Waves Nature of Light, Electromagnetic Wave

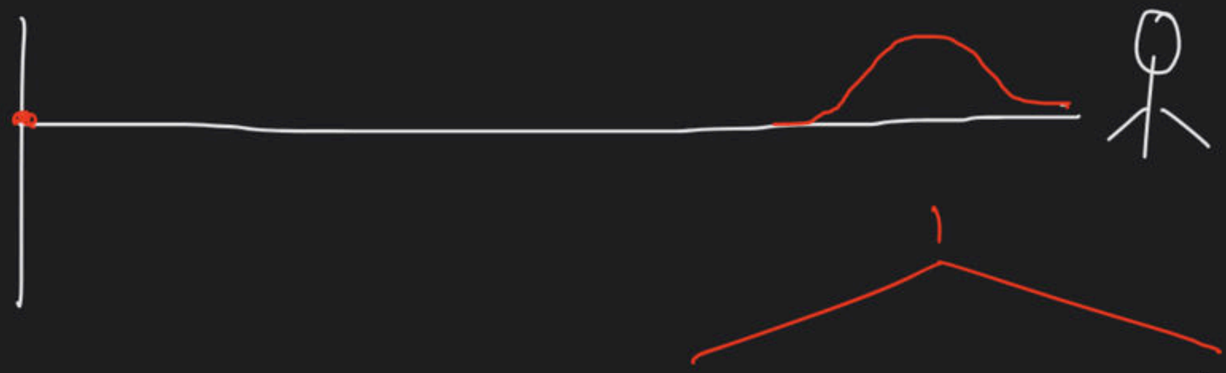
Course on Atomic Structure for Class XI

akhilesh • Lesson 2 • Aug 25, 2021

4.

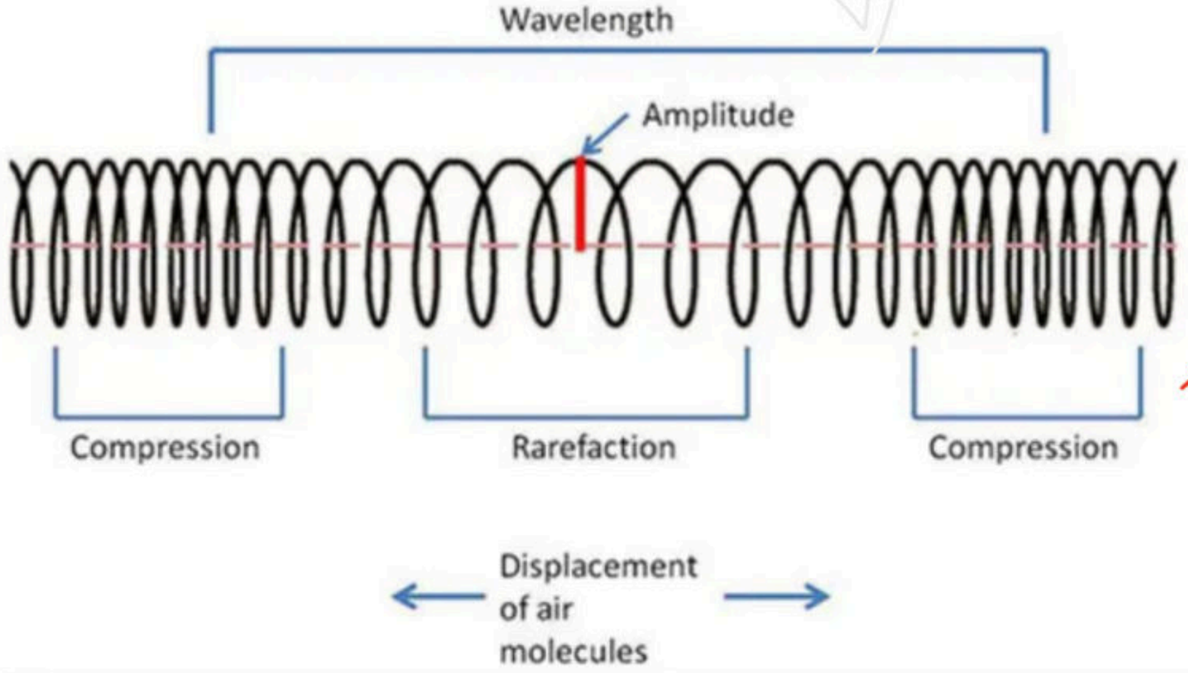
2.

Waves :→ Used to transfer energy without the net transfer of matter

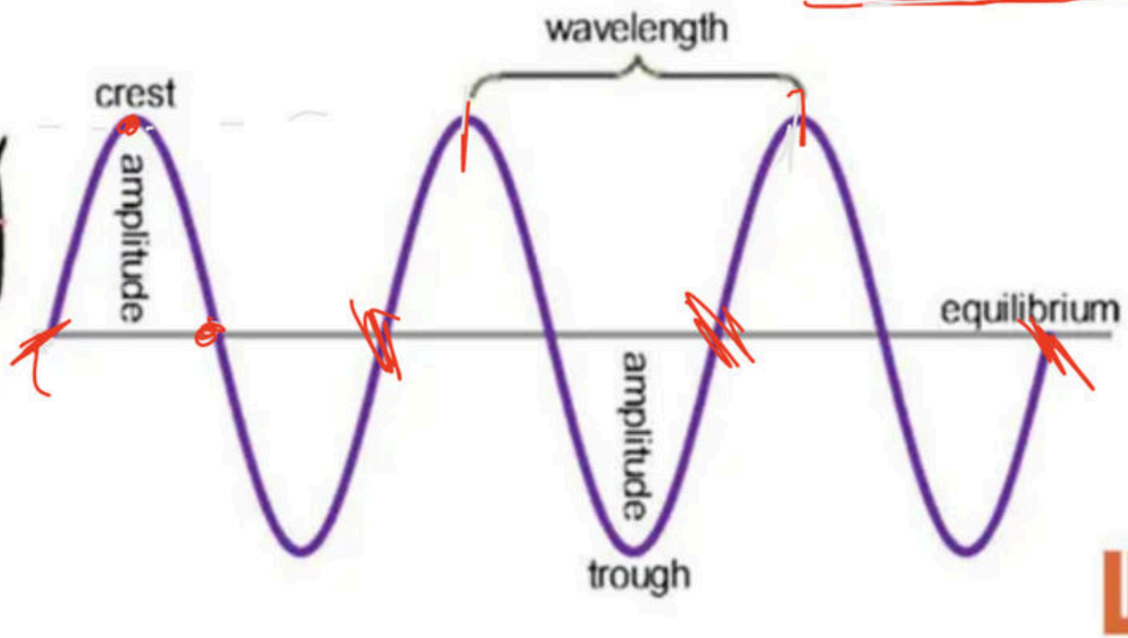


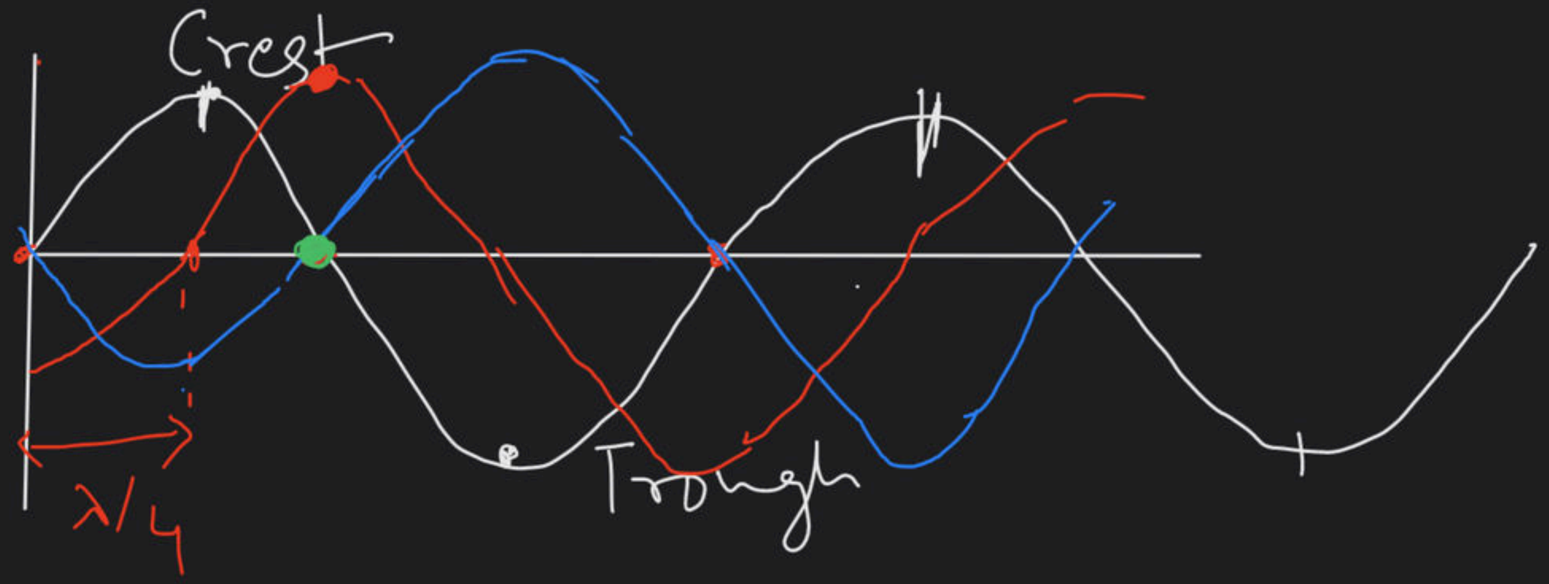
- **Transverse**
  - e.g. String wave
    Water waves
    Electromagnetic
- **Longitudinal**
  - Sound wave

Longitudinal Wave



Transverse Wave

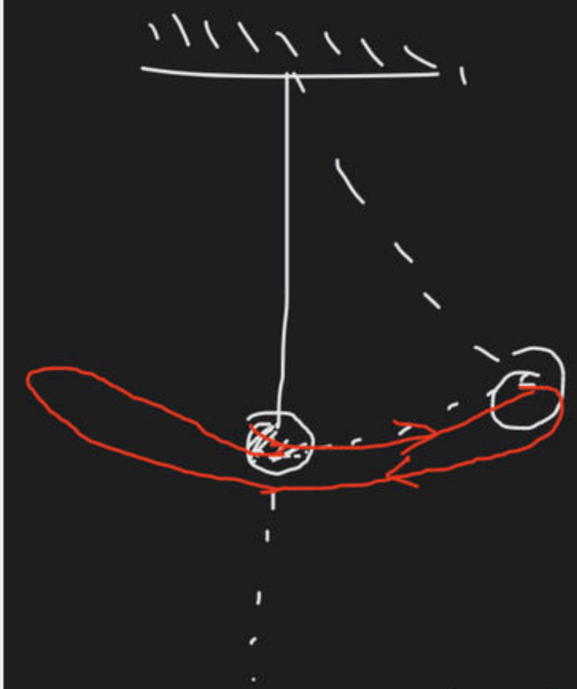




(1) Amplitude :- maximum displacement from mean position.

(2) Wavelength (λ) Distance bet^{n} two nearest crest or tough

Frequency (ν) (nu) :→ No. of oscillation made by a particle in one second.



Speed of wave = v

distance travelled by wave in one second = v

λ ⟶ 1 oscillation

| ——— | ——— |

v ⟶ $\frac{v}{\lambda} = \nu$

In case of light

$c = 3 \times 10^8$ m/sec

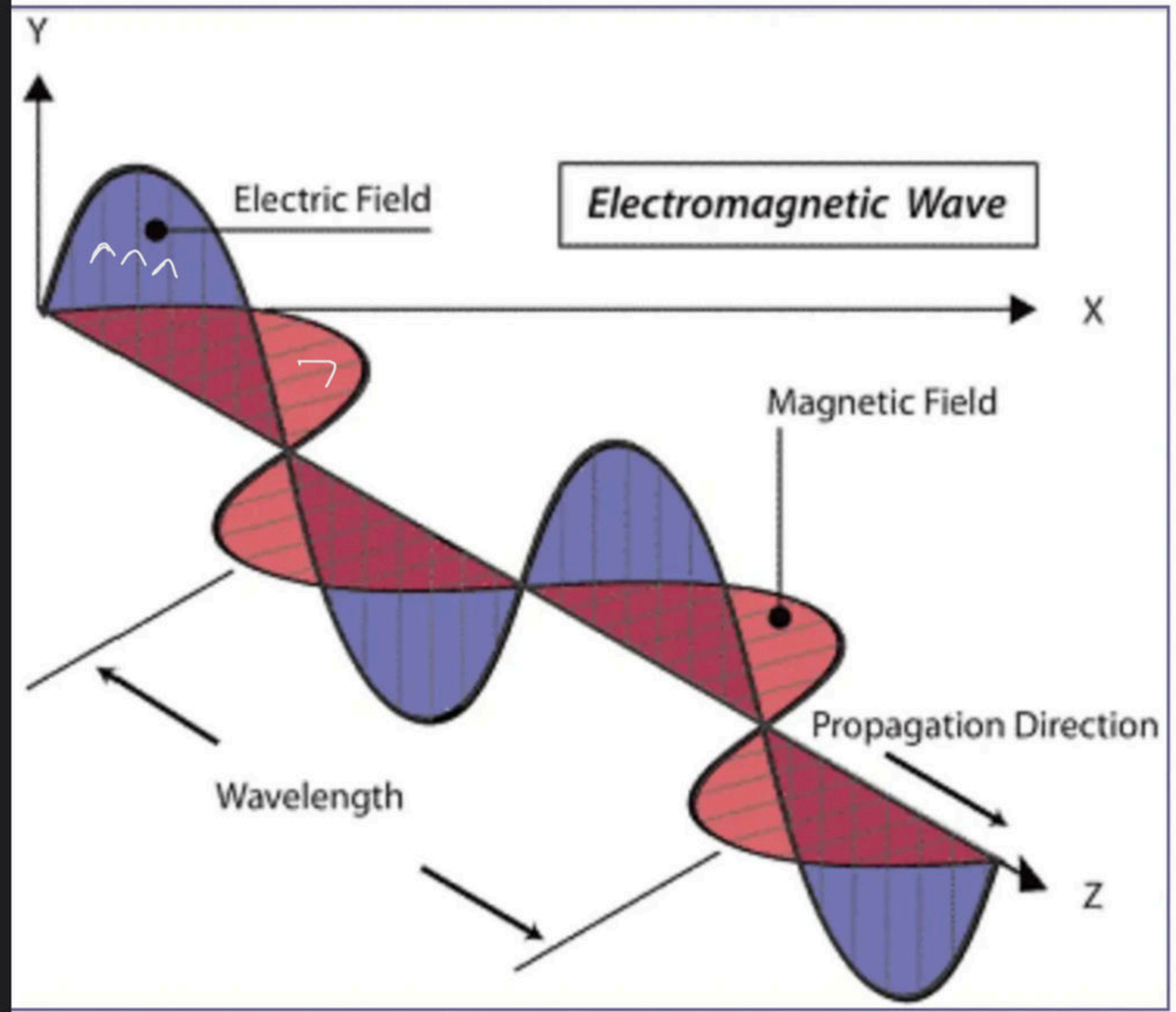
$\nu = \frac{c}{\lambda}$

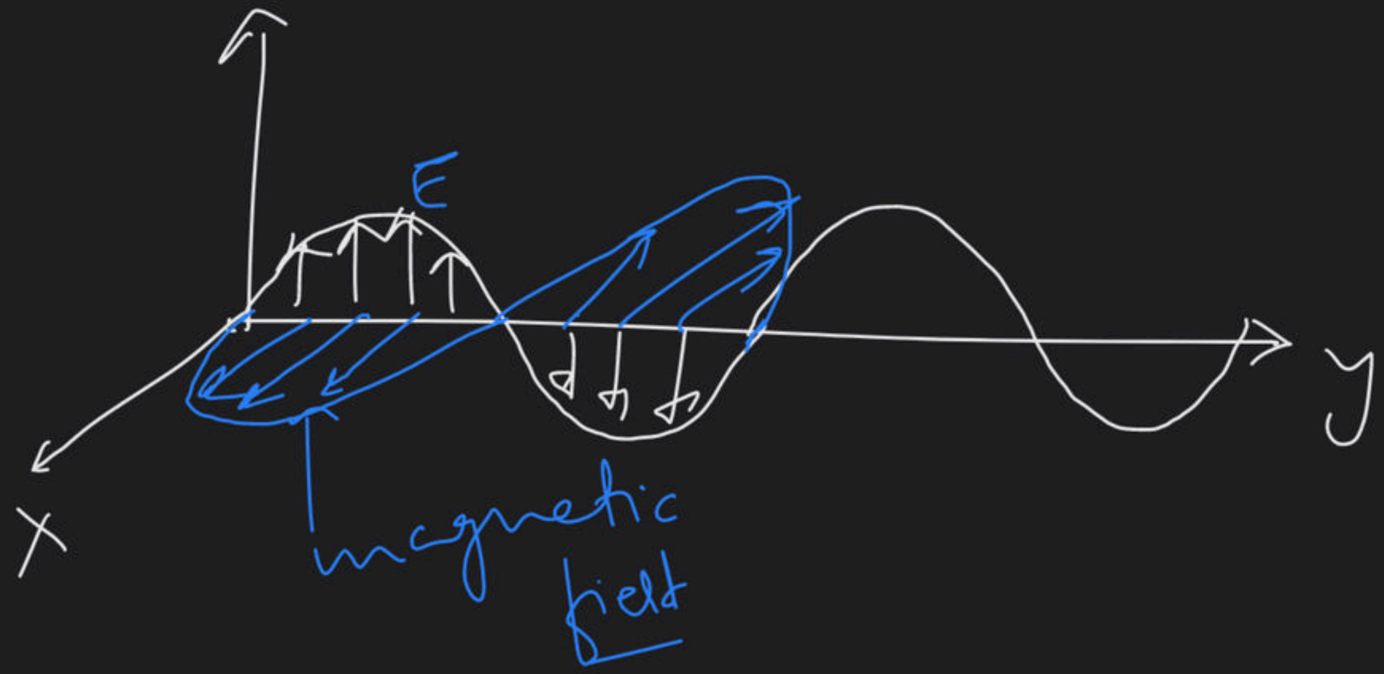
Wave number ($\bar{\nu}$) = No of waves in unit distance

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

Electromagnetic radiation (wave) or light

It consist of oscillating electric and magnetic which are ⊥ar to each other and ⊥ar to the propogation of wave.


Y
Electric Field
Electromagnetic Wave
X
Magnetic Field
Propagation Direction
Wavelength
Z

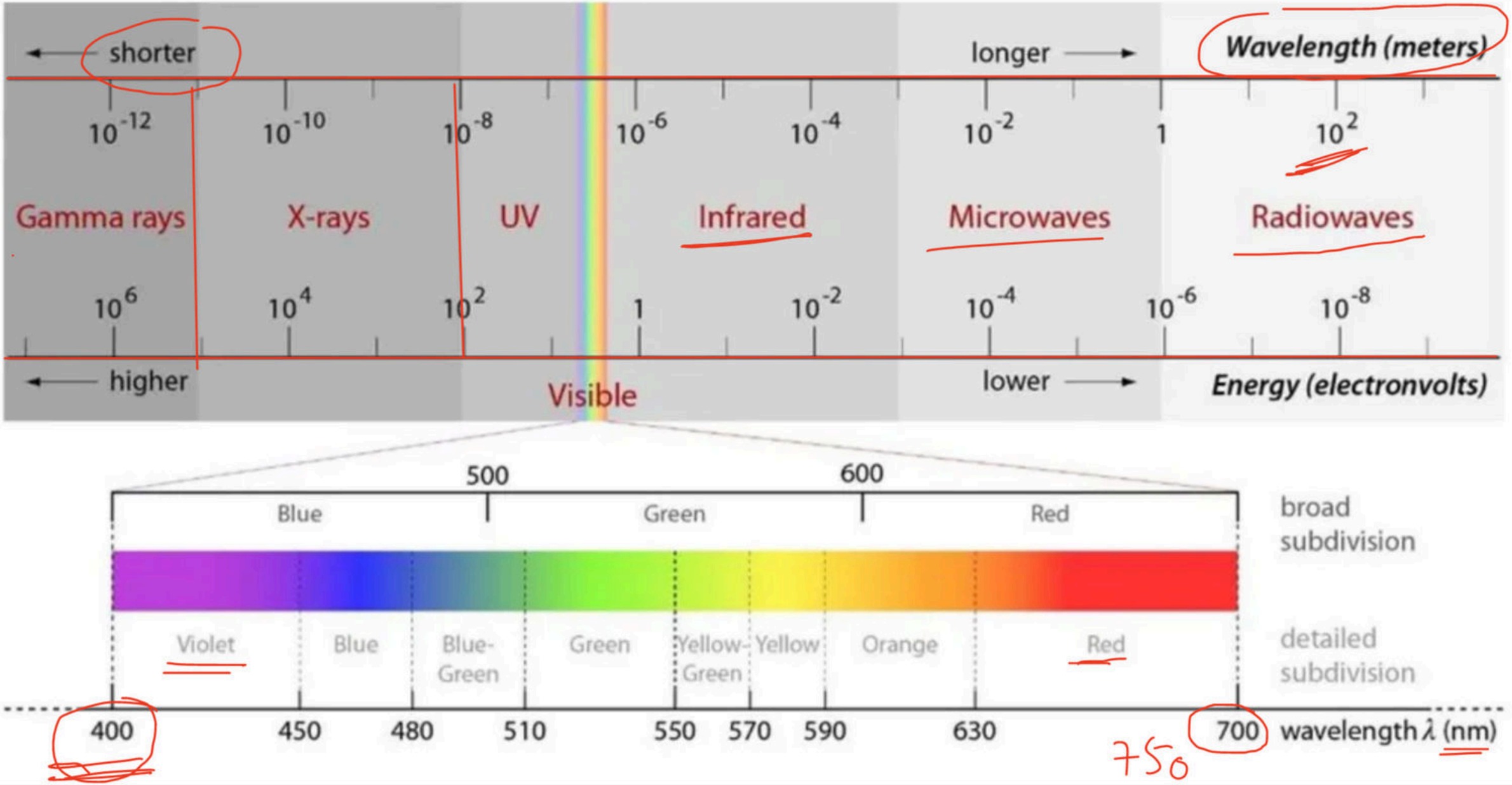

E
y
x
magnetic field

Electromagnetic Spectrum :→

Range of visible spectrum

400 (nm) ——————— 750 (nm)

V I B G Y O R


shorter
longer
Wavelength (meters)
10^{-12}
10^{-10}
10^{-8}
10^{-6}
10^{-4}
10^{-2}
1
10^{2}
Gamma rays
X-rays
UV
Infrared
Microwaves
Radiowaves
10^{6}
10^{4}
10^{2}
1
10^{-2}
10^{-4}
10^{-6}
10^{-8}
higher
lower
Energy (electronvolts)
Visible
500
600
Blue
Green
Red
broad subdivision
Violet
Blue
Blue-Green
Green
Yellow-Green
Yellow
Orange
Red
detailed subdivision
400
450
480
510
550
570
590
630
700
wavelength λ (nm)
750

Interference < constructive
destructive

Reflection

Refraction

$$Z = 1 + \frac{P \cdot b}{RT}$$

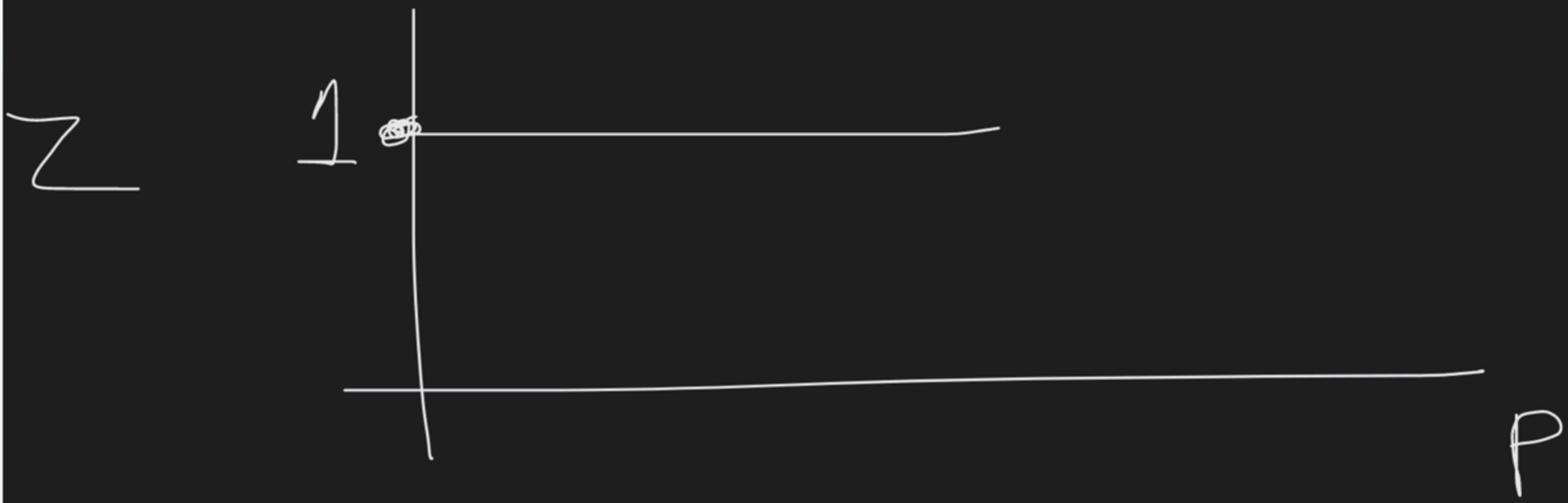
$Z > 1$ repulsion / size

five

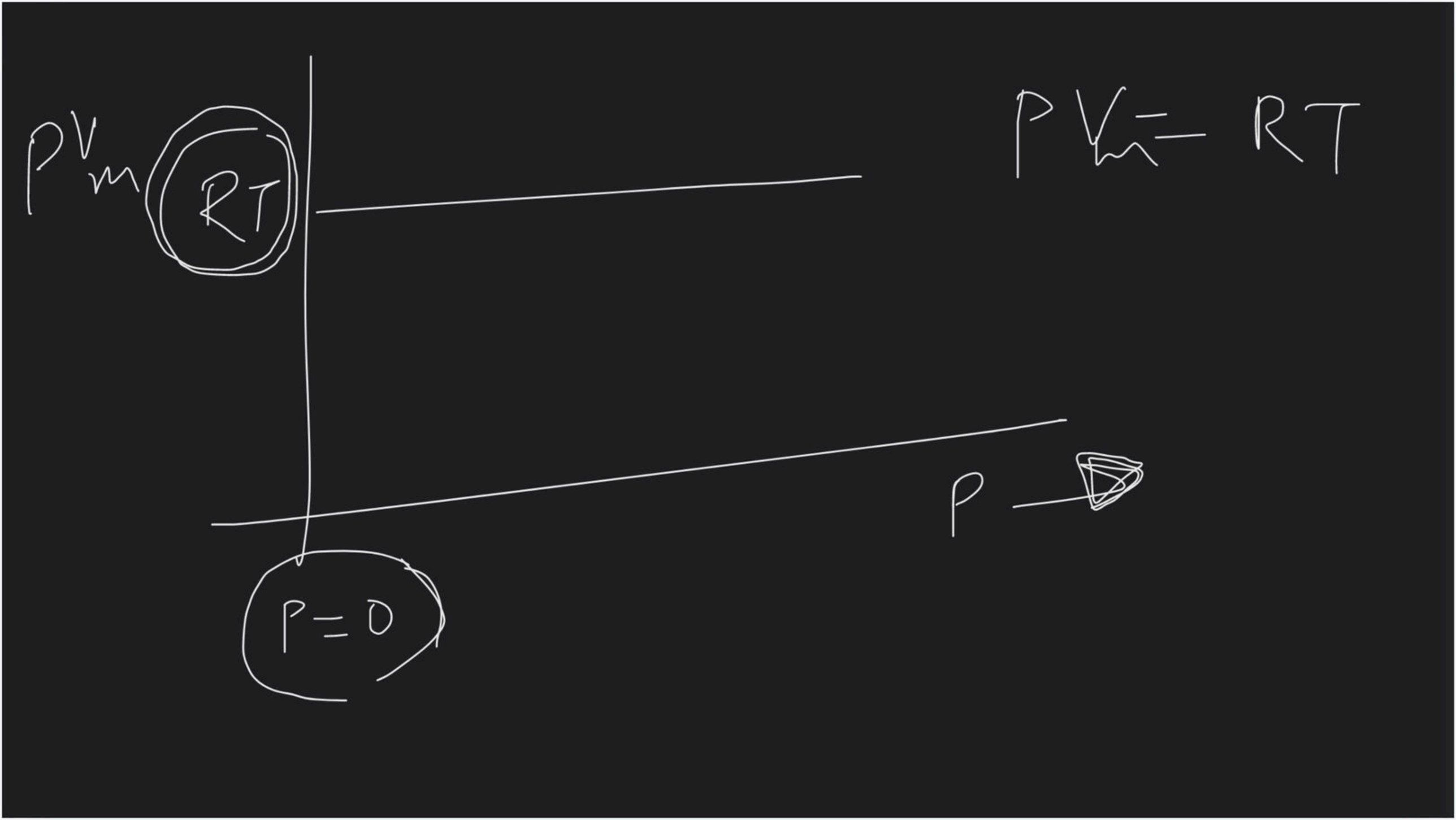
$Z < 1$

attraction

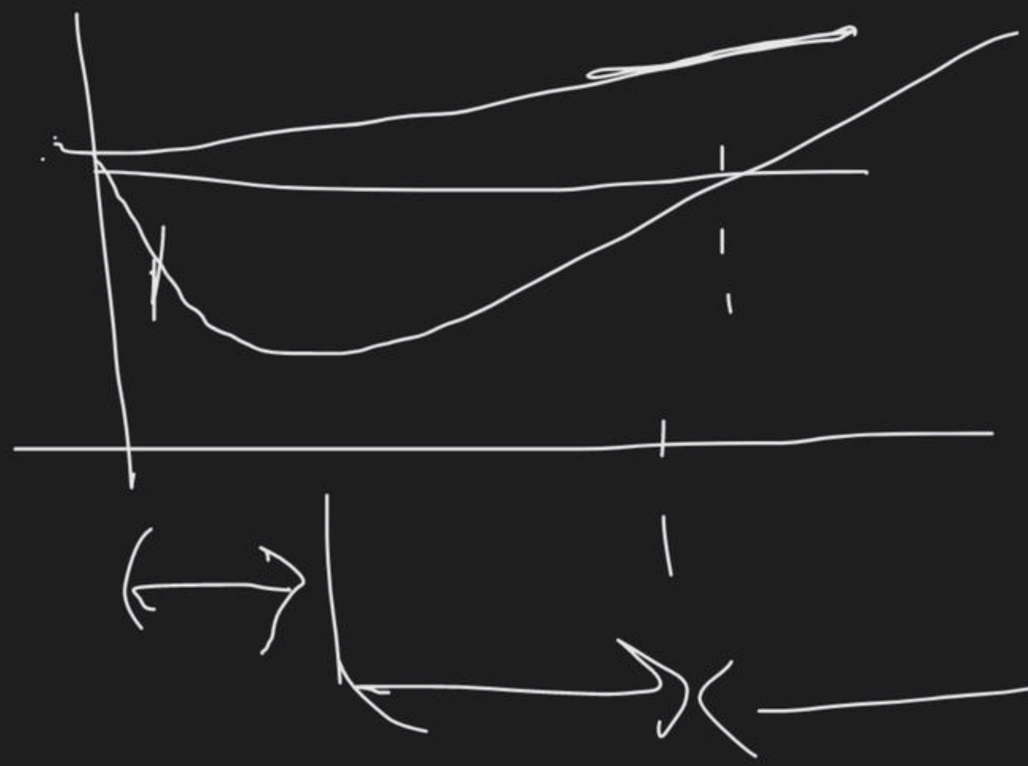
$$Z = 1 + \frac{Pb}{RT}$$



$$Z = 1 = \frac{PV_m}{RT}$$


PV = RT
PVm
RT
P
P=0

(11)



$Z > 1$

CO_2

$A \longrightarrow PS$


D

$a = 0$