

Solids, liquids and gases explained

Grade 6 science (Year 7 · Class 6) · Worksheet

Name: _____ Date: _____ Class: _____

These problems train you to sort materials into solids, liquids and gases, to read particle diagrams and to explain behaviour with the particle picture. Early problems are recall; later ones involve volumes, fractions and unit conversion. They suit Grade 6, Year 7 and Class 6 students.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS1-4

Problem 1 Sorting everyday items (easy)

Wanjiru in Nairobi lists these items: a brick, orange juice, helium in a party balloon, a pencil, milk, the air in a football, a coin.

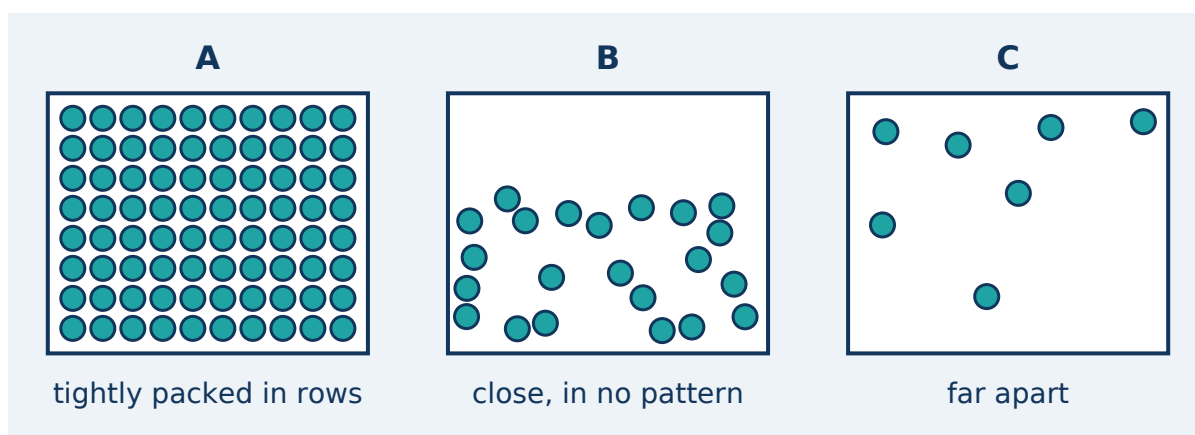
1. Classify each item as solid, liquid or gas.
2. Name the state that has a fixed shape.

Problem 2 Shape and volume (easy)

Answer using the words solid, liquid or gas.

1. State which state has a fixed shape and a fixed volume.
2. State which state has a fixed volume but no fixed shape.
3. State which state spreads out to fill the whole container.

Problem 3 Reading particle diagrams (easy)



Boxes A, B and C.

1. Identify the state shown in each box.
2. Describe how the particles in box B move.
3. Name the box in which the particles are furthest apart.

Problem 4 Pouring juice (easy)

Bilal in Lahore pours 300 mL of mango juice from a carton into a tall thin glass, then into a wide bowl.

1. State the volume of juice in the glass.
2. State the volume in the bowl.
3. State what changes when he pours it from the glass into the bowl.

Problem 5 Cooking oil bottles (easy)

A kitchen jar holds 1.5 L of cooking oil. Mei in Singapore fills 250 mL bottles from it.

1. Convert 1.5 L to mL.
2. Calculate how many bottles she can fill.
3. State what happens to the volume of oil when it moves from the jar into a bottle.

Problem 6 Describing particle motion (easy)

Complete each description using the words vibrate, slide or fly.

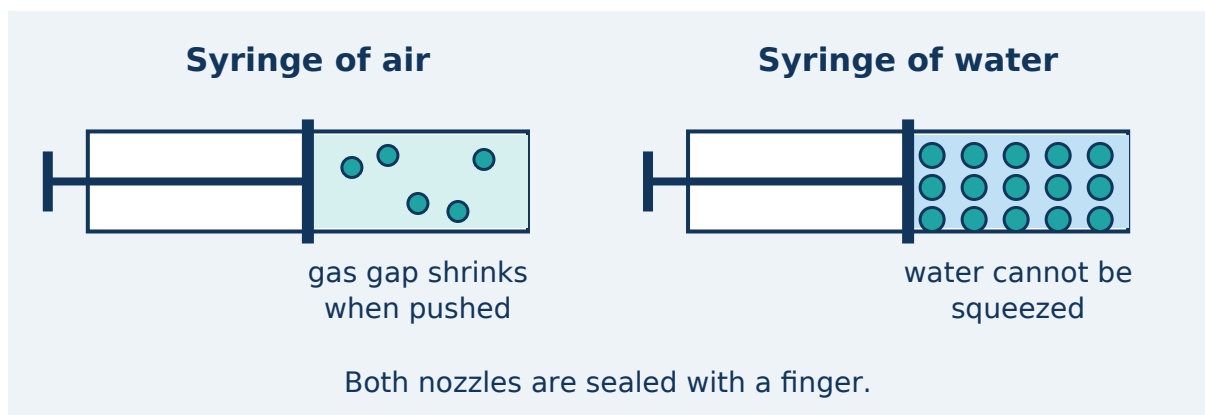
1. In a solid, particles ... on the spot.
2. In a liquid, particles ... past one another.
3. In a gas, particles ... in all directions.

Problem 7 Why a brick does not pour (easy)

Kofi in Accra says, "A brick can be carried in your hands, but water cannot be carried without a container."

1. Explain, using particles, why a brick keeps its shape.
2. Explain, using particles, why water does not keep its shape.

Problem 8 Squeezing air in a syringe (medium)



Diego in Texas seals a syringe with 50 mL of air and pushes the plunger in until it reads 20 mL.

1. Calculate the decrease in volume.

2. Calculate the fraction of the first volume that is left.
3. State whether the number of air particles has changed.

Problem 9 Squeezing water in a syringe (medium)

Diego repeats the experiment with 50 mL of water and a blocked tip. The plunger hardly moves.

1. State the volume reading after he pushes hard.
2. Explain the result using the spacing of particles.

Problem 10 Pumping a bike tyre (medium)

A pump holds 400 cm³ of air. When the plunger is pushed in, all the air is squeezed into 100 cm³.

1. Calculate the number of times the air has been compressed.
2. Compare the spacing of the particles before and after.
3. State whether the pump contains more, fewer or the same number of particles after pushing.

Problem 11 A smell spreading (medium)

Emma in Leeds opens a bottle of vinegar. Classmates raise a hand when they smell it.

Distance from the bottle (m)	Time to smell it (s)
1	4
2	9
3	15
4	22

1. Describe the pattern in the table.
2. Calculate how much longer it takes at 4 m than at 1 m.
3. Explain why the smell spreads.
4. Predict whether the times would be shorter or longer in a cold room.

Problem 12 Is sand a solid? (medium)

Chiamaka pours dry sand from a bucket. It flows and forms a heap.

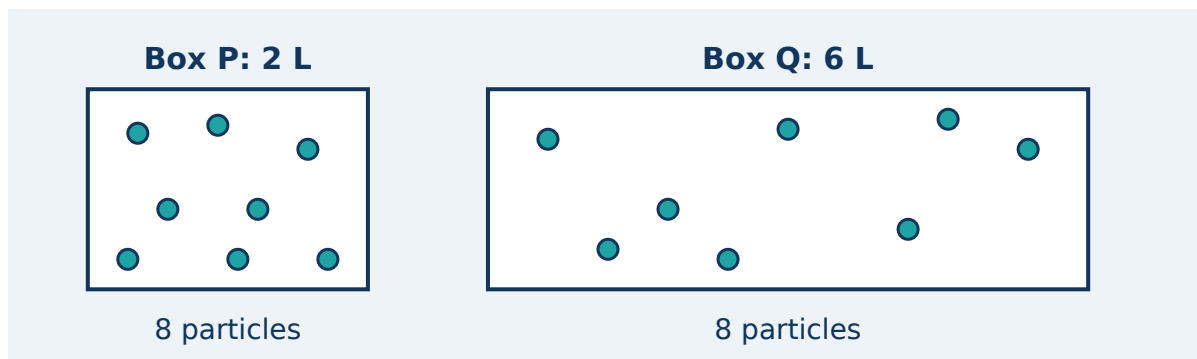
1. State whether sand is a solid, a liquid or a gas.
2. Explain why the sand flows even though it is not a liquid.

Problem 13 Spot the errors (medium)

Aarav writes: "In a solid the particles do not move. In a gas the particles are far apart because they are lighter."

1. Identify the mistake in the first sentence and correct it.
2. Identify the weakness in the second sentence and write a better reason.

Problem 14 Same gas, two boxes (medium)



Box P has volume 2 L and box Q has volume 6 L. Each holds 8 particles of the same gas.

1. State which box has the particles further apart.
2. Calculate how many times larger the volume of Q is than that of P.
3. Predict what happens to the gas if the 6 L box is made smaller.

Problem 15 Why a balloon stays inflated (medium)

Mei blows up a balloon and ties it.

1. Describe the movement of the gas particles inside it.
2. Explain why the balloon keeps its round shape and does not collapse.

Problem 16 Filling juice bottles (hard)

A factory in Lahore has a tank holding 99 L of juice. Bottles hold 330 mL and are packed in cartons of 6.

1. Convert 99 L to mL.
2. Calculate how many bottles can be filled.
3. Calculate how many full cartons that makes.
4. Explain why the factory can count bottles from the volume of juice but could not do so with a gas.

Problem 17 Flowing sand timer (hard)

A sand timer holds 120 g of sand. All the sand runs through the narrow neck in 240 s at a steady rate.

1. Calculate the rate of flow in g/s.
2. Calculate the mass left in the top bulb after 100 s.
3. Explain why sand can flow through a neck, using the idea of grains.

Problem 18 Scuba tank (hard)

A scuba tank has volume 12 L. If the air inside were released, it would take up 1800 L at normal pressure.

1. Calculate how many times the air has been compressed.
2. Describe what happened to the gaps between the particles.
3. State whether the number of particles changed.
4. Explain why 12 L of liquid water could not be compressed into a space like this.

Problem 19 Design a fair comparison (hard)

Lina wants to show that gases can be compressed but liquids cannot.

1. Describe the equipment you would choose.
2. State what you would keep the same.
3. State what you would measure.
4. Predict the results for each syringe.

Problem 20 Evaluating a human model (hard)

A class models the states with students. Solid: they stand in tight rows holding hands and wobble. Liquid: they walk around shoulder to shoulder. Gas: they run in all directions in the hall.

1. Match each action to the correct particle behaviour.
2. Give one strength of the model.
3. Give one weakness of the model.