BFSU A-2

Solids, Liquids, and Gases

Three states of matter — and how temperature moves things between them

OVERVIEW

*Everything you can ever touch is a **solid**, a **liquid**, or a **gas** — and all of it together is called **matter**. The only thing that moves matter from one state to another is **temperature**.*

SOLID

Keeps its shape all by itself — blocks, rocks, ice, spoons, you can stack it.

LIQUID

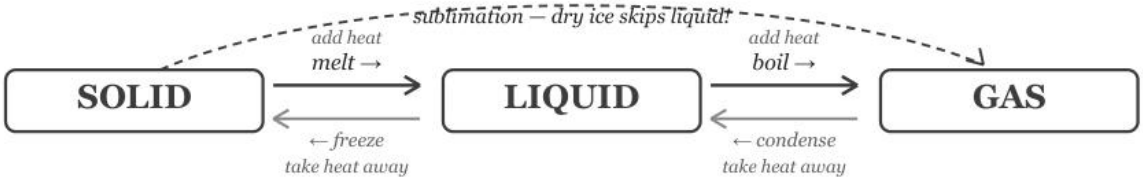
Flows and runs, and takes the shape of its container — but doesn't fill it up.

GAS

Spreads out to fill every corner of any space — like the air all around you.

The Shapeshifter — the same water, three ways

*Fig. 1 — **one substance, three states:** ice (solid), water (liquid), and water vapor (gas) — the white puff is tiny drops; the true gas is invisible, in the clear gap.*



Words to Know

solid · liquid · gas · matter · melt · freeze · boil · temperature · sublimation

matter *— solids, liquids, and gases all together; everything that has weight and takes up space* · ***melt*** *— heat turns a solid into a liquid* · ***freeze*** *— cold turns a liquid into a solid* · ***boil*** *— heat makes a liquid turn into gas fast* · ***temperature*** *— the number that tells how hot or cold* · ***sublimation*** *— a solid goes straight to gas, skipping liquid*

Watch For This in Everyday Life

- Butter in a hot pan at dinner. *What is the heat doing to it?*
- An ice cube shrinking in a summer drink. *Which state is it leaving?*
- Water going into the freezer at night. *What will the cold turn it into?*
- Any smell, anywhere — every smell is something in its **gas** state. *What is your nose catching?*
- Look at the whole world: land, ocean, sky. *Solid, liquid, and gas — can you name all three?*

solid

solid

liquid

liquid

gas

gas

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Solids, Liquids, and Gases

My sorting chart — front

WORKSHEET

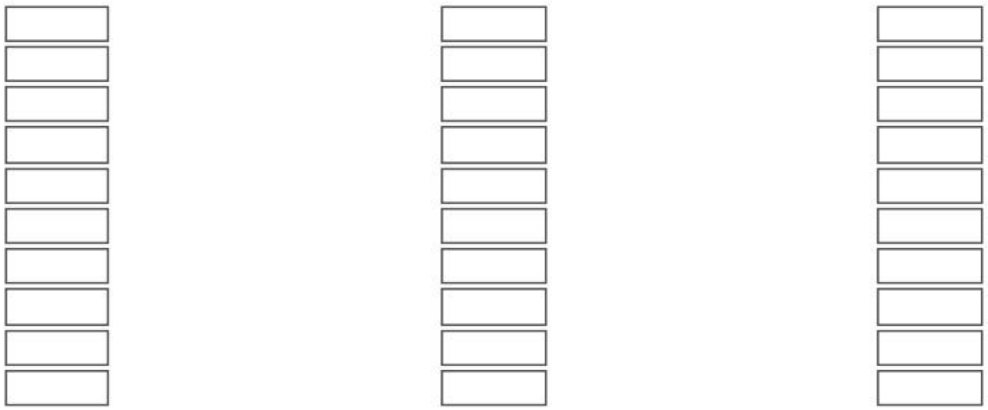
1 · Glue each little picture where it belongs

Cut the little pictures from the paste strip. Ask each one: does it keep its shape? does it flow? does it fill all the space? Then glue it in its column.

SOLID	LIQUID	GAS
keeps its shape by itself	*flows — takes its container's shape*	*spreads out to fill any space*

2 · Our bar chart

Shade one box for each card your team put in that bucket in the floor game — start at the bottom. The tallest stack is the state we found the most of. Put a ★ star on the winner.



solid *liquid* *gas*

3 · The same water, three ways

SOLID	add heat →	LIQUID	add heat →	GAS
draw an ice cube		*draw water in a glass*		*draw the kettle — the gas above the spout is invisible!*

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The Melt Race

Every material melts at its own temperature

WORKSHEET

1 · One ice cube, all three states — circle your guess first

We will keep heating one ice cube until it melts, boils, and the pan is **empty and dry**. Where will the water be then?

gone forever — it vanished

in the air of the room — invisible gas

hiding in the pan as a drop

draw the pan at the end

2 · The Melt Race — guess the order, then record what happened

Before the heat goes on: write your guess — 1, 2, 3, 4, 5, 6 (1 = melts first). After the race: write the real order, and how long each took.

What's racing	My guess (1st–6th)	Real order	How long? (seconds or minutes)
 *ice cube*			
 *coconut oil*			
 *chocolate*			
 *butter*			
 *gummy bear*			
 *crayon*			

Ordinal words to copy: first · second · third · fourth · fifth · sixth

3 · The spoiler — and thinking like a scientist

The cheese got hot too… did it ever **run like a liquid**? Circle: **YES** / **NO**. Not everything melts! Now put a ★ on the race winner and tell someone why the racers finished in different order. *Hint: every material has its own melting temperature — its own number.*

Number Log

Temperature is a number — read it and write it big

1 · Reading Real Temperatures

Read the thermometer (or the point-and-read gun) and write the number. A grown-up can write it first for you to copy.

WHERE WE MEASURED	°F	COLDER OR WARMER THAN ME? (I AM ABOUT 98 °F)
 *ice water*		
 *room air*		
 *warm water*		
 *hot plate surface (teacher points the gun)*		

32 °F

water's freeze-and-melt line — below it water is ice; above it ice becomes water

212 °F

water's boil line — here liquid water races away into invisible gas

2 · My Ice Shape Race

Draw your shape when we set it out. Check it after each experiment — when only a puddle is left, write down how long your shape lasted.

MY SHAPE AT THE START (DRAW IT)	MY SHAPE AFTER LUNCH (DRAW IT)	HOW LONG DID IT LAST?

Which shape in the race melted first — a big fat one or a small skinny one? Tell a grown-up why.

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Solid, Liquid, Gas

the lesson's song — sing it, then say what it means

SONG

Verse 1

An ice cube keeps its corners, a rock sits on its own,
A teddy keeps his bear shape when you leave him all alone.
Stack it, hold it, tap it — it stays the way it was:
That's a SOLID, that's a solid, that's what a solid does!

Chorus

Solid keeps its shape! (huddle up tight)
Liquid flows and pours! (hold hands loose)
Gas spreads out to fill the space — out every door!
Solid, liquid, gas — it's all matter, don't you know,
And it's temperature, temperature, that makes the changes go!

Verse 2

Now water in a pitcher goes wiggle, slide, and slip,
It lies down in its container and it dribbles when you tip.
It never keeps a shape — it takes the shape it's in:
That's a LIQUID, that's a liquid — pour it out and pour it in!

(Chorus)

Verse 3

And what's inside this jar here? You say it's empty air?
It's GAS — it fills the corners, it's spreading everywhere!
You can't see it, can't hold it, but it's real as real can be —
Every smell that finds your nose is a gas that's flying free!

(Chorus)

Bridge (slower, wondering)

Warm it up — it MELTS… (solid turns to liquid, see it run)
Warm it more — it BOILS… (liquid turns to vapor in the sun)
Cool it down — it's drops again, then FREEZES hard and true —
The very same water, coming back to you!
And strange old dry ice skips a step — no puddle on the grass —
SUB-LI-MA-TION! Solid straight to gas!

(Chorus ×2, second time stomp on "temperature, temperature")

Tag (spoken, kids): "Solid!… Liquid!… Gas!… That's matter — now sort it!"

How to use it. Play the recording once while everyone just listens. Play it again and join in on the chorus only — that is the part carrying the lesson. By the third time most children have the chorus. Then close the binder and ask what the words actually mean; a child who can sing it and explain it has the idea for good.