TEST YOURSELF

A. Objective Questions :

1. Write **true** or **false** for each statement :

(a) Two trains going in opposite directions with the same speed are at rest relative to each other. F

(b) A ball is thrown vertically upwards. Its motion is uniform throughout. F

(c) The motion of a train starting from one station and reaching at another station is non-uniform. T

(d) A motion which repeats itself after a fixed interval of time is called periodic motion. T

(e) A ball thrown by a boy from a roof-top has oscillatory motion. F

(f) Mass has both magnitude and direction. F

(g) Weight always acts vertically downwards. T

(h) Mass varies from place to place but weight does not. F

Ans. True—(c), (d), (g) **False**—(a), (b), (e), (f), (h)

2. Fill in the blanks :

(a) Two boys cycling on the road with the same speed are at rest relative to each other.

(b) The motion in a straight path is rectilinear motion.

(c) One to and fro motion of a clock pendulum takes time = 2 sec.

(d) 36 km h^{-1} = 10 m s^{-1}.

(e) Total distance travelled = av. speed × total time taken.

(f) The weight of a girl is 36 kgf. Her mass will be 36 kg.

(g) The weight of a body is measured using spring balance

Ans. (a) at rest, (b) straight line (c) 2 s (d) 10 m s^{-1} (e) average speed (f) 36 kg (g) a spring balance

3. Match the following :

Column A	Column B
(a) Circular motion	(i) a running fan (d)
(b) Periodic motion	(ii) a car moving in a market (e)
(c) Vibratory motion	(iii) movement of the hands of a clock (a)
(d) Rotatory motion	(iv) motion of wire of a guitar (c)
(e) Non uniform motion	(v) motion of pendulum of a clock (b)

Ans. (a)–(iii), (b)–(v), (c)–(iv), (d)–(i), (e)–(ii)

4. Select the correct alternative :

(a) A book lying on a table is an example of :
- (i) a body at rest
- (ii) a body in motion
- (iii) a body neither at rest nor in motion
- (iv) none of these.

(b) The motion of a pendulum is :
- (i) rotatory
- (ii) oscillatory
- (iii) curvilinear
- (iv) rectilinear

(c) A car moving on a straight road is an example of :
- (i) rotatory motion
- (ii) rectilinear motion
- (iii) oscillatory motion
- (iv) periodic motion

(d) A ball falls down vertically. Its motion is :
- (i) periodic
- (ii) linear
- (iii) circular
- (iv) vibratory

(e) If a body covers equal distances in equal intervals of time, the motion is said to be :
- (i) uniform
- (ii) non-uniform
- (iii) oscillatory
- (iv) rotatory

(f) A boy goes from his house to school by bus at a speed of 20 km h^{-1} and returns back through the same route at a speed of 30 km h^{-1}. The average speed of his journey is :
- (i) 24 km h^{-1}
- (ii) 25 km h^{-1}
- (iii) 30 km h^{-1}
- (iv) 20 km h^{-1}

(g) The earth attracts a body of mass 1 kg with a force of 10 N. The mass of a boy is 50 kg. His weight will be :
- (i) 50 kg
- (ii) 500 N
- (iii) 50 N
- (iv) 5 N

Ans. (a)–(i), (b)–(ii), (c)–(ii), (d)–(ii), (e)–(i), (f)–(i), (g)–(ii)

B. Short/Long Answer Questions :

1. Explain the meaning of the terms rest and motion.
2. Comment on the statement 'rest and motion are relative terms'. Give an example.
3. Fill in the blanks using one of the words : at rest, in motion.
   (a) A person walking in a compartment of a stationary train is ..... relative to the compartment and is ..... relative to the platform.
   (b) A person sitting in a compartment of a moving train is ..... relative to the other person sitting by his side and is..... relative to the platform.
4. Name *five* different types of motion you know.
5. What do you mean by translatory motion ? Give *one* example.
6. Explain the meanings of (i) rectilinear motion, and (ii) curvilinear motion. Give *one* example of each.
7. What is rotatory motion? Give *two* examples.
8. What is meant by circular motion? Give *one* example.
9. How does rotatory motion differ from circular motion?
10. Explain oscillatory motion by giving *one* example.
11. What is vibratory motion? Give *one* example
12. Differentiate between periodic and non-periodic motions by giving an example of each.
13. What is random motion? Give an example.

Exercises

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B. Answer the following.

Q1. Explain the meaning of the terms 'Rest' and 'Motion.'

Ans → When the position of a body with respect to its surroundings doesn't change with time. The body is said to be at rest. For ex- A book laying on the table willn't change its position if it isn't disturbed and will be considered to be in a state of rest.

~~When the position of a body changes with respect to time~~ with respect to its surroundings

When the position of a body with respect to its surroundings changes with time, the body is said to be in motion. For ex- a flying bird is said to be in motion as it changes its position with respect to the fixed object such as tree.

Q2. Comment on the statement 'Rest and Motion are relative ~~students~~ terms'. Give an example.

Ans→ An object can be in motion relative to one set of objects while at rest relative to other set of objects. Thus rest and motion are relative terms. For ex - Suppose, we are sitting in a room we are at rest in relation to all other stationary objects inside the room but the room is on the earth and the earth is continously revolving around the sun. So, we are in a state of motion in relation to Sun.

For ex - A passanger sitting in a moving bus is said to be at rest with respect to all the passengers inside the bus. But the same passanger is said to be in motion when he is observed by some other person outside the bus inside the bus station.

3. Fill in the blanks

(a) A person walking in a compartment of a stationary train is in motion relative to the compartment and is in motion relative to the platform.

(b) A person sitting in a compartment of a moving train is at rest relative to the other person sitting by his side and is in motion relative to the platform.

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4. Name five different types of motion you know.

Ans → The different types of motion are:-

1. Translatory motion
2. Rotatory motion
3. Circular motion
4. Oscillatory motion
5. Vibratory motion
6. Periodic motion
7. Non-periodic motion

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

Ans → If an object 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.

For ex - the motion of an apple falling from a tree, the motion of a man walking on a road.

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

Ans → (i) rectilinear motion → If the motion of a body is along a straight line it is said to be in linear or rectilinear motion. For ex - a ball falling from a height straight towards the surface of the Earth. Marchpast of the soldiers in a parade on a straight road.

(ii) curvilinear motion → If the motion of a body is along a curved path then, it is said to be in curvilinear motion. For ex - the motion of a cycle while taking a turn on the road, A car moving along a curved path.

7. What is rotatory motion? Give two examples.

Ans → A body is said to be in rotatory motion if it moves about a fixed axis. For ex - The blades of a fan, a spinning top, A potter's wheel, A Merry-go round.

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

Ans → The motion of a body along a circular path is called circular motion. Circular motion is a special type of curvilinear motion in which the distance of a moving object from a fixed point (centre) doesn't change. For ex- the motion of the hands of a clock, the motion of a satellite around the earth.

Book Q ANS

q. How does rotary motion differ from circular motion?

Ans A body is said to be in rotatory motion if it moves about a fixed axis. In rotatory motion the axis of rotation passes from a point in the body itself. For ex- the rotation of the earth about its own axis. The motion of a body along a circular path is called circular motion. In a circular motion the axis of revolution passes through a point outside the body. For ex - the revolution of the earth.

10. Explain oscilatory motion by giving one example.

Ans→ The to and fro motion of a body from its rest motion is called the oscilatory motion. For ex - the motion of the pendullum of a wall clock and the motion of a swing represents oscilatory motion.

11. What is vibratory motion? Give one example.

Ans→ Vibratory motion is also a type of oscilatory motion in which a part of the body always remain 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. For ex - Our Vocal chords vibrate to produce sound when we speak or swing. The vibration of the membraene of a tabla when played shows vibratory motion.

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12. Differentiate between periodic and non-periodic motion.

Ans → Periodic motion → A motion which gets repeated after a regular interval of time is called periodic motion. For ex - the earth completes one revolution around the sun in $365\frac{1}{4}$ days and this motion is repeated after every $365\frac{1}{4}$ days. A normal person's heart beats after every 0.8 seconds.

Non-periodic motion → The motion which does n't repeat itself after a regular interval of time is called a non-periodic motion. For ex - a footballer running on a field, application of brakes of a moving vehicle, a ball rolling down the ground gradually slows down and finally stops.

13. What is random motion? Give example.

Ans → Random motion is a motion in which the object moves in a zig-zag manner and not in a straight line. In this type of motion the object moves in any direction and the direct

ion continually changes. For ex- A flying kite, the movement of the clouds in the sky, the movement of the fish in the river.

14. Name the type or types of motion?

Ans A. Vehicle on a straight road - rectilinear

B. Blades of an electric fan in motion - rotational, uniform

C. Pendullum of a wall clock - Oscilatory, periodic

D. Smoke particles from chimney - Random

E. Hands of a clock - Circular

F. Earth ~~not~~ or round the sun - circular, periodic

G. A spinning top - Rotational

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

Ans If the body can have more than one type of motion simultaneously then its motion is called a

mixed motion. For ex-

- The wheels of a moving vehicle such as cycle, train, car etc have both translatory as well as rotatory motion. When the wheel rotates about its axis it exhibit rotational motion and when the wheel moves as a whole by covering some distances then, it exhibits translatory motion.

- A drill used by a carpenter has both rotational as well as translatory motion. As the tip of the drill moves ahead inside the wood it shows translatory motion and the tip of the screw also rotates to enter into the ~~road~~ wood showing rotational motion.

16. State the types of motion of the following:

(a) The needle of a sewing machine- Periodic motion

(b) The wheel of a bicycle- rotational, translatory motion

(c) The drill machine- rotational motion, translatory motion

(d) The carpenter's saw- oscillatory, translatory motion

12. Distinguish between uniform and non-uniform motion giving an example of each.

Ans→ If a moving body travels equal distances in equal intervals of time its motion is said to be uniform. In an uniform motion the speed of the moving body remains constant. For ex- the blades of a ceiling fan. If the speed of a car is 10 m/s then, the car covers 10 meters in one second. The speed of the car remains constant in every second. If we plot a graph between distance and time in uniform motion the nature of the graph will be a straight line passing through the origin.

If a moving body travels unequal distances in equal intervals of time its motion is said to be non-uniform. In non-uniform motion the speed of the moving body doesn't remain constant. For ex- If a car travels 10 meters in first 2 seconds and 15 meters in the next 2 seconds the speed of the car doesn't remain constant in 2 second. If we plot a grap between distance and time in non-uniform motion the nature of the graph is not a straight line.

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Q8 How do you determine the average speed of a body in non-uniform motion.

Ans → In non-uniform motion a moving body travels unequal distances in equal intervals of time. In this type of motion the speed of the moving body doesn't remain constant. Its average speed is calculated by finding the ratio of the total distance travelled by the body to the total time taken in the journey i.e.

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

For ex - If a car travels 4 km in 1st hour, 8 km in the 2nd hour and 3 km in 3rd hour so, the total distance travelled is 15 km and total time taken in the journey is 3 hrs so, the average speed is :-

$$\frac{15 \text{ km}}{3 \text{ hr}} = 5 \text{ km h}^{-1}$$

19. Define the term 'weight' and state its S.I. unit?

Ans: The weight of a body is the force with which earth attracts the body i.e. the weight of a body is the force of gravity on it. The weight of a body isn't constant and it changes from place to place. The weight of the body is zero at the centre of the earth and in an artificial sattelite. It is represented by the symbol 'W'. The si unit of weight is newton (N).

$$W = mg$$

where m = mass of the body and g = gravitational force of earth

$$g = 10\ N\ kg^{-1}$$

Weight is a vector quantity and thus has magnitude and direction. The direction of the weight is vertically downward.

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

Ans: 1 kgf = 10 N (nearly)

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2. State three difference between mass and weight

Ans:

Mass	Weight
• It is the quantity of matter contained in a body.	• It is the force with which the earth attracts the body.
• Its S.i. unit is kilogram (kg).	• Its S.i. unit is newton (N) and the another unit is kilogram force (Kgf) where 1 kgf = 10 N (nearly)
• It is constant for a body and it doesn't change by changing the place of the body.	• It is not constant for a body, but changes from place to place.
• It is measured by using a beam balance.	• It is measured by using a spring balance.
~~• Weight can never be~~ • Mass can ~~be~~ never be zero	• Weight can be zero.

22. Which quantity: mass or weight, doesn't change by change of place?

Ans→ Mass doesn't change by change of place.

23. State which of the quantities, mass or weight is always directed vertically downwards.

Ans→ Weight is always directed vertically downwards.

C. Numericals

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

Ans→ Given that distance (d) = 160 km

time (t) = 4 h

So, the average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$

$= \frac{160 \text{ km}}{4 \text{ hr}} = 40 \text{ km h}^{-1}$

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2. A train travels a distance of 300 km with an average speed of 60 km h^{-1}. How much time does it take to cover the distance?

Ans → Given that distance (d) = 300 km
speed (v) = 60 km h^{-1}

So, the time taken for the journey = $t = \frac{d}{v}$

$$\frac{300 \text{ km}}{60 \text{ km } h^{-1}} = 5 \text{ hr}$$

3. A boy travels with an average speed of 10 m s^{-1} for 20 minutes. How much distance does he travelled?

Ans → Given that speed (v) = 10 m s^{-1}
time (t) = 20 minutes

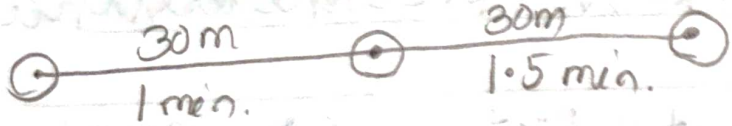
So, 20 minutes = 1200 secs

so, the total distance travelled = $d = vt$

$= 10 \text{ m s}^{-1} \times 1200 \text{ s} = 12000 \text{ m}$
or 12 km

4. A boy walks a distance of 30m in 1 minute and another 30m in 1.5 minutes. Describe the type of motion of the boy and find its average speed. (in $m\,s^{-1}$)

Ans→



The motion of the boy can be divided into 2 parts. In the first part the boy covers 30 m in 1 minute and another 30m in 1.5 minutes. Since, the boy covers equal distance in unequal interval of time so, the the motion of the boy is non-uniform.

In the first part of the journey

$D_1 = 30\,m$

$t_1 = 1$ minute

So, speed $(v_1) = \frac{D_1}{t_1}$

$= \frac{30\,m}{1\,\text{minute}}$

$= \frac{30\,m}{60\,sec} = \frac{1}{2}\,m\,s^{-1}$

$= 0.5\,m\,s^{-1}$

$d_2 = 30\,m$

$t_2 = 1.5$ minutes

$\therefore v_2 = \frac{d_2}{t_2}$

$= \frac{30\,m}{1.5 \text{ minutes}}$

$= \frac{30\,m}{90 \text{ sec}} = \frac{1}{3}\,m\,s^{-1}$

$= 0.33\,m\,s^{-1}$

So, the motion of the body is non-uniform.

So, the average speed $= \frac{\text{total distance travelled}}{\text{total time taken}}$

$= \frac{60\,m}{2.5 \text{ minutes}}$

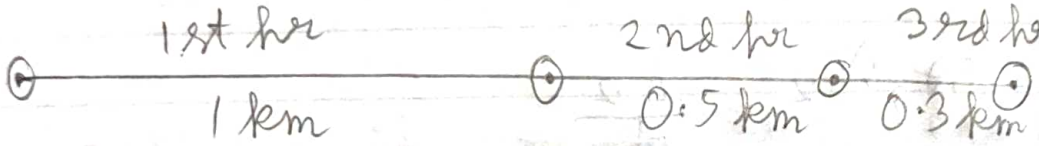
$= \frac{60\,m}{150 \text{ sec}} = \frac{2\,m}{5 \text{ sec}}$

$= 0.4\,m/sec$

25
x 60
150
1500

5. 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}

Ans →



total distance covered = 1.8 km
total time taken = 3 hrs

(i) so, the average speed in km h^{-1} = $\frac{\text{total distance travelled}}{\text{total time taken}}$

= $\frac{1.8 \text{ km}}{3 \text{ hr}}$ = 0.6 km h^{-1}

(ii) the average speed in m s^{-1} = $\frac{\text{total distance travelled}}{\text{total time taken}}$

= $\frac{0.6 \text{ km}}{1 \text{ hr}}$ = $\frac{600 \text{ m}}{3600 \text{ sec}}$

= 0.1666 m/s

= 0.0167 m/s

6. A car travels with speed 30 km h^{-1} for 30 minutes and then with speed 40 km h^{-1} for one hour.

Find:

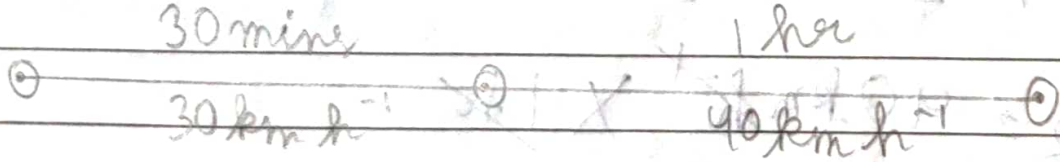
(a) total distance travelled by the car

~~Ans → 70 km h^{-1} distance~~

(b) the total time of travel.

(c) the average speed of car

Ans →



the journey of the car can be divided into 2 parts. In the first part

Given that

$v_1 = 30$ km h^{-1}

$t_1 = 30$ mins $= 0.5$ hrs

~~so, the total distance travelled by the car =~~ So, d_1 =

$d_1 = v_1 t_1$

$d_1 = 30\ km\ h^{-1} \times 0.5\ h$

$= 15\ km$

In the second part

given that

$v_2 = 40\ km\ h^{-1}$

$t_2 = 1\ hr$

~~so, the total distance travelled by the car~~

So, $d_2 = v_2 t_2$

$d_2 = 40\ km\ h^{-1} \times 1\ h$

$= 40\ km$

so, the total distance travelled by the car =

~~15 km +~~ $d_1 + d_2$

$= 15\ km + 40\ km$

$= 55\ km$

(b) So, $t_1 = 0.5$ hr

So, $t_2 = 1$ hr

so, the total time of travel =

$$t_1 + t_2$$

$$= 0.5 + 1 \text{ hr}$$

$$= 1.5 \text{ hr}$$

(c) so, the average speed of the car =

$$\frac{\text{total distance travelled}}{\text{total time taken}}$$

$$= \frac{55 \text{ km}}{1.5 \text{ hr}}$$

$$= \frac{55 \times 10}{1.5 \times 10} = \frac{550}{15} = 36.67 \text{ km h}^{-1}$$

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

Ans→ Given that

the weight of a body of mass 1.0 kg is 10N on earth ~~while on moon~~

(a) ∴, the weight of a body of mass 37 kg in kgf =

37 kg = 37 kgf (∵ 1 kg = 1 kgf)

(b) ∴, the weight of the body in N =

37 kgf = 370N (∵ 1 kgf = 10N)

8. The weight of a body of mass 6.0 kg on moon is 10N. If a body of mass 30 kg goes from earth to the moon surface. What will be his (a) mass (b) weight

Ans→ Given that

the mass of the body is 30 kg on earth's surface.

(a) Since the mass is constant everywhere ∴, the mass of the boy on moon's surface is 30 kg.

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(b) Given that

mass of 6 kg has weight on moon = 10 N

so, the mass of 30 kg has weight =

$$\frac{10\,N}{\cancel{6\,kg}} \times \cancel{30\,kg} = 50\,N$$