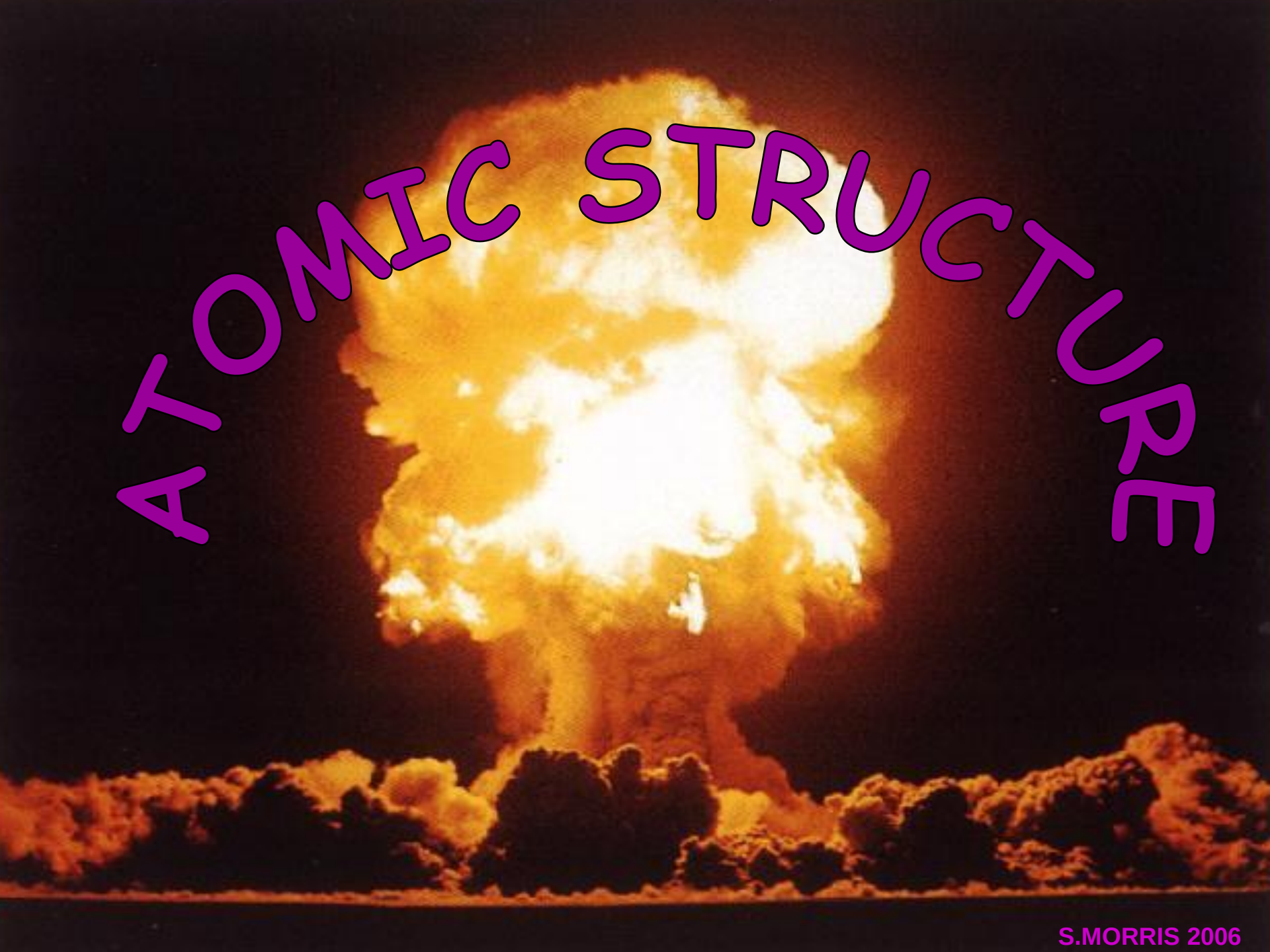
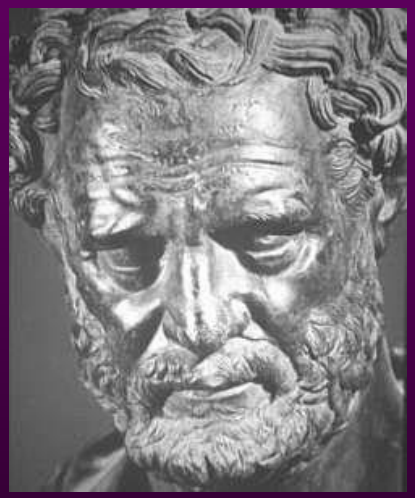


S.MORRIS 2006

HISTORY OF THE ATOM

460 BC Democritus develops the idea of atoms



he pounded up materials in his pestle and mortar until he had reduced them to smaller and smaller particles which he called

ATOMA

(*greek for indivisible*)

HISTORY OF THE ATOM

1808 John Dalton

suggested that all matter was made up of tiny spheres that were able to bounce around with perfect elasticity and called them

ATOMS

HISTORY OF THE ATOM

1898 Joseph John Thompson

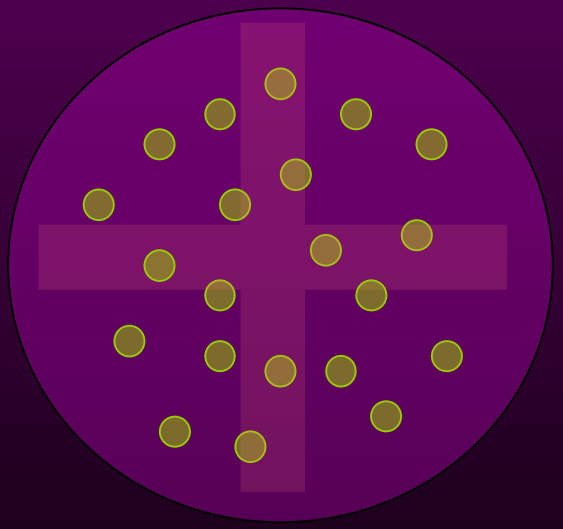
found that atoms could sometimes eject a far smaller negative particle which he called an

ELECTRON

HISTORY OF THE ATOM

1904

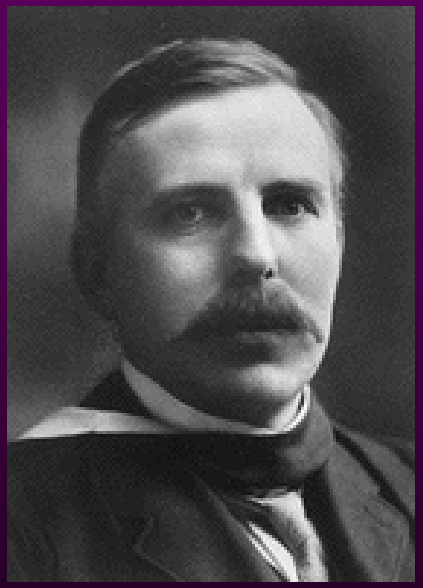
Thompson develops the idea that an atom was made up of electrons scattered unevenly within an elastic sphere surrounded by a soup of positive charge to balance the electron's charge like plums surrounded by pudding.



PLUM PUDDING MODEL

HISTORY OF THE ATOM

1910 Ernest Rutherford

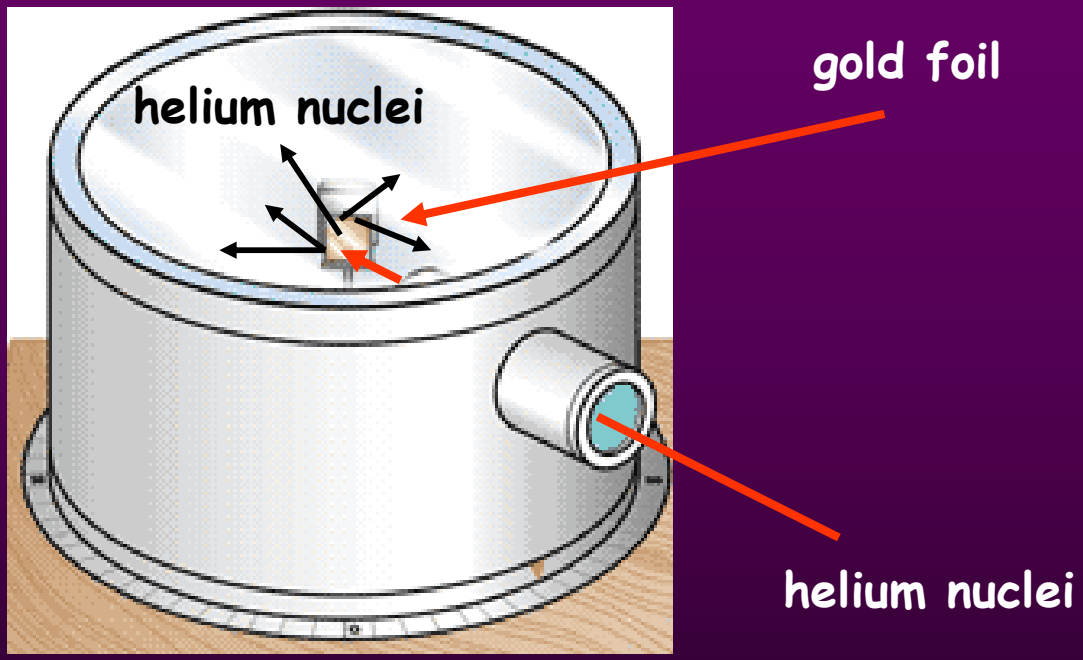


oversaw Geiger and Marsden carrying out his famous experiment.

they fired Helium nuclei at a piece of gold foil which was only a few atoms thick.

they found that although most of them passed through. About 1 in 10,000 hit

HISTORY OF THE ATOM



They found that while most of the helium nuclei passed through the foil, a small number were deflected and, to their surprise, some helium nuclei bounced straight back.

HISTORY OF THE ATOM

Rutherford's new evidence allowed him to propose a more detailed model with a **central nucleus**.

He suggested that the **positive charge** was all in a central nucleus. With this holding the electrons in place by electrical attraction

However, this was not the end of the story.

HISTORY OF THE ATOM

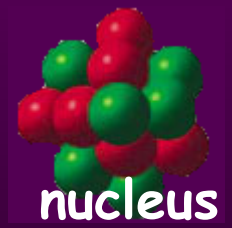
1913 Niels Bohr

studied under Rutherford at the Victoria University in Manchester.

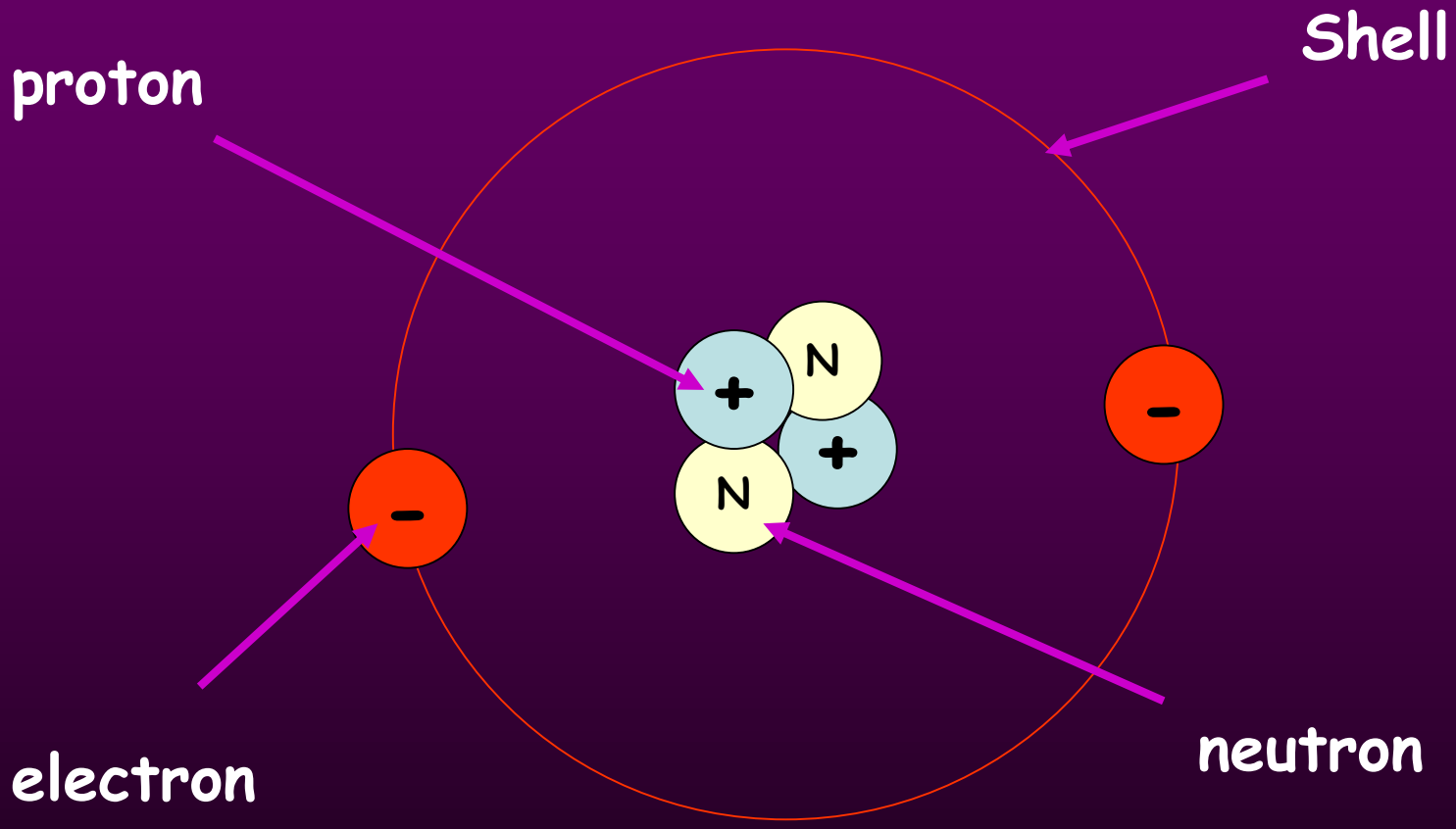
Bohr refined Rutherford's idea by adding that the electrons were in **orbits**. Rather like planets orbiting the sun. With each orbit only able to contain a set number of electrons.

Bohr's Atom

electrons in orbits



HELIUM ATOM



What do these particles consist of?

ATOMIC STRUCTURE

Particle	Charge	Mass (amu)
proton	+ 1 charge	1
neutron	No charge	1
electron	-1 charge	nil

ATOMIC STRUCTURE

$^{4}_{2}He$

2 **Atomic number**

the number of protons in an atom

4 **Atomic mass**

the number of protons and neutrons in an atom

number of electrons = number of protons

ATOMIC STRUCTURE

Electrons are arranged in Energy Levels or Shells around the nucleus of an atom.

- first shell ⟶ a maximum of 2 electrons
- second shell ⟶ a maximum of 8 electrons
- third shell ⟶ a maximum of 18 electrons

ATOMIC STRUCTURE

There are two basic ways to represent the atomic structure of an element or compound;

1. Simple Electronic Configuration

2. Bohr Models

ELECTRONIC CONFIGURATION

With electronic configuration elements are represented **numerically** by the number of electrons in their shells and number of shells. For example;

Nitrogen → configuration = 2 , 5

2 in 1st shell

5 in 2nd shell

2 + 5 = 7

ELECTRONIC CONFIGURATION

Write the electronic configuration for the following elements;

a) $^{20}_{40}Ca$ — 2,8,8,2

b) $^{11}_{23}Na$ — 2,8,1

c) $^{8}_{16}O$ — 2,6

d) $^{17}_{35}Cl$ — 2,8,7

e) $^{14}_{28}Si$ — 2,8,4

f) $^{5}_{11}B$ — 2,3

Bohr Models

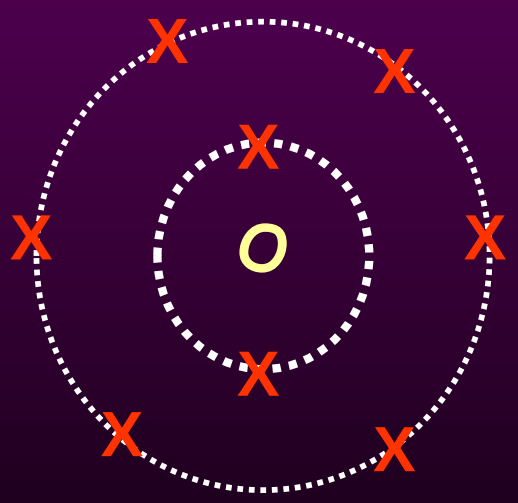
With Bohr Models elements and compounds are represented by Dots or X's to show electrons, and concentric circles to show the energy shells. For example;

Nitrogen →

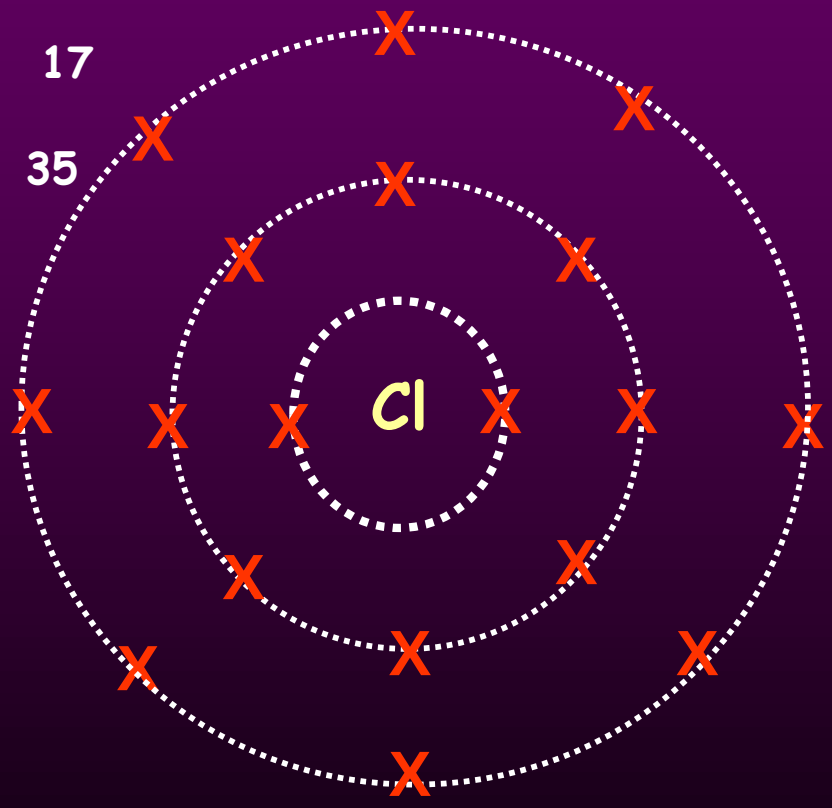
Bohr Models

Draw the Bohr Models for the following elements;

a) $^{16}_{8}O$



b) $^{35}_{17}Cl$



SUMMARY

1. The **Atomic Number** of an atom = number of protons in the nucleus.

2. The **Atomic Mass** of an atom = number of Protons + Neutrons in the nucleus.

3. The number of Protons = Number of Electrons.

4. Electrons orbit the nucleus in **shells, or energy levels**.

5. Each shell can only carry a **maximum** number of electrons.