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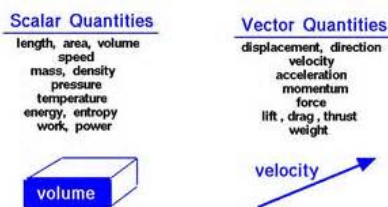
NCERT Class 11 Physics Solutions: Chapter 4 – Motion in a Plane Part 1

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Question: 4.1

State, for each of the following physical quantities, if it is a scalar or a vector: Volume, mass, speed, acceleration, density, number of moles, velocity, angular frequency, displacement, angular velocity.

Answer:



Scalar: Volume, mass, speed, density, number of moles, angular frequency.

Vector: Acceleration, velocity, displacement, angular velocity.

- A scalar quantity is specified by its magnitude only. It does not have any direction associated with it. Volume, mass, speed, density, number of moles, and angular frequency are some of the scalar physical quantities.
- A vector quantity is specified by its magnitude as well as the direction associated with it. Acceleration, velocity, displacement, and angular velocity belong to this category.

Question: 4.2

Pick out the two scalar quantities in the following list:

Force, angular momentum, work, current, linear momentum, electric field, average velocity, magnetic moment, relative velocity.

Answer:

Scalars

- ▶ A scalar quantity is a quantity that has magnitude only and has no direction in space

Examples of Scalar Quantities:

- ▶ Length
- ▶ Area
- ▶ Volume
- ▶ Time
- ▶ Mass



Work and current are scalar quantities.

- Work done is given by the dot product of force and displacement. Since the dot product of two quantities is always a scalar, work is a scalar physical quantity.

- Current is described only by its magnitude. Its direction is not taken into account. Hence, it is a scalar quantity.

Question: 4.3

Pick out the only vector quantity in the following list:

Temperature, pressure, impulse, time, power, total path length, energy, gravitational potential, coefficient of friction, charge.

Answer:

Vectors

- ▶ A vector quantity is a quantity that has both magnitude and a direction in space

Examples of Vector Quantities:

- ▶ Displacement
- ▶ Velocity
- ▶ Acceleration
- ▶ Force



Impulse:

Impulse is given by the product of force and time. Since force is a vector quantity, its product with time (a scalar quantity) gives a vector quantity.

Question 4.4:

State with reasons, whether the following algebraic operations with scalar and vector physical quantities are meaningful:

- (a) Adding any two scalars.
- (b) Adding a scalar to a vector of the same dimensions.
- (c) Multiplying any vector by any scalar.
- (d) Multiplying any two scalars.
- (e) Adding any two vectors,
- (f) Adding a component of a vector to the same vector.

Answer:

(a) Meaningful:

The addition of two scalar quantities is meaningful only if they both represent the same physical quantity.

(b) Not Meaningful:

The addition of a vector quantity with a scalar quantity is not meaningful.

(c) Meaningful:

A scalar can be multiplied with a vector. For example, force is multiplied with time to give impulse.

(d) Meaningful:

A scalar, irrespective of the physical quantity it represents, can be multiplied with another scalar having the same or different dimensions.

(e) Meaningful:

The addition of two vector quantities is meaningful only if they both represent the same physical quantity.

(f) Meaningful:

A component of a vector can be added to the same vector as they both have the same Dimensions.