

- (b) According to the evidence collected, both electric charges and magnets change the direction of cathode rays but not laser light. Therefore, cathode rays are different in nature from electromagnetic radiation like visible light.

Evaluation

- (c) There are no obvious flaws in the design. The materials and procedure could be improved by including several different sources of cathode rays and different types of light. This would produce more evidence to make the answer to the question more certain.
(Other effects could also be tested.)
- (d) The hypothesis that cathode rays are a form of electromagnetic radiation has been shown to be false because the evidence clearly shows significant differences between cathode rays and light.

Synthesis

- (e) The bending of cathode rays when passing near electrically charged plates suggests that cathode rays contain charged particles.
- (f) Opposite electric charges attract each other and like charges repel. The evidence that cathode rays are attracted to the positively charged plate and repelled from the negative plate suggests that cathode rays contain negatively charged particles.

ACTIVITY 3.1.1 RUTHERFORD'S GOLD FOIL EXPERIMENT

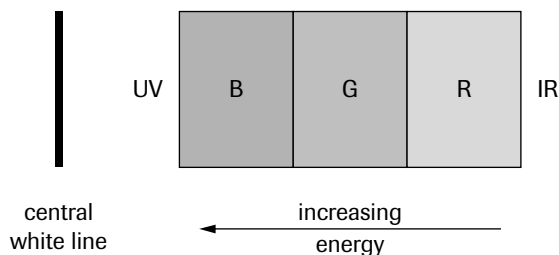
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- animation mode; activity of source = average; scintillations set to remain; time = 5 min
 - Most alpha particles are deflected within 20° of the straight-line path; a few alpha particles are deflected up to 40° , occasionally up to 60° , and very rarely beyond 90° (only 2 in this simulation).
- (a) According to the Thomson atom model, a stream of alpha particles should pass more or less straight through a gold foil, perhaps deflecting a little.
- (b) Rutherford's results showed that the majority of alpha particles deflected little but some alpha particles deflected significantly and few appeared to "bounce back."
- (c) Almost all of the alpha particles were relatively undeflected, suggesting that the nucleus is very much smaller than the atom, because most alpha particles miss it completely.
- (d) The evidence conflicts strongly with the Thomson model, which therefore must be replaced with a new model.
- (e) The general pattern of the results with aluminum foil should be similar to that with the gold foil. With aluminum foil, fewer alpha particles should deflect through significant angles because an aluminum nucleus (13 p^+) is not as positive as a gold nucleus (79 p^+).

ACTIVITY 3.3.1 HOT SOLIDS

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- (a) The filament starts with a dim, orange-red colour that becomes brighter and more orange, and then brighter and more yellow, and then brighter still and white.
- (b) "White hot" objects are much hotter than "red hot" ones.
- (c) Objects in a home that may be red hot at certain times include electric stove elements and wires in electric toasters.
- (d)



The main colours in the visible spectrum to the right of the central white line are blue, green, and red.

- (e) The region beyond the blue is called ultraviolet; and the region beyond the red is called infrared.