

# CHEMISTRY STUDY GUIDE

Element  
Mixture  
Compound  
Colloid  
Solution  
Chemical Reaction  
Physical Reaction  
Solute  
Solvent  
Covalent Bond  
Ionic Bond  
Ion  
Subscript  
Coefficient  
Reactants  
Products  
Isotope

Metals  
Non-Metals  
Periods  
Families  
Solid  
Liquid  
Gas  
Melting  
Freezing  
Boiling  
Evaporation  
Condensation  
Protons  
Neutrons  
Electrons  
Nucleus  
Diatomic Elements  
Valence Electrons

**Draw the Following Bohr Models**

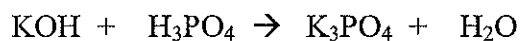
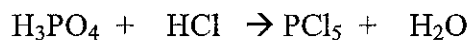
Mg

Sulfur

Potassium

Al

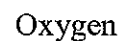
**Balance the Following:**



**Draw the Following Bonds:**



**Draw the Following in  
Lewis Dot Diagram Form:**



**Concepts to know:**

Why would atoms form a bond?

Ionic vs. Covalent (What is each)

Hydrogen “breaks the rules”

Lewis Dot Diagrams

Balancing Equations

Why don't we see bonds with family #8?

Determining Isotopes

Hydrogen and Hydrogen:

Sodium and Chlorine:

## Multiple Choice

1. Protons are located in the nucleus of the atom. A proton has
  - a) No charge
  - b) A negative charge
  - c) A positive and a negative charge
  - d) A positive charge
2. Neutrons are in the nucleus of the atom. A neutron has
  - a) A positive charge
  - b) No charge
  - c) A negative charge
  - d) Twice as much positive charge as a proton
3. An electron is in a region outside the nucleus. An electron
  - a) Is larger than a proton and has no charge
  - b) Has less mass than a proton and has a negative charge
  - c) Is smaller than a proton and has no charge
  - d) Has a positive charge
4. A hydrogen atom is made up of one proton and one electron. The proton and electron stay near each other because
  - a) Positive and negative charges repel
  - b) Positive and positive charges repel
  - c) Positive and negative charges attract
  - d) Two negatives make a positive
5. The atomic number of an atom is
  - a) The mass of the atom
  - b) The number of protons added to the number of neutrons
  - c) The number of protons
  - d) Negatively charged
6. The atoms of the same element can have different isotopes. An isotope of an atom
  - a) Is an atom with a different number of protons
  - b) Is an atom with a different number of neutrons
  - c) Is an atom with a different number of electrons
  - d) Has a different atomic number
7. The atomic mass of an element is
  - a) The average mass of all the isotopes of the element
  - b) A measure of the density of that element
  - c) The mass of the most common isotope of that element
  - d) The number of protons and electrons in the atoms of the element
8. An element and an atom are different but related because
  - a) A particular element is made up of many different types of atoms
  - b) A molecule is the same as an atom
  - c) An element is made up of all the same type of atom
  - d) An element is smaller than an atom

9. The periodic table shows that a carbon atom has six protons. This means that a carbon atom also has

- a) Six electrons
- b) Six neutrons
- c) More protons than electrons
- d) An atomic mass that equals six

10. The atomic number of nitrogen is 7. The atomic mass is 14.01. This means that

- a) All nitrogen atoms have exactly 7 neutrons.
- b) A small percentage of nitrogen atoms have fewer than 7 neutrons
- c) A small percentage of nitrogen atoms have more than 7 neutrons
- d) Some nitrogen atoms have fewer than 7 electrons

11. Electrons are in regions around the nucleus called energy levels. The first energy level

- a) Is furthest from the nucleus
- b) Is closest to the nucleus
- c) Holds the most electrons
- d) Needs more than two electrons to fill it up

12. Neon has 10 protons and 10 electrons. The electrons fill the energy levels in Neon like this:

- a) 2 in the first, 2 in the second, and 6 in the third
- b) 4 in the first, 4 in the second, and 2 in the third
- c) 2 in the first, 4 in the second, and 4 in the third
- d) 2 in the first, and 8 in the second

13. The atoms in a column of the periodic table all have

- a) The same abbreviation
- b) The same number of energy levels
- c) The same number of electrons
- d) The same number of electrons in the outer energy level

14. In the process of covalent bonding, atoms share electrons. This means that

- a) Electrons from each atom are attracted to the nucleus of both atoms
- b) Protons and neutrons attract
- c) Atoms lose electrons and become ions
- d) Atoms gain electrons and become ions

15. In the process of ionic bonding

- a) Both atoms gain electrons
- b) One atom gains one or more electrons and the other loses the same number
- c) Atoms switch protons
- d) Both atoms lose electrons

16. In the process of ionic bonding, ions come together because

- a) Opposite charges repel
- b) Positive and negative ions attract
- c) Salt is magnetic
- d) Like charges attract each other

17. In a Lewis dot diagram, the electrons shown

- a) Are in the innermost energy level
- b) Always equal the number of protons
- c) Are in the outermost energy level
- d) Always add up to an even number

True/False and Fill-in-the-blank

True or false?

Electrons are found in the nucleus of an atom.

True or false?

Neutrons and electrons are attracted to one another.

The atomic number of an atom is equal to the number of \_\_\_\_\_ in the atom's \_\_\_\_\_.

Different atoms of the same element can have a different number of \_\_\_\_\_.

The electrons of an atom are located in regions around the nucleus called \_\_\_\_\_.

True or false?

The first energy level of atom is closest to the nucleus.

True or false?

In a covalent bond, electrons are shared between two atoms.

The electrons on the outermost energy level of an atom are called \_\_\_\_\_ electrons.

True or false?

In an ionic bond, electrons are shared between two atoms.

When an atom loses an electron, it forms a \_\_\_\_\_ ion.

When an atom gains an electron, it forms a \_\_\_\_\_ ion.

Lewis dot structures are a shorthand way of showing only the valence \_\_\_\_\_ of an atom.

True or false?

It is possible to have double covalent bond.

## Short Answer

1. What are the three common subatomic particles? Where are they found within an atom? What charge do they have?
2. When you charged a strip of plastic by rubbing it through your fingers or on cloth, you actually transferred electrons onto the plastic strip. Using the terms "electrons" and "protons", and "negative" and "positive", explain why the strip was attracted to your fingers or the cloth you rubbed it on.
3. When you rub a balloon on your hair, electrons are transferred onto the balloon. Using the terms "electrons" and "protons", and "negative" and "positive", explain why a rubbed balloon is attracted to and sticks to a wall even though you didn't rub the balloon on the wall.
4. How is it that different atoms of the same element can have slightly different atomic masses?
5. What is the difference between the atomic number and atomic mass of an element in the periodic table?
6. If you know the atomic number of an element in the periodic table, do you also know the number of neutrons in any atom of that element? Explain.
7. Magnesium's atomic number is 12. Magnesium's atomic mass is 24.30. If all magnesium atoms had 12 neutrons, its atomic mass would be about 24.00. If all magnesium atoms had 13 neutrons, its atomic mass would be about 25.00. Explain why the atomic mass of magnesium is between 24 and 25.
8. What are the "energy levels" of an atom?
9. What is special about valence electrons?
10. If you know that an atom has 6 electrons on the second energy level and no electrons on the third energy level, explain how you know that this atom must be oxygen.
11. What does it mean for two atoms to be covalently bonded?
12. If you put an electric current through water, the electricity can actually break the covalent bonds between the hydrogen atoms and the oxygen atom in the water molecules. This process releases oxygen gas ( $O_2$ ) and hydrogen gas ( $H_2$ ). Think about the formula for water ( $H_2O$ ) and explain why this process produces more hydrogen gas than oxygen gas.
13. What is an ion and how is it formed?
14. Assume that two atoms interact and become ions. Explain why the atom that loses an electron becomes a positively charged ion and the atom that gains an electron becomes a negatively charged ion.
15. How is ionic bonding different than covalent bonding?
16. Use the series of pictures below to explain what happens between sodium (Na) and chlorine (Cl) atoms to make an ionic bond to form sodium chloride (NaCl).
17. What do the dots in a Lewis dot diagram show and why are they useful?
18. Carbon has 6 protons in its nucleus and 6 electrons. Why does the Lewis dot structure for carbon only show 4 electrons?