

5

Exploring Forces

Fill in the Blanks

1. A push or pull on an object resulting from its interaction with another object is called a _____.
2. The SI unit of force is _____.
3. The force resulting from the action of muscles is known as _____ force.
4. The force that comes into play when an object moves or tries to move over another surface is called _____.
5. Friction always acts in a direction _____ to the direction of motion or attempted motion.
6. The force exerted by a magnet on another magnet or magnetic material is called _____ force.
7. The force exerted by a charged body on another charged or uncharged body is called _____ force.
8. The force with which the Earth attracts objects towards itself is called _____ force.
9. The force with which the Earth pulls an object towards itself is called its _____.
10. The upward force exerted by a liquid on an object is called _____ or _____ force.

Multiple Choice Questions

1. Which of the following best describes a force?
 A. Only a push B. Only a pull
 C. A push or a pull D. A movement
2. Which of the following is a contact force?
 A. Gravitational force B. Magnetic force
 C. Electrostatic force D. Muscular force
3. Which force opposes the motion of an object sliding over a surface?
 A. Magnetic force B. Frictional force
 C. Gravitational force D. Electrostatic force
4. Which of the following is a non-contact force?
 A. Muscular force B. Frictional force
 C. Magnetic force D. Force applied by hand
5. When two like poles of magnets are brought near each other, they:
 A. Attract each other B. Stop exerting force
 C. Become neutral D. Repel each other
6. When a plastic scale is rubbed with polythene and brought near small pieces of paper, the paper pieces are attracted because of:
 A. Electrostatic force B. Friction
 C. Muscular force D. Gravitational force
7. What happens to the mass of an object when it is taken from Earth to the Moon?
 A. It becomes one-sixth B. It becomes six times
 C. It remains unchanged D. It becomes zero

8. The SI unit of weight is:

- | | |
|-------------|-----------|
| A. Kilogram | B. Gram |
| C. Metre | D. Newton |

9. Which instrument is used to measure weight?

- | | |
|-----------------|-----------------------|
| A. Beam balance | B. Spring balance |
| C. Thermometer | D. Measuring cylinder |

10. An object floats in water when:

- A. Its weight is greater than the buoyant force
- B. Its weight is equal to or appropriately balanced by the buoyant force
- C. There is no gravitational force
- D. There is no friction

Assertion – Reason Questions

Directions:

- (a) Both A and R are true and R is the correct explanation.
- (b) Both A and R are true but R is not the correct explanation.
- (c) A is true but R is false.
- (d) A is false but R is true.

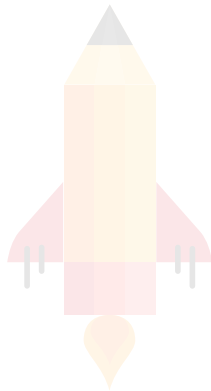
1. Assertion: A force can change the speed of a moving object.
Reason: A force can cause a moving object to speed up or slow down.
2. Assertion: Friction is a contact force.
Reason: Friction comes into play when two surfaces are same.
3. Assertion: Friction always acts in the same direction as the motion of an object.
Reason: Friction opposes the motion or attempted motion between surfaces.
4. Assertion: Magnetic force is a non-contact force.
Reason: A magnet can exert force on another magnet without touching it.
5. Assertion: Like electric charges repel each other.
Reason: Two balloons rubbed in the same way acquire similar charges and move away from each other.

Short Answer Questions

1. What is force? What is its SI unit?
2. What are the different effects that a force can produce?
3. Why are forces said to result from interactions between objects?
4. What is muscular force? Give two examples.
5. What is friction? In which direction does it act?
6. Why does a ball rolling on the ground eventually stop?
7. Why is magnetic force called a non-contact force?
8. What is gravitational force?
9. Differentiate between mass and weight.
10. What is buoyant force?

Long Answer Questions

1. Explain the different effects of force with suitable examples.
2. Explain contact and non-contact forces with examples.
3. Explain friction and the factors affecting it.
4. Explain magnetic force and electrostatic force.
5. Explain gravitational force with the help of an example.
6. Explain the difference between mass and weight.
7. Describe how a spring balance is used to measure weight.
8. Explain why some objects float while others sink in water.
9. Describe what happens to a ball thrown vertically upwards.
10. Explain Archimedes' Principle and its connection with floating and sinking.



Answers

Fill in the blanks

1. force
2. newton (N)
3. muscular
4. friction
5. opposite
6. magnetic
7. electrostatic
8. gravitational
9. weight
10. upthrust, buoyant

MCQs

1. C. A push or a pull
2. D. Muscular force
3. B. Frictional force
4. C. Magnetic force
5. D. Repel each other
6. A. Electrostatic force
7. C. It remains unchanged
8. D. Newton
9. B. Spring balance
10. B. Its weight is equal to or appropriately balanced by the buoyant force

Assertion – Reason

1. A
2. C
3. D
4. A
5. A

Short Questions – Answers

Ans 1: A force is a push or pull on an object resulting from its interaction with another object. The SI unit of force is newton (N).

Ans 2: A force can:

- Make an object move from rest.
- Change the speed of a moving object.
- Change the direction of motion.
- Change the shape of an object.
- Produce two or more of these effects together.

Ans 3: A force comes into play when two or more objects interact. For example, when we push a table, our hand interacts with the table and applies a force to it. Thus, at least two objects are involved in an interaction producing force.

Ans 4: Muscular force is the force resulting from the action of muscles in our body. Lifting a school bag and pushing a box are examples of muscular force.

Ans 5: Friction is the force that comes into play when an object moves or tries to move over another surface. It is a contact force and acts opposite to the direction of motion or attempted motion.

Ans 6: A rolling ball eventually stops because friction acts between the ball and the ground. Friction opposes the motion of the ball and gradually reduces its speed until it stops.

Ans 7: Magnetic force is called a non-contact force because a magnet can attract or repel another magnet or attract a magnetic material without physically touching it.

Ans 8: Gravitational force is the force with which the Earth attracts objects towards itself. It acts without physical contact and is therefore a non-contact force. Gravity is always attractive.

Ans 9:

Mass	Weight
Mass is the amount of matter in an object.	Weight is the gravitational force with which the Earth pulls an object.
It is measured in grams or kilograms.	It is measured in newtons.
Mass remains unchanged from place to place.	Weight can change from place to place.

Ans 10: Buoyant force or upthrust is the upward force exerted by a liquid on an object placed in it. If the gravitational force on an object is greater than the buoyant force, the object sinks. When the forces are appropriately balanced, the object floats.

Long Questions – Answers

Ans 1: Force can produce several effects on an object:

- It can make an object move from rest.
- For example, kicking a stationary football makes it move.
- It can change the speed of an object.
- Applying brakes to a moving bicycle reduces its speed.
- It can change the direction of motion.
- Hitting a moving cricket ball with a bat can change its direction.
- It can change the shape of an object.
- Pressing an inflated balloon changes its shape.

Thus, a force can change the motion, speed, direction, shape, or more than one of these.

Ans 2: Forces can be classified into contact forces and non-contact forces.

Contact forces act only when the objects are physically in contact. Examples include:

- Muscular force: produced by the action of muscles.
- Frictional force: acts between surfaces in contact and opposes motion.

Non-contact forces can act even when the objects are not touching. Examples include:

- Magnetic force: exerted by a magnet.
- Electrostatic force: exerted by a charged body.
- Gravitational force: exerted by the Earth on objects.

Therefore, the main difference is whether physical contact is necessary for the force to act.

Ans 3: Friction is the force that comes into play when an object moves or tries to move over another surface. It acts opposite to the direction of motion.

Friction occurs because the surfaces in contact have tiny irregularities. These irregularities can lock into one another and oppose motion.

The amount of friction depends on the nature of the surfaces in contact. Rough surfaces generally produce greater friction than smooth surfaces.

For example, a box pushed over a rough surface stops sooner than the same box pushed over a smoother surface. Friction can also act when objects move through liquids and gases.

Ans 4:

Magnetic force:

The force exerted by a magnet on another magnet or a magnetic material is called magnetic force. It can act without contact, so it is a non-contact force. Like poles of magnets repel each other, while unlike poles attract each other.

Electrostatic force:

When certain materials are rubbed together, they can acquire static charges. A charged object can exert a force on another charged or uncharged object without touching it. This force is called electrostatic force. Like charges repel, while unlike charges attract.

Both magnetic and electrostatic forces can act from a distance.

Ans 5: The force with which the Earth attracts objects towards itself is called gravitational force or gravity. It is a non-contact force and is always attractive.

For example, when a ball is thrown vertically upwards, it moves upward for some time, slows down, stops momentarily at its highest point, and then falls back towards the Earth. This happens because Earth's gravitational force continuously pulls the ball downward.

Gravitational force also causes objects dropped from a height to move towards the ground.

Ans 6: Mass is the amount of matter present in an object. It is measured in grams (g) or kilograms (kg) and remains the same from one place to another.

Weight is the gravitational force with which the Earth or another planet pulls an object. It is measured in newtons (N).

The weight of an object can change because the gravitational force is different on different planets. For example, a 1 kg object has a weight of about 10 N on Earth but about 1.6 N on the Moon. Its mass, however, remains 1 kg.

Ans 7: A spring balance is a simple instrument used to measure weight or force.

It consists of a spring fixed at one end and a hook attached to the other end. When an object is suspended from the hook, the object pulls the spring downward due to gravity, causing the spring to stretch.

The amount of stretching corresponds to the weight of the object. A scale marked in newtons (N) allows us to read the weight.

Before using a spring balance, we should check its maximum range and smallest division. The object being measured should not be heavier than the maximum weight that the spring balance can measure.

Ans 8: When an object is placed in water, two important forces act on it:

Gravitational force acts downward.

Buoyant force or upthrust exerted by water acts upward.

If the gravitational force is greater than the buoyant force, the object sinks.

If the forces are appropriately balanced, the object floats.

For example, a coin sinks in water because its weight is greater than the upward buoyant force acting on it. A wooden block can float because it is less dense than water and can displace enough water to provide sufficient buoyant force.

Ans 9: When a ball is thrown vertically upwards, an upward force is initially applied to the ball. After the ball leaves the hand, the Earth's gravitational force acts downward on it.

During its upward motion:

- The ball moves upward.
- Its speed gradually decreases due to gravity.
- At the highest point, its speed becomes momentarily zero.

After reaching the highest point:

- The ball starts moving downward.
- Its speed increases as it falls because gravity acts downward.

Thus, gravity changes the ball's speed and causes its direction of motion to change.

Ans 10: Archimedes' Principle states that when an object is fully or partially immersed in a liquid, it experiences an upward force equal to the weight of the liquid displaced by the object.

This upward force is called buoyant force or upthrust.

If the weight of the liquid displaced is less than the weight of the object, the object sinks. If the weight of the displaced liquid is equal to the weight of the object, the object floats.

Therefore, buoyant force helps explain why some objects float while others sink in liquids.