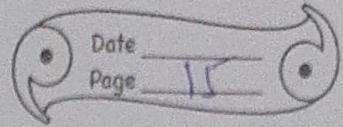


HW
25/6/21

ch-2
Motion
Exercise



A) Objective Questions

i) Write True or False

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 and direction. False

HU
28/6/21

Date _____
Page 16

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 takes time = 2s

d) $36 \text{ km h}^{-1} = \underline{10} \text{ ms}^{-1}$

e) Total distance travelled = average speed \times total time taken.

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

HW
25/6/21

Date _____
Page _____

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

b) Periodic motion

ii) a car moving on market

c) Vibratory motion

iii) movement of the hands of a clock.

d) Rotatory motion

iv) motion of wire of a guitar.

e) Non-uniform motion

v) motion of pendulum of a clock;

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

HOD
25/6/21

Date _____
Page 18

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) vibratory

f) A boy goes from his home 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 :-

HOD
28/6/22

Date _____
Page 19

Q) 24 km h^{-1}

Q) 30 km h^{-1}

Q) 25 km h^{-1}

Q) 20 km h^{-1}

Q) 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 :-

Q) 50 kg Q) 500 N Q) 50 N Q) 5 N

B) Short / Long answer questions:-

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

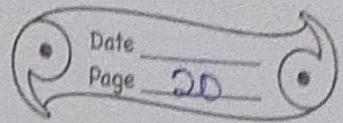
Ans) Rest:- A body is said to be at rest if it does not change its position with respect to its immediate surroundings.

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, you are at rest. Hence it is concluded

25/6/21



that rest and motion are relative terms.

Q3) 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 at rest relative to the platform.

4) Name the five different types of motion you know.

Ans) 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.

HOD
25/6/21

Date _____
Page _____ 21

Q5) What do you mean by translatory motion?
Give one example.

Ans) 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. Ex - 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 corner ~~to~~ of a room to the other, are all the translatory motion.

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

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

ii) Curvilinear - If the motion of a body is along a curved path, it is said to be the curvilinear motion. Ex - the motion of a cycle while taking a turn on the road, a car moving ~~to~~ along a curved path, a ball thrown by an

HOD
25/6/21

Date _____
Page 22

athletes are in curvilinear motion.

#) What is rotatory motion? Give two examples.
Ans) 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. Ex - the blades of a fan, a spinning wheel.

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

Ans) The motion of a body along a circular path is called circular motion. Ex - a girl is whirling a stone tied at the end of a string in a circular path.

Q) How does a rotatory motion differ from the circular motion?

Ans) In rotatory motion, the axis of rotation passes through 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

HOD
25/6/21

Date _____
Page 23

Q Is the rotational motion.

Ans In the circular and rotatory motions, the distance of a point of a the body from a fixed point always remain 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 simple pendulum is an oscillatory motion.
Ex - 1) The motion of a swing, 2) Piston of an engine.

Q11) what is vibratory motion? Give one example.
Ans 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. Ex - when we breath, our chest expands and contracts. This motion is vibratory motion.

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

4/2
25/6/12

Date _____
Page _____ 24

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

14) Name the type of motion being performed by each of the following:-

- a) Vehicle on a straight road :- Rectilinear
- b) Blades of an electric fan in motion :- Rotatory
- c) Pendulum of a wall clock :- oscillatory & periodic
- d) Smoke particles from chimney :- Non-periodic
- e) Hands of a clock :- Uniform, Circular & periodic
- f) Earth around the sun :- Rotatory, Circular & periodic
- g) A spinning top :- Rotatory

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

Ans) Sometimes a body can have more than one type of motion. Such a motion is called the mixed motion. Ex- (i) The wheels of a moving train 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

17) Distinguish between uniform and non-uniform motions, giving an example of each.

Ans

Uniform motion	Non-uniform motion
1) When a body covers equally when a body covers distances in a straight line, equal distances in equal intervals of time, intervals of time however small there are in a straight line.	

2) In this case direction of motion remains the same.
3) In this case direction of motion changes.

2) Ex - A body moving with a constant speed in a straight line has uniform motion.	3) Ex - Circular motion is example of non-uniform motion.
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18) How do you determine the average speed of a body in non-uniform motion?

Ans 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,

~~HOD
28/6/17~~

Date _____
Page 28

Average speed = Total distance travelled by the body / Total time of Journey.

19) Define the term weight and state its SI 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 is not constant, but it changes from place to place. It is represented by the symbol W . The SI unit of weight is newton (N).

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

Ans) $1 \text{ kgf} = 10 \text{ N}$

21) State three differences between mass and weight.

Ans) Mass

(i) It is the quantity of matter contained in a body

(ii) Its SI unit is Kilogram (kg)

(iii) It is measured by a beam balance.

110
23/6/21

Date _____
Page _____ 28

Weight

Q) It is the force with which the earth attracts the body.

A) Its SI unit is newton (N)

A) It is measured by a spring balance.

22) Which quantity : mass or weight, does not change by change of place?

A) 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.

A) Mass is the quantity of matter contained in a body. Weight is the force with which the earth attracts the body. Weight is always directed vertically downwards.

Numericals

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

~~WOO~~
~~25/6/21~~

Date _____
Page 29

Q) Distance = 160 km

Time = 4 h

Speed = Distance travelled

$$= \frac{\text{Time Taken}}{\text{Distance}} = \frac{4 \text{ h}}{160 \text{ km}} = 40 \text{ km/h}$$

Q) 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?

A) Speed = 60 km/h^{-1}

Distance covered = 300 km

\therefore Speed = Distance travelled
Time taken

\therefore Time taken = Distance travelled
Speed

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

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

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

Time taken = 20 min

Distance travelled = speed \times Time taken

HW
25/6/21

Date _____
Page 30

Convert minutes into seconds

$$1\text{ min} = 60\text{ sec}$$

$$20\text{ min} = 20 \times 60 = 1200\text{ sec}$$

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

4) A boy walks a distance 30m in 1 min and another 30m in 1.5 min. Describe the type of motion of the boy and find his average speed in m s^{-1} .

Sol) Total distance travelled in going and coming back

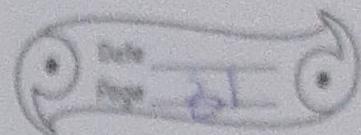
$$\text{Distance} = 30\text{ m} + 30\text{ m} = 60\text{ m}$$

$$\text{Total time taken} = 1\text{ min} + 1.5\text{ min} = 2.5\text{ min}$$
$$= 2.5 \times 60\text{ s} = 150\text{ s}$$

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time of travel}}$$
$$= \frac{60\text{ m}}{150\text{ s}} = 0.4\text{ m s}^{-1}$$

5) A cyclist travels a distance of 1km 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
9) km h^{-1} 9) m s^{-1}

HW
25/6/21



Q1) Distance in first hour = 1 km

Distance in second hour = 0.5 km

Distance in third hour = 0.3 km

Total time taken = 3 hr

$$\text{Total distance} = 1 + 0.5 + 0.3 = 1.8 \text{ km}$$

Q2) Average speed in km h^{-1}

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

Q3) Average speed in m s^{-1}

$$1 \text{ km} = 1000 \text{ m}$$

$$1.8 = 1.8 \times 1000 \text{ m}$$
$$= 1800 \text{ m}$$

$$1 \text{ hour} = 3600 \text{ seconds}$$

$$3 \text{ hours} = 3600 \times 3 = 10800 \text{ s}$$

$$\text{Sav} = \frac{\text{D}}{\text{T}} = \frac{1800}{10800} = 0.167 \text{ ms}^{-1}$$

Q4) A car travels with speed 30 km h^{-1} for 30 min and then with speed 40 km h^{-1} for one hour. Find :-

- the total distance travelled by the car.
- the total time of travel, and
- the average speed of car.

Ans) Speed of car for first 30 min = 30 km h^{-1}
Speed of car for next 1 hour = 40 km h^{-1}
∴ Total distance travelled by the car

1st case, speed = $\frac{\text{Distance}}{\text{Time}}$ $\Rightarrow \text{Distance} = \text{Speed} \times \text{Time}$

($\because 30 \text{ min} = 0.5 \text{ hr}$)

$$\text{Distance} = 30 \times 0.5$$
$$= 15 \text{ km}$$

2nd case speed = $\frac{\text{D}}{t}$ $\Rightarrow D = sxt$

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

Add 1st case and 2nd case

$$\text{Total distance} = 15 \text{ km} + 40 \text{ km} = 55 \text{ km}$$

b) Total time of travel = $0.5 \text{ hr} + 1.0 \text{ hr} = 1.5 \text{ hr}$

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

$$= \frac{55 \text{ km}}{1.5 \text{ hr}} = 36.67 \text{ km h}^{-1}$$

H.U.O
25/6/21

Date _____
Page _____ 33

Q) On earth the weight of a body of mass 1.0 kg is 10N. 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 = 10N

a) Weight of a boy of mass = 37 kg

b) Weight of a boy of 37 kg in N will be
 $1 \text{ kgf} = 10 \text{ N}$

$$\therefore 37 \text{ kgf} = 37 \times 10 \text{ N}$$
$$= 370 \text{ N}$$

Q) The weight of a body of mass 6.0 kg on moon is 10N. 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 $\frac{1}{6}$

$$\therefore 30 \text{ kg boy will weight } 30 \times \frac{1}{6} = 5 \text{ kg}$$

$$1 \text{ kg} = 10 \text{ N} \Rightarrow 5 \times 10 \text{ N} = 50 \text{ N}$$

\therefore Weight of boy on moon surface = 50 N.