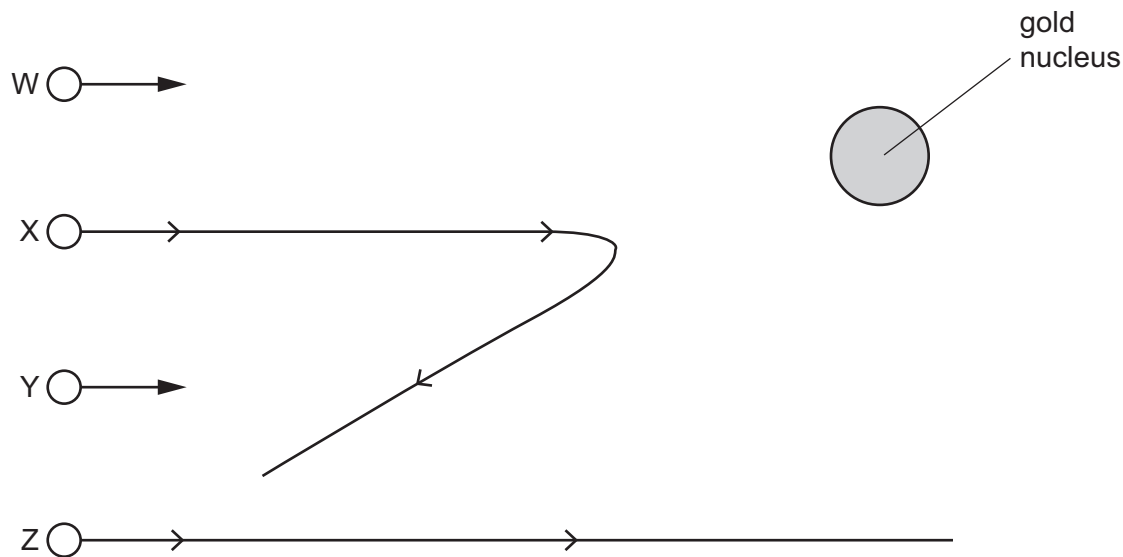


- 6 Fig. 6.1 shows four alpha particles W, X, Y and Z moving towards a gold nucleus that is in thin gold foil.



**Fig. 6.1** (not to scale)

- (a) (i) The paths of particles X and Z are shown.

Complete Fig. 6.1 to show possible paths for particles W and Y. [3]

- (ii) Describe what may be inferred about the structure of an atom from the path of particle X.

.....  
 .....  
 ..... [1]

- (iii) When a beam containing many alpha particles is incident on thin gold foil, nearly all of the alpha particles follow paths that are similar to the path of particle Z.

Describe what may be inferred from this about the structure of an atom.

.....  
 .....  
 ..... [1]

- (b) State the mass and the charge, in terms of the atomic mass unit  $u$  and the elementary charge  $e$ , of an alpha particle.

mass = .....  $u$

charge = .....  $e$   
[2]

- (c) There are two types of hadron.  
The hadrons that are in alpha particles are each composed of three quarks.

- (i) State the name of this type of hadron.

..... [1]

- (ii) Show, by reference to their constituent quarks, that the hadrons in an alpha particle have charges of either zero or  $+1e$ .

[2]

[Total: 10]