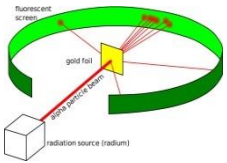


## Nucleus development

This experiment allowed us to replace the plum pudding model with the nuclear model - the atom was mainly empty space with a small positively charged nucleus



## Alpha particle scattering

Geiger and Marsden

fired positively-charged alpha particles at gold foil. This showed that the mass of an atom was concentrated in the centre, it was positively charged too

**Plum pudding**  
After the electron was discovered, Thomson created the plum pudding model - the atom was a ball of positive charge with negative electrons scattered in it

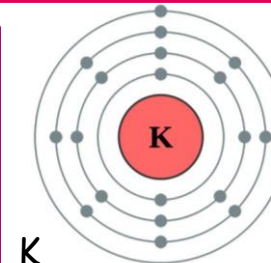
**Early ideas**  
Before the discovery of the electron, Dalton thought that atoms were tiny spheres, that couldn't be divided

## Position in the Periodic Table:

- The number of electrons in the outer shell tells us the group in the periodic table
- Potassium 2,8,8,1 and Lithium 2,1 both have 1 electron in their outer shell and are both found in group 1

## Rules for electron shells:

- The first shell will only hold 2 electrons
- Shells after the first one will have up to 8 electrons
- Electrons try to move as far away from each other as possible
- Once the 4 points are filled up then the electron's will pair up
- We write the electron configuration, which tells us how many electrons are in each shell



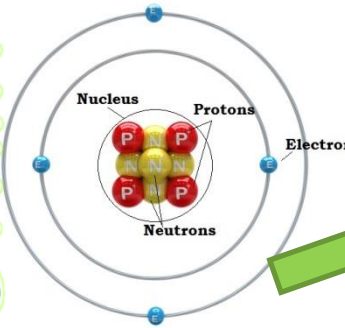
**K**  
Electron configuration: 2,8,8,1

- Mass number = protons + neutrons  
 $7 = 3 + \text{neutrons}$   
 $7 - 3 = \text{neutrons} = 4$
- Atomic number = no. of protons  
Protons = 3
- no. of electrons = no. of protons  
Electrons = 3



Mass number = 39  
Atomic number = 19  
Protons = 19  
Electrons = 19  
Neutrons = 4

START



Particle	Charge	Mass
Electron	-1	0
Proton	+1	1
Neutron	0	1

**Element**  
All the same type of atom

**Compound**  
More than one type of atom chemically bonded together

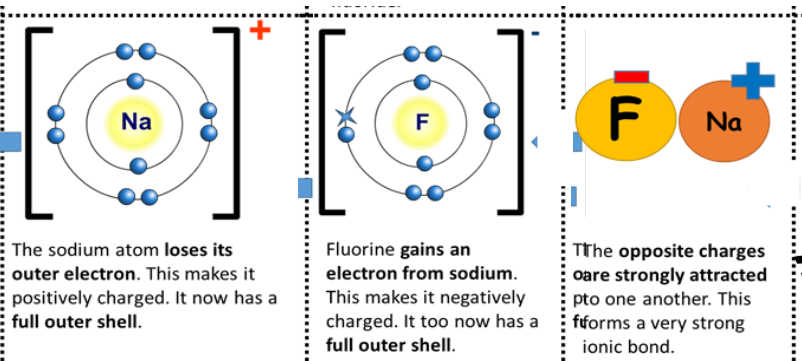
**Mixture**  
More than one type of element or compound not chemically bound together

## Key words:

- Proton:** Found inside the nucleus of an atom, have a positive charge
- Electron:** Found in rings orbiting the nucleus, have a negative charge
- Neutrons:** Found in the nucleus of an atom, have no charge
- Nucleus:** The centre of an atom, made up of protons and neutrons
- Mass number:** The mass of the atom, made up of protons and neutrons
- Atomic number:** The number of protons in an atom
- Element:** All the same type of atom chemically bonded together
- Compound:** More than one type of atom chemically bonded together
- Mixture:** More than one type of element or compound not chemically bound together
- Electron Shell:** A ring surrounding the nucleus containing the electrons

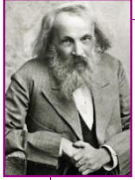


- Rules:**
- Mass number = protons + neutrons
  - Atomic number = no. of protons
  - No. of electrons = no. of protons



CONTINUE

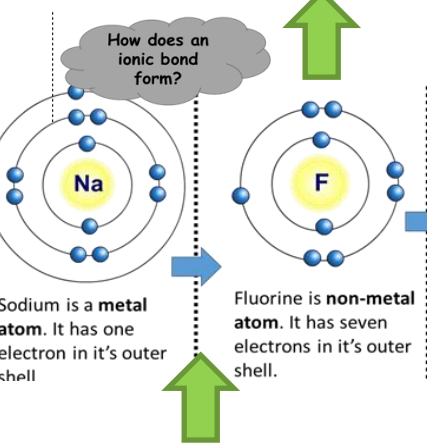
**Development of the periodic table**  
As more elements were discovered scientist tried to classify them



**Mendeleev**  
Overcame the problems of atomic weight. He did this by:

- Early tables**
- First attempts to classify elements were made before subatomic particles were discovered
  - John Newlands ordered the elements based on atomic weight
  - Wrong groups used

- Leaving gaps
- Changing the order of the elements
- Predicted elements were discovered
- Differences were accounted for by isotopes



- Keywords:**
1. **Atomic Number:** number of protons (which is equal to number of electrons) in an atom
  2. **Atomic Mass Number:** number of protons + neutrons in the nucleus of an atom
  3. **Isotope:** atoms that have the same number of protons and electrons but a different number of neutrons
  4. **Ion:** An atom that has gained an electron is a negative ion (non-metal) and atom that has lost an electron is a positive ion (metal)
  5. **Group:** column number in periodic table representing number of electrons on outer shell
  6. **Period:** row number in periodic table representing number of electron shells

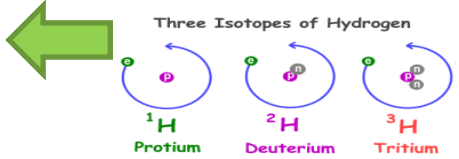
- Today**
- Elements with similar properties arranged in groups
  - Based on properties
  - All have the same number of electrons in the outer shell
  - The arrangement of elements in a table based on proton number, properties and outer electron number

- Metals**
- Majority of elements are metals
  - Form positive ions
  - Found on left hand side, middle and bottom of table

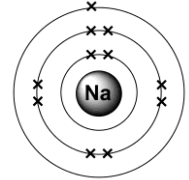
**Non-metals**

- Form negative ions
- Found on right hand side and top of table

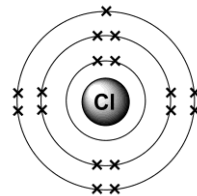
**Isotopes**  
Same number of protons and electrons, but a different number of neutrons. The overall charge stays the same because neutrons are neutral



- Group 1**
- Alkali metals
  - 1 outer electron
  - Reactivity increases going down the group



- Group 7**
- Halogens
  - 7 outer electrons
  - Non-metals
  - Molecules made of pairs of atoms
  - React with metals to form ionic compounds
  - React with non-metals to form covalent compounds



# Questions

1. Draw and label the structure of an atom
2. Describe the differences between an atom, element and a compound
3. Name the 3 key parts in a word equation
4. How was the periodic table first ordered?
5. Why were early versions of the periodic table changed?
6. Describe 2 changes Mendeleev made to the periodic table
7. Describe one similarity and one difference between Mendeleev's and Newlands' periodic table
8. Why are the groups in the periodic table so useful?
9. How are the elements arranged in the modern periodic table?
14. Draw the electron structure for sodium, lithium and potassium
15. What is the electron structure for the alkali metals?
16. Describe the trend of reactivity in the alkali metals
17. Describe the properties of group 7 elements

18. Draw the electron structure for fluorine, chlorine and bromine

19. Describe the difference in formation of ions between metals and non-metals

21. Describe the mass, charge and location of the subatomic particles

22. Draw the electron structure for the first 12 elements in the periodic table

23. Describe 3 key differences between the plum pudding model and the nuclear model

24. Describe 2 similarities between the plum pudding model and the nuclear model

25. Explain how Geiger and Marsden's experiment led to the discovery of the nucleus