Metric System Handout/Worksheet *8/03*
Integrated Science 1
Redwood High School **Name:** **Period:**

Background

The system of measurement used today by scientists in all countries of the world is called the **metric system.** The metric system is a decimal system, meaning it is based on the number ten and multiples of ten, such as 100 and 1000. This handout will act as your reference to the metric system throughout Integrated Science 1 and 2.

Units

Length (L) [typical tool used = meter stick]

Length is the distance from one point to another. The basic unit of length in the metric system is a **meter (m)**. A meter is slightly longer than a yard.

1 meter (m) = 100 centimeters (cm)
1 meter (m) = 1,000 millimeters (mm)
1 meter (m) = 1,000,000 micrometers (μm)

1,000 meters = 1 kilometer (km)
1 centimeter = 10 millimeters (mm)

Volume (V) [typical tool used = graduated cylinder]

Volume is the amount of space an object takes up. The basic unit of volume in the metric system is a **liter (l).**

1 liter (l) = 1,000 milliliters (ml) = 1000 cubic centimeters (cm^3)

Temperature (T) [typical tool used = mercury thermometer]

Temperature measures the average kinetic energy of the particles in a substance. Kinetic energy is the energy of motion. More energy = more particle motion = higher temperature. Likewise, less energy = less particle motion = lower temp. In the metric system, temperature is measured in degrees **Celsius (°C)**

0° C = freezing point of water 100°C = boiling point of water

Mass (M) [typical tool used = electronic balance]

Mass is commonly used to describe the weight of an object. The basic unit of mass is a **gram (g)**.

1 kilogram (kg) = 1,000 grams (g) 1,000 milligrams (mg) = 1 gram

Conversions

Conversions between units, is a skill needed when working with the metric system. The following example should be your primary way of converting units.

Example: convert 152 meters in centimeters.

Solution:

the value you are converting → $\frac{152\text{m}}{} \times \frac{100\text{ cm}}{1\text{ meter}} = 15{,}200\text{cm}$

this fraction is an equivalency that features the unit you are converting from as the denominator - and your target unit as the numerator

this is the answer obtained by canceling the meter units - leaving centimeters - which was your target unit

■ Practice Unit Conversions

Complete the following problems (in the space provided) by showing all of your work - and by drawing a box around your final answer.
"showing all of your work" means setting up the entire equation and using unit abbreviations for each value

1. 3 meters into centimeters

2. 10 kilometers into meters

3. 15,050 milligrams into grams

4. 3,264 milliliters into liters

5. 9,674,444 grams into kilograms

6. 3.1 kilograms into milligrams

7. 5,897,159 milligrams into kilograms

Questions 1-7 were conversion problems within the metric system. Questions 8-13 are unique conversion problems because they are asking you to convert between two different systems: the English System and the Metric System

As long as the English system continues to be used, conversions between the two systems will be necessary. Use the conversion factors below to complete the problems that follow.

Length	Volume	Mass
2.54 centimeter = 1 inch	1 liter = 1.06 quarts	1 kilogram = 2.20 pounds
1 meter = 3.28 feet	3.79 liters = 1 gallon	
1 meter = 1.094 yards		
1.609 kilometer = 1 mile		

8. 4.5 inches into centimeters

9. 25.3 meters into feet

10. 2.3 miles into kilometers

11. 14 inches into centimeters

12. 125 pounds into kilograms

13. 20 gallons into liters

Basic Atomic Structure Worksheet

1. The 3 particles of the atom are:

   a. _____
   b. _____
   c. _____

   Their respective charges are:

   a. _____
   b. _____
   c. _____

2. The number of protons in one atom of an element determines the atom's _____, and the number of electrons determines the _____ of the element.

3. The atomic number tells you the number of _____ in one atom of an element. It also tells you the number of _____ in a neutral atom of that element. The atomic number gives the "identity" of an element as well as its location on the periodic table. No two different elements will have the _____ atomic number.

4. The _____ of an element is the average mass of an element's naturally occurring atom, or isotopes, taking into account the _____ of each isotope.

5. The _____ of an element is the total number of protons and neutrons in the _____ of the atom.

6. The mass number is used to calculate the number of _____ in one atom of an element. In order to calculate the number of neutrons you must subtract the _____ from the _____.

7. Give the symbol of and the number of protons in one atom of:

   Lithium _____ Bromine _____

   Iron _____ Copper _____

   Oxygen _____ Mercury _____

   Krypton _____ Helium _____

8. Give the symbol of and the number of electrons in a neutral atom of:

   Uranium _____ Iodine _____

   Boron _____ Xenon _____

   Chlorine _____

9. Give the symbol of and the number of neutrons in one atom of:

   (Mass numbers are ALWAYS whole numbers...show your calculations)

   Barium _____ Bismuth _____

   Carbon _____ Hydrogen _____

   Fluorine _____ Magnesium _____

   Europium _____ Mercury _____

10. Name the element which has the following numbers of particles:

    a. 26 electrons, 29 neutrons, 26 protons _____

    b. 53 protons, 74 neutrons _____

    c. 2 electrons (neutral atoms) _____

    d. 20 protons _____

    e. 86 electrons, 125 neutrons, 82 protons _____

    f. 0 neutrons _____

11. If you know ONLY the following information can you ALWAYS determine what the element is? (Yes/No)

    a. Number of protons _____

    b. Number of neutrons _____

    c. Number of electrons in a neutral atom _____

    d. Number of electrons _____

12. Fill in the missing items in the table below.

NAME	SYMBOL	Z	A	# PROTONS	# ELECTRONS	# NEUTRONS	ISOTOPIC SYMBOL
a.	Na						
b.		17			18		
c. Potassium							
d.	P						
e. Iron					24		
f.				53			
g. Silver							
h.		36					
i.	W						
j.		29					
k.				49			
l.				79	78		
m.		16			18		