

The Metric System

Name: _____

Date: _____ Period: _____

I. INTERNATIONAL SYSTEM OF UNITS

As you know, it is very important that all the scientists in the world use the same units. In 1960, the *Système international d'unités* was created. In English it is called: the International System of Units (SI), which is also known as the **Metric System**. All scientists use the metric system in order to avoid mistakes and miscommunications associated with using different units. Every country in the world has adopted the metric system except for three: The United States, Berma, and Liberia.

1. Fill in the missing information on the table of physical quantities.

Physical Quantity	Symbol	SI Unit (abbreviation)
	x	meters (m)
Force		newtons (N)
Mass		
	t	
	f	hertz (Hz)
	v	meters per second (m/s)
Energy		joule (J)
	P	watt (W)

2. In the metric system, how many standard units are there for each physical quantity?

3. Why was the international system of units (the metric system) invented?

II. PHYSICAL QUANTITIES VS. UNITS

A common mistake of a beginning physics student is the confusion of *physical quantities* and *units of measure*. **Physical quantities** are any of the characteristics of objects in nature that can be measured. **Units of measure** are the basic standards of measurement used to measure a physical quantity. Different physical quantities are measured in different units of measure. For example, you wouldn't measure your weight by using seconds!

4. Indicate whether the underlined **symbol** is a physical quantity or a unit then write what it stands for.

(a) I burned a million J of energy at the gym.

___ Physical Quantity

___ Unit

(b) My Wi-Fi router is set to f of 2.4 GHz.

___ Physical Quantity

___ Unit

(c) The F of the engine was 20 MN.

___ Physical Quantity

___ Unit

(d) The length of my car is about 5 m.

___ Physical Quantity

___ Unit

(e) v = 30 m/s

___ Physical Quantity

___ Unit

(f) $t = 1.20$ s

___ Physical Quantity

___ Unit

III. POWERS OF TEN

Before we continue our discussion of the Metric System we need to review the mathematics of exponents. When writing numbers it is often easier to express the number as an exponent of the base number 10. For example, the number 100 can be written as 10^2 . This is because 10^2 means 10×10 which is equal to 100. We use the base number 10 because multiplying and dividing by 10 can be accomplished very quickly and easily by simply moving the decimal place.

5. Write the power of ten as a number or write the number as a power of ten.

a) 10^3

b) 10^{-3}

a) _____ 10000000

b) _____ 0.0000001

6. Convert each power of ten into a number or convert the number into a power of ten.

10^2 = _____

10^{-3} = _____

0.000001 = _____

0.001 = _____

10^4 = _____

10^5 = _____

10,000 = _____

100 = _____

10^{-2} = _____

IV. METRIC PREFIXES

The problem with using standard units to make measurements is that sometimes you will measure something that is much larger or much smaller than the standard unit. For example, the distance from the Earth to the Sun is over 100000000000 meters. Alternatively, the radius of a proton is less than 0.000000000000001 meters. The Metric System solves this problem by allowing the use of prefixes which can be added in front of a unit in order to shrink or expand the standard unit to fit the size of the object being measured. Using metric prefixes we say the distance from the Earth to the Sun is 93 Gm (giga-meters) and the radius of a proton is less than 1 fm (femto-meter). Prefixes make it much easier to record scientific measurements!

7. Fill in the missing information.

Number	Power	Metric Prefix	
1,000,000,000			giga
	10^6		mega
1,000		k	
0.001		m	
	10^{-6}		micro
0.000 000 001			nano

8. Write out the full name of each unit.

a) km _____

b) ms _____

c) GW _____

d) mm _____