

Stage 1 Physics

Investigations Folio Task: Science as a Human Endeavour

Topic 6: Nuclear Models and Radioactivity

The 'Plum Pudding Model' of the atom was first proposed by J.J. Thomson in 1904. It attempted to consolidate the known properties of atoms at the time. They were, 1) Electrons are negatively charged particles and 2) Atoms are neutrally charged. Thompson said... *"the atoms of the elements consist of a number of negatively electrified corpuscles enclosed in a sphere of uniform positive electrification."* In other words he believed the electrons were surrounded by a positively charged material much like currents in a current bun. Ernest Rutherford, a previous student of Thomson, devised further experiments to explore the composition of atoms. Rutherford had two of his own students, Hans Geiger and Ernest Marsden, fire alpha particles at thin sheets of gold foil and were astounded at the result. Some of the alpha particles passed straight through the foil, some deviated from their original straight line path and some particles bounced straight back at the detector. Rutherford explained, *'It was almost as incredible as if you fired a 15-inch shell at a piece of tissue paper and it came back and hit you.'* Rutherford interpreted this data as atoms contained a very small charged nucleus, containing much of the atom's mass, orbited by low-mass electrons. This work led to the formulation the Rutherford model of the atom in 1911.

Choose an aspect of the above paragraph and examine it from the perspective of Science as a Human Endeavour (SHE). You may choose from the suggestions below or take an area that interests you and expand.

Construct a one page outline for feedback to help shape your final submission. Due date: _____

The final submission can be presented as a poster, essay, or short presentation to your fellow students (a video is fine).

Final Submission has a word limit of 1000 words or six minutes. All submissions must have a written bibliography (including videos) Due date: _____

Aspect of SHE	Possible exploration
Communication and Collaboration Development Influence	This may include <ul style="list-style-type: none"> A discussion on the contribution of the individuals, teams and organisations that were involved in the development of the Rutherford model of the atom. OR <ul style="list-style-type: none"> The role of an individuals that collaborated to produce the Rutherford model. OR <ul style="list-style-type: none"> The multidisciplinary science made possible/improved by a better description of the atom
Science behind the application/development	This may include (but not limited to) <ul style="list-style-type: none"> Describe the experiment that led to Rutherford's description of the atom Explain the shortfalls of the plum pudding model in the light of scientific knowledge today Explore modern ideas on the structure of the atom and the process that led to the Bohr model (extension)
Application and Limitation	Discuss <ul style="list-style-type: none"> The impact that a better understanding of the atom has on society (benefits and risks) This was one of many discoveries that led to the development of nuclear weapons. Are all scientific discoveries a good thing? Discuss the pros and cons.

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Name: _____

Where Assessed	SF	A	B	C	D	E	
An outline of the final product. Teacher will draft the outline. Not included in the final word count.	IAE1	Designs a logical, coherent, and detailed, physics investigation.	Designs a well-considered and clear physics investigation.	Designs a considered and generally clear physics investigation.	Prepares the outline of a physics investigation.	Identifies a simple procedure for a physics investigation.	I
Analysing and interpreting information gathered during research of the topic. Logical conclusions formulated of impacts on society by the increased understanding of science.	IAE3	Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.	Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.	Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.	Describes data and undertakes some basic interpretation to formulate a basic conclusion.	Attempts to describe results and/or interpret data to formulate a basic conclusion.	I
Explanation of the science behind the application.	KA1	Demonstrates deep and broad knowledge and understanding of a range of physics concepts.	Demonstrates some depth and breadth of knowledge and understanding of a range of physics concepts.	Demonstrates knowledge and understanding of a general range of physics concepts.	Demonstrates some basic knowledge and partial understanding of physics concepts.	Demonstrates limited recognition and awareness of physics concepts.	I
Discussion of collaborations and contributions made by individuals, teams and organisations. The impact on the individual and society.	KA3	Critically explores and understands in depth the interaction between science and society.	Logically explores and understands in some depth the interaction between science and society.	Explores and understands aspects of the interaction between science and society.	Partially explores and recognises aspects of the interaction between science and society.	Attempts to explore and identify an aspect of the interaction between science and society.	I
Appropriate communication and reference list.	KA4	Communicates knowledge and understanding of physics coherently with highly effective use of appropriate terms, conventions, and representations.	Communicates knowledge and understanding of physics mostly coherently with effective use of appropriate terms, conventions, and representations.	Communicates knowledge and understanding of physics generally effectively, using some appropriate terms, conventions, and representations.	Communicates basic physics information, using some appropriate terms, conventions, and/or representations.	Attempts to communicate information about physics.	I