

Chemistry A-level Summer Task: How has the model of the structure of the atom changed over time?

Introduction

The idea of an atom was first conceived by the ancient philosophers of Greece. In the fifth century BC, Leucippus and his student Democritus suggested that there were small indivisible particles, which he called atoms – from the Greek *atomos* meaning ‘uncuttable’.

This idea of atoms has been built on by many other scientists over hundreds of years. These scientists have drawn conclusions from a variety of different experiments. Some conclusions have been arrived at when scientists were researching other questions, and some ideas have been proven by designing a specific experiment.

A model of the structure of the atom is still evolving today. Particle physicists are working at particle accelerators like CERN, on newly discovered quarks. In this task you will be researching one of the models to have been developed over the years to describe the structure of an atom.

Task

Your task is to produce a report into one of the different models of the atom that has been developed by scientists since 1890. Your research should be done online, using the web links provided on the *Sources* page as well as any other credible sources you feel would be useful.

Your report will either be a written report or a PowerPoint presentation and should include images and, where appropriate, diagrams of the experiments conducted.

Your report should include:

- information about the key scientists who developed this model of the atom
- a description of what they believed the atom looked like when they began their work
- the key experiments that they did and what they found out from them
- the conclusions that they drew from their work and the model of the atom that developed from their work
- information about when their ideas were suggested.

The different models of the atom that you can choose from are:

- the plum pudding model of an atom
- the solar system or planetary model of an atom
- electron cloud model of an atom
- the discovery of the neutron
- current developments.

You only need to complete research on ONE of these models. It is due the week commencing 10th September.

Process

Step 1: Decide which model of the atom you want to research

The general websites listed on the *Sources* page will give an overview of the models of the atom you have been asked to choose from. You may wish to have a look through these before making your decision.

Step 2: Research

There is a selection of online sources listed on the *Sources* page. These should provide you with a starting point for the online element of your research, but you should not conduct all of your research in this way. Remember to also make a judgement about how reliable these online resources are.

Step 3: Write your report or presentation

Your report is to be a written report of approximately one, and no more than two, pages in length and should contain diagrams to illustrate experiments that were done and the model that developed as a result. These could be drawn or downloaded images from the internet. However, the material must not just be copied from other sources. Extract important ideas only.

Sources

Chapter 1, Atomic structure, in the Student Book provides the fundamental knowledge of the model of an atom. Before you start this work, you should read this chapter and ensure that you understand all this information.

General websites that are useful:

<http://www.chalkbored.com/lessons/chemistry-11/atomic-models-handout.pdf>

<http://www.visionlearning.com/en/library/Chemistry/1/Atomic-Theory-I/50>

The plum pudding model of an atom:

<https://www.aip.org/history/exhibits/electron/>

<http://www.universetoday.com/38326/plum-pudding-model/>

http://www-outreach.phy.cam.ac.uk/camphy/nucleus/nucleus1_1.htm

The solar system or planetary model of an atom:

<http://micro.magnet.fsu.edu/electromag/java/rutherford/>

<http://web.archive.org/web/20080423002707/http://dbhs.wvusd.k12.ca.us/webdocs/AtomicStructure/Rutherford-Model.html>

<http://www.nuffieldfoundation.org/practical-physics/developing-model-atom-nuclear-atom>

Electron cloud model of an atom:

<http://www.colorado.edu/physics/2000/quantumzone/schroedinger.html>

<http://regentsprep.org/Regents/physics/phys05/catamodel/cloud.htm>

<http://www2.lbl.gov/abc/wallchart/chapters/02/2.html>

The discovery of the neutron

http://www-outreach.phy.cam.ac.uk/camphy/neutron/neutron_index.htm

<http://www.ph.surrey.ac.uk/partphys/chapter2/Neutron.html>

Current developments:

http://www.fnal.gov/pub/inquiring/physics/discoveries/top_quark.html

<http://home.cern/topics/higgs-boson>

<http://home.cern/topics/large-hadron-collider>

Conclusion

Having completed this task you should now understand:

- that the model of the atom has changed over time
- that various models have been used to describe atomic structure
- how scientists have worked together to modify the model of the atom
- why scientists are still researching into the structure of an atom
- that the model of the atom is still developing.