Solid, Liquid or Gas? Sorting Materials

Teacher		**Class**	Year 4
Subject	Science	**Topic**	States of matter
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Pupils learn how to tell solids, liquids and gases apart. They run, sort and explain which hoop each material belongs in.

Curriculum links

- compare and group materials together, according to whether they are solids, liquids or gases [1]

Learning objectives

- Students will compare everyday materials by shape, flow and spreading out.
- Students will group materials as solids, liquids or gases with reasons.

Success criteria

- I can sort things into solid, liquid and gas groups.
- I can say why a material fits in its group.

What students already know

Hold up a wooden ruler and a water bottle. Ask: Which one keeps its shape when I hold it? Which one flows? Take 2 minutes of hands up.

Key words

solid	something that keeps its own shape and can be picked up and held [3]
liquid	something that flows and takes the shape of its tub or cup [3]
gas	something that spreads out to fill all the space around it [1] [3]
container	a tub, bottle or other holder that keeps things inside

Materials

- 3 hoops with solid / liquid / gas labels
- picture cards: wood, ice, sand, water, honey, milk, steam, helium, oxygen, sugar, salt, flour
- interactive whiteboard for Slides 1-7, 9-10, 12 and Video clip 1
- printed copies of Worksheet Task E for pairs
- mini whiteboards and pens

Before the lesson

- Print picture cards and solid / liquid / gas labels, plus one copy of Worksheet Task E per pair
- Test Slide 6 Video clip 1 (0:00-4:35) for sound and picture
- Clear tables back, place 3 hoops in spaces with dry, clear walkways

Lesson outline

0–8 min **Starter** 8 min · Whole class

To hook pupils and set up the sorting goal for solids, liquids and gases.

YOU DO

1. Welcome the class and show Slide 1 Solids, Liquids and Gases, then Slide 2 Today we will.
2. Say the hook and get a physical vote: ask pupils to stand still like a thud for solid or wobble like a splish for liquid.
3. Show Slide 3 and explain that all the stuff around us can be grouped as solid, liquid or gas [1].
4. Share the two I can statements and keep them on the board.

STUDENTS DO

1. Join in the splish or thud vote and say what they think.
2. Look at Slide 3 and repeat the 3 groups: solid, liquid, gas.
3. Listen to the success steps for sorting and explaining.

Say: If I tried to pour you into a cup, would you go splish or thud? Show me where you belong! Today we will compare everyday materials by what they do and group materials as solid, liquid or gas.

Ask: How many groups can we sort all the stuff around us into? (3 groups, solid, liquid and gas.) · If I pour you, would a solid go splish or thud? (Thud, because a solid keeps its shape and does not flow.)

Check understanding: Hands up for 3 fingers for 3 groups. If unsure, point again to Slide 3 and chant solid, liquid, gas together.

Support: Show the three hoop labels up close and let pupils point to the matching word. **Stretch:** Ask what tricky test we will use later for things that pour but may still be solid.

Use: Slides 1–3

8–20 min **Teaching** 12 min · Whole class

To explain the keep shape, flow and fill tests for each state.

YOU DO

1. Show Slide 4 Three groups to sort and model each test with a real thing.
2. Play Video clip 1 on Slide 6 from 0:00-4:35 and ask pupils to spot one example of each state.
3. Pause to recap: solids stay in one place and can be held [3] and keep their shape and do not spread out like gases [3].
4. Recap liquids and gases: liquids can flow or be poured easily and change their shape depending on the container they are in [3], gases spread out and change their shape and volume to fill up whatever container they are in [3].

STUDENTS DO

1. Watch the video and whisper one solid, one liquid and one gas they hear.
2. Practise the actions: hold shape hands, pour hands, spread wide for fill.
3. Answer test questions with a partner before answering aloud.

Say: Solid keeps its own shape and can be held. Liquid flows and takes the shape of its tub. Gas spreads out to fill all the space. Watch and listen for shape and flow words, then we will use these tests to sort.

Worked example: Wooden ruler: I hold it, it keeps its shape in my hand, it does not flow, so it is a solid, like wood, ice and sand [3]. Water in a jug: I tip it, it flows, it takes the shape of the cup I pour it into, so it is a liquid, like water, honey and milk [3]. Air let from a balloon: I cannot hold it, it spreads out into the room, so it is a gas, like steam, helium and oxygen [3].

Ask: How do you know the wooden block is a solid? (It keeps its shape, can be held, and does not flow like a liquid [3].) · How do you know water is a liquid? (It flows, is not easy to hold, and takes the shape of its tub [3].) · Where does a gas go if the container is not sealed? (It escapes from an unsealed container and spreads out to fill space [1] [3].)

Check understanding: Show me with actions on 3-2-1: hold, pour, fill. Re-teach any test most pupils mix up using Slide 4.

Support: Keep the three test pictures on the board and repeat the sentence frames: It keeps... It flows... It fills... **Stretch:** Ask pupils to predict what stays the same when a liquid moves tubs: it still takes up the same amount of space [3].

Use: Slides 4, 6 and Video clip 1 (0:00–4:35)

20–40 min **Main activity** 20 min · Groups

To compare and group everyday materials as solids, liquids or gases.

YOU DO

1. Set out 3 hoops with labels and show Slide 9 Your task and Slide 10 How to decide.
2. Hold up cards one at a time, easy ones then tricky ones, and send groups to the matching hoop.
3. Ask each group to say why they chose that hoop, using keep shape, flow or spread out ideas.
4. Remind them that solids keep their shape and do not spread out like gases [3] and liquids change shape but still take up the same amount of space [3].

STUDENTS DO

1. Run carefully to the matching hoop when their card is held up.
2. Place the card down and tell the group why using keep shape, flow or fill words.
3. Check other groups and challenge if a card looks in the wrong hoop.

Say: Look closely. Test: keeps shape, flows, or fills space? Place the picture in the hoop. Tell your group why it fits there. Use our tests to decide.

Worked example: Card shows honey: Does it keep its shape in the hand? No. Does it flow and take the tub shape? Yes, it pours slowly from the bottle. So honey goes in the liquid hoop, with water and milk [3]. Card shows steam from a kettle: Does it keep shape or flow in a pool? No. Does it spread out to fill space? Yes. So steam goes in the gas hoop [3].

Ask: Why did you put ice and sand in the solid hoop? (Because examples of solids include ice, wood and sand, they keep shape [3].) · Why did milk go in the liquid hoop? (It flows, is poured easily and takes the shape of its cup [3].)

Check understanding: Each hoop group holds up one card and gives its reason. Move any wrong card together and re-test with Slide 10 questions.

Support: Give picture cards with a tick list: Does it keep its shape? Does it flow? Does it fill the whole room?
Stretch: Add sugar, salt and flour cards and ask pupils to justify why pouring does not make them liquids.

Use: Slides 9–10

40–50 min **Tricky sort** 10 min · Pairs

To explain why powders that pour are still grouped as solids.

YOU DO

1. Show Slide 5 mystery: I can be poured, but I am not a liquid. What am I?
2. Reveal the answer and show Slide 7 that flour, salt and sugar can pour but are solids [3].
3. Explain that solids hold their shape and liquids form a pool not a pile [1], and each particle of salt keeps the same shape and volume [3].
4. Hand out Worksheet Task E and ask pairs to place each material on the line from keeps its shape to spreads out.

STUDENTS DO

1. Answer the mystery and say why sugar is still a solid.
2. Do Worksheet Task E: place letters A to D on the keeps shape to spreads out line.
3. Compare lines with another pair and explain one pile and one pool choice.

Say: I can be poured, but I am not a liquid. What am I? Sugar! Poured sugar is still a solid - each piece keeps its shape. Powders pile up, liquids make a flat pool.

Worked example: Sugar tipped from a spoon: it pours in a stream but lands as a little pile, each grain keeps its shape, so it sits near keeps its shape on the line, not with water which makes a pool [1] [3].

Ask: If sugar pours, why is it not a liquid? (Even though they can be poured, sugar, salt and flour are all solids, each piece keeps shape [3].) · Pool or pile for water and for sugar? (Water makes a pool, sugar makes a pile, because liquids form a pool not a pile [1].)

Check understanding: Hold up Task E lines and check pile end has sugar/sand and pool middle has water. Re-model pile versus pool if mixed.

Support: Provide magnifier picture of grains and word bank pile, pool, flow, keep shape. **Stretch:** Predict where dry sand would sit on the line and why it is a solid like wood and ice.

Use: Slides 5, 7 and Worksheet Task E

50–60 min **Plenary** 10 min · Whole class

To check pupils can sort and explain solids, liquids and gases.

YOU DO

1. Show Slide 12 Quick quiz and read each question aloud.
2. Ask pupils to answer on mini whiteboards and hold up together.
3. Go through answers using the keep, flow, fill tests and link back to the I can statements.

STUDENTS DO

1. Write answers on whiteboards and hold up on signal.
2. Say why for each answer using keep shape, flow or fill words.
3. Tick their own I can statements for sorting and explaining.

Say: Which group keeps its own shape? Milk is poured into a cup. Solid, liquid or gas? Show your board, then tell your partner why it fits there.

Ask: Which group keeps its own shape, like wood and ice? (Solids.) · Milk is poured into a cup. Solid, liquid or gas, and why? (Liquid, it flows and takes the cup shape.) · Air pumped into a tyre spreads to fill it. Solid, liquid or gas? (Gas, it spreads out to fill all the space.)

Check understanding: Count correct whiteboards for all three. If many miss gas, re-show balloon spread and repeat fill test together.

Support: Offer the three hoop labels as answer choices to point to before writing. **Stretch:** Ask pupils to name one more classroom solid, liquid and gas and give the test for each.

Use: Slide 12

Common mistakes

Mistake	How to spot it	How to fix it
Thinking anything that can be poured is a liquid, such as sugar, salt, flour or sand.	Pupil puts powder card in liquid hoop or calls a pile a pool.	Compare pile and pool: solids hold their shape and liquids form a pool not a pile [1]. Show that even though they can be poured, sugar, salt and flour are all solids and each grain keeps shape [3].
Thinking gases are nothing because they cannot be seen.	Pupil says classroom air or balloon air is not a group or leaves gas hoop empty.	Feel air escaping and show it fills and takes the balloon shape. Stress that gases spread out and change shape and volume to fill the container and escape from an unsealed container [1] [3].
Mixing up shape change and amount of space for liquids.	Pupil says water in a tall beaker is more water than in a wide dish.	Pour 200 ml between tubs to show level changes but amount stays. Repeat that even when liquids change shape, they always take up the same amount of space, as do solids [3].

Support

- Use picture cards with tick list tests and word bank pile, pool, flow, keep shape.
- Work in mixed pairs so pupils hear reasons aloud before running to hoops.

Stretch

- Add sugar, salt, flour and sand cards to defend as solids that pour.
- Challenge pupils to add two classroom examples per hoop and explain the test used.

For the LSE or teaching assistant

Stay with the hoop groups during the run. Prompt with Does it keep shape? Does it flow? Does it fill space? Help record reasons for Task E.

Safety

- Clear tables back and keep walkways dry so no one slips or bumps while moving.

Check for understanding

Question	Answer
Which group keeps its own shape and can be held?	Solids.
Juice is poured into a beaker and takes the beaker shape. Which group?	Liquid, because it flows and takes the shape of its container.
Sugar is poured from a spoon and makes a pile. Solid, liquid or gas, and why?	Solid, because each grain keeps its shape and it piles, not a pool.

Homework

Spot one solid, one liquid and one gas at home and write why each fits its group.

Sources

1. Science programmes of study: key stages 1 and 2 - GOV.UK · assets.publishing.service.gov.uk · https://assets.publishing.service.gov.uk/media/5a806ebd40f0b62305b8b1fa/PRIMARY_national_curriculum_-_Science.pdf
2. Science Curriculum Year 4 · queenshill.norfolk.sch.uk · https://www.queenshill.norfolk.sch.uk/wp-content/uploads/2019/11/Science-Curriculum-Year-4.pdf
3. What are the states of matter? - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/zsgwwxs
4. Solids, liquids and gases - The three states of matter - AQA ... · bbc.co.uk · https://www.bbc.co.uk/bitesize/guides/z93jfcw/revision/1
5. States of matter - Creative Chemistry · creative-chemistry.org.uk · https://www.creative-chemistry.org.uk/gcse/keyideas/states
6. States of Matter | GCSE Chemistry Revision | KS4 · revisescience.org.uk · https://www.revisescience.org.uk/chemistry/GCSE/pure-substances-mixtures/states-of-matter/
7. pdf · eli10.co.uk · https://eli10.co.uk/topics/the-three-states-of-matter-explained/pdf
8. State of matter Facts for Kids · kids.kiddle.co · https://kids.kiddle.co/State_of_matter
9. States of matter - KS2 Science - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/topics/zgwc96f
10. matter: states of matter - Kids | Britannica Kids | Homework Help · kids.britannica.com · https://kids.britannica.com/kids/assembly/view/191187
11. matter - Kids | Britannica Kids | Homework Help · kids.britannica.com · https://kids.britannica.com/kids/article/matter/353444
12. [1710.02304] Exotic states of matter with polariton chains · arxiv.org · https://arxiv.org/abs/1710.02304
13. Chem4Kids.com: Matter: States of Matter · web.archive.org · https://web.archive.org/web/20240204085922/http://www.chem4kids.com/files/matter_states.html
14. States of Matter: Solids, Liquids, and Gases for Kids · whatihavelearnedteaching.com · https://whatihavelearnedteaching.com/states-of-matter/
15. State of Matter For KIds - 3 States of Matter Solid Liquid Gas · smartclass4kids.com · https://smartclass4kids.com/science/chemistry/state-of-matter/
16. States of Matter Explained for Kids: Story, Facts ... · mystorypie.com · https://mystorypie.com/learn/en/concept/states-of-matter-solid-liquid-gas/
17. States of Matter for Kids (Free Worksheets & Easy Experiments) · littlebinsforlittlehands.com · https://littlebinsforlittlehands.com/states-of-matter/
18. States of Matter Explained for Kids | Solid, Liquid, Gas · welearnscience.com · https://welearnscience.com/chemistry/state-of-matter.html
19. States of Matter for Kids | Changing States | Facts About ... · k8schoollessons.com · https://k8schoollessons.com/states-of-matter-for-kids/
20. New State of Matter Discovered: Both Solid and Liquid at Once! - Glass Almanac · glassalmanac.com · https://glassalmanac.com/new-state-of-matter-discovered-both-solid-and-liquid-at-once/

Created with LessonDino.com · AI lesson planner with checkable sources

21. Scientists at University of Edinburgh discovers chain-melted state of matter – GKToday · gktoday.in · https://www.gktoday.in/scientists-at-university-of-edinburgh-discovers-chain-melted-state-of-matter/
22. States of Matter - ABCya! · abcya.com · https://www.abcya.com/games/states_of_matter
23. States of Matter Lesson | Science4Us - ExploreLearning · science4us.explorelearning.com · https://science4us.explorelearning.com/elementary-physical-science/matter/states-of-matter/