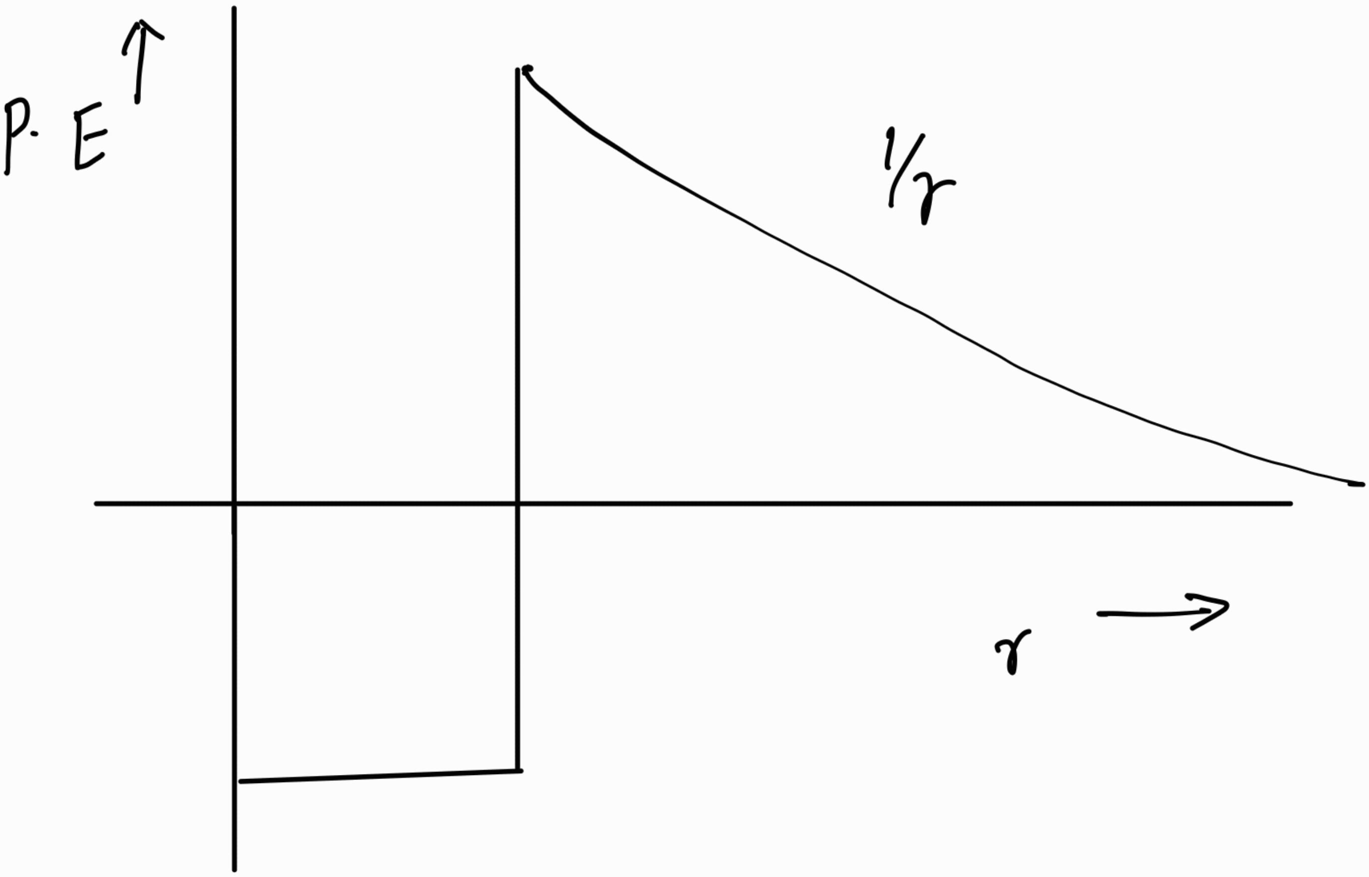
$${}^{A}_{Z}X \longrightarrow {}^{A-4}_{Z-2}Y + {}^{4}_{2}He$$

(α) 4-10 MeV

$+ \; Q$



$$P.E = \frac{K\,Qq}{r} = \frac{K\,(Z-2)e \times 2e}{r}$$

$$= \frac{2}{4\pi\epsilon_0}\frac{(Z-2)e^2}{r}$$ ← radius of nuclei

P.E of α particle stuck in barrier

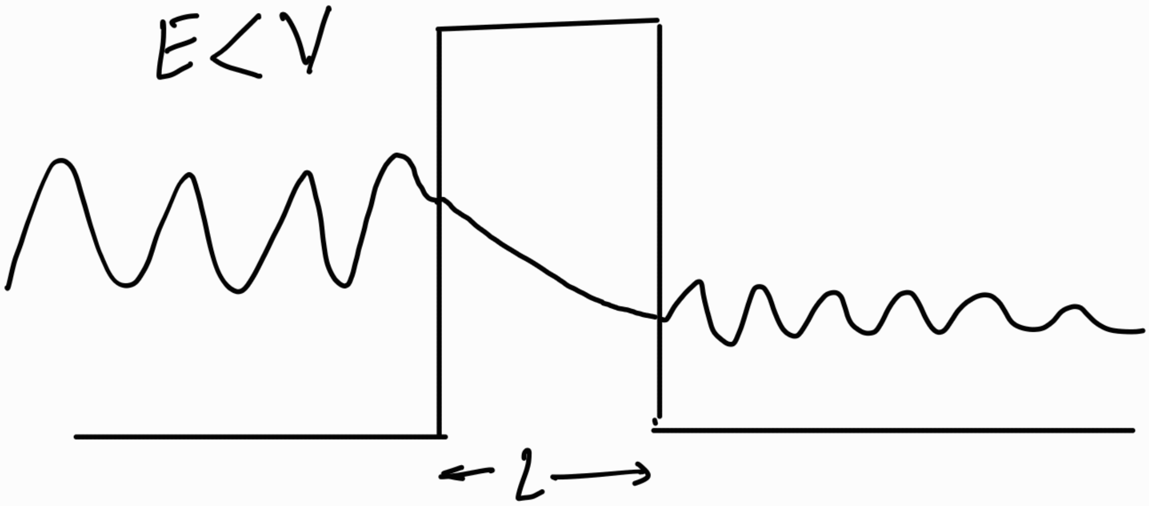
For $^{235}_{92}U$

$$P.E = \frac{1}{4\pi\epsilon_0} \frac{(92-2) \times e^2}{10^{-4}} \simeq \underline{26 MeV}$$

$PE \in 25-30 MeV$

α-partile having energy 10 MeV crones barrier potential of 25-30 MeV.

So, we use Quantum tunneling.



Transmission probability

$$T = e^{-2\gamma}$$

$$\gamma = \int_{x_1}^{x_2} \frac{\sqrt{2m(V-E)}}{\hbar}\, dx$$

α decay is a spontaneous radioactive decay process in which a large sized nucleus ($A > 200$) spontaneously undergoes decay process leading to emission of α-particle.

$$^{A}_{Z}X \longrightarrow {}^{A-4}_{Z-2}Y + {}^{4}_{2}He + Q$$

α-partile is basically He nucleus.

Before emission, α particle can be assumed to exist inside the nucleus.

When different kinds of α-decay processes for diff. kinds of nuclei were studied, it was found that max K.E of emitted α-particle usually ranges from 4-10 MeV.

α-particle experiences a barrier of height 26 MeV inside a Uranium nucleus before emission.

An α-particle has a wave associated with it. A wave function ψ can describe the wave mech behaviour of wave.

This theory explains Quantum tunneling.