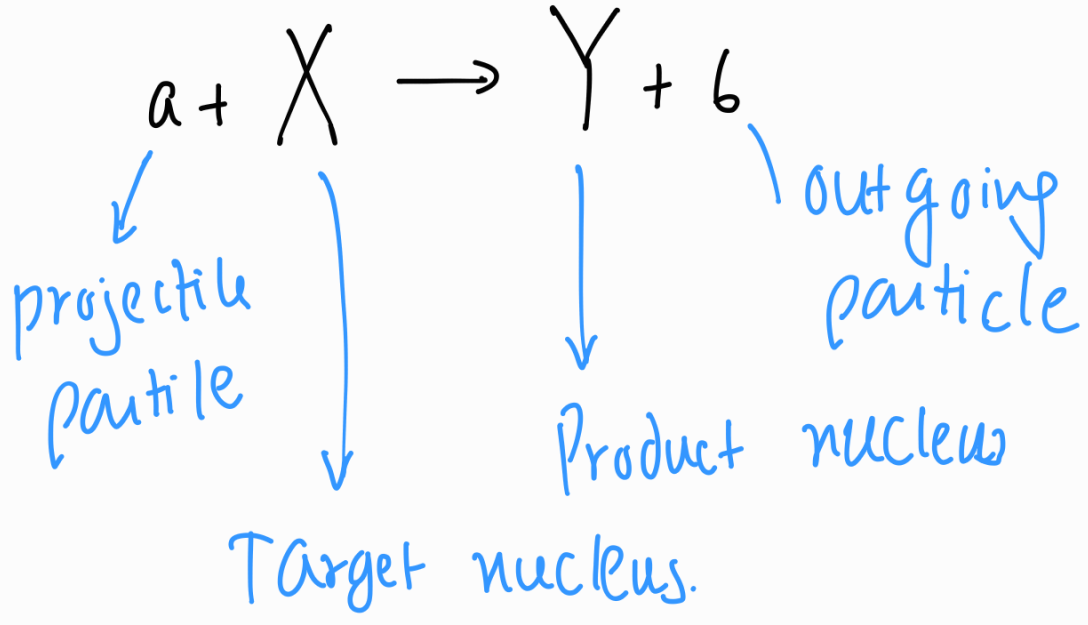
A nuclear reaction is a process in which brings about change in comp & energy of nucleus of a substance by bombarding it with fast moving particles. Bombarding particles may be α, β, γ-rays obtained from natural radioactive substances or may be accelerated protons, e^-, n, etc.



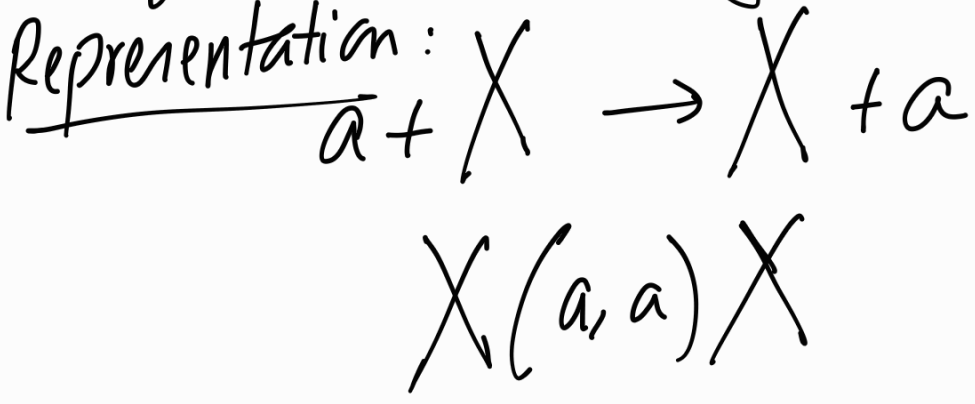
In short, this nuclear reac^{n} can be written as $X(a,b)Y$

Elastic Scattering

Projectile particle strikes target nucleus & leaves without any loss of energy but in general with changed dir. of motion.

Eg:- α scattering of Gold foil

Representation:



$$a + X \rightarrow X + a$$

$$X(a, a)X$$

Inelastic Scattering

K.E of projectile particle is not conserved, part of KE of projectile is taken by target nucleus which gets excited to higher state.

Then, ex. nucleus comes back to ground state by radiating γ-rays.

Nuclear Disintegration

On striking target nucleus, projectile particle is absorbed & diff outgoing particle is ejected.

Product nucleus is diff. from target nucleus.

Eg. $${}^{4}_{2}He + {}^{14}_{7}N \longrightarrow {}^{19}_{8}O + {}^{1}_{1}H$$

$$ {}^{14}_{7}N \left({}^{4}_{2}He , {}^{1}_{1}H \right) {}^{19}_{8}O $$

Photonuclear Reactions

Target nucleus is bombarded by high energy γ-rays.

Outgoing particle is either proton $_1^1H$ or neutron $_0^1n$.

$$_{13}^{27}Al + \gamma \longrightarrow {}_{12}^{26}Mg + {}_1^1H$$

Direct Reaction

(i) Pick-up Reacn.

Incident projectile particle on colliding with nucleus immediately pulls one of nucleons out of it.

Eg:- $$_1^1H + {}_{19}^{40}K \longrightarrow {}_{19}^{39}K + {}_1^2H$$

(ii) Stripping Direct Reac.n

incident projectile particle on colliding with target nucleus, immediately looses one of its nucleons to target nucleus.

$$^{63}_{29}Cu + {}^{2}_{1}H \longrightarrow {}^{64}_{29}Cu + {}^{1}_{1}H$$

Heavy ion Reactions

Incident projectile particle is heavier than α-particle.

$$^{29}_{13}Al + {}^{12}_{6}C \rightarrow {}^{38}_{19}K + 2\,{}^{1}_{0}n$$