Q. 1 Explain the meaning of the terms rest and motion.

Answer:

Rest— A body is said to be at rest if it does not change its position with respect to its immediate surroundings.

Motion— A body is said to be in motion if it changes its position with respect to its immediate surroundings.

Q. 2 Name five different types of motion you know.

Answer:

The different types of motion are :

1. Translatory motion
2. Rotatory motion
3. Oscillatory motion
4. Vibratory motion
5. Periodic motion
6. Multiple motion
7. Random motion.

Q. 3 What do you mean by translatory motion ? Give one example.

Answer:

If an object like a vehicle, moves in a line in such a way that every point of the object moves through the same distance in the same time, then the motion of the object is called translatory motion.

Example :

The motion of an apple falling from a tree, the motion of a man walking on a road, the motion of a box when pushed from one comer of a room to the other, are all the translatory motion.

Q. 4 Explain the meanings of (i) rectilinear motion, and (ii) curvilinear motion. Give one example of each.

Answer:

(i) Rectilinear motion — If the motion of a body is along a straight line, it is said to be the rectilinear or linear motion. The motion of bullet fired from a gun.

(ii) Curvilinear motion — If the motion of a body is along a curved path, it is said to be the curvilinear motion. For example, the motion of a cycle while taking a turn on the road, a car moving along a curved path, a ball thrown by an athlete are in curvilinear motion.

Q. 5 What is rotatory motion ? Give two examples.

Answer:

Rotatory motion— A body is said to be in a rotatory motion or a circular motion if it moves about a fixed axis without changing the radius of its motion.

Examples : The blades of a fan, a spinning wheel.

Q. 6 What is meant by circular motion ? Give one example.

Answer:

The motion of a body along a circular path is called circular motion.

Example : A girl is whirling a stone tied at the end of a string in a circular path.

Q. 7 How does a rotatory motion differ from the circular motion?

Answer:

(i) In rotatory motion, the axis of rotation passes from a point
in the body itself whereas in circular motion, the axis of revolution passes through a point outside the body. Thus the motion of earth around the sun is the circular motion whereas the motion of earth about its own axis is the rotational motion.

(ii) In the circular and rotatory motions, the distance of a point of a the body from a fixed point always remains same, whereas it is not same in curvilinear motion.

Q. 8 Explain oscillatory motion by giving one example.

Answer:

Oscillatory motion— The to and fro motion of a simple pendulum is an oscillatory motion.

Example : 1. The motion of a swing, 2. Piston of an engine.

Q. 9 What is vibratory motion ? Give one example.

Answer:

In vibratory motion, a part of the body always remains fixed and the rest part moves to and fro about its mean position. During the vibratory motion, the shape and size of the body changes.

Example : When we breath, our chest expands and contracts. This motion is vibratory motion.

Q. 10 Differentiate between periodic and non-periodic motions by giving an example of each.

Answer:

Periodic motion : A motion which gets repeated after regular intervals of time is called a periodic motion.

Examples : The earth moving around the sun takes 365 days to complete one revolution and this motion gets repeated after every 365 days.

Non-periodic motion : The motion which does not repeat itself after regular interval of time is

called non-periodic motion.

Examples : A footballer running on a field, application of brakes in a moving vehicle, a ball rolling down the ground gradually slows down and finally stops, motion of tides in the sea, etc.

Q. 11 Name the type/types of motion being performed by each of the following:

(a) Vehicle on a straight road

(b) Blades of an electric fan in motion

(c) Pendulum of a wall clock

(d) Smoke particles from chimney

(e) Hands of a clock

(f) Earth around the sun

(g) A spinning top.

Answer:

(a) Rectilinear motion

(b) Rotatory motion

(c) Oscillatory motion, periodic motion

(d) Non-periodic motion

(e) Uniform circular and periodic motion

(f) Rotatory motion, circular motion and periodic motion

(g) Rotatory motion

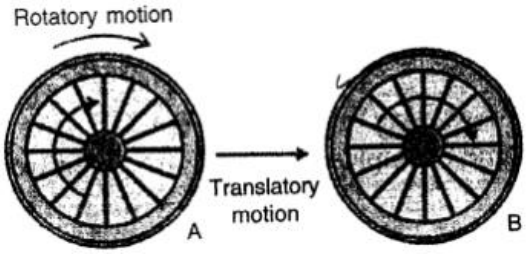
Q. 12 Give two examples to illustrate that a body can have two or more types of motion simultaneously.

Answer:

Sometime a body can have more than one type of motion. Such a motion is called the mixed motion.

Example :

(i) The wheels of a moving train have both the translatory as well as the rotatory motions as it moves from position A to position B while rotating.



(ii) The earth rotates about its axis (rotatory motion) and at the same time it revolves around the sun in a curved path (curvilinear or circular motion) in a fixed time interval (periodic motion).

Q. 13 State the types of motion of the following :

(a) The needle of a sewing machine

(b) The wheel of a bicycle

(c) The drill machine

(d) The carpenter's saw

Answer:

(a) Periodic motion

(b) Rotatory motion

(c) Mixed = Translatory and Rotatory motion

(d) Mixed = Translatory and Oscillatory motion

Q. 14 Distinguish between uniform and non-uniform motions, giving an example of each.

Answer:

Uniform motion	Variable motion or Non-uniform motion
1. When a body covers equal distances in a straight line, in equal intervals of time, however small these time intervals may be.	1. When a body covers unequal distances in equal intervals of time in a straight line.
2. In this case direction of motion remains the same.	2. In this case direction of motion changes.
3. **Example :** A body moving with a constant speed in a straight line has uniform motion.	3. **Example :** Circular motion is example of non-uniform motion.

Q. 15 How do you determine the average speed of a body in non-uniform motion ?

Answer:

In a non-uniform motion, the average speed of a body is calculated by dividing the total distance travelled by the body, with the total time of its journey. Thus,

Average speed = Total distance travelled by the body / Total time ofjoumey

Q.16 How are the units of weight, kgf and newton related ?

Answer:

1 kg F = 10 N

Numericals

Q. 1A car covers a distance of 160 km between two cities in 4 h. What is the average speed of the car ?

Answer:

Distance =160 km

Time taken = 4h

Speed = ?

Speed = Distance covered / Time taken

= 160km / 4h = 40 km h^{-1}

Q. 2 A boy travels with an average speed of 10 m s^{-1} for 20 min. How much distance does he travel ?

Answer:

Average speed of boy = 10 m s^{-1}

Time taken = 20 min

Distance travelled = Speed × Time taken

Convert minutes into seconds

1 minute = 60 sec.

20 minutes = 20 × 60 = 1200 sec.

Distance travelled = 10 m s^{-1} × 1200 sec.

= 12000 m Or 12 km

Q. 3 A boy walks a distance 30 m in 1 minute and another 30 m in 1.5 minute. Describe the type of motion of the boy and find his average speed in m s-1.

Answer:

As the speed does not remain constant throughout the journey the motion is non-uniform

Total distance travelled in going and coming back

d = 30 m + 30 m = 60 m

Total time taken in going and coming back

t = 1 min + 1.5 min = 2.5 min

= 2.5 × 60 s = 150 s

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time of travel}}$$

$$= \frac{60\text{ m}}{150\text{ s}} = 0.4\text{ m s}^{-1}$$

Q. 4 A cyclist travels a distance of 1 km in the first hour, 0.5 km in the second hour and 0.3 km in the third hour. Find the average speed of the cyclist in

(i) km h^{-1}, (ii) m s^{-1}.

Answer:

(a) Distance travelled in first hour = 1 km

Distance travelled in second hour = 0.5 km

Distance travelled in third hour = 0.3 km

Total time taken = 3 hr

Total distance travelled = 1 + 0.5 + 0.3 = 1.8 km

(i) Average speed in km h^{-1}

$$\text{Speed} = \frac{\text{Distance}}{\text{Time taken}} = \frac{1.8}{3} = 0.6 \text{ km h}^{-1}$$

Average speed in m s^{-1}

1 km = 1000 m

1.8 km = 1.8 × 1000 m

= 1800 m

1 hour = 3600 seconds

3 hour = 3600 × 3 = 10800 sec.

$$\text{Average speed} = \frac{D}{T}$$

$$= \frac{1800}{10800} = 0.167 \text{ m s}^{-1}$$

Q.5 A car travels with speed 30 km h^{-1} for 30 minute and then with speed 40 km h^{-1} for one hour. Find :

(a) the total distance travelled by the car

(b) the total time of travel, and

(c) the average speed of car

Answer:

Speed of car for first 30 minutes = 30 km h^{-1}

Speed of car for next 1 hour = 40 km h^{-1}

(a) Total distance travelled by the car

$$\text{Ist case, Speed} = \frac{\text{Distance}}{\text{Time}} \Rightarrow \text{Distance} = \text{Speed} \times \text{Time}$$

($\because$ 30 minutes = 0.5 hours)

$$\text{Distance} = 30 \times 0.5$$

$$= 15 \text{ km} \quad \ldots(i)$$

$$\text{IInd case Speed} = \frac{\text{Distance}}{\text{Time}} \Rightarrow \text{Distance} = \text{Speed} \times \text{Time}$$

$$\text{Distance} = 40 \text{ km } h^{-1} \times 1 \text{ hr}$$

$$= 40 \text{ km} \quad \ldots(ii)$$

Adding (i) and (ii)

Total Distance = 15 km + 40 km = 55 km

(b) Total time of travel = 0.5 hr + 1.0 hrs = 1.5 hr

$$\text{(c) Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$= \frac{5.5 \text{ km}}{1.5 \text{ hr}} \quad \text{[from above (a) and (b)]}$$

$$= 36.67 \text{ km } h^{-1}$$

Q. 6 On earth the weight of a body of mass 1.0 kg is 10 N. What will be the weight of a boy of mass 37 kg in (a) kgf (b) N ?

Answer:

Weight of a body of mass 1.0 kg body = 10 N

(a) Weight of a boy of mass = 37 kg

(b) Weight of a boy of 37 kg in newton will be 1 kgf = 10N

$\therefore$ 37 kgf = 37 × 10 N

= 370 N

Q. 7 The weight of a body of mass 6.0 kg on moon is 10 N. If a boy of mass 30 kg goes from earth to the moon surface, what will be his (a) mass, (b) weight ?

Answer:

(a) Mass remains same it does not change

So mass of boy 30 kg on earth = 30 kg on moon surface

(b) Weight of boy on moon becomes 1 / 6

∴ 30 kg boy will weight 30 x 1/6 = 5kg

1 kg = 10 N ⇒ 5 × 10 N = 50 N

∴ Weight of boy on moon surface = 50 N