

CP Chem Review 2

Matching

Match each item with the correct statement below.

- | | |
|----------------------|----------------------|
| a. activated complex | d. activation energy |
| b. reaction rate | e. free energy |
| c. inhibitor | |

- _____ 1. the minimum energy colliding particles must have in order to react
- _____ 2. arrangement of atoms at the peak of an energy barrier
- _____ 3. the number of atoms, ions, or molecules that react in a given time to form products
- _____ 4. a substance that interferes with a catalyst
- _____ 5. energy available to do work

Match each item with the correct statement below.

- | | |
|-------------------------|------------------------|
| a. spontaneous reaction | d. reaction mechanism |
| b. entropy | e. elementary reaction |
| c. chemical equilibrium | |

- _____ 6. when the forward and reverse reactions take place at the same rate
- _____ 7. a reaction that releases free energy
- _____ 8. the measure of disorder
- _____ 9. Reactants are converted to products in a single step.
- _____ 10. includes all elementary reactions of a complex reaction

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 11. Which of the following usually makes a substance dissolve faster in a solvent?
 - a. agitating the solution
 - b. increasing the particle size of the solute
 - c. lowering the temperature
 - d. decreasing the number of particles
- _____ 12. Which of the following expressions is generally used for solubility?
 - a. grams of solute per 100 grams of solvent
 - b. grams of solute per 100 milliliters of solvent
 - c. grams of solute per 100 grams of solution
 - d. grams of solute per 100 milliliters of solution
- _____ 13. Which of the following pairs of factors affects the solubility of a particular substance?
 - a. temperature and the nature of solute and solvent
 - b. temperature and degree of mixing
 - c. particle size and degree of mixing
 - d. particle size and temperature
- _____ 14. Which of the following occurs as temperature increases?

a. Solubility decreases.	c. Solubility remains the same.
b. Solubility increases.	d. Molarity doubles.

- ____ 15. The solubility of a gas in a liquid is ____.
- proportional to the square root of the pressure of the gas above the liquid
 - directly proportional to the pressure of the gas above the liquid
 - inversely proportional to the pressure of the gas above the liquid
 - unrelated to the pressure of the gas above the liquid
- ____ 16. If the solubility of a particular solute is $\frac{10 \text{ g}}{100 \text{ g H}_2\text{O}}$ at 20°C , which of the following solution concentrations would represent a supersaturated aqueous solution of that solute?
- $\frac{10 \text{ g}}{100 \text{ g H}_2\text{O}}$ at 25°C
 - $\frac{10 \text{ g}}{100 \text{ g H}_2\text{O}}$ at 15°C
 - $\frac{9 \text{ g}}{100 \text{ g H}_2\text{O}}$ at 20°C
 - $\frac{11 \text{ g}}{100 \text{ g H}_2\text{O}}$ at 20°C
- ____ 17. What happens to the solubility of a gas, in a liquid, if the partial pressure of the gas above the liquid decreases?
- The solubility decreases.
 - The solubility increases.
 - The solubility remains the same.
 - The solubility cannot be determined.
- ____ 18. In a concentrated solution there is ____.
- no solvent
 - a large amount of solute
 - a small amount of solute
 - no solute
- ____ 19. What is the molarity of a solution that contains 6 moles of solute in 2 liters of solution?
- $6M$
 - $12M$
 - $7M$
 - $3M$
- ____ 20. In which of the following is the solution concentration expressed in terms of molarity?
- $\frac{10 \text{ g of solute}}{1000 \text{ g of solution}}$
 - $\frac{10 \text{ g of solute}}{1000 \text{ mL of solution}}$
 - $\frac{10 \text{ mL of solute}}{1 \text{ L of solution}}$
 - $\frac{10 \text{ mol of solute}}{1 \text{ L of solution}}$
- ____ 21. What is the molarity of a solution containing 7.0 moles of solute in 569 mL of solution?
- $81M$
 - $0.081M$
 - $12M$
 - $4.0M$
- ____ 22. Which of the following is NOT a colligative property of a solution?
- boiling point elevation
 - supersaturation
 - vapor pressure lowering
 - freezing point depression
- ____ 23. Colligative properties depend upon the ____.
- nature of the solute
 - nature of the solvent
 - number of solute particles in a solution
 - freezing point of a solute
- ____ 24. A solute depresses the freezing point because the solute ____.
- is colder than the solvent
 - disrupts crystal formation of the solvent
 - tends to sink to the bottom of the solution
 - has bigger molecules than the solvent

- ____ 25. Another name for the activated complex is ____.
- energy barrier
 - transition state
 - rate limiter
 - collision group
- ____ 26. At what stage of a reaction do atoms have the highest energy?
- reactant stage
 - product stage
 - transition state stage
 - The stage of highest energy depends on the atom.
- ____ 27. Activation energy is ____.
- the heat released in a reaction
 - an energy barrier between reactants and products
 - the energy given off when reactants collide
 - generally very high for a reaction that takes place rapidly
- ____ 28. Why does a higher temperature cause a reaction to go faster?
- There are more collisions per second only.
 - Collisions occur with greater energy only.
 - There are more collisions per second and the collisions are of greater energy.
 - There are more collisions per second or the collisions are of greater energy.
- ____ 29. Why does a higher concentration make a reaction faster?
- There are more collisions per second only.
 - Collisions occur with greater energy only.
 - There are more collisions per second and the collisions are of greater energy.
 - There are more collisions per second or the collisions are of greater energy.
- ____ 30. Why does a catalyst cause a reaction to proceed faster?
- There are more collisions per second only.
 - The collisions occur with greater energy only.
 - The activation energy is lowered only.
 - There are more collisions per second and the collisions are of greater energy.
- ____ 31. What happens to a catalyst in a reaction?
- It is unchanged.
 - It is incorporated into the products.
 - It is incorporated into the reactants.
 - It evaporates away.
- ____ 32. A catalyst works by ____.
- lowering the activation energy barrier
 - shifting the equilibrium position toward the products
 - changing the temperature of the reactants
 - changing the particle size of the reactants
- ____ 33. The rate of a chemical reaction normally ____.
- decreases as temperature increases
 - is slowed down by a catalyst
 - increases as reactant concentration increases
 - decreases as reactant concentration increases

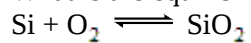
- ____ 34. Which of the following substances act as catalysts in the body?
- carbohydrates
 - nucleic acids
 - lipids
 - enzymes
- ____ 35. If a reaction is reversible, what are the relative amounts of reactant and product at the end of the reaction?
- no reactant; all product
 - no product; all reactant
 - some product; some reactant
 - The relationship between reactants and products cannot be determined.
- ____ 36. Consider the reaction $\text{N}_2(g) + 3\text{H}_2(g) \rightleftharpoons 2\text{NH}_3(g)$. What is the effect of decreasing the volume on the contained gases?
- The reaction shifts toward the product gas.
 - The system reacts by increasing the number of gas molecules.
 - The pressure on the gases decreases momentarily.
 - Ammonia is consumed in the reaction.
- ____ 37. What happens to a reaction at equilibrium when more reactant is added to the system?
- The reaction makes more products.
 - The reaction makes more reactants.
 - The reaction is unchanged.
 - The answer cannot be determined.
- ____ 38. In an endothermic reaction at equilibrium, what is the effect of raising the temperature?
- The reaction makes more products.
 - The reaction makes more reactants.
 - The reaction is unchanged.
 - The answer cannot be determined.
- ____ 39. In a reaction (at equilibrium) that makes more moles of gas than it consumes, what is the effect of increasing the pressure?
- The reaction makes more products.
 - The reaction makes more reactants.
 - The reaction is unchanged.
 - The answer cannot be determined.
- ____ 40. What is the effect of adding more water to the following equilibrium reaction?
- $$\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$$
- More H_2CO_3 is produced.
 - CO_2 concentration increases.
 - The equilibrium is pushed in the direction of reactants.
 - There is no effect.
- ____ 41. What is the equilibrium constant for the following reaction?
- $$\text{C} + \text{O}_2 \rightleftharpoons \text{CO}_2$$
- $\frac{[\text{C}][\text{O}_2]}{[\text{CO}_2]}$
 - $\frac{[\text{CO}_2]}{[\text{C}][\text{O}_2]}$
 - $\frac{[\text{C}]^2[\text{O}_2]^2}{[\text{CO}_2]^2}$
 - $\frac{[\text{CO}_2]^2}{[\text{C}]^2[\text{O}_2]^2}$
- ____ 42. If a reaction has an equilibrium constant just greater than 1, what type of reaction is it?
- irreversible
 - spontaneous
 - reversible, favoring products
 - reversible, favoring reactants
- ____ 43. The K_{eq} of a reaction is 4×10^{-7} . At equilibrium, the ____.
- reactants are favored
 - products are favored
 - reactants and products are present in equal amounts
 - rate of the forward reaction is much greater than the rate of the reverse reaction

- ___ 44. The energy that is available to do work in a reaction is called ____.
- heat
 - enthalpy
 - entropy
 - free energy
- ___ 45. Entropy measures ____.
- energy
 - heat transferred
 - disorder
 - force
- ___ 46. The amount of disorder in a system is measured by its ____.
- activation energy
 - entropy
 - equilibrium position
 - K_{eq}
- ___ 47. In which of these systems is the entropy decreasing?
- air escaping from a tire
 - snow melting
 - salt dissolving in water
 - a liquid cooling
- ___ 48. Which of the following statements is true?
- All spontaneous processes are exothermic.
 - All nonspontaneous processes are endothermic.
 - All spontaneous processes release free energy.
 - Entropy always increases in a spontaneous process.
- ___ 49. Spontaneous reactions ____.
- are always exothermic
 - always take place at a rapid rate
 - always result in increased disorder of the system
 - always release free energy
- ___ 50. What determines whether or not a reaction is spontaneous?
- change in molar volume and heat change
 - change in enthalpy only
 - enthalpy change and entropy change
 - change in entropy only
- ___ 51. When an acid reacts with a base, what compounds are formed?
- a salt only
 - water only
 - metal oxides only
 - a salt and water
- ___ 52. What is the formula for phosphoric acid?
- H_2PO_3
 - H_3PO_4
 - HPO_2
 - HPO_4
- ___ 53. Which of the following is a property of an acid?
- sour taste
 - nonelectrolyte
 - strong color
 - unreactive
- ___ 54. What is a property of a base?
- bitter taste
 - watery feel
 - strong color
 - unreactive
- ___ 55. The formula of the hydrogen ion is often written as ____.
- H_2O^+
 - OH^+
 - H^+
 - H_4N^+
- ___ 56. What is the charge on the hydronium ion?
- 2-
 - 2-
 - 0
 - 1+

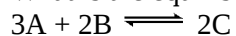
- ____ 57. The products of self-ionization of water are ____.
- a. H_3O^+ and H_2O
 - b. OH^- and OH^+
 - c. OH^+ and H^-
 - d. OH^- and H^+
- ____ 58. In a neutral solution, the $[\text{H}^+]$ is ____.
- a. $10^{-14} M$
 - b. zero
 - c. $1 \times 10^7 M$
 - d. equal to $[\text{OH}^-]$
- ____ 59. What is pH?
- a. the negative logarithm of the hydrogen ion concentration
 - b. the positive logarithm of the hydrogen ion concentration
 - c. the negative logarithm of the hydroxide ion concentration
 - d. the positive logarithm of the hydroxide ion concentration
- ____ 60. Which type of solution is one with a pH of 8?
- a. acidic
 - b. basic
 - c. neutral
 - d. The type varies, depending on the solution.
- ____ 61. Which of these solutions is the most basic?
- a. $[\text{H}^+] = 1 \times 10^{-2} M$
 - b. $[\text{OH}^-] = 1 \times 10^{-4} M$
 - c. $[\text{H}^+] = 1 \times 10^{-11} M$
 - d. $[\text{OH}^-] = 1 \times 10^{-13} M$
- ____ 62. What characterizes a strong acid or base?
- a. polar covalent bonding
 - b. complete ionization in water
 - c. ionic bonding
 - d. presence of a hydroxide or hydrogen ion
- ____ 63. The process of adding a known amount of solution of known concentration to determine the concentration of another solution is called ____.
- a. neutralization
 - b. hydrolysis
 - c. titration
 - d. buffer capacity
- ____ 64. In a titration, when the number of moles of hydrogen ions equals the number of moles of hydroxide ions, what is said to have happened?
- a. The equivalence point has been reached.
 - b. The end point has been reached.
 - c. The point of neutralization has been reached.
 - d. The titration has failed.

Short Answer

65. What is the equilibrium constant for the following reaction?



66. What is the equilibrium constant for the following reaction?



67. What is the ion-product constant for water?

68. If the $[\text{H}^+]$ in a solution is 1×10^{-1} mol/L, what is the $[\text{OH}^-]$?

69. If the pH is 9, what is the concentration of hydroxide ion?