Chapter 10



GRAVITATION

In Chapters 8 and 9, we have learnt about the motion of objects and force as the cause of motion. We have learnt that a force is needed to change the speed or the direction of motion of an object. We always observe that an object dropped from a height falls towards the earth. We know that all the planets go around the Sun. The moon goes around the earth. In all these cases, there must be some force acting on the objects, the planets and on the moon, Isaac Newton could grasp that the same force is responsible for all these. This force is called the gravitational force.

In this chapter we shall learn about gravitation and the universal law of gravitation. We shall discuss the motion of objects under the influence of gravitational force on the earth. We shall study how the weight of a body varies from place to place. We shall also discuss the conditions for objects to float in liquids.

10.1 Gravitation

We know that the moon goes around the earth. An object when thrown upwards, reaches a certain height and then falls downwards. It is said that when Newton was sitting under a tree, an apple fell on him. The fall of the apple made Newton start thinking. He thought that: if the earth can attract an apple, can it not attract the moon? Is the force the same in both cases? He conjectured that the same type of force is responsible in both the cases. He argued that at each point of its orbit, the moon falls towards the earth. instead of going off in a straight line. So, it must be attracted by the earth. But we do not really see the moon falling towards the eacrth.

Let us try to understand the motion of the moon by recalling activity 8.11.

Activity 10.1

- Take a piece of thread.
 Tie a small stone at one end, Hold the other end of the thread and whirl it round, as shown in Fig. 10.1.
- Note the motion of the stone.
- Release the thread.
 Again, note the direction of motion of the stone.

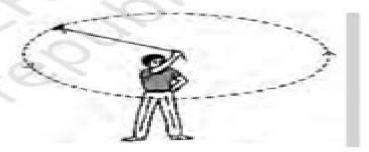


Fig. 10.1: A stone describing a circular path with a velocity of constant magnitude.

Before the thread is released, the stone moves in a circular path with a certain speed and changes direction at every point. The change in direction involves change in velocity or acceleration. The force that causes this acceleration and keeps the body moving along the circular path is acting towards the centre. This force is called the centripetal (meaning 'centre-seeking') force. In the absence of this

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