UNIT 2 – FORCE AND MOTION

Class : VII

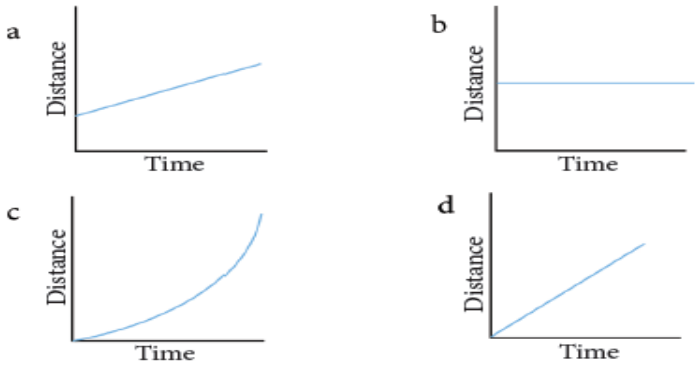
Subject : SCIENCE

I. Choose the best answer.

1. A particle is moving in a circular path of radius r. The displacement after half a circle would be

a. Zero b. R **c. 2 r** d. r / 2

2. Which of the following figures represent uniform motion of a moving object correctly?



Ans : b

3. Suppose a boy is enjoying a ride on a merry go round which is moving with a constant speed of 10 m/s. It implies that the boy is

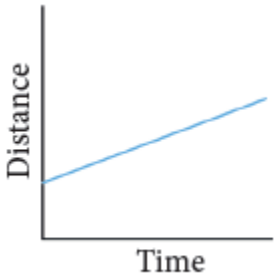
a. at rest b. moving with no acceleration

c. in accelerated motion d. moving with uniform velocity

4. From the given v-t graph it can be inferred that an object is

a. in uniform motion b. at rest

c. in non - uniform motion **d. moving with uniform accelerations**



5. How can we increase the stability of an object?

a. Lowering the centre of gravity b. Raising the centre of gravity

c. Increasing the height of the object d. Shortening the base of the object

II. Fill in the blanks.

1. The shortest distance between two places is **Displacement.**

2. The rate of change of velocity is **Acceleration.**

3. If the velocity of an object increases with respect to time, then the object is said to be in **Positive** acceleration.

4. The slope of the speed–time graph gives **Velocity.**

5. In **Neutral** equilibrium, the centre of gravity remains at the same height when it is displaced

III. Match the following.

Displacement	-	Knot	3
Light travelling through vacuum	-	Geometric centre	5
Speed of ship	-	Metre	1
Centre of gravity of geometrical shaped objects	-	Larger base area	4
Stability	-	Uniform velocity	2

IV. Analogy

1. Velocity : metre / second :: Acceleration : **Meter / second ^{2}.**

2. Length of scale : metre :: Speed of aero plane : **Knot.**

3. Displacement / Time : Velocity :: Speed / Time : **Acceleration .**

V. Answer very briefly.

1. Asher says all objects having uniform speed need not have uniform velocity. Give reason.

Ans :

An object moving in uniform circular motion is moving around the perimeter of the circle with a constant speed.

While the speed of object is constant, its velocity is changing

Ex: Merry- go-round, roller coaster ,Planets orbiting the sun

2. Saphira moves at a constant speed in the same direction. Rephrase the same sentence in fewer words using concepts related to motion.

Ans :

She moves in a straight line with constant velocity

3. Correct your friend who says that acceleration gives the idea of how fast the position changes.

Ans:

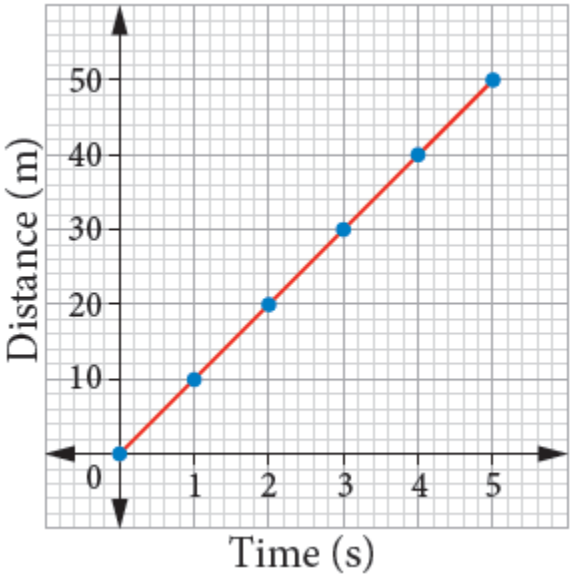
The Acceleration gives the idea of how fast the velocity changes

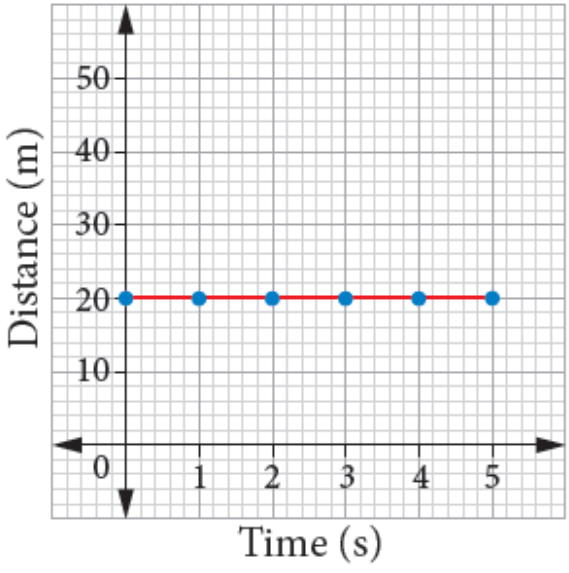
VI. Answer briefly.

1. Show the shape of the distance – time graph for the motion in the following cases.

a. A bus moving with a constant speed.

b. A car parked on a road side.





2. Distinguish between speed and velocity.

Speed

Speed is the rate of change of distance.

Speed = Distance / Time

The unit of speed is metre/second (m/s).

Velocity

Velocity is the rate of change in displacement.

Velocity (v) = Displacement / Time

SI unit of velocity is metre / second (m/s).

3. What do you mean by constant acceleration?

A body is said to have constant acceleration .if it travels is a straight line and its velocity increase or decreases by equal magnitude in equal intervals of time .

Ex: The motion of a freely falling body.

4. What is centre of gravity?

The centre of gravity of an object is the point through which the entire weight of the object appears to act.

VII. Answer in detail.

1. Explain the types of stability with suitable examples.

Stability is a measure of the body's ability to maintain its original position. Three types of stability are:

a. Stable equilibrium

b. Unstable equilibrium

c. Neutral equilibrium

Let us demonstrate them by taking a frustum.

Stable Equilibrium

In stable equilibrium, the frustum can be tilted through quite a big angle without toppling.

Its centre of gravity is raised when it is displaced. The vertical line through its centre of gravity still falls within its base. So, it can return to its original position.

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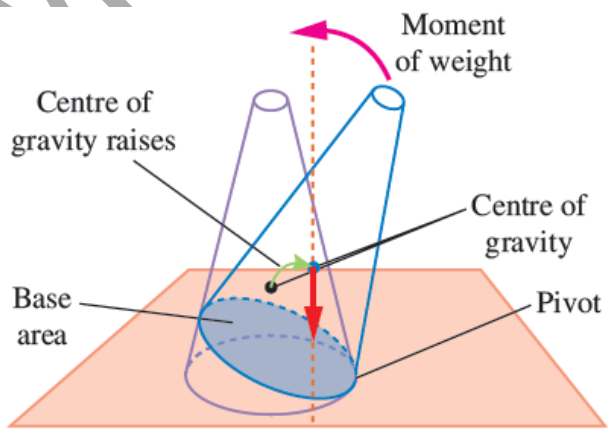
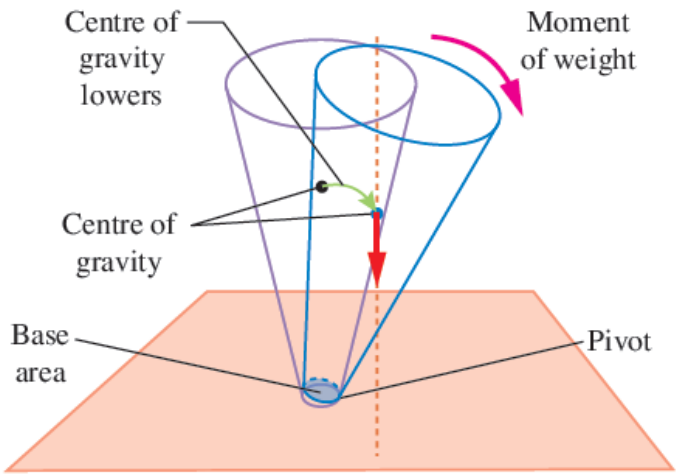


Unstable Equilibrium

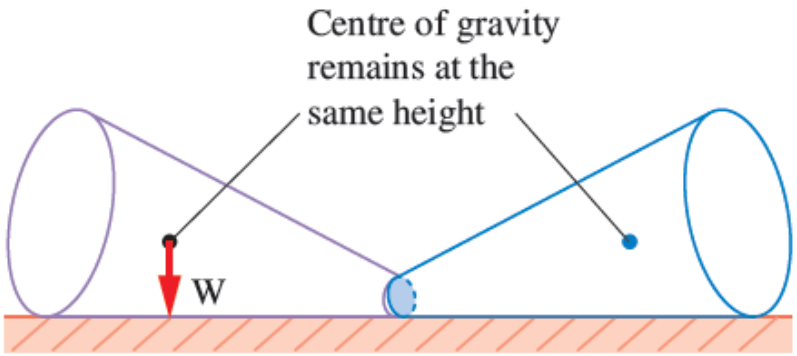
In this equilibrium, the frustum will topple with the slightest tilting. Its centre of gravity is lowered when it is displaced.

Here, the vertical line through its centre of gravity falls outside its base. So, it will not come back to its position.



Neutral Equilibrium

It causes frustum to topple. The frustum will roll about but does not topple. Its centre of gravity remains at the same height when it is displaced. The body will stay at any position to which it has been displaced.



2. Write about the experiment to find the centre of gravity of the irregularly shaped plate.

1. Make three holes in the lamina.

2. Suspend the lamina from the optical pin through one of the holes as shown in figure.

3. Suspend the plumbline from the pin and mark the position of the plumbline on the lamina.

4. Draw lines on the lamina representing the positions of the plumbline.

5. Repeat the above steps for the other holes.

6. Label the intersection of the three lines as X, the position of the centre of gravity of the lamina.

VIII. Numerical problems.

1. Geetha takes 15 minutes from her house to reach her school on a bicycle. If the bicycle has a speed of 2 m/s, calculate the distance between her house and the school.

Ans:

Given:

Time taken = 15 min [1 min = 60 sec]

= 15 x 60 = 900 sec

Speed = 2 m / s

Distance = ?

Distance = Speed x time

= 2x 900

Distance = 1800 m

2. A car starts from rest and it is travelling with a velocity of 20 m /s in 10 s. What is its acceleration?

Ans

Given

Initial velocity of the car (u) = 0 m /s

Final Velocity of the car (v) = 20 m / s

Time taken = 10 s

Acceleration = a = $\frac{v-u}{t} = \frac{20-0}{10} = \frac{20}{10} = 2$

3. A bus can accelerate with an acceleration of 1 m / s2. Find the minimum time for the bus to attain the speed of 100 km / s from 50 km / s.

Ans:

Given

Acceleration of the bus (a) = 1 m / s^2

Initial velocity (u) = 50 x km /s

= 50 x10^3 m /s

Final Velocity (v) =100 km / s

= 100 x 10^3 m /s

Time = ?

$$= \frac{V-U}{t} \quad = \quad t = \frac{V-U}{a}$$

$$t = \frac{100 \times 10^3 - 50 \times 10^3}{1}$$

$$= \frac{50 \times 10^3}{1}$$

$$t = 50 \times 10^3 \text{ s}$$

IX. Fill in the boxes.

S.No	First Move	Second Move	Distance (m)	Displacement
1	Move 4 metres east	Move 2 metres west	6	2 m east
2	Move 4 metres north	Move 2 metres south	6	2 m north
3	Move 2 metres east	Move 4 metres west	6	2 m west
4	Move 5 metres east	Move 5 metres west	10	0 (Same place)
5	Move 5 metres south	Move 2 metres north	7	3 m South
6	Move 10 metres west	Move 3 metres east	13 m	7 m West