THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

GRADE 11 – PHYSICS

CHAPTER – MOTION IN A STRAIGHT LINE

1) Can a moving body have relative velocity zero with respect to another body? Give an example.

Answer:

Yes, two trains running on two parallel tracks with the same velocity in the same direction.

2) Tell under what condition a body moving with uniform velocity can be in equilibrium?

Answer:

When the net force on the body is zero.

3) What does the speedometer records: the average speed or the instantaneous speed?

Answer:

It records (or measures) the instantaneous speed.

4) Can an object be accelerated without speeding up or slowing down? Give examples,

Answer:

Yes, circular motion.

5) Which motion is exactly represented by $\Delta s = v\Delta t$?

Answer:

It Represents motion with uniform velocity.

6) Which motion is exactly represented by $\Delta s = v\Delta t$?

Answer:

It Represents motion with uniform velocity.

7) Give an example of a motion which even though is accelerated motion yet it is called uniform motion.

Answer:

Uniform circular motion.

8) How many-dimensional motion does the following have?

(a) Train moving fast on its track.

Answer -One dimensional motion.

(b) A lizard moving on a wall in a room.

Answer -Two-dimensional motion.

(c) Kite flying in the sky.
Answer - Three-dimensional motion.

9) When is the average velocity over an interval of time becomes equal to instantaneous velocity?

Answer -When the velocity is constant

10) A coolie carries a bag of luggage from one side of a platform to another side on the same platform. How far vertically the load is shifted?
Answer -Zero.

11)The displacement of a body is proportional to the square of time along a straight line. Is the body moving with constant velocity or constant acceleration?
Answer-It is moving with constant acceleration.

12) Under what condition the magnitude of the average velocity of a particle is equal to the average speed?
Answer- The magnitude of the average velocity of a particle is equal to the average speed if it moves with constant velocity.

13) Define the speed of the object.
Answer-The speed of an object is defined as the distance covered by it per unit of time.

14) Why the speed of an object cannot be negative?
Answer -The speed of an object cannot be negative because the distance can never be negative.

15) Can a body have zero velocity and still accelerating?
Answer -Yes.

16) Can the direction of the velocity of a body change, when acceleration is constant?
Answer-Yes.

17) Is the acceleration of a car is greater when the accelerator is pushed to the floor or when the brake pedal is pushed hard?
Answer - The acceleration of the car is greater when the brake pedal is pushed hard because the car comes to rest suddenly i. e. the rate of change of velocity of the car is large in this case, so the acceleration.

18) .The displacement is given by $x = 2 + 4t + 5t^2$. Find the value of instantaneous acceleration.

Answer - $a = d^2x/dt^2 = 10$

19) A stone is thrown vertically upwards from the surface of Earth. What is the direction of the velocity and acceleration of the stone?

(a) on its upward motion

Answer -Velocity is vertically upward and acceleration is vertically downward.

(b) On its downward motion?

Answer -Both velocity and acceleration are vertically downward.

20) Can Earth be regarded as a point object if only the orbital motion of Earth around the Sun is considered? Why?

Answer - Yes. This is because the size of Earth is very small as compared to the size of the orbit of the Earth around the Sun.

21) The motion of two persons is shown by two straight lines on a displacement time graph intersecting each other at a certain point. What information do you get from the point of intersection?

Answer -This means that the two persons cross each other at a certain place at a given instant of time.

22) Following two equations represents the x – t relation for the motion of an objects.
$x(t) = x(0) + v(0)t + 12\ at^2$
and $x(t) = v(0)t + 12\ at^2$ What is the difference between them?

Answer- The first equation is a more general form of motion as it contains information regarding the initial position of the object.

23) Can the speed of a body change if its velocity is constant? Why?

Answer - No, the speed of a body cannot change if its velocity is constant which means that both the magnitude and direction of velocity do not change. The magnitude of velocity is speed, so speed cannot change.

24)If the instantaneous velocity of a particle is zero, will its instantaneous acceleration be necessarily zero?

Answer - No.

25) What is the shape of the displacement time graph of a particle having an average velocity equal to its instantaneous velocity?

Answer-In this case, the velocity is uniform, so the x – t graph is a straight line.

26) Can there be a two-dimensional motion with acceleration in one dimension only? Give example.

Answer -Yes, a projectile motion which is two-dimensional one has acceleration only in one dimension i.e. vertically downward.

27) Under what condition will the distance and displacement of a moving object will have the same magnitude?

Answer -The distance and displacement of a moving object will have the same magnitude when it is moving with uniform velocity along a straight line.

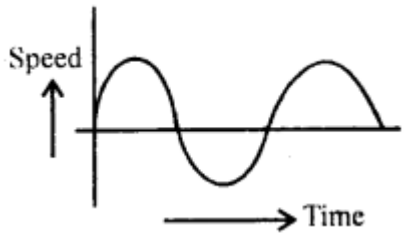
28) Under what condition an object in motion cannot be considered a point object?

Answer -A moving object cannot be considered as a point object if its size is not negligible as compared to the distance travelled by it.

29) Define a point object.

Answer -It is defined as an object having dimensions (length, breadth, thickness etc.) very small as compared to the distance covered by it.

30) Is the following graph possible for the motion of a particle moving along a straight line?

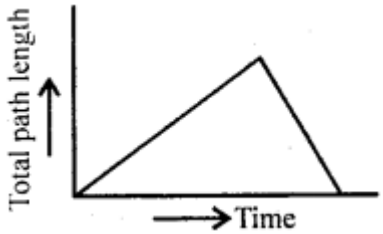


Answer -No.

31) Explain why the graph in the above question is not possible?

Answer:This is because the speed for a given time is negative and speed is always positive.

32) .Why the following graph is not possible for the motion of a particle moving along a straight line?



Answer:This is because here the path length decreases with time while it must either increase or must remain constant.

33) Separate the following in one, two and three-dimensional motion :
(a) A kite flying on a windy day.
(b) An insect crawling on a globe.
(c) A carom coin rebounding from the side of the board,
(d) A planet revolving around its star.
(e) The motion of a boat.
(f) The motion of a dropped body.
(g) The motion of a tennis ball.
(h) A charged particle moving under an electric field.
(i) Movement of a saw while cutting wood.
(j) Molecular motion.
(k) A charged particle moving under a magnetic field.

Answer:

- One dimensional motion : (e), (f), (i)
- Two dimensional motion : (b), (c), (d), (g), (h), (k).
- Three dimensional motion : (a), (j).

34) Prove that the average velocity of a particle over an interval of time is either smaller than or equal to the average speed of the particle over the same interval.

Answer - Average velocity is defined as the ratio of the total displacement to the total time. Average speed is defined as the ratio of the total distance to the total time. Since displacement is less than or equal to the distance, therefore the average velocity is less than or equal to the average speed.

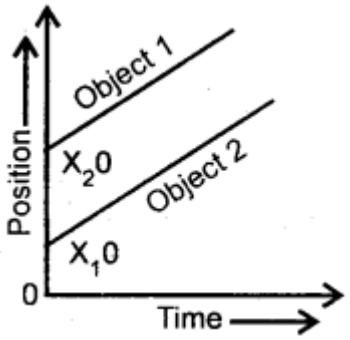
35) Two trains each of the length 109 m and 91 m are moving in opposite directions with velocities 34 km h^{-1} and 38 km h^{-1} respectively. At what time the two trains will completely cross each other?

Answer- t = 10s

36) Draw the position-time graphs for two objects initially occupying different positions but having zero relative velocity.

Answer-The positive T time graphs for two objects initially occupying different positions but having zero relative velocity are parallel to each other as

shown in Fig.



37) "It is the velocity and not the acceleration which decides the direction of motion of a body." Justify this statement with the help of a suitable example.

Answer:The direction of velocity is always in the direction of motion of the body whereas the direction of acceleration may or may not be in the direction of motion of the body. Thus we conclude that it is the velocity that decides the direction of motion of the body.

Example: When a ball is thrown vertically upwards, the direction of motion of the ball and velocity is the same i.e. vertically upwards. On the other hand, the acceleration due to gravity on the ball acts vertically downwards i.e. opposite to the direction of motion of the ball.

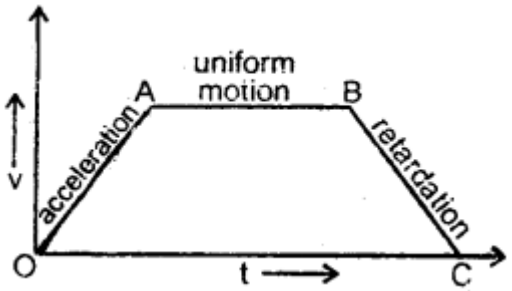
38) A draw velocity-time graph for a body which

(i) accelerates uniformly from rest,

(ii) then moves with a uniform velocity

(iii) finally retarded uniformly

Answer: (i) The required velocity-time graph is shown in Fig. here



OA part of the graph represents the uniformly accelerated motion of the body.

(ii) Answer-AB part of the graph represents motion with uniform velocity.

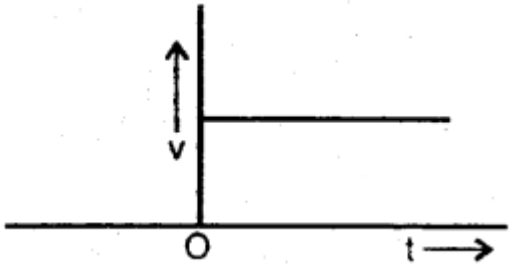
(iii).Answer -BC part of the graph represents motion with uniform retardation of the body.

39) Draw the velocity-time graph for an object moving with uniform velocity. What does it show for t < 0?

Answer:

As the object moves with uniform velocity, the magnitude and direction of its velocity remain the same at all points of its path. Thus v – t graph' is a straight line parallel to the time axis as shown in Fig. here.

For t < 0, the v – t graph shows that the object is at rest till t = 0.



40) Derive the expression for the time taken by a body dropped from a height h to reach at Earth.

Answer: Here,

initial velocity, u = 0

acceleration, a = g

distance covered, S = h

Let t = time taken

Using the relation

$$S = ut + \frac{1}{2}at^2, \text{ we get}$$

$$h = 0 \times t + \frac{1}{2}gt^2$$

$$t^2 = \frac{2h}{g}$$

$$t = \sqrt{\frac{2h}{g}}$$