1. Whenever the surfaces in contact tend to move or move with respect to each other, the force of friction comes into play

(a) only if the objects are solid.

(b) only if one of the two objects is liquid.

(c) only if one of the two objects is gaseous.

(d) irrespective of whether the objects are solid, liquid or gaseous.

Soln:

The answer is (d) irrespective of whether the objects are solid, liquid or gaseous.

Explanation:

Force of friction acts in solids, liquids and gasses and opposes each other's motion.

2. In Fig.12.1, a boy is shown pushing the box from right to left. The force of friction will act on the box

(a) from right to left (←)

(b) from left to right (→)

(c) vertically downwards (↓)

(d) vertically upwards (↑)

Fig. 12.1

Soln:

The answer is (b) from left to right (→)

Explanation:

Friction always acts in the opposite direction to the motion, hence the force of friction will be from left to right.

3. To sharpen the blade of a knife by rubbing it against a surface, which of the following will be most suitable?

(a) stone

(b) plastic block

(c) wooden block

(d) glass block

Soln:

Answer is (a) stone

Explanation:

Stone exerts a greater frictional force which sharpens the blades upon rubbing.

4. A toy car released with the same initial speed will travel farthest on

(a) muddy surface

(b) polished marble surface

(c) cemented surface

(d) brick surface

Soln:

The answer is (b) polished marble surface

Explanation:

Polished marble surface has the least frictional force and least inertia, hence car will travel farther on a marble floor.

5. If we apply oil on door hinges, the friction will

(a) increases

(b) decreases

(c) disappear altogether

(d) will remain unchanged

Soln:

The answer is (b) decreases

Explanation:

Because oil acts as a lubricant and reduces friction.

6. Which of the following statements is incorrect?

(a) Friction acts on a ball rolling along the ground.

(b) Friction acts on a boat moving on water.

(c) Friction acts on a bicycle moving on a smooth road.

(d) Friction does not act on a ball moving through air.

Soln:

The answer is (d) Friction does not act on a ball moving through air.

Explanation:

Friction acts on a body moving in the air as fluid friction

7. A boy rolls a rubber ball on a wooden surface. The ball travels a short distance before coming to rest. To make the same ball travel longer distance before coming to rest, he may

(a) spread a carpet on the wooden surface.

(b) cover the ball with a piece of cloth.

(c) sprinkle talcum powder on the wooden surface.

(d) sprinkle sand on the wooden surface

Soln:

Answer is (c) sprinkle talcum powder on the wooden surface.

Explanation:

Applying talcum powder will reduce the frictional force, which will make the ball to travel a longer distance.

8. In a large commercial complex, there are four ways to reach the main road. One of the paths has loose soil, the second is laid with polished marble, the third is laid with bricks and the fourth has a gravel surface. It is raining heavily and Paheli wishes to reach the main road. The path on which she is least likely to slip is

(a) loose soil.

(b) polished marble.

(c) bricks.

(d) gravel.

Soln:

The answer is (d) gravel.

Explanation:

The only path will have sufficient frictional force to walk easily, hence the answer is (d) gravel.

Very Short Answer Questions

9. Two blocks of iron of different masses are kept on a cemented floor as shown in Fig.12.2. Which one of them would require a larger force to move it from the rest position?

Fig. 12.2

Soln:

The larger force will be required to move the heavier block.

10. Will force of friction come into play when a raindrop rolls down a glass window pane?

Soln:

Yes**,** force of friction comes into play when a raindrop rolls down a glass window pane.

11. Two boys are riding their bicycles on the same concrete road. One has new tyres on his bicycle while the other has tyres that are old and used. Which of them is more likely to skid while moving through a patch of the road which has lubricating oil spilt over it?

Soln:

The bicycle with worn-out tyres is more likely to skid.

12. Fig.12.3 shows two boys applying force on a box. If the magnitude of the force applied by each is equal, will the box experience any force of friction?

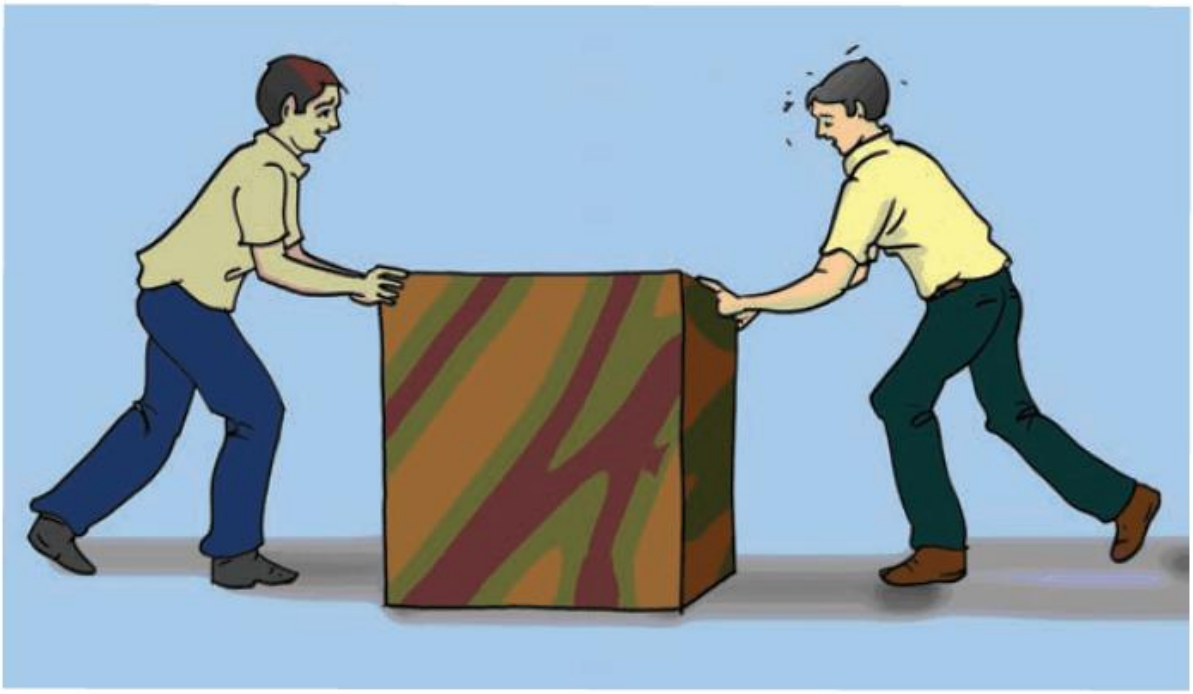

Fig. 12.3

Soln:

Force of friction will be zero as the net force on the box is zero.

13. Imagine that an object is falling through a long straight glass tube held vertical; the air has been removed completely from the tube. The object does not touch the walls of the tube. Will the object experience any force of friction?

Soln:

No, the object will not experience any force of friction.

Short Answer Questions

14. You might have noticed that when used for a long time, slippers with rubber soles become slippery. Explain the reason.

Soln:

After using slippers for a long time, soles become smooth. This decreases the friction between the sole and floor. Therefore, slippers become slippery.

15. Is there a force of friction between the wheels of a moving train and iron rails? If yes, name the type of friction. If an air cushion can be introduced between the wheel and the rail, what effect will it have on the friction?

Soln:

Yes, there exists a rolling force between the wheels of a moving train and iron rails. If an air cushion is introduced between the wheel and the rails, the friction will decrease.

16. Cartilage is present in the joints of our body, which helps in their smooth movement. With advancing age, this cartilage wears off. How would this affect the movement of joints?

Soln:

With advancing age, this cartilage wears off. This increases the friction, which will lead to difficulty in movement and will cause joint pain.

17. While playing tug of war (Fig.12.4), Preeti felt that the rope was slipping through her hands. Suggest a way out for her to prevent this.

Soln:

She may rub soil to increase friction between the rope and her hand.

18. The handle of a cricket bat or a badminton racquet is usually rough. Explain the reason.

Soln:

To have a better grip on the bat it should be rough because rough surface decreases the friction and allow to have a firm grip on the bat.

19. Explain why the surface of mortar and pestle (silbatta) used for grinding is etched again after prolonged use?

Soln:

To increase friction to make it more effective for grinding again.

20. A marble is allowed to roll down an inclined plane from a fixed height. At the foot of the inclined plane, it moves on a horizontal surface (a) covered with silk cloth (b) covered with a layer of sand and (c) covered with a glass sheet. On which surface will the marble move the shortest distance. Give the reason for your answer.

Soln:

A marble moves to the shortest distance on the floor covered with sand as it offers maximum friction against its motion.

21. A father and son pushed their car to bring it to the side of the road as it had stalled in the middle of the road. They experienced that although they had to push with all their might

initially to move the car, the push required to keep the car rolling was smaller, once the car started rolling. Explain.

Soln:

Because initially they had to apply force to set the card in motion but once the car started rolling, they had to apply force only to balance rolling friction of the car, the value of which is very less.

Long Answer Questions

22. When the cutting edge of a knife is put against a fast rotating stone to sharpen it, sparks are seen to fly. Explain the reason.

Soln:

Heat is produced as a result of friction between a knife and the rotating stone. As the speed of rotation increases the amount of heat generated also increases which result in the sparks.

23. We have two identical metal sheets. One of them is rubbed with sandpaper and the other with ordinary paper. The one rubbed with sandpaper shines more than the other. Give reason.

Soln:

Friction between plane paper and the metal sheet is less compared to the friction between sandpaper and metal. This friction acts on the top layer of metal sheet which will remove the top layer to make the metal shine.

24. While travelling on a rickshaw, you might have experienced that if the seat cover is very smooth, you tend to slip when brakes are applied suddenly. Explain.

Soln:

If the seat cover is very smooth then the friction between the seat and our body is very less. Because of this, we tend to slip when brakes are applied in a rickshaw.

25. Two friends are trying to push a heavy load as shown in Fig.12.5. Suggest a way which will make this task easier for them.

Fig. 12.1

Soln:

Their work can be made easy by putting rollers below the heavy load because the rolling friction is smaller than the sliding friction.