Gravitation - Lesson 6
What happens if there is no Centripetal Force?

In the absence of this centripetal force, which we call gravitational force, planets will not conform to orbits, nor will matter form spherical blobs called planets. If we switch off gravity, the earth will continue to move but in a straight line. It is the same effect when we tie a string to a stone and rotate it above our head, like a helicopter. If the string breaks, it will set off in a straight line which is the tangent to the circle of revolution. This happens because the force applied is suddenly removed, and there is no force to bend the stone towards the centre. This force is essential for the occurence of nature as we see and observe it.

Apart from this, there are various phenomena that occur due to gravity, such as the occurrence of high and low tides and the fact that we are always stuck to the earth's surface.

You should, now, be able to answer the following questions:

1. In the absence of centripetal force, if an object goes off in the tangential direction. What is the angle between the line showing the direction of centripetal force and the line showing the direction of motion?

2. What if instead of switching of the gravitational force, we gradually increase it. How would the motion look?

Conclusion

In the absence of centripetal force, the object in circular motion will fly off in a straight line which is the tangent at that point.

Note to Teacher

THaving introduced centripetal force in the previous lesson, the purpose of the lesson is to give the reader an understanding about the absence of centipetal force. It enforces the importance of it as well. The text relates the whirling of stone to centripetal force, an important comparision. The goal here is to understand that any object under the influence of centripetal force will travel in a straight line when the centripetal force is switched off suddenly.

Student Worksheet

1. Absence of centripetal force will enable the object to move in a

   (a) spiral

   (b) circle

   (c) straight line

   (d) zigzag path

2. The above path also forms a _____ to the circle.

3. Why is the above path a stratight line?

Answers

1. The tangent to a circle is always 90° or perpendicular to the line joining the point to the centre of the circle.
2. If we try to gradually increase the gravitational force, the motion of the object in question would look like a spiral. As the force is increasing, the object will experience more force than the previous instance and the orbit will start to shrink. As it shrinks gradually, the object will follow a spiral path.

Student Worksheet Answers

1. (c) straight line
2. Tangent
3. Because there is no force to bend the object towards the centre.