

Science Starters
Worksheet #7
TAKS Objective 4

61. Mixtures

When materials are combined without uniting chemically they form a _____. In a mixture no chemical reaction has occurred.

There are two types of mixtures:

- Heterogeneous the materials are not evenly dispersed. You can see the different materials.
 - Chocolate chip cookies, soil.
- Homogeneous- same composition throughout. You cannot distinguish the different materials.
 - Kool-aid, air , saltwater

A solution is a type of _____ mixture. The particles are too small to be distinguished from each other and remain evenly mixed.

Saltwater is an example of a solution. Salt is the solute and water is the solvent.

Mixtures can be separated. Because they are not chemically combined, the materials in a mixture can be separated by physical means.

Questions

1. What is the difference between a heterogeneous mixture and a homogeneous mixture?
2. Can sugar dissolved in water be separated? Explain.

62. Elements

Elements- made of _____ 1 kind of atom (on the periodic table)

An element is a pure substance that cannot be broken down into a simpler substance. An atom is the smallest particle of an element that still has the properties of the element.

Examples of elements include: Gold, silver, oxygen carbon, hydrogen, nitrogen.

The elements are organized on the _____ table.

The properties of an element determine its placement on the periodic table.

The Periodic Table includes the following information for each element:

- Atomic number- the number of protons in a single atom of this element. (If the atom is neutral it's also the # of electrons.)
- The _____ for this element.
- Average Atomic mass - the number of protons + neutrons, or the average mass of the nucleus of an atom.
- The name of the element

Questions

1. What is a pure substance?
2. Name 4 elements.

63. Atomic Structure

Atoms are made up of protons, neutrons, and electrons. The protons and neutrons are located in the _____ of the atom and the electrons surround the nucleus forming an electron cloud.

Protons have a positive charge.

Neutrons have no charge (neutral)

Electrons have a negative charge.

Helium Atom has _____ protons, 2 neutrons and _____ electrons.

Electrons form energy levels.

The 1st level will hold a maximum of 2 electrons. The 2nd level will hold a maximum of _____ electrons. The 3rd energy level holds a maximum of 18 electrons but only 8 are available for bonding.

Electrons in the outermost energy level are called _____ electrons.

Questions

1. List the location and the charge of the 3 subatomic particles.
2. What are valence electrons?

64. Metals, Nonmetals and Metalloids

4 Basic Types of Elements:

- Metals: found on the _____ and center of the Table of Elements
- Non-metals: found on the right side of the Table of Elements
- Metalloids: found along the _____ line
- Synthetic: made in the laboratory and not yet found in nature.
Includes many of the Actinide and Lanthanide series and very large # elements.

Metals, shown in pink, are located to the left of the stair step. (Hydrogen is not a metal.) Most elements are metals.

Properties of Metals:

- Metals are:
 - _____
 - Lustrous
 - Electron donors
 - Malleable -can be hammered into thin sheets
 - Ductile-made into a thin wire

Nonmetals, shown in blue, are to the right of the stair step. Hydrogen is included in this group.

Properties of Nonmetals:

- Nonmetals are brittle, _____ and electron acceptors.
- They usually form negative ions (except H).
- Many are gases at room temperature.

Metalloids have properties of both metals and non metals and are found along the stair step.

Metals tend to _____ valence electrons and nonmetals gain valence electrons.

The Noble Gases are nonmetals that **don't** gain electrons because their outermost energy levels are already full.

To remember that _____ tend to lose electrons and nonmetals tend to gain electrons, imagine the elements on the left side of the periodic table throwing electrons at the elements on the right side.

Metals in group 1 (alkali metals) are most likely to donate, or give up, 1 electron to become more stable.

Metals in group 2 are most likely to donate, or give up, 2 _____ to become more stable.

Nonmetals in group 17 (7A - halogens) are most likely to accept 1 electron to become more stable. Then their outermost energy level will be filled.

_____ in group 16 (6A) are most likely to accept 2 electrons to become more stable.

Questions

1. Where on the periodic table will you find the metals most likely to donate 1 electron?
2. The noble gases in group 18 (8A) are non metals that do not accept electrons. Why not?

65. Periodic Groups and Valence Electrons

Groups on the periodic table are found in _____ columns.

Elements in groups 1-2 and 13-18 are the "**Main Group**" elements.

_____ in groups 1-2 and 13-18 are also known as groups 1A-2A and 3A-8A.

The TAKS periodic table has the main group elements labeled both ways.

Elements in groups 3-12 are called the _____ elements (B group elements).

Remember that valence electrons are the electrons in the outermost energy level that are available to be lost, gained or shared for bonding.

Elements in the same main groups have the same _____ of valence electrons.

Elements with the same number of valence electrons have similar bonding characteristics.

The elements in group 1 have 1 valence electron.

Group 2 has _____ valence electrons.

Group 13 (3A) has 3 valence electrons.

Group 14 (4A) has _____ valence electrons.

Group 15 (5A) has 5 valence electrons.

Group 16 (6A) has _____ valence electrons.

Group 17 (7A) has 7 valence electrons.

Group 18 (8A) has _____ valence electrons. Exception: Helium has 2 valence electrons. Since helium only has one electron shell, it has a full outer energy level.

Questions

1. Why do elements in the same group have similar bonding characteristics?
2. How many valence electrons do elements in group 2 have?
How many valence electrons do elements in group 15 (5A) have?

66. Periodic Groups and Reactivity

Some elements are highly _____ so they easily combine chemically with other elements. Reactive and nonreactive elements are grouped together on the periodic table.

Groups on the periodic table are found in vertical columns. Elements in the same group have similar properties.

Elements in group 1 have 1 valence electron and are very _____ metals. They are called the alkali metals. Remember that hydrogen is in group 1 because it has 1 valence electron, but it is not a metal.

Group 2 includes elements with 2 valence electrons. They are reactive but not as reactive as group 1. They are called the alkaline earth metals.

The elements in group 17 (7A) are the _____ nonmetals. Group 17 (7A) elements are called the halogens.

Halogens (group 17) react with alkali metals (group 1) to form salts. An example is NaCl, or table salt.

Remember, atoms are "happy" atoms if their _____ energy levels are filled! Metals lose electrons and nonmetals gain electrons to become "happy". Where do you find the happy atoms on the periodic table? On the far right, the inert or noble gases have full outer electron shells. They rarely combine with other elements.

The closer an atom is to having 8 _____ electrons, the more reactive it is.

The closer an atom gets to having a complete outer electron shell the more _____ it becomes. Unstable atoms are reactive atoms ☺

Questions

1. What group of metals are the most reactive and why are they the most reactive?
2. What group of nonmetals are the most reactive and why are they the most reactive?

67. Ionic Bonds

When an atom loses electrons, it has more protons than electrons. This causes the atom to have a positive charge. It is a positive ion.

A _____ is an ion with more protons than electrons.

A cation has a positive charge.

When an atom gains electrons, it has more electrons than protons. This causes the atom to have a negative charge. It is a negative ion.

An _____ is an ion with more electrons than protons.

An anion has a negative charge.

Some atoms can fill their outermost energy levels by giving up or _____ electrons, forming an ionic bond.

An ionic bond often joins a metal to a nonmetal. Metals lose electrons and nonmetals gain electrons.

Questions

1. What makes an atom "happy"?
2. How does an ionic bond form?

68. Ionic Compounds

Ion - an atom with a charge. An _____ bond forms between positive and negative ions. An ionic compound is formed!

When metals lose electrons they have more protons than electrons and will have a positive charge. When _____ gain electrons they will have more electrons than protons and will have a negative charge.

Metals lose electrons to become positive ions. Nonmetals gain electrons to become _____ ions.

When atoms in group 1 _____ 1 electron they become 1+ ions. Atoms in group 7 accept 1 electron and become 1- ions.

Atoms in group 2 lose 2 electrons to become 2+ ions. Atoms in group 6A (16) _____ 2 electrons to become 2- ions.

Atoms in group 3A (13) lose 3 electrons to become 3+ _____. Atoms in group 5A (15) gain 3 electrons to become 3- ions.

_____ in group 4A (14) do not usually form ions.

Group 8, the noble gases, don't form ions because their outer electron level is full.

In ionic compounds the total + charges must _____ the total - charges. The charges must balance and add to zero.

How do you figure out what ionic compound is formed between sodium (Na) and oxygen (O)?

Sodium is in group 1 so we know it forms 1+ ions. Oxygen is in group 6A (16) so we know it forms 2- ions.

To figure out what compound Na¹⁺ and O²⁻ will form, just _____ the charge numbers so they become subscripts. An ionic compound formed between sodium and oxygen must have 2 sodium (Na) ions and 1 oxygen (O) ion. The 1 after oxygen is not necessary so the compound is Na₂O.

Questions

1. When forming the ionic compound magnesium bromide, how do you determine how many atoms of each are in the compound? Show your work.
2. Why do we say that ionic bonds are give and take bonds?

69. Covalent Bonds

An atom is a happy atom if its outermost energy level is _____!

Hydrogen-1 valence electron-Hydrogen needs 1 more electron to be "happy"

Oxygen-6 valence electrons-Oxygen needs 2 more electrons

Nitrogen -5 valence electrons-Nitrogen needs 3 more electrons

Carbon-4 valence electrons- Carbon _____ 4 more electrons

Some atoms can fill their outermost energy levels by sharing electrons. This is called a covalent bond.

_____ Bond-These two hydrogen atoms are sharing electrons. A covalent bond is formed when electrons are shared. By sharing electrons they each have 2 electrons (the maximum number for the 1st energy level) orbiting their nucleus. This makes them "happy" ☺

Covalent bonds between carbon and hydrogen. CH_4 = Methane Gas

_____ is formed by polar covalent bonds. The shared electrons spend more time around the oxygen and less time around the hydrogens, which gives the oxygen end a slightly negative charge and the hydrogen end a slightly positive charge. A polar molecule has a positive pole and a negative pole.

The polarity of the water molecule gives it unique properties.

Questions

1. Covalent bonds are formed when two or more (usually nonmetal) elements share electrons. What is the purpose of sharing electrons?
2. What do we mean when we say water is polar?

70. Electronegativity

Electronegativity describes the power of an atom to _____ electrons toward itself when bonded.

Groups on the periodic table are found in vertical columns.

Periods on the periodic table are _____ rows.

Electronegativity generally increases as you move from _____ to _____ across a period.

Electronegativity generally increases as you move _____ a group.

Fluorine (F) has the highest electronegativity.

Questions

1. Why are the nonmetals generally more electronegative than metals?
2. What is electronegativity?

Quiz Next Class!