

Tech exercise and CRQ

Chapter 2

1. Define scalar and vector quantities.

Ans: A **scalar quantity** is a physical quantity that has **magnitude only**, e.g., distance, time, speed.

A **vector quantity** is a physical quantity that has **both magnitude and direction**, e.g., displacement, velocity, force.

2. Give 5 examples each for scalar and vector quantities.

Ans: Scalars: Distance, length, time, speed, energy.

Vectors: Displacement, velocity, acceleration, weight, force.

3. State head-to-tail rule for addition of vectors.

Ans: In the head-to-tail rule, the **head of one vector is joined to the tail of the next vector**. The **resultant vector is drawn from the tail of the first vector to the head of the last vector**.

4. What are distance–time graph and speed–time graph?

Ans: A **distance–time graph** shows the relation between **distance (S) and time (t)** of a moving body.

A **speed–time graph** shows the relation between **speed (v) and time (t)** of a moving body.

5. Falling objects near the Earth have the same constant acceleration. Does this imply that a heavier object will fall faster than a lighter object?

Ans: No, a heavier object will **not fall faster** than a lighter object if air resistance is negligible. Both fall with the **same acceleration due to gravity**.

6. The vector quantities are sometimes written in scalar notation (not bold face). How is the direction indicated?

Ans: When vectors are written in scalar form, their **direction is shown by the sign** with the number. + **sign** shows right or up direction, while – **sign** shows left or down direction.

7. A body is moving with uniform speed. Will its velocity be uniform? Give reason.

Ans: If the motion is **in a straight line**, the velocity is uniform. If the motion is **circular or changes direction**, velocity is not uniform because direction changes.

8. Is it possible for a body to have acceleration when moving with: (i) constant velocity (ii) constant speed? (2.6)

Ans: (i) With **constant velocity**, acceleration is **zero** because magnitude and direction remain the same.

(ii) With **constant speed**, acceleration is **possible** if the direction changes, e.g., **uniform circular motion**.

CRQ

1. Distance and displacement may or may not be equal in magnitude. Explain this statement.

Ans: Distance and displacement are **equal when motion is in a straight line in one direction**. They are **not equal when the path is not straight**, because distance becomes greater than displacement.

2. When a bullet is fired, its velocity with which it leaves the barrel is called the muzzle velocity of the gun. The muzzle velocity of one gun with a longer barrel is lesser than that of another gun with a shorter barrel. In which gun is the acceleration of the bullet larger? Explain.

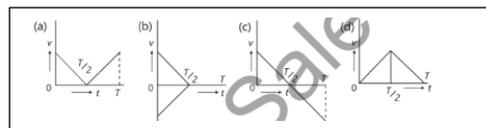
Ans: The bullet in the **shorter barrel gun** has larger acceleration because the force acts for a **shorter time**, so it must accelerate more to reach a higher muzzle velocity. In the **longer barrel gun**, the force acts longer, giving the bullet **smaller acceleration**.

3. For a complete trip, average velocity was calculated. Its value came out to be positive. Is it possible that its instantaneous velocity at any time during the trip had a negative value? Give justification. (2.5)

Ans: Yes, it is possible. **Instantaneous velocity** can be negative at some points if the body moves in the opposite direction, but the **average velocity** remains positive as long as the **net displacement** is positive.

4. A ball is thrown vertically upward with velocity v . It returns to the ground in time T . Which graph correctly represents the motion? Explain.

Ans: Graph “d” correctly represents the motion.
Reason: The ball **decelerates upward**,



stops momentarily at the top, and then **accelerates downward** due to gravity.

5. Figure given below shows the distance–time graph for the travel of a cyclist. Find the velocities for the segments a, b, and c.

Ans:

- **Segment a:** Velocity is **increasing** (cyclist is accelerating).
- **Segment b:** Velocity is **constant** (cyclist moves at uniform speed).
- **Segment c:** Velocity is **decreasing** (cyclist is slowing down).

