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TEST YOURSELF

A. Objective Questions:

1. Write T for True and F for False for each statement:

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

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

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

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

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

f) Mass has both ~~~~ magnitude & direction. False

g) Weight always acts vertically downwards. True

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

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 line is rectilinear motion.

c) One to and fro motion of a clock pendulum take time = 2 s

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

e) Total distance travelled = average speed x 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 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)

4. Select the correct alternative:

(a) A book lying on a table is an example of:

i) a body at rest
ii) a body neither at rest nor in motion
iii) a body 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 distance 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

B. Short / Long Answer Questions:

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

Ans: 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.

2. Comment on the statement 'rest and motion are relative terms'. Give an example.

Ans: Imagine you are sitting inside a moving bus. When you look outside you will observe that you are moving. Now look to the roof of the bus. With respect to the roof of bus, you are at rest. Hence it is concluded that rest and motion are relative terms.

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 in motion relative to the compartment and is in motion relative to the platform.

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

4. Name five different types of motion you know.

Ans: The different types of motion are:

i) Translatory motion ii) Rotatory motion
iii) Oscillatory motion iv) Vibratory motion
v) Periodic motion vi) Multiple motion
vii) Random motion

9. How does rotatory motion differ from circular motion?

Ans: 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 the body from a fixed point always remains same, whereas it is not same in curvilinear motion.

10. Explain oscillatory motion by giving one example.

Ans: Oscillatory motion -: The to and fro motion of a body from its rest position (or mean position) is called the oscillatory motion. For example, the motion of the pendulum of a wall clock.

11. What is vibratory motion. Give one example

Ans: It is also an oscillatory motion with the difference that in vibratory motion, a part of the body always remains fixed and the rest part moves to and fro about its mean position.
Example -: Our vocal cords vibrate to produce sound when we speak or sing.

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

Ans:

Periodic Motion	Non-periodic Motion
* A motion which gets repeated after regular intervals of time.	The motion which does not repeat itself after regular intervals of time.

Periodic Motion	Non-Periodic Motion
* The Earth moving around the sun takes 365 days to complete one revolution and this motion gets repeated after every 365 days.	A football running on a field, application of brakes in a moving vehicle, a ball rolling down the ground gradually slows down and finally stops.

13. What is random motion? Give one example.

Ans: When an object in a motion has no specific path and which suddenly changes its motion is said to have a random motion.
Example -: A flying kite.

14. Name the type or types of motion being performed by each of the following:

a) Vehicles on a straight road
Ans: Rectilinear Motion
b) Blades of an electric fan in motion.
Ans: Rotatory motion
c) pendulum of a wall clock
Ans: Oscillatory motion, Periodic motion
d) Smoke particles from chimney.
Ans: Non-Periodic Motion
e) Hands of a clock
Ans: Uniform, circular and periodic motion
f) Earth around the sun
Ans: Rotatory, circular and periodic Motion
g) A spinning top
Ans: Rotatory Motion

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

Ans: 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).

16. State the types of motion of the following:

a) The needle of a sewing machine.

Ans: Periodic Motion

b) The wheel of a bicycle.

Ans: Rotatory Motion

c) The drill machine

Ans: Mixed ⇒ Translatory and rotatory motion

d) The carpenter's saw

Ans: Mixed ⇒ Translatory and oscillatory motion

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

Ans: 1 kg F ⇒ 10 N

21. Which quantity: mass or weight, does not change by change of place?

Ans: The mass of a body is constant and it does not change by changing the position of the body.

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

Ans: Mass is the quantity of matter contained in a body. Weight is always directed vertically downwards.

C. Numericals

1. A car covers a distance of 180 km between two cities in 4 h. What is the average speed of the car?

Ans: Distance ⇒ 180 km

Time taken ⇒ 4 h

Speed ⇒ ?

Speed ⇒ $\frac{\text{Distance covered}}{\text{Time taken}} \Rightarrow \frac{180\ \text{km}}{4\ \text{h}} \Rightarrow 40\ \text{km h}^{-1}$

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: Speed ⇒ 60 km h^{-1}

Distance covered ⇒ 300 km

Speed ⇒ $\frac{\text{Distance covered}}{\text{Time taken}}$

Time taken $\Rightarrow \frac{\text{Distance covered}}{\text{speed}} \Rightarrow \frac{300\ km}{60\ km\ h^{-1}}$

$\Rightarrow 5\ h$

3. A boy travels with an average speed of $10\ m\ s^{-1}$ for 20 min. How much distance does the travel?

Ans: Average speed of boy $\Rightarrow 10\ m\ s^{-1}$

Time taken $\Rightarrow$ 20 min

Distance travelled $\Rightarrow$ Speed $\times$ Time taken

Convert minutes into seconds

1 minute $\Rightarrow$ 60 sec

20 minutes $\Rightarrow 20 \times 60 \Rightarrow 1200$ sec

Distance travelled $\Rightarrow 10\ m\ s^{-1} \times 1200$ sec.

$\Rightarrow 12{,}000$ or 12 km

4. 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 averag speed in $m\ s^{-1}$.

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

Total distance travelled in going and coming back $\Rightarrow d \Rightarrow 30\ m + 30\ m = 60\ m$

Total time taken in going and coming back

$t \Rightarrow 1\ min + 1.5 = 2.5\ min \Rightarrow 2.5 \times 60\ s \Rightarrow 150\ s$

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

$\Rightarrow \frac{60\ m}{150\ s} \Rightarrow \frac{6\ m}{15\ s} \Rightarrow 0.4\ m\ s^{-1}$

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: Distance travelled in first hour $\Rightarrow$ 1 km

Distance travelled in second hour $\Rightarrow$ 0.5 km

Distance travelled in third hour $\Rightarrow$ 0.3 km

Total time taken $\Rightarrow$ 3 h

Total distance travelled $\Rightarrow 1 + 0.5 + 0.3 \Rightarrow 1.8$ km

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

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

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 seconds

Average speed ⇒ $\frac{D}{T}$ ⇒ $\frac{1800}{10800}$ ⇒ 0.167 $m\,s^{-1}$

6. 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

c) the average speed of car

Ans: 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

1st case, Speed ⇒ $\frac{\text{Distance}}{\text{Time}}$ ⇒ Distance ⇒ Speed × Time

(∵ 30 minutes ⇒ 0.5 hour)

Distance ⇒ 30 × 0.5

⇒ 15 km ...(i)

2nd case, Speed ⇒ $\frac{\text{Distance}}{\text{Time}}$ ⇒ Distance ⇒ Speed × Time

Distance ⇒ 40 $km\,h^{-1}$ × 1 h ⇒ 40 km ...(ii)

Adding (i) and (ii)

Total Distance ⇒ 15 km + 40 km ⇒ 55 km

b) Total time of travel ⇒ 0.5 h + 1.0 h ⇒ 1.5 h

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

⇒ $\frac{55\text{ km}}{1.5\text{ h}}$ [from above (a) and (b)]

⇒ 36.67 km h^{-1}

7. 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?

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

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

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

⇒ 37 kgf ⇒ 37 × 10 N ⇒ 370 N

8. 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?

Ans: (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 ⇒ $\frac{1}{6}$
∴ 30 kg boy will weight $\overset{5}{\cancel{30}} \times \frac{1}{\cancel{6}_1} \Rightarrow 5$ kg
1 kg ⇒ 10 N ⇒ 5 × 10 N ⇒ 50 N
∴ Weight of boy on moon surface ⇒ 50 N

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