To Study the Conservation of Energy of a Ball Rolling Down on an Inclined Plane (using a double inclined plane)

Aim

To study the conservation of energy of a ball rolling down on an inclined plane (using a double inclined plane).

Apparatus

A double inclined plane (track), a steel ball of diameter about 20 cm, two wooden blocks (2.5 cm length), two weights of one kg each. Stop clock/watch, plumb line, metre scale, spirit level.

Theory

A body (ball) at rest at the top of an inclined track has only potential energy and zero kinetic energy. When the body rolls down the track, its potential energy decreases and kinetic energy increases. At the bottom of the track, it has all kinetic and zero potential energy.

If the same ball rolls up the second inclined track, its kinetic energy decreases and potential energy increases. When the ball stops somewhere near the top of the second inclined track, it has only potential energy and zero kinetic energy.

The ball will roll back from this second track and this will continue.

In the absence of any friction in the track, the sum of the kinetic and the potential energy of the ball will remain constant (conserved) throughout the motion of ball and motion of ball continue forever.

Diagram

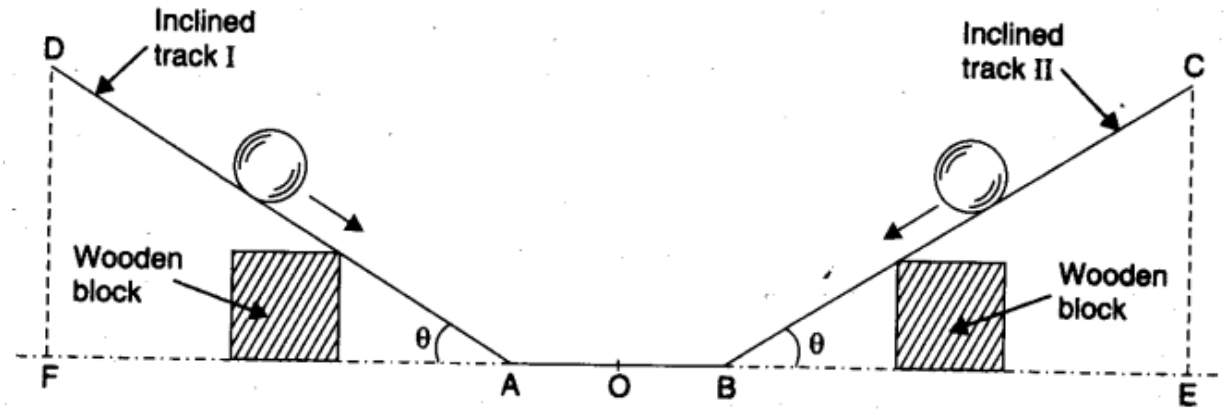

Fig. Double inclined track (plane).

Procedure

1. Set the laboratory table with its top horizontal as tested by a spirit level.
2. Keep the double inclined track on the table top and make it stable by putting weights on its wings.
3. Insert the wooden block under each track to make it inclined. The angle of inclination of the two tracks may not be equal.
4. Take the steel ball and put it on mark D on inclined track I and leave it gently.
5. Note the position of mark C on inclined plane II up to which the ball rises.
6. Measure the vertical heights DF and CE using a plumb line and metre scale.
7. Change the angles or position of mark D and repeat 4, 5, 6 three more times.
8. Record observations in a table as given below.

Observations

Serial No. of Obs.	Position of mark		Vertical height		Difference DF – CE
	D on track I	C on track II	DF	CE	
1.					
2.					
3.					
4.					

Calculation

Difference between initial and the final vertical heights are the same within limits of the experimental error.

Result

From above, it is clear that the body (rolling ball) has same initial and final potential energy, though the energy changes into kinetic energy during rolling motion of the ball. In other words, the sum of the kinetic energy and the potential energy of the ball is constant within the limits of the experimental error. This shows that the energy is being transferred from potential to Kinetic and vice versa . It is neither being created nor destroyed. This verifies the law of conservation of energy.

Precautions

1. Inclined tracks should be cleaned by cotton, moistened in benzene.
2. Both tracks should be in same vertical plane.
3. Distance (AB) should be negligible as compared to distance moved by the ball along the track.

4. Note the position C of the ball on plane II correctly.

Sources of error

1. Planes may not be friction less.
2. The planes may be shaky