Hydrogen, helium and lithium: Johnstone's triangle

Learning objectives

1 Match the name of the elements to a description of their use.

2 Name the element based on the arrangement of its atoms.

3 Identify the particle diagram that represents each element.

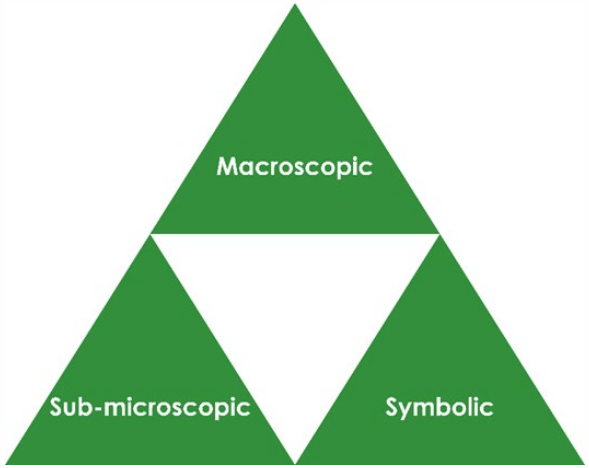
Introduction

Hydrogen, helium and lithium are all elements but the arrangement of the atoms in each is different. For example, in hydrogen, the atoms are joined in pairs called molecules but this is not the case for lithium or helium.

Johnstone's triangle

In chemistry we make sense of the things that we can see by representing what we can't see using formulas, equations, diagrams and models.

Johnstone's triangle is a way of thinking about these different concepts as different corners of a triangle:



- Macroscopic – what we can see. Think about the properties we 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.

Being able to connect and move between these three different levels is important for scientific understanding.

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Johnstone's triangle 11–14 years

Available from rsc.li/4wp8qUy

Macroscopic – what we can see

Give the name of each element from the description.

This gas can be used to fill balloons.

_____

This metal is used to make rechargeable batteries.

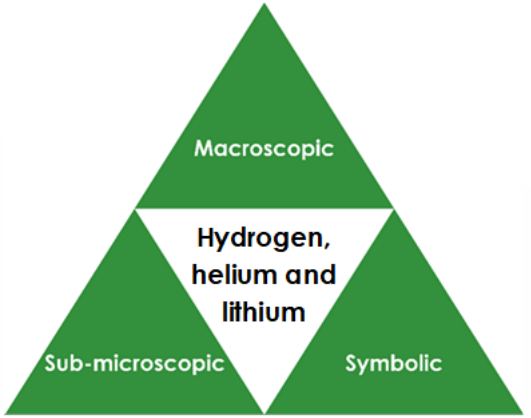
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This gas may become a cleaner fuel for the future.

_____



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Sub-microscopic – smaller than we can see

The table describes the arrangement of atoms for each element.

Complete the table by naming the element that matches each description (**hydrogen**, **helium** or **lithium**).

Description of atom arrangement	Name of element
All atoms are joined together	
Atoms are joined in pairs forming molecules	
All atoms are separate	

Describe what happens to the arrangement of atoms when lithium melts.

_____

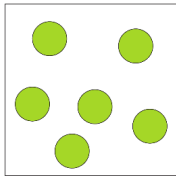
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Symbolic – representations

Write the name of the element represented by each element symbol.

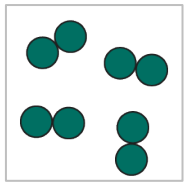
Li _____ He _____ H _____

Give the letter of the particle diagram that represents each element.



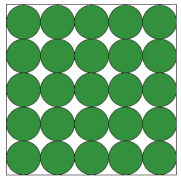
A

hydrogen ____



B

helium ____



C

lithium ____

Hydrogen gas has the formula H_2. Suggest why.

_____

_____

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