BBC BITESIZE

Development of the atomic model

Big Manny: Alright, cool.

Everything around us is made of atoms.

But how do we know what atoms look like when they're so small?

Now, the answer lies in the development of the atomic model, which is a series of discoveries that change how we understand matter.

These changes are best understood in four key parts.

First came Rutherford's model.

In 1911, Ernest Rutherford proposed that atoms have a tiny, positively charged nucleus at their center.

At this time, scientists believed electrons were randomly arranged around the atom, making the model look a bit like planets orbiting a star.

Next, a scientist called Niels Bohr built on Rutherford's idea.

His calculations show that electrons don't just fly around randomly.

They orbit the nucleus in fixed shells at specific distances.

As research continued, scientists made another key discovery.

They realised that the nucleus wasn't just a vague positive charge.

It contained particles called protons, each carrying a small positive charge.

But something didn't quite add up though.

Scientists knew the nucleus contained protons, but the mass of an atom didn't match the number of protons alone.

For example, helium has a relative mass of four, but it's only got two protons.

Something was missing.

The mass of electrons is tiny compared to protons and neutrons, so most of an atom's mass must be concentrated in its nucleus.

Finally, in 1932, James Chadwick solved the puzzle.

He discovered the neutron, a particle with mass but no charge.

Added neutrons explain the missing mass and made the atomic model more accurate.

Man's got a quick test for you innit.

Over to you.

Why does the nucleus have an overall positive charge?

Is it A, because it's made up of more positive protons than negative electrons?

Is it B, because it's made up of positive protons and neutral neutrons?

Or C, because the protons are the heaviest particle in an atom.

Pause the video and write down your answer.

Okay, let's check if you've been listening.

The answer is B.

It's because it contains positive protons and neutral neutrons.

Negative electrons orbit the nucleus in shells, which can often be where people get confused innit.

Now it's time for a recap.

Electrons are negative and orbit in shells.

Protons are positive and they're found in the nucleus.

Neutrons are neutral and they're also found in the nucleus.

From Rutherford to Chadwick, every discovery has reshaped our understanding, leading to the modern atomic model we know today.