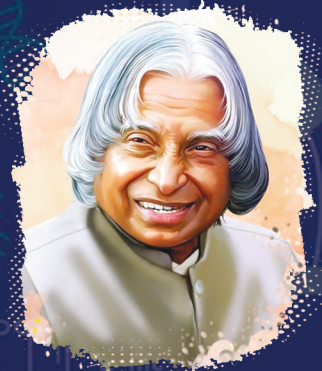


PHYSICAL SCIENCE HANDBOOK

8th Class

(Semester-1)

NEW VERSION



FEATURES

- Mind Map
- Main Points
- Intext Questions
- Keep the curiosity alive
- Discover, design, and debate
- Investigates (Activities)
- Prepare some questions based on your learnings so far
- Multiple choice questions
- CBA Questions

Shaping
Young Minds
for
a Better Future

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SEMESTER -1	
Chapter	Pages
Readiness	1
1. The Exploring the World of Science	2 - 4
2. Types of Forces	5 - 22
3. Particulate Nature of Matter	23 - 38
4. Pressure and its Effects	39 - 53
5. Solutions	54 - 69

Readiness - Key

<p>Day 1: Types of Forces</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> Force Push Pull Friction gravity <p>Match the Following:</p> <p>1-d 2-c 3-b 4-a</p>	<p>Day 2: Particulate Nature of Matter</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> matter diffusion solid liquid gas <p>Match the Following:</p> <p>1-b 2-c 3-a</p>	<p>Day 3: Pressure and Winds</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> air pressure wind atmosphere breeze <p>Match the Following:</p> <p>1-b 2-c 3-a</p>
<p>Day 4: Storms and Cyclones</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> storm cyclone rainfall storm surge disasters <p>Match the Following:</p> <p>1-b 2-c 3-a</p>	<p>Day 5: Solute, Solvent and Solution</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> solute solvent solution dissolves mixture <p>Match the Following:</p> <p>1-c 2-b 3-a</p>	<p>Day 6: Solubility and Mixtures</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> solubility mixture dissolves water liquid <p>Match the Following:</p> <p>1-b 2-c 3-a</p>
<p>Day 7: Light, Mirrors and Reflection</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> light reflection mirror image source <p>Match the Following:</p> <p>1-b 2-c 3-a</p>	<p>Day 8: Lenses</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> lens convex concave magnification image <p>Match the Following:</p> <p>1-b 2-c 3-a</p>	<p>Day 9: Electric Current and Circuits</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> electric current circuit battery switch conductor <p>Match the Following:</p> <p>1-b 2-c 3-a</p>
<p>Day 10: Effects of Current Electricity</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> heating magnetic electromagnet magnets energy <p>Match the Following:</p> <p>1-c 2-b 3-a</p>	<p>Day 11: States of Matter</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> matter solid liquid gas particles <p>Match the Following:</p> <p>1-b 2-c 3-a</p>	<p>Day 12: Changes of State</p> <p>Fill in the Blanks</p> <ol style="list-style-type: none"> evaporation condensation vapour water cycle temperature <p>Match the Following:</p> <p>1-a 2-c 3-b</p>
<p>Day 13: Keeping Time with the Skies</p> <p>Fill in the Blanks: 1. sun 2. shadow 3. sundial 4. earth 5. rotation</p> <p>Match the Following: 1-b 2-c 3-a</p>		



CHAPTER - 1: Exploring the World of Science

Introduction to Science

- Science begins with curiosity and asking questions like “Why?” and “How?”.
- Investigation is the heart of science.
- Science is always evolving; every answer leads to new questions.
- We learn not only new facts, but also how to find new facts.

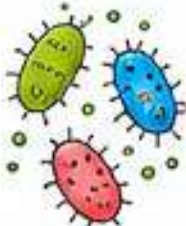





Key Ideas of Scientific Investigation

- Careful observation
- Asking focused questions
- Doing experiments
- Record observations
- Explaining results clearly



Our Investigate Adventure in Class 8

Microorganisms	Electric Current
<ul style="list-style-type: none"> • Tiny organisms found everywhere. • Some are useful: <ul style="list-style-type: none"> ○ Help digestion ○ Produce medicines • Some are harmful: <ul style="list-style-type: none"> ○ Cause diseases and infections 	<ul style="list-style-type: none"> • Heating Effect <ul style="list-style-type: none"> ○ Used in heaters, irons, etc. • Magnetic Effect <ul style="list-style-type: none"> ○ Helps motors and machines work. 
Health and Diseases	Force and Motion
<ul style="list-style-type: none"> • To stay healthy: <ul style="list-style-type: none"> ○ Eat nutritious food ○ Exercise regularly ○ Use medicines properly ○ Take vaccines 	<ul style="list-style-type: none"> • Force can: <ul style="list-style-type: none"> ○ Move objects ○ Stop objects ○ Change speed ○ Change direction <p>Examples:</p> <ul style="list-style-type: none"> ○ A ball thrown up falls back to the ground. ○ A car stops when brakes are applied. 

Pressure and Air

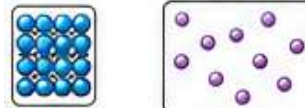
- Pressure = force acting on an area.
- Difference in air pressure causes:
 - Breeze
 - Winds
 - Cyclones



Matter and Particles

Everything around us is made of tiny particles.

- Solids
 - Particles are closely packed.
 - Cannot move freely.
- Gases
 - Particles move freely.



Classification of Materials

Elements

- Pure substances

Compounds

- Two or more elements chemically combined

Mixtures

- Materials mixed physically
- Can be separated physically

Example: Sugar dissolved in tea forms a solution.



Light

Reflection

- Light bounces from mirrors and surfaces.

Refraction

- Light bends through lenses.

Applications:

- Mirrors
- Spoons
- Spectacles



Moon and Calendars

- The Moon reflects sunlight.
- Different illuminated portions create phases of the Moon.
- Moon phases helped humans create calendars.



Ecosystem

An ecosystem is the interaction between:

- Living organisms
- Air
- Water
- Sunlight
- Environment



Every organism depends on others for survival.

Earth and Climate

Earth supports life because:

- It is at the right distance from the Sun.
- Liquid water is present.
- Atmosphere has oxygen.
- Atmosphere protects us from harmful UV rays.

But human activities can:

- Increase Earth's temperature.
- Disturb climate patterns.



Role of Science in Protecting Earth

Science helps us to:

- Observe changes
- Measure changes
- Experiment
- Solve environmental problems



Importance of Curiosity

1. Curiosity leads to questioning and investigation.
2. Scientific discoveries begin with simple questions such as:
 - Why is the sky blue?
 - Why do objects fall to the ground?
 - Why do diseases occur?
3. Asking questions helps develop scientific thinking.

Characteristics of a Young Scientist

1. A young scientist should:
2. Be curious.
3. Observe carefully.
4. Ask questions.
5. Think logically.
6. Conduct investigations.
7. Record observations accurately.
8. Learn from evidence.

INVESTIGATING A PURI – AN EXAMPLE OF SYSTEMATIC INVESTIGATION

Scientific Question: Why does one side of a puri become thinner?

Variables We Can Change (Controlled Variables)

- Thickness of dough
- Size of dough
- Type of flour
- Temperature of oil
- Method of dropping into oil

**Observations:**

- Whether puri puffs or not
- Time taken to puff
- Shape and thickness

Important Rule

Change only one factor at a time to see its effect clearly.

Systematic Investigation

Scientific experiments follow a systematic process:

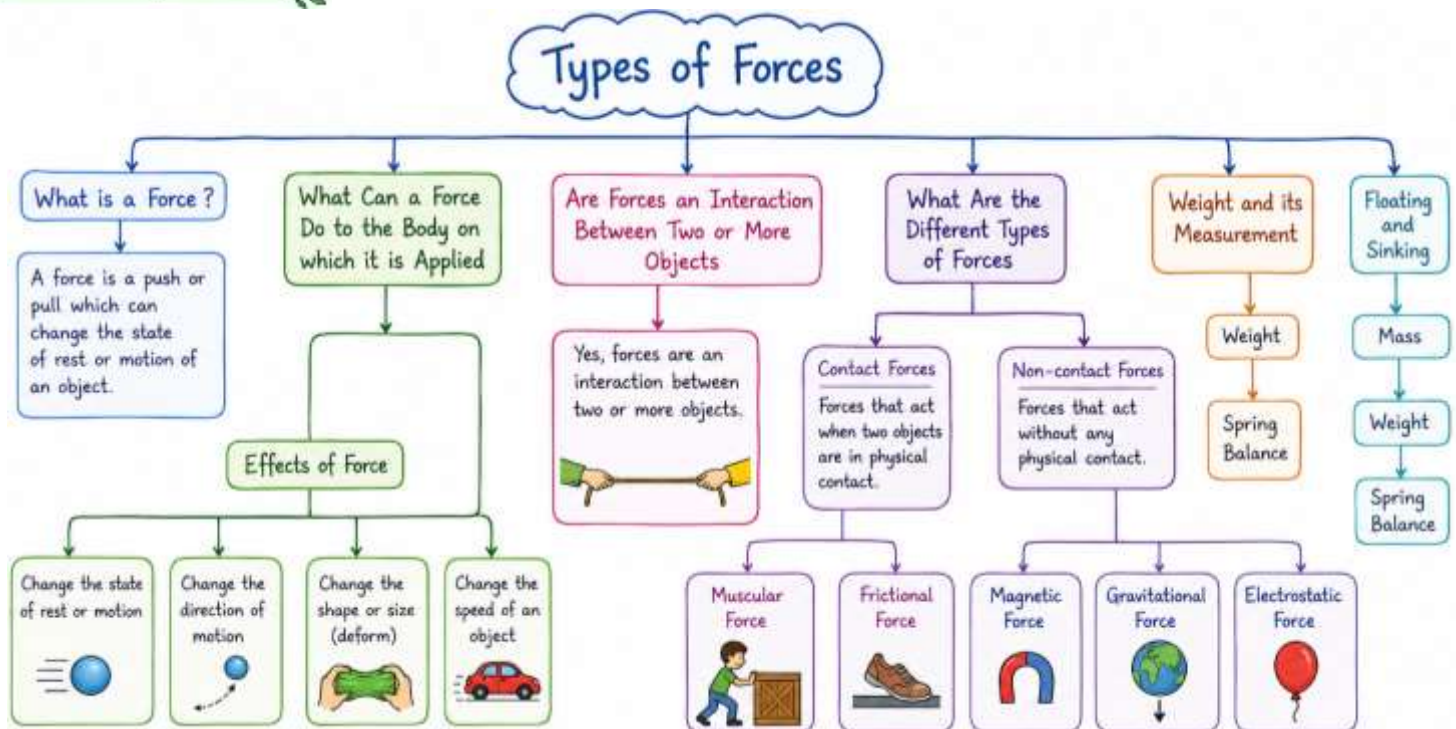
- Observation
- Questioning
- Testing
- Recording results
- Drawing conclusions





CHAPTER - 2: Types of Forces

Mind Map



Main Points

1. **Force is a push or pull** acting on an object.
2. A force is produced due to the **interaction between two objects**.
3. The **SI unit of force is newton (N)**.
4. Force can **make a stationary object move**.
5. Force can **stop a moving object**.
6. Force can **change the speed** of an object.
7. Force can **change the direction of motion** of an object.
8. Force can **change the shape** of an object.
9. Forces are of two types: **contact forces and non-contact forces**.
10. **Contact force** acts only when objects are in physical contact.
11. **Muscular force** is produced by the action of muscles.
12. Humans and animals use muscular force for **movement and work**.
13. **Friction** is the force that opposes motion between two surfaces in contact.
14. Friction always acts **opposite to the direction of motion**.
15. Friction is greater on **rough surfaces** than on smooth surfaces.
16. Friction arises due to **irregularities on surfaces**.
17. Air and water also produce **frictional force** on moving objects.
18. **Non-contact force** acts without physical contact.
19. **Magnetic force** is the force exerted by magnets.
20. Like poles of magnets **repel**, unlike poles **attract**.
21. **Electrostatic force** is produced due to electric charges.
22. Rubbing certain materials creates **static electric charges**.
23. Like electric charges **repel** and unlike charges **attract**.
24. **Gravitational force** is the force by which Earth attracts objects.
25. Gravity is always an **attractive force**.
26. Objects thrown upward eventually **fall back due to gravity**.

27. **Weight** is the force with which Earth pulls an object.
28. The SI unit of weight is also **newton (N)**.
29. **Mass remains constant**, but weight can change from place to place.
30. Liquids exert an upward force called **upthrust or buoyant force**. Objects float when buoyant force balances weight.

-----: Definitions :-----

Force: A force is a push or pull on an object resulting from the object's interaction with another object.

Contact Force: Forces that act only when there is physical contact between objects are called contact forces.

Muscular Force: The force produced due to the action of muscles is known as muscular force.

Friction: Friction is the force that comes into play when an object moves or tries to move over the surface of another object.

Non-contact Force: A force that can exert its effect without physical contact is called a non-contact force.

Magnetic Force: The force exerted by a magnet on another magnet or a magnetic material is called magnetic force.

Electrostatic Force: The force exerted by a charged body on another charged body or an uncharged body is called electrostatic force.

Gravitational Force: The force with which the Earth attracts objects towards itself is called gravitational force.

Mass: Mass is the amount of matter in an object.

Weight: The force with which the Earth pulls an object towards itself is called the weight of the object.

Probe and Ponder

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

Because while going uphill, we have to work against the force of gravity. More force is needed to move the bicycle upward, so pedaling feels harder.

Why is it easier to slip on a wet surface?

A wet surface has less friction than a dry surface. Due to reduced friction between our feet and the ground, it becomes easier to slip.

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

At the highest point, the swing changes its direction and starts moving downward. For a brief moment, our body experiences less support force, making us feel lighter or as if we are floating.

Share your questions.

1. Why do bicycles move faster on a downhill road?
2. Why do objects fall to the ground when dropped?
3. Why do brakes stop a moving bicycle?
4. Why is it difficult to walk on ice?
5. Why does a swing eventually stop moving?

Intext Questions

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

Ans: When you go uphill, you are working against gravity. Gravity pulls you downward, so you must apply more force to move upward. On flat ground, gravity does not oppose motion as much.

2. Why is it easier to slip on a wet surface?

Ans: Water reduces friction between your feet and the ground. With less friction, your feet cannot grip properly, so you slip easily.

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

Ans: At the highest point, your speed becomes very low and direction changes. Your body experiences less support force, so you feel light or weightless for a moment.

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

Ans: Yes. Force is required to change speed, direction, or shape of an object.

5. Does a force cause a moving object to stop?

Ans: Yes. Example - Applying brakes on a bicycle uses frictional force to stop motion.

6. Can it change speed, or direction of motion, or change the shape of an object?

Ans: Yes. Increase or decrease speed, change direction, change shape.

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

Ans: No.

8. Does it mean that there are two kinds of electrical charges? (or) Are there two kinds of electrical charges?

Ans: Yes. Positive charge (+) and Negative charge (-).

9. Why do all the objects fall towards the Earth?

Ans: Because of gravitational force and Earth pulls objects toward its centre.

10. Is there any force which acts on them? What exerts this force?

Ans: Yes. The force is gravity, and it is exerted by the Earth.

11. Does the Earth pull every object with equal force?

Ans: No. Force depends on mass. Heavier objects has more gravitational force and Lighter objects has less gravitational force

12. What is the difference between weight and mass?

Ans:

Mass	Weight
Amount of matter	Force due to gravity
Same everywhere	Changes with location
Measured in kg	Measured in newtons (N)

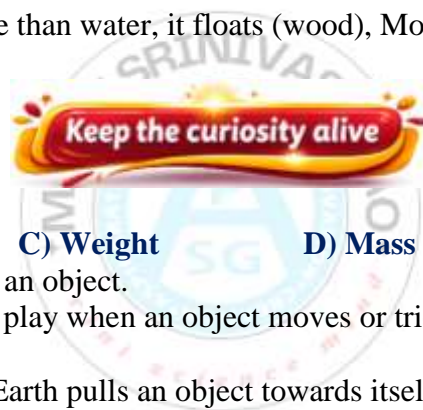
13. If we place some objects on water, some of them float, while others fall to the bottom. The gravitational force of the Earth is acting on all objects, then why don't all objects fall to the bottom?

Ans: Because of **buoyant force** (upward force of water).

If buoyant force \geq weight, then object floats,

If buoyant force $<$ weight, then object sinks

Also depends on density. Less dense than water, it floats (wood), More dense, it sinks (stone)



1. Define the following.

A) Force

B) Friction

C) Weight

D) Mass

E) Buoyant force

Ans: A) **Force:** A push or pull acting on an object.

B) **Friction:** The force that comes into play when an object moves or tries to move over another surface is called friction.

C) **Weight:** The force with which the Earth pulls an object towards itself is called weight.

D) **Mass:** The amount of matter present in an object.

E) **Buoyant force:** When an object is placed in a liquid, the force applied by a liquid on an object in the upward direction is known as Upthrust or Buoyant force.

2. Which of the following is a non-contact force?

A) Muscular force

B) Frictional force

C) Gravitational force

D) Push by hand

Ans: C) Gravitational force

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

Column A	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) Balloon rubbed on woollen cloth attracting hair strands
(v) Electrostatic force	(e) A compass needle pointing North

Ans: (i) – (b), (ii) – (e), (iii) – (a), (iv) – (c), (v) – (d)

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.

Ans: A coin sinks in water because its density is greater than that of water, so the buoyant force is less than its weight. A wooden block floats because its density is less than that of water, so the buoyant force balances or exceeds its weight.

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

Ans: (i) During its upward motion:

Gravitational force (weight): Acts vertically downward, opposite to the direction of motion.

Air resistance (if considered): Acts downward, opposite to the upward motion.

(ii) During its downward motion:

Gravitational force (weight): Acts vertically downward, in the same direction as the motion.

Air resistance (if considered): Acts upward, opposite to the downward motion.

(iii) At its topmost position:

Gravitational force (weight): Acts vertically downward.

(The velocity of the ball is zero at this point, but the force of gravity still acts.)

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

Ans: We sometimes slip on smooth surfaces like ice or polished floors because there is very little friction between our feet and the surface. Friction helps our feet to grip the ground while walking. On smooth surfaces, the grip is weak, so our feet slide easily. This is why we may slip or fall.

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

Ans: Yes, a force is being applied to an object in non-uniform motion.

Non-uniform motion means the speed or direction of the object changes. A change in speed or direction happens only when a force acts on the object. Therefore, some force must be acting on it.

8. 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?

Ans: The weight of an object on the Moon becomes one-sixth of its weight on the Earth because the gravitational force of the Moon is much weaker than that of the Earth.

No, the mass of the object does not change. Mass is the amount of matter in an object and remains the same everywhere. Only the weight changes because it depends on gravity.

9. Read the statements and choose the correct answer.

P: The force exerted by a magnet on another magnet is a NON-CONTACT FORCE.

Q: The force exerted by a magnet on a piece of iron is a CONTACT FORCE.

Select the correct option based on the statements given above.

A) P is true, Q is false B) P is false, Q is true C) Both P and Q are true D) Both P and Q are false

Ans: A) P is true, Q is false

10. Which situation causes a change in shape of an object?

A) Opening a drawer B) Stopping a moving ball C) Stretching a rubber band D) Applying brakes on a bicycle

Ans: C) Stretching a rubber band

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

Ans: They repel each other. Because balloons acquire the same kind of electric charge through rubbing. Since like charges repel each other, the balloons move apart.

12. Ravi rolls two identical balls with the same push—one on a sandy playground and the other on a smooth classroom floor. He observes that the ball on the sand stops much earlier. Why does the ball stop sooner on the sandy surface?

A) Sand attracts the ball

B) Gravitational force is more on sand

C) Friction is greater on sand

D) The ball loses mass while rolling

Ans: C) Friction is greater on sand

13. 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. 2.16. 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) $w_3 > w_1 > w_2$

Ans: More submerged volume indicates greater weight. Object 1 is submerged the most, so it is the heaviest. Object 3 is submerged the least, so it is the lightest.

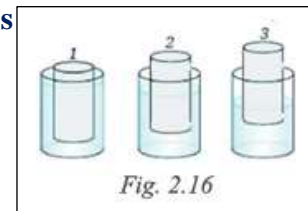


Fig. 2.16

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

14. 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.

Ans: (i) True

(ii) False

(iii) False

15. 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.



Fig. 5.16

Ans: The stopping point of the ball on the horizontal surface depends on the amount of friction it experiences.

- (i) Increase friction on the horizontal surface. Making the surface rougher (spreading sand, using a rough mat, cloth, or carpet). Increasing resistance to motion so the ball loses energy faster.
- (ii) Decrease friction on the horizontal surface. Making the surface smoother (polishing it or applying oil/grease). Reducing resistance so the ball rolls for a longer distance.



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.

Ans: Aim: To find which materials get charged when rubbed and attract small pieces of paper.

Materials Required: Plastic scale, Wool cloth, Silk cloth, Rubber balloon, Polythene sheet, Paper sheet, Metal spoon, Small paper pieces, Dry hair, Notebook and pen

Procedure:

1. Cut small pieces of paper and place them on the table.
2. Rub one material with another for 20–30 seconds.
3. Bring the rubbed material near the paper pieces without touching them.
4. Observe if the paper pieces are attracted.
5. Record the result in the table.

PICTURES OF THE ACTIVITY



Rubber balloon
attracting paper
pieces

Polythene sheet
attracting paper
pieces

Plastic scale
attracting paper
pieces

Glass rod
attracting paper
pieces

Paper sheet –
very weak
attraction

Metal spoon –
no attraction

S. No.	Material Rubbed	Rubbed With	Observation (Attracts small paper pieces?)	Result (Charged / Not Charged)	Strength of Attraction (Strong/Weak/None)
1	Plastic scale	Dry hair	Yes	Charged	Strong
2	Polythene sheet	Wool cloth	Yes	Charged	Strong
3	Rubber balloon	Wool cloth	Yes	Charged	Strong
4	Glass rod	Silk cloth	Yes	Charged	Strong
5	Wool cloth	Plastic scale	Yes	Charged	Weak
6	Paper sheet	Dry cloth	Very little	Weakly Charged	Weak
7	Metal spoon	Cotton cloth	No	Not Charged	None
8	Aluminium foil	Wool cloth	No	Not Charged	None

CONCLUSION:

1. When some materials are rubbed with another material, they become electrically charged.
2. These charged materials attract light objects like small paper pieces.
3. Plastic, rubber, polythene, glass, silk and wool get charged easily.
4. Metals do not get charged easily because the charge flows away through our body.
5. This activity shows the presence of electrostatic force produced by friction.

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

Ans: Cartoon Strip – *The Day Gravity Disappeared*

<p>Panel 1: A Normal Morning Picture: Ravi is getting ready for school. Ravi: "What a beautiful day!" Caption: Everything is normal on Earth.</p>	<p>Panel 2: Gravity Vanishes Picture: Suddenly Ravi, his school bag, and furniture begin floating. Ravi: "Help! Why am I floating?" Caption: Gravity suddenly disappears!</p>
<p>Panel 3: Chaos Everywhere Picture: Cars, bicycles, animals, and people float into the air. People: "Catch me!" "My bicycle is flying away!" Caption: Without gravity, nothing stays on the ground.</p>	<p>Panel 4: Scientists at Work Picture: Scientists in a laboratory studying the problem. Scientist: "Gravity keeps everything on Earth. We must restore it quickly!" Caption: Scientists search for a solution.</p>
<p>Panel 5: Gravity Returns Picture: A bright flash appears and everyone slowly comes back to the ground. Ravi: "Hurray! We're safe again!" Caption: Gravity returns and life becomes normal.</p>	<p>Panel 6: Lesson Learned Picture: Ravi writing in his notebook. Ravi: "Gravity is very important for life on Earth." Caption: We realize the importance of gravity every day.</p>



Moral: Gravity is an invisible force that keeps us, the oceans, the air, and everything else firmly on Earth. Without gravity, life would be impossible.

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.

Ans: During the discussion, students shared different opinions.

For the Statement: "Friction is a necessity"

1. It helps us to walk without slipping.
2. It helps vehicles to stop when brakes are applied.
3. It helps us to hold objects.
4. It is important for writing.
5. It helps machines to work properly.

Against the Statement: "Friction is a problem"

1. It causes wear and tear of machines.
2. It produces heat and wastes energy.
3. It makes objects difficult to move.
4. It reduces the efficiency of vehicles and machines.

Where friction is a necessity

S. No	Situation	How Friction Helps	Examples
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1	Walking	Provides grip between our feet and the ground.	Walking on road or playground
2	Writing	Pencil or pen needs friction to write on paper.	Writing in notebook
3	Holding objects	Helps us to hold things without slipping.	Holding a glass, book or bottle
4	Vehicle movement	Helps vehicles to start, stop and turn.	Brakes in car, bicycle tyres on road
5	Climbing	Provides grip on stairs or hills.	Climbing stairs or a mountain
6	Sports	Helps players to run, catch and play games.	Running, football, cricket
7	Using tools	Helps tools to work properly.	Screwdriver, hammer, scissors
8	Lighting a matchstick	Friction produces heat and lights the match.	Rubbing matchstick on box

When Friction is a problem

S. No	Situation	How Friction Causes Problems	Examples/Solutions
1	Machines	Causes wear and tear of moving parts.	Engine parts wear out → Lubrication needed
2	Heat production	Friction produces heat and wastes energy.	Machine becomes hot → Efficiency decreases
3	Moving heavy objects	Makes it difficult to move things.	Pushing a heavy box on rough floor
4	Vehicles	Increases fuel consumption.	More friction → More fuel needed
5	Sliding objects	Slows down motion.	Sledge on mud or sand
6	Clothes and shoes	Causes wear and tear.	Soles of shoes wear out
7	Electrical appliances	Extra heat may damage parts.	Fan or motor gets heated
8	Noise	Friction can produce unwanted sound.	Brakes squeak, machine noise

Conclusion of the Discussion:

- Friction is a force that opposes motion between surfaces.
- It is a necessity when it helps us in our daily activities.
- It becomes a problem when it causes wear, heat, noise or energy loss.
- We should reduce friction where it is harmful and increase it where it is needed.
- Proper use of lubricants, smooth surfaces and suitable materials help to control friction.

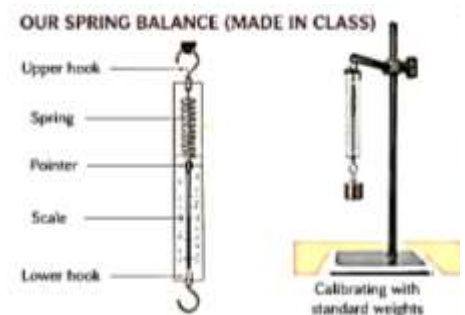
4. **Make your own spring balance with the help of your teacher and calibrate it using standard weights. Now measure the weights of different objects and calculate the ratio of the weight and mass of different objects. Do you observe a pattern?**

Ans: Aim: To make a spring balance, calibrate it using standard weights and find the ratio of weight to mass.

Materials Required: Helical spring, Scale (meter scale), Pointer (thin wire or paper strip), Hook, Standard weights, Different objects, Stand and clamp, Tape, marker

Procedure:

- Fix the spring vertically with a hook at the lower end.
- Attach a pointer near the scale.
- Note the initial reading (zero) with no load.
- Hang standard weights one by one.
- Note the extension and mark the scale reading for each weight.
- The spring balance is now calibrated.
- Measure different objects and note the reading.
- Calculate the ratio W/m for each object.



Observations: Calibration of Spring balance

S. No.	Standard Weight (mass in g)	Spring Balance Reading (N)	Extension (cm)
0	0	0.00	0.0
1	10	0.10	0.4
2	20	0.20	0.8
3	50	0.49	2.0
4	100	0.98	4.0
5	200	1.96	8.0

6	500	4.90	20.0
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Observations: Measurement of Different objects

S. No.	Object	Mass (m) (kg)	Weight (W) (N)	W/m (N/kg)
1	Pencil	0.010	0.098	9.8
2	Eraser	0.020	0.196	9.8
3	Sharpener	0.030	0.294	9.8
4	Small stone	0.050	0.490	9.8
5	Metal nut	0.100	0.980	9.8
6	Key	0.150	1.470	9.8
7	Small metal object	0.200	1.960	9.8
8	Large stone	0.300	2.940	9.8

Formula: $W=mg$, Where $g \approx 9.8 \text{ N/kg}$

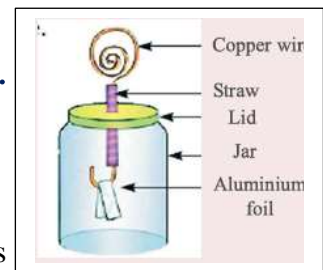
CONCLUSION:

- The spring balance can be made easily and calibrated.
- Weight increases as mass increases.
- The ratio of weight to mass (W/m) is nearly constant ($\approx 9.8 \text{ N/kg}$) for all objects at the same place.
- This constant is the acceleration due to gravity (g).
- Thus, weight is directly proportional to mass.

5. An electroscope is a device which can determine whether an object is electrically charged. You can make your own electroscope (Fig. 2.18) in your class with the help of your teacher, test the device. Explore in what other ways you may use this electroscope.

Ans: Aim: To make an electroscope, test it and explore its uses.

Materials Required: Glass jar with a lid, Metal rod or thick copper wire, Aluminium foil, Cardboard or rubber, stopper, Small metal cap or coin, Tape, scissors

**Procedure**

- Make a small hole in the centre of the lid or stopper.
- Insert the metal rod through the hole so that it touches the bottom of the jar.
- Fix a small metal cap or coin on the upper end of the rod.
- Cut two small strips of aluminium foil (about 2–3 cm long and 0.5 cm wide).
- Hang the foil strips at the lower end of the rod.
- Fix the lid tightly on the jar.

Your electroscope is ready!

TESTING THE ELECTROSCOPE

Test with Different Objects

- Rub a plastic scale with a woollen cloth and touch it to the metal cap.
- Rub a glass rod with silk and touch it.
- Touch an uncharged metal spoon.
- Bring a charged object near (without touching) the metal cap.

S. No.	Object/Action	Observation	Leaves Move Apart?
1	Rubbed plastic scale with wool and touch	Leaves diverged	Yes
2	Rubbed glass rod with silk and touch	Leaves diverged	Yes
3	Touched with metal spoon	No change	No
4	Charged plastic scale brought near	Leaves diverged	Yes
5	Uncharged scale brought near	No change	No

OTHER WAYS TO USE AN ELECTROSCOPE

Check if an object is charged: It helps to find out whether an object (like a balloon, comb, scale) is charged or not.

Check if a body loses its charge: Touch a charged object to the electroscope. If the leaves no longer diverge later, the object has lost its charge.

Compare strengths of charge: More the divergence of leaves, stronger is the charge.

Detect charge without touching: Bring a charged body near the metal cap without touching. If leaves diverge, it is charged.

Identify if two bodies have the same type of charge: If a charged body is touched to the electroscope and the leaves diverge more, it has the same type of charge. If divergence decreases, it has the opposite type.

Science experiments: It can be used in simple experiments to study static electricity.

Activities

Activity 2.1

Aim: To understand that a push or pull is called a force. (or) To experience the push or pull due to force.

Required materials: A large cardboard box (or any heavy object).

Procedure:

- a) Take a cardboard box.
- b) Try to move the box by pushing it.
- c) Now try to move it by pulling it.
- d) Also try lifting or carrying the box.
- e) Observe how the box moves in each case.



Observation: The box moves when it is pushed or pulled.

It also moves when it is lifted or carried.

Conclusion: A push or a pull can move an object. This push or pull is called force.

Activity 2.2

Aim: To study the effects of force on objects (or) To understand the different actions of force and their effects.

Required materials: Ball, inflated balloon, toy car or bicycle (optional), and a notebook.

Procedure:

- a) Hit a moving ball and observe what happens.
- b) Press an inflated balloon gently.
- c) Push or pull a toy car or any object.
- d) Observe the changes in motion, direction, or shape.
- e) Write your observations.

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
2	Hitting a moving ball with a bat	Push	Changing the direction of a moving ball
3	Pressing an inflated balloon	Push	Change in shape of the balloon

Observation: The ball changes its direction when hit.

The balloon changes its shape when pressed.

Objects start moving, stop, or change speed when pushed or pulled.

Conclusion: Force can change the speed, direction, and shape of an object.

It can also start or stop the motion of an object.

Activity 2.3

Aim: To understand that friction acts on moving objects and brings them to rest (or) To understand the force of friction

Required materials: A flat object (lunch box/geometry box/notebook) and a table or floor.

Procedure:

- a) Place the object on a table or floor.
- b) Gently push the object and observe its motion.
- c) Note whether it stops after some distance.
- d) Now push the object in the opposite direction.
- e) Observe again what happens.



Observation: The object moves when pushed but stops after some distance.

It also stops when pushed in the opposite direction.

Conclusion: A force called friction acts between the object and the surface.

Friction opposes motion and brings the moving object to rest.

Activity 2.4

Aim: To study how friction depends on different surfaces (or) To understand the nature of the frictional force.

Required materials: A flat object (book/lunch box), different surfaces (glass, cloth, wood, tile, sand).

Procedure:

- Place the object on one surface (like glass).
- Push the object gently and observe how far it moves before stopping.
- Repeat the same with other surfaces like cloth, wood, tile, and sand.
- Compare the distances travelled on each surface.

Observation: The object travels more distance on smooth surfaces like glass.

The object travels less distance on rough surfaces like cloth or sand.

The stopping distance is different for different surfaces.

Conclusion: Friction depends on the nature of surfaces. It is less on smooth surfaces and more on rough surfaces.

Activity 2.5

Aim: To show that magnets can exert force without touching (non-contact force) (or) To understand the nature of magnetic force.

Required materials: Two ring magnets and a wooden stick.

Procedure:

- Insert one ring magnet into the wooden stick.
- Place the second ring magnet above it with like poles facing each other.
- Observe whether the upper magnet floats.
- Gently push the upper magnet down and feel the force.
- Release it and observe again.

Observation: The upper magnet floats above the lower magnet.

When pushed down, it moves back up without touching.

Conclusion: Magnets can exert force without contact.

This force is called magnetic force and it is a non-contact force.



Activity 2.6

Aim: To show that charged objects attract small pieces of paper (electrostatic force) (or) To understand the nature of electrostatic force.

Required materials: Plastic scale or straw, polythene sheet, small paper bits.

Procedure:

- Rub the plastic scale or straw with a polythene sheet for a few seconds.
- Do not touch the rubbed part with your hand.
- Bring the rubbed scale near small pieces of paper.
- Observe what happens.

Observation: The small paper pieces get attracted to the plastic scale or straw.

Conclusion: Rubbing produces electric charges on the object.

A charged object attracts light objects without touching. This force is called electrostatic force.



Activity 2.7

Aim: To show that like charges repel and unlike charges attract (or) To understand the different types of charges.

Required materials: Two balloons, thread, woollen cloth.

Procedure:



- Inflate two balloons and hang them using threads so they do not touch each other.
- Rub both balloons with a woollen cloth.
- Release them and observe their movement.
- Now bring the woollen cloth near one rubbed balloon and observe again.

Observation: The two balloons move away from each other (repel).

When the woollen cloth is brought near a balloon, they move towards each other (attract).

Conclusion: Like charges repel each other and unlike charges attract each other.

This shows the nature of electrostatic force.

Activity 2.8

Aim: To observe that objects fall towards the Earth due to gravity (or)
To understand the nature of gravitational force.

Required materials: A ball (or any small object).

Procedure:

- Throw a ball vertically upwards.
- Observe what happens to the ball.
- Now throw the ball upwards with more force.
- Again observe its motion.



Observation: The ball goes up and then comes down to the ground.

Even when thrown harder, it still comes back down.

Conclusion: Objects fall towards the Earth due to gravitational force.

Gravity always pulls objects towards the Earth.

Activity 2.9

Aim: To observe that different weights cause different stretching in a spring (or)
To measure the weight of different objects using a spring.

Required materials: A spring, a nail, and objects of different masses (pencil box, tiffin box, stone, etc.).

Procedure:

- Hang the spring from a nail or support.
- Attach one object to the spring and observe how much it stretches.
- Remove it and hang another object.
- Repeat with different objects one by one.
- Compare the stretching each time.

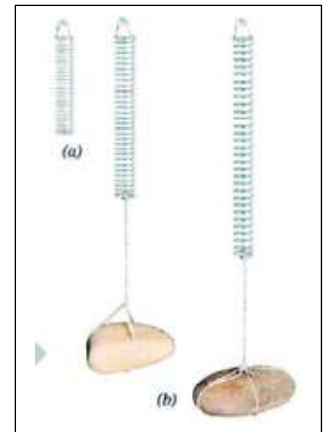
Observation: The spring stretches when an object is hung.

Heavier objects cause more stretching than lighter objects.

Different objects cause different amounts of stretch.

Conclusion: The stretch of a spring depends on the weight (force) of the object.

Heavier objects apply more force and stretch the spring more.



Activity 2.11

Aim: To find the smallest value (least count) measured by a spring balance (or)
To identify the smallest weight the spring balance can measure.

Required materials: A spring balance.

Procedure:

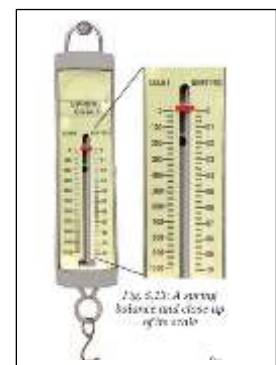
- Observe the scale of the spring balance carefully.
- Note the values of two consecutive big marks (Example: 0 N and 1 N).
- Count the number of small divisions between these big marks.
- Divide the value difference by the number of small divisions.

Observation: The difference between two big marks is 1 N.

There are 5 small divisions between them.

Each small division represents 0.2 N.

Conclusion: The least count of the spring balance is 0.2 N. It can measure weight in steps of 0.2 N.



Activity 2.12

Aim: To measure the weight of different objects using a spring balance.

Required materials: Spring balance, objects like pencil box, water bottle, etc.

Procedure:

- Take a spring balance.
- Hang an object (like a pencil box) on the hook.
- Read the value shown on the scale.
- Record the weight.

e) Repeat the same steps with other objects.

S.No.	Object	Weight (N)
1	Pencil Box	2 N
2	Partially filled water bottle	5 N

Observation: Different objects show different readings on the spring balance.
Heavier objects show higher readings.

Conclusion: A spring balance is used to measure the weight of objects. Weight is measured in newtons (N).

Activity 2.13

Aim: To observe the upward force (buoyant force) exerted by water (or)
To understand the concept of upthrust.

Required materials: An empty plastic bottle (with lid closed) and a bucket of water.

Procedure:

- Take a bucket filled with water.
- Push the empty plastic bottle into the water.
- Feel the force acting on the bottle.
- Release the bottle and observe what happens.

Observation: An upward force is felt when pushing the bottle into water.

When released, the bottle comes back up and floats.

Conclusion: Water exerts an upward force called buoyant force (upthrust). This force makes objects float in water.



Prepare Some Questions Based on Your Learnings So Far

- Why does a moving bicycle stop after some time when we stop pedalling?
- How does friction help us to walk safely on the ground?
- Why do objects fall toward the Earth when dropped?
- How can a force change the direction of a moving object?
- Where do we use magnetic force in daily life?
- Why is it difficult to push a heavy box compared to a light box?
- When does friction become useful and when does it become harmful?
- How long will a ball continue to move if there is no friction?
- Why do vehicles need brakes to stop?
- Why do astronauts feel weightless in space?

Multiple Choice Questions

1. A force is a
 - A. kind of energy
 - B. push or pull
 - C. type of matter
 - D. form of light
2. Force can change the
 - A. colour of an object only
 - B. shape, speed or direction of an object
 - C. mass of an object
 - D. temperature only
3. The SI unit of force is
 - A. joule
 - B. watt
 - C. newton
 - D. pascal
4. A force can make a stationary object
 - A. remain at rest always
 - B. start moving
 - C. disappear
 - D. lose mass
5. A force can stop a moving object by
 - A. decreasing its motion
 - B. increasing its mass
 - C. changing its colour
 - D. melting it
6. A force can change the direction of motion of an object. This is seen when
 - A. a ball is kicked
 - B. a moving bicycle is turned
 - C. a stone is heated
 - D. water is boiled
7. Muscular force is the force applied by
 - A. machines
 - B. magnets
 - C. muscles of living beings
 - D. gravity
8. Which of the following is an example of muscular force?
 - A. Pulling a cart
 - B. Magnet attracting iron
 - C. Apple falling from tree
 - D. Compass needle moving
9. Friction is a force that
 - A. always increases speed
 - B. opposes motion
 - C. acts only in liquids
 - D. has no effect on moving objects
10. Friction acts between
 - A. only solid surfaces
 - B. surfaces in contact
 - C. only liquids and gases
 - D. magnets only
11. Which of the following reduces friction?
 - A. Making surfaces rough
 - B. Applying oil or grease
 - C. Increasing pressure always
 - D. Using sand
12. Rolling friction is
 - A. greater than sliding friction
 - B. less than sliding friction
 - C. equal to fluid friction always
 - D. absent in wheels
13. Wheels are used in vehicles because they
 - A. increase friction
 - B. reduce friction
 - C. increase weight
 - D. reduce speed
14. Force due to Earth's attraction is called
 - A. magnetic force
 - B. electrostatic force
 - C. gravitational force
 - D. muscular force
15. An object falls towards Earth because of
 - A. muscular force
 - B. frictional force
 - C. gravitational force
 - D. magnetic force
16. The force exerted by a magnet is called
 - A. frictional force
 - B. magnetic force
 - C. muscular force
 - D. gravitational force
17. A magnet can attract
 - A. wood
 - B. plastic
 - C. iron
 - D. rubber
18. Electrostatic force is the force between
 - A. two magnets
 - B. charged objects
 - C. two muscles
 - D. two stones
19. A rubbed plastic scale attracting small paper bits shows
 - A. muscular force
 - B. gravitational force
 - C. electrostatic force
 - D. friction only
20. Contact forces act when objects
 - A. are far apart
 - B. touch each other
 - C. are very hot
 - D. are charged
21. Non-contact forces act
 - A. only through touch
 - B. without physical contact
 - C. only in solids
 - D. only in machines
22. Which of the following is a contact force?
 - A. Magnetic force
 - B. Electrostatic force
 - C. Frictional force
 - D. Gravitational force
23. Which of the following is a non-contact force?
 - A. Muscular force
 - B. Frictional force
 - C. Magnetic force
 - D. Push by hand
24. Friction can be increased by
 - A. polishing surfaces
 - B. using lubricants
 - C. making surfaces rough
 - D. using wheels
25. The force needed to open a door is applied
 - A. at the hinge
 - B. near the handle
 - C. at the centre only
 - D. equally everywhere
26. In a tug of war, the team that applies greater force
 - A. always loses
 - B. wins by pulling the other team
 - C. remains still
 - D. changes colour
27. A spring balance is used to measure
 - A. mass
 - B. force
 - C. speed
 - D. temperature
28. The force that acts against the motion of a ball rolling on the ground is mainly
 - A. magnetic force
 - B. frictional force
 - C. muscular force
 - D. electrostatic force
29. A force can change the shape of an object. This happens when we
 - A. stretch a rubber band
 - B. drop a stone
 - C. switch on a bulb
 - D. see a rainbow
30. Two opposite forces acting on an object may
 - A. always move it
 - B. balance each other
 - C. destroy the object
 - D. increase its mass
31. Balanced forces
 - A. always change motion
 - B. do not change the state of motion
 - C. act only on moving objects
 - D. act only on resting objects
32. Unbalanced forces can
 - A. never move an object
 - B. change the state of motion
 - C. only change colour
 - D. only reduce friction

33. If two people push a box in opposite directions with equal force, the box
 A. moves faster B. remains in the same state
 C. flies upward D. melts
34. Fluid friction is also called
 A. drag B. thrust C. pressure D. tension
35. Fluid friction acts in
 A. solids only B. liquids and gases
 C. vacuum only D. magnets only
36. A parachute slows down a falling person because it
 A. increases gravitational force
 B. increases air resistance
 C. decreases mass D. removes friction
37. Birds and aeroplanes have streamlined bodies to
 A. increase friction B. reduce air resistance
 C. increase weight D. reduce lift
38. A swimmer experiences resistance in water due to
 A. muscular force B. gravitational force
 C. fluid friction D. magnetic force
39. Which of the following is not a force?
 A. push B. pull C. friction D. speed
40. When you kick a football, the force applied is mainly
 A. magnetic B. muscular
 C. electrostatic D. gravitational
41. The force that pulls all objects towards the centre of Earth is
 A. friction B. muscular force
 C. gravity D. magnetism
42. Which of the following can act from a distance?
 A. push by hand B. friction
 C. magnetic force D. pull by rope

44. If the same force is applied on a smaller area, the effect is
 A. less B. more C. zero D. unchanged always
45. A nail has a pointed tip so that
 A. it looks shiny
 B. force acts on a smaller area and it enters easily
 C. it becomes heavier D. friction becomes zero
46. Which of the following is an example of gravitational force?
 A. Iron filings moving towards magnet
 B. Paper bits attracted by comb
 C. Fruit falling from tree D. Cart pulled by horse
47. Which of the following is an example of electrostatic force?
 A. Falling leaves B. Magnet attracting pin
 C. Charged balloon sticking to wall
 D. Braking a cycle
48. To move a heavy object more easily, we often use
 A. rough surfaces B. wheels or rollers
 C. pointed ends D. magnets
49. A force may fail to move an object if
 A. the object is too light
 B. an equal opposite force balances it
 C. the object is coloured D. the object is hot
50. The study of forces helps us understand
 A. only colour changes
 B. motion and interaction of objects
 C. only sound production D. only electric circuits

Answers

- | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. B | 2. B | 3. C | 4. B | 5. A | 6. B | 7. C | 8. A | 9. B | 10. B |
| 11. B | 12. B | 13. B | 14. C | 15. C | 16. B | 17. C | 18. B | 19. C | 20. B |
| 21. B | 22. C | 23. C | 24. C | 25. B | 26. B | 27. B | 28. B | 29. A | 30. B |
| 31. B | 32. B | 33. B | 34. A | 35. B | 36. B | 37. B | 38. C | 39. D | 40. B |
| 41. C | 42. C | 43. B | 44. B | 45. B | 46. C | 47. C | 48. B | 49. B | 50. B |

COMPETENCY BASED QUESTIONS

1 Mark Questions

1. Which of the following statements is NOT correct?
 - A) Friction acts opposite to the direction of motion.
 - B) Magnetic force is a contact force.
 - C) Force can change the shape of an object.
 - D) Gravity pulls objects towards the Earth.
2. Which force helps a child to lift a school bag?
 - A) Magnetic force
 - B) Electrostatic force
 - C) Muscular force
 - D) Gravitational force
3. A ball rolling on a rough road stops after some time mainly due to ____
 - A) buoyant force
 - B) magnetic force
 - C) frictional force
 - D) electrostatic force
4. Which of the following is a non-contact force?
 - A) Frictional force
 - B) Muscular force
 - C) Push by hand
 - D) Gravitational force
5. Given below are three situations involving forces
 - (i) A football being kicked
 - (ii) A magnet attracting iron pins
 - (iii) A balloon rubbed with wool attracting paper pieces
 In which cases do non-contact forces act?
 - A) only case (i)
 - B) only cases (ii) and (iii)
 - C) only cases (i) and (ii)
 - D) all cases (i), (ii), and (iii)
6. A student throws a ball vertically upward. What happens to the speed of the ball while moving upward?
 - A) It increases continuously
 - B) It remains constant
 - C) It decreases gradually
 - D) It suddenly becomes zero
7. Which of the following statements is correct regarding friction?
 - A) Friction acts in the direction of motion.
 - B) Friction is greater on smooth surfaces.
 - C) Friction opposes motion between surfaces.
 - D) Friction is a non-contact force.
8. What is the SI unit of force?
 - A) Joule
 - B) Newton
 - C) Pascal
 - D) Watt
9. A designer uses magnets in a science project. Two similar poles of magnets are brought close together. What happens?
 - A) They attract each other.
 - B) They repel each other.
 - C) They lose magnetism.
 - D) They become electrically charged.
10. A charged plastic scale attracts small pieces of paper because of ____
 - A) gravitational force
 - B) magnetic force
 - C) muscular force
 - D) electrostatic force
11. Why do we slip more easily on wet floors?
 - A) Wet floors increase friction.
 - B) Water reduces friction between surfaces.
 - C) Gravity becomes weaker.
 - D) Water increases muscular force.
12. Which of the following instruments is used to measure weight?
 - A) Beam balance
 - B) Thermometer
 - C) Spring balance
 - D) Measuring cylinder
13. A stone sinks in water because ____
 - A) buoyant force is greater than its weight
 - B) no gravitational force acts on it
 - C) its weight is greater than buoyant force
 - D) water pushes it downward
14. A wooden block floats on water because ____
 - A) buoyant force balances its weight
 - B) no force acts on it
 - C) gravity stops acting on it
 - D) friction acts upward
15. Which statement is correct about mass and weight?
 - A) Both mass and weight remain same everywhere.
 - B) Weight changes from place to place but mass remains same.
 - C) Mass changes from planet to planet.
 - D) Weight is measured in kilograms only.

1-B 2-C 3-C 4-D 5-B 6-C 7-C 8-B 9-B 10-D 11-B 12-C 13-C 14-A 15-B

16. Assertion (A): Friction is greater on rough surfaces.

Reason (R): Rough surfaces have more irregularities.

- 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

Ans: A

17. Assertion (A): Weight changes from planet to planet.

Reason (R): Gravitational force is different on different planets.

- 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

Ans: A

18. Assertion (A): Gravitational force is a non-contact force.

Reason (R): Earth attracts objects without touching them.

- 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

Ans: A

19. Match the Following

Column A	Column B
1. Muscular force	a. Earth pulls objects
2. Frictional force	b. Opposes motion
3. Gravitational force	c. Force by muscles
4. Magnetic force	d. Attraction by magnet

Ans: 1-c 2-b 3-a 4-d

20. Identify the type of force:

Situation	Type of Force
1. Pulling a cart	a. _____
2. Magnet attracting pins	b. _____
3. Falling apple	c. _____
4. Balloon attracting paper	D. _____

Ans: a. Muscular force b. Magnetic force c. Gravitational force d. Electrostatic force

2 Marks Questions

1. Why is it easier to pull a suitcase with wheels than drag a box?

Ans: A suitcase with wheels experiences **rolling friction**, which is much less than the **sliding friction** acting on a dragged box. Therefore, less force is needed to move the suitcase.

2. Why does a football stop after rolling for some distance?

Ans: The football stops because **friction** acts between the ball and the ground, opposing its motion and gradually reducing its speed until it comes to rest.

3. Why do vehicles use wheels instead of sliding on roads?

Ans: Wheels reduce friction by converting sliding friction into rolling friction. Since rolling friction is smaller, vehicles can move more easily and efficiently.

4. Why is a thick bucket handle more comfortable than a thin handle?

Ans: A thick handle has a larger area of contact with the hand. Since pressure = Force/Area, the pressure on the hand is less, making it more comfortable to carry.

5. Arrange wet marble floor, dry marble floor, newspaper, coconut coir mat in increasing order of friction.

Ans: Wet marble floor < Dry marble floor < Newspaper < Coconut coir mat
 (Friction increases as the surface becomes rougher.)

6. Why do sports shoes have rough soles?

Ans: Rough soles increase friction. Better grip is obtained. Slipping is prevented. Walking and running become safer.

7. During a tug-of-war, the rope does not move. What can you infer about the forces?

Ans: Both teams apply force. Forces act in opposite directions. Forces are equal. Hence, balanced forces are produced.

8. Meena rubbed two balloons with a woollen cloth and brought them close to each other.

The balloons moved away from each other.

a) Which force is responsible for this behaviour?

Ans: Electrostatic force

b) Why did the balloons move away from each other?

Ans: Both balloons acquired similar charges and like charges repel each other.



9. Why do players sprinkle sand on the ground before playing kabaddi or kho-kho?

Ans: Players sprinkle sand to increase friction between their feet and the ground. This helps them avoid slipping while running.

10. What is friction? Write any two advantages of friction.

Ans: Friction is the force that opposes the motion between two surfaces in contact.

Advantages: Friction helps us to walk without slipping. Friction helps vehicles to stop when brakes are applied.

11. Name the forces acting in the following situations:

- a) A magnet attracting iron pins b) An apple falling from a tree

Ans: a) Magnetic force b) Gravitational force

12. Why is it difficult to walk on a wet floor?

Ans: A wet floor has less friction between our feet and the floor. Therefore, we may slip while walking.

13. A chapati maker converts balls of dough into chapatis. What effect of force comes into play?

Ans: The chapati maker presses the dough using force. The applied force changes the shape of the dough from a round ball into a flat chapati. This shows that force can change the shape of an object.

14. Two blocks of iron of different masses are kept on a floor. Which one needs more force to move and why?

Ans: The heavier block requires more force because it exerts greater weight on the floor, producing more friction. Therefore, a larger force is needed to overcome the friction.

15. A marble is allowed to roll down an inclined plane from a fixed height. At the foot of the inclined plane, it moves on a horizontal surface on (a) Silk cloth (b) Sand and (c) Glass sheet.**On which surface will it move the shortest distance? Why?**

Ans: The marble will move the shortest distance on sand because sand offers the greatest friction, slowing down the marble quickly.

16. Explain why ships float even though they are very heavy.

Ans: Ships displace large amounts of water, producing enough buoyant force to balance their weight.

17. Why do aeroplanes and ships have streamlined shapes?

Ans: To reduce friction caused by air or water.

18. Ravi was riding his bicycle on a rough road. He noticed that the bicycle slowed down quickly when he stopped pedalling.

- a) Which force caused the bicycle to slow down?

Ans: Frictional force

- b) Why was the bicycle slowing faster on the rough road?

Ans: Rough surfaces produce greater friction.

- c) Mention one advantage of friction in this situation.

Ans: Friction helps the bicycle move without slipping / helps in braking.

**4 Marks Questions****1. What are contact and non-contact forces?**

Ans: Contact Forces: Forces that act only when objects are in physical contact.

Examples: Muscular force, Frictional force.

Non-contact Forces: Forces that act without physical contact between objects.

Examples: Magnetic force, Electrostatic force, Gravitational force.

2. Explain electrostatic force with an example.

Ans: The force exerted by a charged body on another charged or uncharged body is called electrostatic force. It is a non-contact force. Example: A plastic scale rubbed with polythene attracts small bits of paper.

3. Explain how friction can be reduced in machines and vehicles.

Ans: Friction can be reduced by

- i) Applying lubricants like oil or grease. ii) Using ball bearings between moving parts.
ii) Polishing surfaces to make them smooth. iv) Using wheels and rollers for movement.

These methods help machines work smoothly and reduce wear and tear.

4. Describe any four effects of force with suitable examples.

Ans: Effects of force are:

Force can move a stationary object: Example - Kicking a football.

Force can stop a moving object: Example - Applying brakes to a bicycle.

Force can change the direction of motion: Example - Hitting a cricket ball with a bat.

Force can change the shape of an object: Example - Stretching a rubber band.

5. Explain the importance of friction in our daily life.

Ans: i) Friction helps us to walk and run.

ii) It helps us to write on paper.

iii) Vehicles move due to friction between tyres and road.

iv) Brakes work because of friction.

v) Nails and screws hold objects due to friction.

6. Why do sports shoes have spikes?

- Ans:** i) Spikes increase friction between the shoes and the ground.
 ii) Increased friction provides better grip.
 iii) It prevents slipping.
 iv) Therefore, athletes can run and move safely.

7. Raju pushes a cupboard, but it does not move. Does this mean no force is acting? Explain.

Ans: Raju applies force on the cupboard. The cupboard does not move because friction opposes the force. The forces become balanced. Therefore, force is acting even though motion is absent.

8. A cyclist stops pedaling but the bicycle continues moving for some distance before stopping. Explain why.

Ans: The bicycle continues moving due to its motion. Friction acts between tyres and road. Air resistance also opposes motion. These forces gradually stop the bicycle.

9. A student rubs a balloon with wool and brings it near paper bits. The paper bits move towards the balloon. Why?

Ans: Rubbing produces electric charges. The balloon becomes charged. Charged balloon exerts electrostatic force. Paper bits are attracted towards it.

8 Marks Questions**1. Explain different types of forces with examples.**

Ans: Forces are of two types

A. Contact Forces: These forces act only when objects are in contact.

i) **Muscular Force:** The force exerted by muscles of humans or animals.

Examples: Lifting a bag, pushing a cart, pulling a rope.

ii) **Frictional Force:** The force that opposes the motion of an object.

Examples: A rolling ball slowing down, brakes stopping a bicycle.

B. Non-contact Forces: These forces act without physical contact.

i) **Magnetic Force:** The force exerted by a magnet on another magnet or magnetic material.

Example: A magnet attracting iron pins.

ii) **Electrostatic Force:** The force exerted by a charged body on another charged or uncharged body.

Example: A rubbed plastic scale attracting paper bits.

iii) **Gravitational Force:** The force with which the Earth attracts objects towards itself.

Example: Fruits falling from a tree.

2. Explain why friction is both useful and harmful.

Ans:

Useful Effects

1. Helps walking.
2. Helps writing.
3. Helps vehicles move.
4. Helps vehicles stop.

Harmful Effects

1. Causes wear and tear.
2. Produces heat.
3. Reduces efficiency.
4. Wastes energy.

3. What is friction? Explain the factors affecting friction and methods to reduce and increase friction.

Ans: Friction is the force that comes into play when an object moves or tries to move over the surface of another object.

Factors affecting friction: Nature of surface, Force pressing the surfaces together.

Methods to reduce friction: Applying lubricants, Using ball bearings, Polishing surfaces.

Methods to increase friction: Making surfaces rough, Using treads on tyres and shoes, Sprinkling sand on slippery roads.

4. Write detailed notes on gravitational force and electrostatic force. Mention their uses in daily life.

Ans: Gravitational Force: The force by which Earth attracts objects towards it is called gravitational force.

Examples: Fruits falling from trees, Rainwater falling to the ground.

Uses: Keeps us on the Earth, Helps rivers flow downward, Helps satellites revolve around planets.

Electrostatic Force: The force produced due to electric charges is called electrostatic force.

Examples: Comb attracting paper bits, Balloon sticking to a wall after rubbing.

Uses: Used in photocopy machines, spray painting, air purifiers to remove dust particles.

5. A student throws a ball vertically upwards. Explain the forces acting on the ball during

- (a) Upward motion (b) Highest point (c) Downward motion

Ans: (a) Upward Motion: Gravitational force acts downward.

Speed decreases continuously.

(b) Highest Point: Gravity still acts downward.

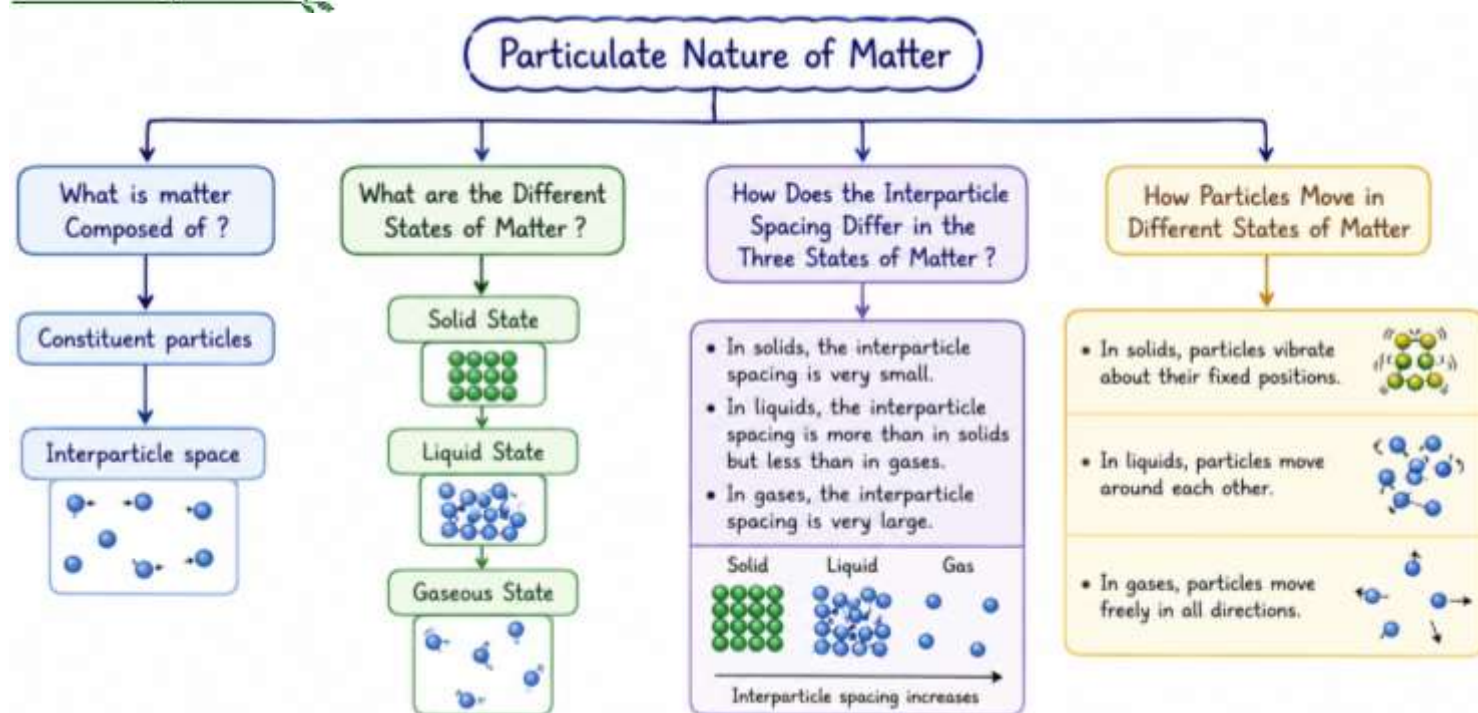
Speed becomes zero.

(c) Downward Motion: Gravity pulls the ball downward. Speed increases continuously.



CHAPTER - 3: Particulate Nature of Matter

Mind Map



Main Points

- Matter is made up of extremely small particles.
- These tiny particles are called **constituent particles**.
- A constituent particle is the **basic unit of a substance**.
- Chalk, sand, sugar, and all substances can be broken into smaller particles.
- Grinding chalk is a **physical change**, not a chemical change.
- Sugar dissolves in water because sugar particles spread among water particles.
- There are **spaces between particles** called **interparticle spaces**.
- Particles of matter are held together by **interparticle forces of attraction**.
- The strength of interparticle attraction depends on the **distance between particles**.
- Matter exists mainly in **three states** — **solid, liquid, and gas**.
- In solids, particles are **closely packed** together.
- Solids have a **fixed shape and fixed volume**.
- In solids, particles can only **vibrate about fixed positions**.
- Heating increases particle vibrations in solids.
- The temperature at which a solid changes into liquid is called its **melting point**.
- Liquids have **fixed volume but no fixed shape**.
- Liquids take the **shape of the container** in which they are kept.
- Interparticle attraction in liquids is **weaker than in solids**.
- Particles in liquids can **move freely within a limited space**.
- The temperature at which a liquid changes into vapour is called its **boiling point**.
- Evaporation** occurs at all temperatures from the surface of a liquid.
- Gases have **no fixed shape and no fixed volume**.
- Gas particles move **freely in all directions**.
- Interparticle attraction in gases is **negligible**.
- Gases occupy the **entire available space**.
- Solids and liquids are almost **incompressible**, while gases are highly compressible.
- Sugar dissolves in water because dissolved particles occupy spaces between water particles.
- Particles of matter are in **constant motion**.

29. Heating increases the **movement of particles**.
30. The physical state of matter depends on **thermal energy, interparticle attraction, and interparticle spacing**.

-----: Definitions :-----

Matter: Anything that occupies space and has mass is called matter.

Solution: A uniform mixture, such as that of salt or sugar and water, is called a solution.

Melting Point: The minimum temperature at which a solid melts to become a liquid at atmospheric pressure is called its melting point.

Boiling Point: The temperature at which a liquid boils and turns into vapour at atmospheric pressure is called its boiling point.

Evaporation: The process of conversion of a liquid into vapour at temperatures even below the boiling point is called evaporation.

Fluids: Substances that can flow are called fluids (liquids and gases).

Atmospheric Pressure: The pressure exerted by the air around us is called atmospheric pressure.

Diffusion: The spreading of particles from one place to another due to their continuous movement is called diffusion.

Compressibility: The property by which the volume of a substance can be reduced by applying pressure is called compressibility.

Suspended Particulate Matter (SPM): The tiny dust particles suspended in air and not settled down are called Suspended Particulate Matter (SPM).

Probe and Ponder

Why is it possible to pile up stones or sand, but not a liquid like water?

Stones and sand are solids. Their particles are closely packed and can stay in one place, so they can be piled up. Water is a liquid whose particles move freely, so it flows and cannot form a pile.

Why does water take the shape of folded hands but lose that shape when released?

Water has no fixed shape. It takes the shape of any container or object holding it, such as folded hands. When released, it flows away and loses that shape.

We cannot see air, so how does it add weight to an inflated balloon?

Air is made up of tiny particles that have mass. When a balloon is inflated, air enters it and increases its mass, making the balloon heavier.

Is the air we breathe today the same air that existed thousands of years ago?

Yes, much of the air on Earth has been continuously recycled through natural processes such as respiration, photosynthesis, and the water cycle. Although its composition changes slightly, the atmosphere has existed for millions of years.

Share your questions

1. Why does air occupy space?
2. Why do liquids flow but solids do not?
3. Can gases be converted into liquids?
4. Why does a balloon burst when overinflated?
5. How do clouds form from water vapour?

Intext Questions

1. Why is it possible to pile up stones or sand, but not a liquid like water?

Ans: Stones or sand can be piled up because their particles are closely packed and have a fixed shape. Water flows, so it cannot be piled up.

2. Why does water take the shape of folded hands but lose that shape when released?

Ans: Water takes the shape of folded hands because it has no fixed shape and takes the shape of the container. It loses the shape when released because it flows.

3. We cannot see air, so how does it add weight to an inflated balloon?

Ans: Air adds weight to an inflated balloon because air has mass and occupies space.

4. Is the air we breathe today the same that existed thousands of years ago?

Ans: Yes, the air we breathe today is mostly the same air that existed thousands of years ago because air keeps moving in nature.

5. Is every speck of this fine chalk powder still composed of the same substance, or has it changed into

something else on breaking or grinding?

Ans: Every speck of chalk powder is still the same substance. It only becomes smaller, not a new substance.

6. Are the units of chalk obtained in this manner considered the smallest units of chalk?

Ans: No, these are not the smallest units of chalk. Chalk can be broken into even smaller particles.

7. What happens to sugar when it is dissolved in water?

Ans: When sugar dissolves in water, its particles spread evenly in the water and become invisible.

8. Chalk and sugar can both be broken down into their constituent particles. But how are the constituent particles held together to form the solid pieces we see?

Ans: The particles in chalk and sugar are held together by force of attraction between them.

10. How are constituent particles held together in solids?

Ans: In solids, constituent particles are held together very tightly by strong forces of attraction.

11. Solids have a definite volume; what about liquids and gases?

Ans: Liquids have definite volume but no fixed shape. Gases have neither definite shape nor definite volume.



1. Choose the correct option. The primary difference between solids and liquids is that the constituent particles are:

- (i) closely packed in solids, while they are stationary in liquids.
- (ii) far apart in solids and have fixed position in liquids.
- (iii) always moving in solids and have fixed position in liquids.
- (iv) closely packed in solids and move past each other in liquids.

Ans: (iv) closely packed in solids and move past each other in liquids.

2. Which of the following statements are true? Correct the false statements.

- (i) Melting ice into water is an example of the transformation of a solid into a liquid.
- (ii) Melting process involves a decrease in interparticle attractions during the transformation.
- (iii) Solids have a fixed shape and a fixed volume.
- (iv) The interparticle interactions in solids are very strong, and the interparticle spaces are very small.
- (v) When we heat camphor in one corner of a room, the fragrance reaches all corners of the room.
- (vi) On heating, we are adding energy to the camphor, and the energy is released as a smell.

Ans: (i) True (ii) True (iii) True (iv) True (v) True (vi) False

Correct Statement for (vi): On heating, camphor absorbs energy and changes directly into vapour. The vapour particles diffuse through the air and spread the smell throughout the room.

3. Choose the correct answer with justification. If we could remove all the constituent particles from a chair, what would happen?

- (i) Nothing will change.
- (ii) The chair will weigh less due to lost particles.
- (iii) Nothing of the chair will remain.

Ans: (iii) Nothing of the chair will remain.

A chair is completely made up of tiny particles (atoms and molecules). These particles form the structure, shape, mass, and properties of the chair. If all the constituent particles are removed, there will be no matter left to form the chair.

4. Why do gases mix easily, while solids do not?

Ans: Gases mix easily because the particles of gases are far apart, have very weak forces of attraction, and are in continuous random motion. This allows gas particles to diffuse and mix quickly with other gases.

Solids do not mix easily because their particles are closely packed, have strong forces of attraction, and can only vibrate at fixed positions. They do not move freely, so mixing is very slow.

5. When spilled on the table, milk in a glass tumbler, flows and spreads out, but the glass tumbler stays in the same shape. Justify this statement.

Ans: Milk is a liquid, while the glass tumbler is a solid. The difference is due to the arrangement and movement of their particles.

In liquids (milk), particles are not tightly packed and have weaker forces of attraction. They can move freely and slide past one another, so milk flows and spreads on the table. In solids (glass tumbler), particles are very closely packed with strong forces of attraction. They can only vibrate in fixed positions and cannot move freely. Therefore, the tumbler retains its shape and does not spread.

- Place the bottle in the hot water.
- Observe the balloon for a few minutes.
- Record your observations.

Observations and Results:

S. No.	Observation	What I Saw	Interpretation
1	Before putting the bottle in hot water	Balloon was small and loose.	Air inside the bottle was at room temperature.
2	After 1–2 minutes in hot water	Balloon started to expand a little.	Air particles gained energy and moved faster.
3	After 3–4 minutes in hot water	Balloon inflated more.	Air took up more space and pushed the balloon.
4	After 5–6 minutes in hot water (up to a point)	Balloon became fully inflated (to some extent).	Maximum air expansion occurred.
5	After removing from hot water and cooling down	Balloon slowly deflated.	Air cooled down, particles moved slower and occupied less space.

DISCOVER	
<p>Let's Think!</p> <ol style="list-style-type: none"> Air is made up of tiny particles. These particles have spaces between them. When air gets heated, the particles move faster. Faster moving particles spread out and take up more space. This change in space can create pressure. <p>Predict If I put a bottle with a balloon on its neck in hot water, I think the balloon will inflate.</p> <p style="text-align: center;">DEBATE</p> <p>Question: Why does the balloon inflate when the bottle is placed in hot water? For the Statement: "The balloon inflates because air expands when heated"</p>	<ol style="list-style-type: none"> Heating increases the kinetic energy of air particles. Particles move faster and spread out. Air takes up more space and pushes against the balloon. This causes the balloon to inflate. <p>Against the Statement: "The balloon inflates due to some other reason"</p> <ol style="list-style-type: none"> The balloon is already empty and will not inflate by itself. The bottle is kept in water, not over fire. The only change is the temperature of air inside the bottle. <p>Conclusion: The balloon inflates because the air inside the bottle gets heated, its particles move faster, spread out and take up more space. This increase in space creates pressure and inflates the balloon.</p>

2. Design and create simple models to represent particles of solids, liquids, and gases showing interparticle spacing using clay balls, beads, etc.



Activity: Model of Particles in Solids, Liquids, and Gases

Aim: To design and create simple models representing particles of solids, liquids, and gases, showing the spacing between particles.

Materials Required: Clay balls / beads / thermocol balls, Cardboard sheet or chart paper, Glue, Marker pen

Procedure:

Solid Model	Liquid Model	Gas Model
<ol style="list-style-type: none"> Take several clay balls or beads of the same size. Arrange them very close to each other in a regular pattern (rows and columns). Paste them on a cardboard sheet. Label it as "Solid". <p>Observation: Particles are tightly packed with very little space between them.</p>	<ol style="list-style-type: none"> Take the same number of clay balls or beads. Arrange them close together but not in a fixed pattern. Leave small gaps between particles. Paste them on another cardboard sheet. Label it as "Liquid". <p>Observation: Particles are close together but can move past one another.</p>	<ol style="list-style-type: none"> Arrange the clay balls or beads far apart from each other on a cardboard sheet. Leave large gaps between particles. Paste them and label as "Gas". <p>Observation: Particles are very far apart and move freely in all directions.</p>

OUR MODELS		
SOLID	LIQUID	GAS
 <ul style="list-style-type: none"> • Particles are very close together. • Very less space between particles. • Strong force of attraction. • Fixed shape and fixed volume. 	 <ul style="list-style-type: none"> • Particles are close but not fixed. • Some space between particles. • Medium force of attraction. • No fixed shape but fixed volume. 	 <ul style="list-style-type: none"> • Particles are far apart. • Large space between particles. • Very weak force of attraction. • No fixed shape and no fixed volume.

Conclusion:

State of Matter	Arrangement of Particles	Interparticle Space
Solid	Closely packed and orderly	Very small
Liquid	Close but irregular	Moderate
Gas	Far apart and random	Very large










3. Pretend to be particles of solids, liquids, and gases, at different temperatures— create and perform a role-play/dance showing particles in motion.

Aim: To perform a role-play/dance to show the motion of particles in solids, liquids and gases at different temperatures.


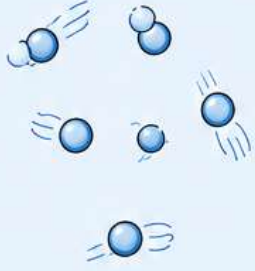









Materials Required: Open space, Music / drum / claps, Cards/badges: Solid, Liquid, Gas
Temperature cards: Low, Medium, High

Procedure:

1. Solid Particles	2. Liquid Particles	3. Gas Particles
i) Students stand very close together in neat rows. ii) Hold hands or stand shoulder-to-shoulder. iii) Move slightly by shaking or vibrating in place. iv) Teacher says " Low Temperature " → Students vibrate slowly. v) Teacher says " High Temperature " → Students vibrate faster but remain in their positions.	i) Students stand close together but not fixed. ii) Move slowly around one another without separating much. iii) Teacher says " Low Temperature " → Move slowly. iv) Teacher says " High Temperature " → Move faster and change positions more frequently.	i) Students spread out across the room. ii) Move freely in all directions without touching. iii) Teacher says " Low Temperature " → Walk slowly. iv) Teacher says " High Temperature " → Move quickly and randomly.

OUR PERFORMANCE GUIDE								
SOLID			LIQUID			GAS		
Low Temperature	Medium Temperature	High Temperature	Low Temperature	Medium Temperature	High Temperature	Low Temperature	Medium Temperature	High Temperature
								
<ul style="list-style-type: none"> • Stand very close together. • Hardly any movement. • Faces forward. • Strong bonds. • Example: Ice (very cold) 	<ul style="list-style-type: none"> • Stand close together. • Slight movement in place. • Little space between. • Example: Ice melting 	<ul style="list-style-type: none"> • Move a little more. • Vibrate, shake or sway. • More space between. • Example: Soft wax 	<ul style="list-style-type: none"> • Stand close but can move. • Move slowly around. • Slide past each other. • Example: Cold water (slow flow) 	<ul style="list-style-type: none"> • Move around each other. • Flow like water. • Change places easily. • Example: Normal water (flowing) 	<ul style="list-style-type: none"> • Move faster. • More space. • Flow quickly. • Example: Hot water (fast flow) 	<ul style="list-style-type: none"> • Stand far apart. • Move slowly. • In straight directions. • Lots of space. • Example: Cold air (slow moving) 	<ul style="list-style-type: none"> • Move faster. • Random movements. • Change directions. • Example: Warm air (moving air) 	<ul style="list-style-type: none"> • Move very fast. • Jump, run, turn freely. • Very far apart. • Example: Hot air / Steam (very fast)

4. Debate in the class — 'Gases can spread and fill all the available space'. Is this property of gases beneficial or harmful?

FOR THE STATEMENT (This property is beneficial)	DEBATE TOPIC	AGAINST THE STATEMENT (This property can be harmful)
<p>1 Oxygen for Life Oxygen spreads in the air and helps all living beings to breathe and stay alive. </p>	<p>'Gases can spread and fill all the available space.' Is this property of gases beneficial or harmful?</p> 	<p>1 Air Pollution Harmful gases from vehicles and factories spread in the air and cause pollution and health problems. </p>
<p>2 Pleasant Smell Spreads The smell of food, flowers or perfume spreads everywhere and makes our surroundings pleasant. </p>		<p>2 Bad Odours Unpleasant gases from garbage, sewage or dirty places spread and cause discomfort. </p>
<p>3 Cooking Made Easy LPG gas spreads evenly in the stove and helps in cooking our food. </p>		<p>3 Disease Spread Germs in the air spread through sneezing, coughing and can make people sick. </p>
<p>4 Weather and Rain Water vapour spreads in the air, forms clouds and brings rain, which is essential for life. </p>		<p>4 Fire and Accidents Gases like LPG can spread and cause leaks, fires or explosions if not handled carefully. </p>
<p>5 Communication Sound travels through air (a gas) and helps us speak, listen to music and communicate. </p>		<p>5 Greenhouse Effect Some gases trap heat in the air and cause global warming and climate change. </p>
<p>Conclusion (For Side): This property is very useful for life and daily activities.</p>	<p>NEUTRAL POINTS</p> <ul style="list-style-type: none"> Gases have no fixed shape or volume. They spread out to fill all the available space. This property is natural and happens all the time. The effect depends on the type of gas and how we use or control it. 	<p>Conclusion (Against Side): This property can become dangerous if gases are poisonous or uncontrolled.</p>

Final conclusion: The property of gases spreading and filling all available space in both beneficial and harmful. It is beneficial for breathing, cooking, weather and communication. It is harmful when dangerous gases spread pollution, disease or fire.

Activites

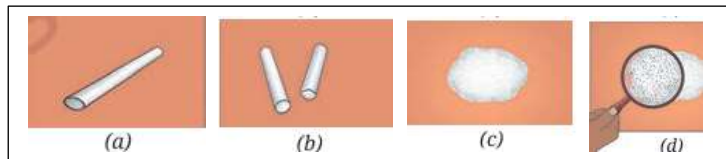
Activity 3.1

Aim: To observe that a substance can be broken into smaller particles without changing its nature. (or) To understand that matter is made up of extremely small particles by breaking and grinding a chalk stick.

Required materials: Chalk piece, mortar and pestle (or any tool for grinding), magnifying glass.

Procedure:

- a) Take a piece of chalk and break it into two pieces.
- b) Break it further into smaller pieces.
- c) Grind the small pieces to form a fine powder.
- d) Observe the powder using a magnifying glass.



Observation: The chalk becomes smaller pieces and then powder. Each small particle still looks like chalk.

Conclusion: Breaking or grinding does not change the substance. It only reduces the size of particles.

This is a physical change.

Activity 3.2

Aim: To show that particles of matter are very small and spread throughout the solution (or) To observe the dissolving of sugar in water and understand that matter is made up of extremely small particles.

Required materials: Glass tumbler, water, sugar, spoon.

Procedure:

- a) Fill a glass with water.
- b) Add two teaspoons of sugar.
- c) Do not stir and taste the top layer of water.
- d) Now stir the water until sugar dissolves completely.
- e) Taste the water again.



Observation: Before stirring, the top layer may not taste sweet. After stirring, the whole water tastes sweet.

Sugar particles are not visible.

Conclusion: Sugar dissolves and spreads throughout the water.

Particles of matter are very small and occupy spaces between water particles.

Activity 3.3

Aim: To observe that solids have a definite shape and size (or) To observe the physical properties of different solids and understand that solids contain closely packed particles with strong forces of attraction between them.

Required materials: Small objects like iron nail, rock salt, stone, wooden block, key, chalk piece.

Procedure:

- a) Collect a few solid objects.
- b) Observe their shapes and sizes carefully.
- c) Try to change their shape by pressing or holding them.
- d) Note your observations.

S. No.	Object	Shape	Size	Can the Shape be Changed by Pressing?	Observation
1	Iron nail	Long and cylindrical	Small	No	Has a fixed shape and size.
2	Rock salt	Irregular crystal	Small	No	Remains unchanged when pressed.
3	Stone	Irregular/Round	Medium	No	Hard and retains its shape.
4	Wooden block	Cuboid	Medium	No	Fixed shape and size.
5	Key	Irregular	Small	No	Does not change shape on pressing.
6	Piece of aluminium	Irregular sheet	Small	No (under normal pressing)	Maintains its shape and size.

Observation: All objects have a fixed shape and size. Their shape does not change easily on pressing.

Conclusion: Solids have a definite shape and size. Their particles are closely packed and strongly held together.

Activity 3.4

Aim: To show that liquids have no fixed shape but have a definite volume (or) To observe that liquids acquire the shape of their container while maintaining a fixed volume.

Required materials: Three containers of different shapes, water, marker.

Procedure:

- Take three containers of different shapes and label them A, B, and C.
- Mark the same level (Example: 200 mL) on each container.
- Pour water into container A up to the marked level.
- Transfer the water from A to B and observe its shape and level.
- Now transfer the water from B to C and observe again.

Observation: Water takes the shape of each container. The level (volume) of water remains the same in all containers.

Conclusion: Liquids do not have a fixed shape but have a definite volume.

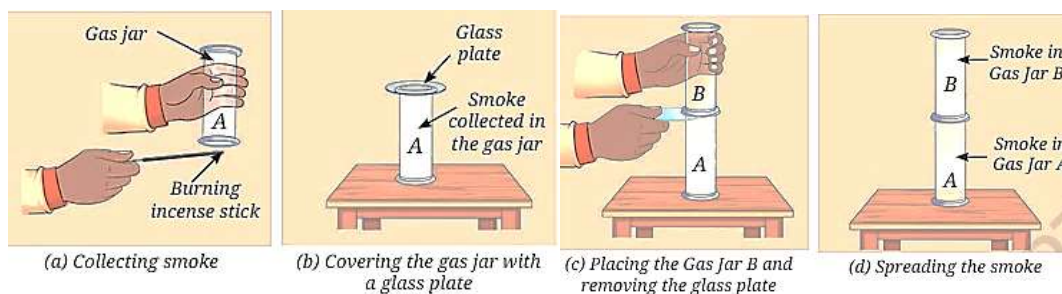


Activity 3.5

Aim: To show that gases have no fixed shape and can spread easily (or) To demonstrate that gases have neither a fixed nor a fixed volume and can spread to occupy all the available space.

Required materials: Two transparent glass jars, glass plate, incense stick.

Procedure:



- Take two glass jars and label them A and B.
- Light an incense stick and collect smoke in jar A.
- Cover jar A with a glass plate.
- Invert jar B over jar A and remove the glass plate.
- Observe what happens to the smoke.

Observation: Smoke spreads from jar A to jar B. After some time, smoke is present in both jars.

Conclusion: Gases spread easily and fill available space. They have no fixed shape or volume.

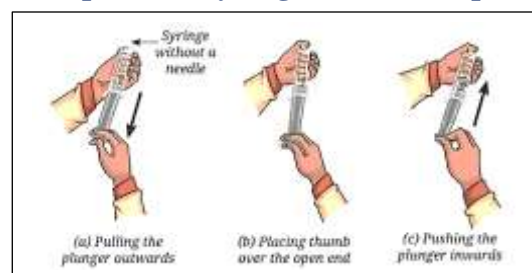
Activity 3.6

Aim: To show that gases can be compressed (or) To understand the compressibility of gases and compare it with the incompressibility of liquids using a syringe.

Required materials: Syringe (without needle).

Procedure:

- Take a syringe and pull the plunger outward.
- Close the open end of the syringe with your thumb.
- Push the plunger inward slowly.
- Observe what happens.
- Release the plunger and observe again.



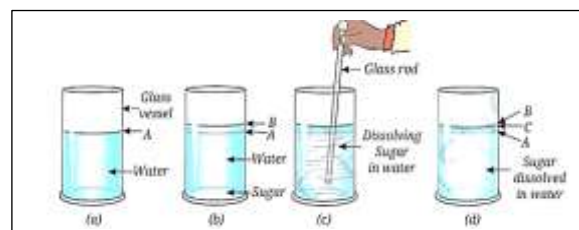
Observation: The plunger can be pushed inward, reducing the space of air. When released, the plunger moves back.

Conclusion: Gases can be compressed because their particles have space between them.

Activity 3.7

Aim: To observe that particles of matter occupy spaces between them (or) To observe whether particles of a substance occupy spaces between water particle when dissolved and to understand interparticle spacing in different substances.

Required materials: Glass vessel, water, sugar, glass rod/spoon.



Procedure:

- Take water in a glass and mark its level.
- Add sugar to the water.
- Stir well until the sugar dissolves completely.
- Observe the water level again.

Observation: The sugar dissolves in water. The water level increases very little or remains almost the same.

Conclusion: Sugar particles occupy the spaces between water particles.

This shows that there are spaces between particles of matter.

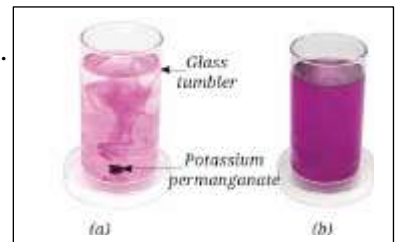
Activity 3.8

Aim: To show that particles of matter are continuously moving (diffusion). (or) To observe how particles move in a liquid and understand the concept of particle motion and diffusion.

Required materials: Glass tumbler, water, a few grains of potassium permanganate.

Procedure:

- Take water in a glass tumbler.
- Add a few grains of potassium permanganate.
- Do not stir and observe carefully.
- Wait for some time and observe again.



S. No	Step/Action	Observation
1	Take water in a glass tumbler.	Water is colourless and clear.
2	Add a few grains of potassium permanganate.	Purple crystals settle in the water.
3	Do not stir and observe carefully.	Purple colour slowly starts spreading through the water.
4	Wait for some time and observe again.	The entire water becomes uniformly purple in colour.

Conclusion: Particles of matter are continuously moving and mix on their own. This process is called diffusion.

Activity 3.9

Aim: To show that gases spread in all directions (diffusion of gases).

Required materials: Incense stick (agarbatti), matchbox.

Procedure:

- Light an incense stick in one corner of the room.
- Wait for a few minutes.
- Smell the air from different places in the room.



S. No.	Step/Action	Observation
1	Light an incense stick (agarbatti) in one corner of the room.	Fragrance is noticed near the incense stick.
2	Wait for a few minutes.	The fragrance starts spreading to nearby areas.
3	Smell the air from different places in the room.	The fragrance can be smelled throughout the room, even at a distance from the incense stick.

Conclusion: Gas particles move freely and spread in all directions. This shows diffusion of gases

Prepare Some Questions Based on Your Learnings So Far

- Why can the smell of perfume spread quickly in a room?
- How do particles of matter move continuously?
- Why does sugar disappear when mixed in water?
- How can we prove that particles of matter have spaces between them?
- Where do we observe diffusion in our daily life?
- Why do gases spread faster than liquids?
- When does evaporation take place more quickly?
- How long can the smell of incense stick remain in a closed room?
- Why do solids have a fixed shape while liquids do not?
- Why does ice change into water when heated?

Multiple Choice Questions

1. **Matter is anything that**
 - A. has no mass
 - B. occupies space and has mass
 - C. can only be seen
 - D. has no particles
2. **The particulate nature of matter means that matter is made up of**
 - A. waves only
 - B. continuous material
 - C. tiny particles
 - D. light rays
3. **The particles of matter are**
 - A. completely still
 - B. always at rest
 - C. in constant motion
 - D. visible to naked eye
4. **Diffusion is the process in which particles move from**
 - A. lower concentration to higher concentration
 - B. higher concentration to lower concentration
 - C. one solid to another only
 - D. bottom to top only
5. **The spreading of smell of perfume in a room is due to**
 - A. evaporation
 - B. condensation
 - C. diffusion
 - D. melting
6. **Which of the following shows that particles of matter have spaces between them?**
 - A. Dissolving sugar in water
 - B. Breaking glass
 - C. Cutting wood
 - D. Heating iron
7. **Brownian motion is the random movement of**
 - A. large stones in water
 - B. visible tiny particles suspended in a fluid
 - C. planets in space
 - D. only gases in a container
8. **Matter is mainly classified into**
 - A. two states
 - B. three states
 - C. four states
 - D. five states
9. **The three common states of matter are**
 - A. heat, light, sound
 - B. atom, molecule, ion
 - C. solid, liquid, gas
 - D. mass, volume, density
10. **In solids, particles are**
 - A. very far apart and move freely
 - B. loosely packed
 - C. closely packed
 - D. absent
11. **Solids have**
 - A. fixed shape and fixed volume
 - B. fixed shape only
 - C. fixed volume only
 - D. neither shape nor volume
12. **Liquids have**
 - A. fixed shape and fixed volume
 - B. no fixed shape but fixed volume
 - C. fixed shape but no fixed volume
 - D. neither fixed shape nor volume
13. **Gases have**
 - A. fixed shape and fixed volume
 - B. fixed shape only
 - C. fixed volume only
 - D. neither fixed shape nor fixed volume
14. **The force of attraction between particles is strongest in**
 - A. gases
 - B. liquids
 - C. solids
 - D. plasma
15. **The force of attraction between particles is weakest in**
 - A. solids
 - B. liquids
 - C. gases
 - D. all are same
16. **Diffusion occurs fastest in**
 - A. solids
 - B. liquids
 - C. gases
 - D. all at same rate
17. **On heating, particles of matter**
 - A. stop moving
 - B. lose energy
 - C. gain kinetic energy
 - D. become larger in size
18. **Melting is the process of changing**
 - A. solid into liquid
 - B. liquid into solid
 - C. gas into liquid
 - D. liquid into gas
19. **Freezing is the process of changing**
 - A. solid into liquid
 - B. liquid into gas
 - C. liquid into solid
 - D. gas into liquid
20. **Evaporation is the process of changing**
 - A. liquid into gas
 - B. gas into liquid
 - C. solid into liquid
 - D. gas into solid
21. **Condensation is the process of changing**
 - A. liquid into gas
 - B. gas into liquid
 - C. solid into gas
 - D. liquid into solid
22. **Sublimation is the direct change of**
 - A. solid into liquid
 - B. liquid into gas
 - C. solid into gas
 - D. gas into liquid
23. **Which of the following substances undergoes sublimation?**
 - A. Ice
 - B. Camphor
 - C. Water
 - D. Oil
24. **The process of changing gas directly into solid is called**
 - A. deposition
 - B. sublimation
 - C. evaporation
 - D. melting
25. **When sugar dissolves in water, the sugar particles**
 - A. disappear completely
 - B. fill the spaces between water particles
 - C. destroy water particles
 - D. change into water
26. **The shape of a liquid changes because**
 - A. its particles are fixed
 - B. its particles can slide over one another
 - C. it has no particles
 - D. its particles are tightly packed
27. **Gases can be compressed easily because**
 - A. they have strong forces of attraction
 - B. their particles are very close
 - C. there is large space between particles
 - D. they have fixed shape
28. **Which state of matter can flow?**
 - A. solids only
 - B. liquids only
 - C. gases only
 - D. liquids and gases
29. **The volume of a gas**
 - A. is always fixed
 - B. depends on the container
 - C. is zero
 - D. is greater than mass
30. **Which property is common to all matter?**
 - A. It is visible
 - B. It has mass and occupies space
 - C. It is solid
 - D. It is made of large particles

31. The spreading of ink in water is an example of
A. melting B. diffusion
C. freezing D. sublimation
32. Water exists in nature as
A. only solid B. only liquid
C. only gas D. solid, liquid and gas
33. Ice, water and steam are
A. three different substances
B. three states of the same substance
C. not matter D. only liquids
34. The process by which a solid changes directly into gas on heating is
A. melting B. condensation
C. sublimation D. freezing
35. During evaporation, particles escape from the
A. middle of liquid only B. surface of liquid
C. bottom of liquid only D. whole solid
36. Which of the following has the highest diffusion rate?
A. honey B. water C. oxygen gas D. ice
37. The movement of particles becomes slower when
A. temperature increases B. temperature decreases
C. heat is supplied D. matter changes into gas
38. Which one has definite volume but no definite shape?
A. solid B. liquid C. gas D. all of these
39. Which one has neither definite shape nor definite volume?
A. solid B. liquid C. gas D. ice
40. The particles in a solid vibrate
A. freely from place to place
B. only at fixed positions
C. very far from each other D. not at all
41. The intermixing of particles of two different substances on their own is called
A. freezing B. melting C. diffusion D. boiling
42. Which of the following statements is correct?
A. Particles of matter do not attract each other
B. Particles of matter are static
C. Particles of matter have spaces between them
D. Matter is continuous and has no particles
43. On cooling a gas, it may change into
A. solid directly only B. liquid
C. plasma D. nothing
44. Which of these is an example of condensation?
A. Drying of wet clothes
B. Formation of water droplets on outside of a cold glass
C. Melting of wax D. Dissolving salt in water
45. Which state of matter has maximum intermolecular space?
A. solid B. liquid C. gas D. all equal
46. Matter changes from one state to another due to change in
A. colour only B. size only
C. temperature and pressure D. shape only
47. Which of the following can be stored in a cylinder because it is compressible?
A. stone B. milk C. cooking gas D. wood
48. The reason solids are rigid is that their particles
A. move very fast
B. are closely packed and strongly attracted
C. have no mass D. are very far apart
49. Which of these is not a characteristic of particles of matter?
A. They have spaces between them
B. They are continuously moving
C. They do not attract one another
D. They are very small
50. The particulate nature of matter helps explain
A. only colour of substances
B. only smell of substances
C. diffusion, dissolving and change of state
D. only sound production

Answers

- | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. B | 2. C | 3. C | 4. B | 5. C | 6. A | 7. B | 8. B | 9. C | 10. C |
| 11. A | 12. B | 13. D | 14. C | 15. C | 16. C | 17. C | 18. A | 19. C | 20. A |
| 21. B | 22. C | 23. B | 24. A | 25. B | 26. B | 27. C | 28. D | 29. B | 30. B |
| 31. B | 32. D | 33. B | 34. C | 35. B | 36. C | 37. B | 38. B | 39. C | 40. B |
| 41. C | 42. C | 43. B | 44. B | 45. C | 46. C | 47. C | 48. B | 49. C | 50. C |

COMPETENCY BASED QUESTIONS

1 Mark Questions

1. Which of the following statements is NOT correct?

A) Matter is made up of tiny particles.	B) Solids have a fixed shape and volume.
C) Gases have stronger interparticle attraction than solids.	D) Liquids take the shape of the container.
2. When sugar dissolves in water, the sugar particles ____

A) disappear completely	B) settle at the bottom
C) occupy spaces between water particles	D) change into water particles
3. Which state of matter has the maximum interparticle space?

A) Solid	B) Liquid	C) Gas	D) Plasma
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4. Which of the following has a definite volume but no fixed shape?

A) Stone	B) Water	C) Air	D) Iron nail
----------	----------	--------	--------------
5. Given below are three situations related to matter
 - (i) Fragrance of perfume spreading in a room
 - (ii) Sugar dissolving in water
 - (iii) Air getting compressed in a syringe
 Which of the above situations show movement or spacing of particles?

A) only case (i)	B) only cases (i) and (ii)	C) only cases (ii) and (iii)	D) all cases (i), (ii), and (iii)
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6. A solid changes into liquid on heating because ____

A) particles stop vibrating	B) interparticle attraction becomes weaker
C) particles disappear	D) interparticle spaces vanish
7. Which of the following statements is correct regarding gases?

A) Gases have fixed shape.	B) Gases cannot flow.
C) Gases occupy all available space.	D) Gas particles are tightly packed.
8. The temperature at which a solid changes into liquid is called ____

A) boiling point	B) condensation point	C) melting point	D) freezing point
------------------	-----------------------	------------------	-------------------
9. A student observes potassium permanganate spreading uniformly in water after some time. This shows that ____

A) water particles are stationary	B) particles of matter are continuously moving
C) solids cannot dissolve in liquids	D) liquids have no particles
10. Why can gases be compressed easily?

A) Gas particles are very large.	B) Gases have strong attractive forces.
C) There is a lot of space between gas particles.	D) Gas particles are fixed in position.
11. Which of the following has the strongest interparticle attraction?

A) Air	B) Water vapour	C) Water	D) Ice
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12. Which instrument/activity best demonstrates compressibility of gases?

A) Melting ice	B) Pushing air in a syringe	C) Dissolving sugar in water	D) Burning incense stick
----------------	-----------------------------	------------------------------	--------------------------
13. Why does fragrance from an incense stick spread throughout the room?

A) Gas particles are motionless.	B) Air particles help fragrance particles spread.
C) Smoke particles are heavier than air.	D) Incense stick attracts air particles.
14. Which statement is correct about solids?

A) They have no definite volume.	B) Their particles move freely everywhere.
C) Their particles are closely packed.	D) They easily flow from one place to another.
15. Which of the following is an example of evaporation?

A) Ice changing into water	B) Water boiling at 100°C	C) Wet clothes drying in air	D) Steam changing into water
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1-C 2-C 3-C 4-B 5-D 6-B 7-C 8-C 9-B 10-C 11-D 12-B 13-B 14-C 15-C

16. Assertion (A): Gases can fill the entire container.

Reason (R): Gas particles move freely in all 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 |

Ans: A

17. **Assertion (A):** Solids have fixed shape.

Reason (R): Particles in solids are tightly packed.

- 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

Ans: A

18. **Assertion (A):** Sugar dissolves in water.

Reason (R): There are spaces between particles of water.

- 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

Ans: A

19. **Match the Following**

Column A	Column B
1. Solid	a. No fixed volume
2. Liquid	b. Fixed shape
3. Gas	c. Takes shape of container
4. Melting point	d. Solid changes to liquid

Ans: 1-b 2-c 3-a 4-d

20. **Identify the state of matter**

Property	State
1. Fixed shape and volume	a. _____
2. Fixed volume but no fixed shape	b. _____
3. No fixed shape and no fixed volume	c. _____

Ans: a. Solid b. Liquid c. Gas

2 Marks Questions

1. **Why does perfume smell spread throughout a room?**

Ans: Perfume smell spreads throughout a room because the particles of perfume move continuously and mix with air particles. This process is called **diffusion**.

2. **Why does sugar disappear after dissolving in water?**

Ans: Sugar does not actually disappear. It breaks into tiny constituent particles that spread uniformly throughout the water and occupy the spaces between water particles.

3. **Why do gases occupy the entire container?**

Ans: Gas particles move freely in all directions and have very weak intermolecular attractions. Therefore, they spread out and occupy all the available space in a container.

4. **Define diffusion. Give one example.**

Ans: The spreading of particles from one place to another due to their continuous movement is called diffusion.

Ex: Ink spreading in water.

5. **A student added sugar to water and stirred it. The sugar disappeared, but the water tasted sweet.**

a) Why did the water taste sweet?

Ans: Sugar particles dissolved and spread throughout the water.

b) Why could sugar not be seen after dissolving?

Ans: Sugar particles occupied spaces between water particles.

c) What does this activity prove about matter?

Ans: Matter is made up of tiny particles with spaces between them.

d) Why did the sugar disappear?

Ans: Sugar particles mixed uniformly with water particles.

6. **A student burned an incense stick in one corner of the room.**

After some time, the fragrance spread everywhere.

a) Why did the fragrance spread throughout the room?

Ans: Gas particles move freely in all directions.

b) Which property of gases is shown here?

Ans: Diffusion of gases.

D) A is false but R is true

D) A is false but R is true



c) What does this show about gas particles?

Ans: Gas particles move freely and rapidly.

7. Why does potassium permanganate colour spread in water?

Ans: The colour spreads because potassium permanganate particles move continuously and mix with water particles. This demonstrates the movement of particles and diffusion in liquids.

8. Why can air be compressed but water cannot?

Ans: Air can be compressed because gas particles have large spaces between them. Water cannot be compressed easily because liquid particles are much closer together and have very little empty space.

4 Marks Questions

1. A drop of ink spreads throughout water without stirring. Explain.

Ans: Ink particles and water particles are continuously moving. Ink particles move into the spaces between water particles and spread throughout the water. This process is called diffusion.

2. Why can gases be compressed easily?

Ans: Gas particles have large spaces between them. When pressure is applied, these particles come closer together. Therefore, gases can be compressed easily.

3. Explain why matter is called particulate in nature.

Ans: Matter is called particulate in nature because it is made up of tiny particles.

Evidence: i) Sugar dissolves completely in water.

ii) Smell of food spreads in air.

iii) Ink diffuses in water.

These examples show that matter consists of tiny moving particles.

4. Explain the effect of temperature on diffusion.

Ans: When temperature increases, particles move faster. Therefore diffusion occurs more quickly.

Ex: Hot water mixes with ink faster than cold water.

5. Why does fragrance spread quickly in summer than in winter?

Ans: Temperature is higher in summer. Particles of fragrance gain more kinetic energy. They move faster and diffuse more quickly in air. Therefore, fragrance spreads faster in summer than in winter.

6. Why does ice melt when kept outside a refrigerator?

Ans: Ice absorbs heat from the surroundings. The particles gain energy and move faster. The attractive forces between particles become weaker. As a result, ice changes from a solid state to liquid water.

7. Why can gases fill the entire available space?

Ans: Gas particles move freely. Attraction between particles is negligible. Particles move in all directions. Hence gases occupy all available space.

8. Why can a syringe containing air be compressed easily but not when filled with water?

Ans: Air has large intermolecular spaces. These spaces decrease on compression. Water particles are closely packed. Therefore, water is nearly incompressible.

8 Marks Questions

1. Compare solids, liquids and gases. (or) Differentiate between the three states of matter.

Ans:

Property	Solids	Liquids	Gases
Shape	Fixed	No fixed shape	No fixed shape
Volume	Fixed	Fixed	No fixed volume
Interparticle spacing	Minimum	More than solids	Maximum
Interparticle attraction	Strongest	Moderate	Negligible
Movement of particles	Vibrate at fixed positions	Move within the liquid	Move freely in all directions
Compressibility	Very low	Very low	High
Diffusion	Slowest	Faster	Fastest

2. Explain the characteristics of particles of matter with suitable examples.

Ans: 1. Particles of matter are very small

Example: A small crystal of potassium permanganate can colour a large amount of water.

2. Particles of matter have spaces between them

Example: Sugar dissolves in water by occupying spaces between water particles.

3. Particles of matter are continuously moving

Example: Smell of incense sticks spreads throughout the room.

4. Particles of matter attract each other

Example: It is difficult to break a solid object because particles attract each other strongly.

Thus, matter is made up of tiny moving particles with spaces and attractive forces between them.

3. What is diffusion? Explain the diffusion process in solids, liquids and gases with examples.

Ans: The spreading of particles from one place to another due to their continuous movement is called diffusion.

Diffusion in gases: Gases diffuse very fast because particles move freely.

Ex: Smell of perfume spreading in air.

Diffusion in liquids: Liquids diffuse slower than gases.

Ex: Ink mixing with water.

Diffusion in solids: Diffusion in solids is very slow.

Ex: Two metal blocks joining together after long contact.

Diffusion is fastest in gases and slowest in solids.

4. Explain the changes of state of matter with suitable examples.

Ans: a) **Melting:** The process of changing solid into liquid by heating.

Ex: Ice changing into water.

b) **Freezing:** The process of changing liquid into solid by cooling.

Ex: Water changing into ice.

c) **Evaporation:** The process of conversion of a liquid into vapour at temperatures even below the boiling point is called evaporation.

Ex: Drying of wet clothes.

d) **Condensation:** The process of changing gas into liquid.

Ex: Formation of water droplets on a cold bottle.

e) **Sublimation:** The process in which a solid changes directly into gas.

Ex: Camphor changing into vapour.

5. A student adds sugar to water. Initially the water level rises, but after stirring it does not increase much.

Explain scientifically.

Ans: i) Sugar particles dissolve in water.

ii) Water contains intermolecular spaces.

iii) Sugar particles occupy these spaces.

iv) Therefore volume does not increase significantly.

v) This proves matter has spaces between particles.

vi) Sugar particles are tiny.

vii) Uniform solution is formed.

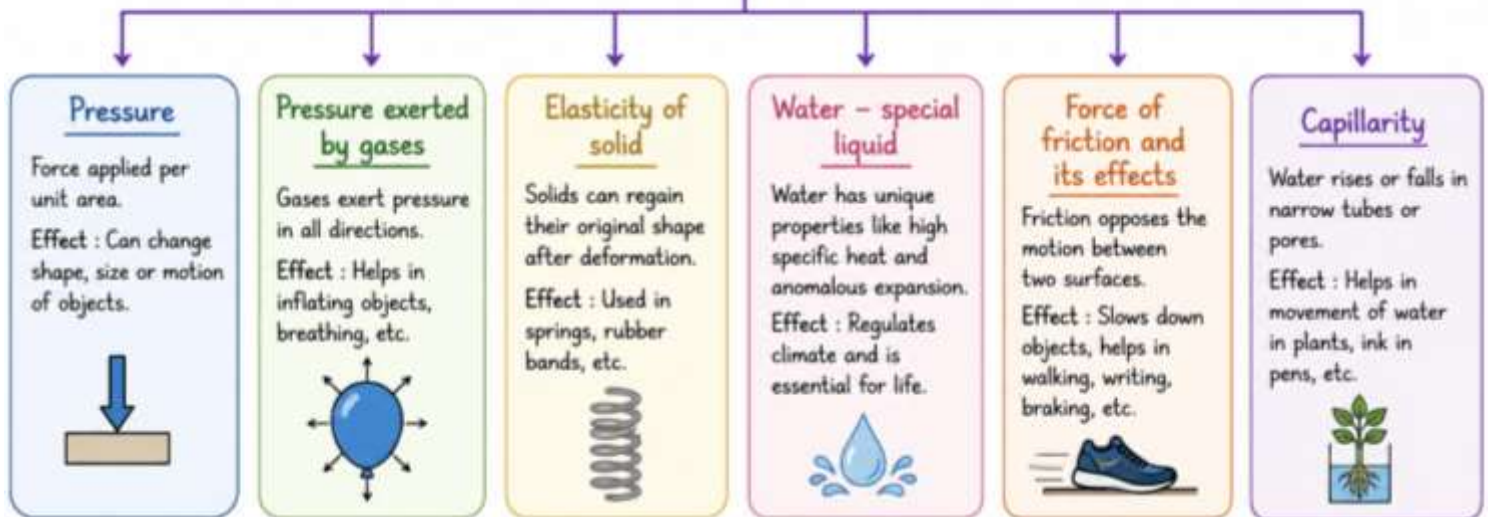
viii) This demonstrates particulate nature of matter.



CHAPTER - 4: Pressure and its Effects

Mind Map

Properties and its effects



Main Points

1. **Pressure is force per unit area.**
2. Pressure is calculated using: $\text{Pressure} = \text{Force} / \text{Area}$
3. The SI unit of pressure is **newton per square metre (N/m²)** or **pascal (Pa)**.
4. Broad straps reduce pressure by increasing the area over which force acts.
5. Smaller area produces **greater pressure** for the same force.
6. Sharp knives and pointed nails work easily because they exert **high pressure** on small areas.
7. Liquids exert pressure at the **bottom of containers**.
8. Pressure exerted by a liquid depends on the **height of the liquid column**.
9. Overhead water tanks are placed at a height to increase water pressure.
10. Liquids exert pressure on the **walls of containers** also.
11. Liquids exert pressure in **all directions**.
12. The atmosphere is the envelope of air surrounding Earth.
13. Air exerts pressure called **atmospheric pressure**.
14. Air pressure acts on all objects in all directions.
15. Balloons inflate because air inside exerts pressure on their walls.
16. Rubber suckers stick to surfaces due to atmospheric pressure difference.
17. The human body is not crushed by air pressure because internal body pressure balances atmospheric pressure.
18. Air moves from a **high-pressure region to a low-pressure region**.
19. Winds are caused due to **differences in air pressure**.
20. Sea breeze occurs during the day because land heats faster than water.
21. Land breeze occurs at night because water remains warmer than land.
22. High-speed winds create **low-pressure areas**.
23. Strong winds can blow off roofs due to pressure difference above and below roofs.
24. Warm moist air rises and creates a **low-pressure area**.
25. Storms form when rising warm air cools and water vapour condenses into clouds.
26. Rubbing of water droplets and ice particles creates **electric charges in clouds**.
27. Lightning occurs due to sudden flow of electric charges.
28. Thunder is caused by rapid heating and expansion of air around lightning.
29. A cyclone is a large storm formed over warm ocean waters with very low pressure at its centre.

30. The calm centre of a cyclone is called the **eye of the cyclone**.

-----: Definitions :-----

Pressure: Pressure is defined as force per unit area.

Atmosphere: The envelope of air surrounding the Earth is called atmosphere.

Atmospheric Pressure: The pressure exerted by the air around us is known as atmospheric pressure.

Storm: A storm is a weather condition with strong winds, often accompanied by rain and thunder.

Lightning: A sudden bright flash of light caused by electric discharge in the atmosphere is called lightning.

Thunder: The loud sound produced due to rapid heating and expansion of air during lightning is called thunder.

Thunderstorm: A storm accompanied by lightning and thunder is called a thunderstorm.

Cyclone: A spinning system of clouds, winds and rain formed around a very low-pressure area is called a cyclone.

Satellites: Objects placed in space that move around the Earth and help in weather observation and communication are called satellites.

Probe and Ponder

Why are winds stronger on some days than on others?

Winds are stronger on some days because of greater differences in air pressure and temperature. Air moves from high-pressure areas to low-pressure areas, creating stronger winds.

Why are water tanks usually placed at a height?

Water tanks are placed at a height so that water can flow down through pipes due to gravity. This provides enough water pressure for easy distribution.

Can air pressure really crush us?

No. Air pressure acts on our bodies from all directions, and the pressure inside our bodies balances the outside air pressure. Therefore, we are not crushed.

What causes storms and cyclones? If the Earth stopped rotating, would cyclones still form?

Storms and cyclones are caused by differences in air pressure, warm ocean water, and strong winds. The Earth's rotation helps cyclones spin. If the Earth stopped rotating, cyclones as we know them would not form because the spinning effect would be absent.

Share your questions.

1. Why does lightning occur during storms?
2. How are cyclones named?
3. Why do strong winds bend trees?
4. How do weather forecasts predict storms?
5. What safety measures should we take during a cyclone?

Intext Questions

1. Why are winds stronger on some days than on others?

Ans: Winds are stronger when the difference in air pressure between two places is large.

Greater pressure difference → faster moving air → stronger winds.

2. Why are water tanks usually placed at a height?

Ans: Water tanks are placed high so that gravity creates pressure, allowing water to flow easily through pipes to houses.

3. Can air pressure really crush us?

Ans: No, because our body has internal pressure that balances the external air pressure.

If this balance is disturbed (like in deep sea or high altitude), effects can be felt.

4. What causes storms and cyclones? If the Earth stopped rotating, would cyclones still form?

Ans: Storms and cyclones are caused by large differences in air pressure and temperature, which make air move very fast. The rotation of the Earth helps in the spinning of cyclones. If the Earth stopped rotating, cyclones would not form.

5. Do liquids also exert pressure?

Ans: Yes, liquids exert pressure due to their **weight**. The pressure increases with **depth**.

6. What will happen to the bulge of the balloon if we increase the height of the water column?

Ans: The **bulge increases** because higher water column → more pressure → balloon expands more.

7. Do liquids also exert pressure on the walls of the container?

Ans: Yes, liquids exert pressure on the walls of the container in all directions.

8. Does the difference in air pressure have anything to do with the formation of winds?

As it rises, it becomes cool and water vapour changes into tiny water drops. These water drops form big dark clouds. Strong winds and electric charges form inside the clouds, causing lightning and thunder. Then heavy rain and strong winds occur. This is called a thunderstorm.

7. Explain the process that causes lightning.

Ans: During a thunderstorm, strong winds make water droplets and ice particles move rapidly. These particles rub against each other and produce electric charges. Positive charges collect near the top of the cloud and negative charges near the bottom. When the amount of charge becomes very large, it flows suddenly between clouds or between cloud and earth. This sudden electric discharge produces a bright flash of light called **lightning**.

8. Explain why holes are made in banners and hoardings.

Ans: Strong winds create high pressure on banners and hoardings. If there are no holes, the wind may tear or blow them away. Holes allow air to pass through easily and reduce wind pressure. Therefore, holes are made in banners and hoardings to prevent them from getting damaged.

9. A person finds it easier to carry a schoolbag with wide straps than narrow straps because:

- A) Wide straps reduce the weight of the bag B) Wide straps reduce pressure on the shoulders
C) Wide straps increase force on the shoulders D) Narrow straps increase surface area

Ans: B) Wide straps reduce pressure on the shoulders

10. Choose the correct statement.

Look at Fig. 4.24 carefully. Vessel R is filled with water.

When pouring of water is stopped, the level of water will be _____

- A) the highest in vessel P B) the highest in vessel Q
C) the highest in vessel R D) equal in all three vessels



Fig. 4.24

Ans: D) equal in all three vessels

(Pressure depends on the height of water column, not the shape)

11. A rubber sucker (M) is pressed on a flat smooth surface and an identical sucker (N) is pressed on a rough surface:

- A) Both M and N will stick to their surfaces. B) Both M and N will not stick to their surfaces.
C) M will stick but N will not stick. D) M will not stick but N will stick.

Ans: C) M will stick but N will not stick.

(Smooth surface allows the air to be pushed out, creating a vacuum that helps it stick)

12. A water tank is placed on the roof of a building at a height 'H'. To get water with more pressure on the ground floor, one has to

- A) increase the height 'H' at which the tank is placed.
B) decrease the height 'H' at which the tank is placed.
C) replace the tank with another tank of the same height that can hold more water.
D) replace the tank with another tank of the same height that can hold less water.

Ans: A) increase the height 'H' at which the tank is placed.

(Pressure increases with the height of the water column)

13. Two vessels, A and B contain water up to the same level as shown in Fig. 4.25. P_A and P_B is the pressure at the bottom of the vessels. F_A and F_B is the force exerted by the water at the bottom of the vessels A and B.

- (a) $P_A = P_B$, $F_A = F_B$
(b) $P_A = P_B$, $F_A < F_B$, $F_A = F_B$
(d) $P_A > P_B$, $F_A > F_B$

Ans: A) $P_A = P_B$, $F_A = F_B$

(Same height = same pressure = same force)

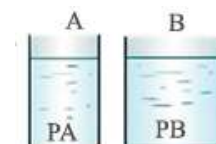


Fig. 4.25

14. An elephant stands on four feet. If the area covered by one foot is 0.25 m^2 , calculate the pressure exerted by the elephant on the ground if its weight is 20000 N.

Ans: Weight = 20000 N

Area per foot = 0.25 m^2

Total area = 4 feet = $4 \times 0.25 = 1 \text{ m}^2$

Pressure = $\frac{\text{Force}}{\text{Area}} = \frac{20000}{1} = 20000 \text{ Pa}$

15. There are two boats, A and B. Boat A has a base area of 7 m^2 , and 5 persons are seated in it. Boat B has a base area of 3.5 m^2 , and 3 persons are seating in it. If each person has a weight of 700 N, find out which boat will experience more pressure on its base and by how much?

Ans: Pressure on base of boat A

Pressure on base of boat B

$$\text{Area} = 7 \text{ m}^2$$

$$\text{Total weight} = 5 \times 700 = 3500 \text{ N}$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{3500}{7} = 500 \text{ Pa}$$

Boat B experiences more pressure and difference is 100 Pa

$$\text{Area} = 3.5 \text{ m}^2$$

$$\text{Total weight} = 3 \times 700 = 2100 \text{ N}$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{2100}{3.5} = 600 \text{ Pa}$$

16. Would lightning occur if air and clouds were good conductors of electricity? Give reasons for your answer.

Ans: No, lightning would not have occurred if air and clouds were good conductors.

17. State whether the following statements are True [T] or False [F].

A) Air flows from a region of higher pressure to a region of lower pressure. []

B) Liquids exert pressure only at the bottom of a container. []

C) Weather is stormy at the eye of a cyclone. []

D) During a thunderstorm, it is safer to be in a car. []

Ans: A) True B) False C) False D) True

18. Fig. 4.26(a) shows a boy lying horizontally, and Fig. 4.26(b) shows the boy standing vertically on a loose sand bed. In which case does the boy sink more in sand? Give reasons.



Ans: The boy sinks more when he is standing vertically in fig. 4.26(b).

When standing, his weight acts on a small area (feet), so pressure is more and he sinks more.

When lying down, weight spreads over a larger area, so pressure is less and he sinks less.



1. Hold a strip of paper, 18 cm long and 2 cm wide, between your thumb and forefinger so that it hangs freely.

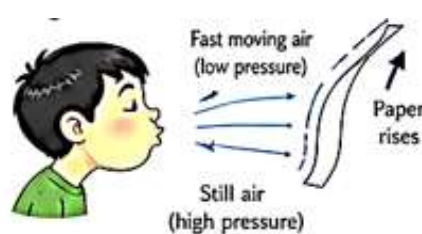
Predict what you will observe if you blow over the paper. Perform the activity now. Note down your observations and interpret your results.

Aim: To observe the effect of moving air on a paper strip and understand the concept of air pressure.

Materials Required: A strip of paper (18 cm long and 2 cm wide)

Procedure:

1. Hold the paper strip between your thumb and forefinger so that it hangs vertically.
2. Blow over the top surface of the paper strip.
3. Observe what happens.
4. Repeat the activity by blowing from different distances and strengths.
5. Note down your observations.



Observations and Results:

S. No.	Activity	What I Observed	Interpretation (Why it happened)
1	Held the paper strip freely	Paper hangs down	Air pressure is equal on both sides
2	Blew gently over the paper	Paper rises a little	Air above moves faster → pressure decreases → higher pressure below pushes paper up
3	Blew strongly over the paper	Paper rises more	Greater speed of air → greater drop in pressure → paper rises higher
4	Blew from a distance	No rise or very little rise	Air does not move fast enough → pressure difference is small

Conclusion: Blowing over the paper strip makes the air above it move faster. This reduces the air pressure above the strip. The higher pressure of the still air below pushes the paper up. Thus, moving air creates low pressure.

2. List three major cyclones which have occurred in India in the last 20 years. List two major destruction caused by each of the cyclones. What measures were taken by the local government and communities to reduce the loss of life and destruction of property? Mention two suggestions you would like to propose to the local government.

Aim: To find information about three major cyclones in India in the last 20 years, their effects and the measures taken to reduce damage.

Procedure:

1. Collect information from newspapers, internet and magazines.
2. List the cyclones and the year they occurred.
3. Find out the major destruction caused by each cyclone.
4. Note the measures taken by the local government and communities.
5. Think and suggest two ways to further reduce damage.

Three Major Cyclones in India (Last 20 Years)

S. No.	Cyclone Name (Year)	Area Affected	Two Major Destructions	Measures Taken by Local Government and Communities
1	Cyclone Aila (2009)	West Bengal	<ul style="list-style-type: none"> • Heavy flooding in low-lying areas. • Damage to crops and thousands of houses. 	<ul style="list-style-type: none"> • Early warning given through TV, radio and mobile. • People shifted to cyclone shelters. • Embankments and mangroves helped reduce damage.
2	Cyclone Phailin (2013)	Odisha	<ul style="list-style-type: none"> • Strong winds destroyed many houses and villages. • Power supply and communication systems affected. 	<ul style="list-style-type: none"> • Mass evacuation of people to shelters. • Schools used as relief centres. • Restoration of power and roads quickly after the cyclone.
3	Cyclone Fani (2019)	Odisha	<ul style="list-style-type: none"> • Severe damage to houses and trees. • Disruption of transport and electricity. 	<ul style="list-style-type: none"> • Early warnings by IMD and local officials. • Community volunteers helped in evacuation. • Distribution of food and water in relief camps.

Suggestions to Local Government:

1. Strengthen Cyclone Shelters and Infrastructure

Construct more cyclone-resistant shelters and strengthen houses, roads, and power lines in coastal areas.

2. Increase Public Awareness and Preparedness

Conduct regular disaster preparedness drills and awareness programs in schools and communities to help people respond effectively during emergencies.

Conclusion: Cyclones such as **Fani, Amphan, and Michaung** caused significant loss of life and property.

However, timely warnings, evacuations, disaster management efforts, and community cooperation greatly reduced the impact. Better preparedness and stronger infrastructure can further minimize future losses.

3. Collect data on the strength of thunderstorms for various regions of India. Compare your findings and identify which regions are more prone to thunderstorms. Can you give reasons for your findings?

Aim: To collect data on the strength and frequency of thunderstorms in different regions of India and analyse the results.

Procedure:

1. Collect data from IMD reports, newspapers, websites and weather apps.
2. Select different regions of India.
3. Note the average number of thunderstorm days per year and the average strength.
4. Compare the data and identify the most prone regions.
5. Find reasons for the variations.



Data on Thunderstorms in different regions of India (Average per Year)

S. No.	Region	Average Number of Thunderstorm Days	Average Strength (Level 1 to 5)	Characteristics
1	North-East India (Assam, Meghalaya)	60–80	4–5 (Very High)	High rainfall, hilly region, high humidity, Bay of Bengal moisture
2	East Coast (Odisha, West Bengal)	40–60	3–4 (High)	Coastal region, warm and humid air from Bay of Bengal
3	Central India (Madhya Pradesh, Chhattisgarh)	30–40	3 (Moderate to High)	Pre-monsoon heating causes thunderstorms
4	North India (Plains) (Delhi, Punjab, Haryana)	20–30	2–3 (Moderate)	Western disturbances and pre-monsoon thunderstorms
5	West Coast (Maharashtra, Goa)	20–30	2–3 (Moderate)	Arabian Sea moisture, but less than East Coast
6	West India (Rajasthan, Gujarat)	10–20	1–2 (Low)	Dry climate, less moisture
7	High Altitude Areas (Ladakh, Himachal Pradesh)	5–10	1–2 (Low)	Cold and dry, less thunderstorm activity

Reasons for High Thunderstorm Activity

1. Moisture from the Bay of Bengal:

- Warm, moisture-laden winds from the Bay of Bengal provide abundant water vapour.
- This moisture fuels the formation of large thunderclouds.

2. High Temperature and Humidity:

- During summer and pre-monsoon months, land surfaces become very hot.
- Warm air rises rapidly, leading to the formation of thunderstorms.

3. Mountainous Terrain:

- The Himalayas and northeastern hills force moist air to rise.
- Rising air cools and condenses, producing thunderstorms and heavy rain.

4. Nor'westers (Kalbaisakhi):

- Eastern and northeastern India experience severe pre-monsoon thunderstorms called **Nor'westers**.
- These storms bring strong winds, lightning, hail, and heavy rain.

Conclusion: Northeast India and Eastern India are the most thunderstorm-prone regions of the country, followed by Kerala and parts of South India. This is mainly due to abundant moisture from the Bay of Bengal, high temperatures, humid conditions, and the influence of hills and mountains that promote strong convection and cloud formation.

Activities

Activity 4.1

Aim: To show that liquids exert pressure and greater depth produces more pressure and not on the shape or volume of the container.

Required materials: Two plastic pipes (same length, different diameters), rubber balloons, water, stand/clamp, and thread.

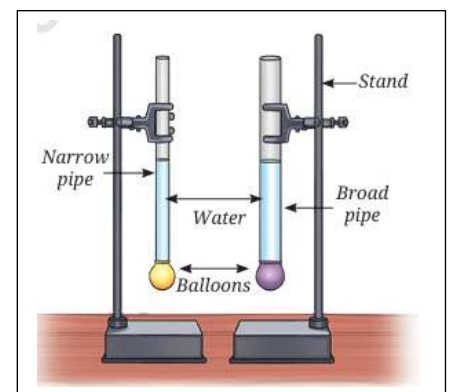
Procedure:

- Fix balloons to one end of both pipes.
- Clamp the pipes vertically on a stand.
- Pour equal amounts of water into both pipes.
- Observe the balloons.
- Now add more water to increase the water level.
- Observe the change in the balloons again.

Observation: Both balloons bulge when water is poured. The bulge

is similar when water levels are equal. When more water is added, the balloons bulge more.

Conclusion: Liquids exert pressure on the walls. Pressure increases with the height (depth) of the liquid.



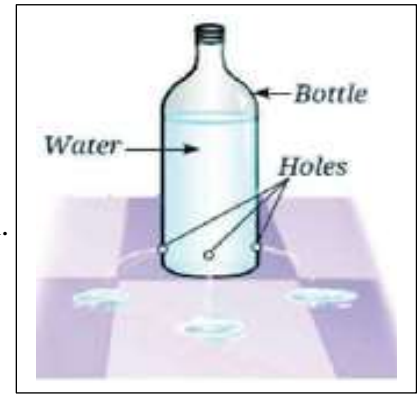
Activity 4.2

Aim: To show that liquids exert pressure on the sides of a container (or) To show that liquids exert pressure not just at the bottom but also on the sides of a container.

Required materials: Plastic bottle, needle or pin, tape, and water.

Procedure:

- Take a plastic bottle and make small holes around its sides near the bottom.
- Close all the holes with tape.
- Fill the bottle with water.
- Remove the tape from all holes at the same time.
- Observe the flow of water.



Observation: Water comes out from the holes on the sides of the bottle.

Conclusion: Liquids exert pressure not only at the bottom but also on the sides of a container.

Activity 4.3

Aim: To show that pressure in a liquid increases with depth.

Materials Required: Plastic bottle, water, pin/nail (to make holes).

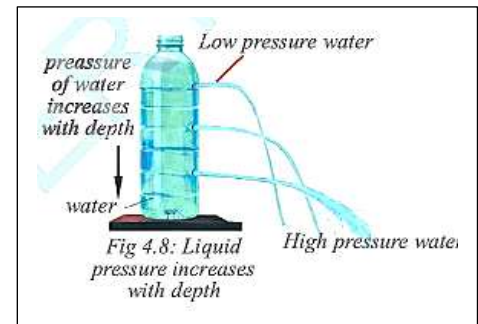
Procedure:

- Take a plastic bottle.
- Make three holes on one side at different heights.
- Fill the bottle with water.
- Observe the water flowing out from the holes.

Observation:

- Water from the lowest hole comes out with the greatest force and travels the farthest.
- Water from the middle hole comes out with moderate force.
- Water from the topmost hole comes out with the least force.

Conclusion: The pressure of a liquid increases with depth. Therefore, water at lower levels exerts more pressure than water at higher levels.

**Activity 4.4**

Aim: To show that air exerts pressure (or) To show that air exerts pressure from above and presses against surfaces.

Required materials: A paper plate, a stick, two chart paper sheets, and a table.

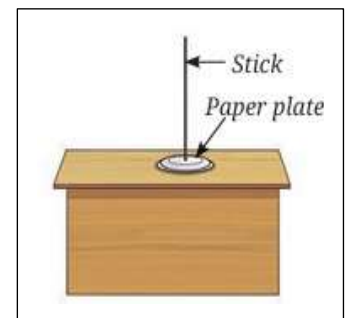
Procedure:

- Fix a stick at the center of a paper plate and place it on a table.
- Take a folded chart paper (with a hole in the center) and place it over the plate.
- Try to lift the plate using the stick and feel the effort.
- Now replace it with an unfolded (bigger) chart paper and try to lift again.
- Observe the effort needed.

Observation: It is easier to lift the plate with the smaller (folded) paper.

It is harder to lift the plate with the larger (unfolded) paper.

Conclusion: Air exerts pressure on objects. Greater surface area experiences more air pressure.

**Activity 4.5**

Aim: To show that atmospheric pressure can hold objects together (or)

To observe how air pressure helps a rubber sucker stick to a surface.

Required materials: Rubber sucker (suction cup) and a smooth flat surface (glass/table).

Procedure:

- Press the rubber sucker firmly on a smooth surface.
- Observe whether it sticks to the surface.
- Now try to pull it off.
- Notice the effort needed to remove it.

Observation: The rubber sucker sticks tightly to the surface. It is difficult to pull it off.

Conclusion: Air (atmospheric) pressure acts on objects. It presses the sucker against the surface and holds it firmly.



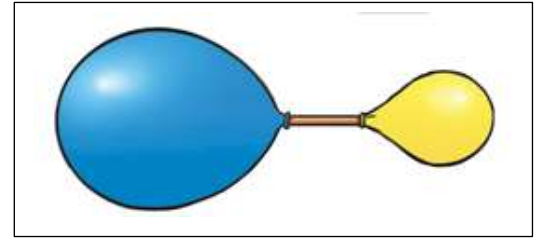
Activity 4.6

Aim: To show that air moves from a region of high pressure to a region of low pressure.

Required materials: Two balloons, a straw, and rubber bands.

Procedure:

- Blow air into one balloon and tie it.
- Attach the straw to the mouth of the inflated balloon.
- Fix the other balloon (empty) to the other end of the straw.
- Release the air from the first balloon into the second balloon.
- Observe what happens.



Observation: Air moves from the inflated balloon to the empty balloon.

The first balloon becomes smaller and the second balloon becomes bigger.

Conclusion: Air moves from high pressure (inflated balloon) to low pressure (empty balloon).

This shows the movement of air due to pressure difference.

Activity 4.7

Aim: To show that fast-moving air creates low pressure (or) To observe how High-speed wind reduces air pressure and affects nearby objects.

Required materials: Two balloons, thread, and a stick.

Procedure:

- Inflate two balloons and tie them with threads.
- Hang them from a stick with a small gap between them.
- Blow air gently between the balloons and observe.
- Now blow harder and observe again.

Observation: When air is blown between the balloons, they move towards each other.

When blown harder, they come closer faster.

Conclusion: Fast-moving air creates low pressure between the balloons.

Higher pressure outside pushes them together.



Prepare Some Questions Based on Your Learnings So Far

- Why can the smell of perfume spread quickly in a room?
- How do particles of matter move continuously?
- Why does sugar disappear when mixed in water?
- How can we prove that particles of matter have spaces between them?
- Where do we observe diffusion in our daily life?
- Why do gases spread faster than liquids?
- When does evaporation take place more quickly?
- How long can the smell of incense stick remain in a closed room?
- Why do solids have a fixed shape while liquids do not?
- Why does ice change into water when heated?

Multiple Choice Questions

1. Air exerts
 - A. no pressure
 - B. only upward pressure
 - C. pressure in all directions
 - D. pressure only downward
2. The pressure exerted by air is called
 - A. water pressure
 - B. atmospheric pressure
 - C. force pressure
 - D. wind pressure
3. Moving air is called
 - A. storm
 - B. cyclone
 - C. wind
 - D. pressure
4. Winds are produced due to
 - A. movement of clouds
 - B. differences in air pressure
 - C. rotation of Earth only
 - D. rainfall only
5. Air moves from a region of
 - A. low pressure to high pressure
 - B. high pressure to low pressure
 - C. equal pressure to unequal pressure
 - D. hot air to cold air only
6. When air is heated, it becomes
 - A. heavier and sinks
 - B. lighter and rises
 - C. unchanged
 - D. colder and denser
7. Land breeze blows during
 - A. daytime
 - B. nighttime
 - C. afternoon only
 - D. rainy season only
8. Sea breeze blows during
 - A. daytime
 - B. nighttime
 - C. winter only
 - D. midnight only
9. During the day, land gets heated
 - A. slower than water
 - B. faster than water
 - C. equally as water
 - D. not at all
10. At night, land cools
 - A. slower than water
 - B. faster than water
 - C. equally as water
 - D. never cools
11. A cyclone is a
 - A. gentle breeze
 - B. large scale wind system with low pressure at the centre
 - C. type of rainfall
 - D. snowstorm only
12. The centre of a cyclone is a region of
 - A. high pressure
 - B. low pressure
 - C. medium pressure
 - D. no pressure
13. Cyclones generally develop over
 - A. deserts
 - B. mountains
 - C. oceans with warm water
 - D. polar ice only
14. The calm central part of a cyclone is called the
 - A. storm wall
 - B. eye
 - C. centre ring
 - D. pressure hole
15. Very high speed winds in a cyclone can
 - A. cause no damage
 - B. uproot trees and damage houses
 - C. only cool the air
 - D. stop rainfall completely
16. Cyclones are often accompanied by
 - A. sunshine only
 - B. thunder, heavy rain and strong winds
 - C. snowfall only
 - D. dry weather only
17. In India, cyclone warnings are issued by
 - A. ISRO
 - B. DRDO
 - C. India Meteorological Department
 - D. NCERT
18. The instrument used to measure atmospheric pressure is
 - A. thermometer
 - B. barometer
 - C. anemometer
 - D. hygrometer
19. The instrument used to measure wind speed is
 - A. barometer
 - B. thermometer
 - C. anemometer
 - D. rain gauge
20. Air pressure decreases with
 - A. increase in height
 - B. decrease in height
 - C. increase in rainfall
 - D. increase in wind only
21. The main cause of winds on Earth is
 - A. unequal heating of Earth's surface
 - B. tides
 - C. magnetic field only
 - D. earthquakes
22. Warm air rises because it is
 - A. denser
 - B. lighter
 - C. wetter
 - D. heavier
23. Cooler air is generally
 - A. lighter
 - B. less dense
 - C. denser
 - D. hotter
24. A storm is
 - A. calm weather
 - B. violent weather with strong winds and often rain
 - C. only snowfall
 - D. only hot air
25. Tornadoes are
 - A. weak winds
 - B. rotating columns of air
 - C. ocean currents
 - D. land breezes
26. Cyclones in coastal regions can cause
 - A. storm surge
 - B. drought only
 - C. snowfall
 - D. earthquakes
27. A storm surge is
 - A. a sudden rise in sea water level
 - B. a fall in temperature
 - C. a decrease in wind speed
 - D. underground water flow
28. The best place to move during a cyclone warning is
 - A. open field
 - B. under a tree
 - C. safe shelter or strong building
 - D. near electric poles
29. During a cyclone, people should
 - A. go near the sea
 - B. ignore warnings
 - C. switch off electricity if advised
 - D. stand on rooftops
28. The best place to move during a cyclone warning is
 - A. open field
 - B. under a tree
 - C. safe shelter or strong building
 - D. near electric poles
29. During a cyclone, people should
 - A. go near the sea
 - B. ignore warnings
 - C. switch off electricity if advised
 - D. stand on rooftops
30. Which of the following is unsafe during a storm?
 - A. Staying indoors
 - B. Listening to official warnings

- C. Taking shelter under a tree
D. Keeping emergency supplies ready
- 31. Lightning usually occurs during**
A. fair weather only B. thunderstorms
C. winter nights only D. calm mornings only
- 32. During lightning, one should avoid**
A. open spaces B. metal objects
C. tall trees D. all of these
- 33. Monsoon winds are an example of**
A. local winds only B. seasonal winds
C. polar winds D. permanent storms
- 34. The movement of air from sea to land during the day is called**
A. land breeze B. sea breeze
C. cyclone D. storm surge
- 35. The movement of air from land to sea during the night is called**
A. sea breeze B. land breeze
C. tornado D. monsoon
- 36. Low pressure area is generally formed when air**
A. cools and sinks B. heats and rises
C. stops moving D. becomes solid
- 37. High pressure area is generally formed when air**
A. rises after heating B. cools and sinks
C. becomes lighter D. moves fast upward
- 38. Cyclones rotate due to**
A. Earth's rotation B. only sunlight
C. moonlight D. sea salt
- 39. Which of the following regions is more vulnerable to cyclones?**
A. coastal areas B. deserts
C. plateaus only D. mountain peaks only
- 40. One important safety measure before a cyclone is to**
A. keep emergency medicines and torch ready
B. go for swimming C. remove house roof
D. stand outside and watch clouds
- 41. Falling air pressure may indicate**
A. clear sky only B. approaching storm
C. no weather change D. snowfall always
- 42. Strong winds can increase evaporation and also cause**
A. no change B. damage to crops and buildings
C. only cooling effect D. only fog formation
- 43. The unequal heating of land and water causes**
A. sea breeze and land breeze B. earthquakes
C. volcanoes D. tides
- 44. The eye of a cyclone is usually**
A. the most violent part
B. calm compared to surrounding region
C. full of dust only D. hottest place on Earth
- 45. The region around the eye with the strongest winds is**
A. eye wall B. rain band
C. calm centre D. pressure belt
- 46. Cyclones can lead to**
A. floods B. destruction of houses
C. loss of life and property D. all of these
- 47. Which one is a warning sign of severe storm conditions?**
A. sudden drop in pressure
B. clear blue sky for many days
C. no wind movement at all times
D. low humidity only
- 48. The pressure exerted by air on us is not felt strongly because**
A. air has no weight
B. our body balances it internally
C. pressure acts only at night
D. gravity cancels it fully
- 49. Which disaster is mainly associated with intense low pressure over warm seas?**
A. cyclone B. earthquake
C. landslide D. drought
- 50. The most important thing during cyclone alerts is to**
A. spread rumours
B. follow official instructions carefully
C. go outdoors and observe D. travel to the beach

Answers

- | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. C | 2. B | 3. C | 4. B | 5. B | 6. B | 7. B | 8. A | 9. B | 10. B |
| 11. B | 12. B | 13. C | 14. B | 15. B | 16. B | 17. C | 18. B | 19. C | 20. A |
| 21. A | 22. B | 23. C | 24. B | 25. B | 26. A | 27. A | 28. C | 29. C | 30. C |
| 31. B | 32. D | 33. B | 34. B | 35. B | 36. B | 37. B | 38. A | 39. A | 40. A |
| 41. B | 42. B | 43. A | 44. B | 45. A | 46. D | 47. A | 48. B | 49. A | 50. B |

COMPETENCY BASED QUESTIONS

1 Mark Questions

1. Which of the following statements is NOT correct?

A) Pressure is force per unit area.	B) Liquids exert pressure in all directions.
C) Air does not exert pressure.	D) Broad straps reduce pressure on shoulders.
2. Why are school bags with broad straps more comfortable to carry?

A) They increase pressure on shoulders.	B) They reduce the area of contact.
C) They spread force over a larger area.	D) They reduce the weight of the bag.
3. Which of the following units is used to measure pressure?

A) Newton	B) Joule	C) Pascal	D) Watt
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4. Why are overhead water tanks placed at a height?

A) To decrease water pressure	B) To increase water pressure in taps
C) To reduce the weight of water	D) To cool the water
5. Given below are three situations related to pressure
 (i) Cutting fruits with a sharp knife (ii) Driving a nail with its pointed end (iii) Carrying loads with broad straps
 Which situations involve increasing pressure by reducing area?

A) only case (i)	B) only cases (i) and (ii)	C) only cases (ii) and (iii)	D) all cases (i), (ii), and (iii)
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6. Water flows out through holes in a bottle because ____

A) water has no weight	B) liquids exert pressure on container walls
C) air pushes water upward	D) gravity stops acting on water
7. Which of the following statements about atmospheric pressure is correct?

A) Air exerts no pressure.	B) Atmospheric pressure acts only upward.
C) Air exerts pressure in all directions.	D) Atmospheric pressure is weaker than vacuum only.
8. What happens when air is blown between two hanging balloons?

A) They move apart	B) They burst immediately	C) They move towards each other	D) They remain stationary
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9. High-speed winds create ____ -

A) high pressure regions only	B) low pressure regions	C) no pressure difference	D) gravitational force
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10. Winds blow from ____

A) low pressure to high pressure regions	B) high pressure to low pressure regions
C) colder regions to hotter regions only	D) oceans to mountains only
11. Sea breeze occurs during daytime because ____

A) sea gets heated faster than land	B) land gets heated faster than sea
C) both land and sea are equally heated	D) air moves from land to sea
12. Lightning occurs due to ____

A) collision of clouds only	B) sudden flow of electric charges
C) evaporation of water	D) movement of ocean waves
13. Which of the following is safe during lightning?

A) Standing under a tree	B) Holding a metal umbrella	C) Staying inside a car	D) Swimming in a pond
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14. The calm central region of a cyclone is called ____

A) storm zone	B) pressure belt	C) eye of the cyclone	D) thunder region
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15. Which of the following instruments protects buildings from lightning?

A) Thermometer	B) Lightning conductor	C) Barometer	D) Wind vane
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1-C 2-C 3-C 4-B 5-B 6-B 7-C 8-C 9-B 10-B 11-B 12-B 13-C 14-C 15-B

16. Assertion (A): Sharp knives cut easily.

Reason (R): Sharp edges exert more pressure.

- | | |
|---|-----------------------------|
| A) Both A and R are true and R is the correct explanation | D) A is false but R is true |
| B) Both A and R are true but R is not the correct explanation | |
| C) A is true but R is false | |

Ans: A

17. Assertion (A): Winds are caused by pressure differences.

Reason (R): Air moves from high pressure to low pressure regions.

- | | |
|---|-----------------------------|
| A) Both A and R are true and R is the correct explanation | D) A is false but R is true |
| 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

Ans: A

18. Match the Following

Column A	Column B
1. Cyclone	a. Calm centre
2. Eye of cyclone	b. Atmospheric pressure
3. Lightning conductor	c. Protects buildings
4. Air pressure	d. Strong rotating storm
5. Pressure	e. Air moving from high to low pressure
6. Wind	f. Force per unit area

Answers: 1-d 2-a 3-c 4-b 5.f 6.e

2 Marks Questions

1. Why are school bags provided with broad straps?

Ans: Broad straps increase the area over which the weight of the bag acts. Since pressure = Force/Area, increasing the area decreases the pressure on the shoulders, making the bag more comfortable to carry.

2. Why are dams broader at the bottom?

Ans: Pressure in a liquid increases with depth. The bottom of a dam experiences greater water pressure than the top. Therefore, dams are made broader and stronger at the bottom to withstand this pressure.

3. Why are overhead tanks built at heights?

Ans: The pressure exerted by water increases with the height of the water column. Overhead tanks are built at heights so that sufficient water pressure is available for water to flow through taps.

4. Why does a balloon bulge when attached to a bottle filled with water?

Ans: Water exerts pressure on the walls and bottom of the container. When a balloon is attached to the bottle, the pressure exerted by water causes the balloon to bulge outward.

5. Why do roofs sometimes blow away during storms?

Ans: During storms, high-speed winds create a low-pressure region above the roof. The air pressure inside the house remains higher, pushing the roof upward. As a result, weak roofs may blow away.

6. A force of 200 N acts on an area of 4 m². Find the pressure.

Ans: Pressure = Force/ Area
 = 200/4
 = 50 Pa

7. Megha and Praveen carried school bags of equal weight. Megha's bag had broad straps while Praveen's bag had narrow straps. Pawan felt pain on his shoulders.

a) Why did Praveen feel more pain?

Ans: Narrow straps exert greater pressure on the shoulders.

b) Why are broad straps more comfortable?

Ans: Spread force over a larger area and reduce pressure.

c) What formula relates force and pressure?

Ans: Pressure = Force / Area

8. During a storm, strong winds blew over the roofs of houses.

Some weak roofs were blown away.

a) Why were the roofs blown away?

Ans: High-speed winds created low pressure above the roof.

b) How can roof damage be reduced during storms?

Ans: By keeping doors and windows open to reduce pressure difference.

c) Which scientific principle explains this situation?

Ans: High-speed winds lower air pressure.

9. Name any two effects of cyclones.

Ans: i) Damage to houses and trees. ii) Heavy rainfall and floods.

10. What is a lightning conductor?

Ans: A **lightning conductor** is a metallic rod installed on buildings to provide a safe path for lightning charges to pass into the ground, protecting the building from damage.



4 Marks Questions

1. Why can a sharp needle pierce cloth more easily than a blunt needle?

Ans: A sharp needle can pierce cloth more easily because it has a very small tip area. When the same force is applied, the pressure exerted by the sharp needle is greater because pressure is inversely proportional to area. Due to this high pressure, the sharp needle easily penetrates the cloth, whereas a blunt needle exerts less pressure and cannot pierce as easily.

2. A water tank is placed on a building terrace. Why does water flow to lower floors without a motor?

Ans: Water stored in an overhead tank exerts pressure due to its height above the ground. The pressure of water increases with the height of the water column. Since the tank is placed on the terrace, sufficient pressure is created, allowing water to flow through pipes to the lower floors without the need for a motor.

3. Why do fishermen and weather departments monitor cyclones?

Ans: Fishermen and weather departments monitor cyclones because cyclones can cause severe damage through strong winds, heavy rainfall, and floods. Early detection and monitoring help issue warnings to people living in coastal areas. These warnings enable people to take necessary safety measures and save lives and property.

4. During a storm, doors and windows suddenly open. Explain.

Ans: During a storm, high-speed winds blow outside the house, reducing the air pressure outside. The air pressure inside the house remains comparatively higher. This pressure difference creates a force that pushes the doors and windows outward, causing them to open suddenly.

5. Explain any four safety measures to be followed during a cyclone.

Ans: i) Stay indoors in a safe place.
 ii) Keep emergency medicines, food and water ready.
 iii) Avoid touching electric poles and wires.
 iv) Listen to weather warnings and follow instructions from authorities.

6. Write safety measures during thunderstorms.

Ans: i) Stay indoors during lightning.
 ii) Avoid open fields and tall trees.
 iii) Do not use umbrellas with metal rods.
 iv) Stay away from electric poles.
 v) Listen to weather warnings.

7. How does atmospheric pressure affect our daily life?

Ans: i) Drinking through a straw works due to atmospheric pressure.
 ii) Syringes work because of pressure differences.
 iii) Winds are caused by atmospheric pressure differences.
 iv) Weather changes occur due to pressure variations in the atmosphere.

8. Why is it easier to cut fruits with a sharp knife than a blunt knife?

Ans: A sharp knife has a smaller area at its edge. When force is applied, it produces greater pressure because pressure is inversely proportional to area. The increased pressure helps the knife cut fruits easily. A blunt knife has a larger area and exerts less pressure.

9. How do liquids exert pressure on the walls of a container?

Ans: Liquids exert pressure not only at the bottom but also on the sides of a container. This can be observed when water flows out through holes made on the sides of a bottle. The flowing water shows that liquids exert pressure in all directions.

10. Why does a rubber sucker stick to a smooth surface?

Ans: When a rubber sucker is pressed against a smooth surface, most of the air inside it is pushed out. The pressure inside the sucker becomes less than the atmospheric pressure outside. The greater atmospheric pressure presses the sucker against the surface, causing it to stick firmly.

8 Marks Questions

1. Explain the formation of cyclones.

Ans: Cyclones form over warm ocean waters. The warm, moist air rises and creates a low-pressure region. More air rushes towards this region and also rises. As water vapour condenses into clouds, heat is released, causing the air to rise further and lowering the pressure more. Strong winds begin to spiral around the low-pressure centre. This rotating system of clouds and winds develops into a cyclone, which can cause heavy rain, floods and destruction.

2. Explain the formation of wind.

Ans: Wind is caused by differences in air pressure. When the Sun heats the Earth's surface, the air above it becomes warm and rises. This creates a low-pressure area. Cooler air from surrounding high-pressure regions moves towards the low-pressure area. This movement of air is called wind. The greater the pressure difference, the stronger the wind. Sea breezes and land breezes are examples of winds formed due to pressure differences.

3. Explain the formation of thunderstorms and lightning.

Ans: Thunderstorms form when warm, moist air rises rapidly and cools to form clouds. Strong upward and downward winds cause water droplets and ice particles to rub against each other, producing electric charges. Positive and negative charges accumulate in different parts of the cloud. When the charge difference becomes very large, a sudden discharge of electricity occurs, producing lightning. The rapid heating and expansion of air around the lightning path produce the sound called thunder.

4. Explain how a storm becomes a cyclone.

Ans: A storm becomes a cyclone in the following way:

1. When air over the sea becomes very hot, it rises up.
2. This creates a low-pressure area.
3. Surrounding air rushes in to fill this low pressure.
4. Warm moist air rises, cools, and forms clouds with heavy rain.
5. Due to the rotation of the Earth, the winds start rotating.
6. The storm grows stronger and develops into a cyclone.

Thus, a storm becomes a cyclone due to low pressure, rising warm air, and rotation of winds.

5. What is pressure? Explain its importance in daily life.

Ans: Pressure is defined as the force acting per unit area.

It is calculated using the formula $\text{Pressure} = \text{Force}/\text{Area}$.

The SI unit of pressure is Pascal (Pa).

Pressure plays an important role in daily life. Sharp knives, needles, nails and pins work effectively because they exert greater pressure due to their small area. Broad straps of school bags reduce pressure on shoulders by increasing the area of contact.

6. Explain sea breeze and land breeze.

Ans: Sea Breeze

- i) During daytime, land heats faster than sea water.
- ii) Warm air over land rises.
- iii) Cool air from the sea moves towards land.
- iv) This is called sea breeze.

Land Breeze

- i) During night time, land cools faster than sea water.
- ii) Warm air over the sea rises.
- iii) Cool air from land moves towards the sea.
- iv) This is called land breeze.

7. Explain the causes of winds, storms and cyclones with suitable examples.

Ans: Winds: Winds are caused due to differences in atmospheric pressure. Air moves from high-pressure regions to low-pressure regions.

Ex: Sea breeze and land breeze are examples of local winds.

Storms: Storms are violent weather conditions with strong winds, rain and thunder caused by sudden pressure differences.

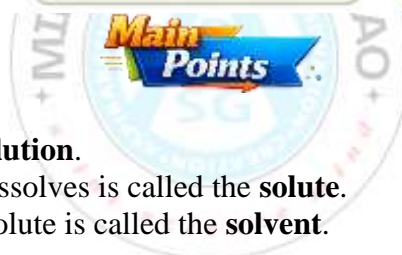
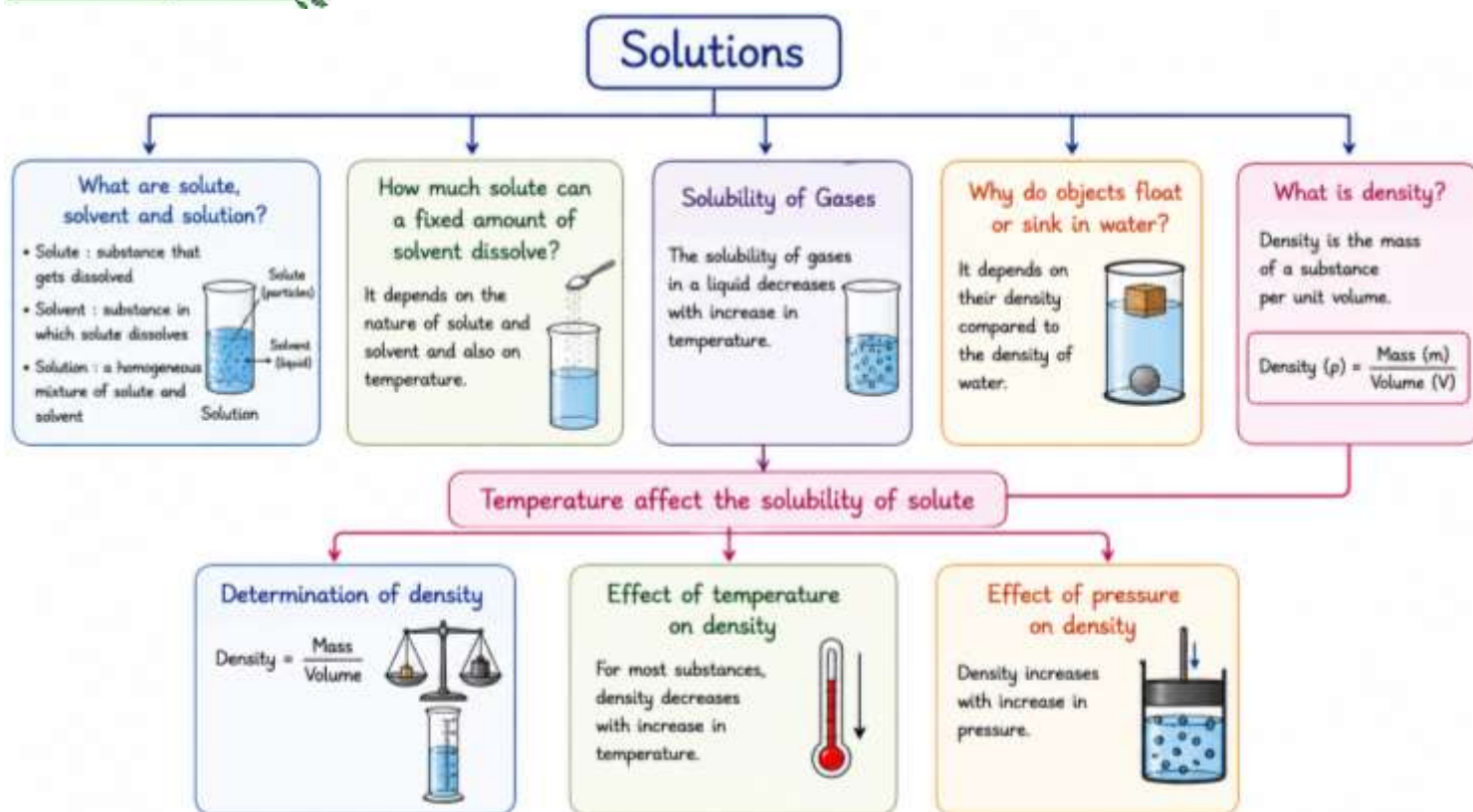
Ex: Thunderstorms occur during rainy seasons.

Cyclones: Cyclones are powerful rotating storms formed over warm ocean waters due to low-pressure systems.

Ex: Cyclones like Hudhud and Fani caused severe destruction in India.

CHAPTER - 5: Solutions

Mind Map



1. A **uniform mixture** is called a **solution**.
2. In a solution, the substance that dissolves is called the **solute**.
3. The substance that dissolves the solute is called the **solvent**.
4. Solute + Solvent → **Solution**.
5. Sugar and salt dissolve uniformly in water to form solutions.
6. Sand, chalk powder, and sawdust form **non-uniform mixtures** with water.
7. In mixtures of two liquids, the component present in smaller amount is called the **solute**.
8. Air is a **gaseous solution**.
9. In air, nitrogen acts as the **solvent**, while oxygen and other gases act as **solutes**.
10. A solution in which more solute can dissolve is called an **unsaturated solution**.
11. A solution in which no more solute dissolves at a given temperature is called a **saturated solution**.
12. The amount of solute present in a fixed quantity of solution is called its **concentration**.
13. A solution with less solute is called a **dilute solution**.
14. A solution with more solute is called a **concentrated solution**.
15. **Solubility** is the maximum amount of solute that dissolves in a fixed amount of solvent.
16. For most substances, solubility increases with increase in temperature.
17. A saturated solution becomes unsaturated when temperature increases.
18. Gases such as oxygen dissolve in water.
19. Dissolved oxygen in water supports aquatic life.
20. Solubility of gases decreases as temperature increases.
21. Density describes the heaviness of a substance.
22. Density is defined as **mass per unit volume**.
23. The formula for density is Density = Mass/ Volume
24. The SI unit of density is **kilogram per cubic metre (kg/m³)**.
25. Relative density compares the density of a substance with the density of water.

26. Mass is measured using a **balance**.
27. Volume of liquids is measured using a **measuring cylinder**.
28. Volume of irregular solids is measured by the **water displacement method**.
29. Generally, density decreases with increase in temperature.
30. Ice floats on water because ice is less dense than liquid water.

-----: Definitions :-----

Solute: The component that dissolves in a liquid to form a solution is called the solute.

Solvent: The liquid component in which the solute dissolves is called the solvent.

Solution: A homogeneous (uniform) mixture formed by dissolving a solute in a solvent is called a solution.

Unsaturated Solution: A solution in which more solute can still be dissolved at a given temperature is called an unsaturated solution.

Saturated Solution: A solution in which no more solute can be dissolved at a given temperature is called a saturated solution.

Dilute Solution: A solution containing a relatively smaller amount of solute is called a dilute solution.

Concentrated Solution: A solution containing a relatively larger amount of solute is called a concentrated solution.

Solubility: The maximum amount of solute that can dissolve in a fixed quantity of solvent at a given temperature is called solubility.

Probe and Ponder

What do you think is happening in the picture above?

The picture shows Mahatma Gandhi and his followers walking along a seashore and collecting salt from seawater. This represents the Dandi March (Salt March), a movement against the British salt tax.

What happens when you add too much sugar to your tea and it stops dissolving? How can you solve this problem?

When too much sugar is added, the tea becomes a saturated solution and no more sugar can dissolve. Add more hot tea or warm the tea so that additional sugar can dissolve.

Why do sugar and salt dissolve in water but not in oil? Why is water considered a good solvent?

Sugar and salt dissolve in water because water can attract and separate their particles. Oil cannot do this effectively.

Water is called a good solvent because it can dissolve many substances.

Why are water bottles usually tall and cylindrical instead of spherical?

Are easy to hold and carry, Can stand upright without rolling, Fit easily in bags, bottle holders, and refrigerators, Can be stored and stacked efficiently.

Share your questions.

1. Why does salt dissolve faster in hot water than in cold water?
2. Why does oil float on water?
3. How is sea salt obtained from seawater?
4. Why do some substances dissolve in water while others do not?
5. What happens when water evaporates from a salt solution?

Intext Questions

1. What happens when you add too much sugar to your tea and it stops dissolving? How can you solve this problem?

Ans: When too much sugar is added, it stops dissolving and settles at the bottom. This is a saturated solution. We can solve it by adding more water or heating the tea.

2. Why do sugar and salt dissolve in water but not in oil? Why is water considered a good solvent?

Ans: Sugar and salt dissolve in water because water is a good solvent. They do not dissolve in oil because oil has different properties. Water is called a good solvent because it dissolves many substances.

3. Why are water bottles usually tall and cylindrical in shape instead of spherical?

Ans: Water bottles are tall and cylindrical because they are easy to hold, store, and carry. They also save space better than spherical bottles

4. Why does ORS not taste salty in one sip and sweet in another?

Ans: ORS tastes the same in every sip because salt and sugar dissolve completely and form a uniform solution.

5. What happens when chalk powder is mixed with water—does it form a uniform mixture?

Ans: No, chalk powder in water does not form a uniform mixture. It forms a non-uniform mixture because chalk settles down.

6. Would a mixture of gases also be considered a solution?

Ans: Yes, a mixture of gases can also be a solution, like air. It is a uniform mixture.

7. What will happen if we keep on adding more salt in a given amount of water?

Ans: If we keep adding more salt, after some time it stops dissolving and settles at the bottom.

8. How many spoons of salt were you able to dissolve before some of it remained undissolved?

Ans: It depends on the amount of water, but usually 3–4 spoons dissolve before some remains undissolved.

9. What does this indicate about the capacity of water to dissolve salt?

Ans: This shows that water has a limited capacity to dissolve salt.

10. Can you now reflect — which solution is more concentrated; 2 spoons of salt in 100 mL of water or 4 spoons of salt in 50 mL of water?

Ans: 4 spoons of salt in 50 mL water is more concentrated.

11. Does temperature affect the solubility of a solute?

Ans: Yes, temperature affects solubility. Higher temperature usually helps more solute dissolve.

12. Is the mixture of gases in water a uniform or non-uniform mixture?

Ans: The mixture of gases in water is a uniform mixture if the gases dissolve completely.

13. Does temperature affect the solubility of gases in liquids also? If so, how?

Ans: Yes, gases dissolve less in liquids when temperature increases.

14. I observed that in some non-uniform mixtures, such as sawdust in water, the sawdust floats, whereas in the mixture of sand and water, the sand sinks. I wonder why that happens?

Ans: Sawdust floats because it is lighter than water. Sand sinks because it is heavier than water.

15. Have you noticed that some packets of ghee or oil are labelled with a volume of 1 litre but a weight of only say 910 grams (Fig. 9.11)? What does this tell us about the density of the oil, and is it less or more than that of water?

Ans: It shows that oil is less dense than water because 1 litre oil weighs less than 1 litre water.

16. A tetra pack says it contains 200 mL buttermilk (chach) (Fig. 9.14). What does that mean?

Ans: It means the tetra pack contains 200 mL of buttermilk by volume.

17. What is the maximum volume it can measure?

Ans: The maximum volume is the highest marking shown on the measuring cylinder.

18. What is the smallest volume it can measure?

Ans: The smallest volume is one small division on the measuring cylinder.

19. How much is the volume difference indicated between the two bigger marks (for example, between 10 mL and 20 mL)?

Ans: The difference is 10 mL.

20. How many smaller divisions are there between the two bigger marks?

Ans: Usually there are 10 smaller divisions

21. How much volume does one small division indicate?

Ans: One small division indicates 1 mL.

22. Why are measuring cylinders always designed narrow and tall instead of wider and short like a beaker?

Ans: Measuring cylinders are narrow and tall to measure liquid more accurately.

23. I wonder how the level of a coloured liquid is measured?

Ans: The level of coloured liquid is measured by looking at the lower curve (meniscus) at eye level.

24. Did you know that our planet, Earth, is composed of several layers, such as crust, upper mantle, lower mantle, outer core, and inner core, each with its particular range of density?

Ans: Yes, Earth has layers like crust, mantle, and core, and each layer has different density.

25. how is the density of solids affected when pressure is applied?

Ans: Solids are even less affected by pressure than liquids, and changes in their density are usually negligible.

26. Why does ice float on water?

Ans: Ice floats on water because ice is less dense than water.



1. Define the following

a) Solution

b) Solute

c) Solvent

d) Saturated solution

e) Unsaturated solution

f) Solubility

g) Mass

h) Volume

i) Density

Ans: a) Solution: A homogeneous (uniform) mixture formed by dissolving a solute in a solvent is called a solution.

b) Solute: The component that is dissolved in the solvent is called the solute.

c) Solvent: The component in which the solute dissolves is called the solvent.

d) Saturated solution: A solution in which no more solute can be dissolved at a given temperature is called a saturated solution.

e) Unsaturated solution: A solution in which more solute can be dissolved at a given temperature is called an unsaturated solution.

f) Solubility: The maximum amount of solute that can be dissolved in a particular solvent at a particular temperature is called solubility.

g) Mass: Mass is the amount of matter in an object.

h) Volume: The amount of space occupied by an object is called its volume.

i) Density: Density is the mass per unit volume of a substance.

2. Pressure is best described as

A. The total force acting on an object

B. The force acting per unit area

C. The area over which force is applied

D. The weight of an object

Ans: B. The force acting per unit area

3. Fill in the blanks.

(i) The volume of a solid can be measured by the method of displacement, where the solid is _____ in water and the _____ in water level is measured.

(ii) The maximum amount of _____ dissolved in _____ at a particular temperature is called solubility at that temperature.

(iii) Generally, the density _____ with increase in temperature.

(iv) The solution in which glucose has completely dissolved in water, and no more glucose can dissolve at a given temperature, is called a _____ solution of glucose.

Ans: (i) immersed, change (ii) solute, solvent (iii) decreases (iv) saturated

4. You pour oil into a glass containing some water. The oil floats on top. What does this tell you?

(i) Oil is denser than water

(ii) Water is denser than oil

(iii) Oil and water have the same density

(iv) Oil dissolves in water

Ans: (ii) Water is denser than oil

Since oil floats on water, it shows that oil has lower density than water.

5. You are provided with an experimental setup as shown in Fig. 5.26(a) and 5.26(b). On keeping the test tube (Fig 5.26b) in a beaker containing hot water (~70 °C), the water level in the glass tube rises. How does it affect the density?

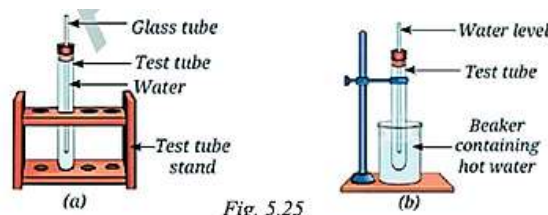


Fig. 5.25

Ans: When the test tube is placed in hot water, the water inside gets heated and expands, causing the water level in the glass tube to rise. Since mass remains constant but volume increases, the density of water decreases.

6. A stone sculpture weighs 225 g and has a volume of 90 cm³. Calculate its density and predict whether it will float or sink in water.

Ans: Given Mass = 225 g Volume = 90 cm³

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Density} = \frac{225}{90} = 2.5 \text{ g/cm}^3$$

The density of the sculpture is greater than the density of water, the stone sculpture will sink in water.

7. You have a bottle with a volume of 2 litres. You pour 500 mL of water into it. How much more water can the bottle hold?

Ans: Bottle capacity = 2 L = 2000 mL, Water poured = 500 mL

Remaining capacity = 2000 - 500 = 1500 mL = 1.5 L

8. An object has a mass of 400 g and a volume of 40 cm³. What is its density?

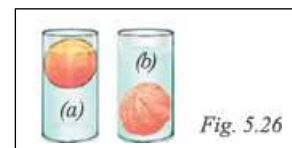
Ans: Given: Mass = 400 g Volume = 40 cm³

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{400}{40} = 10 \text{ g/cm}^3$$

9. Analyse Fig. 5.25(a) and 5.25(b).

Why does the unpeeled orange float, while the peeled one sinks? Explain.

Ans: The unpeeled orange floats because the peel contains air spaces, which reduce the overall density of the orange, making it less than that of water. The peeled orange sinks because the air-filled peel is removed, so its density becomes greater than water, and it sinks.



10. Object A has a mass of 200 g and a volume of 40 cm³. Object B has a mass of 240 g and a volume of 60 cm³. Which object is denser?

Ans: $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

$$\text{Object A:} \\ \text{Density} = \frac{200}{40} = 5 \text{ g/cm}^3$$

$$\text{Object B:} \\ \text{Density} = \frac{240}{60} = 4 \text{ g/cm}^3$$

Object A is denser.

11. Reema has a piece of modeling clay that weighs 120 g. She first moulds it into a compact cube that has a volume of 60 cm³. Later, she flattens it into a thin sheet. Predict what will happen to its density.

Ans: $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

The mass of the clay remains 120 g in both shapes.

The volume of the clay also remains the same (60 cm³), even when it is flattened.

The density remains unchanged, because density depends only on mass and volume, not on shape.

12. A block of iron has a mass of 600 g and a density of 7.9 g/cm³. What is its volume?

Ans: Given: Mass = 600 g Density = 7.9 g/cm³

$$\text{Volume} = \frac{\text{Mass}}{\text{Density}} = \frac{600}{7.9} = 75.95 \text{ cm}^3 \approx 76 \text{ cm}^3$$

13. Ravi lives on the ground floor of an apartment building. His neighbour lives on the first floor. Both flats receive water from the same overhead tank, but Ravi notices that water flows with greater force from his taps than in his neighbour's taps. What is the most appropriate reason for this observation?

- A. Water becomes heavier as it flows downward
- B. The water tank contains more water for the ground floor
- C. The length of the pipe connected to the ground floor is longer
- D. The pressure at the tap increases due to a greater height of the water column

Ans: D. The pressure at the tap increases due to a greater height of the water column

14. Which one of the following is the most appropriate statement, and why are the other statements not appropriate?

- (i) A saturated solution can still dissolve more solute at a given temperature.
- (ii) An unsaturated solution has dissolved the maximum amount of solute possible at a given temperature.
- (iii) No more solute can be dissolved into the saturated solution at that temperature.
- (iv) A saturated solution forms only at high temperatures.

Ans: Correct statement: (iii) No more solute can be dissolved into the saturated solution at that temperature.

(i) Incorrect — a saturated solution cannot dissolve more solute at the same temperature.

(ii) Incorrect — this describes a saturated, not an unsaturated, solution.

(iv) Incorrect — a saturated solution can form at any temperature, not only at high temperatures.



1. Research project on Dead Sea: Why is there no aquatic life in the Dead Sea? Try to find out if there are any other similar water bodies.

Aim: To find out why there is no aquatic life in the Dead Sea and to research if there are other similar water bodies.

Steps

1. Collect information from books, articles and websites.
2. Note down the location, features and water composition of the Dead Sea.
3. Understand the role of solutes in water.
4. Find other similar water bodies and compare them.



5. Prepare charts, diagrams and models.

Why is there no aquatic life in the dead sea?

1. The Dead Sea has an extremely high concentration of dissolved salts (solutes).
2. Salinity is about **34.2%**, almost 10 times saltier than normal seawater.
3. High salt concentration makes the water very dense.
4. This causes a strong osmosis effect. Water moves out of living cells of fish and plants into the salty water.
5. The cells lose water, shrink and die.
6. Very high salt also affects reproduction and survival of aquatic organisms.
7. Lack of inflow of fresh water and high evaporation increase salt concentration.

Why Is the Dead Sea So Salty?

1. The Dead Sea has no outlet to the ocean.
2. Water enters mainly from the Jordan River.
3. Due to the hot climate, water evaporates rapidly.
4. Salts remain behind and accumulate over thousands of years, increasing salinity.

Similar Water Bodies in the World

1. **Great Salt Lake:** Located in the United States. Very salty and supports only limited life such as brine shrimp and algae.
2. **Lake Retba:** Also called the Pink Lake. Known for its high salt content and pink colour caused by salt-tolerant algae.
3. **Lake Assal:** One of the saltiest lakes in the world. Very few organisms can survive in it.
4. **Don Juan Pond:** Extremely salty and rarely freezes. Supports only microscopic life.

Other water bodies with high salinity

Water Body	Location	Salinity / Features	Aquatic Life
Great Salt Lake	Utah, USA	Salinity varies (5%–27%), high in summer	Very few brine shrimp and algae
Lake Retba (Pink Lake)	Senegal, Africa	Salty due to high evaporation, pink colour from algae	Some microorganisms and algae only
Lake Assal	Djibouti, Africa	One of the saltiest lakes (>35%)	No fish; only salt-loving microbes
Don Juan Pond	Antarctica	Extremely salty brine pond	No aquatic life

Final Conclusion: The Dead Sea has a very high concentration of dissolved salts. This extreme salinity makes it impossible for most aquatic life to survive. Similar water bodies exist in different parts of the world with little or no life. Understanding solutes, solvents and solutions helps us understand these natural wonders and their importance.

2. Investigate how well common salt dissolves in different solvents, such as water, vinegar, and oil. Compare the solubility of salt in each solvent and record your observations.

Aim: To investigate how well common salt dissolves in different solvents – water, vinegar and oil.

Materials Needed: Common salt, Water, Vinegar, Cooking oil, 3 transparent cups or beakers, 3 spoons, Stirring rod, Labels, Notebook

Procedure:

1. Take equal amounts (50 mL) of each solvent in 3 different cups.
2. Add 1 teaspoon (about 5 g) of salt to each cup.
3. Stir each mixture with a spoon for 1 minute.
4. Observe what happens.
5. Record your observations in the table.
6. Compare the solubility of salt in each solvent.

Observations:

Solvent (50 mL each)	Before Adding Salt	Observation After Adding 1 Teaspoon (5 g) of Salt and Stirring	Undissolved Salt (if any)	Solubility of Salt
Water (Transparent, colourless)	Clear liquid	Salt disappears completely. Solution is clear. No particles visible.	None	HIGH (Dissolves completely)
Vinegar (Acidic, colourless)	Clear liquid	Salt dissolves completely. Solution is clear. No particles visible.	None	HIGH (Dissolves completely)

Oil (Yellowish, transparent)	Clear liquid	Salt does not dissolve. Particles settle at the bottom. Oil remains separate.	Most of the salt remains	INSOLUBLE (Does not dissolve)
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Water	Vinegar	Oil
Water is a polar solvent. Salt dissolves readily because water molecules attract and separate the salt particles.	Vinegar is mostly water with a small amount of acetic acid. Salt dissolves fairly well because of the water present.	Oil is a non-polar solvent. Salt does not dissolve because oil molecules cannot separate the salt particles.

Conclusion: Our investigation shows that common salt dissolves completely in water and vinegar but does not dissolve in oil. Solubility depends on the nature of the solvent. This knowledge helps us make smart choices in daily life and in many real-world applications.

3. Debate in class — Is water truly the most versatile solvent?

Topic: "Is Water Truly the Most Versatile Solvent?"

Introduction: Water is often called the "**Universal Solvent**" because it can dissolve more substances than most other liquids. But is it truly the most versatile solvent? Let's debate!

Team A	Team B
YES – Water is the Most Versatile Solvent	NO – Water is Not the Most Versatile Solvent
<p>Arguments:</p> <ol style="list-style-type: none"> Dissolves a Wide Variety of Substances Salt, sugar, acids, bases, and many gases dissolve in water. Essential for Life Nutrients and minerals are transported in the body through water. Abundant and Environment-Friendly Water is easily available, non-toxic, and inexpensive. Used in Many Industries Water is used in cooking, cleaning, agriculture, medicine, and manufacturing. Supports Chemical Reactions Many biological and chemical reactions occur in aqueous solutions. <p>Examples: Salt dissolved in water. Sugar dissolved in tea. Oxygen dissolved in water supports aquatic life.</p>	<p>Arguments:</p> <ol style="list-style-type: none"> Dissolves a Wide Variety of Substances Salt, sugar, acids, bases, and many gases dissolve in water. Essential for Life Nutrients and minerals are transported in the body through water. Abundant and Environment-Friendly Water is easily available, non-toxic, and inexpensive. Used in Many Industries Water is used in cooking, cleaning, agriculture, medicine, and manufacturing. Supports Chemical Reactions Many biological and chemical reactions occur in aqueous solutions. <p>Examples: Cooking oil does not mix with water. Nail polish remover (acetone) works better than water for removing nail polish.</p>

Comparison Table:

Water	Other Solvents
Dissolves many ionic and polar substances	Dissolve many non-polar substances
Non-toxic and eco-friendly	Often specialized for particular tasks
Essential for life	Useful in industries and laboratories
Cannot dissolve oil and grease	Can dissolve substances water cannot

Teacher's Conclusion: Water is called the "Universal Solvent" because it dissolves more substances than any other common liquid and is essential for life. However, it cannot dissolve every substance. Other solvents are needed for materials such as oils, waxes, paints, and plastics.

Final Verdict: Water is the most versatile and widely used solvent in nature and daily life, but it is not a perfect solvent because some substances dissolve better in other solvents.

Activites

Activity 5.1

Aim: To find how much solute can dissolve in a fixed amount of solvent (or) To understand the concepts of saturated and unsaturated solutions.

Required materials: Glass tumbler, water, salt, spoon.

Procedure:

Amount of salt taken (teaspoon)	Observation (salt dissolves/salt does not dissolve)
One	Salt dissolved completely
Two	Salt dissolved completely
Three	Salt dissolved completely
Four	Salt does not dissolve completely
Five	Salt begins to settle at the bottom

- a) Fill a glass with a fixed amount of water.
- b) Add one spoon of salt and stir until it dissolves.
- c) Keep adding salt spoon by spoon and stir each time.
- d) Count how many spoons dissolve completely.
- e) Stop when the salt no longer dissolves.

Observation: Salt dissolves easily at first. After some time, extra salt does not dissolve and settles at the bottom.

Conclusion: Only a fixed amount of solute can dissolve in a given amount of solvent.

This maximum amount is called solubility.

Activity 5.2

Aim: To study how temperature affects the solubility of a solute.

Required materials: Beaker, water, baking soda, thermometer, glass rod, heat source.

Procedure:

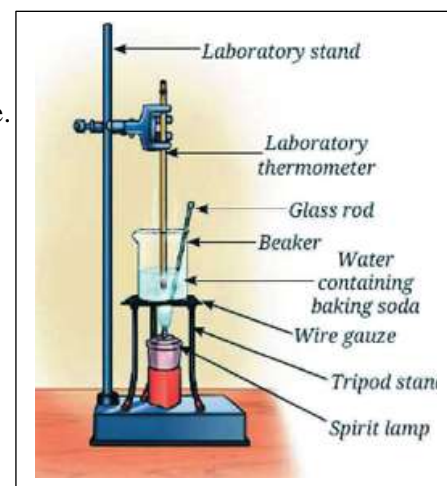
- a) Take water in a beaker and note its temperature.
- b) Add baking soda little by little and stir until it stops dissolving.
- c) Heat the solution to about 50°C while stirring.
- d) Observe what happens to the undissolved baking soda.
- e) Add more baking soda and repeat.
- f) Heat further to about 70°C and observe again.

Observation: More baking soda dissolves when the temperature increases.

Undissolved baking soda dissolves on heating.

Conclusion: Solubility of a substance increases with temperature.

Hot water can dissolve more solute than cold water.



Activity 5.3

Aim: To measure the mass of an object using a digital weighing balance.

Required materials: Digital weighing balance, watch glass (or butter paper), solid object (stone, etc.).

Procedure:



- a) Switch ON the digital weighing balance.
- b) Check if the reading is zero (reset if needed).
- c) Place a watch glass on the balance and reset to zero again.
- d) Now place the solid object on the watch glass.
- e) Note the reading shown on the balance.

Observation: The balance shows the mass of the object in grams. Different objects show different readings.

Conclusion: A digital weighing balance is used to measure mass accurately.
Mass is measured in grams (g) or kilograms (kg).

Activity 5.4

Aim: To find the least count and capacity of a measuring cylinder.

Required materials: Measuring cylinder.

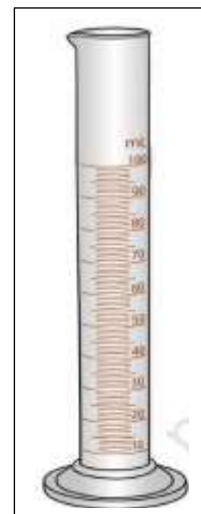
Procedure:

- Take a measuring cylinder and observe its markings.
- Note the maximum value marked (capacity).
- Find the difference between two big markings (Examples 10 mL to 20 mL).
- Count the number of small divisions between them.
- Divide the value difference by the number of small divisions.

Observation: The cylinder can measure up to its maximum marked value (Example: 100 mL). There are equal small divisions between big markings.

Each small division represents a fixed volume (Example: 1 mL).

Conclusion: The least count of the measuring cylinder is the value of one small division.
It helps in measuring liquid volume accurately.



Activity 5.5

Aim: To measure 50 mL of water using a measuring cylinder (or) To measure 50 mL of water accurately using a measuring cylinder and understand how to read the meniscus.

Required materials: Measuring cylinder, water.

Procedure:

- Place the measuring cylinder on a flat surface.
- Pour water slowly into the cylinder.
- Adjust the level to 50 mL using a dropper if needed.
- Keep your eye level with the marking.
- Read the level at the bottom of the curved surface (meniscus).

Observation: The water forms a curved surface (meniscus).

The correct reading is taken at the bottom of the meniscus.

Conclusion: Liquids are measured accurately using a measuring cylinder.
Reading should be taken at eye level using the meniscus.



Activity 5.6

Aim: To calculate the volume of a solid object with a regular shape.

Required materials: Cuboid-shaped object (notebook/box), scale.

Procedure:

- Take a cuboid-shaped object.
- Measure its length (l), width (w), and height (h) using a scale.
- Use the formula: $\text{Volume} = l \times w \times h$.
- Calculate the volume.

Object	Length (l) cm	Width (w) cm	Height (h) cm	Volume ($V = l \times w \times h$) cm ³
Notebook	25	15	2	750
Box	15	12	3	540

Observation: The object has measurable dimensions (length, width, height).

Volume is obtained by multiplying these three values.

Conclusion: The volume of a regular solid can be calculated using a formula. For a cuboid, $\text{Volume} = l \times w \times h$.

Activity 5.7

Aim: To measure the volume of an irregular solid using water displacement method.

Required materials: Measuring cylinder, water, irregular object (stone/metal key), thread.

Procedure:

- Fill the measuring cylinder with water and note the initial level.
- Tie the object with a thread.
- Gently lower the object into the water.
- Note the new water level.
- Find the difference between final and initial readings.



S.No.	Object	Initial volume of water in the measuring cylinder (mL) (A)	Final volume of water in the measuring cylinder (mL) (B)	Volume of water displaced in the measuring cylinder (mL) (B-A)	Volume of the object (cm ³)
1	Stone	50	65	15	15
2	Metal key	50	58	8	8
3	Eraser	50	62	12	12

Observation: The water level rises when the object is placed in it.

The difference in water levels gives the volume of the object.

Conclusion: The volume of an irregular object can be measured by water displacement.

Volume of object = Final level – Initial level.



Prepare Some Questions Based on Your Learnings So Far

1. Why does salt dissolve easily in water?
2. How can we separate a solute from a solution?
3. Why do some substances dissolve faster in hot water than in cold water?
4. What happens when too much sugar is added to water?
5. Where do we use solutions in our daily life?
6. Why is water called a universal solvent?
7. When does a solution become saturated?
8. How long does it take for ink to spread completely in water?
9. Why do some substances remain insoluble in water?
10. Why is stirring helpful while preparing a solution?

Multiple Choice Questions

- A solution is a
 - pure substance
 - homogeneous mixture
 - heterogeneous mixture
 - compound
- The substance that dissolves in a solution is called
 - solvent
 - solute
 - sediment
 - residue
- The substance in which a solute dissolves is called
 - solvent
 - solute
 - filtrate
 - mixture
- In a salt solution, salt is the
 - solvent
 - solute
 - residue
 - medium
- In a sugar solution, water is the
 - solute
 - solvent
 - residue
 - impurity
- Which of the following is a true solution?
 - Sand in water
 - Chalk powder in water
 - Salt in water
 - Mud in water
- A true solution is usually
 - opaque
 - transparent
 - rough
 - insoluble
- The particles in a true solution are
 - visible to naked eye
 - very large
 - very small
 - always coloured
- Which of the following is not a solution?
 - Sugar in water
 - Salt in water
 - Sand in water
 - Vinegar in water
- The component present in larger amount in a solution is usually the
 - solute
 - solvent
 - residue
 - precipitate
- The process of dissolving a solute in a solvent forms a
 - compound
 - solution
 - suspension
 - sediment
- Common salt dissolves in water because water acts as a
 - solute
 - solvent
 - residue
 - solid
- Solubility means
 - the colour of a solute
 - the ability of a substance to dissolve in a solvent
 - the mass of a solution
 - the boiling point of water
- A substance that cannot dissolve more solute at a given temperature forms a
 - dilute solution
 - unsaturated solution
 - saturated solution
 - suspension
- A solution that can still dissolve more solute is called
 - saturated solution
 - unsaturated solution
 - concentrated solution
 - colloid
- A solution containing a small amount of solute is called
 - concentrated solution
 - dilute solution
 - saturated solution
 - insoluble solution
- A solution containing a large amount of solute is called
 - dilute solution
 - concentrated solution
 - unsaturated solution
 - suspension
- Which factor affects the rate of dissolving?
 - stirring
 - temperature
 - size of solute particles
 - all of these
- Sugar dissolves faster in hot water because
 - hot water is heavier
 - particles move faster at higher temperature
 - sugar becomes solid
 - water loses particles
- Stirring helps in dissolving because it
 - reduces solubility always
 - increases mixing between solute and solvent particles
 - changes the solute into gas
 - cools the solution
- Powdered sugar dissolves faster than large crystals because
 - it is sweeter
 - it has larger surface area exposed
 - it is heavier
 - it is colder
- Which of the following is a solvent in aerated drinks?
 - carbon dioxide only
 - water
 - sugar
 - flavour only
- In a lemonade solution, lemon juice and sugar are generally the
 - solvents
 - solutes
 - residues
 - filtrates
- Which of the following is an example of a solid dissolved in a liquid?
 - oxygen in water
 - salt in water
 - carbon dioxide in soda
 - brass
- Which of the following is an example of a gas dissolved in a liquid?
 - salt in water
 - sugar in water
 - carbon dioxide in water
 - copper sulphate in water
- Which of the following is an example of a liquid dissolved in a liquid?
 - vinegar in water
 - chalk in water
 - sand in water
 - oxygen in water
- A solution in which no more solute can dissolve at a given temperature is
 - unsaturated
 - dilute
 - saturated
 - transparent
- Solubility of most solids in water generally
 - decreases with increase in temperature
 - increases with increase in temperature
 - remains always same
 - becomes zero
- Which of the following substances is insoluble in water?
 - sugar
 - common salt
 - sand
 - alum
- The process of separating a dissolved solid from a solution by heating is
 - filtration
 - sedimentation
 - evaporation
 - decantation
- To obtain pure water from salt solution, we use
 - filtration
 - evaporation
 - distillation
 - handpicking

- 32.** A solute dissolves in a solvent because of
 A. interaction between particles
 B. colour change only
 C. size increase only
 D. heating only
- 33.** When copper sulphate is added to water, the blue colour spreads due to
 A. melting
 B. diffusion
 C. sedimentation
 D. freezing
- 34.** Which of the following is a coloured solution?
 A. sugar in water
 B. salt in water
 C. copper sulphate in water
 D. distilled water
- 35.** The amount of solute present in a given amount of solution tells us its
 A. transparency
 B. concentration
 C. boiling point only
 D. filtration speed
- 36.** Sea water is a solution of
 A. only water
 B. salts dissolved in water
 C. sand and water only
 D. oil in water
- 37.** Tincture of iodine is a solution of iodine in
 A. water
 B. kerosene
 C. alcohol
 D. milk
- 38.** Air is considered a solution because it is
 A. a pure gas
 B. a homogeneous mixture of gases
 C. a compound
 D. made of one element
- 39.** Which of the following is not a homogeneous mixture?
 A. salt solution
 B. air
 C. sugar solution
 D. sand in water
- 40.** If more and more solute is added to a saturated solution, it
 A. will always dissolve
 B. will settle undissolved
 C. will turn into gas
 D. will reduce solvent amount
- 41.** Solubility of gases in water generally
 A. increases on heating
 B. decreases on heating
 C. remains same always
 D. becomes infinite
- 42.** Cold drinks are bottled under pressure because
 A. pressure increases solubility of gas in liquid
 B. pressure decreases solubility of gas
 C. bottles become lighter
 D. sugar dissolves better only
- 43.** Which of the following is the best example of a concentrated solution?
 A. a little salt in a lot of water
 B. a lot of salt in little water
 C. sand in water
 D. chalk in water
- 44.** When a saturated solution is heated, it can usually dissolve
 A. less solute
 B. more solute
 C. no solute
 D. only gases
- 45.** A residue left after evaporation of salt solution is
 A. water
 B. salt
 C. air
 D. steam
- 46.** Which of the following is used to speed up dissolving in daily life?
 A. stirring tea after adding sugar
 B. keeping sugar in lumps only
 C. cooling the solvent always
 D. avoiding mixing
- 47.** Honey mixed in warm water dissolves faster because of
 A. lower temperature
 B. increased movement of particles
 C. loss of mass
 D. decrease in diffusion
- 48.** The solvent in tincture used for first aid is generally
 A. water
 B. alcohol
 C. salt
 D. sugar
- 49.** A solution always has
 A. visible particles
 B. uniform composition throughout
 C. particles that settle down
 D. different layers
- 50.** The study of solutes, solvents and solutions helps us understand
 A. only gases
 B. how substances dissolve and mix uniformly
 C. only solids
 D. only colour changes

Answers

- | | | | | | | | | | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 1. B | 2. B | 3. A | 4. B | 5. B | 6. C | 7. B | 8. C | 9. C | 10. B |
| 11. B | 12. B | 13. B | 14. C | 15. B | 16. B | 17. B | 18. D | 19. B | 20. B |
| 21. B | 22. B | 23. B | 24. B | 25. C | 26. A | 27. C | 28. B | 29. C | 30. C |
| 31. C | 32. A | 33. B | 34. C | 35. B | 36. B | 37. C | 38. B | 39. D | 40. B |
| 41. B | 42. A | 43. B | 44. B | 45. B | 46. A | 47. B | 48. B | 49. B | 50. B |

2. Solvent	b. Mass per unit volume
3. Density	c. Substance dissolved
4. Saturated solution	d. No more solute dissolves

Ans: 1-c 2-a 3-b 4-d

19. Match the Following

Column A	Column B
1. Solute	a. kg/m^3
2. Solvent	b. Dissolves solute
3. Density	c. Substance dissolved
4. Measuring cylinder	d. Measures liquid volume

Ans: 1-c 2-b 3-a 4-d

2 Marks Questions

1. Why is sea water not suitable for drinking?

Ans: Sea water contains a large amount of dissolved salts. The high salt concentration makes it unsuitable for drinking and does not meet the body's water requirements.

2. Why does sugar dissolve faster in hot water?

Ans: When water is heated, its particles move faster. The faster-moving water particles mix more quickly with sugar particles, increasing the rate of dissolution.

3. Why does salt not dissolve indefinitely in water?

Ans: A fixed amount of water can dissolve only a limited amount of salt at a given temperature. After reaching this limit, the solution becomes saturated and additional salt remains undissolved.

4. Why does cold water hold more oxygen than warm water?

Ans: Gas solubility decreases with temperature. Cold water's higher density allows more oxygen to dissolve and support aquatic life.

5. Justify: "Oil floats on water because its density is less than water."

Ans: Liquids with lower density than water float on its surface. Oil is less dense than water, so it floats.

6. Ravi added sugar to tea and kept stirring. Initially the sugar dissolved completely, but after adding too much sugar, some sugar settled at the bottom.

a) Why did sugar settle at the bottom?

Ans: The solution became saturated and could not dissolve more sugar.

b) What type of solution was formed before sugar started settling?

Ans: Unsaturated solution.

c) How can Ravi dissolve more sugar in the tea?

Ans: By heating the tea.

7. A student placed an iron nail and a wooden stick of the same size in water. The iron nail sank while the wooden stick floated.

a) Why did the iron nail sink?

Ans: Iron is denser than water.

b) Why did the wooden stick float?

Ans: Wood is less dense than water.



8. "Dissolved oxygen is vital for aquatic life." Explain why fish survive better in cold water than warm water.

Ans: Cold water can dissolve more oxygen than warm water. Since aquatic animals depend on dissolved oxygen for respiration, fish survive better in cold water.

9. What happens to the density of air inside a hot air balloon when heated?

Ans: When air is heated, its volume increases while mass remains the same. Therefore, density decreases and the balloon rises.

10. Why does a measuring cylinder give more accurate volume readings than a beaker?

Ans: A measuring cylinder is narrow and has clear graduations, making small volume changes easy to observe. It also allows accurate meniscus reading, unlike a beaker.

11. Rama molds 120 g clay from a cube (60 cm^3) into a thin sheet. Does density change? Explain.

Ans: No. Density depends on mass and volume, not shape. Since mass (120 g) and volume (60 cm^3) remain unchanged, density remains the same.

4 Marks Questions

1. Explain why water is considered a good solvent.

Ans: Water is considered a good solvent because it can dissolve a wide variety of substances. Many solids, liquids and gases dissolve in water to form solutions. Water plays an important role in biological processes, household activities and industrial applications. Due to its excellent dissolving ability, it is known as a universal solvent.

2. Why is ORS considered a solution?

Ans: ORS (Oral Rehydration Solution) contains water, salt and sugar. The salt and sugar dissolve completely in water and form a uniform mixture. Since the components are evenly distributed throughout the mixture, ORS is considered a solution.

3. Explain the importance of solutions in daily life.

Ans:

1. Medicines are prepared as solutions.
2. Soft drinks and juices are solutions.
3. Salt solution is used in cooking.
4. Washing powders dissolve in water for cleaning clothes.

4. Why does sugar dissolve faster in hot water?

Ans: Hot water contains particles with higher kinetic energy. These particles move faster and interact more frequently with sugar particles. As a result, sugar dissolves more quickly in hot water than in cold water.

5. "In gulab jamun syrup, sugar is in larger quantity than water, yet water is the solvent." Justify.

Ans: The solvent is the substance that dissolves the solute, not necessarily the one present in larger quantity. In sugar syrup, water dissolves sugar. Hence, water is the solvent and sugar is the solute.

6. An iron nail sinks, but a ship made of iron floats. Explain.

Ans: An iron nail has a density greater than water, so it sinks. A ship is hollow and contains air, which reduces its average density below that of water. Therefore, it floats.

7. Write differentiate between Saturated and Unsaturated Solutions.

Ans:

Saturated Solution	Unsaturated Solution
Cannot dissolve more solute	Can dissolve more solute
Solute may settle at bottom	All solute dissolves
Maximum solute present	Less than maximum solute present
Forms at a given temperature	May become saturated later

8. With reference to the meniscus formation in a measuring cylinder, explain how to accurately measure volumes of both colourless and coloured liquids.

Ans: For colourless liquids (water), read the **bottom of the concave meniscus** at eye level.

For coloured liquids, read the **top of the meniscus**.

The measuring cylinder should be kept on a flat surface and viewed at eye level to avoid parallax error.

9. Why does density gradually increase from the Earth's crust to the inner core?

Ans: Density increases because pressure and temperature increase towards the Earth's center, compressing materials into more compact and heavier forms. The crust is least dense, while the inner core is the densest layer.

10. Why is air considered a solution?

Ans:

- i) Air is a homogeneous mixture.
- ii) Nitrogen acts as solvent.
- iii) Oxygen and other gases act as solutes.
- iv) Components are uniformly mixed.

8 Marks Questions

1. Define solute, solvent and Solution. Give example.

Ans: Solute: The component that dissolves in a liquid to form a solution is called the solute.

Solvent: The liquid component in which the solute dissolves is called the solvent.

Solution: A homogeneous (uniform) mixture formed by dissolving a solute in a solvent is called a solution.

Example: salt is the solute, water is the solvent and salt water is the solution.

2. Explain factors affecting solubility.

Ans: 1. Nature of Solute and Solvent: Different substances dissolve differently in a solvent.

For example, sugar and salt dissolve in water, whereas sand does not.

2. Temperature: Temperature greatly affects solubility.

Most solids dissolve more in hot water than in cold water. Heating increases the movement of particles and helps more solute dissolve.

3. Amount of Solvent: The quantity of solvent also affects the amount of solute that can dissolve. More solvent generally dissolves more solute.

4. Stirring: Stirring helps the solute particles mix faster with the solvent, increasing the rate of dissolution. Thus, temperature, nature of substances, amount of solvent, and stirring affect solubility.

3. Differentiate between homogeneous and heterogeneous mixtures.

Ans:

Homogeneous Mixture	Heterogeneous Mixture
Composition is uniform throughout.	Composition is not uniform throughout.
Components cannot be seen separately.	Components can often be distinguished.
Called a solution.	Not a solution.
Example: Salt water, sugar solution, ORS.	Example: Sand and water, sawdust and water, chalk powder and water.

4. A shopkeeper prepares lemon juice for customers. Explain the role of solute, solvent and solution in this process.

Ans: i) While preparing lemon juice, **water acts as the solvent** and **sugar and salt act as the solutes**.

ii) The sugar and salt dissolve completely in water.

iii) Lemon juice also mixes uniformly with the water.

iv) As a result, a homogeneous mixture with a uniform taste is formed.

v) This homogeneous mixture is called a **solution**.

vi) Thus, lemon juice is an example of a liquid solution.

5. Explain why ORS is important during dehydration.

Ans: i) ORS contains water, salt and sugar.

ii) It replaces lost body fluids.

iii) Restores essential salts.

iv) Provides quick energy.

v) Dissolved substances form a solution.

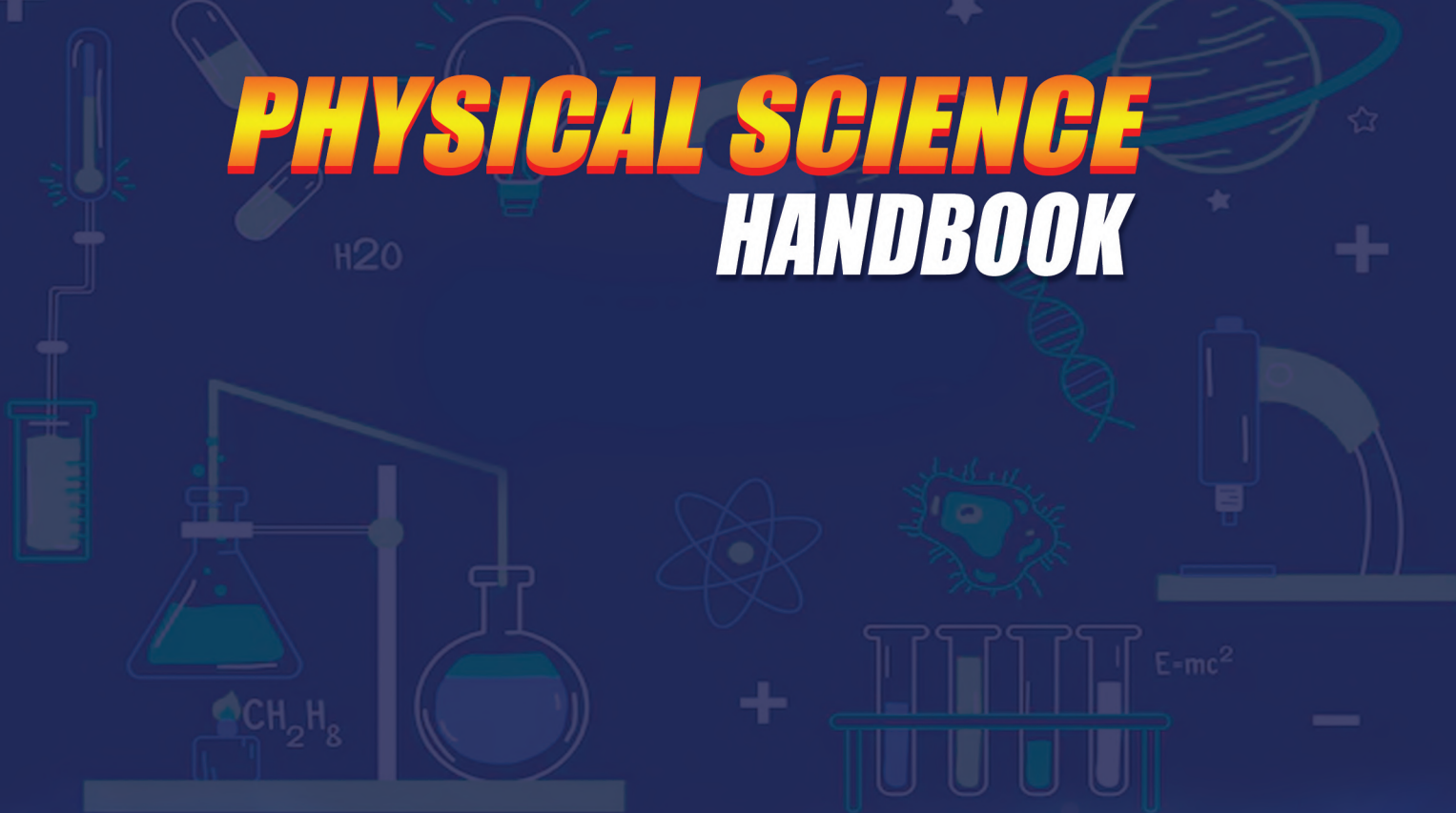
vi) The solution is absorbed easily.

vii) Helps prevent dehydration.

viii) Therefore ORS is widely used.



PHYSICAL SCIENCE HANDBOOK



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