

BIO 130 (General Biology)

Worksheet 4: The basics of Life & Molecules of Life

Name: _____ Date: _____

Read the following and answer questions 1-13

ATOMS: The basic building block of matter is element. Ex. OXYGEN (O), HYDROGEN (H), SODIUM (Na), CHLORINE (Cl), NITROGEN (N). Two or more elements may combine together in a certain proportion to form a compound. Each unit of a compound is called a molecule. Smallest part of an element that still acts like that element is called an atom. It consists of 3 particles: A) protons (positively charged), and B) neutrons (neutral) are located in the nucleus while C) electrons (negatively charged) move in orbits around the nucleus. **In an atom, the number of protons is equal to the number of electrons**, hence an atom is neutrally charged. The atomic number of an atom is equal to the number of protons. The atomic mass number (atomic weight) of an atom is equal to the number of protons plus the number of neutrons. Mass number (rounded off) minus the atomic number is equal to the number of neutrons.

Atomic # = # of Protons.

of protons (atomic #) = # of electrons.

Mass# (Atomic Weight) = # of protons + # of neutrons.

Mass # (rounded off) – Atomic # = # of neutrons.

1. What two particles are located in the nucleus of an atom? (3 pts)

2. Why an atom is neutrally charged? (3 pts) _____

3. What compound is formed when two parts of hydrogen combines with one part of oxygen? (3 pts)

4. What is an atomic number? (3 pts)

Calculate the following (Show your work where applicable):

5. How many atoms of hydrogen are present in one molecule of table sugar, $C_{12}H_{22}O_{11}$? (3 pts)

6. What is the atomic mass (mass number) of an atom of phosphorus (P) which contains 15 protons and 16 neutrons within its nucleus? **Show your work** (5pts)

7. What is the atomic mass (mass number) of an atom of nickel (Ni) which contains 28 protons and 31 neutrons within its nucleus? **Show your work** (5pts)

8. What is the atomic mass (mass number) of an atom of sulfur (S) which contains 16 protons and 16 neutrons within its nucleus? **Show your work** (5pts)

9. What is the number of protons in an atom with atomic number 12 and mass number 22? (4pts)

10. What is the number of electrons in an atom with atomic number 12 and mass number 22? (4pts)

11. The mass number for oxygen (O) is 16 and it has 8 protons. Calculate the number of neutrons. (**show your work**) (5pts) _____

12. The mass number for bromine (Br) is 80 and it has 35 protons. Calculate the number of neutrons.
(*show your work*) (5pts)
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13. The mass number for magnesium (Mg) is 24 and it has 12 protons. Calculate the number of neutrons.
(*show your work*) (5pts)
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14. Determine the number of **electrons** in an atom of the following elements: (4x1=4 pts)

A.	19 K 39.10	B.	30 Zn 65.41	C.	7 N 14.01	D.	35 Br 79.90
	Potassium		Zinc		Nitrogen		Bromine
	A. _____		B. _____		C. _____		D. _____

Valance Electrons: the number of electrons in the outermost shell of an atom.

15. Refer to the periodic table and determine the number of valance electrons for each of the following elements: (4x 4 =16 pts)
- A. Calcium (Ca) _____ B. Phosphorus (P) _____
 C. Sodium (Na) _____ D. Chlorine (Cl) _____

Ion: Atom that has either gained or lost one or more electrons is an ion. Ions are charged atoms. Atoms that *lose* one or more electrons become positively charged. When an atom *gains* one or more electrons, it becomes negatively charged. (5 x 3 = 15 pts)

16. If an atom gains 3 electrons, what is the net charge? _____
 17. If an atom loses 2 electrons, what is the net charge? _____
 18. If an atom gains 1 electron, what is the net charge? _____
 19. If an atom loses 1 electron, what is the net charge? _____
 20. What is the charge of an atom? _____

Chemical Reactions: When atoms or molecules interact (reactants) with each other to form new combinations (reactants), a chemical reaction takes place. Salts are formed when an acid is mixed with a base.

EX. $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ **Reactants** are substances that are changed, usually on the left side of the equation. **Products** are new chemical substances formed, usually on the right side of the equation.

21. Identify the **REACTANTS** in the following chemical equations:
- A. $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$ _____ (2pts)
 B. $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ _____ (2 pts)
 C. $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow 2 \text{NaCl} + \text{BaSO}_4$ _____ (2 pts)
22. Identify the **PRODUCTS** in the following chemical equations:
- A. $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ _____ (2 pts)
 B. $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$ _____ (2 pts)
 C. $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$ _____ (2 pts)

