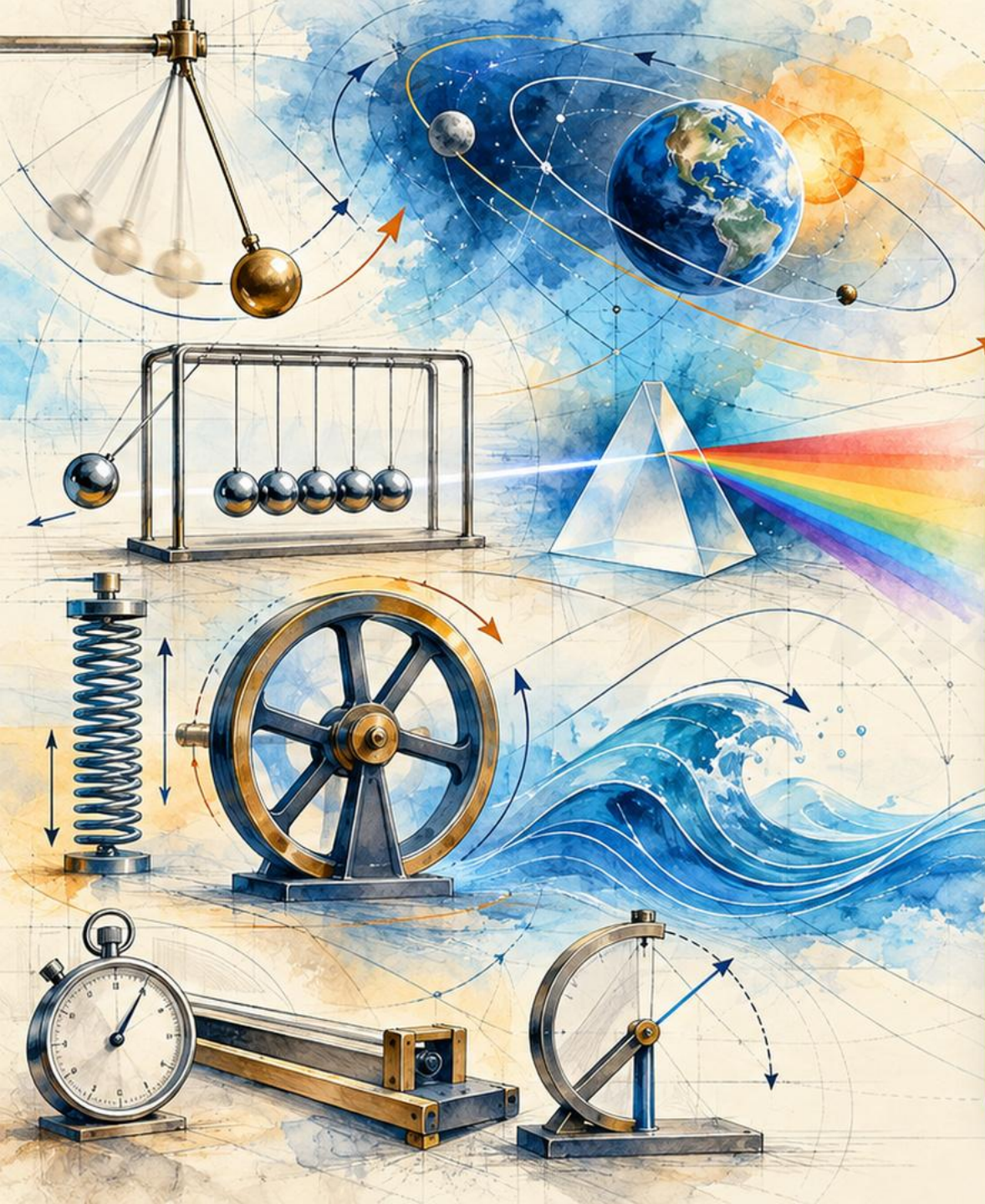




PHYSICS • CLASS 11

3

CHAPTER

Motion in a Plane

NCERT SOLUTIONS

EXERCISE SOLUTION: QUESTION 3.1

Q. Classify each quantity as a scalar or a vector: volume, mass, speed, acceleration, density, number of moles, velocity, angular frequency, displacement and angular velocity.

Answer:

SCALARS

- Volume
- Mass
- Speed
- Density
- Number of moles
- Angular frequency

A scalar has magnitude but no spatial direction.

VECTORS

- Acceleration
- Velocity
- Displacement
- Angular velocity

A vector has magnitude and direction and follows vector addition.

Angular frequency is a scalar; angular velocity is a vector.

EXERCISE SOLUTION: QUESTION 3.2

Q. 3.2 Pick out the two scalar quantities: force, angular momentum, work, current, linear momentum, electric field, average velocity, magnetic moment and relative velocity.

Answer: **WORK and ELECTRIC CURRENT**

Work is a scalar, even though it may be positive, negative or zero.

Electric current is a scalar. Its conventional direction describes charge flow; it does not make current a spatial vector.

The other quantities in the list are vectors.

- force
- angular momentum
- linear momentum
- electric field
- average velocity
- magnetic moment
- relative velocity

EXERCISE SOLUTION: QUESTION 3.3

Question 3.3: Pick out the only vector quantity: temperature, pressure, impulse, time, power, total path length, energy, gravitational potential, coefficient of friction and charge.

Answer: **IMPULSE**

Impulse equals the change in linear momentum, so it is a vector.

$$\vec{J} = \Delta \vec{p}$$

For a constant force acting during a time interval:

$$\vec{J} = \vec{F} \Delta t$$

Multiplying a force vector by a time interval gives a vector in the force's direction. All the other quantities in the question are scalars.

EXERCISE SOLUTION: QUESTION 3.4

Which operations on scalar and vector physical quantities are meaningful? Give reasons.

(a) Add any two scalars.

Answer: Not always. They must have the same physical kind and compatible dimensions. Length plus mass is invalid.

(b) Add a scalar and a vector with the same dimensions.

Answer: No. A scalar cannot be added to a vector.

(c) Multiply any vector by any scalar.

Answer: Yes. The product is a vector; dimensions multiply.

(d) Multiply any two scalars.

Answer: Yes. The product is scalar; dimensions multiply. Length times breadth gives area.

(e) Add any two vectors.

Answer: Not always. They must be of the same physical kind and compatible dimensions.

(f) Add a component to the same vector.

Answer: No, for a scalar coordinate component. $A_x + \vec{A}$ is invalid; $A_x \hat{i} + \vec{A}$ is a vector sum.



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