10^{-4} M after you take two tablets of aspirin. If the volume of your plasma is 5.85 L, how many grams of aspirin are in your blood? (Assume that the density of plasma is 1.00 g/mL.)

True/False
Indicate whether the statement is true or false.

____ 20) The solubility of gases in water always decreases with increasing temperature.

____ 21) The solubility of a solid *always* increases with increasing solvent temperature.