Name: _____ Date: _____

m_r^β Physics Practice: Scientific Notation and more units practice

The International System of Units (SI) brought you words like terabyte, gigabit, megawatt, kilometer, centimeter, milliliter, microsecond, and nanotechnology. But wait, there's more:

SI prefix	symbol	10^n	Decimal	English word
yotta	Y	10^{24}	1,000,000,000,000,000,000,000,000	septillion
zetta	Z	10^{21}	1,000,000,000,000,000,000,000	sextillion
exa	E	10^{18}	1,000,000,000,000,000,000	quintillion
peta	P	10^{15}	1,000,000,000,000,000	quadrillion
tera	T	10^{12}	1,000,000,000,000	trillion
giga	G	10^{9}	1,000,000,000	billion
mega	M	10^{6}	1,000,000	million
kilo	k	10^{3}	1,000	thousand
hecto	h	10^{2}	100	hundred
deca	da	10^{1}	10	ten
		10^{0}	1	one
deci	d	10^{-1}	0.1	tenth
centi	c	10^{-2}	0.01	hundredth
milli	m	10^{-3}	0.001	thousandth
micro	μ	10^{-6}	0.000001	millionth
nano	n	10^{-9}	0.000000001	billionth
pico	p	10^{-12}	0.000000000001	trillionth
femto	f	10^{-15}	0.000000000000001	quadrillionth
atto	a	10^{-18}	0.000000000000000001	quintillionth
zepto	z	10^{-21}	0.000000000000000000001	sextillionth
yocto	y	10^{-24}	0.000000000000000000000001	septillionth

In many cases, keeping track of all those decimal places is difficult and error-prone. Physics in particular often deals in quantities that are much greater or much less than one. So let's get comfortable with the very large and the very small.

Express your answers in both scientific notation. and decimal notation. For example, the speed of light is about 3×10^8 m/s, or 300,000,000 /ms. **Show all work.**

Use either a TI-84, or desmos.com as a calculator.

1. If light travels 3×10^8 m/s, how many meters does it travel in

a. a nanosecond?

b. a femtosecond?

c. a gigasecond?

2. The earth's mass is 6×10^{24} kg. What is its mass in

a. grams?

b. milligrams?

c. metric tons (where a metric ton is 1000 kilograms)?

3. How far does light travel in a year, measured in

a. meters?

b. kilometers?

c. centimeters?

4. How tall are you in

a. inches?

b. centimeters (where one inch equals 2.54 centimeters)?

c. meters?

d. nanometers?

e. kilometers?

f. light years?

5. The observable universe has a diameter of 93 billion light years. What is the diameter of the universe in meters?

6. The diameter of a hydrogen nucleus is 1.75 fm. How many hydrogen nuclei laid out in a line would it take to span the universe?

7. The average density of the observable universe is 6 protons per cubic meter. How massive is a region the size of earth with that density?