Atomic Number:

(1) it is also known as Nuclear charge

(2) No. of +ve charges = no. of protons
= no. of electrons → in neutral atom

(3) represented by 'Z'

(4) it was determined by Moseley.

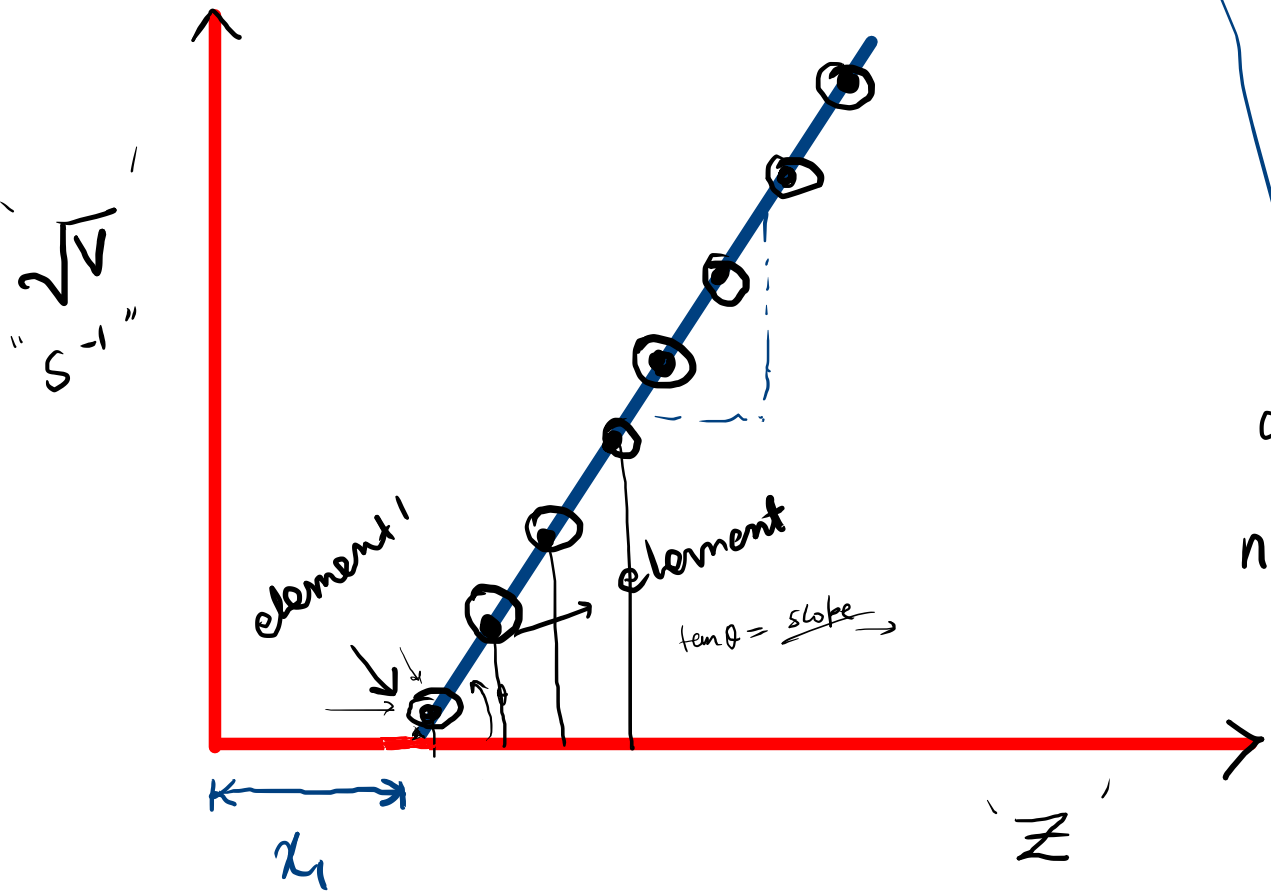
$$\sqrt{\nu} = a(Z-b) \quad \text{or} \quad aZ - ab$$

$\nu \rightarrow$ frequency of X-ray

$Z \rightarrow$ atomic no.

a & $b \rightarrow$ constants → Metal

Moseley's graph on determination of Atomic Number



$x_1 \rightarrow$ slope → a, b

atomic no. ⟶

no. of protons

$Z \propto \sqrt{\nu}$

* Two different elements can never have identical atomic number.

(2) Mass number

no. of nucleons

"A" = no. of protons (Z) + no. of neutrons

∴ no. of neutrons = A − Z

Symbol

" X_Z^A "

Atomic species

1. Isotopes (soddy)

Similarities

1) Atomic no. (Z) is same
2) no. of protons
3) no. of electrons
4) electronic config.
5) chemical prop.
6) position in p. table

Differences

1. Mass no.
2. no. of neutrons
3. physical prop. are diff.

Ex. → $_{1}^{1}H$ $_{1}^{2}H$ $_{1}^{3}H$

→ $_{8}^{16}O$ $_{8}^{17}O$ $_{8}^{18}O$

★ → $_{17}^{35}Cl$ $_{17}^{37}Cl$

2) Isobars:

Similarities:

1) Mass no. (A) is same
2) No. of nucleons is same

(1) ex: $^{40}_{18}Ar$ $^{40}_{19}K$ $^{40}_{20}Ca$

Differences:

1. Z
2. proton, e^-, neutron
3. E. config.
4. Ch. prop.
5. position diff.

3) **Isotones**:

Similarity: No. of neutrons

$^{3}_{1}H$ $^{4}_{2}He$

diff: 1) Z
2) A
3) E. Config
4) phy. & chem. prop
5) position in p. table.

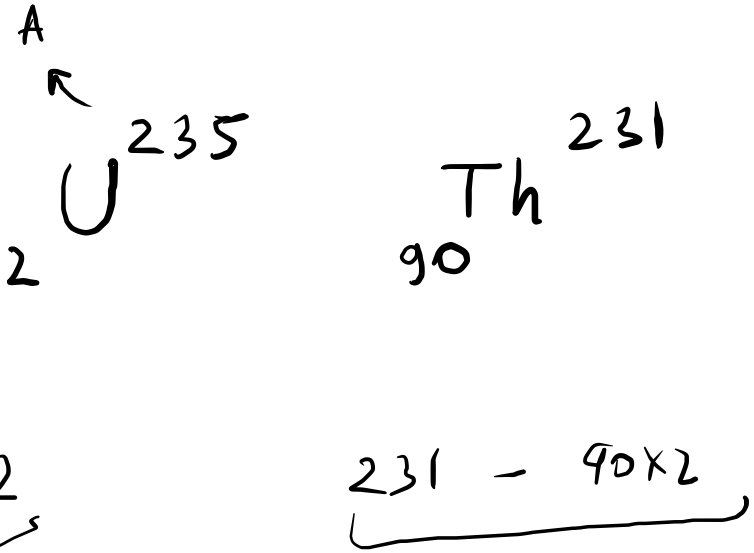
ex (1)

$^{30}_{14}Si$ $^{31}_{15}P$ $^{32}_{16}S$

(11)

$^{39}_{19}K$ $^{40}_{20}Ca$

4) Iso diaphers:



similarities!

→ (A - 2Z) 235 - 92X2 231 - 90X2

Differences!

i) At. No., M. No, electrons, protons, neutrons

ii) phy. & chem. prop.

$^{39}_{19}K$ $^{19}_{9}F$

ex: $^{65}_{29}Cu$ $^{55}_{24}Cr$

5) Isoelectronic → atom is not neutral in nature

Similarity:

1) no. of e⁻s are same
2) E. Config. same

Diff:

1) At. no.
2) M. No.

e.g. H^-, He, Li^+, Be^{2+}

iso electronic species

6) Isosters:

Similarities

1) No. of atoms
2) No. of e⁻s.

Diff-

1) only in prop

Phy

Chem.

Ex 1) N_2 and CO

2) CO_2 and N_2O

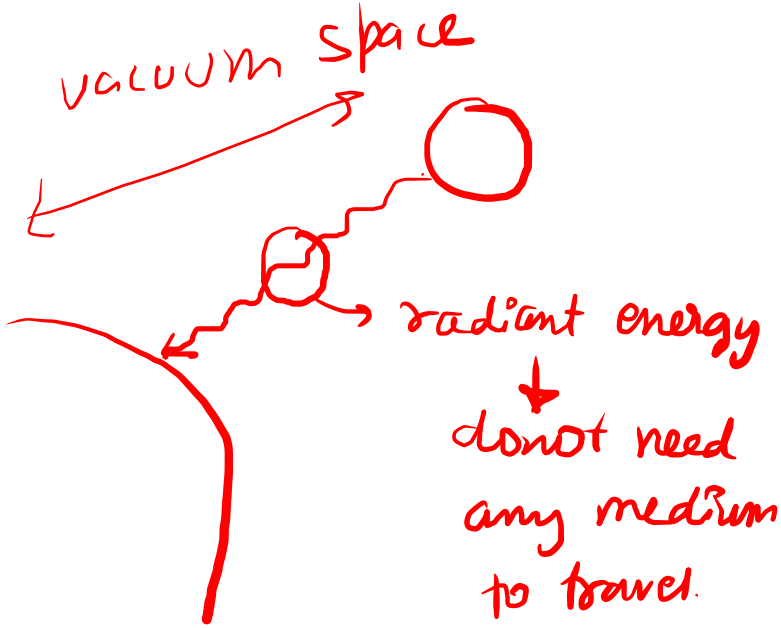
3) NCl and F_2

4) CaO and MgS

5) C_6H_6 and $B_3N_3H_6$

Electromagnetic Radiation

1. Light and energies (radiant energy) propagates without any medium.



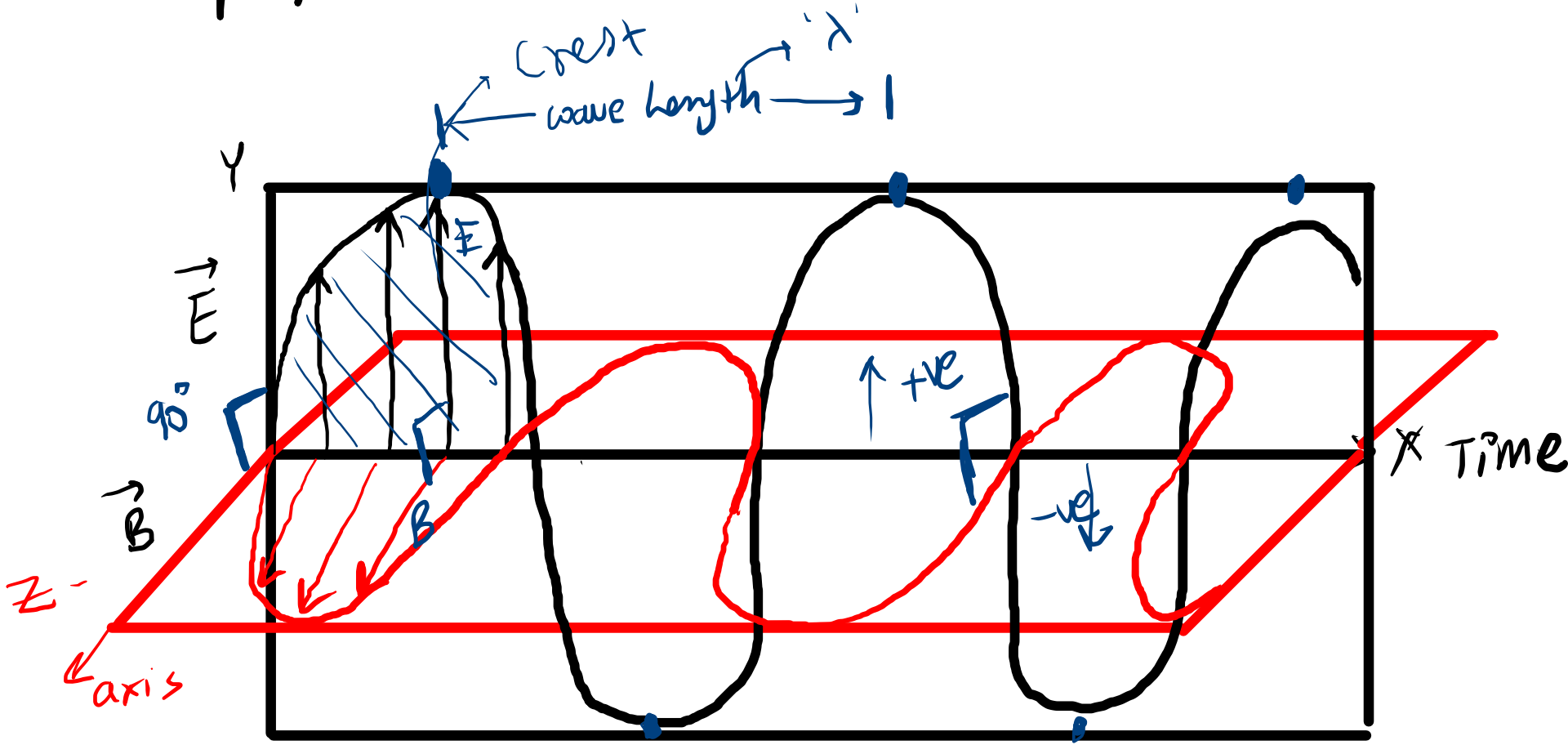
* These waves can be produced by charged body moving in magnetic field.

$\vec{E}$ $\vec{B}$ → energy → "electromagnetic energy Radiation"

eg: X-ray, cosmic rays, ordinary light, microwave, infrared, ...

Characteristics:

1. all EMR travel with speed of light (c).
2. $\vec{E}$ and $\vec{B}$ fields → that oscillates in directions perpendicular to each other.



1) Wavelength:

dist. b/w two nearest Crest or troughs is called wavelength.

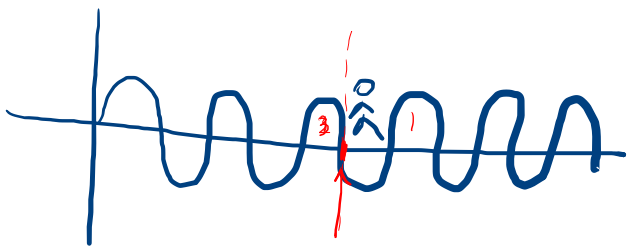
λ (lambda)

↳ cm, angstrom (Å), micron (μ)
Nanometer (nm).

$1 Å = 10^{-10} m$ $\quad$ $1 nm = 10^{-9} m$

$1 \mu = 10^{-6} m$

2) Frequency:



no. of waves → pass through a point in 1sec.

(nu) → ν Unit : s^{-1}

'cps' → cycles per second

'hertz → Hz'

frequency

$\lambda \cdot \nu$ = distance travelled in one second → c

all:

frequency = c/λ

$\lambda \cdot f$ = velocity

$m \cdot s^{-1}$ → velocity

velocity → speed of light → c

velocity = $\frac{D}{T}$ → 1

$S = \frac{D}{T}$ · c

D = S × T = one second

$c \cdot 1 = c$

$\lambda \cdot f$ = dist. travelled in one second = c

$\lambda \cdot f = c$

$f = \frac{c}{\lambda}$

(iii) velocity

↳ dist. covered in one second by the wave

→ 'c' ←

dist. = speed × time

= c × 1

dist = c

$c = \lambda\nu$ = **3×10^{10} cm/s**

(iv) Wave number:

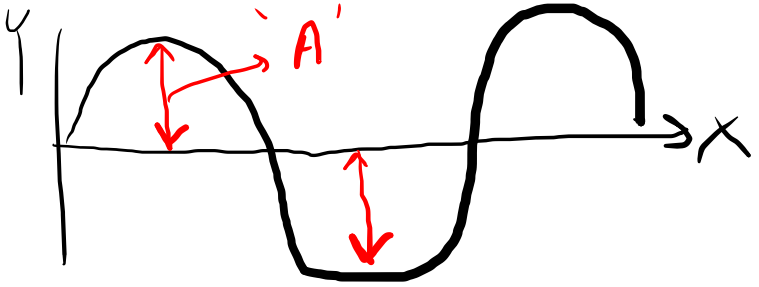
Reciprocal of wavelength.

i.e. no. of wavelengths per centimetre.

$(\bar{\nu})$ cm^{-1}, m^{-1}

$$\bar{\nu} = \frac{1}{\lambda}$$

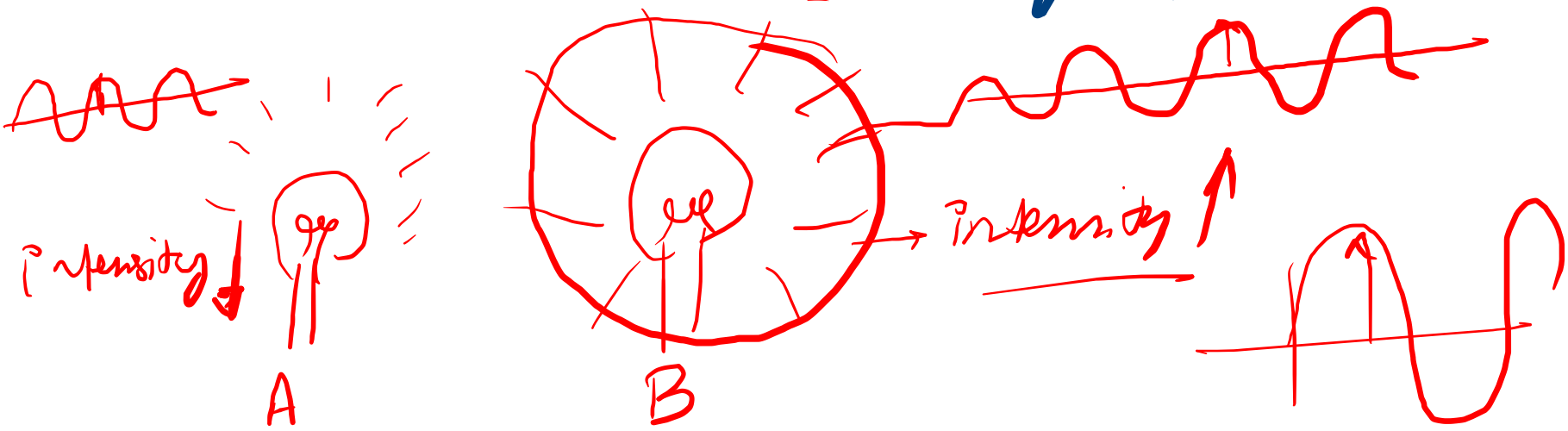
(V) Amplitude :



↓
A'

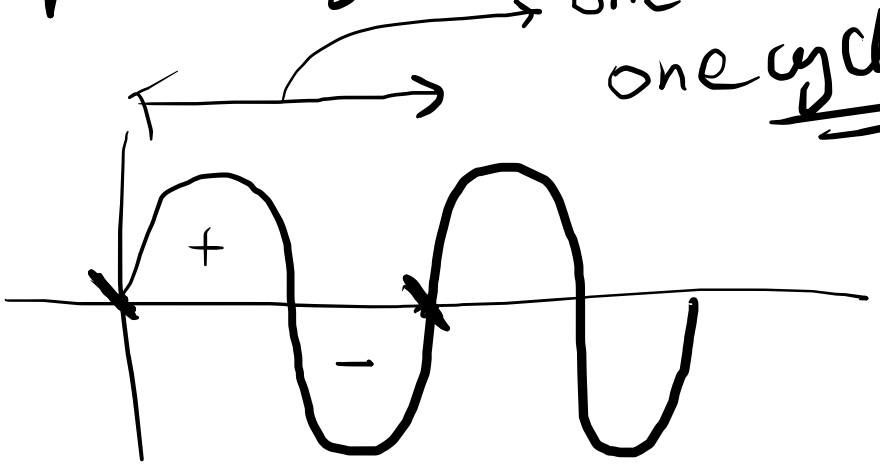
ht. of Crest or depth of trough.

* it determines the intensity of Radiation



(vi) Time period :

time taken by wave for one complete cycle.



$$T = \frac{1}{\vartheta}$$

$\vartheta \rightarrow$ velocity

unit → sec

second per cycle