States of Matter and Particle Model

Solids, liquids and gases all behave differently because of how their particles are arranged and move — a core KS3 chemistry idea that runs right through GCSE Science.



(a) (i) Choose words from the box to complete the sentence below.

solid	**liquid**	**gas**

A snowflake falls on Stefan's nose and melts.
When the snowflake melts, it changes

from a _____ to a _____ .

(iii) In his hotel, Stefan sees some changes.
Are the changes below reversible?
Write **yes** or **no**.

ice melting _____

wood burning _____

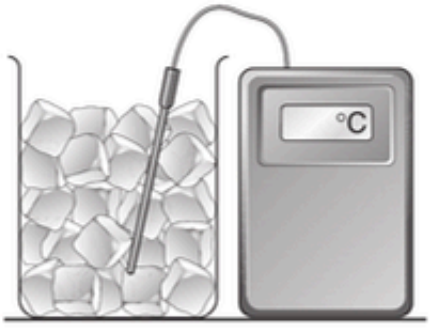
toasting bread _____

KS3 Science SATs, Paper 1 (2009) - Q1(a)(iii)

4. (a) Draw a line from each change of state to the correct name.
Draw only **four** lines.

change of state	name
solid to liquid	evaporating
liquid to gas	melting
gas to liquid	condensing
liquid to solid	freezing

(b) Kate made some ice cubes from pure water.
She used a sensor to measure the temperature of the ice.

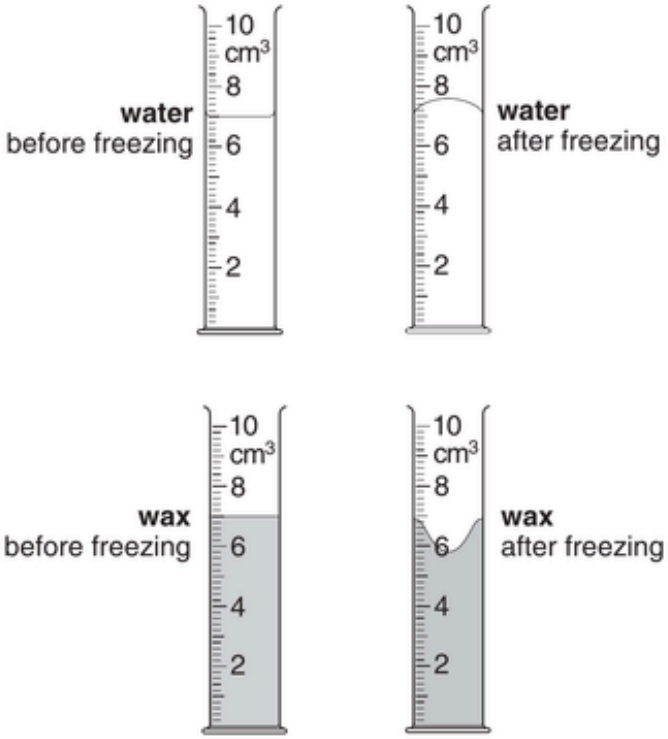


What temperature will the sensor show when the ice is melting?

_____ °C

Modern Tuition

5. Meera poured 7 cm^3 of water into a measuring cylinder.
She poured 7 cm^3 of melted wax into another measuring cylinder.
She put both measuring cylinders into a freezer for 24 hours.



(a) Look at the measuring cylinders.
What happened to the volume of the water and the wax after freezing?

the volume of water _____

the volume of wax _____

(b) The measuring cylinders were taken out of the freezer and left in a room at 20 C.

- Frozen water melts at 0 C.
- Wax melts at 53 C.

What would the physical state of each substance be at 20 C?

Choose from gas or liquid or solid.

water _____

wax _____

Modern Tuition

12. (a) The table below shows the melting points and boiling points of four elements.

element	melting point (°C)	boiling point (°C)
aluminium	660	2520
iron	1540	2760
magnesium	650	1100
mercury	–39	357

When answering the questions below, you may give the name of an element more than once.

Which element in the table is:

(i) a liquid at 0°C?

_____

(ii) a solid at 1500°C?

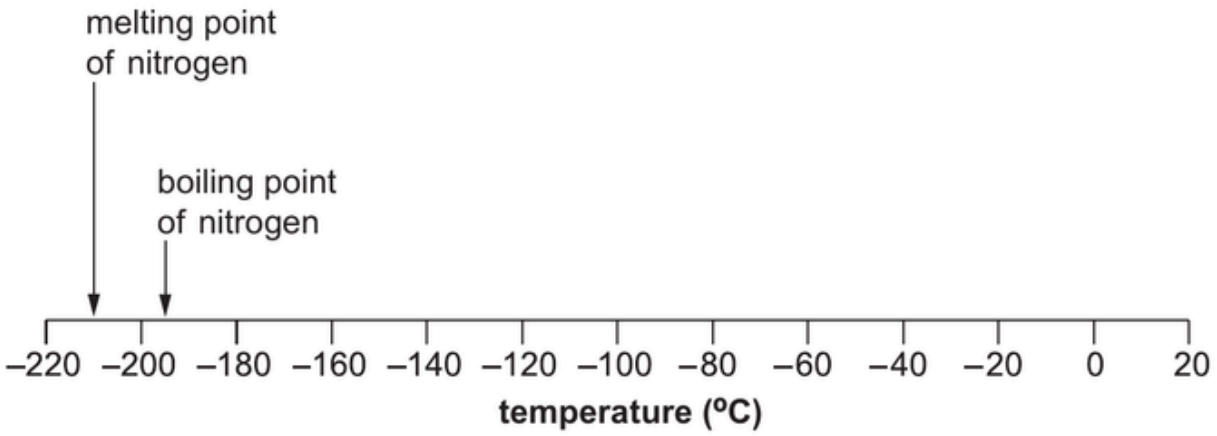
_____

(iii) a gas at 500°C?

_____

(iv) a liquid over the biggest temperature range?

(b) The melting point and boiling point of nitrogen are marked on the scale below.



(i) **Draw an arrow** on the scale above to show the temperature at which water freezes.

(ii) When water is a liquid, what is the physical state of nitrogen?
Tick the correct box.

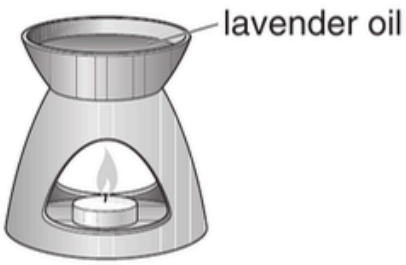
solid ☐ liquid ☐ gas ☐

(iii) What is the physical state of nitrogen at –200°C?
Tick the correct box.

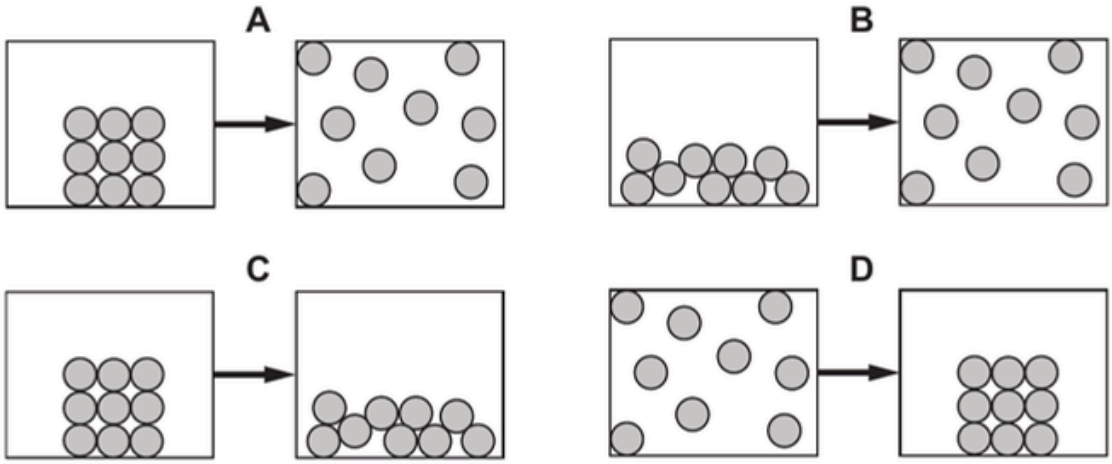
solid ☐ liquid ☐ gas ☐

Modern Tuition

(c) Rosie poured some lavender oil into an oil burner.
She heated it with a candle.



The oil changed state.

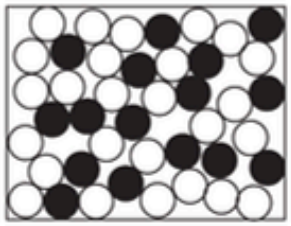


Which diagram represents this change of state?
Write the letter.

_____

Modern Tuition

(c) The diagram below shows the mixture of particles of wax and white spirit in Wax Seal.



key

○ = particle of white spirit

● = particle of wax

not to scale

After Jill sprays the car, the white spirit evaporates leaving a layer of solid wax on the surface.

(i) In the box below, draw **eight** circles, ○, to show the arrangement of particles in a gas.



particles in a **gas**

(ii) In the box below, draw **eight** circles, ●, to show the arrangement of particles in a solid.



particles in a **solid**

Modern Tuition

10. (a) (i) Air contains nitrogen.
In the box below draw **five** circles, ○, to show the arrangement of particles in nitrogen gas.

(ii) Zeena carries a personal emergency alarm.
It uses nitrogen gas to produce a very loud sound.



The nitrogen gas in the container is under much higher pressure than the nitrogen gas in the air.

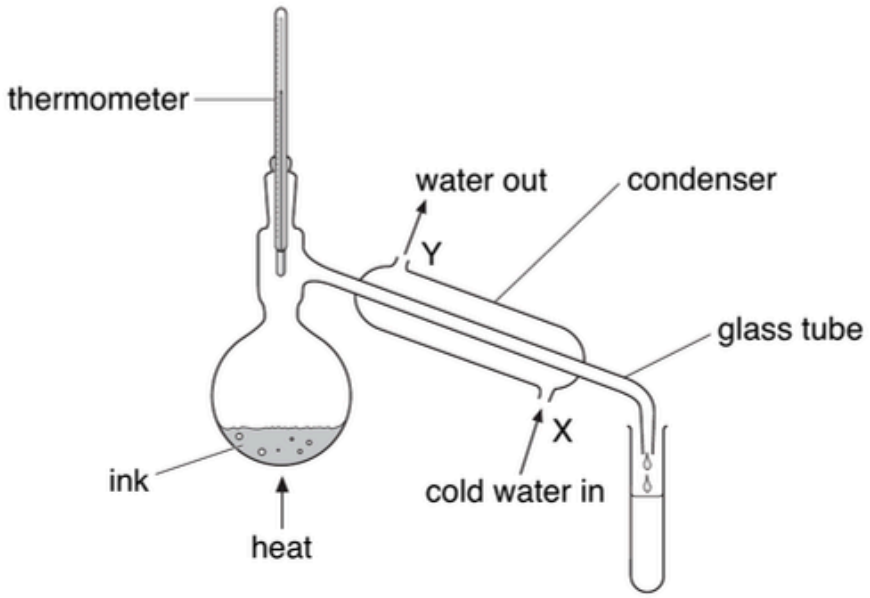
How does the arrangement of nitrogen particles change when the gas is under higher pressure?

_____

_____

Modern Tuition

12. Rema used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus A

(a) Which processes occur during distillation?
Tick the correct box.

condensation then evaporation	☐
evaporation then condensation	☐
melting then boiling	☐
melting then evaporation	☐

Modern Tuition

(c) Alcohol and mercury are two liquids that can be used in glass thermometers. The table gives information about these liquids.

liquid	boiling point (°C)	colour
alcohol	78	colourless
mercury	357	shiny grey

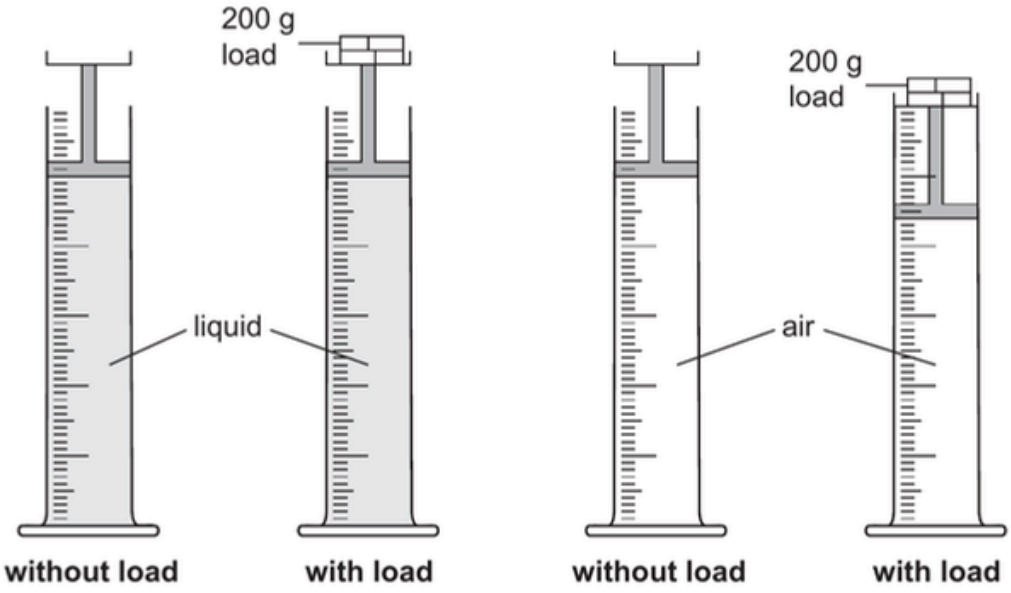
(ii) Choose words from the list below to fill the gaps in the sentences.

gas **liquid** **solid**

When alcohol and mercury boil they both change from a liquid to a _____.

A thermometer containing mercury can be used to measure the temperature of an oven at 150°C because mercury is a _____ at 150°C.

(b) Rebekah set up a different experiment as shown below.
She measured the volume of the liquid and the air in the cylinders before and after a 200 g load was added to the piston.



(i) When the loads were added to the pistons, the volume of the liquid did **not** change but the volume of the air decreased.

Explain why this happened.

_____

Modern Tuition