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SOLUTIONS BOOK

CLASS 8

Science · Curiosity

CHAPTER 5

Exploring Forces

Complete Questions and Activities Solutions

In-text Questions | Keep the Curiosity Alive | Discover, Design, and Debate

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5.1

CLASS 8 SCIENCE · CHAPTER 5

In-text Questions

Solutions · 30 questions

Directions (Questions 1–30): These are the questions that appear inside the chapter (Probe and ponder, activities and the questions asked in the text), numbered in the order in which they appear. Many are activity-based or open-ended; model answers based on the chapter are given, and you may add examples from your own surroundings.

QUESTION 1 *Probe and ponder · p. 62*

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

ANSWER

Going uphill, we have to work against the pull of the Earth (gravity) as well as friction.

- Gravity pulls the bicycle and the rider downwards. On a slope, this pull acts against the motion up the hill, so a larger force is needed to move forward.
- On flat ground, gravity does not oppose the forward motion, so only friction and air have to be overcome.

Therefore, pedalling uphill is harder because we must apply a larger force against the gravitational pull (and friction).

QUESTION 2 *Probe and ponder · p. 62*

Why is it easier to slip on a wet surface?

ANSWER

Water reduces the force of friction between our feet and the surface.

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- Friction arises due to the irregularities of the two surfaces in contact. Water fills these irregularities and makes the surface smoother, so they lock into each other less.
- With less friction, our feet cannot grip the ground and slide easily.

Therefore, we slip easily on a wet surface because friction becomes small.

QUESTION 3 *Probe and ponder · p. 62*

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

ANSWER

This is a model answer based on the idea of gravity pulling us downwards.

- At the highest point the swing stops for a moment, and then it begins to move down because of the gravitational pull of the Earth. The speed goes on increasing while coming down.
- As we move down along with the swing, the seat presses less against us, so we feel light, as if floating.

Therefore, we feel light because we are moving downwards under gravity and the support force from the swing becomes less.

QUESTION 4 *Introduction · p. 63*

As they were coming down the slope of the hill, they realised that their bicycles were moving down at a great speed even though they were not pedalling! Sonali yelled, "It's thrilling! It seems something is pulling us downhill, what could it be?"

ANSWER

The bicycles are pulled downhill by the force of gravity.

- The gravitational force of the Earth pulls everything towards itself, including the bicycles and the girls.
- On the slope this pull makes the bicycle speed up even without pedalling.

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Therefore, the gravitational force of the Earth is pulling them downhill.

QUESTION 5 *Activity 5.1 · p. 63*

Take a large cardboard box. Try moving the box in as many different ways as you can think of. Did you move the box in any other way than shown in Fig. 5.1?

ANSWER

Yes, the box can be moved in many other ways, and each way needs a push or a pull.

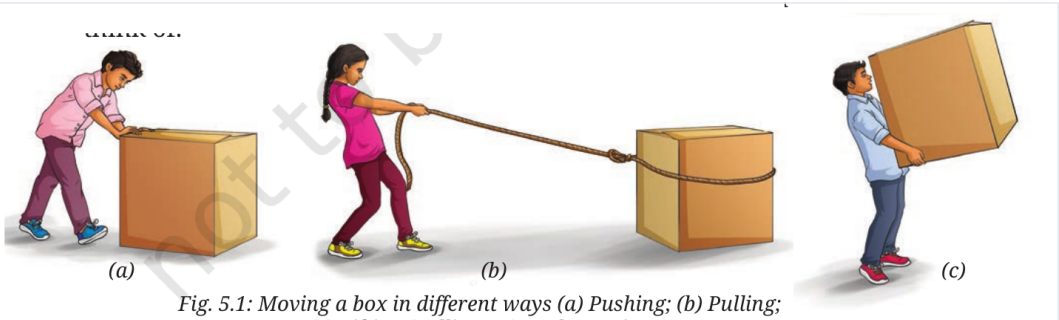

Fig. 5.1: Moving a box in different ways (a) Pushing; (b) Pulling; (c) Lifting (pulling up), and carrying

Way of moving the box	Push or pull	Shown in Fig. 5.1?
Pushing it with the hands	Push	Yes (a)
Pulling it with a rope	Pull	Yes (b)
Lifting and carrying it	Pull (pulling up)	Yes (c)
Kicking it, or pushing it with a stick or foot	Push	No
Dragging it by hand	Pull	No
Rolling it, or tilting it over	Push	No

- In all the ways of moving the box, a push or a pull is applied. The push or pull applied on an object is called force.

Therefore, whichever way we move the box, we apply a force, that is, a push or a pull.

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QUESTION 6 *Activity 5.2 · p. 64*

Think of situations where a force (push or pull) is applied and list them in Table 5.1. Analyse each situation and write the effect of the force in Table 5.1. Some situations and their effects are already listed for you.

ANSWER

The three situations given in the chapter and some more are listed in Table 5.1.

S.No.	Action	Push/Pull	Effect
1.	Your friend holding your moving bicycle from behind to stop it	Pull	Stopping or decreasing the speed of the bicycle (given)
2.	Hitting a moving ball with a bat	Push	Changing the direction of a moving ball (given)
3.	Pressing an inflated balloon	Push	Change in shape of the balloon (given)
4.	Opening a drawer	Pull	The drawer moves from rest
5.	Stretching a rubber band	Pull	Change in shape of the rubber band
6.	A fielder stopping a ball	Push (on the ball, opposite to its motion)	The ball stops, i.e. its speed decreases to zero
7.	Kicking a football	Push	The ball moves from rest; its speed and direction change
8.	Applying brakes on a moving bicycle	Push (brake pads press the wheel)	The speed of the bicycle decreases
9.	Rolling a chapati with a rolling pin	Push	Change in shape of the dough
10.	Turning the steering handle of an autorickshaw	Push or pull	Change in the direction of motion

Therefore, a force can start, stop, speed up or slow down an object, change its direction or change its shape.

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QUESTION 7 *Activity 5.2 · p. 64*

What do you conclude from these examples? Does a force cause a moving object to stop? Can it change speed, or direction of motion, or change the shape of an object?

ANSWER

Yes, a force can do all of these things.

- A force can make an object move from rest.
- A force can stop a moving object or change the speed of an object that is moving (e.g. the brakes of a bicycle).
- A force can change the direction of motion (e.g. a bat hitting a ball).
- A force can change the shape of an object (e.g. pressing a balloon or stretching a rubber band).
- A force may cause some or all of these effects.

Therefore, a force can cause a moving object to stop and can change speed, direction of motion or shape.

QUESTION 8 *Section 5.2 · p. 65*

Does this mean that whenever there is a change in speed or direction, or change in shape, a force is acting on the object?

ANSWER

Yes. None of these changes takes place without the action of a force.

- Whenever the speed of an object changes, or its direction of motion changes, or its shape changes, we can say that a force is acting on it.

Therefore, a change in speed, direction or shape shows that a force is acting on the object.

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QUESTION 9 *A step further · p. 65*

Suppose an object is at rest. Does it mean that no force is acting on this object?

ANSWER

No. An object at rest may have forces acting on it.

- If the object is at rest, it means that the forces acting on the object are balancing one another.
- Balanced forces are studied in higher grades.

Therefore, an object at rest does not necessarily have no force acting on it; the forces may be balanced.

QUESTION 10 *Section 5.3 · p. 65*

Think of all the actions listed in Table 5.1. How many objects are involved in each of the actions? Do you notice that forces result only when two objects are interacting in some way or the other?

ANSWER

In each action, two objects are involved.

Action	The two objects
Friend holding a moving bicycle	Friend’s hand and the bicycle
Hitting a ball with a bat	Bat and ball
Pressing a balloon	Hand and balloon
Pushing a table	Hand and table

- Yes, forces result only when two objects interact. At least two objects must interact for a force to come into play.

Therefore, a force is a push or pull resulting from the interaction of two (or more) objects.

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QUESTION 11 *A step further · p. 66*

When you pushed the table with your hand, did you feel a force on your hand too?

ANSWER

Yes, we feel a force on the hand too.

- Whenever two objects interact, each object experiences a force from the other.
- The moment we stop pushing, the force on the hand disappears. As soon as the interaction ceases, the two objects no longer experience the force.

Therefore, when two objects interact, each one experiences a force from the other.

QUESTION 12 *Section 5.4.1 · p. 67*

A ball rolling on a flat ground stops on its own after some time. … What causes the change in the speed of objects in such situations? … Is it possible that some force is indeed acting on them? Which force is that? (Also: Is there any other contact force?)

ANSWER

Yes, a force is acting. It is the force of friction.

- A force is essential to change the speed of an object. Here the speed decreases gradually because friction acts between the surfaces in contact.
- The rougher the road, the sooner the bicycle stops, because the friction is greater.
- Friction is another example of a contact force, besides muscular force.

Therefore, the force of friction is the force that slows down and stops a rolling ball or bicycle.

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QUESTION 13 *Activity 5.3 · p. 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 (Fig. 5.5). Does it stop after travelling some distance? Is there a force acting on it which brings it to rest? Now repeat by pushing the object in the opposite direction. Does it stop again after travelling some distance?

ANSWER

Yes, the object stops after sliding some distance, in both directions.



Fig. 5.5: Friction acts between two surfaces and opposes the motion of the object.

- A force acts between the surfaces of the sliding object and the table or floor, which are in contact. This force acts on the object in a direction opposite to its direction of motion and brings it to a stop.
- When pushed in the opposite direction, it stops again, because friction again acts opposite to the direction of motion.
- This force is the force of friction. It comes into play when an object moves or tries to move over another surface.

Therefore, the object stops because friction acts opposite to its motion.

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QUESTION 14 *Activity 5.4 · p. 68*

Try Activity 5.3 again, but this time place the same object on different surfaces, such as glass, cloth, wood, ceramic tile, and sand. Does the object stop after travelling the same distance as in Activity 5.3? Does the object stop at the same distance on all surfaces? (Also: Does this mean that the force of friction will be greater if the surfaces are rough?)

ANSWER

No, the object stops after different distances on different surfaces.

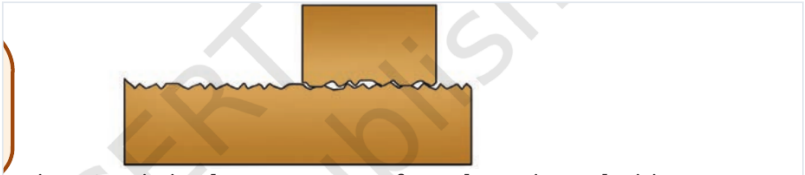

Fig. 5.6: Friction between two surfaces due to irregularities

Surface	Distance travelled (typical)	Friction
Glass, ceramic tile	Long distance	Small
Wood	Medium distance	Medium
Cloth	Short distance	Large
Sand	Shortest distance	Largest

- The exact distances depend on the object and the surfaces; the order above is what is usually found.
- Even smooth-looking surfaces have minute irregularities. When two surfaces touch, the irregularities lock into each other and oppose motion.
- Yes, the force of friction is greater on rough surfaces. It depends upon the nature of the surfaces in contact.

Therefore, the force of friction depends on the nature of the surfaces and is greater on rough surfaces.

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QUESTION 15 *A step further · p. 68*

Does the force of friction act only if the objects are moving on solid surfaces? What about objects moving through liquids and gases?

ANSWER

No. Friction also acts on objects moving through liquids and gases.

- Air, water and other liquids also exert a force of friction on objects moving through them.
- For this reason, aeroplanes, ships, boats and high-speed trains are designed with specific shapes that reduce the friction due to the air or water around them.

Therefore, friction acts in liquids and gases too, and vehicles are shaped to reduce it.

QUESTION 16 *Section 5.4.2 · p. 69*

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

ANSWER

No, it is not essential. Some forces act even without contact.

Type	Example
Contact forces	Muscular force and friction: physical contact is needed
Non-contact forces	Magnetic force, electrostatic force and gravitational force: they act from a distance

Therefore, forces can be contact forces or non-contact forces.

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QUESTION 17 *Activity 5.5 · p. 69*

Take two ring magnets and a wooden stick. While holding the stick in a vertical position over a wooden table, insert one ring magnet onto the stick (Fig. 5.7). Now insert the second ring magnet above it such that the like poles of the two magnets face each other. Does the second magnet stay floating above the first magnet? Try pushing the second magnet down gently. Do you feel a force on it? Now, reverse the poles of both the magnets. Does the second magnet still remain floating?

ANSWER

Yes, the second magnet stays floating above the first.



g. 5.7: Force between two ring magnets

- Like poles repel each other, so the first magnet pushes the second magnet upwards, and it floats without touching.
- On pushing it down gently, we feel a force pushing it back up.
- If the poles of *both* magnets are reversed, like poles still face each other, so the second magnet still floats.
- A magnet can exert force on another magnet without being in contact with it. This force is called magnetic force, and it is a non-contact force.

Therefore, a magnet exerts a force on another magnet from a distance: magnetic force is a non-contact force.

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QUESTION 18 *Activity 5.6 · p. 70*

Rub a plastic scale or plastic straw vigorously with polythene. Do not touch the rubbed part. Now bring it close to small pieces of paper placed on a table, taking care not to touch the paper pieces (Fig. 5.8). Do you notice something surprising? Why does this happen?

ANSWER

The paper pieces get pulled towards the plastic scale and stick to it.



Fig. 5.8: Charged plastic scale attracting small paper pieces

- When two objects of certain materials are rubbed together, electrical charges build up on their surfaces. These are called static charges as they do not move by themselves.
- The rubbed scale becomes a charged object. A charged object exerts a force on uncharged objects made of certain materials, such as small pieces of paper, and attracts them.
- This force acts even when the objects are not in contact.

Therefore, the charged scale attracts the paper pieces because of static charges.

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QUESTION 19 *Activity 5.7 · p. 70*

Inflate two balloons and hang them so that they do not touch each other (Fig. 5.9a). Rub both balloons with the woollen cloth and release them. What do you observe? Now bring the woollen cloth used for rubbing the balloons close to one of the rubbed balloons. What happens? What do we infer from these observations?

ANSWER

The balloons move apart, and the woollen cloth attracts a rubbed balloon.

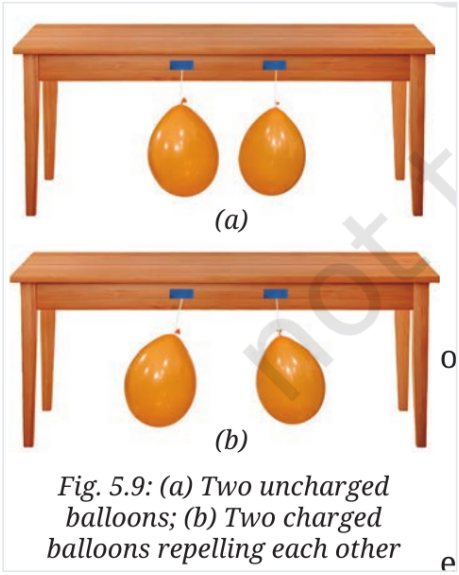

Fig. 5.9: (a) Two uncharged balloons; (b) Two charged balloons repelling each other

Observation	Inference
The two rubbed balloons move away from each other (Fig. 5.9b)	Similarly charged balloons repel each other: like charges repel
The woollen cloth and a rubbed balloon move towards each other	The balloon and the cloth have opposite kinds of charge; unlike charges attract each other

- Both the rubbing object and the rubbed object get charged, but they acquire opposite kinds of charges. The two kinds of static charges are called positive and negative.
- The force exerted by a charged body on another charged or uncharged body is called electrostatic force. It is a non-contact force.

Therefore, like charges repel, unlike charges attract, and there are two kinds of charges.

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QUESTION 20 *Section 5.4.2 · p. 71*

Does this indicate that the charge on the balloon is of a different kind from the charge on the woollen cloth? (Also: Does it mean that there are two kinds of electrical charges?)

ANSWER

Yes, there are two kinds of electrical charges.

- The balloon and the woollen cloth attract each other, so their charges are of opposite kinds.
- The two balloons, charged in the same way, repel each other, so they have similar charges.
- The two kinds of static charges are said to be ‘positive’ and ‘negative’.

Therefore, there are two kinds of charges, positive and negative.

QUESTION 21 *Activity 5.8 · p. 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?

ANSWER

Yes, the ball comes down both times.



Fig. 5.10: Some objects falling towards the Earth

- When thrown harder the ball goes higher, but it still falls back to the ground.
- Any object thrown up in any direction finally falls or comes back to the ground or floor (e.g. a falling fruit or a diver).

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- This happens because the Earth attracts objects towards itself.

Therefore, objects thrown up come back down due to the Earth's gravitational pull.

QUESTION 22 *Section 5.4.2 · p. 72*

Why do all the objects fall towards the Earth? Is there any force which acts on them? What exerts this force?

ANSWER

The Earth attracts all objects towards itself with a force.



Fig. 5.11: (a) Dropping an object from a height; (b) Throwing an object vertically upwards

- The force with which the Earth attracts objects towards itself is called the gravitational force, force of gravity or simply gravity.
- It acts without contact, so it is a non-contact force, and it is always an attractive force (unlike magnetic or electrostatic force, which can be attractive or repulsive).
- A dropped object takes a straight vertical path downwards. An object thrown up slows down, stops momentarily at the top, and then comes down with increasing speed. This is vertical motion under gravity.

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Therefore, objects fall because the Earth exerts the gravitational force on them.

QUESTION 23 *Section 5.4.2 · p. 72*

Does the Earth pull every object with equal force?

ANSWER

No. The Earth pulls different objects with different forces.

- The force with which the Earth pulls an object is its weight. Different objects have different weights, as Activity 5.9 shows by the different stretch of a spring.

Therefore, the Earth does not pull all objects with equal force.

QUESTION 24 *Activity 5.9 · p. 73*

Hang one end of a spring from a nail (Fig. 5.12a). From the other end, hang an object and observe the spring (Fig. 5.12b). Does the spring stretch? Now hang the other objects, one by one and notice the stretch in the spring each time. Is the stretch caused by each object the same? Can we use the spring to measure the weight of an object?

ANSWER

Yes, the spring stretches, and the stretch is different for different objects.

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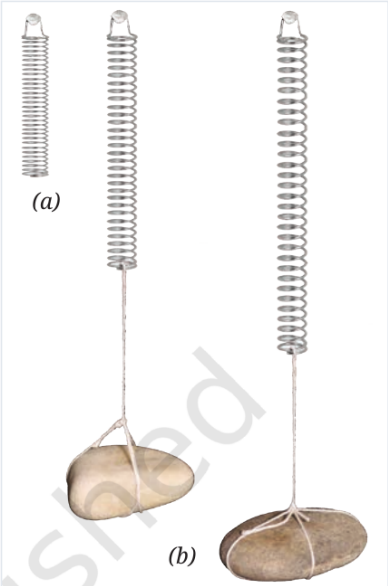

Fig. 5.12: (a) A hanging spring; (b) Two different objects hung from the spring

- The spring stretches due to the force applied on the object by the Earth.
- The stretch is different for different objects, so the Earth pulls different objects with different forces; the weights are different.
- Yes, the spring can be used to measure weight. A spring balance does this: the amount of stretching gives the weight of the object.

Therefore, the stretch of a spring depends on the weight of the object, so a spring can measure weight.

QUESTION 25 *Activity 5.10 · p. 73*

Look at the spring balance shown in Fig. 5.13 carefully. What is the maximum weight it can measure?

ANSWER

The maximum weight it can measure is 10 N.

- The scale in Fig. 5.13 reads from 0 to 10 N (the mass scale reads from 0 to 1000 g).
- So the range of this spring balance is 0 to 10 N.

Therefore, the range of the spring balance is 0 to 10 N.

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QUESTION 26 *Activity 5.11 · p. 74*

Look at the spring balance shown in Fig. 5.13 and note down the following: How much is the weight difference indicated between the two bigger marks? How many divisions (shown by smaller marks) are there between these two bigger marks? How much weight does one small division indicate?

ANSWER

The smallest value that can be read is found by dividing the gap between two big marks by the number of small divisions.

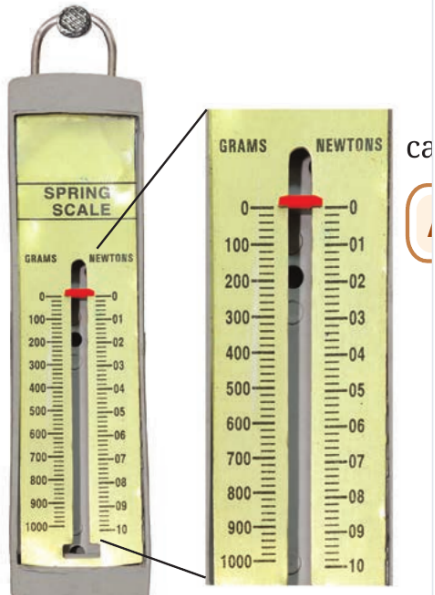

Fig. 5.13: A spring balance and close-up of its scale

Step	Working
Difference between two big marks	1 N (between 0 and 1 N, or 1 N and 2 N)
Number of small divisions between them	5
Weight shown by one small division	1 N ÷ 5 = 0.2 N
Check	5 × 0.2 N = 1 N

- The smallest weight that this spring balance can read is 0.2 N. For the balance given to you, count the divisions and calculate the value in the same way, since the range and the smallest division may be different.

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Therefore, the weight difference is 1 N, there are 5 divisions, and one division is 0.2 N.

QUESTION 27 *Activity 5.12 · p. 74*

Take a spring balance and a few objects. Suspend the objects one by one from the hook (Fig. 5.14). Read the scale for weight carefully and record your observations in Table 5.2 (Pencil box; Partially filled water bottle).

ANSWER

The readings depend on your objects and your balance. The method of reading is given below.



Fig. 5.14: Object suspend from a spring balance

Step	How to do it
1	Check the range and the smallest division of the balance (see Activity 5.11); do not hang an object heavier than the maximum value, or the balance may get damaged
2	Hang the object from the hook and wait until the pointer stops

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Step	How to do it
3	Read the mark at the pointer, keeping the eye level with it. Reading = last big mark + (number of small divisions × smallest division)
Example	If the pointer is 3 small divisions below the 2 N mark, the weight = 2 N + 3 × 0.2 N = 2.6 N
4	Write the weight in newton against each object in Table 5.2 (pencil box, partially filled water bottle, etc.)

- The mass scale on the other side can be read in the same way to find the mass in grams.

Therefore, weight is measured by reading the pointer on the newton scale of the spring balance.

QUESTION 28 *Section 5.5 · p. 75*

What is the difference between weight and mass?

ANSWER

Mass is the amount of matter in an object, while weight is the force with which the Earth pulls it.

Point	Mass	Weight
Meaning	Amount of matter in an object	Gravitational force with which the Earth (or another planet) pulls the object
Unit	Gram (g) or kilogram (kg)	Newton (N)
Change with place	Remains the same everywhere	Can change from place to place (very slightly on the Earth, very different on other planets)
Measured by	Beam balance (or indirectly, a spring balance)	Spring balance

- Example from the chapter: an object of 1 kg has a weight of 10 N on Earth, 1.6 N on the Moon, 3.8 N on Mars, 9 N on Venus and 25.4 N on Jupiter, while its mass is 1 kg everywhere.
- In daily life we say “weight of wheat is 10 kg”, but scientifically 10 kg is a mass, not a weight.

Therefore, mass stays unchanged, whereas weight can vary from place to place.

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QUESTION 29 *Section 5.6 · p. 76*

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, then why don't all objects fall to the bottom? (While taking out water using a mug, do you notice that the mug feels lighter when it is inside water?)

ANSWER

Because the liquid exerts an upward force on the objects, called the buoyant force.

- The gravitational force acts on an object downwards, but the liquid applies an upward force (upthrust or buoyant force) on it.
- If the gravitational force is more than the buoyant force, the object sinks. If the two forces are equal, the object floats.
- The mug feels lighter inside water because the water pushes it upwards, which balances part of its weight.

Therefore, objects float when the buoyant force balances the gravitational force.

QUESTION 30 *Activity 5.13 · p. 76*

Take an empty bottle (with its lid closed tightly) and a bucket full of water. Push the bottle in the water (Fig. 5.15). Do you feel an upward push? Release the bottle. Does it bounce up?

ANSWER

Yes, we feel an upward push, and the bottle bounces back up to the surface.

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Fig. 5.15: Bottle in water

- Water applies a force on the bottle in the upward direction. All liquids apply a similar force.
- The force applied by a liquid on an object in the upward direction is called upthrust or buoyant force.
- It depends on the density of the liquid, which will be learnt in a later chapter.

Therefore, water exerts an upward buoyant force on the bottle.

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5.2

CLASS 8 SCIENCE · CHAPTER 5

Keep the Curiosity Alive

Solutions · 10 questions

Directions (Questions 1–10): These are the questions in Keep the curiosity alive at the end of the chapter (pages 77–79). Answer each in your own words using the points given.

QUESTION 1

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

ANSWER

Each type of force is matched with the example in which it acts.

Column A (Type of force)	Column B (Example) and reason
(i) Muscular force	**(b)** A child lifting a school bag: the force is caused by the action of muscles
(ii) Magnetic force	**(e)** A compass needle pointing North: the needle is a magnet acted on by the Earth’s magnetic field
(iii) Frictional force	**(a)** A cricket ball stopping on its own: friction with the ground opposes its motion
(iv) Gravitational force	**(c)** A fruit falling from a tree: the Earth pulls it downwards
(v) Electrostatic force	**(d)** A balloon rubbed on woollen cloth attracting hair strands: the charged balloon attracts the hair

Therefore, (i)–(b), (ii)–(e), (iii)–(a), (iv)–(c), (v)–(d).

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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

Each statement is checked against what has been learnt about force.

Part	Answer	Reason
(i)	**True**	A force is essential to change the speed of an object; the speed does not change without the action of a force
(ii)	**False**	Friction acts opposite to the motion, so it decreases the speed of the rolling ball until it stops
(iii)	**False**	Two charged objects exert an electrostatic force on each other even when they are not in contact: like charges repel and unlike charges attract

Therefore, (i) True, (ii) False, (iii) False.

QUESTION 3

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

ANSWER

The two balloons will repel each other, that is, move away from each other.

- Both balloons are rubbed in the same way, so they acquire similar (like) charges.
- Like charges repel each other, so the electrostatic force between the balloons is repulsive. This force acts without contact.

Therefore, the balloons repel each other because they carry similar charges.

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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

Whether an object sinks or floats depends on the buoyant force compared with the gravitational force, not on its size.

Object	Forces	Result
Coin	The gravitational force (weight) is more than the upward buoyant force of the water	The coin sinks
Wooden block	The buoyant force becomes equal to the gravitational force (the weight of water displaced equals its weight)	The block floats

- The buoyant force depends on the density of the liquid and on the weight of the liquid displaced (Archimedes' principle). The coin is made of a material denser than water, so the weight of water it displaces is less than its own weight. Wood is less dense than water, so a block of it displaces water equal to its weight before it is fully under water, and it floats even though it is bigger.

Therefore, the coin sinks since gravity exceeds buoyancy, and the wooden block floats since the two forces become equal.

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

The forces are the gravitational force (weight) and the friction due to air.

NCERT ARCHIVE

Position	Gravitational force	Friction due to air
(i) Upward motion	Acts downwards (towards the Earth)	Acts downwards, opposite to the upward motion
(ii) Downward motion	Acts downwards	Acts upwards, opposite to the downward motion
(iii) Topmost position	Acts downwards (the ball is momentarily at rest)	Almost zero, since the ball is momentarily at rest

- The gravitational force always acts vertically downwards, so the speed decreases while going up and increases while coming down.
- Friction (air) always opposes the motion; it is very small compared to the gravitational force for a ball.

Therefore, gravity acts downwards at all times, while the air friction acts opposite to the direction of 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 Fig. 5.16. It comes to stop at the 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 distance travelled on the horizontal surface depends on the force of friction, so we change the friction.

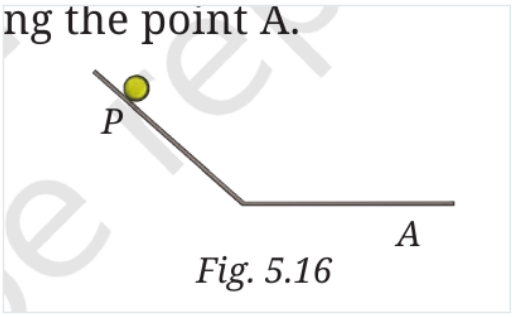

Fig. 5.16

Required result	What to do
(i) Stops before A	Increase the friction on the horizontal surface, e.g. make it rough by spreading sand or covering it with a cloth or rough paper

NCERT ARCHIVE

Required result	What to do
(ii) Stops after crossing A	Decrease the friction on the horizontal surface, e.g. make it smoother using glass, a ceramic tile or a polished surface (or a little oil/powder)

- Friction is greater on rough surfaces, which stops the ball sooner; on smoother surfaces the ball travels farther.

Therefore, increase friction to stop before A, and reduce friction to cross A.

QUESTION 7

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

ANSWER

We slip because the friction between our feet and a smooth surface is very small.

- Friction arises due to irregularities of the surfaces in contact. Smooth surfaces such as ice or polished floors have very few irregularities, so there is little friction.
- Without enough friction, our feet cannot grip the surface and slide when we try to walk. A wet floor is slippery for the same reason.

Therefore, we slip on smooth surfaces because friction is small and our feet cannot grip.

QUESTION 8

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

ANSWER

Yes, a force is acting on the object.

- In non-uniform motion the speed changes, or the direction of motion changes, or both.
- A force is essential to change the speed or the direction of an object, and none of these changes takes place without a force.

NCERT ARCHIVE

Therefore, a force is applied to an object in non-uniform motion.

QUESTION 9

The weight of an object on the Moon becomes one-sixth of its weight on the Earth. What causes this change? Does the mass of the object also become one-sixth of its mass on the Earth?

ANSWER

The change is caused by the difference in the gravitational pull. The mass does not change.

Point	Explanation
Cause of change in weight	Weight is the gravitational force with which a planet or the Moon pulls the object. The Moon pulls with a weaker force than the Earth, so the weight is less
Example from the chapter	1 kg object: 10 N on the Earth, 1.6 N on the Moon; 1.6 ÷ 10 = 0.16, about one-sixth
Mass	No. Mass is the amount of matter in the object and remains the same everywhere: 1 kg on the Moon as well

Therefore, weight becomes one-sixth because of the Moon's weaker gravity, but the mass does not change.

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 Fig. 5.17. If the weights of the three objects 1, 2, and 3 are w_1, w_2, and w_3, respectively, then
(i) $w_1 = w_2 = w_3$ (ii) $w_1 > w_2 > w_3$ (iii) $w_2 > w_3 > w_1$ (iv) $w_3 > w_1 > w_2$

ANSWER

The correct option is (ii) $w_1 > w_2 > w_3$.

NCERT ARCHIVE

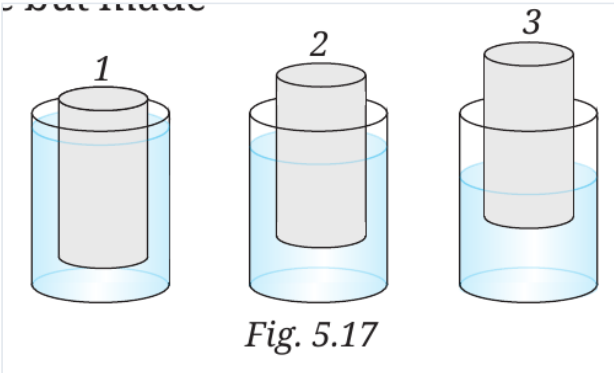

Fig. 5.17

- All three objects float, so for each one the buoyant force is equal to its weight.
- The buoyant force equals the weight of the water displaced, which depends on how much of the object is under water. Object 1 dips the deepest, so it displaces the most water; object 3 dips the least, so it displaces the least.
- Hence the weights are in the order $w_1 > w_2 > w_3$. They cannot be equal, since the depths are different.

Therefore, the correct option is (ii): $w_1 > w_2 > w_3$.

NCERT ARCHIVE

5.3

CLASS 8 SCIENCE · CHAPTER 5

Discover, Design, and Debat

Solutions · 5 questions

Directions (Questions 1–5): These are the project tasks in Discover, design, and debate (page 79). Model answers and record formats are given.

QUESTION 1

Collect objects made of different materials, such as plastic, wool, silk, rubber, polythene sheet, paper, and metals. Rub one material with another and check if it attracts small pieces of paper or not, that is, whether it gets charged or not. Record your observations in a systematic manner and write a research paper.

ANSWER

The results depend on the materials and the weather; a model way of recording is given.

Materials rubbed together	Attracts paper pieces?	Charged?
Plastic scale/straw rubbed with polythene (Activity 5.6)	Yes	Yes
Balloon (rubber) rubbed with woollen cloth (Activity 5.7)	Yes	Yes
Metal rod held in the hand and rubbed	Usually no	Not observed this way
Paper rubbed with paper	Usually little or none	Weak or none

- Record the pair of materials, the method of rubbing, the observation and the conclusion in a table, and write a short report with the aim, materials, method, observations and conclusion.
- Do not touch the rubbed part with your hand or a metal object, since the charge may then be lost.

Therefore, many pairs of materials become charged on rubbing and attract paper pieces, and this can be written up as a research report.

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QUESTION 2

Imagine a scenario where the gravity disappears. Develop a story. Create a cartoon strip to present your story.

ANSWER

This is a creative task. A model story outline based on the chapter is given.

Panel	Idea
1	A girl throws a ball up; it never comes down and keeps drifting away (gravity does not pull it back)
2	Objects, books, water and people float in the room; nothing stays on the table or floor
3	Pouring water or drinking is difficult; water floats as blobs
4	Weight becomes zero, so a spring balance shows no stretch and a bucket does not feel heavy
5	Gravity returns and everything falls down again; the girl realises how important gravity is

Therefore, without gravity nothing would stay on the ground, which shows its importance in our daily life.

QUESTION 3

Organise a discussion in your class on the topic: Friction — a necessity or a problem? Make a note of the discussion and state where friction is a necessity and when it is a problem.

ANSWER

Friction is both a necessity and a problem, depending on the situation.

Friction is a necessity	Friction is a problem
Walking without slipping; gripping objects	Wears out shoe soles, tyres and machine parts
Brakes stopping a moving bicycle or vehicle	Slows down moving objects and makes more effort necessary, e.g. pushing a heavy box

NCERT ARCHIVE

Friction is a necessity	Friction is a problem
Writing with a pencil on paper	Air or water friction slows down vehicles, ships and aeroplanes, so their shapes are designed to reduce it

Therefore, friction is needed for walking, gripping and stopping, but it is a problem where it wastes effort and causes wear.

QUESTION 4

Make your own spring balance with the help of your teacher and calibrate it using standard weights. Now measure the weights of different objects and calculate the ratio of the weight and mass of different objects. Do you observe a pattern?

ANSWER

Yes, the ratio of the weight to the mass is nearly the same for all objects at one place.

Mass of object	Weight (N) on the Earth	Ratio weight ÷ mass
1 kg	about 10 N (chapter value)	10 N per kg
0.5 kg	about 5 N	10 N per kg
2 kg	about 20 N	10 N per kg

- Model values based on the chapter's data (1 kg object has a weight of 10 N on the Earth); your measured values will be close to these.
- Pattern: the weight is proportional to the mass; heavier objects (larger mass) have a larger weight, and the ratio stays almost the same at one place. On the Moon the same ratio would be 1.6 N per kg.

Therefore, weight divided by mass is constant at a given place (about 10 N per kg on the Earth).

NCERT ARCHIVE

QUESTION 5

An electroscope is a device which can determine whether an object is electrically charged. You can make your own electroscope (Fig. 5.18) in your class with the help of your teacher, test the device. Explore in what other ways you may use this electroscope.

ANSWER

The electroscope shows the presence of charge by the movement of the aluminium foil.

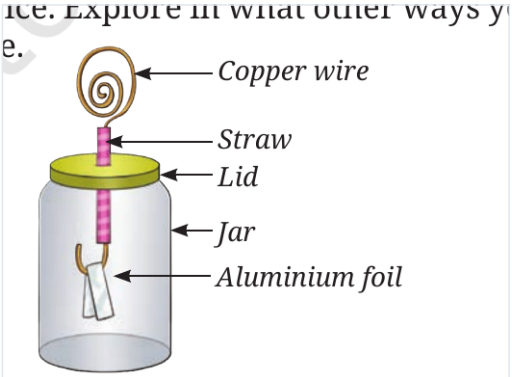

Fig. 5.18

Part	Role
Jar and lid	Hold the set-up and keep the foil away from air movement
Straw	Holds the wire through the lid
Copper wire	Conducts charge from a charged object to the foil
Aluminium foil	Light strips that move when charged

- Testing: bring a charged object (such as a rubbed plastic scale) near or touching the copper wire. The foil strips move (spread apart) because they get charged, which shows that the object is charged. An uncharged object causes no movement.
- Other uses: compare materials after rubbing to find which get charged, and compare the amount of charge from the amount of foil movement.

Therefore, an electroscope shows that an object is charged by the movement of its foil.

NCERT ARCHIVE