History of the atom : WEBQUEST TASK SHEET

Early scientists thought that atoms were tiny solid spheres that could not be made any smaller. Today's chemists now know the atom is made of neutrons, protons and electrons. A positive nucleus, containing protons and neutrons, is orbited by negative electrons. Most of the atom is empty space. *So what led to the changes in our ideas about the atom?*

In this WebQuest you are going to:

You will carry out research into how the model of the atom has changed over time. You will use your research to produce a detailed timeline of the major discoveries.

Your timeline will need to cover the following things:

- ***Who made the discovery?***
- ***What did they discover and how?***
- ***What did this tell them about the atom?***
- ***How did this change the model of the atom?***

Try to include a diagram or picture for each model of the atom in your timeline.

Step 1 – Carry out your research

These are the KEY POINTS that your research should focus on :

- **what early scientists and philosophers thought particles and atoms were like**
- **the 'plum pudding model' of the atom**
- **Rutherford and Marsden's gold foil experiment**
- **the discovery of protons**
- **Niels Bohr's revised model of the atom**
- **James Chadwick's discovery of the neutron**

Step 2 – Prepare your timeline

Your timeline will need to be in the style of a poster. On the back of this are 2 examples of timelines to show you how to set it up……(*but small enough so you can't just copy it !!!).*

You can do this as a google doc, or a powerpoint . But if you do this ON the computer, you must be able to upload it to the digital exercise at Hartismere website item number : **26331**.

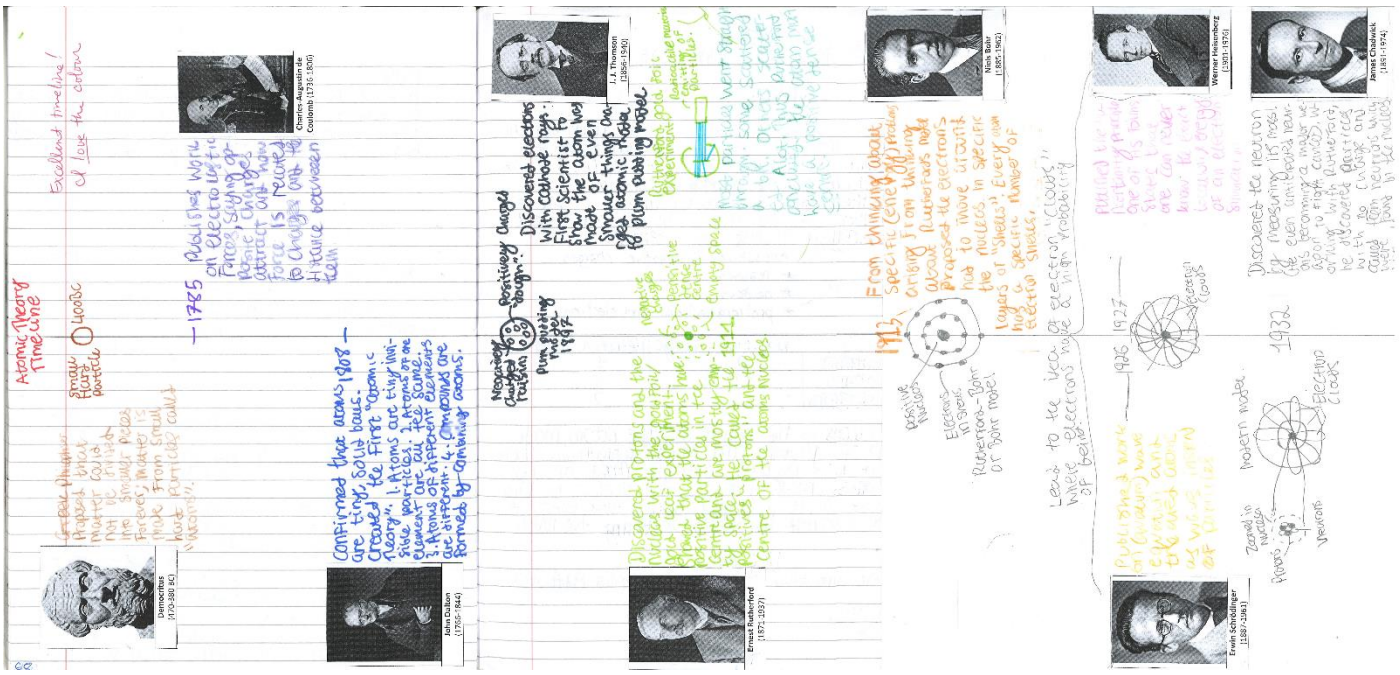
If you feel more confident with pen and paper, please make sure that you take some A4 or A3 paper from the lab down to the computer room with you. Hand this in at the end of the lesson.

It should put key dates in chronological order. Each discovery should have a description of how and why the scientists carried out the experiment, and what they found out.

Your timeline should also include a diagram or picture for each model of the atom, so that the changes can be seen. There are sets of paper copies of Scientists and atom models to use.

Step 3

Upload your completed timeline by the end of the lesson (or hand in a paper copy to the teacher)


Atomic Theory Timeline
Excellent timeline! I love the colour
Democritus (470-380 BC)
Greek philosopher
Proposed that matter could not be divided into smaller pieces forever; matter is made from small, hard particles called "atoms."
400 BC
small, hard particle
1785
Charles-Augustin de Coulomb (1736-1806)
Publishes work on electrostatic forces, saying opposite charges attract and how force is related to charges and the distance between them.
John Dalton (1766-1844)
Confirmed that atoms are tiny, solid balls. Created the first "atomic theory":
1. Atoms are tiny, invisible particles
2. Atoms of one element are all the same.
3. Atoms of different elements are different.
4. Compounds are formed by combining atoms.
1808
J.J. Thomson (1856-1940)
Discovered electrons with cathode rays. First scientist to show the atom was made of even smaller things. Changed atomic model to "plum pudding" model.
plum-pudding model
negatively charged "raisins"
positively charged "dough"
1897
Ernest Rutherford (1871-1937)
Discovered protons and the nucleus with the gold foil/gold leaf experiment. Showed that the atoms have positive particles in the centre and are mostly empty space. He called the positives "protons" and the centre of the atom the "nucleus".
1911
positive dense centre
negative charges
empty space
Rutherford model
Rutherford's gold foil experiment
detector
radioactive material emitting α particles
thin piece of gold
Most α particles went through the foil, some were scattered a little, but some were scattered A LOT! Concluded the atom must have a very dense, positive centre.
Niels Bohr (1885-1962)
From thinking about specific (energy) problems arising from thinking about Rutherford's model, proposed the electrons had to move around the nucleus in specific layers or "shells". Every atom has a specific number of electron shells.
1913
positive nucleus
electrons in shells
Rutherford-Bohr or Bohr model
Lead to the idea of electron "clouds" where electrons have a high probability of being
Erwin Schrödinger (1887-1961)
Published work on (quantum) wave equation and treated atoms as waves instead of particles
1926
positive nucleus
electron clouds
Published the "uncertainty principle". One of its forms states that one can never know the exact location & energy of an electron simultaneously.
Werner Heisenberg (1901-1976)
1927
nucleus
protons
neutrons
1932
modern model
electron clouds
???
James Chadwick (1891-1974)
Discovered the neutron by measuring its mass! (He even anticipated neutrons becoming a major weapon to fight cancer.) Working with Rutherford, he discovered particles with no charge and called them neutrons, which were found in the nucleus with the protons