

Friction (Science)

Question 1:

Fill in the blanks.

- (a) Friction opposes the motion between the surfaces in contact with each other.
- (b) Friction depends on the nature of surfaces.
- (c) Friction produces heat.
- (d) Sprinkling of powder on the carrom board reduces friction.
- (e) Sliding friction is less than the static friction.

Question 2:

Four children were asked to arrange forces due to rolling, static and sliding frictions in a **decreasing order**. Their arrangements are given below. Choose the correct arrangement.

- (a) rolling, static, sliding
- (b) rolling, sliding, static
- (c) static, sliding, rolling
- (d) sliding, static, rolling

Ans:

- (c) static, sliding, rolling

Friction comes into play when irregularities present in the surfaces of two objects in contact get interlocked with each other. Static friction comes into play when we try to move an object which is at rest. Sliding friction comes into play when an object slides over the surface of another object. In sliding friction, the time given for interlocking is very small. Hence, interlocking is not strong. Therefore, less force is required to overcome this interlocking. Because of this reason, sliding friction is less than static friction. Similarly, the area of contact in case of rolling friction is smallest as compared to static or sliding friction. This area of contact changes gradually because of rolling. Hence, rolling friction is lesser than both static and sliding friction. Thus, the correct sequence is—static, sliding, rolling.

Question 3:

Alida runs her toy car on dry marble floor, wet marble floor, newspaper and towel spread on the floor. The force of friction acting on the car on different surfaces in **increasing order** will be

- (a) wet marble floor, dry marble floor, newspaper and towel.
- (b) newspaper, towel, dry marble floor, wet marble floor.
- (c) towel, newspaper, dry marble floor, wet marble floor
- (d) wet marble floor, dry marble floor, towel, newspaper

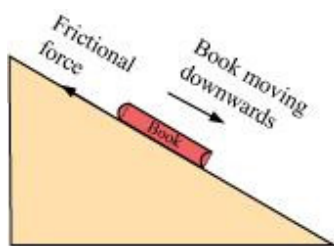
Ans: (a) wet marble floor, dry marble floor, newspaper and towel

Force of friction depends on the nature of surfaces in contact. The rougher the surface, the more is the friction between the surfaces in contact and vice-versa. Roughness present in the given surfaces can be arranged in an ascending order as wet marble floor, dry marble floor, newspaper and towel. Hence, the correct sequence of these surfaces when arranged according to the increase in the force of friction acting on the car is—wet marble floor, dry marble floor, newspaper and towel.

Question 4:

Suppose your writing desk is tilted a little. A book kept on it starts sliding down. Show the direction of frictional force acting on it.

When a book slides on the writing desk, a frictional force acts between the book and the surface of the desk. The direction of frictional force on the book is opposite to the direction of its motion and acts in upward direction, as shown in the following figure.



Question 5:

You spill a bucket of soapy water on a marble floor accidentally. Would it make it easier or more difficult for you to walk on the floor? Why?

We are able to walk because of the friction present between our feet and the ground. In order to walk, we push the ground in the backward direction with our feet. The force of friction pushes it in the forward direction and allows us to walk. The force of friction between the ground

and feet decreases when there is soapy water spilled on the floor. Hence, it becomes difficult to walk on the soapy floor.

Question 6:

Explain why sportsmen use shoes with spikes.

Sportsmen use shoes with spikes because these shoes give them a better grip while running. This is because the force of friction between the shoes and the ground increases with the help of spikes.

Question 7:

Danish I has to push a lighter box and Semran has to push a similar heavier box on the same floor. Who will have to apply a larger force and why?

Force of friction arises because of interlocking of irregularities on the two surfaces in contact. When a heavy object is placed on the floor, the interlocking of irregularities on the surfaces of box and floor become strong. This is because the two surfaces in contact are pressed harder. Hence, more force is required to overcome the interlocking. Thus, to push the heavier box, Semran has to apply a greater force than Danish.

Question 8:

Explain why sliding friction is less than static friction.

Friction comes into play when irregularities present in the surfaces of two objects in contact get interlocked with each other. In sliding, the time given for interlocking is very small. Hence, interlocking is not strong. Therefore, less force is required to overcome this interlocking. Because of this reason, sliding friction is less than static friction.

Question 9:

Give examples to show that friction is both a friend and a foe.

Ans: Advantages of friction:

- (i) We are able to walk because of friction.
- (ii) Friction between the tip of the pen and a paper allows us to write.

Disadvantages of friction:

- (i) Tyres and soles of shoes wear out because of friction.

(ii) Friction between the different parts of machines produces heat. This can damage the machines.

Question 10:

Explain why objects moving in fluids must have special shapes.

When a body moves through a fluid, it experiences an opposing force which tries to oppose its motion through the fluid. This opposing force is known as the drag force. This frictional force depends on the shape of the body. By giving objects a special shape, the force of friction acting on it can be minimised. Hence, it becomes easier for the body to move through the fluid.