Sodium and chlorine reaction: Johnstone's triangle

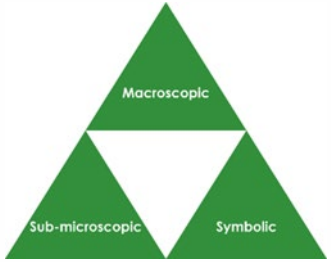
This resource is from the **Johnstone's triangle** series which can be viewed at: rsc.li/43jMfSn. It will help learners to understand the different ways you need to think in chemistry, and to build their mental models and understanding.

Learning objectives

1. Recognise the different parts of a word equation.
2. Match observations to reactants and product names.
3. Complete the particle diagram for the product.

How to use Johnstone's triangle

Use Johnstone's triangle to develop learners' thinking about scientific concepts at three different conceptual levels:



- Macroscopic – what we can see. Think about the properties you can observe, measure and record.
- Sub-microscopic – smaller than we can see. Think about the particle or atomic level.
- Symbolic – representations. Think about how we represent chemical ideas including symbols and diagrams.

For learners to gain a deeper awareness of a topic, they need to understand it at all three levels.

When introducing a topic, don't introduce all three levels of thinking at once. This will overload working memory. Instead complete the triangle over a series of lessons, beginning with the macroscopic level and then introducing other levels, in turn, once secure.

The levels are interrelated. For example, learners need visual representation of the sub-microscopic in order to develop mental models of the particle or atomic level.

Find further reading about Johnstone's triangle and how to use it in your teaching at rsc.li/4a40jml.

Scaffolding

Share the structure of the triangle with learners prior to use. Tell them why you are using it and how it will help them to develop their understanding. Use an 'I try, we try, you try' approach when introducing Johnstone's triangle for the first time.

More resources

To further develop learner's thinking in all areas of Johnstone's triangle, try our **Developing understanding of word equations** worksheet (rsc.li/494lFAY). To see a demonstration of the reaction between sodium and chlorine, watch our *Exhibition chemistry* video **That's a salt** (rsc.li/3uW6BQz).

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Macroscopic – what we can see

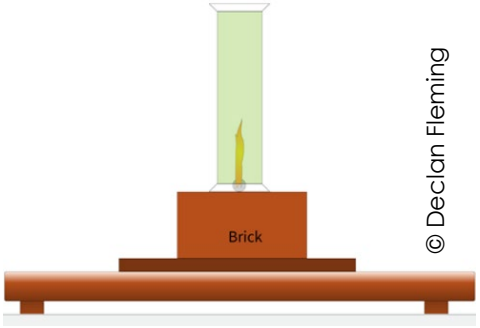
Sodium reacts with chlorine to form sodium chloride,

Name the substances observed from the descriptions.

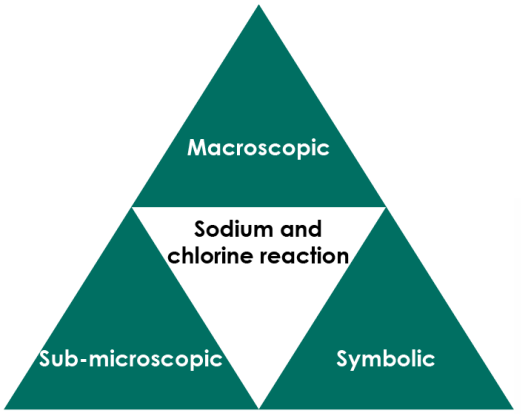
yellow-green gas *chlorine* shiny grey solid *sodium*

A smoke is made up of tiny fragments of a solid that are suspended in a gas. Name the substance that makes up the observed white smoke.

sodium chloride

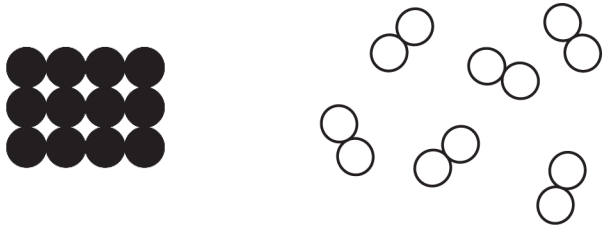


This reaction between sodium and chlorine is carried out in a fume cupboard



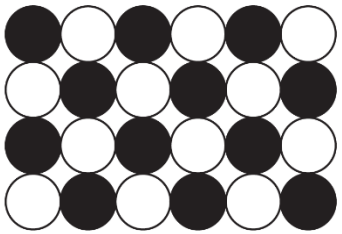
Sub-microscopic – smaller than we can see

Label the two particle diagrams to show which reactant each represents.



sodium *chlorine*

Colour the particle diagram to represent the product of the reaction (sodium chloride).



Symbolic – representations

The word equation for the reaction between sodium and chlorine is:

sodium + chlorine → sodium chloride

Name the two reactants

sodium and chlorine

Name the product

sodium chloride

Explain why the maths sign = is not used in a chemical equation.

Sodium and chlorine are not the same as sodium chloride. The two sides are not equal.

Give the meaning of the sign → in words.

The sign means 'produce' or 'form'.

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