

**Activity 1** – sheet 1 of 2**Programme Questions****Atomic Structure**

1. What was J J Thompson studying when he discovered electrons?  
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2. If cathode rays are deflected by a very small magnetic field, does this suggest they are heavy or light?  
\_\_\_\_\_
3. If the strength of the electric field in Thompson's experiment were increased what would happen to the amount the rays are deflected?  
\_\_\_\_\_
4. Why did Rutherford carry out his gold foil experiment in a vacuum?  
\_\_\_\_\_
5. What is the charge and relative mass on each of these particles?

	Electron	Proton	Neutron
Charge			
Mass			

**Atomic Number and Mass Number**

1. Which element has the lowest atomic number?  
\_\_\_\_\_
2. Does atomic number increase in a regular way?  
\_\_\_\_\_
3. What is the atomic number of an atom equal to?  
\_\_\_\_\_
4. Which is bigger, the atomic number or the mass number?  
\_\_\_\_\_
5. What is an atom's mass number equal to?  
\_\_\_\_\_

### Activity 1 – sheet 2 of 2

### Programme Questions

#### Electron Structure

1. Where are the electrons found in an atom?

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2. What is the maximum number of electrons that can fit into the first shell?

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3. What is the maximum number of electrons that can fit in the second and third shells?

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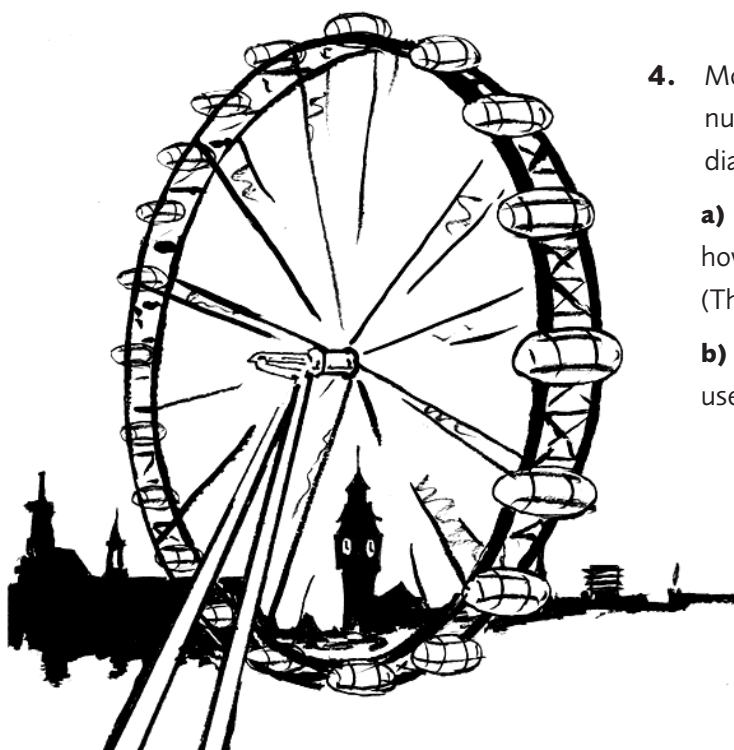
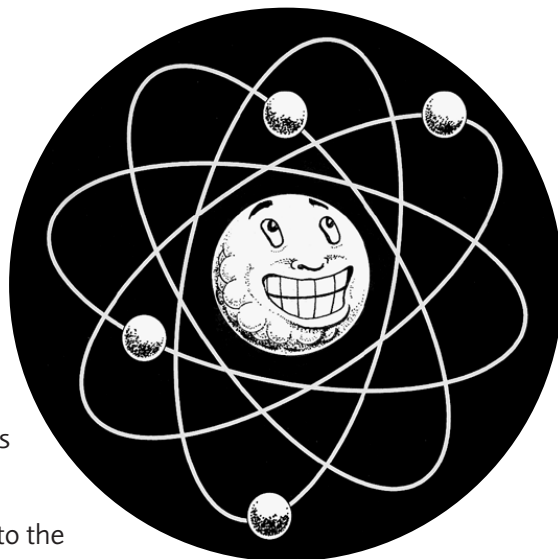
4. What is the electron arrangement in an atom of magnesium and which group of the periodic table does it belong to?

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### Activity 2 – sheet 1 of 1

#### Amazing Atoms

- In this activity you will be finding out just how small atoms really are. You will be dealing with some very large and some very small numbers.
  - If your calculator shows an answer like this  $2^{15}$ , it means 2 with 15 zeros after it (2 000 000 000 000 000).
  - If your calculator shows an answer like this  $2^{-12}$  it means 11 zeros after a decimal point and then the 2 (0.000000000002).
1. Approximately 10 000 000 atoms could be fitted in a line across the full stop at the end of this sentence.
    - a) If the atoms were the size of peas (diameter 0.75cm) then, to the same scale, how wide would the full stop be in kilometres?
    - b) If your school were at one edge of this giant full stop, where might the other edge be?
  2. In 1g of carbon there are about 50 000 000 000 000 000 000 000 atoms (that's 5 with 22 zeros!). If each of these atoms were the thickness of a page of a book, how thick would that book be? (You can take the thickness of one page to be 0.0001m.)
  3. A grain of sand weighs 0.0000001kg. If the atoms in sand weigh about 0.00000000000000000000000004kg (that's a decimal point with 25 zeros followed by a 4), how many atoms are there in a grain of sand?



4. Most of an atom is empty space. The diameter of the nucleus is about 100 000 times smaller than the diameter of the whole atom.
  - a) If the atom is represented by the London Eye, how big would the nucleus be on the same scale? (The London Eye is about 100m in diameter.)
  - b) On this scale, which everyday object could be used to represent the nucleus?

### Activity 3 – sheet 1 of 2

#### Electron Arrangement

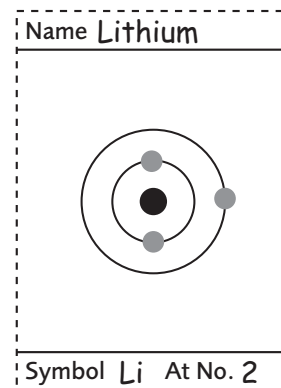
You will be given a sheet showing the electron shells of the first 18 atoms.

On each picture add the:

1. name of the element
2. atomic number
3. electrons in each shell

Start with hydrogen and work up to argon, eg for lithium it will look like this:

Cut out each rectangle and stick them one at a time to a sheet of A4 like this:



1							2
3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18

You have made your own simple periodic table showing how the electrons are arranged in the first 18 atoms.

Answer the following questions using your chart to help you:

1. When two atoms meet and react, which parts of the atoms will touch first?
2. How many electrons are there in the outer shell of lithium and sodium?
3. How many electrons are in the outer shell of fluorine and chlorine?

Lithium and sodium have very similar chemical properties: they are both soft metals that react with water and oxygen. Fluorine and chlorine also have similar properties. They are both reactive non-metals

4. What do you think the link is between the number of electrons in the outer shell of an atom and how the atom behaves?
5. What is special about the number of electrons in the outer shells of helium, neon and argon?

The vertical columns in the periodic table are called Groups. They are numbered 1 to 7 from the left and the last group is numbered 0.

6. What is the link between the group number and the number of electrons in the outer shell? Are there any exceptions to this pattern.
7. Find two properties that the elements in Group 0 have in common.
8. Try and explain in your own words why chemists might be so interested in the number of electrons in the outer shell of an atom.

Name		Name		Name		Name	
Symbol	At No.	Symbol	At No.	Symbol	At No.	Symbol	At No.
Name		Name		Name		Name	
Symbol	At No.	Symbol	At No.	Symbol	At No.	Symbol	At No.
Name		Name		Name		Name	
Symbol	At No.	Symbol	At No.	Symbol	At No.	Symbol	At No.
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