CH=6 (Motion and time)

Speed :-

= Speed is an indicator of rate/ rapidity of a given motion

SPEED = $\frac{\text{DISTANCE}}{\text{TIME}}$

or

speed = distence per unit time

Avrage speed = $\frac{\text{Total distance covered}}{\text{Total time taken.}}$

SPEEDOMETRE :-

= The speedometre, of vehicles, directly record the speed at a given time (instantaneous speed) in km/h. The vehicles is in uniform motion (along a straigh path), if its average speed is some as its instentaneous speed.

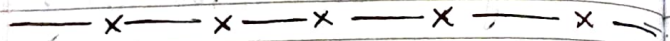
Uniform and Non-Uniform Motion :-

Uniform = When an object, moving along a straight path, covers equal distance in equal intervals of time (however small these time interval may be) its motion is called a uniform motion

Eg :- Car moving on straigth road.

Non-Uniform = when a object (i) moving along a straigth path, covers unequal distance in equal intervals of time or (ii) does not more along a straigth path, its motion is called a non-uniform motion

Eg:- When a car moving on road which have heavy traffic

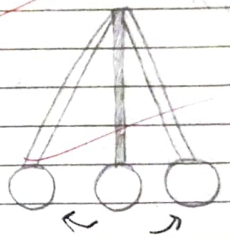


Example 1: Suppose, on an educational trip, you have travelled a total distance of 440 km and your trip took 8 hours. Your (average) speed was.

Soln = $\frac{440\,km}{8\,h} = 55\,km/h$.

THE SIMPLE PENDULAM

= A simple pendulum is made up of a metal ball (bob) attached to a taut light string, or thread that is fixed rigidly at on end



Graph :-

= Graph is the pictorial representation of "concept or idea"

* Uses of graph

) Graph very often used in Science, mathematics and other fields of study, help us in having such a 'Pictorial' and 'alive' representation

) They enable us to communicate information in an interesting and visual manner

* Types of graph

1) Bar graph
2) Pie chart
3) Linear or Straight line graph

Example 1) Suppose on an educational trip you have travelled a total distance of 440 Km and your trip took 8 hours. your average speed was

$$\frac{440\ Km}{8\ h} = 55\ Km/h$$

Example 2) The odometre of a car reads 12000 km at the start of trip and 12400 km at the end of the trip. if the trip took 8 hours, find the average speed of the car.

Distance covered by the car = 12400 km - 12000 km
= 400

Time taken = 8 hours

Average Speed = Distance covered by the car / Time taken

$$= \frac{400\ Km}{8\ hour} = 50\ Km/h$$

Example = 3 The Shatabdi Express takes 6 hours to travel from New Delhi to Lucknow at an average speed of 80 km/h. Find the distance from New Delhi to Lucknow.

we have

$$\text{distance} = \text{speed} \times \text{time}$$
$$= \frac{80 \text{ km}}{\text{h}} \times 6$$
$$= 480 \text{ km Ans}$$

Example 4 = The distance from delhi to chandigarh is 250 km. A bus travels at an average speed of 50 km/h. How much time would it take to travel from delhi to chandigarh

$$\text{time taken} = \frac{\text{distance covered}}{\text{speed}}$$
$$= \frac{250 \text{ km}}{50 \text{ km/h}}$$
$$= 5 \text{ h Ans}$$

SOMETHING TO KNOW

A Fill in the blanks:-

1) An object is said to be at rest if it does not change its position with time.

2) The S.I unit of time is second

3) A child sitting in a revolving giant wheel, is an example of a circular motion.

4) A car, moving on a busy straight road, is an example of non-uniform motion.

5) The speedometer of a motorbike measures its speed in km/h

B) Write true or false

1) The speed of a fast moving train is usually measured in metre per hour False

2) The average speed remains constant for an object having a uniform motion True

3) A man walks for 1 minute, at a speed of 1m/s, along a straight track. The total distance covered by him is 1m False

4) An object, moving along a straight line, is said to be in uniform motion if it covers regularly increasing distance in equal intervals of time True

5) The time period of a simple pendulum, that takes 42 second to complete 20 oscillation, equals 2.1 second True

6) The distance-time graph, for a car kept parked on a side road, is a straight line parallel to the time axis True

C Tick the correct option

1) Out of the following, the only correct formula is —

= distance = speed x time

2) A man walks on a straight road from his home to a market 3km away with a speed of 6km/h. The time, taken by the man to go from his home to market, equals.

= 30 min

now,

Time taken = $\frac{\text{distance}}{\text{speed}}$

$= \frac{3\,km}{6\,km/h}$

$= \frac{1}{2}\,h$

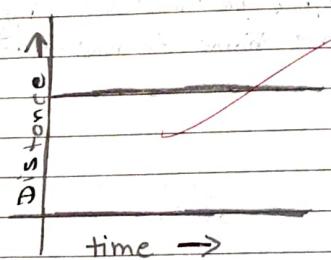
$= 30\,h$

3) The odometre of a car, reads 57321.0 km when the clock shows the time as 8:30 a.m. The odometre reading changes to 57336.0 km at time 8:50 am. The distance, moved by the car, in these 20 min, equals-

= 15km

4) Out of the following distance-time graphs, the graph that represents a truck at rest, is the graph labelled-

=



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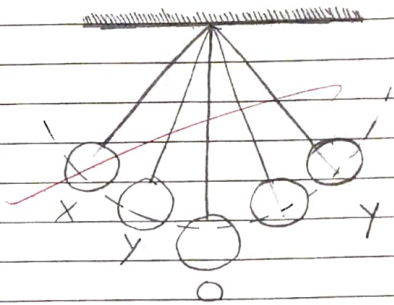
5) In the given diagram of a simple pendulam, the time taken by the bob to move from X to Z is 't_1' and from Z to O is 't_2'. The time period of the simple pendulam is-



= $4(t_1 + t_2)$

6) The S.I. unit of speed is -

= m/second

D Answer the following in brief.

Q1) A boy walk to his ~~bag~~ school with a constant speed of 4Km/h and reaches there in 30 minute. Find the distance of the school from his house.

Ans Speed = 4Km/h

Time = 30 min = $\frac{30}{60} = \frac{1}{2}$ h

Speed = $\frac{\text{distance}}{\text{Time}}$

Distance = Speed x time

= $4 \times \frac{1}{2} = 2$ Km

Q2 The distance between two station is 216 Km. A bus taken 4 hours to cover this distance. Calculate the average ~~speed~~ speed of the ~~bus~~ in Km/hour

Ans Distance = 216 Km

Time taken = 4h

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

= $\frac{216 \text{ Km}}{4 \text{ h}}$

= 54 Km/h

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3) Two car A and B (starting at the same time, from the same point) are moving with average speeds of 40 Km/h and 50 Km/h, respectively, in the same direction. Find how far will car B be from car A after 3 hour.

Car A = 40 Km/h

Car B = 50 Km/h

Car A :-	Car B :-
Speed = 40 Km/h	Speed = 50 Km/h
time = 3h	Time = 3h
Distance = S x t	Distance = S x T
= 40 x 3	= 50 x 3
= 120 Km	= 150 Km

∴

Distance between car A and B

= (150 - 120) Km

= 30 Km

Car B is 30 Km more than Car A

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④ A car moves with a speed of 40 km/h for 15 min and then with a speed of 60 km/h for the next 15 min. Find the total distance covered by the car in these 30 minutes

Ans Distance of car in 15 min

$= 40 \times \frac{15}{60}$

$= 10$ Km

Distance of car in next 15 min

$= 60 \times \frac{15}{60}$

$= 15$ Km

∴ total distance covered

$= (10 + 15)$ km

$= 25$ Km Ans

5) Define the term 'Periodic motion'. Give two example of periodic motions that can be used to measure time.

Ans Periodic motion :-
motion, which repeats itself after a regular interval of time, is called periodic motion

Example :- (1) motion of the hands of a clock
(2) motion of the moon around the earth

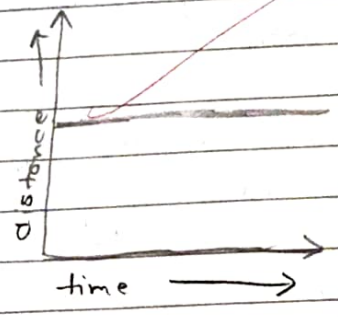
6) Distinguish between uniform and non-uniform motion. Give one example of each

Uniform motion
when an object, moving in equal distance in equal interval of time.
example :-
car moving on a straight road

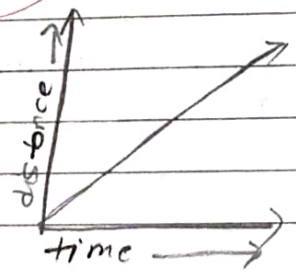
Non-uniform motion:
when an object moving along a path, covers unequal distance in unequal intervel of time

7) Draw the shape of distance-time graph for:

(a) a man, waiting for bus, standing at one point.



(b) a man, walking on a level, straigth and narrow road, with a constant speed.



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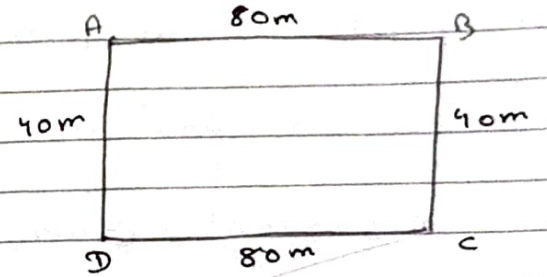
1) A farmer moves along the boundary of a rectangular field ABCD as shown in the figure. He takes 4 min to travel across each side



Is the motion of the farmer uniform or non-uniform? Find the average speed over one complete round of the field.

Ans Average speed = Total distance covered / Total time taken

$= \frac{80+80+40+40}{4\times4}$

$= \frac{240}{16} = 15\text{m/min}$

∴ motion of farmer is in non-uniform

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2 During rainy season, shivam noted that the thundering sound of cloud was heard 6 second after the lightning was seen by him. If speed of sound in air is 340 m/s. find the distance of the point where the thundering sound was produced.

Ans Speed of sound = 340 m/s (Given)

Time = 6 second (Given)

∴ distance = Speed × time

= 340 × 6

= 2040 m

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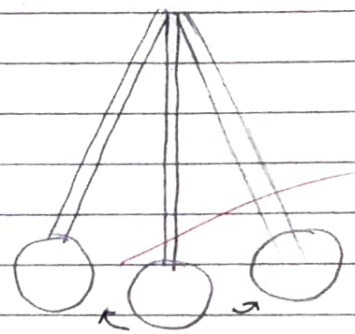
(3) (a) How can we make a simple pendulum?

Ans A simple pendulum is made up of a metal ball attached to a taut light string, or thread, that is fixed rigidly at one end.

The bob of the pendulum is free to oscillate. When the pendulum is at rest it is in its mean (equilibrium) position. When the bob of the pendulum is slightly displaced from its mean position, the (bob) undergoes a regular 'to and fro' motion



b) A simple pendulum takes 10 seconds to complete 5 oscilation. Find the time period of this pendulum.

Ans Time period = $\frac{\text{time take for the oscillation}}{\text{Total no. of oscillation}}$

$= \frac{10 \text{ sec}}{5} = 2 \text{ sec}$

∴ Time taken for 1 oscillation is 2 second

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in book.

4) Carefully examine the data given for motion of two different objects A and B. State whether the motion of these two objects is uniform or non-uniform motion.

Ans (a) The object A is in uniform motion because it covers equal distance in equal interval of time.

(b) The object B is in non-uniform motion because it covers unequal distance in equal interval of time.

5) Observe the graph shown in book

Ans 1) values of P = 3 m
Q = 12 m

2) value of R = 12 second

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