

iii) sprinkle talcum powder on the wooden surface

iv) sprinkle sand on the wooden surface.

Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below-

i) Both A and R are true and R is the correct explanation of the assertion.

ii) Both A and R are true but R is not the correct explanation of the assertion.

iii) A is true but R is false.

iv) A is false but R is true

8. Assertion (A): Friction increases with increase in mass.

Reason (R): A rough surface has more irregularities than smooth surface. (ii)

9. Assertion (A): The streamlined shape of birds and fishes does not help them move easily in fluids.

Reason(R): This streamlined shape helps in overcoming drag without spending much energy. (iv)

10. Assertion (A): Wheels are said to be one of the greatest inventions of mankind.

Reason(R): Wheels decreases friction and makes movement of things easier. (i)

II BASIC CONCEPT LEVEL:

1. Name the following-

a) An invisible force acting in opposite direction to the direction of motion- **Friction.**

b) The resistance offered by air to objects moving through it- **drag**

c) The friction acting when a block of wood kept on a cylindrical iron rods-**rolling**

2. What is spring balance? (**Hint-Spring balance is a device used for measuring the force acting on an object. It consists of a coiled spring which gets stretched when a force is applied to it. Stretching of the spring is measured by a pointer moving on a graduated scale. The reading on the scale gives the magnitude of the force.**)

3. Define lubricants. Give two examples of lubricants. (**Hint-A lubricant is a substance that forms a thin layer between the two surfaces in contact. It fills the depressions on the surface and makes it smooth thus helping in reducing friction. e.g., Oil, grease**)

4. A boy is moving from east to west. In which direction is the force of friction acting when he walks. [**Hint: The frictional force exerted by ground on the person is in the direction of his movement. When a person is trying to move, the direction of motion of the particles on his feet is in the backward direction. Frictional force is in such a direction as to oppose relative motion between two bodies at the point of contact. Hence in this case, frictional force will be in the direction of motion**]

5. Two blocks of iron of different masses such as 1 unit and 2 units are kept on a cemented floor. Which one of them would require a larger force to move it from the rest position? [**Hint: The block having mass 2 units will require larger force to move it from the rest**]

position because frictional force increases as the mass of object increases and hence larger mass require a larger force to move it from the rest position.]

III. INTERMEDIATE LEVEL:

1. How is friction caused? What are the factors affecting friction? [Hint- Friction is caused by the irregularities on the two surfaces in contact. Two factors affecting friction are nature of the surface and mass of the body.]
2. Describe two ways each of reducing friction and increasing friction.
[Hint-Reducing friction- We sprinkle powder on carrom board to reduce friction. A bicycle and a motor mechanic uses grease between the moving parts of these machines to increase efficiency of moving parts.
Increasing Friction-Kabaddi players rub their hands with soil for a better grip of their opponents. Sports person have spikes in the soles of their shoes. This increases friction and helps them to get a firm grip on the ground.]
3. Explain the advantages of using ball bearings by citing examples.
[Hint-Ball bearings are small spherical balls which are placed between two cylindrical surfaces. It minimises the area of contact and reduces friction. It also converts sliding friction to rolling friction. It is used between hubs and axles of ceiling fans and bicycles.]
4. What is drag? State the factors affecting friction on an object in a fluid?
[Hint: The frictional force exerted by fluids is called drag. Factors affecting friction are speed, shape, size of the object and nature of the fluid]
5. Why does an aeroplane have a streamlined shape? [Hint-Aeroplane have a streamlined shape to reduce friction offered by fluid.]
6. Is it possible to reduce friction to zero by polishing surfaces or using lubricants? Explain.
[Hint-Friction can never be eliminated but it can be reduced. No surface is perfectly smooth. Some irregularities are always there on surfaces.]
7. Give three examples each where friction is a disadvantage and where it is useful.

[Hint- Disadvantages of Friction: Friction produces unnecessary heat leading to the wastage of energy, Forest fires are caused due to the friction between tree branches, a lot of money goes into preventing friction and the usual wear and tear caused by it by using techniques like greasing and oiling. Advantages of Friction-It helps us walk on the ground, brakes in a car make use of friction to stop the car and meteors are burnt in the atmosphere before reaching Earth due to friction.]

IV. ADVANCED LEVEL:

1. Give reasons
 - a) The jar of a mixer becomes hot if it is run for a few minutes. [friction produces heat]
 - b) A pencil will write on a paper but not on a glass. [friction is more on paper than glass]
 - c) It is easier to roll an object than sliding it. [rolling reduces friction]

- d) Sometimes when you wash utensils, they slip from your hand. [Smooth surface offers less friction]
- e) We sprinkle talcum powder on a carrom board. [Talcum powder makes surface smooth and reduces friction]
- f) Grooves are provided in the soles of shoes. [Grooves makes the surface and increase friction]
2. Explain why, it is easier to drag a mat on the floor when nobody is sitting on it but much more difficult to drag the same mat when a person is sitting on it. [Hint: - Heavier mass will press harder into the irregularities and offers greater resistance to motion that is greater friction]
3. Three children are at work. One is pushing chair, another is pushing the sofa and the third one is pushing an empty trolley. Who is experiencing the maximum friction? Why? [The child pushing the sofa will experience the maximum friction as sofa is the heaviest and friction increases with mass.]
4. Give an example to show the effect of heat generated in a machine due to excessive friction.
[Hint-Friction opposes the relative motion between two surfaces in contact. The loss of energy occurs in the form of heat, sound, light, etc. For example, mechanical engines are lubricated time to time to reduce excessive friction that prevents the loss of energy in the form of heat.]

V. EXEMPLAR QUESTIONS

1. 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 slip while moving through a patch of the road which has lubricating oil spilled over it? [Hint: The boy having the tyres which are old and used is most likely to slip because these tyres will experience less friction force which is insufficient to move on the oily road.]
2. Imagine that an object is falling through a long straight glass tube held vertical, 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? [Hint: No, the object will not experience any frictional force because to experience the force of friction, two surfaces must be there and there is only one surface in this case.]
3. 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? [Hint: Yes, there is always a force of friction between the wheels of a moving train and iron rails. The name of this friction is rolling friction, since the wheels are rolling on the track. On introducing air cushion, the frictional force becomes less, since there is no contact between rails and wheels.]

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