

# MOLECULAR BONDING

- Atoms interact with one another by transferring or sharing electrons.
- The geometry of a molecule affects its physical and chemical properties.
- Carbon has a unique ability to form a variety of compounds.

1. Draw the electron dot structure and structural formula for:		
CH <sub>4</sub>	H <sub>2</sub> O	Cl <sub>2</sub>
C <sub>2</sub> H <sub>6</sub>	C <sub>2</sub> H <sub>4</sub>	C <sub>2</sub> H <sub>2</sub>

2. List the properties of molecular (also called covalent) bonds, metallic bonds, and ionic bonds. How would you test an unknown solid to determine its bond type?

3. Based on the electronegativity of the atoms in water, describe the shape of the water molecule and how this affects its properties.

4. Describe the shape of the CH<sub>4</sub> molecule using VSEPR theory.

5. What are valence electrons and what is their role in ionic and molecular bonds?
6. When iron (Fe) loses two electrons, it \_\_\_\_\_.
7. Write the electron configuration for:
- Na
  - Na<sup>+</sup>
  - F
  - F<sup>-</sup>
8. Order the following in terms of increasing electronegativity: O, Li, F
9. How many valence electrons does phosphorous have (P)?
10. Ionic bonds are \_\_\_\_\_ than molecular bonds.

## STATES OF MATTER & GAS LAWS

$$PV=nRT$$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$R= 8.31 \text{ (L x kPa) / (K x mol)}$$

1. As the average kinetic energy of a substance increases the \_\_\_\_\_ increases.
2. Apply the laws of kinetic theory to the solids, liquids, and gasses.
3. What is taking place at the molecular level when ice melts to form water? What takes place when water changes to steam? Be sure to describe how the arrangement of the molecules changes.
4. How is evaporation different from water boiling to form steam?
5. Describe sublimation and give one example.
6. Convert  $-15^{\circ}\text{C}$  to Kelvin: \_\_\_\_\_ Convert  $75^{\circ}\text{C}$  to Kelvin: \_\_\_\_\_
7. How many moles are in 60 L of  $\text{O}_2$  gas? How many molecules?
8. Describe Boyles and Charles laws. Include graphs in your explanations.

9. The pressure on 0.50L of gas changes from 10kPa to 44 kPa. What is the new volume?

10. If 60.0 liters of hydrogen gas at 546 K is cooled to 273 K at constant pressure, the new volume of the gas will be:

11. If a cylinder has a volume of 20.0L and a pressure of 20,000 kPa at 27°C, how many moles are in the cylinder?  $R = 8.31 \text{ (L} \times \text{kPa) / (K} \times \text{mol)}$

12. What volume will 12.0g of oxygen gas ( $\text{O}_2$ ) occupy at 15°C and a pressure of 52.7kPa?

13. How many moles are in 7 L of  $\text{O}_2$  gas?

# SOLUTIONS & THERMOCHEMISTRY

Molarity = moles/liters     $M = \text{mol/L}$             and             $M_1V_1 = M_2V_2$

1. A solution contains 0.7 grams of NaCl. The volume of the solution is 200 ml. What is the molarity?

2. What is the total number of grams of NaCl(s) needed to make 1.0 L of a 0.010 M solution? How much would you need to make 500ml?

3. Given a 2.0 M solution of HCl, calculate the volume you must dilute to make 3.0 L of 0.50 M HCl solution.

4. Describe hydrogen bonding. Include a diagram and an example.

5. Draw graphs for endothermic and exothermic reactions. Explain what is happening in terms of energy of the system and surroundings, enthalpy of reactants and products,  $\Delta H$ , and the progress of the reaction.

6. Draw the heating curve (graph) for water and explain what is happening as water changes from a solid to a vapor. Describe the temperature changes shown in the heating curve.

7. What are enzymes and activation energy? Draw a graph of a chemical reaction with and without an enzyme. Label the activation energy in each.

8. Define solute and solvent.

9. Define dilute and concentrated in terms of solute and solvent.

## RATES OF REACTION & EQUILIBRIUM

1. What factors influence the rate of a chemical reaction? Use collision theory in your answer.
  
  
  
  
  
  
  
  
  
  
2. What does Le Chatelier's Principle describe? How is it useful to a scientist?

For the equation,  $\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}$  what is the effect of::

- a. adding more  $\text{N}_2$
- b. removing some  $\text{N}_2$
- c. increasing the pressure
- d. decreasing the pressure
- e. adding more  $\text{NO}$

How does a catalyst affect the rate of a chemical reaction (include activation energy in your answer)? What effect does this have on the equilibrium position?

## ACID & BASES,

A strong acid or base \_\_\_\_\_ completely in solution.

What is pH and pOH? Include the mathematical definition, description and names of ions, and examples of substances and their approximate pH/pOH values.

Write the chemical equation for a neutralization reaction. How can we tell that neutralization has taken place?

List three characteristics of acids

List three characteristics of bases.

Divide the pH scale into 3 parts and tell what each part means.