Development of the atomic model

Task 1: From tiny spheres to plum pudding

a) **Rewrite** the paragraph and **correct** the mistakes.

The atom was first theorised by JJ Thomson. He said that atoms were divisible particles. Many years later John Dalton concluded that atoms were indivisible and were tiny, solid cubes. Different elements were all the same size. In 1997, JJ Thomson completed experiments and discovered the atom had charges. He concluded that the atom was a ball of negative charge with positively charged electrons studded throughout it.

b) **Complete** the table with a diagram of each scientist's model and a description.

	John Dalton	**JJ Thomson**
Model diagram		
Description		

Task 2: Rutherford's nuclear model

a) **Explain**, with reference to the atomic structure, why:

i) most alpha particles passed straight through the gold foil.

ii) some alpha particles were deflected at angles as they passed through the gold foil.

iii) a small amount of alpha particles bounced straight back off the gold foil.

b) **Compare** the plum pudding model and Rutherford's nuclear model.

	Plum pudding model	**Rutherford's nuclear model**
electrons		
positive charge		
mass of the atom		

Task 3: An improved nuclear model

Create a timeline of the development of the atom.

You must include:

- a drawing of each atomic model
- names of scientists
- Year of development
- explanation of each structure

Year

Atomic model drawing

Scientist name and structure explanation

Development of the atomic model

Answers

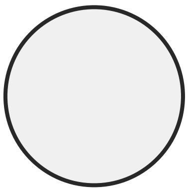
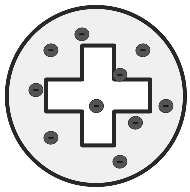
Task 1: From tiny spheres to plum pudding

a) **Rewrite** the paragraph and **correct** the mistakes.

The atom was first theorised by JJ Thomson. He said that atoms were divisible particles. Many years later John Dalton concluded that atoms were indivisible and were tiny, solid cubes. Different elements were all the same size. In 1997, JJ Thomson completed experiments and discovered the atom had charges. He concluded that the atom was a ball of negative charge with positively charged electrons studded throughout it.

The atom was first theorised by ***Democritus***. He said that atoms were ***indivisible*** particles. Many years later John Dalton concluded that atoms were indivisible and were tiny, solid ***spheres***. Different elements were ***different sizes***. In ***1897***, JJ Thomson completed experiments and discovered the atom had charges. He concluded that the atom was a ball of ***positive*** charge with ***negatively*** charged electrons studded throughout it.

b) **Complete** the table with a diagram of each scientist's model and a description.

	John Dalton	**JJ Thomson**
Model diagram		
Description	*a tiny, solid sphere*	*A ball of positive charge with negatively charged electrons throughout.*

Answers

Task 2: Rutherford's nuclear model

a) **Explain**, with reference to the atomic structure, why:

i) most alpha particles passed straight through the gold foil.

Most of the atom is empty space.

ii) some alpha particles were deflected at angles as they passed through the gold foil.

There is a concentration of positive charge in the centre of the atom. As alpha particles were also positive, they were repelled.

iii) a small amount of alpha particles bounced straight back off the gold foil.

The centre of the atom has a nucleus, which is where the positive charge and mass is concentrated. As very few particles bounced off, the nucleus must be very tiny.

b) **Compare** the plum pudding model and Rutherford's nuclear model.

	Plum pudding model	**Rutherford's nuclear model**
electrons	*randomly spread throughout the atom*	*a layer of electrons on the outside of the atom*
positive charge	*spread across the whole atom*	*concentrated in a tiny volume in the centre of the atom (nucleus)*
mass of the atom	*The whole atom is solid sphere.*	*Most of the atom is empty space and the mass is in the centre.*

Answers

Task 3: An improved nuclear model

Create a timeline of the development of the atom.

You must include:

- a drawing of each atomic model
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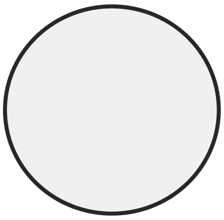
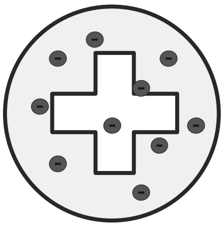
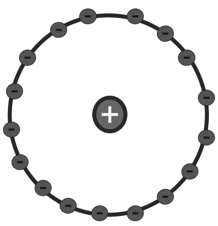
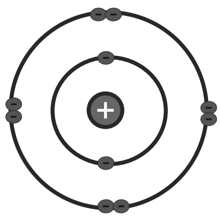
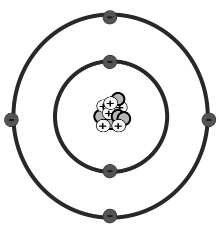
Year	Atomic model drawing	Scientist name and structure explanation
1803		John Dalton solid spheres of varying sizes depending on the element
1897		JJ Thomson solid spheres of positive charge with negatively charged electrons spread randomly
1909		Ernest Rutherford mass and positive charge in tiny nucleus with electrons surrounding outside of atom rest of atom is empty space
1913		Niels Bohr positively charged nucleus with electrons in fixed distances from nucleus, in shells rest of empty is empty space
1932		James Chadwick improved the Bohr model by adding neutrons to the nucleus