Friction

Check point 1

Q. 1. Friction depends on what factors?

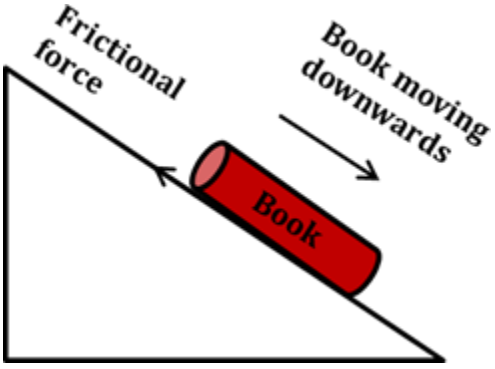
Answer: Friction depends upon the nature of the surfaces in contact with each other and at the state of motion of the object on the surface. The irregularities on the surface lead to friction. Friction depends upon the surface of both the bodies in contact and not only one. The weight of the object, if the weight of the object is high then friction is also high.

Q. 2. State the cause of friction between two surfaces.

Answer: The smoothness or polished degree of both the surfaces leads to cause of friction between two surfaces, if both the surfaces are well polished or smooth then the friction will be less but the friction can't be zero practically. Also, the irregularities lead to friction.

Q. 3. Frictional force always acts in the opposite direction to the direction of motion of body. Why?

Answer: Friction acts always in opposite direction to the direction of motion of body because friction is a reaction force occurring due to the irregularities on the surfaces in contact, so it opposes the relative motion between two surfaces in order to keep the body at rest. Friction is zero when the body is at rest.



Check point 2

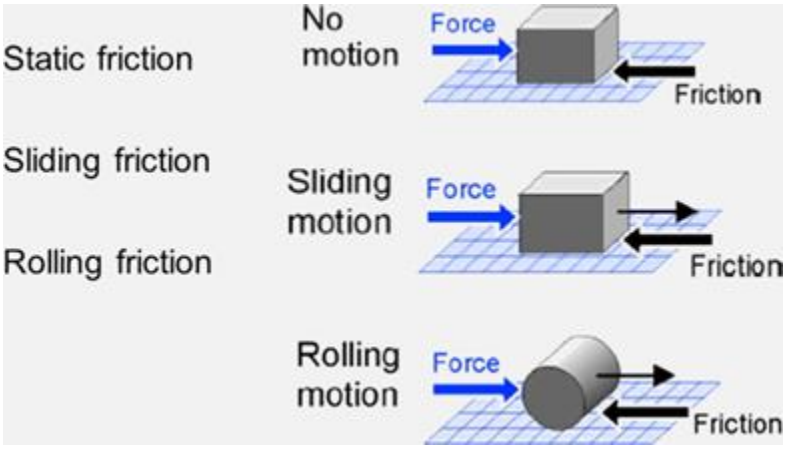
Q. 1. Explain the types of frictions in short.

Answer: Frictional force is of three types:–

I. Static Friction – It is the frictional force acting on a body when the body has not started moving yet and is at rest, also this friction is equal to the amount of force applied on the body and is variable to a certain limit.

II. Sliding Friction – It is the friction acting on the body when it is in motion and this friction is constant and is always less than the maximum value of static friction.

III. Rolling Friction – It is the constant friction acting on the body through wheels, it is the least amount of friction of all and is only applied when the body is moving.



Q. 2. Differentiate sliding friction and rolling friction.

Answer: The differences between Sliding and Rolling friction are:–

A. Sliding Friction –

a) It is the friction acting on the plane surfaces or straight surfaces.

b) The motion of the body is accompanied by rubbing of surfaces.

c) Large amount of work is done.

B. Rolling friction –

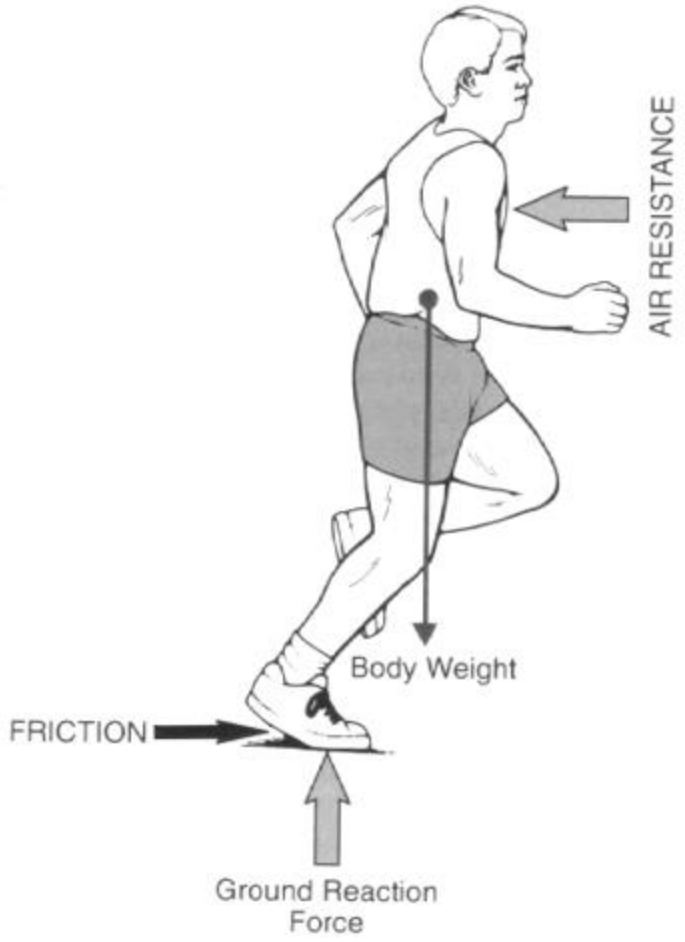
a) It is the friction acting on round objects like wheels which then acts on the body.

b) The motion is accompanied by changing the area of contact of the wheels.

c) Small amount of work is done.

Q. 3. Explain, how can we walk so much easily on the ground.

Answer: As we know that nothing is frictionless and so is the ground and our feet, when we walk we push the ground backwards by our foot and the ground in reaction pushes us forward, because of friction present on the ground we are able to push the ground without slipping and hence it is easy to walk on the ground and also pushing it.



Q. 4. Name three important disadvantages of friction.

Answer: The three important disadvantages of friction are:–

1. Friction reduces the speed of moving objects by dissipating the energy.

2. Friction produces unnecessary heat and damages wheels and machines.

3. Friction causes injuries, when a person falls it's skin gets peeled off due to friction.

Check point 3

Q. 1. Name two methods of increasing friction.

Answer: The two methods of increasing friction are:–

I. Making both the surfaces rough which is increasing the irregularities.

II. Making use of Sliding friction rather than Rolling friction.

Q. 2. Write a short note on term 'groove'.

Answer: Grooves mean cuts, grooves are made on a surface so that to increase the friction of the surface by increasing irregularity, for example on a blackboard when we increase the rub the chalk due to friction the chalk gets printed on blackboard, if we increase the cuts the chalk will get more deposited than previous time.

Q. 3. State the reason for sprinkling of fine powders on the carrom board.

Answer: Power is sprinkled on the carrom board because the powder fills the cuts in the wood of the board and hence reduces the irregularity and hence the friction reduces, so the powder is used to reduce the friction on the carrom board.

Check point 4

Q. 1. Ball bearings are sued in machinery. Explain the reason.

Answer: Ball bearings are used in machineries because due to friction, ball bearings change the type of friction experienced by the machines which means the sliding friction is replaced by rolling friction and as we know that rolling friction is always less than sliding friction, so ball bearings are used as they behave as wheels to roll and not to slip.

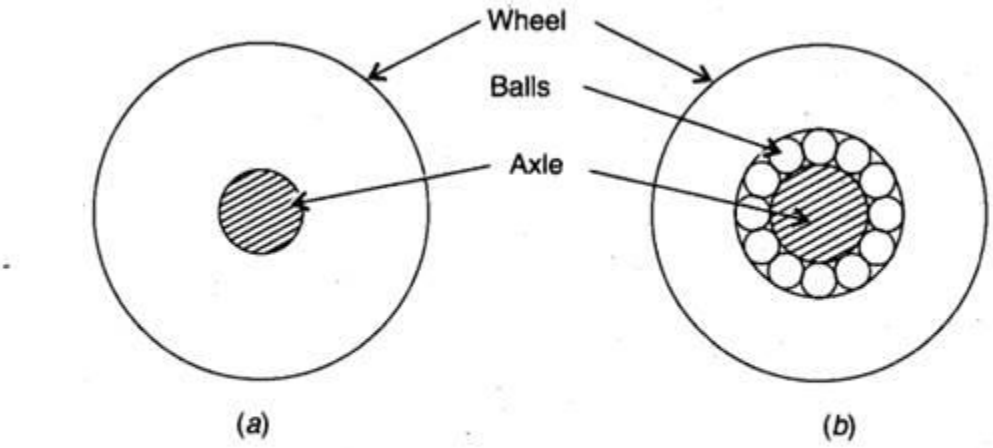


Fig. 7.02. (*a*) Wheel surface sliding over axle surface (*more friction*)
(*b*) Wheel surface moving over balls rolling between it and axle surface. (*less friction*).

Q. 2. State the dependency of frictional force on the viscosity of fluid.

Answer: Viscosity means simply the degree of thickness of liquid more the viscosity thicker is the liquid more friction will be offered by the liquid to an object moving through it. Hence more the viscosity more the friction of liquid.

Q. 3. Is the friction exerted by air on moving bus?

Answer: Friction offered by air is called air friction or air drag and is experienced by every moving object in order to oppose the motion, hence Yes bus experience air friction also.

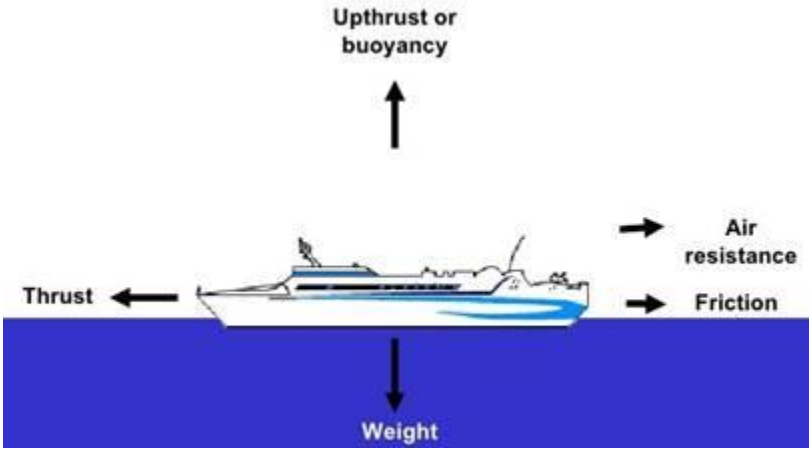
Q. 4. Name the factors on which the frictional force exerted by fluid on an object moving through it depends.

Answer: The factors on which the frictional force exerted by fluid on an object moving through it depends on are:–

i. The shape and weight of the object moving through the liquid.

ii. The nature or viscosity of the liquid.

iii. The speed with which the object is moving.



Chapter Test

Q. 1. Name the force which always opposes motion.

Answer: Frictional force always opposes the relative motion between two surfaces and always acts opposite to the direction of motion.

Q. 2. Out of static friction, sliding friction and rolling friction:

(a) Which one is the largest?
(b) Which one is the smallest?

Answer: Static friction, Sliding friction, Rolling friction.

a) Maximum value of Static friction has largest magnitude or value of them all as it is variable.

b) Rolling friction is the smallest because of wheels used in it.

Q. 3. The surface of matchbox should be rough. Explain why.

Answer: The surface of the matchbox should be rough because when we want to burn the matchstick we should rub it only once on that surface in order to increase it's temperature so that it could burn in order to achieve that temperature the surface should have enough friction to raise the temperature at one rub.

Q. 4. Oiling of the axis of a bicycle makes the bicycle moving easily. Comment along with the reason.

Answer: Oiling or greasing of bicycle axis reduces friction between the tyre and axis. It makes the surface between them both slippery as we know oil is smooth liquid and when we paddle and the tyre moves it moves freely and slips on the axis and does not experience metal to metal sliding.

Q. 5. Write the use of friction.

Answer: General uses of friction are:–

i. Friction is used to apply breaks and move vehicles.

ii. Friction is used to walk.

iii. Friction is used to hold things.

iv. Friction is used to write on paper or blackboard.

Q. 6. Write the condition under which the rolling friction increases.

Answer: We can increase Rolling friction by making the surface, on which the wheel moves, rough and also we can use rubber wheels because rubber experiences more friction than other materials.

Q. 7. Give the name of material which reduces the force of friction.

Answer: Lubricant is the name of the material which is used to decrease the amount of friction between two surfaces in contact. It is a liquid or type of oil actually.

Q. 8. Give one use of spring balance.

Answer: Spring Balance is a device which has a spring inside it which requires high amount of force to be stretched other than small springs. Its main use is to calculate the weight of substance or we can also measure friction with it.

Q. 9. Why is it difficult to walk on a smooth floor?

Answer: It is difficult to move on a smooth floor because when we push the floor back there is no frictional force to stop our foot from going back and our foot keeps on going back by slipping on the surface and hence we do not get any reaction force from the ground to move forward, so it is difficult to walk on a smooth floor.

Q. 10. We always apply powder to a carom board. Why?

Answer: We apply powder to carom board because the wood has a frictional surface and to reduce the friction powder is sprinkled on the board as the powder fills the gaps on board, so the striker moves smoothly and at large distance with even lower force.

Q. 11. Mention a reason which makes the steps of foot-over-bridges at railways stations to wear out slowly.

Answer: The steps of foot over bridges at railway station gets wear out by time because when we walk the soul of our shoes gets plain and thin by time because it gets worn out and also the stairs or road also gets worn out due to friction there is rubbing between these surfaces and as a result there is worn out of both the surfaces by time but the material of shoes is softer than the stairs, so it gets worn out easily than that of stairs.

Q. 12. Explain why does a man slip when he steps on a banana peel thrown on the road.

Answer: The banana peel has fibers on it which makes it smooth and when we place our foot on it the smooth surface is in contact with the ground reducing the friction and the peel goes forward with even low force and takes our feet also with it, so we slip.

Q. 13. Write in brief, how does a bicycle stop when its brakes are applied.

Answer: When we pull the brake lever the calipers attached to the tyre grabs the rim of the tyre or the disk of the tyre (if there are disk brakes) and as the motion of the tyre is opposed by the friction always, so the friction occurring between the surfaces of the rim and the rubber calipers of the brakes as a result of contact developed between them makes the tyre slow by time and ultimately stops it.

Q. 14. Explain why car wheels often spin on icy road.

Answer: Car tyre spins on icy road because of less friction on icy road and due to less friction the force exerted backward by the wheels does not get suitable forward reaction force by the floor and the car does not move forward properly and thus the car tyre slips rather than move along with the car and hence the tyre keeps on exerting force on the floor by spinning and slipping.

Q. 15. Some machines use streamlined shape to reduce friction. Name them.

Answer: Streamline shape is used to reduce the friction by the objects moving in fluids(air and water). The general machines using Streamline shapes are:–

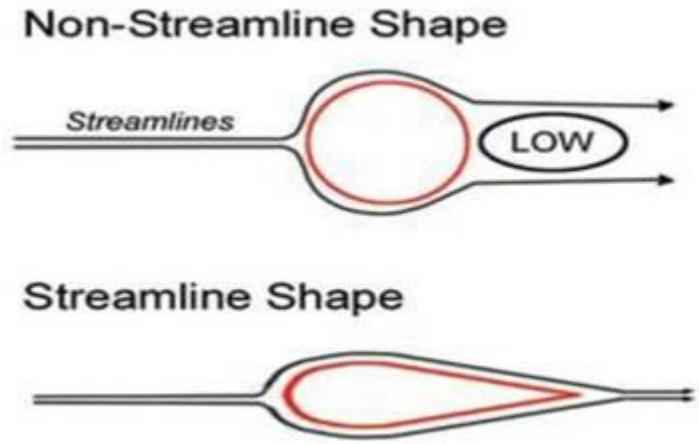
I. Airplanes.

II. Ships.

III. Bullet Trains.

IV. F 1 Cars.

All those objects which are pointed from forward to cut the air every time and get inside it and throw it backward like a bullet.

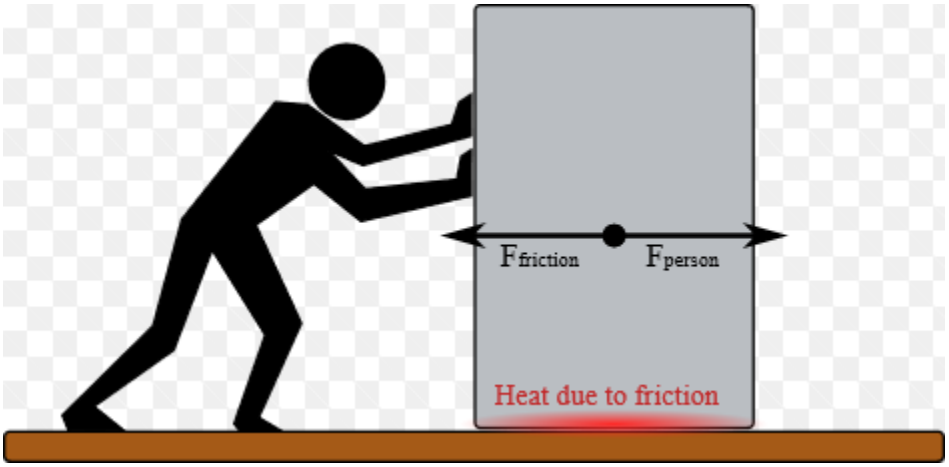


Q. 16. Explain the types of friction with examples.

Answer: The three types of friction are:-

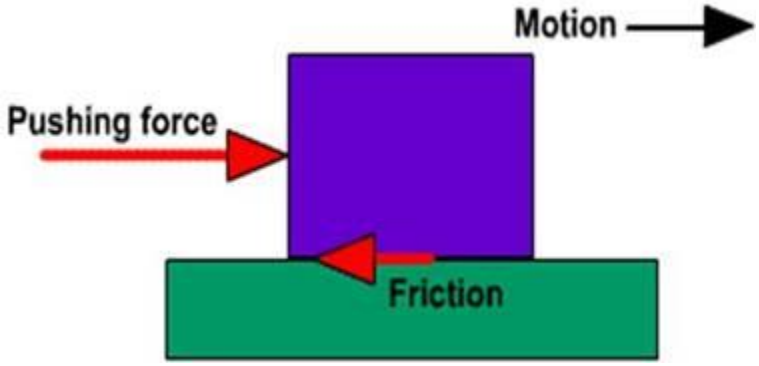
A. Static Friction – It is the friction acting on a body when the body is at rest or has not started moving yet and is variable in nature and is always equal to the amount of force exerted by the person on it. It has the maximum value of them all.

For example – A man pushing a heavy block on a rough surface but still the motion of block has not started.



B. Sliding Friction – It is the friction acting on a body when it is in motion and it is constant friction and is always less than the maximum value of static friction.

For example – A man pushing a block when it is moving.



C. Rolling Friction – It is the friction acting on a wheeled body the friction first acts on wheels and then on the body, it is the least amount of friction of them all and also is constant.

For example – A person pushing a trolly at shopping mall.

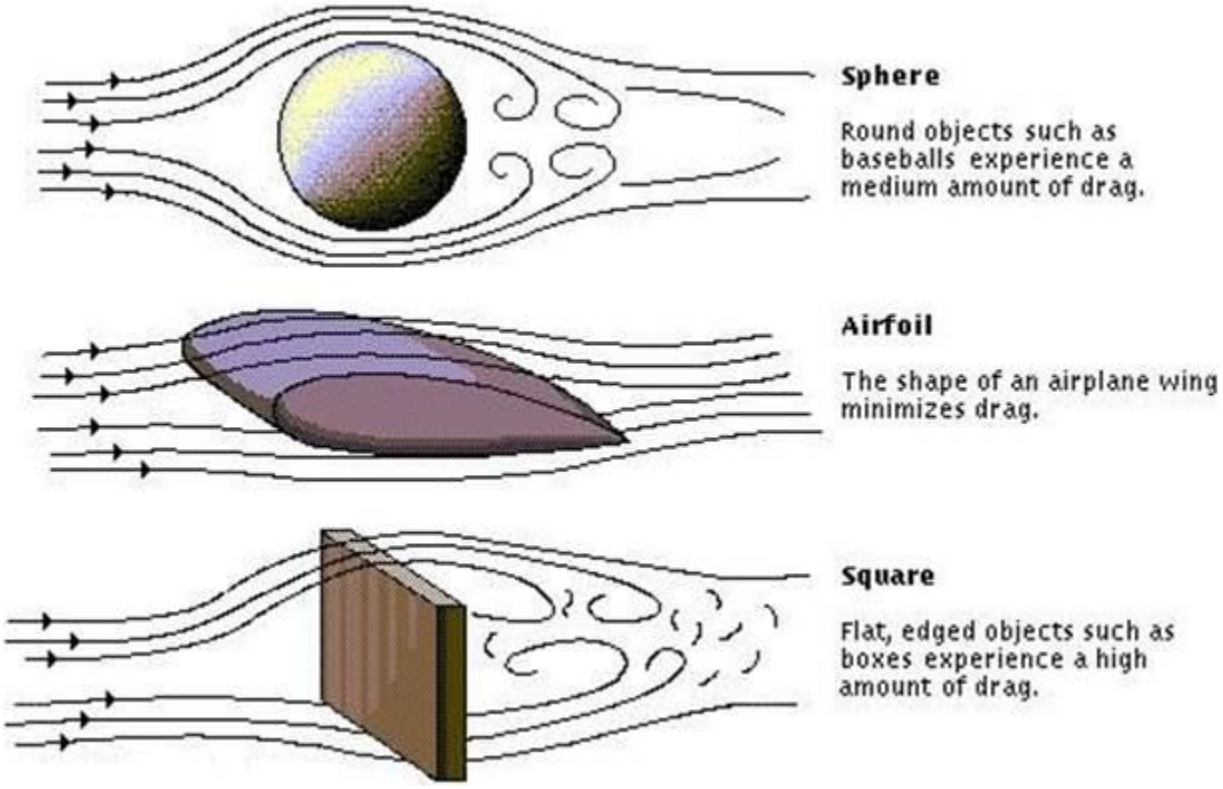
Using trolleys with wheels to move the load.
Rolling friction eases the movement

Q. 17. Write a short note on term 'drag'. Explain why objects moving in fluids should have streamlined shape.

Answer: Drag is also called air friction or fluid friction. It is experienced by all the objects moving. Fluid friction is experienced by all the objects moving in a medium generally liquid(water) is the medium, higher the viscosity higher is the drag offered by the medium. Drag forces depend upon velocity of the object moving through medium.

Objects moving in fluids have streamline shape because this shape reduces the amount of friction experienced by the objects because this shape enables the object to cut and pass through the medium whether it is air or water, the streamline shape is like the shape of bullet it is pointed from forward so that it can cut the medium in front of it and can get pass through it.

Examples – Ship in water, Airplane in air, F1 cars on road these all have streamline shapes.



Q. 18. In which ways friction between the two surfaces can be minimized?

Answer: Friction between two surfaces can be minimized by the following ways:–

I. Smoothening both the surfaces which means reducing irregularity.

II. Lubricating the surface by oils or grease.

III. Use Rolling friction rather than Sliding friction.

IV. Reducing the area of contact between the surfaces.

V. Making the body streamlined in fluids.

VI. Make use of less viscous medium or fluid.

Q. 19. Explain with four examples that sometimes, force of friction is desirable.

Answer: Force of friction is desirable in many cases for example:–

I. Stopping of vehicles – If there were no friction then we cannot stop our vehicles and the vehicles keeps on going and never stop but there is friction which helps us to stop our vehicles because it opposes motion always.

II. Writing – When we write on paper or blackboard then the pencil lead gets dragged on the paper due to friction and gets deposited on the sight where we move it, if there were no friction then there would be no writing on paper with pencil.

III. Walking on ground – When we walk on the ground it is due to friction which gives us forward reaction force due to which we are able to walk and if there were no friction then we were not able to walk.

IV. Picking of objects – When we pick objects this is only due to force of friction because gravity is always acting on objects and if we pick an object it's net force should be zero in order it to not to move.

Q. 20. Write some disadvantages of force of friction.

Answer: The disadvantages of force of friction are as follows:–

i. As we know that friction acts always in opposite direction of motion, so friction slows down any moving object.

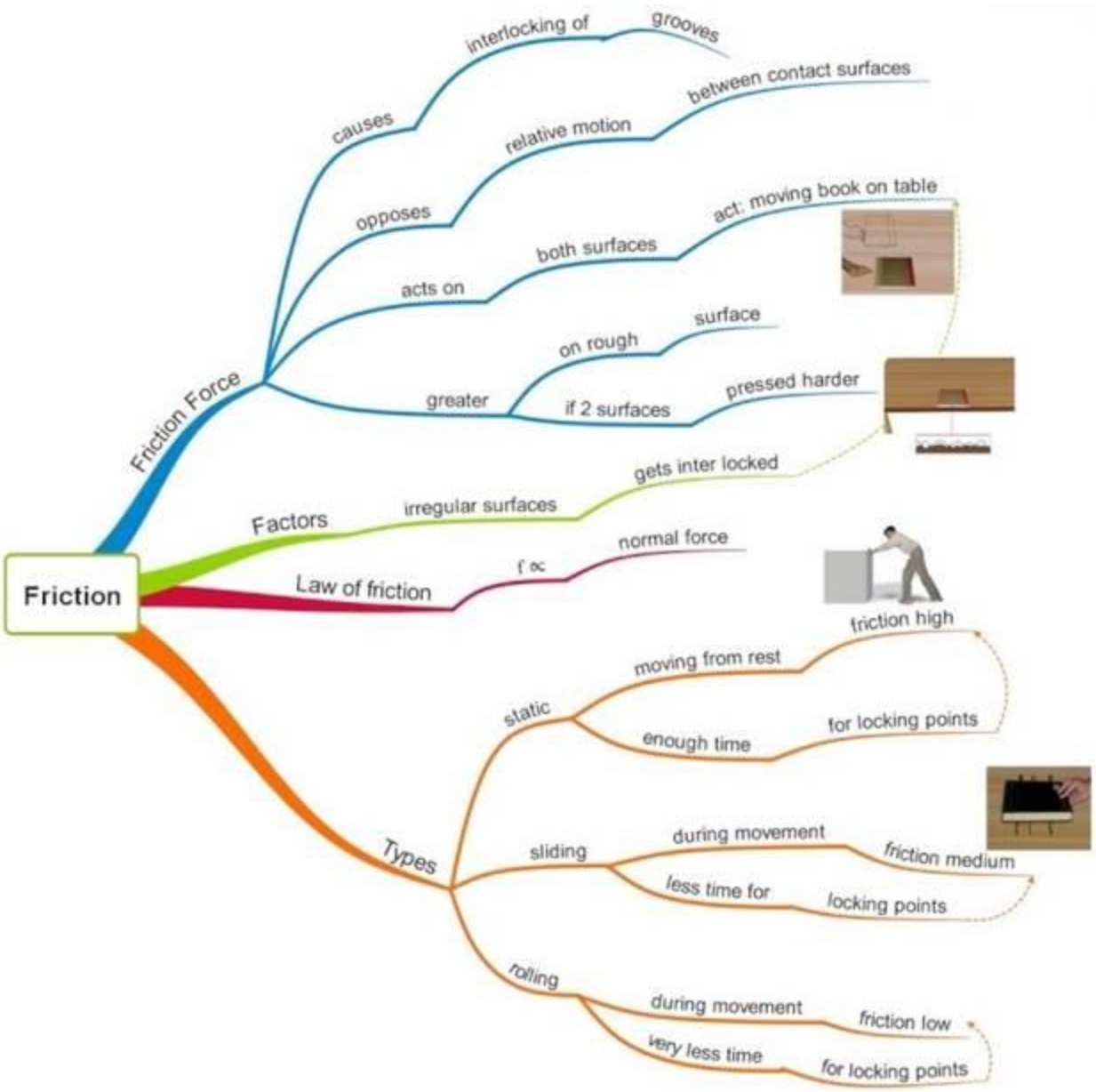
ii. Friction causes unnecessary heat when surfaces are rubbed against each other.

iii. Friction can cause damage to machines having moving parts because of wear and tear.

iv. Friction causes injuries when a person falls its skin gets peeled off due to friction only.

v. Friction makes it difficult to push objects according to mass when we slide them. More the mass more the friction.

vi. Friction cannot be finished completely but can be diminished to great extent.


Friction
Friction Force
causes
interlocking of
grooves
opposes
relative motion
between contact surfaces
acts on
both surfaces
act: moving book on table
greater
if 2 surfaces
on rough
surface
pressed harder
Factors
irregular surfaces
gets inter locked
Law of friction
f ∝
normal force
Types
static
moving from rest
friction high
enough time
for locking points
sliding
during movement
friction medium
less time for
locking points
rolling
during movement
friction low
very less time
for locking points