NCERT Archive

SOLUTIONS BOOK

CLASS 8

Science · Curiosity

CHAPTER 7

Particulate Nature of Matter

Complete In-text Questions, Activities and Exercises Solutions

In-text Questions

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Every question is followed by its answer. Question numbers above are clickable and the PDF bookmarks panel lets you jump to any exercise set or question. Figures are reproduced from the NCERT textbook (© NCERT) for educational use.

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7.1

CLASS 8 SCIENCE · CHAPTER 7

In-text Questions

Solutions · 23 questions

Directions (Questions 1–23): These are the questions, examples and activities that appear inside the chapter (Probe and Ponder, Activities, Speech bubbles, Think like a scientist, Keep the curiosity alive and Discover, design, and debate), numbered in the order in which they appear. Many are open-ended; model answers based on the chapter are given, and you may add examples from your own surroundings.

QUESTION 1 *Probe and Ponder · p. 98*

(i) Why is it possible to pile up stones or sand, but not a liquid like water?
(ii) Why does water take the shape of folded hands but lose that shape when released?
(iii) We cannot see air, so how does it add weight to an inflated balloon?
(iv) Is the air we breathe today the same that existed thousands of years ago?
(v) Share your questions

ANSWER

Each answer depends on how the constituent particles of solids, liquids and gases are held and how they move.

i Piling up stones or sand, but not water

- **Stones and sand are solids.** Their particles are tightly packed and held in fixed positions by very strong interparticle attractions, so every stone or grain keeps its own shape and volume and can be piled up.
- **Water is a liquid.** Its interparticle attractions are slightly weaker, so its particles move past each other. Water flows and spreads out, so it cannot stay in a heap.

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ii Water in folded hands

- Liquids have **no fixed shape**; they take the shape of the container. The folded hands act as a container.
- When the hands are opened there is no container, so the particles keep moving and the water flows away. Its volume stays the same; only its shape changes.

iii Air and the inflated balloon

- Air is matter. It is made of extremely small particles (invisible to us) which have mass and occupy space.
- An inflated balloon holds many more air particles than a flat one, so the extra mass of these particles makes it weigh more.

iv Air today and thousands of years ago

- Air is a gas whose particles move constantly and mix all around the Earth. Particles of matter are not destroyed by moving and spreading, so the air is made of the same kinds of particles as before.
- Living things take in and give out some gases, but these particles are recycled between air, water, plants and animals. So the air today is largely the same material that has been present for thousands of years.

v Share your questions

This is an open prompt for the student's own questions. Model questions with answers are given in Question 22 (p. 113–114).

Therefore, solids keep their shape because their particles are fixed in position, liquids flow because their particles can move past each other, and air has weight because its invisible particles have mass.

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QUESTION 2 *Opening text · p. 99*

(i) Where do these pebbles, stones, and sand come from?
(ii) Is this grain the smallest unit of a bigger rock or can these grains of sand and clay be broken down further?

ANSWER

Rocks are broken down step by step, and even the finest grain is still made of still smaller units.

i Origin of pebbles, stones and sand

- In the mountains, rocks gradually break down due to **erosion**.
- Rivers carry the eroded pieces and, as they flow, break them further into pebbles, stones and sand, and transport large quantities of them to the plains.
- Bigger rocks are eventually broken into finer grains of sand and clay.

ii Is the grain the smallest unit?

- **No.** A grain of sand or clay is not the smallest unit of a rock. Like chalk, it is made up of a very large number of still smaller **constituent particles**.

Therefore, pebbles, stones and sand come from eroded rocks, and the grains of sand and clay can be broken down further into their constituent particles.

QUESTION 3 *Activity 7.1 · p. 99*

(i) What do you observe?
(ii) 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?
(iii) Is grinding chalk a physical change or a chemical change?

ANSWER

Breaking and grinding only reduce the size of the chalk; every speck is still chalk.

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i Observation

- The chalk stick breaks into smaller pieces, which on grinding with the mortar and pestle become a fine white powder.
- Under the magnifying glass the powder is seen as a large number of tiny grains, each one still a speck of chalk.

ii Same substance or new substance?

- Every speck is composed of the **same substance**, chalk. It has not changed into something else.

iii Physical or chemical change

- Grinding chalk is a **physical change**: only the size of each speck is reduced and no new substance forms.

Therefore, grinding is a physical change, and every speck of chalk powder is still chalk.

QUESTION 4 *Speech bubble · p. 100*

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

ANSWER

No. The specks of powder can still be broken into even smaller particles.

a Reasoning

- The specks of chalk powder can be broken further by more grinding.
- If the grinding could be continued, we would reach a stage where the particles cannot be broken down any further. These tiny units are the basic building blocks of chalk.

b Constituent particles

- One piece of chalk is made of a large number of such smaller units, called **constituent particles**.

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- A constituent particle is the basic unit that makes up a larger piece of a substance or material. Grains of sand and clay are likewise made of their constituent particles.

Therefore, the specks of chalk powder are not its smallest units; the smallest units are its constituent particles.

QUESTION 5 *Activity 7.2 · p. 100*

What happens to sugar when it is dissolved in water?
(i) Does the water taste sweet? (sugar added, not stirred, top layer)
(ii) What difference in taste do you notice? Does it taste sweet? (after stirring)
(iii) Do you observe any sugar particles in the solution?

ANSWER

Sugar breaks up into its constituent particles, which are too small to see but can be sensed by taste.

Safety first: perform the activity under the supervision of a teacher or an adult. Never eat or drink anything unless asked to.

i Before stirring

- Most of the sugar settles at the bottom, so the top layer tastes only faintly sweet, if at all.

ii After stirring

- Once the sugar has dissolved completely, the top-layer spoonful tastes **sweet**, clearly sweeter than before, because sugar is now present throughout the water.

iii Are sugar particles visible?

- No sugar particles can be seen, but their presence is sensed by taste.

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iv What happens to sugar in water

- It breaks up into its constituent particles, which cannot be broken down further. Each tiny grain of sugar contains millions and millions of such particles.

Therefore, dissolved sugar is still present as invisible constituent particles spread through the water.

QUESTION 6 *Speech bubble · p. 101*

But, where did the sugar go?

ANSWER

The sugar has not vanished; its particles have gone into the spaces between the water particles.

- The tiny sugar particles separate and occupy the available spaces between the water particles.
- These spaces between particles are called **interparticle spaces**.
- This is why the sugar cannot be seen, yet the solution tastes sweet.

Therefore, the sugar particles occupy the interparticle spaces between the water particles.

QUESTION 7 *Speech bubble · p. 101*

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?

ANSWER

They are held together by forces of attraction between the particles.

- The constituent particles of matter are held together by attractive forces called **interparticle attractions**.

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- The strength of these attractions depends on the nature of the substance and the interparticle distance.
- Even a slight increase in the distance decreases the forces drastically.
- The strength of these forces ultimately decides the physical state (solid, liquid or gas) of a substance.

Therefore, interparticle attractions hold the constituent particles together in solids.

QUESTION 8 *Activity 7.3 · p. 102*

(i) In which of the above six objects do you think particles are strongly held together?
(ii) In the solid state, is there any way to move these particles apart?

ANSWER

All six objects are solids, so in every one the particles are strongly held; some hold on harder than others.

i Strength of attractions in the six solids

- The iron nail, rock salt, stone, wooden block, key and aluminium piece all have a **definite shape and volume**, because their particles are tightly packed and held in fixed positions.
- On hammering, the iron nail and the key resist the most, so among these objects their particles are held together most strongly. The wooden block is the easiest to dent or split.

ii Moving the particles apart

- **Yes, by heating.** On heating, the particles vibrate more vigorously.
- At a certain stage they start leaving their positions, the attractions weaken and the solid changes into a liquid. This happens at the **melting point**.

Therefore, particles in solids are strongly held, and heating a solid up to its melting point can move them apart.

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QUESTION 9 *Speech bubble · p. 103*

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

ANSWER

Liquids have a definite volume, but gases do not.

State	Shape	Volume
Solid	Definite	Definite
Liquid	Not fixed; takes the shape of the container	Definite
Gas	Not fixed; takes the shape of the container	Not fixed; fills all the available space

Therefore, liquids have a definite volume but no fixed shape, and gases have neither a fixed shape nor a fixed volume.

QUESTION 10 *Activity 7.4 · p. 104*

(i) Observe the shape and level of the water when it is transferred from Container A to Container B and then to Container C.
(ii) Are you able to move your finger through the water?

ANSWER

Water takes the shape of each container but keeps the same volume, and a finger moves through it easily.

i Shape and level

- The water takes the **shape of the container** it is poured into, so liquids have no fixed shape. This is because the liquid particles are free to move.
- In all three containers the level stays at 200 mL, so there is no change in volume: liquids have a **definite volume**.

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- If a container is not clean, some water sticks to its walls and the next level is slightly below 200 mL.

ii Moving a finger through water

- **Yes.** The finger moves through the water without breaking it permanently; the water is only displaced temporarily and returns as soon as the finger is removed.
- So in liquids the attractions are slightly weaker than in solids, but still strong enough to keep the particles close together.

Therefore, liquids have no fixed shape but a fixed volume, and their interparticle attractions are slightly weaker than in solids.

QUESTION 11 *Speech bubble · p. 105*

I have seen that spilled water disappears after some time, and it happens at any temperature! (Explain this observation.)

ANSWER

Spilled water disappears by evaporation, which occurs at all temperatures.

- Vapour formation occurs at **all temperatures**, even below the boiling point, though slowly and only at the surface. This slow process is called **evaporation**.
- Particles at the surface of the water escape into the air as vapour, so the spilled water gradually disappears.

	Evaporation	Boiling
Where	Only at the surface	At the surface and within the liquid (bubbles)
Speed	Slow	Very fast
Temperature	At any temperature	At the boiling point only

Therefore, spilled water disappears because it evaporates, and evaporation takes place at any temperature.

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QUESTION 12 *Activity 7.5 · p. 105–106*

(i) Do gases also have a fixed volume?
(ii) Observe how the smoke spreads inside the Gas Jar B.

ANSWER

No. The smoke spreads to fill the whole of Gas Jar B, showing that gases have no fixed volume.

Safety first: be careful while burning an incense stick. If iodine vapour is used instead, remember that its vapours can cause irritation.

i Volume of gases

- The smoke fills the entire space in Gas Jar B, so gases do **not** have a fixed volume and tend to occupy the entire available space.
- Like liquids, gases also acquire the shape of the vessel they are in.

ii Spreading of smoke

- The particles of a gas move freely in all directions and the interparticle attractions are negligible, so gases have no fixed shape or volume.
- Tiny smoke particles suspended in the air are constantly hit by invisible gas particles, and their movement helps us observe the motion of the gas particles.
- Liquids and gases both flow and do not retain a fixed shape, so they are classified as **fluids**.

Therefore, a gas spreads to fill all the space available to it, so it has neither a fixed shape nor a fixed volume.

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QUESTION 13 *Section 7.3 · p. 107*

What role does the interparticle spacing play in determining the properties of each state (solid, liquid, and gas)?

ANSWER

The spacing decides the strength of the attractions, and the attractions decide how particles move and so the properties of each state.

	Solid	Liquid	Gas
Interparticle spacing	Minimum	A little more than in solids	Maximum
Interparticle attraction	Maximum	Slightly weaker than in solids	Minimum (negligible)
Movement of particles	Only vibrations	Restricted to a limited space	In all the available space
Shape and volume	Fixed shape, fixed volume	No fixed shape, fixed volume	No fixed shape, no fixed volume

Therefore, the smaller the spacing, the stronger the attraction and the more rigid the state; the larger the spacing, the freer the particles.

QUESTION 14 *Activity 7.6 · p. 107*

(i) What do you observe?
(ii) What can we say about the behaviour of gas in the syringe?
(iii) Repeat this activity using water and observe.

ANSWER

Air can be compressed, which shows there is a lot of space between gas particles; water cannot.

i Observation

- On pushing the plunger inwards, the volume of air inside the syringe decreases.

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ii Behaviour of gas

- The particles are forced to come closer. Gas particles have a lot of space between them in their natural state, and this space can be reduced by applying external pressure.
- When we stop pushing, the gas particles spread out and the plunger moves back to its original position.

iii Using water

- Water is **practically incompressible**: its particles are already close together, so there is very little space to reduce.

Therefore, gases can be compressed because of large interparticle spaces, while liquids are practically incompressible.

QUESTION 15 *Activity 7.7 · p. 108*

(i) Predict whether the water level will increase or decrease with respect to the mark B.
(ii) What difference do you observe in the water levels?
(iii) Repeat with common salt or glucose, and with sand and stone pieces. What do you observe in each case? Do the sand particles dissolve? Does the volume of water in the vessel change after mixing, and why?

ANSWER

Dissolved sugar goes into the spaces between water particles, so the level falls slightly; sand does not dissolve.

i Prediction

- The level will **decrease** slightly below mark B once the sugar has dissolved.

ii Observation

- When sugar is added, the level rises from A to B. After stirring and dissolving, it falls somewhat to mark C, which lies between A and B.
- The volume of the solution is less than the sum of the volumes of water and sugar. So there is space between the water particles, and the sugar particles occupy these spaces.

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iii Other solids

Solid added	Dissolves?	Water level
Common salt, glucose (soluble)	Yes	Falls slightly after dissolving, like sugar
Sand, stone pieces (insoluble)	No: they settle down	Rises and stays up; they occupy space in the vessel

- Sand particles do **not** dissolve. They settle and occupy space in the container, so the total volume increases.

Therefore, soluble solids fit into the spaces between water particles, whereas insoluble solids like sand do not.

QUESTION 16 *Speech bubble · p. 108*

Sugar and sand are both solids. Why does sugar dissolve in water but sand does not?

ANSWER

The water particles can pull sugar particles out of a grain, but they cannot pull the particles out of sand.

- Water particles are in constant motion. They pull out the sugar particles from the grain and spread them throughout the liquid.
- In sand the constituent particles are held together so strongly that the water particles are unable to pull them out. Such substances are **insoluble** in water.

Therefore, sugar dissolves because its particles can be pulled apart by water; sand does not because its particles are held too strongly.

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QUESTION 17 *Section 7.3 · p. 109*

What do you think about the interparticle spacing in solids?

ANSWER

Solid particles are closely packed, but a little space still remains between them.

- Particles in solids are held by strong attractions, so they do not move from place to place and are closely packed.
- Despite the close packing, **some space is left** between the particles (Fig. 7.12a).
- This space is not filled with air. It contains **nothing at all**.

Therefore, interparticle spacing in solids is very small but not zero, and the space is empty.

QUESTION 18 *Activity 7.8 · p. 109–110*

(i) What do you observe?
(ii) Do you know why this happens?

ANSWER

The colour spreads through the water because the water particles are in constant motion.

Safety first: do not touch potassium permanganate with your hands; use a spoon or a spatula.

i Observation

- Initially, streaks of pink colour spread out from the grain.
- With time, the entire water in the tumbler becomes uniformly pink.

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ii Reason

- The water particles are in constant motion. First they pull out the particles of potassium permanganate from the grain, and later they hit these particles so that they spread throughout the liquid.

Therefore, the colour spreads uniformly because particles of the liquid are constantly moving and carry the permanganate particles with them.

QUESTION 19 *Think like a scientist · p. 110*

Take three clean glass tumblers. Pour hot water in one of them, water at room temperature in the second and ice-cold water in the third. Drop a small grain of potassium permanganate into each of them. Watch carefully and compare. What do you observe? Try to depict it by drawing a diagram.

ANSWER

The permanganate spreads fastest in hot water and slowest in ice-cold water.

a Observation

- Hot water: the colour spreads **fastest**.
- Water at room temperature: it spreads **less quickly**.
- Ice-cold water: it spreads **slowest**.

b Reason

- Water particles move faster in hot water than at room temperature, and slower still in ice-cold water. Hence the movement of particles increases when heat is provided.

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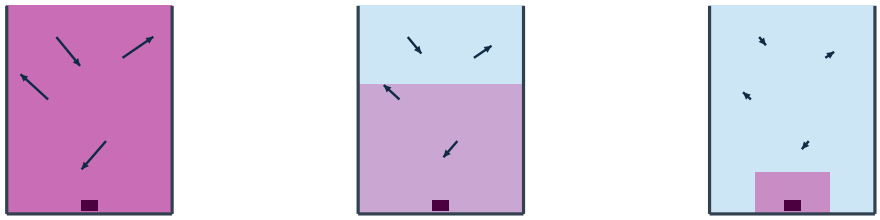
c Diagram

Same time after dropping a grain of potassium permanganate in each tumbler



Hot water
spreads fastest

Room temperature water
spreads more slowly

Ice-cold water
spreads slowest

Spreading of potassium permanganate at different temperatures (longer arrows = faster particle motion)

Therefore, the higher the temperature, the faster the particles move and the faster the colour spreads.

QUESTION 20 *Speech bubble and Activity 7.9 · p. 110–111*

(i) How can we demonstrate the movement of gas particles that cannot be seen with the naked eye?
(ii) Do you notice the fragrance from a distance?

ANSWER

An incense stick shows it: the fragrance spreads through the whole room because gas particles move.

i Demonstrating the movement of gas particles

- Light an incense stick in a corner of the room. At first the fragrance is felt only near the stick; shortly it is smelt throughout the room.
- The particles of the fragrance spread and fill the room. The air particles are constantly moving; they hit the fragrance particles and help them spread. The smoke and iodine vapour of Activity 7.5 also show this.

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ii Fragrance from a distance

- **Yes.** After a few minutes the fragrance is noticed even far from the incense stick.

Therefore, the spreading of fragrance shows that gas particles are constantly moving.

QUESTION 21 *Real-life situations · p. 111*

Can you share a few other real-life situations where you have experienced the movement of gas particles?

ANSWER

Any situation in which a smell or a gas spreads away from its source shows gas particles moving.

- The smell of perfume or deodorant reaching people across a room.
- The aroma of food being cooked in the kitchen reaching other rooms.
- The smell of an LPG leak or of petrol spreading through the air.
- The fragrance of flowers or incense reaching us from a distance; smoke spreading from a fire.

Therefore, in all these cases the gas particles move freely in all directions and spread into the available space.

QUESTION 22 *Keep the curiosity alive · p. 113–114*

Prepare some questions based on your learnings so far … (Why? When? How long? Where? Why not?)
Reflect on the questions framed by your friends and try to answer …

ANSWER

These prompts ask for the student's own questions. A few model questions with answers from the chapter are given.

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Model question	Answer
Why do gases have no fixed shape?	Their particles move freely in all directions and the interparticle attractions are negligible.
When does a solid change into a liquid?	When it is heated to its melting point.
Where do the sugar particles go when sugar dissolves?	Into the interparticle spaces between the water particles.
Why not compress water as we compress air?	Water is practically incompressible because its particles are already close together.
How does the temperature affect the spreading of a colour in water?	The higher the temperature, the faster the particles move and the faster the colour spreads.

Therefore, good questions begin with Why, When, How long, Where or Why not, and can be answered using the particle model.

QUESTION 23 *Discover, design, and debate · p. 115*

(i) Fix a balloon over the neck of a bottle and put the bottle in hot water. Explore what will happen?
(ii) Design and create simple models to represent particles of solids, liquids, and gases showing interparticle spacing using clay balls, beads, etc.
(iii) Pretend to be particles of solids, liquids, and gases, at different temperatures — create and perform a role-play/dance showing particles in motion.
(iv) Debate in the class — 'Gases can spread and fill all the available space'. Is this property of gases beneficial or harmful?

ANSWER

These are projects; model outcomes are given below.

i Balloon on a bottle in hot water

- The balloon **inflates**. The air inside the bottle gains thermal energy, its particles move faster and spread out, so the gas occupies more space and pushes into the balloon.

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ii Models of the three states

- **Solid:** glue beads in a tightly packed, regular pattern on a card (minimum spacing).
- **Liquid:** keep beads close but unfixed in a shallow tray so that they can slide over one another (a little more spacing).
- **Gas:** place only a few beads far apart in a large transparent box (maximum spacing).

iii Role-play

- **Solid:** stand close together in fixed rows and only vibrate on the spot; vibrate more strongly as the ‘temperature’ rises.
- **Liquid:** stay close but move around and past each other within a limited area.
- **Gas:** move freely in all directions over the whole space; move faster at a higher temperature.

iv Debate: is spreading of gases beneficial or harmful?

- **Beneficial:** fragrance and oxygen reach everywhere in a room; gases mix easily, so air stays uniform.
- **Harmful:** harmful gases (such as an LPG leak or smoke) also spread quickly through the available space.

Therefore, the property itself is neutral; whether it is beneficial or harmful depends on which gas spreads and where.

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7.2

CLASS 8 SCIENCE · CHAPTER 7

Exercises

Solutions · 10 questions

Directions (Questions 1–10): These are the exercises given at the end of the chapter under ‘Keep the curiosity alive’, numbered as in the textbook. Every part of every question is answered, and every answer is based on the chapter.

QUESTION 1 *Exercise 1 · p. 113*

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.

ANSWER

The correct option is (iv).

Option	Verdict	Reason
(i)	Incorrect	Liquid particles are not stationary; they move within a limited space.
(ii)	Incorrect	Solid particles are closely packed, and liquid particles do not have fixed positions.
(iii)	Incorrect	Solid particles only vibrate about fixed positions, and liquid particles are not fixed.
(iv)	**Correct**	Solid particles are tightly packed and fixed; liquid particles can move past each other.

Therefore, option (iv) is correct.

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QUESTION 2 *Exercise 2 · p. 113–114*

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.

ANSWER

Statements (i) to (v) are true; only statement (vi) is false.

Statement	True / False	Reason
(i)	**True**	Ice (solid) changes into water (liquid) on melting.
(ii)	**True**	On melting, the vibrations increase and the interparticle forces of attraction get weakened.
(iii)	**True**	Solid particles are held in fixed positions, giving a definite shape and volume.
(iv)	**True**	Solid particles are tightly packed with very strong attractions and minimum spacing.
(v)	**True**	The camphor particles spread by the constant motion of gas particles and fill the room.
(vi)	**False**	The smell is not energy being released; it is due to camphor particles themselves spreading.

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a Corrected statement (vi)

On heating, we are adding energy to the camphor, which makes its particles move faster and spread into the air; the smell is due to these camphor particles reaching our nose, and not due to energy being released as a smell.

Therefore, statements (i)–(v) are true, and statement (vi) is corrected as shown above.

QUESTION 3 *Exercise 3 · p. 114*

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.

ANSWER

The correct answer is (iii): nothing of the chair will remain.

a Justification

- All matter, including a chair, is made up of constituent particles. There is nothing in the chair other than these particles, and the space between them is empty.
- If every particle were removed, no matter would be left, so nothing of the chair would remain.

b Why the other options are wrong

- (i) is wrong because the chair would not stay the same when its particles are removed.
- (ii) is wrong because the chair would not just become lighter; it would disappear completely.

Therefore, option (iii) is correct, because a chair exists only as a collection of its constituent particles.

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QUESTION 4 *Exercise 4 · p. 114*

Why do gases mix easily, while solids do not?

ANSWER

Gas particles are free to move and widely spaced, whereas solid particles are fixed and tightly held.

	Gases	Solids
Interparticle attraction	Negligible	Very strong
Movement of particles	Free to move in all directions	Only vibrate about fixed positions
Interparticle spacing	Maximum	Minimum

- Gas particles move constantly in all directions, hit each other and spread into the available space, so different gases mix easily.
- Solid particles cannot move from their positions, so solids do not mix by themselves.

Therefore, gases mix easily because their particles move freely with negligible attractions, but solid particles are held in fixed positions.

QUESTION 5 *Exercise 5 · p. 114*

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.

ANSWER

Milk is a liquid and glass is a solid, and their particles behave differently.

a **Milk (liquid)**

- Interparticle attractions in liquids are slightly weaker than in solids, and the particles can move past each other. So milk has no fixed shape, flows and spreads out when spilled.

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b **Glass tumbler (solid)**

- In the glass, the particles are tightly packed and held in fixed positions by strong attractions, and they only vibrate. So the tumbler has a fixed shape and keeps it.

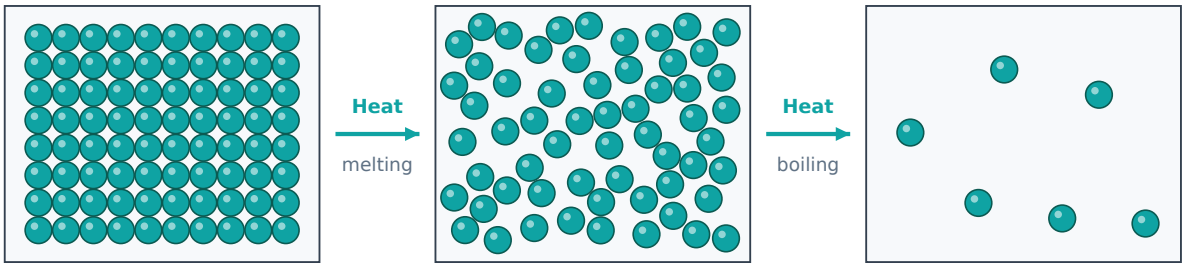
Therefore, milk flows because its particles can move past each other, while glass keeps its shape because its particles are fixed.

QUESTION 6 *Exercise 6 · p. 114*

Represent diagrammatically the changes in the arrangement of particles as ice melts and transforms into water vapour.

ANSWER

On heating, particles gain energy, vibrate more, leave their positions and finally move apart freely.



Ice (solid)
closely packed, vibrate

Water (liquid)
slightly farther, move around

Water vapour (gas)
far apart, move freely

Arrangement of particles as ice melts and then turns into water vapour (magnified schematic)

Stage	Spacing	Attraction	Movement
Ice (solid)	Minimum	Maximum	Only vibrations
Water (liquid)	A little more	Slightly weaker	Within a limited space
Water vapour (gas)	Maximum	Negligible	In all the available space

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The textbook notes that ice is an exception: its particles are farther apart than in water. The figure is only a schematic picture.

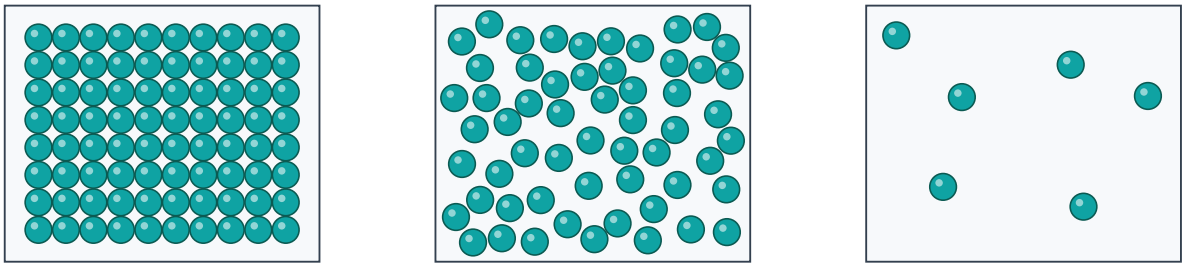
Therefore, on melting and then boiling, particles go from closely packed to loosely packed to widely separated.

QUESTION 7 *Exercise 7 · p. 114*

Draw a picture representing particles present in the following:
(i) Aluminium foil
(ii) Glycerin
(iii) Methane gas

ANSWER

Aluminium foil is a solid, glycerin is a liquid and methane is a gas.



(i) Aluminium foil
solid

(ii) Glycerin
liquid

(iii) Methane gas
gas

Particles in a solid, a liquid and a gas (magnified schematic pictures)

- **(i) Aluminium foil (solid):** particles closely packed in fixed positions.
- **(ii) Glycerin (liquid):** particles slightly loosely packed, free to move within a limited space.
- **(iii) Methane (gas):** particles far apart, free to move in all directions.

Therefore, the spacing of particles is minimum in aluminium foil, slightly more in glycerin and maximum in methane.

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QUESTION 8 *Exercise 8 · p. 114*

Observe Fig. 7.16a which shows the image of a candle that was just extinguished after burning for some time. Identify the different states of wax in the figure and match them with Fig. 7.16b showing the arrangement of particles.

ANSWER

The candle shows wax in all three states: solid, liquid and gas.

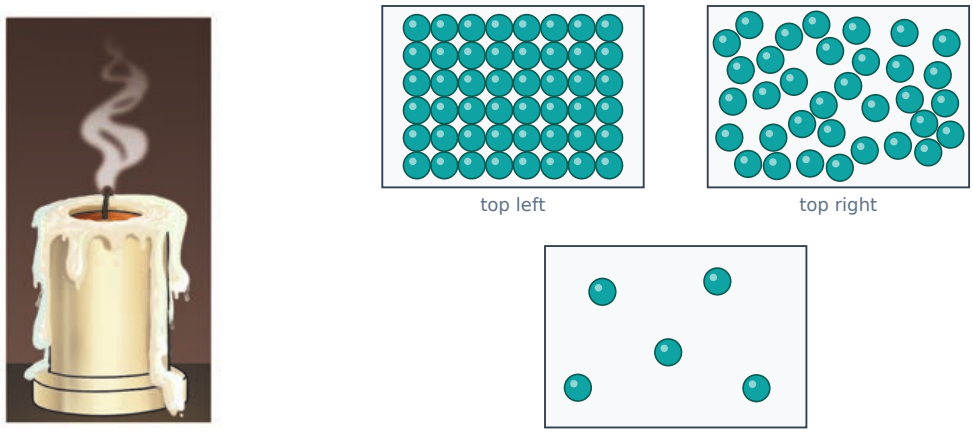

Fig. 7.16: (a) A candle just extinguished; (b) Arrangement of particles

State of wax	Where seen in Fig. 7.16a	Matching particle picture in Fig. 7.16b
Solid	The body of the candle and the hardened wax on its sides	Top-left picture: closely packed particles
Liquid	The melted wax around the wick	Top-right picture: a little loosely packed particles
Gas	The wax vapour rising from the wick	Bottom picture: particles far apart

Therefore, solid wax matches the top-left (closely packed) picture, liquid wax the top-right (loosely packed) picture and wax vapour the bottom (widely spaced) picture.

NCERT ARCHIVE

QUESTION 9 *Exercise 9 · p. 114*

Why does the water in the ocean taste salty, even though the salt is not visible? Explain.

ANSWER

The salt is dissolved in the water as invisible particles, but its presence is sensed by taste.

- When salt dissolves, it breaks up into its extremely small constituent particles, which are too small to be seen.
- These particles go into the interparticle spaces between the water particles and are spread throughout the water by their constant motion.
- Because they are present everywhere in the water, the water tastes salty.

Therefore, ocean water tastes salty because the dissolved salt particles are present throughout it, though invisible.

QUESTION 10 *Exercise 10 · p. 114*

Grains of rice and rice flour take the shape of the container when placed in different jars. Are they solids or liquids? Explain.

ANSWER

They are solids, even though they seem to take the shape of the container.

- Each grain of rice, and each speck of rice flour, is a small solid piece that keeps its own definite shape and volume. Their particles are held in fixed positions.
- Because the grains or specks are tiny and separate, they slide over one another and settle in the jar, so the heap fills the jar.

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- In a liquid, it is the particles themselves that move freely past each other; this is not so inside a grain of rice or flour.

Therefore, rice grains and rice flour are solids, because each grain or speck retains its own shape and volume.

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