Physics 0 **Class Handout** **Week 3**

Teacher: Sayan Chakraborti Student:

Scientific Notation

In physics, we often deal with very large and very small numbers. Scientific notation is a way to express these numbers conveniently.

Scientific Notation:
Scientific notation is a method of expressing numbers as a product of a decimal (greater than or equal to 1 and less than 10) and a power of 10.

Basic Arithmetic:
To multiply or divide numbers in scientific notation, multiply or divide their decimal parts and add or subtract their exponents of 10.

Questions to Practice:

1. Express 4,500,000 meters in scientific notation.

2. Express 0.00000736 seconds in scientific notation.

3. Calculate the volume of the Earth (in scientific notation), given its radius of approximately 6,371 kilometers, assuming it's a perfect sphere. (Hint: Use the formula for the volume of a sphere.)

4. The distance from Earth to the Sun is approximately 93 million miles. If light from the Sun takes about 8 minutes and 20 seconds to reach Earth, what is the speed of light in meters per second?

5. An atom has a diameter of about 1×10^{-10} meters. Calculate how many atoms could fit in a line across 1 centimeter.

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Vectors and Scalars

Introduction:
In physics, we often need to describe quantities that have both magnitude and direction. We categorize these quantities into two types: vectors and scalars.

Scalars:
Scalars are quantities that have only magnitude, such as mass, temperature, and speed. They are represented by a single value and unit.

Vectors:
Vectors are quantities that have both magnitude and direction, like displacement, velocity, and force. Vectors are represented by an arrow, where the length of the arrow represents magnitude, and the direction of the arrow represents direction.

Examples:
Displacement is a vector because it not only tells us how far an object moved but also in which direction.
Speed is a scalar because it provides the magnitude of motion without indicating direction.

Problem (In-Class Activity):
Consider a car driving north for 2 hours at a speed of 60 kilometers per hour and then east for 3 hours at a speed of 40 kilometers per hour. Calculate the following:

The total distance traveled by the car.
The car's displacement from its starting point, including direction.