Friction Class 8

1. Introduction
- **What is Friction**:
  - Friction is a force that slows things down.
  - It stops moving objects after some time.
  - It acts when objects touch each other.
- **Everyday Examples**:
  - A car slows when brakes are pressed.
  - A bicycle stops when you stop pedalling.
  - A ball rolling on ground halts eventually.
- **Why It Matters**:
  - Friction affects how we move things.
  - It explains why we slip on wet floors.
  - It's part of daily life activities.

2. Force of Friction
- **Definition**:
  - Friction is a force opposing motion.
  - It acts between touching surfaces.
  - It tries to stop objects from moving.
- **How It Works**:
  - Push a book, and it stops soon.
  - Friction acts opposite to the push.
  - It resists the book's movement.
- **Direction**:
  - If you push left, friction acts right.
  - If you push right, friction acts left.
  - It always fights the applied force.
- **Key Fact**:
  - Friction is present in all motion.
  - It works where surfaces meet.
  - It's why things don't slide forever.

3. Factors Affecting Friction
- **Surface Smoothness**:
  - Rough surfaces have more friction.
  - Smooth surfaces have less friction.
  - Surface type changes friction's strength.
- **Surface Irregularities**:
  - Surfaces have tiny bumps and dips.
  - These bumps lock when surfaces meet.
  - More bumps mean more friction.
- **Pressure Between Surfaces**:
  - Pressing surfaces harder increases friction.
  - Less pressure reduces friction.
  - Force between surfaces affects friction.
- **Examples**:
  - A brick slides easier on polythene.
  - It's harder to move on jute cloth.
  - A heavy mat is tougher to drag.

4. Types of Friction
- **Static Friction**:
  - It stops objects from starting to move.
  - It acts when an object is at rest.
  - It's stronger than other frictions.
- **Sliding Friction**:
  - It acts when objects slide over each other.
  - It's less than static friction.
  - It keeps objects moving slower.
- **Comparison**:
  - Starting a box needs more force.
  - Moving it needs less force.
  - Sliding is easier than starting.
- **Example**:
  - Pushing a heavy box feels harder at first.
  - Once it moves, it's easier to push.
  - This shows static and sliding friction.

5. Friction: A Necessary Evil
- **Why It's Helpful**:
  - Friction lets us hold things tightly.
  - It helps us walk without slipping.
  - It keeps nails fixed in walls.
- **Helpful Examples**:
  - Writing needs friction to grip the pen.
  - Tyres stop cars due to road friction.
  - Chalk sticks to boards because of friction.
- **Why It's Harmful**:
  - Friction wears out shoes and tyres.
  - It makes machines lose energy.
  - It produces unwanted heat.
- **Harmful Examples**:
  - Soles of shoes get worn over time.
  - Mixer jars heat up when used.
  - Matchsticks catch fire due to friction.
- **Key Fact**:
  - Friction is both good and bad.
  - It helps and harms in different ways.
  - We need it but try to control it.

6. Increasing Friction
- **Why Increase It**:
  - More friction helps grip surfaces.
  - It stops slipping in some cases.
  - It makes tasks safer.
- **Methods**:
  - Shoe soles are grooved for grip.
  - Tyres have treads to hold roads.
  - Brake pads use friction to stop wheels.
- **Examples**:
  - Kabaddi players rub hands with soil.
  - Gymnasts use powder for better hold.
  - Spikes in shoes increase grip.

7. Reducing Friction
- **Why Reduce It**:
  - Less friction makes movement easier.
  - It saves energy in machines.
  - It improves efficiency.
- **Methods**:
  - Lubricants like oil reduce friction.
  - Grease smooths moving parts.
  - Powder on carrom boards helps coins slide.
- **Lubricants**:
  - They form a layer between surfaces.
  - This stops surfaces from locking.
  - Movement becomes smoother.
- **Examples**:
  - Oil on door hinges makes them swing.
  - Grease in bicycles eases pedalling.
  - Air cushions reduce friction in machines.
- **Key Fact**:
  - Friction can't be zero.
  - Even smooth surfaces have some friction.
  - Lubricants only lower it.

8. Wheels and Rolling Friction
- **What is Rolling Friction**:
  - It's friction when objects roll over surfaces.
  - It's less than sliding friction.
  - Rolling is easier than sliding.
- **Why It Helps**:
  - Wheels make heavy loads easy to move.
  - They reduce resistance to motion.
  - They save effort in transport.
- **Examples**:
  - Luggage with rollers moves smoothly.
  - Ball bearings help fans spin easily.
  - Logs under machines make them movable.
- **Key Fact**:
  - Wheels are a great invention.
  - They lower friction for efficiency.
  - Rolling replaces sliding in machines.

9. Fluid Friction
- **What is It**:
  - Fluids like air and water cause friction.
  - It's called drag or fluid friction.
  - It slows objects moving through fluids.
- **Factors Affecting It**:
  - Faster movement increases drag.
  - Object shape changes friction.
  - Fluid type affects resistance.
- **Examples**:
  - Aeroplanes face air friction.
  - Boats feel water resistance.
  - Both lose energy to drag.
- **Reducing Fluid Friction**:
  - Special shapes lower fluid friction.
  - Birds and fish have streamlined bodies.
  - Aeroplanes copy these shapes.
- **Key Fact**:
  - Nature inspires low-friction designs.
  - Streamlined shapes save energy.
  - Vehicles use them to move faster.

Presented with xmind

TOPIC: FRICTION

I. OBJECTIVE-TYPE QUESTIONS

1. Which of the following makes it easier to move a drum of 10 kg?
a) Dragging the drum.
b) Lifting the drum.
c) Rolling the drum.
d) All the above actions need the same effort.

2. If a man is walking, then the direction of friction is:
a) Opposite to the direction of motion.
b) Same as the direction of motion
c) Perpendicular to the direction of motion.
d) 45^0 to the direction of motion

3. The image shows a person rowing a boat over a river.



identify the number of bodies experiencing friction.
a) 1, boat because of the river
b) 1, boat because of the person
c) 2, boat because of the river and the person because of the air
d) 2, boat because of air and river and the person because of air

4. A student rolls a marble on two different surfaces with the same force. The table shows the distance travelled in each trial

TRIAL	SURFACE	DISTANCE TRAVELLED
1	GLASS FLOOR	200cm
2	CARPETED FLOOR	75cm

Why does the marble travel a greater distance on a glass floor but not on a carpeted floor?
a) because the mass of the marble on the glass floor is high
b) because the mass of the marble on a carpeted floor is high
c) because interlocking between the surface of marble and glass floor is high
d) because interlocking between the surface of marble and the carpeted floor is high

5. John experimented to find out how different surfaces (P, Q, R and S) affect the distance a car travelling at 50 km/h needed to stop once the brakes are applied. The results are shown below:

Types of surface	P	Q	R	S
Stopping distance (m)	18	15	19	27

Which type of road will provide the most friction for the car to stop?

a) P
b) Q
c) R
d) S

6. In the decreasing order of magnitude, which of the following is correct?

a. Rolling < static < sliding friction

b. Static > sliding > rolling friction

c. Static > rolling > sliding friction

d. Sliding < static < rolling friction

For the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). 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

7. **Assertion (A):** Friction increases with an increase in mass.
Reason (R): A rough surface has more irregularities than a smooth surface.

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

8. **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) A is false but R is true

9. **Assertion (A):** We do not slip when we walk on a wet floor.
Reason(R): The water forms a thin layer between the feet and the floor and decreases friction.

iv) A is false but R is true

10. **Assertion (A):** Wheels are said to be one of the greatest inventions of mankind.
Reason(R): Wheels decrease friction and make the movement of things easier.

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

II. VERY SHORT QUESTIONS (2M):

1. 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.]**
2. 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. **[Hint-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 results in the sparks.]**
3. 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]**
4. 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]**
5. Give a reason-

   a. An aeroplane has a streamlined shape. **[Hint-Aeroplanes have a streamlined shape to reduce friction offered by fluid.]**

   b. Grooves are provided in the soles of shoes. **[Hint-Grooves make the surface rough and increase friction]**

6. a. When does static friction come into play? **[Hint-Static friction comes into play when we try to move an object from rest.]**

   b. 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]**

III. SHORT ANSWER TYPE QUESTIONS: (3M)

1. Explain the construction and working of a 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. The 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.]**
2. 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 a larger force to move it from the rest position because frictional force increases as the mass of the object increases and hence larger mass requires a larger force to move it from the rest position.]**



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 minimizes 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. 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 paper but not on the glass. **[friction is more on paper than a glass]**

   c) Sometimes when you wash utensils, they slip from your hand. **[Smooth surface offers less friction]**

IV. LONG ANSWER TYPE QUESTIONS. (5M)

1. 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, it reduces the efficiency of machines, Forest fires are caused due to friction between tree branches, it wears out steps of staircases in buildings and foot over bridges.**

Advantages of Friction-It help 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.]

2. Describe two ways each of reducing friction and increasing friction.
[Hint-Reducing friction- We sprinkle the powder on the carrom board to reduce friction. A bicycle and a motor mechanic use grease between the moving parts of these machines to increase the efficiency of moving parts. Increasing friction-Kabaddi players rub their hands with soil for a better grip on their opponents. Sportspersons have spikes in the soles of their shoes. This increases friction and helps them to get a firm grip on the ground.]

V. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

Read the passage and answer the following questions:

a. **Friction is a force between two surfaces that are sliding, or trying to slide, across each other. Friction always works in the direction opposite to the direction in which the object is moving, or trying to move. It always slows a moving object down. Friction also produces heat. If you rub your hands together quickly, you will feel them get warmer. Friction can be a useful force because it prevents our shoes from slipping on the pavement when we walk and stops car tyres from skidding on the road. When you walk, friction is caused between the tread of shoes and the ground. This friction acts to grip the ground and prevent sliding. Sometimes we want to reduce friction. For example, we use oil to reduce the friction between the moving parts inside a car engine. In many machines, friction is reduced by using ball bearings. The reduced friction means there is less wear on the moving parts and less heat produced.**

i) When does friction arise? **[Hint-Friction arises when the irregularities of the two surfaces interlock.]**

ii) Why should we apply oil on the hinges of the door? **[Hint-Oils are one of the best lubricants and applying them on the door hinges reduces friction and eases functioning.]**

iii) Gymnasts apply some coarse substance on their hands. Why? **[Gymnasts apply the coarse substance on their hands to increase friction for a better grip.]**

iv) Explain why sportsmen use shoes with spikes. **[It is done to provide the shoes better grip on the ground.]**
