Chapter 5 Exploring Forces

Question Answer (InText)

(Page 62)

Question 1.

Why does it feel harder to pedal a bicycle when going uphill than on flat ground?

Answer:

When we cycle uphill, we're constantly fighting against the Earth's gravitational pull, which tries to pull us back down. This force acts perpendicular to the ground on a flat surface, meaning it doesn't directly oppose our forward movement. But on a slope, a portion of the gravity acts against our direction of motion, requiring us to exert more force to move forward and upward.

Question 2.

Why is it easier to slip on a wet surface?

Answer:

It is easier to slip on a wet surface due to reduced friction between the foot and the surface. Water acts as a lubricant, minimizing the grip and making it easier to slide.

Question 3.

Why do we feel 'light' or like we are 'floating' just after our swing reaches its highest point and begins to come down?

Answer:

The feeling of lightness or floating experienced on a swing just after it reaches its highest point and begins to descend is due to a change in acceleration and the resulting sensation of reduced gravitational force. As the swing moves upward, it slows down, and at its highest point, it momentarily stops before changing direction. During this brief moment, the force of gravity is still acting on us, but it's not counteracted by any upward force from the swing, leading to a feeling of weightlessness. As the swing starts to descend, we accelerate

downwards, and the feeling of lightness intensifies because our body is essentially falling with the swing.

(Page 67)

Question 4.

Is there any other contact force?

Answer:

Yes. Force of friction.

(Page 69)

Question 5.

Is it essential for an object applying force on another object to always be in contact with it?

Answer:

No, it is not essential for an object applying force on another object to always be in contact with it. Forces can be applied through contact (contact forces) or without direct contact (non-contact forces).

(Page 71)

Question 6.

Does it mean that there are two kinds of electrical charges?

Answer:

Yes, there are two types of electric charge: positive charge and negative charge. These charges are fundamental properties of matter.

(Page 72)

Question 7.

Why do all the objects fall towards the Earth?

Answer:

Objects fall towards the Earth due to gravity, a force of attraction between any two objects with mass. Earth’s gravity pulls all objects towards its center, causing them to fall. This force is stronger for objects with more mass, and it weakens with distance.

Question 8.

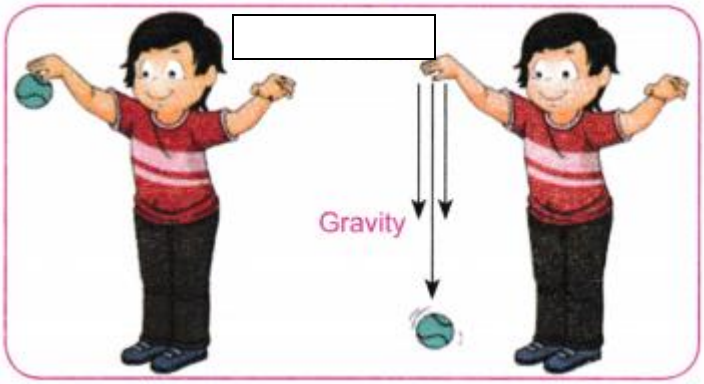
Is there any force that acts on them? What exerts this force?

Answer:

Yes, there is a force acting on any object in the universe, and it is called gravity. Gravity is a force of attraction that exists between any two objects with mass. The Earth, due to its large mass, exerts a gravitational force on all objects near it, pulling them towards its center.

Question 9.

Does the Earth pull every object with equal force?



Answer:

No, the Earth does not pull every object with equal force. The force of gravity is stronger on objects with greater mass. While the Earth exerts a gravitational pull on all objects, the strength of that pull depends on the mass of the object being attracted.

(Page 75)

Question 10.

What is the difference between weight and mass?

Answer:

Mass is the amount of matter in an object. Weight is the downward force acting upon an object due to gravity. On planet Earth, the two quantities are proportional.

(Page 76)

Question 11.

If we place some objects on water, some of them float, while others fall to the bottom. The gravitational force of the Earth is acting on all objects, so why don't all objects fall to the bottom?

Answer:

While the Earth's gravitational force acts on all objects, whether they sink or float in water depends on the buoyant force and the density of the object relative to water. Objects with a density lower than water experience a stronger buoyant force, causing them to float, while those with a higher density experience a weaker buoyant force and sink.

Question Answer (Exercise)

(Pages 77-79)

Question 1.

Match items in Column A with the items in Column B.

Column A (Type of Force)	**Column B (Example)**
(i) Muscular force	(a) A cricket ball stopping on its own just before touching the

	boundary line
(ii) Magnetic force	(b) A child lifting a school bag
(iii) Frictional force	(c) A fruit falling from a tree
(iv) Gravitational force	(d) A balloon rubbed on a woollen cloth attracts hair strands
(v) Electrostatic force	(e) A compass needle pointing North

Answer:

Column A (Type of Force)	Column B (Example)
(i) Muscular force	(b) A child lifting a school bag
(ii) Magnetic force	(e) A compass needle pointing North
(iii) Frictional force	(a) A cricket ball stopping on its own just before touching the boundary line
(iv) Gravitational force	(c) A fruit falling from a tree
(v) Electrostatic force	(d) Balloon rubbed on woollen cloth, attracting hair strands

Question 2.

State whether the following statements are True or False.

(i) A force is always required to change the speed of motion of an object.

(ii) Due to friction, the speed of the ball rolling on a flat ground increases.

(iii) There is no force between two charged objects placed at a small distance apart.

Answer:

(i) True: A force is indeed always required to change the speed of motion of an object. If there is no force acting on an object, it will maintain its current speed and direction (unless it's already at rest, in which case it will stay at rest).

(ii) False: Friction opposes motion, so it will decrease the speed of a rolling ball.

(iii) False: There is a force between charged objects. This force can be attractive or repulsive depending on the charges. But it is always present when charges are close to each other.

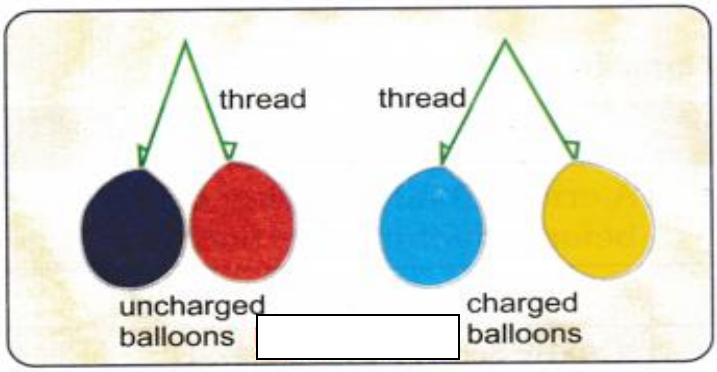
Question 3.

Two balloons rubbed with a woollen cloth are brought near each other. What would happen and why?

Answer:

When two balloons are rubbed with a woollen cloth and brought near each other, they will repel each other. This happens because both balloons will acquire a negative charge when

rubbed with wool, and like charges repel.



Question 4.

When you drop a coin in a glass of water, it sinks, but when you place a bigger wooden block in water, it floats. Explain.

Answer:

A coin sinks in water because its density (mass per unit volume) is greater than that of water. A wooden block floats because its density is less than that of water, causing it to be buoyed up by the water.

Question 5.

If a ball is thrown upwards, it slows down, stops momentarily, and then falls back to the ground. Name the forces acting on the ball and specify their directions.

(i) During its upward motion

(ii) During its downward motion

(iii) At its topmost position

Answer:

When a ball is thrown upwards, the only force acting on it throughout its entire motion is gravity, which pulls it downwards. However, depending on the motion of the ball, the direction of this force relative to the ball's velocity changes.

(i) During its upward motion: The force of gravity is downwards, opposing the upward motion of the ball, causing it to slow down.

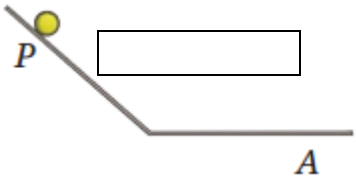
(ii) During its downward motion: The force of gravity is still downwards, but now it aligns with the ball's direction of motion, accelerating it downwards.

(iii) At its topmost position: The ball has zero velocity, meaning it's momentarily stationary. At this point, the force of gravity is still downwards, but since the ball is not moving upwards or downwards, it has no net effect on the ball's motion.

Question 6.

A ball is released from the point P and moves along an inclined plane and then along a

horizontal surface as shown in the figure. It comes to a stop at point A on the horizontal surface. Think of a way so that when the ball is released from the same point P, it stops (i) before the point A, (ii) after crossing the point A.



Answer:

The ball's motion is governed by the forces of gravity and friction. On the inclined plane, gravity provides the acceleration for the motion. On the horizontal surface, only friction acts on the ball.

- Stopping before A: Increasing friction on the horizontal surface will cause the ball to decelerate more rapidly, meaning it will come to a stop sooner, potentially before reaching point A.
- Stopping after A: Decreasing friction on the horizontal surface will reduce the deceleration, allowing the ball to travel further before losing all its kinetic energy and stopping.

Question 7.

Why do we sometimes slip on smooth surfaces like ice or polished floors? Explain.

Answer:

When we walk on surfaces like ice, we often slip, which means we lose our balance and fall. This happens because the force that helps us stay upright and move forward (friction) is not enough. These surfaces have fewer irregularities. Minimizing the contact area and the force of friction between the surface and our shoes makes it easier to slide instead of grip. A layer of water, even a thin one on ice, can further reduce friction by acting as a lubricant, making the surface even more slippery.

Question 8.

Is any force being applied to an object in a non-uniform motion?

Answer:

Yes, for an object to be in non-uniform motion, a force must be acting upon it. Non-uniform motion, also known as accelerated motion, means the object's velocity is changing, either in speed or direction, or both. This change in velocity requires a force to be applied.

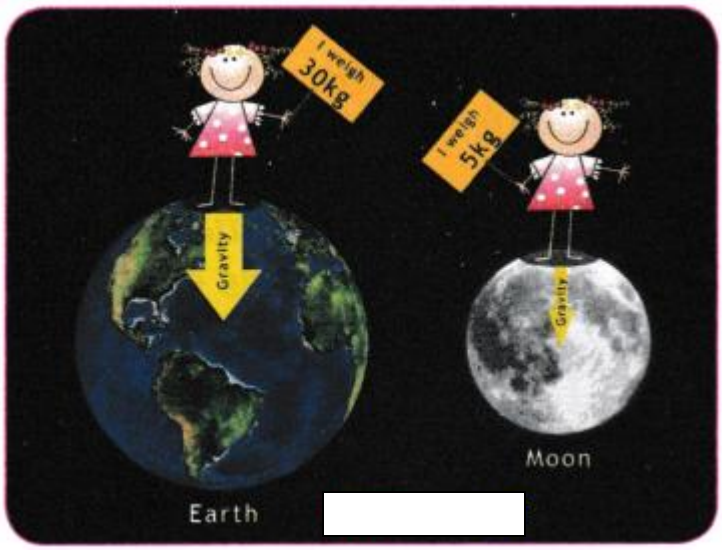
Question 9.

The weight of an object on the Moon becomes one-sixth of its weight on Earth. What causes

this change? Does the mass of the object also become one-sixth of its mass on the Earth?

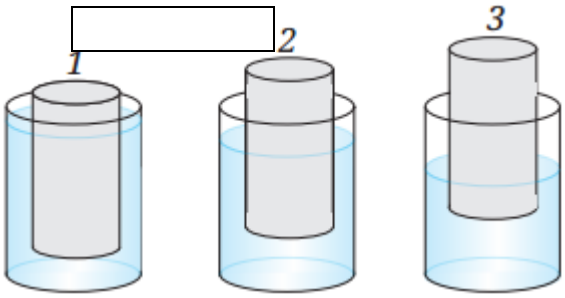
Answer:

The change in an object's weight on the moon compared to Earth is due to the difference in gravitational force. The moon's gravity is significantly weaker than Earth's, roughly one-sixth as strong. However, the mass of an object remains the same regardless of location; only weight changes with gravitational pull.



Question 10.

Three objects, 1, 2, and 3 of the same size and shape but made of different materials, are placed in the water. They dip to different depths as shown in the figure.



If the weights of the three objects 1, 2, and 3 are w1, w2, and w3, respectively, then

(i) w1 = w2 = w3

(ii) w1 > w2 > w3

(iii) w2 > w3 > w1

(iv) w3 > w1 > w2

Answer:

(ii) The relationship between the weights of the objects is w1 > w2 > w3

Object 1 is the deepest meaning it displaces the most water.

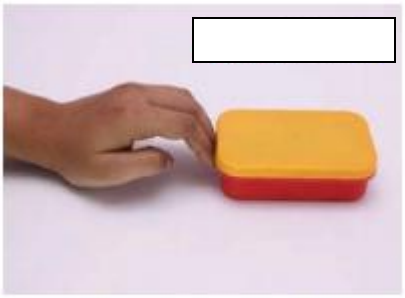
Object 2 is less deep than object 1 but deeper than object 3.

Object 3 is the least deep, meaning it displaces the least amount of water.

Since the objects have the same size and shape, the greater the depth, the greater the weight of the object (assuming they are all made of the same material).
Hence, the object with the greatest weight will sink the deepest, and the object with the least weight will be the closest to the surface.
Question Answer (Activities)

Activity 5.3: Let Us Investigate (Page 67)

- Take an object with a flat base (such as an empty lunch box/geometry box/a notebook) and place it on a table or floor.
- Gently push it and observe. Does it stop after travelling some distance? Is there a force acting on it that brings it to rest?
- Now repeat by pushing the object in the opposite direction. Does it stop again after travelling some distance?



Friction acts between two surfaces and opposes the motion of the object.

Answer:
Yes, the object will stop after moving a certain distance when pushed on a table or floor. This is due to the force of friction, which opposes the motion of the object and eventually brings it to rest. When the object is pushed in the opposite direction, it will again stop after a certain distance due to the same frictional force.

Activity 5.8: Let Us Observe (Page 71)

- Take a ball and throw it vertically upwards. Does it come down?
- Now throw it again, but this time harder. Does it still fall back down to the ground?

Think about different situations around you where any object thrown up in any direction finally falls or comes back to the ground or floor.

Some objects falling towards the Earth

Answer:

1. Throwing a ball upwards: When we throw a ball upwards, it will come back down to the ground.
2. Throwing it harder: Even if we throw the ball harder, it will still fall back down. Throwing it harder simply gives it a greater initial upward velocity, allowing it to reach a higher point before gravity eventually overcomes that upward momentum and pulls it back down.

Different Situations

Many objects around us demonstrate this principle of gravity:

- A thrown stone: Whether we throw a stone straight up or horizontally, it will always follow a curved path and eventually land on the ground due to gravity.
- A dropped mango: A mango falling from a tree illustrates the same principle – gravity pulls it towards the Earth.
- Raindrops: Raindrops fall from the clouds to the ground due to the Earth's gravitational pull.