Chapter – 10 Force and Friction

II. Very short answer type questions

A. Answer the following.

Q.1 Give an example of one contact force.

Ans: a) Friction is a good example of a contact force b) It occurs when two surfaces are in direct contact.

Q.2 What is the SI unit of force?

Ans: The SI unit of force is called the newton (N) and it's named after Sir Isaac Newton.

Q.3 What is a spring balance used for?

Ans: A spring balance is used to measure force or weight and its works based on the stretching of a spring.

Q.4 Give an example of one non-contact force.

Ans: a) Gravitational force is an example of a non-contact force. b) It acts without any physical contact between objects.

Q.5 Give two advantages of friction.

Ans: a) Friction helps us walk without slipping. b) It also allows vehicles to brake and stop safely

B. Define the following.

a) Applied forces

Ans: An applied force is a force that is exerted on an object by another object or person from the outside.

b) Static friction

Ans: Static friction is the frictional force that acts between two surfaces when there is no relative motion between them. It must be overcome to start the motion of an object and is usually greater than kinetic friction.

c) Rolling friction

Ans: Rolling friction is the resistance that occurs when a round object like a wheel or ball rolls over a surface. It is usually smaller than both static and sliding friction, which is why wheels help reduce overall resistance.

d) Sliding friction

Ans: Sliding friction is the force that opposes the motion of two surfaces sliding past each other. It generates heat and slows down the movement of objects in contact, requiring effort to keep motion going.

e) Wear and tear

Ans: Wear and tear refer to the gradual damage or deterioration of materials due to repeated use or constant friction. It often results in reduced performance or failure of machines or tools over time.

III. Short answer type questions.

Q.1 What is the dominant force that acts between two electrically charged objects called?

Ans: The dominant force that acts between two electrically charged objects is called the electrostatic force. This force can either pull them together (attract) or push them apart (repel) depending on their charges.

Q.2 Write down two factors on which the magnitude of frictional force between two surfaces depends.

Ans: Two factors on which the magnitude of frictional force between two surfaces depends are:

a) The nature of the surfaces in contact: Rougher surfaces have more friction than smoother surfaces.

b) How hard the surfaces are pressed together: If you press two surfaces together with more force, the friction between them increases.

Q.3 How can we change the shape of an object? Give an example.

Ans: We can change the shape of an object by applying a force to it.
Example: When you squeeze a sponge, its shape changes. When you push on a lump of clay, you can mild it into different shapes.

Q.4 Give one condition necessary for frictional force to act.

Ans: One condition necessary for frictional force to act is that there must be contact between two surfaces. If two surfaces are not touching, there can be no friction between them.

Q.5 Why is friction a disadvantage?

Ans: Friction is a disadvantage because it often opposes motion and causes things to wear out. For example, friction makes it harder to push a heavy box, and it causes the soles of our shoes to wear thin over time. It also produces unwanted heat.

Q.6 Why are oils and grease used in machinery?

Ans: Oils and grease are used in machinery to reduce friction between moving parts. When oil or grease is applied, it forms a thin layer between the surfaces, making them smoother and allowing the parts to slide past each other more easily. This helps to prevent wear and tear and keeps the machine running smoothly.

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IV. Long answer type questions

Q.1 Discuss the effects of force.

Ans: A force is a push or a pull, and it can do many things to an object. Here are the main effects of force:

a) Change the state of motion: A force can make a stationary object move. For example, if you kick a football, it starts moving. A force can also stop a moving object, like when a goalkeeper catches a ball. It can also change the speed of a moving object, making it faster or slower.

b) Change the direction of motion: When you hit a cricket ball, you not only change its speed but also its direction. A force can make an object turn or move in a different path.

c) Change the shape and size of an object: If you press on a rubber ball, its shape changes. Similarly, when you stretch a rubber band, both its shape and size change. Forces can deform objects.
So, forces are very powerful and can cause a lot of changes in the world around us!

Q.2 Describe an activity to show that the force of friction between two surfaces depends on the nature of the two surfaces in contact.

Ans: We can do a simple activity to show that friction depends on the nature of the surfaces.

Activity:

1. **Materials needed:** A small toy car or a book, a smooth table, a piece of sandpaper, and a piece of cloth.
2. **Procedure:**
   a) First, place the toy car (or book) on the smooth table. Gently push it and observe how far it travels before stopping. You will notice it travels quite a distance.
   b) Next, place the piece of sandpaper on the table. Now, place the toy car on the sandpaper and gently push it with the same amount of force you used earlier. Observe how far it travels. You will find that it stops much quicker.
   c) Finally, replace the sandpaper with the piece of cloth. Push the toy car with the same force again and observe its distance. It will likely travel an even shorter distance than on the sandpaper.
3. **Observation and Conclusion:** We observe that the toy car travels the longest distance on the smooth table, a shorter distance on the sandpaper, and the shortest distance on the cloth. This is because the smooth table offers less friction, while the rough sandpaper and even rougher cloth offer more friction. This activity clearly shows that the force of friction depends on how smooth or rough the surfaces in contact.

Q.3 What is ‘streamlined shape’? Explain and give two examples.

Ans: A streamlined shape is a special kind of shape that is designed to reduce the drag or resistance caused by fluids like air or water. Objects with streamlined shapes have smooth, tapering (getting thinner at the ends) bodies that allow the fluid to flow easily over them without creating much turbulence. This helps them move through the fluid with less effort.

Explanation: Imagine you are trying to push a flat board through water versus pushing a pointed boat. The flat board would be very hard to push because it creates a lot of resistance. The pointed boat, however, cuts through the water easily. This is because the boat has a streamlined shape. When air or water flows over a streamlined object, it separates smoothly and then comes back together, minimizing the force that tries to slow the object down.

Two examples of streamlined shapes:

1. Birds and fishes: Most birds have streamlined bodies that help them fly through the air with less resistance. Similarly, fish have streamlined bodies that allow them to swim through water very efficiently.
2. Aeroplanes and rockets: The bodies of aeroplanes and rockets are designed to be streamlined. This helps them cut through the air at high speeds without too much air resistance, saving fuel and allowing them to travel faster.

This design is streamline

Q.4 Describe how friction can be reduced. In what way will it help if friction is reduced?

Ans: Friction is very useful in many situations, but sometimes it's a disadvantage because it causes wear and tear, wastage of energy, and slows down motion. Here's how friction can be reduced:

a) Using lubricants: Applying substances like oil, grease, or graphite between moving parts of machines reduces friction. These lubricants form a thin layer between surfaces, making them slide past each other more easily.

b) Using rollers or wheels (rolling friction): Instead of sliding objects, using rollers, wheels, or ball bearings changes sliding friction into rolling friction, which is much smaller. This is why it's easier to move heavy luggage with wheels than to drag it.

c) Polishing surfaces: Making surfaces very smooth by polishing them reduces the interlocking of irregularities between them, thereby decreasing friction.

d) Using 'streamlined' shapes: For objects moving through fluids (like air or water), designing them with streamlined shapes reduces fluid friction (drag).

How reducing friction helps: Reducing friction is very helpful in many ways:

a) Reduces wear and tear: When friction is reduced, the surfaces rub less against each other, which means machines and parts last longer and don't get damaged quickly.

b) Saves energy: Less friction means less energy is wasted as heat or resistance, making machines more efficient and saving fuel or electricity.

c) Allows for smoother movement: Machines work more smoothly and easily when friction is reduced, making their operation quieter and more effective.

Q.5 How can we increase friction between two surfaces?

Ans: While reducing friction is often desired, sometimes we need to increase it for safety or to make things work better. Here are ways to increase friction between two surfaces:

a) Making surfaces rougher: Increasing the roughness of the surfaces in contact increases the interlocking between them, which leads to more friction. For example, sports shoes have rough soles (spikes or patterns) to provide a better grip on the ground. Car tyres also have treads for this reason.

b) Increasing the pressing force: When two surfaces are pressed together with greater force, the friction between them increases. This is why brake pads in vehicles are pressed hard against the wheels to stop them.

c) Using materials with high coefficient of friction: Some materials naturally have more friction when rubbed against others. For example, rubber provides a good grip, which is why it's used in tyres and shoe soles.

d) Removing lubricants: If lubricants like oil or water are present, removing them will increase friction because the surfaces will come into direct contact again.