

## Chapter Nine Science: Interactions of Matter and Energy Study Guide

### Lesson One

Matter-solids, liquids, and gases

Mass-amount of matter in an object

Weight-The amount of the pull of gravity between an object and Earth

Volume-amount of space taken up by an object

Density-the amount of mass in a given amount of space; can find density by

1)finding the mass

2)finding the volume

3)and dividing the mass by the volume

-when an object is placed in a less dense liquid or gas, the object will sink toward the bottom

-if the liquid or gas is more dense, the object will float toward the top

Properties-things you can observe with your senses

-may include odor, hardness, color, and shine

Physical Properties-can be observed without changing the identity of the substance

-can include color, odor, density

-can be the ability to conduct electricity and reaction to a magnet

-State-whether it is solid, liquid, or gas

Physical Change-a change in size, shape, or state without forming a new substance

Mixture-any combination of two or more substances in which the substances keep their own properties

-Suspensions-mixture made of parts that separate upon standing (fog)

-Emulsion-a suspension of two liquids that usually do not mix together (oil and water)

-Colloids-undissolved particles or droplets that stay mixed in another substance (fog or smoke)

-Solutions-mixture of one substance dissolved in another so that the properties are the same throughout. All parts have the same properties such as color, odor, and taste

-Alloys-solutions of one or more metals and other solids; are made by heating, melting, and mixing and then cools and hardens

Soluble-can be dissolved

Solute-substance that becomes dissolved (tea particles)

Solvent-part of a solution that dissolves a substance (water)

Pressure-the weight or force on a given area

Buoyant Force-fluid pushes in on the object; the push is greater at the bottom than at the top so the fluid actually pushes the object toward the surface.

### Lesson Two

Elements-substances that cannot be broken down any further into anything simpler

-can be solids, liquids, and gases

Atoms-very tiny particles that make up elements

- always the smallest particle of any element
- have same chemical properties as the element
- have an equal number of protons and electrons making them neutral

Nucleus-densest part of the atom where most of its mass is

- contains protons and neutrons
  - protons-positive electrical charge
  - neutrons-have no charge

Atomic Mass-the sum of an atom's protons and neutrons

- measured in mass units

Electrons-even smaller parts that move around the nucleus and have a negative charge

Atomic Number-number of protons in an element

Isotopes-Atoms that have the same number of protons but different numbers of neutrons

Waves-features are its frequency, wavelength, and amplitude

- Frequency-measure of how many wave crests pass a point in a unit of time
  - higher frequency shorter wavelengths; lower frequency longer wavelengths
- Amplitude-the height of the wave from trough to crest

Periodic Table

- 1868 a Russian scientist named Dmitry Mendeleev was experimenting with arranging elements
  - arranged according to atomic mass he discovered a repetitive pattern to several properties including density, metal character, and ability to react with other elements.
  - His table only had 60 elements
- Today there are at least 112 elements known (some artificial)
- Arranged in order of increasing atomic number
- Vertical columns contain elements that react with other substances in similar ways
- Each row of elements in the table is called a period
- can be placed in one of three groups metals, metalloids, and nonmetals
  - metals conduct heat and electricity, are shiny when polished, and bend rather than break
  - nonmetals-just the opposite of metals
  - metalloids-have some of the properties of metals

### Lesson Three

Chemical Change-produces substances that have new and different properties

- change in color, heat and light given off, gas is produced, powdery solid settles out of a liquid can signal a chemical change

Compound-a chemical combination of two or more substances

- has its own properties, different from the substances it is made of

Chemical Bonds-result from electrical attraction between atoms

Chemical Formula-is a way of using letters and numbers to show how much of an element is in a substance

Covalent Bond-When two nuclei attract the same electrons, they form a type of chemical bond. In a covalent bond, two atoms share electrons. Usually covalent bonds are formed by nonmetals

Ion-particle with unequal numbers of protons and electrons  
-negative ions are named by adding -ide

Ionic Bond-attraction between atoms with opposite charges  
-chemical bond

Chemical Reactions-chemical changes  
-Reactants-original substances  
-Products-new substances  
-Three main types-synthesis reaction, replacement reaction, decomposition reaction  
-Synthesis reaction-involve two separate things joining together to form one compound  
-Decomposition Reaction-breaking down of a more complex substance into two simpler substances  
-Replacement Reaction-takes place when elements switch, or replace each other

Chemical Property-a way of describing a substance by how it reacts to other substances

Molecule-group of atoms covalently bonded together; are bonded so tightly they act like a single particle  
-elements and compounds can be made of molecules

Acids-wide variety of compounds with different properties and uses  
-indicator-a substance that changes color in the presence of a test substance; color results from a chemical change  
-Litmus paper-acid causes blue paper to turn red  
-PH paper-measures the exact strength of acids

Base-group of compounds that share some special properties  
-bitter taste, slippery (you should not taste or feel because they may be dangerous)  
-used in many cleans because they can dissolve hair, wool, grease, and fingernails  
-red litmus paper turns blue in the presence of a base

Exothermic-chemical reactions that give off heat  
-not all produce a flame

Endothermic-chemical energy that absorbs energy  
-require a constant supply of energy to keep going