Answers to Problem 1

(a) An $\alpha-$particle is a nucleous of helium ${}^{4}_{2}\mathrm{He}$.

(b) B repulsion (same charge) ectrons would be *deflected* by the electrons of the gold atom,

and for this reason they would not even reach (and then collide) the nucleous !

(c) (i) The *half-life* period $T_{\frac{1}{2}}$ is the time that must elapse :

- the initial number of radioactive nuclei (N_0) to be reduced by a factor of 2
- the initial activity of the radioactive sample (A_0) to be reduced by a factor of 2

Notice: You can chose your definition either in terms of number (N) or activity (A).

That is because N and A are proportional (to each other).

(ii) ${}^{238}_{92}U \longrightarrow {}^{234}_{90}\mathrm{Th} + {}^{4}_{2}\alpha$

(d) (i) We have to realize that 3 half-lives have gone by, therefore the age is $3T_{\frac{1}{2}} = 1.4 \times 10^{10}$ years.

(ii) We assume that no lead (none of the intervening daughters) was lost from the rocks.