

Bonding, structure and the properties of matter

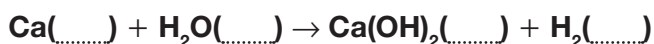
Bonding and structure

① Complete the equations below by adding the correct state symbols. (6 marks, ★★★)

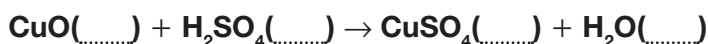
- a On heating, solid calcium carbonate decomposes to form solid calcium oxide and carbon dioxide gas.



- b Solid calcium reacts with water to form a solution of calcium hydroxide and hydrogen gas.



- c Solid copper oxide reacts with sulfuric acid to form a solution of copper sulfate and water.



WORKIT!

Use a number line to help you work out the state of a substance at a given temperature.

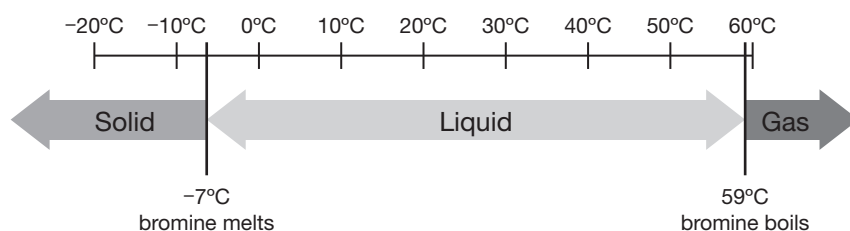
Bromine, Br_2 , melts at -7°C and boils at 59°C .

What state will it be in at the following temperatures?

- a 0°C
b 100°C
c -10°C

Step 1

Draw out a number line which spans just beyond the range of the melting and boiling points. Remember that the negative numbers go backwards!



Step 2

The substance will be a liquid at temperatures between the melting and boiling point. Label this on your number line.

Step 3

The substance will be a solid at any temperature to the left of the melting point. Gases are formed at any temperature greater than the boiling point. Label these on your number line.

Step 4

Use the number line to work out the states at each temperature.

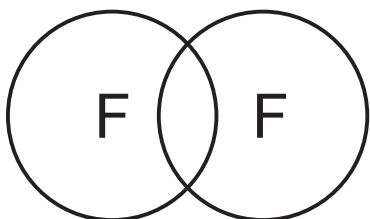
0°C - Liquid

100°C - Gas

-10°C - Solid (but only just!) as -10°C is a slightly lower temperature than -7°C .

Covalent bonds and simple molecules

- 1 a Complete the dot and cross diagram below to show the covalent bonding in the molecule.



- b Write out the formula of the substance.
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NAILIT!

A single covalent bond is formed when one pair of electrons is shared between the atoms of two non-metal atoms. However, not all molecules have single covalent bonds.

WORKIT!

Molecules of oxygen have the formula O_2 . Draw the dot and cross diagram to represent this molecule. (2 marks, ★★★)

Each O has 6 electrons in its outer shell, and needs 2 more to get a full outer shell.



This means that each O has to share 2 of its electrons.

Two pairs of electrons are shared, forming a double covalent bond.

