01. FORCE

Questions and Answers

1. What is force? What changes can be produced by a force?

A. Force is a pull or a push.

The changes can be produced by a force:

(i) It can change the state of motion of an object.

(ii) It may change the shape of an object.

(iii) It may change the direction of a moving object.

(iv) It may change the speed of a moving object.

(v) It can change the state of rest of objects.

2. State an example for a situation mentioned below in which a force:

a) changes the speed of an object

b) changes the shape of an object

c) changes the direction of an object?

A. (a) Kick a ball which is at rest. The ball moves with some speed. So force can change the speed of an object.

(b) Hold a sponge with hand. If we apply force on it, the shape of the sponge changes.

(c) If we apply force on a caroms striker, the coin and striker may move in different directions. So force can change the direction of an object.

3. How can you differentiate between a contact force and a force at a distance?

	Contact force		Force at a distance
1.	Force is which there is a physical contact between two interacting objects is known as contact force.	1.	Force is which there is no physical contact between two interacting objects is known as force at a distance or field force..
2.	Ex: Muscular force, Tension force, Normal force, Frictional force	2.	Ex: Gravitational force, Magnetic force, Electro static force

4. Give two examples each for a contact force and a force at a distance.

A. Examples for a contact force: Muscular force, Tension force, Normal force, force of Friction

Examples for a force at a distance : Magnetic force, Gravitational force, Electro static force.

5. Detect the errors in the following statement and rewrite it in making necessary corrections.

"Because the car is at rest, no forces are acting on it." ?.

A. The sentence should be changed as follows.

"Even though the car is at rest, some forces act on it."

Reason: If car is at rest, the gravitational force acts on it in downward direction and the normal forces on its tyres act in upward direction.

6. Why do tools meant for cutting always have sharp edges?

A. The effect of force increases when the area of contact is less. So the tools meant for cutting always have sharp edges to improve the effect of force. Because they will have less area of contact when we use them to cut objects.

7. Objects change their state of motion due to the net force acting on them. Discuss with examples.

A. The algebraic sum of all forces acting on a body is called net force. The object in rest may come into motion due to net force. The moving object comes to rest or changes its direction of motion due to net force. If net force is zero, the object at rest or the moving object still remains in its position of rest or motion.

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8. When you push a heavy object, it doesn't move. Explain the reason in terms of net force.

A. There are acting two forces on an object at rest. Gravitational force (F_g) and Normal force (F_N). Both are equal magnitude and in opposite directions.

If we push the object, 2 forces acting on that horizontally. (i) Applied force (F_a)
(ii) Force of friction (F_f)

Case(i): If $F_a > F_f$, the net force = $F_a - F_f$ (positive)

Means the object moves in the direction of applied force.

Case(ii): If $F_a = F_f$, the net force = $F_a - F_f$ (zero)

Means the object does not move.

Case(iii): If $F_a < F_f$, the net force = $F_a - F_f$ (negative)

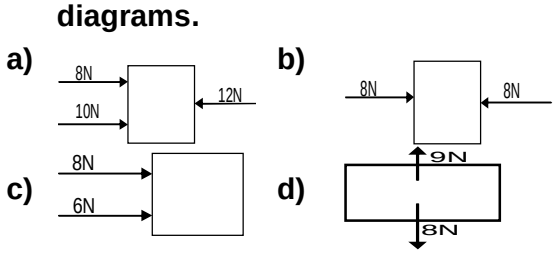
Means the object does not move.

Because force of friction is more than the applied force.

9. If you push on a heavy box which is at rest, you must exert some force to start its motion. However, once the box is sliding, you can apply a smaller force to maintain the motion. Why?

A. If we push on a heavy box which is at rest, we must exert some force to start its motion. However, once the box is sliding, we can apply a smaller force to maintain the motion. Because If we apply force in the direction of motion of an object, the speed of the object increases. We have to maintain the previous speed, so it is sufficient to apply smaller force.

10. Find net forces from the following diagrams.



A. (a) Total force from left to right direction = 8N +10N = 18N

Total force from right to left direction = 12N

Net force on the body = 18 – 12 = 6 N towards right

(b) Total force from left to right direction = 8N

Total force from right to left direction = 8N

Net force on the body = 8 – 8 = 0 N

(c) Total force from left to right direction = 8N +6N = 14 N

Total force from right to left direction = 0 N

Net force on the body = 14 – 0 = 14 N towards right

(d) Total force in upward direction = 9 N

Total force in downward direction= 8 N

Net force on the body = 9 – 8 = 1 N In upward direction

11. How do you increase the pressure by keeping (a) area unchanged and (b) force unchanged?

A. Pressure = $\frac{Force}{Area} = \frac{F}{A}$

(a) If area unchanged, then P α F

If we increase force, then the pressure is increased.

(b) If force unchanged, then P $\alpha \frac{1}{A}$

If we decrease the surface area on which the force is applied, then the pressure will be increased.

12. Imagine that friction has disappeared from the earth. What will happen?

A. If friction has disappeared in the world,

(i) We can not walk. (ii) We can not write

(iii) We can not hold things

(iv) We can not cook

(v) We can not eat

(vi) We can not drive vehicles

(vii) No work on the earth can be done.

13. Karthik is observing the live telecast of a one day cricket match. He noticed motion of a roller on the pitch during lunch break. He thought about various forces acting on the roller and the net force when it is in motion. Many questions arose in his mind regarding the direction of the net force. Can you guess what would be those questions?

A. The following questions may be arose in his mind:

(i) What forces acting on the roller when it is in rest?

(ii) What forces acting on the roller when it moves?

(iii) What is the net force acting on the roller?

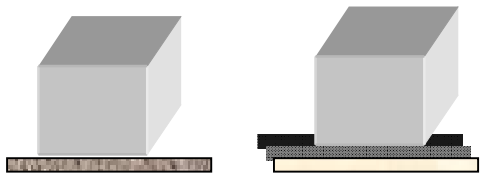
(iv) Does the motion of the roller depends upon the roughness of the surface?

(v) Are same forces act on the roller whether it is pushed or pulled?

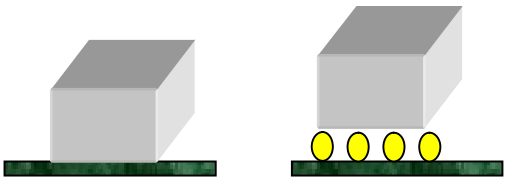
14. Design and conduct experiments to test few ways how friction may be reduced?

A. Friction may be reduced by using lubricants and ball bearings.

Experiment-1: The brick moves slowly on the rough surface. If we use oil on the surface it can move easily. Lubricants reduce the friction.



Experiment-2: The brick moves slowly on the rough surface. If we use spherical balls or marbles under the brick, it can easily move. So ball bearings reduce friction.



15. a) Take two identical straws and suspend one piece freely. Rub the other straw with a piece of paper. Bring the rubbed end of the straw near the suspended one. What do you observe from this activity.

Can you tell which type of force it is?

b) Comb your dry hair. Bring the comb to small pieces of paper. What do you observe? Explain.

A. (a) The straw rubbed with paper gets charge and it is called charged body.

The suspended straw is uncharged body.

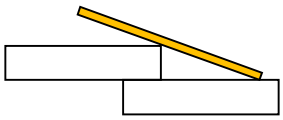
If rubbed end of charged straw bring towards the suspended straw, they attract each other. This is a non contact force.

This force is called electro static force.

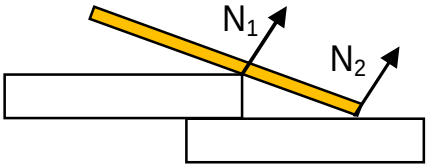
This is a force at a distance.

(b) When we comb our dry hair, comb gets charge on its surface. The paper pieces are uncharged bodies. If we put the charged comb near to the uncharged paper pieces, they will attract to the comb. This is a force at a distance or field force. This is called electro static force.

17. A stick is placed on steps as shown in figure. Draw normal forces on the stick.



A.



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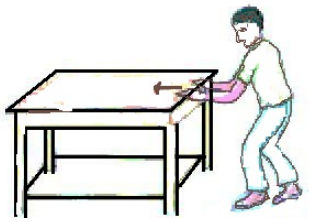
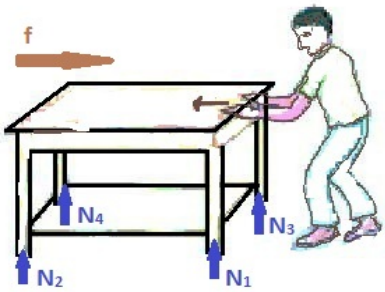
18. Observe the figure below and find in which direction the force of friction acts. Also indicate the normal forces and their directions.

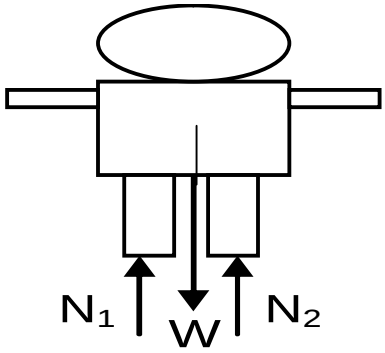


A. Friction force (f) acts in the opposite direction to the direction of motion.
Friction acts in between table and ground.
Normal forces acts always perpendicular direction to the surface of contact. Hence normal force acts at four legs of the table.



19. A man is standing still on a level floor. What forces act on him? Draw a free body diagram (FBD) to show all forces acting on him.

A. A man is standing still on a level floor.
Two forces act on the man.



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(i) Gravitational force (F_g or W) in downward direction
(ii) Normal force (F_N) in upward direction at two places.

20. How do you appreciate the role of friction in facilitating our various activities?

A. If friction has disappeared in the world,
(i) We can not walk.
(ii) We can not write
(iii) We can not hold things
(iv) We can not cook
(v) We can not eat
(vi) We can not drive vehicles
(vii) No work on the earth can be done.
For doing so many works, we need friction.
So I appreciate the role of friction for its facilitation to do various activities.

21. A monkey hangs stationary at the end of the vertical vine. What forces act on the monkey?

A. Imagine a monkey hangs stationary at the end of a vertical vine. Two forces act on monkey.
(i) Gravitational force (F_g or W) in downward direction
(ii) Tension force (T) in the vine in upward direction