

**PHYSICS 2204**  
**UNIT 1: KINEMATICS**  
**WORKSHEET #1: MEASUREMENT AND UNITS**



**STUDENT NAME:** \_\_\_\_\_

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**Physics:** is the study of motion, matter, energy, and force.

**Qualitative Descriptions:** are descriptions made by observing with the 5 senses, such as the smell of a flower or the colour of someone's eyes. They include observations which cannot be measured.

**Quantitative Descriptions :** are descriptions that are based on measurements or counting (i.e. they are numerical), such as the number of petals a flower has or how tall a person is. They deal with quantities.

**Le Système International d'Unités (SI):** refers to a single measurement system (metric system) that has been agreed upon by scientist all over the world. SI has seven base units. Most other units are derived from these seven units

This system of measurement has two benefits:

- 1) Scientists around the world can easily share and compare their data because all measurements are made in the same units.
- 2) SI units are based on the number 10. This makes it easy to change from one unit to another.

**Base unit:** are the 7 units of measure agreed upon by the international system of units .

SI Base Units		
Quantity	SI base unit	Symbol
Length	meter	m
Mass	kilogram	kg
Temperature	kelvin	K
Time	second	s
Amount of substance	mole	mol
Luminous intensity	candela	cd
Electric current	ampere	A

Most common base units in Physics are:

**Meter** is the unit of length. Length is measured with a meterstick, ruler, or measuring tape. It is defined as the distance light travels in a small fraction of a second.

**Kilogram** is the unit for mass. Mass is measured with a balance. A kilogram is defined as the mass of a certain lump of platinum and iridium that is kept in Paris under glass to protect it from chemical changes that could alter its mass.

**Time** is the unit for time. Time is measured using a stopwatch

**Derived units** are ones that we “figure out” by using base units.

For example:

The length and width of a rectangle

$$\text{Area} = \text{length} \times \text{width}$$

$$= \text{m} \times \text{m} = \text{m}^2$$

$$= (\text{base unit}) \times (\text{base unit}) = (\text{Derived unit})$$

Some other examples of are

Volume -  $\text{m}^3$

Speed -  $\text{m/s}$

Acceleration  $\text{m/s}^2$

Other Common SI Prefixes:

Commonly Used Metric Prefixes			
Prefix	Symbol	Meaning	Factor
mega	M	1 million times larger than the unit it precedes	$10^6$
kilo	k	1000 times larger than the unit it precedes	$10^3$
deci	d	10 times smaller than the unit it precedes	$10^{-1}$
centi	c	100 times smaller than the unit it precedes	$10^{-2}$
milli	m	1000 times smaller than the unit it precedes	$10^{-3}$
micro	$\mu$	1 million times smaller than the unit it precedes	$10^{-6}$
nano	n	1 billion times smaller than the unit it precedes	$10^{-9}$
pico	p	1 trillion times smaller than the unit it precedes	$10^{-12}$

## PART A: MULTIPLE CHOICE

- Which of the following involves the study of motion, matter, energy, and force?
  - Biology
  - Chemistry
  - Meteorology
  - Physics
- Which of the following is a great physicist?
  - Albert Einstein
  - Galileo Galilei
  - Isaac Newton
  - All are correct
- Which of the following is used to make a qualitative description?
  - Your bath scales
  - Your Eyes
  - A measuring Tape
  - A rain gauge
- Which of the following is a quantitative description?
  - The glass is half full
  - It is warm in the physics lab
  - The lemon tastes sour
  - The mass the cat is 2.0 kg

5. Which organization is responsible for creating a system of base units to be followed by the scientific community?
- (A) International Union of Pure and Applied Chemistry (IUPAC)
  - (B) Le Système International d'Unités (SI)
  - (C) French Academy of Sciences (FAS)
  - (D) International Space Agency (ISA)
6. What is the base unit for measuring time?
- (A) Kilograms
  - (B) Meter
  - (C) Second
  - (D) Meter/second
7. What is the base unit for measuring mass?
- (A) Kilogram
  - (B) Meter
  - (C) Second
  - (D) Meter/second
8. Which of the following is a derived unit?
- (A) Kilograms
  - (B) Meter
  - (C) Second
  - (D) Meter/second
9. What prefix is represented by  $10^3$ ?
- (A) Centi
  - (B) Kilo
  - (C) Nano
  - (D) Pico
10. What prefix is represented by  $10^{-2}$ ?
- (A) Centi
  - (B) Kilo
  - (C) Nano
  - (D) Pico
11. What does the prefix nano mean?
- (A)  $10^{-9}$
  - (B)  $10^{-3}$
  - (C)  $10^2$
  - (D)  $10^6$
12. What does the prefix milli mean?
- (A)  $10^{-3}$
  - (B)  $10^{-2}$
  - (C)  $10^6$
  - (D)  $10^9$

## PART B: WRITTEN RESPONSE

1. Complete the chart below.

Step 1. Tell if each of the following is a quantitative or qualitative description.

Step 2. If it is a quantitative description, tell if the unit is a derived unit or a base(standard) unit.

Measurement	Quantitative/ Qualitative	Derived Unit/ Base Unit
a speed of 25 m/s		
a foul odour		
mass is 75.1 kg		
a long trip		
salty taste		
a time of 200.0 seconds		
a density of 200 g/m <sup>3</sup>		

2. For each of the following commonly used measurements, indicate its symbol. Use the symbols to complete the following sentences with the most appropriate unit. Units may be used more than once or not at all.

kilogram \_\_\_\_\_ meter \_\_\_\_\_ millimeter \_\_\_\_\_

milligram \_\_\_\_\_ second \_\_\_\_\_ liter \_\_\_\_\_

3. What is the prefix for each of the following?

10<sup>6</sup> \_\_\_\_\_ 10<sup>3</sup> \_\_\_\_\_

10<sup>-12</sup> \_\_\_\_\_ 10<sup>-2</sup> \_\_\_\_\_

10<sup>-6</sup> \_\_\_\_\_ 10<sup>-3</sup> \_\_\_\_\_

4. What power does the following represent?

k \_\_\_\_\_ M \_\_\_\_\_ d \_\_\_\_\_

p \_\_\_\_\_ n \_\_\_\_\_ μ \_\_\_\_\_

c \_\_\_\_\_ m \_\_\_\_\_

5. Complete the following table

Prefix	Symbol	Meaning	Multiply By
Micro			
	p		
		100 times smaller than the unit that precedes it	
			10 <sup>-3</sup>
	k		
		10 times smaller than the unit that precedes it	