



Chapter: FRICTION

EXERCISE

Q.1. Answer the following questions:

- i. Why are the worn out tyres discarded ?
- ii. Why do carrom coins move faster on carom board when dusted with talcum powder.
- iii. Why is the surface of conveyor belt made rough?
- iv. Why is the sewing machine often oiled?
- v. Why do new automobile tyres have deep grooves?
- vi. Why does a ball rolling on the ground slow down?
- vii. Why are the boats and aeroplanes given special shape?
- viii. Why do meteors burn on entering into the atmosphere?
- ix. Why do painters use sand papers in polishing doors?
- x. Why is it easier to tie a knot with cotton string as compared to silk string?

ANSWERS:

- i. The worn out tyres from which grooves have disappeared are discarded, as they slip on the roads. It is because they do not offer required amount of friction.
- ii. Like all other surfaces carom board surface too have uneven projections which offer force of friction to the movement of carom coin. When talcum powder is dusted on its surface, it fills the irregularities and makes the surface smoother, thus reducing friction resulting in the fast movement of carom coin.
- iii. The surface of conveyor belt used for turning wheels and pulleys in factories is made rough so that they could provide the necessary reaction due to friction, and the wheels could turn about the axles.
- iv. The oil used as lubricant in wheels separates the two surfaces so that the interlocking of irregularities gets reduced as the spaces are filled with the oil. This makes the various parts of the machine to move faster and smoothly.
- v. The new automobile tyres are made to have deep grooves, so that they offer the required amount of friction. This therefore prevents the slipping and skidding of wheel on the road.
- vi. When a ball rolls on the ground it is acted on by the force of friction which opposes the movement of a ball, this makes the ball to slow down.
- vii. The boats and aeroplanes are given special shape (streamlined) in order to reduce the force of friction, this helps them for their free and easy movement.
- viii. The meteors enter the atmosphere at a very high speed, at such high speed the friction offered by air is also very high due to which the temperature of meteor increases and it catches fire.



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- ix. The painters use sand papers to break the projections on the surface of wood so as to have a surface which would have minimum friction. Then the irregularities if any are filled with polish making it further frictionless and glossy.
- x. We can tie a knot only when the material offers some friction, thus in case of cotton thread the friction is much more than silk.

Q.2. Fill in the blanks:

- i. opposite ii. Static iii. Movement. iv. Sliding v. streamlined.

Q.3. Statements given below are incorrect. Write the correct statements.

Answers :

- i. Less
- ii. Increase
- iii. Increases
- iv. Rolling
- v. independent

Question 1

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

(e) 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 2

Ali 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 3

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 4

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 5

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 6

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 7

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 8

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 9:

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 minimized. Hence, it becomes easier for the body to move through the fluid.