LESSON TWO

- **Note**. The standard integrals

1. $\int x^n dx = \frac{x^{n+1}}{n+1} + C,$ for n $\neq$ 1

2. $\int \frac{dx}{x} = \ln x + C,$ for n = 1

- **Nuclear force**

- **Stable nucleus**

- **Unstable nucleus :**This is a nucleus in which the nuclear force is not too strong to hold the nucleons together and break up into smaller nuclei with the simultaneous release of ***great avalanche of energy***

Radioactivity

This is the process of *unaided disintegration or break up* of ***unstable nuclide*** leading to the formation of smaller nuclides with the simultaneous release of ***great avalanche of energy*** as well as the emission of nuclear particles such as **p, n, α, β** and γ

- **<u>Natural Radioactivity</u>**
- In the absence of any human controlled bombardment with an appropriate energy particle
- Example $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + {}^{4}_{2}\alpha$

- **<u>Artificial Radioactivity</u>**
- Process of unaided disintegration of an artificial produced ***unstable nuclide*** into smaller nuclides with the release of ***great avalanche of energy*** as well as the emission nuclear particles.

PARTICLES EMITTED FROM NUCLEAR TRANSMUTATION or RADIOACTIVITY

There are three (3) main types of radioactive emissions. They are

Alpha (α), $\mathbf{{}^{4}_{2}He}$,

Beta (β) $\mathbf{{}^{0}_{-1}\beta}$, or $\mathbf{{}^{0}_{-1}e}$ and

Gamma (γ), ${}^{0}_{0}\gamma$

- Penetrability
- Ionization of matter
- Deflection by electric and magnetic field

NATURE AND PROPERTIES OF RADIOACTIVE EMISSIONS

TYPE OF RADIATION	α - PARTICLE	β - PARTICLE	γ - RAY
NATURE	Alpha Nucleus $^{4}_{2}He$	Electron $^{0}_{-1}\beta$	Electromagnetic wa
CHARGE	Positive (+ 2e)	Negative (-1e)	Zero charge
VELOCITY	About 0.05c	0.03c – 0.09 c	Velocity of light (c)
MASS	4 amu	$\frac{1}{1840}$ amu	Zero mass
PENETRATING POWER	low	High	Very high
RANGE IN AIR	Of the order of 1cm	Of the order of 1m	Infinite
ABSORBER	Thin paper	Metal plate	Large lead block or Thick concrete
IONISING POWER IN AIR	Strong	Small	Weak
ELECTRIC AND MAGNETIC FIELD EFFECT	Deflected by both electric and magnetic fields	Deflected by both electric and magnetic fields	Not deflected by both electric and magnetic fi