



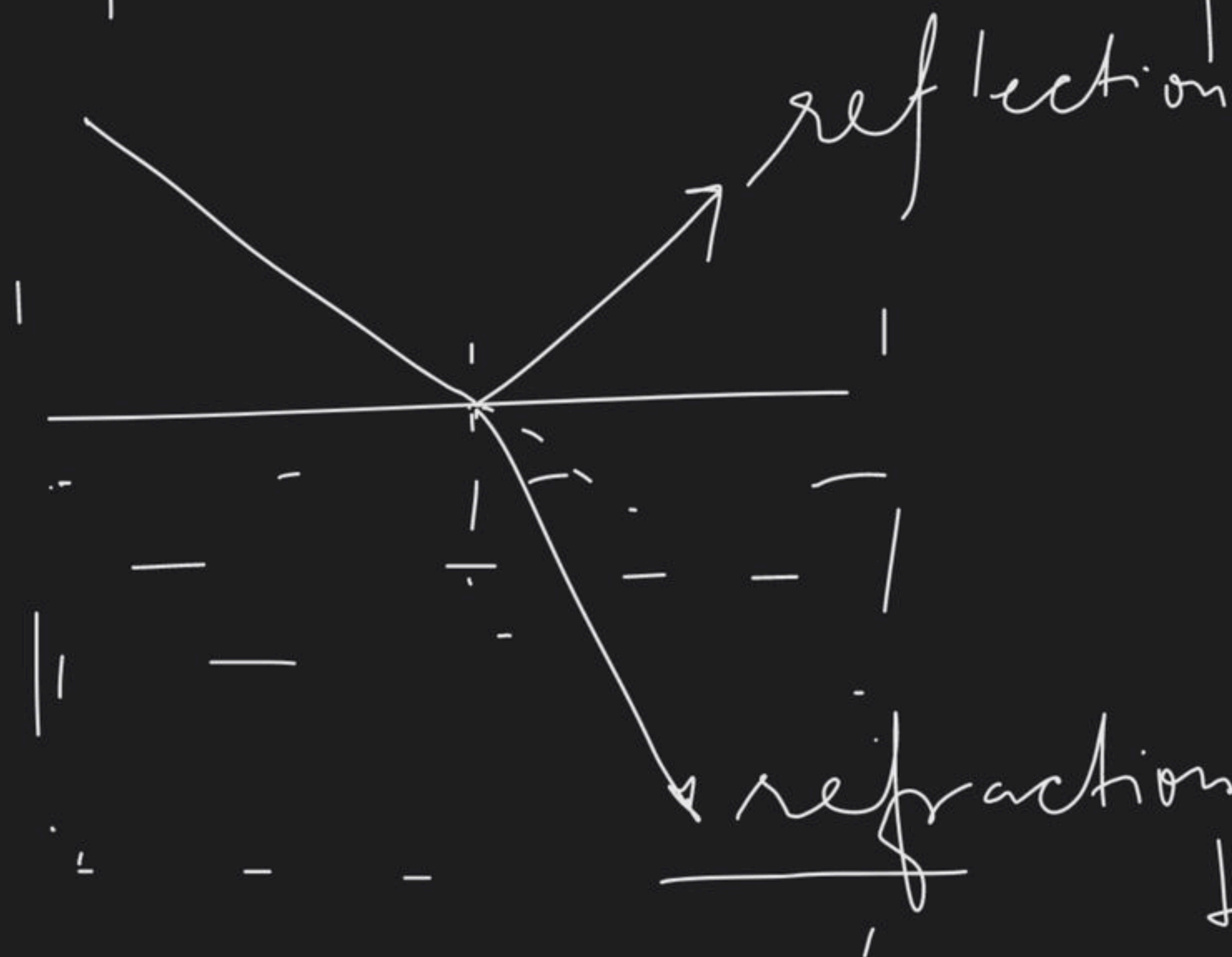
Spectrum, Planck's Quantum Theory

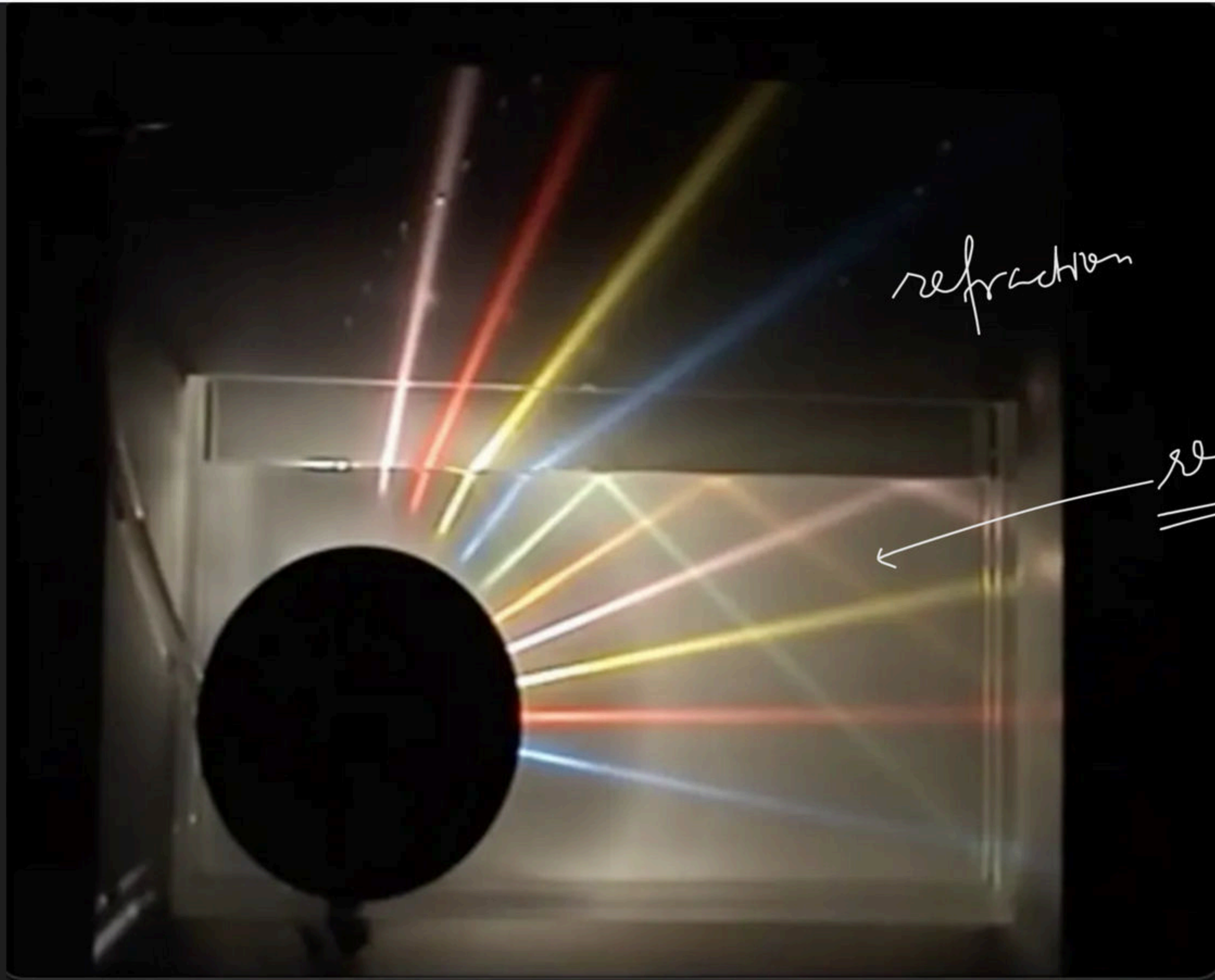
Course on Atomic Structure for Class XI



Reflection

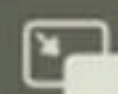
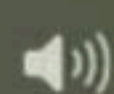
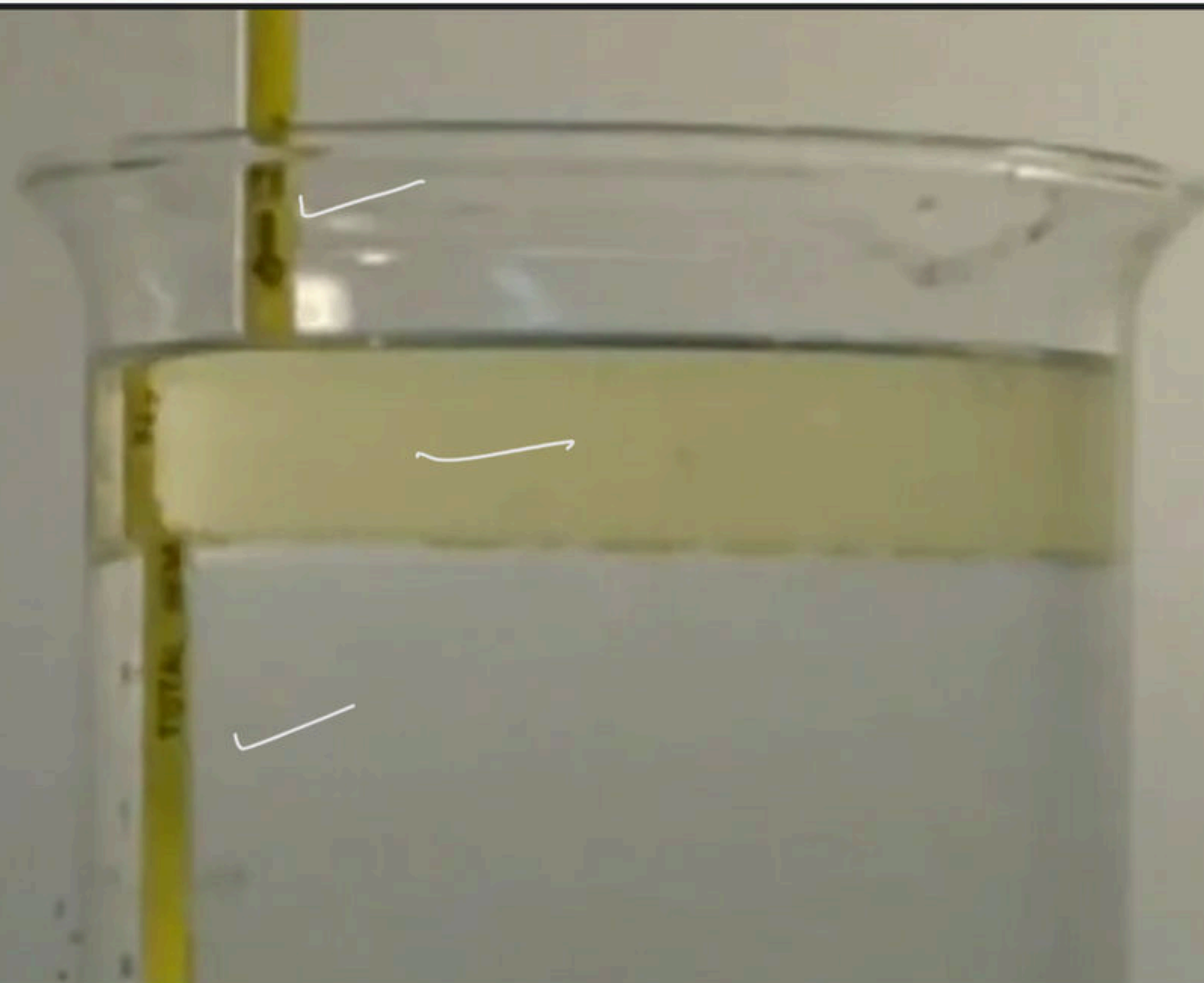
Refraction





refraction

reflection

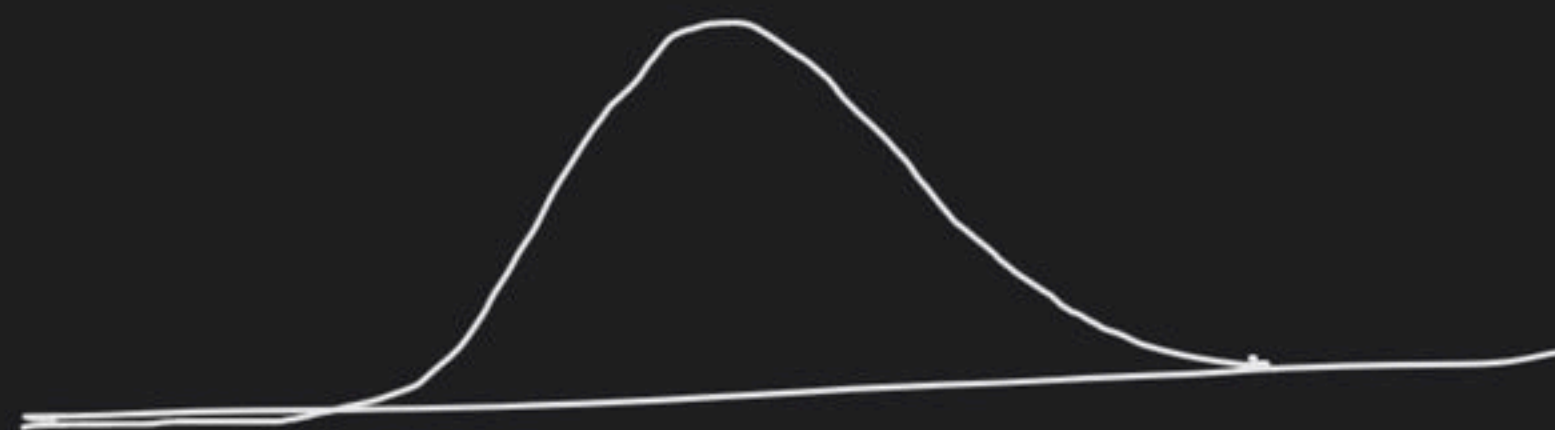


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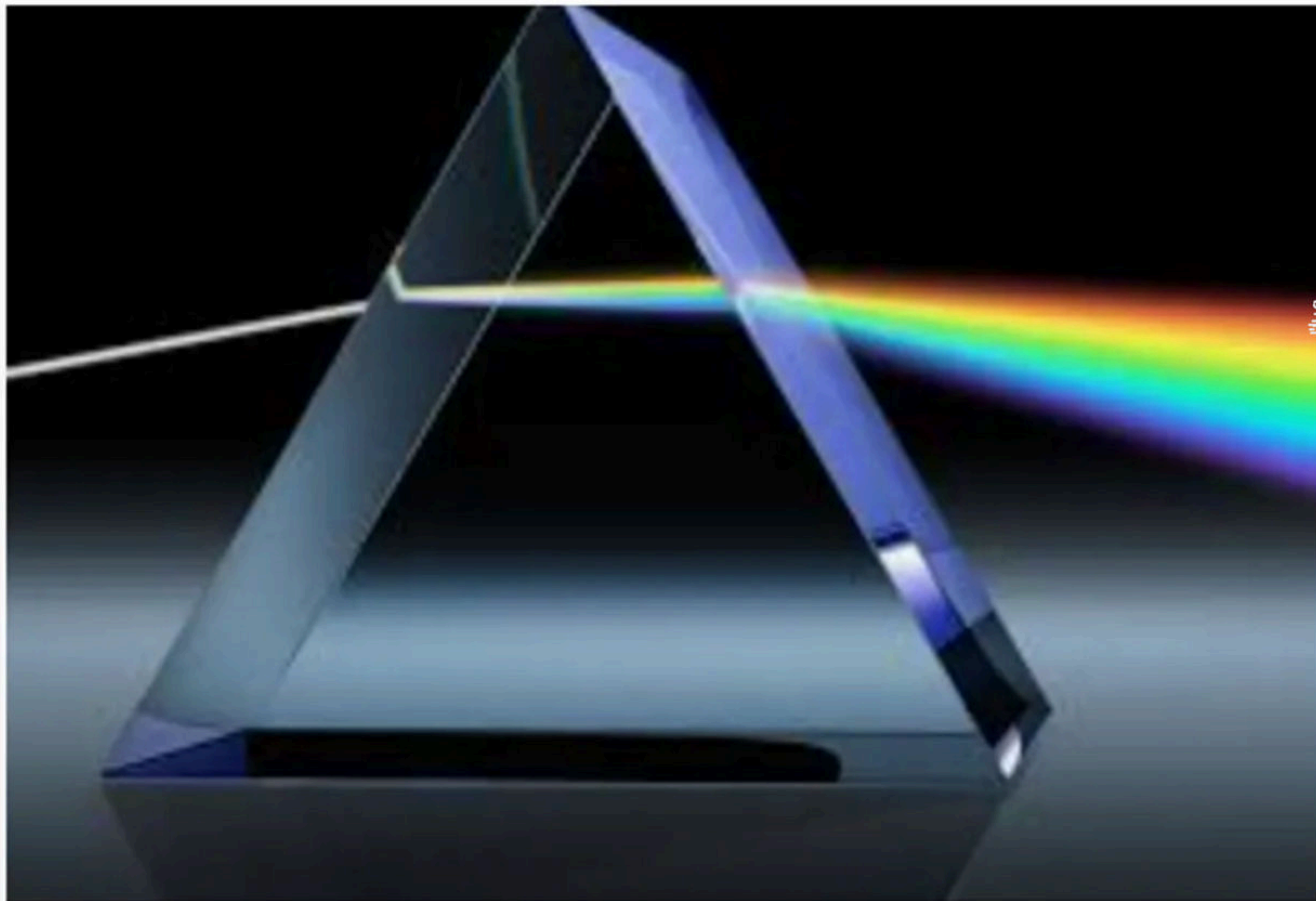


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Interference $\begin{cases} \rightarrow \text{Constructive} \\ \rightarrow \text{Destructive} \end{cases}$



Spectrum : \rightarrow When a beam of light is passed through a prism it splits the beam into different beam depending upon the wavelength. collection of such a dispersed light giving it wavelength composition is called spectrum.



high density
hot matter



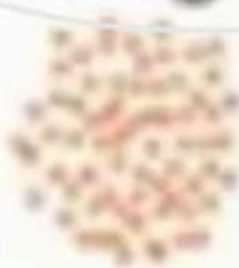
Prism



Continuous spectrum



hot gas



Emission spectrum



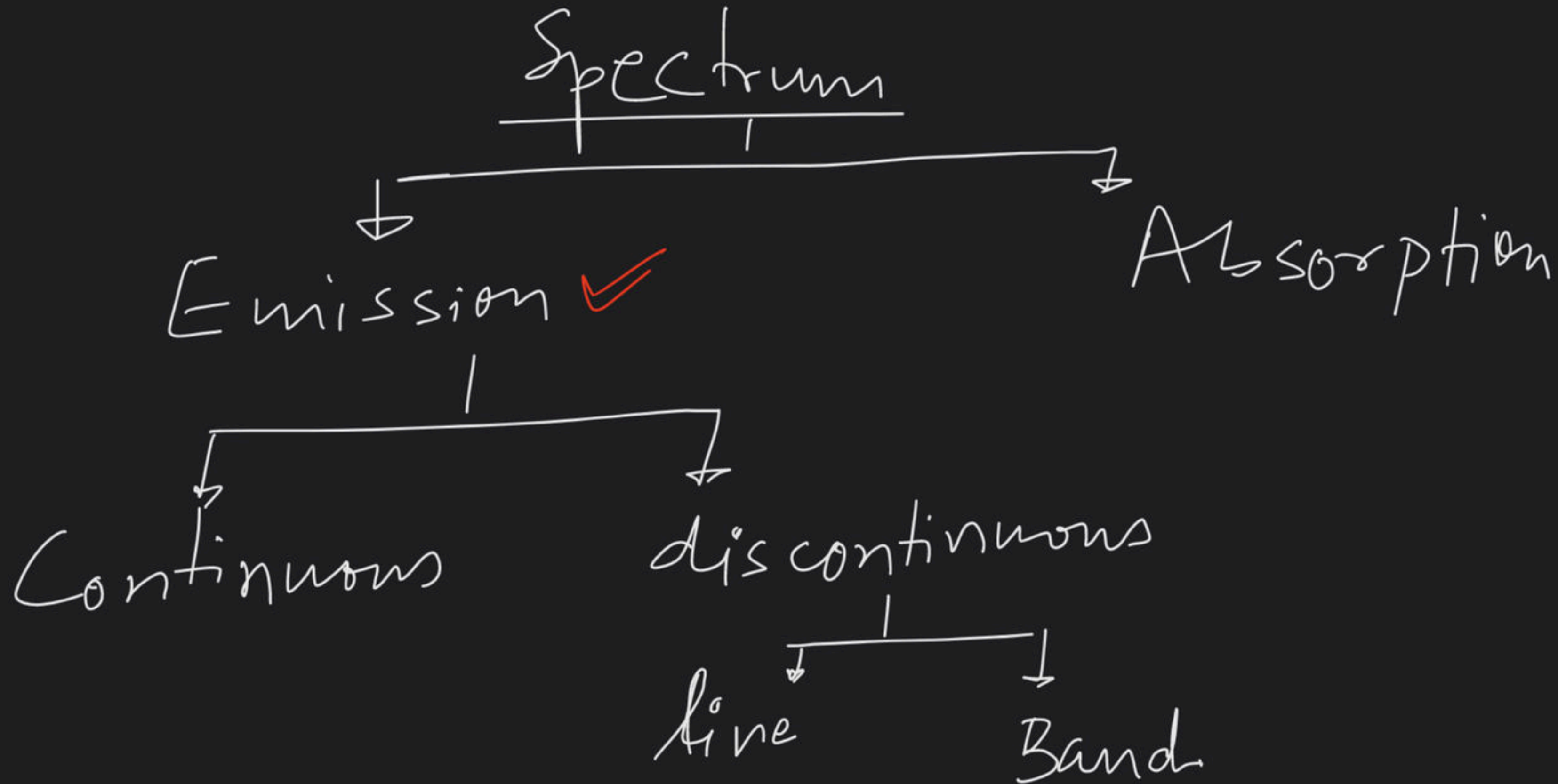
cold gas



Absorption spectrum



angle of refraction $\propto \frac{1}{\lambda}$



Continuous Spectrum:- Light emitted from bulb, tubelight, sun etc. usually consist of radiations of all the wavelength of visible range. When a light is dispersed we get continuous bands of colours called continuous spectrum.

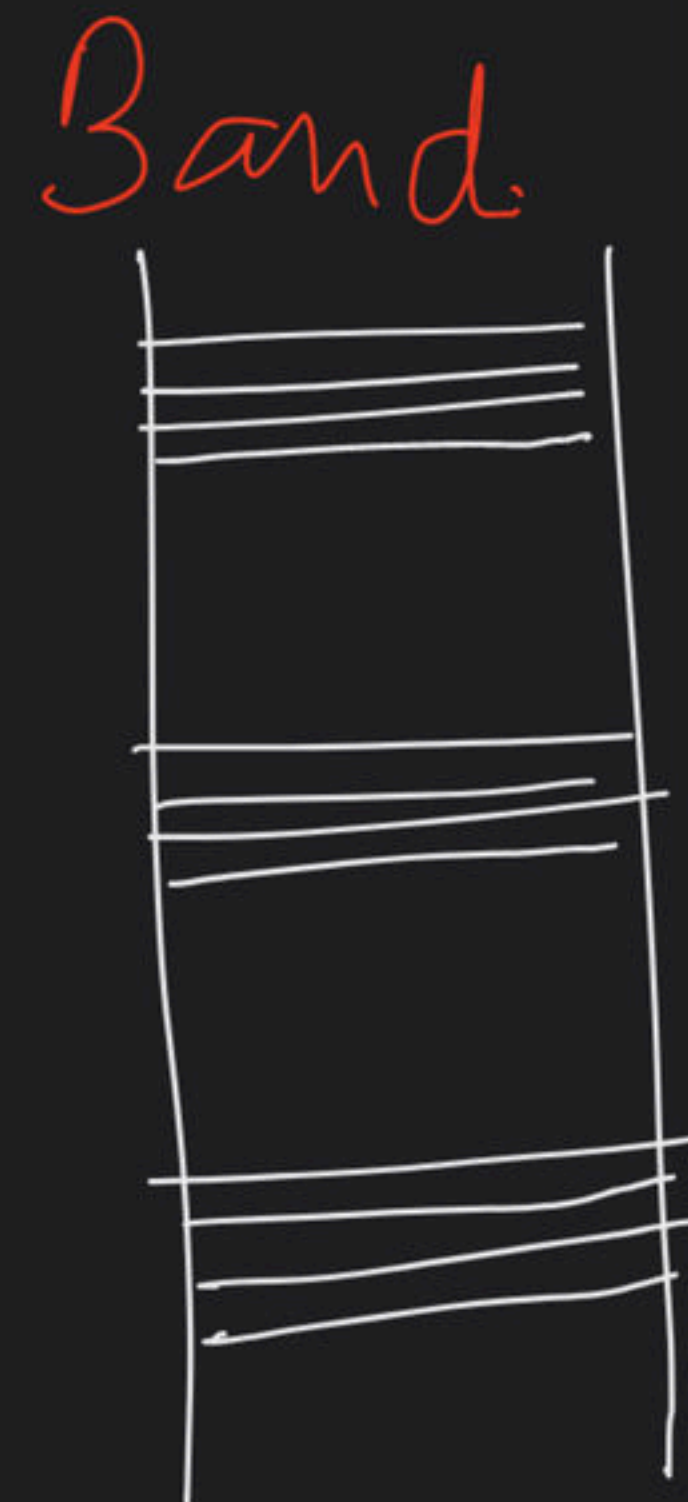
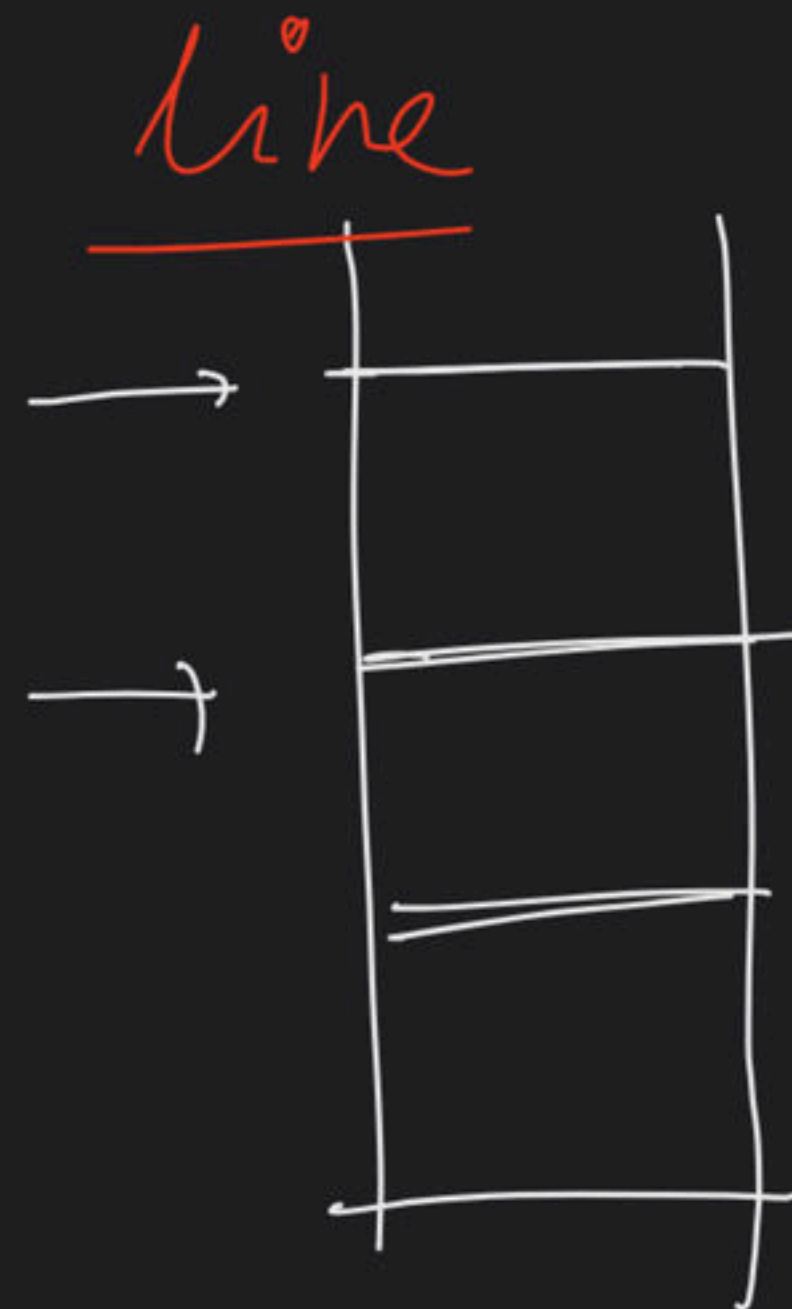
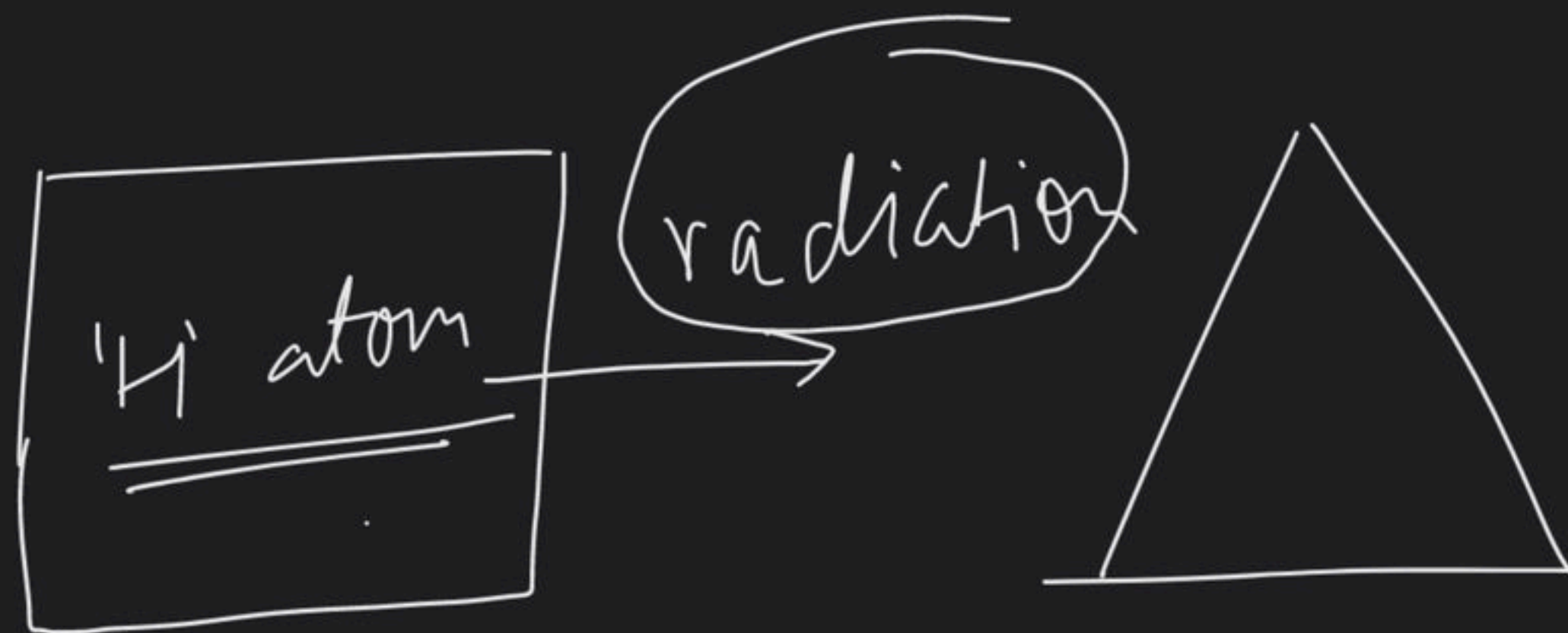
Discontinuous Spectrum :- When

light consisting of radiations of few particular wavelength, we

get discontinuous spectrum.

e.g. spectrum of elements

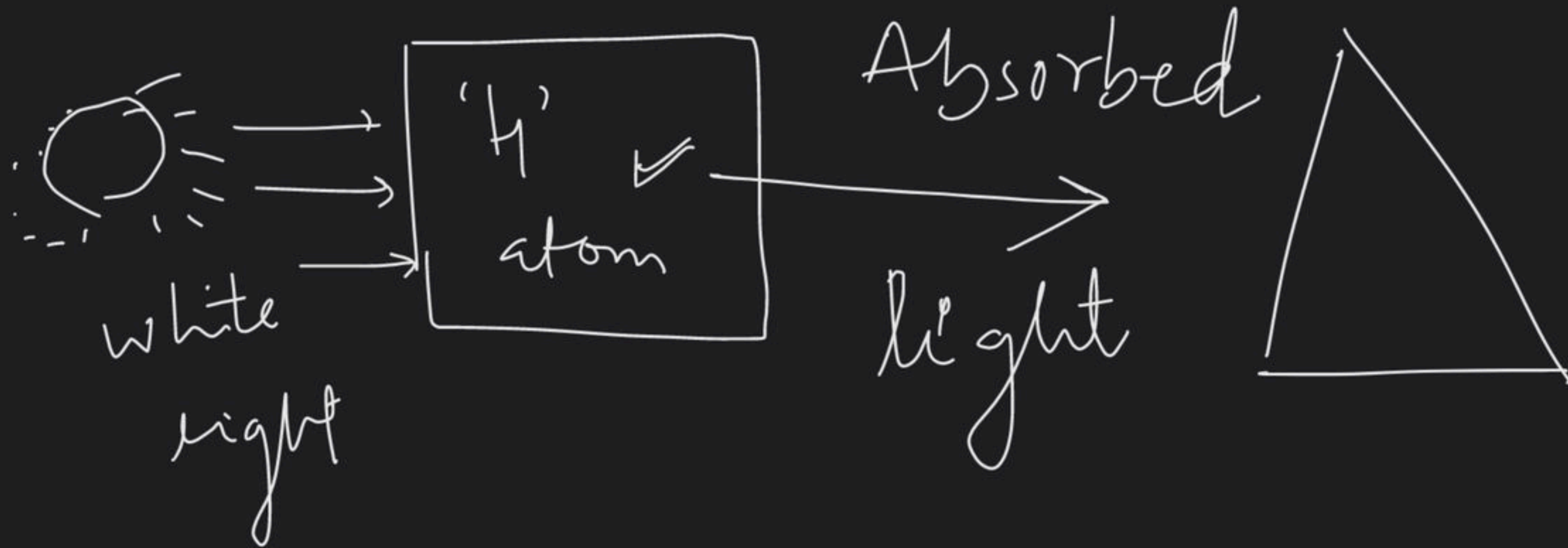
like, H, O¹ etc.



Emission Spectrum : →

when emitted light is passed
through a prism, its called emission
spectrum.

Absorption Spectrum

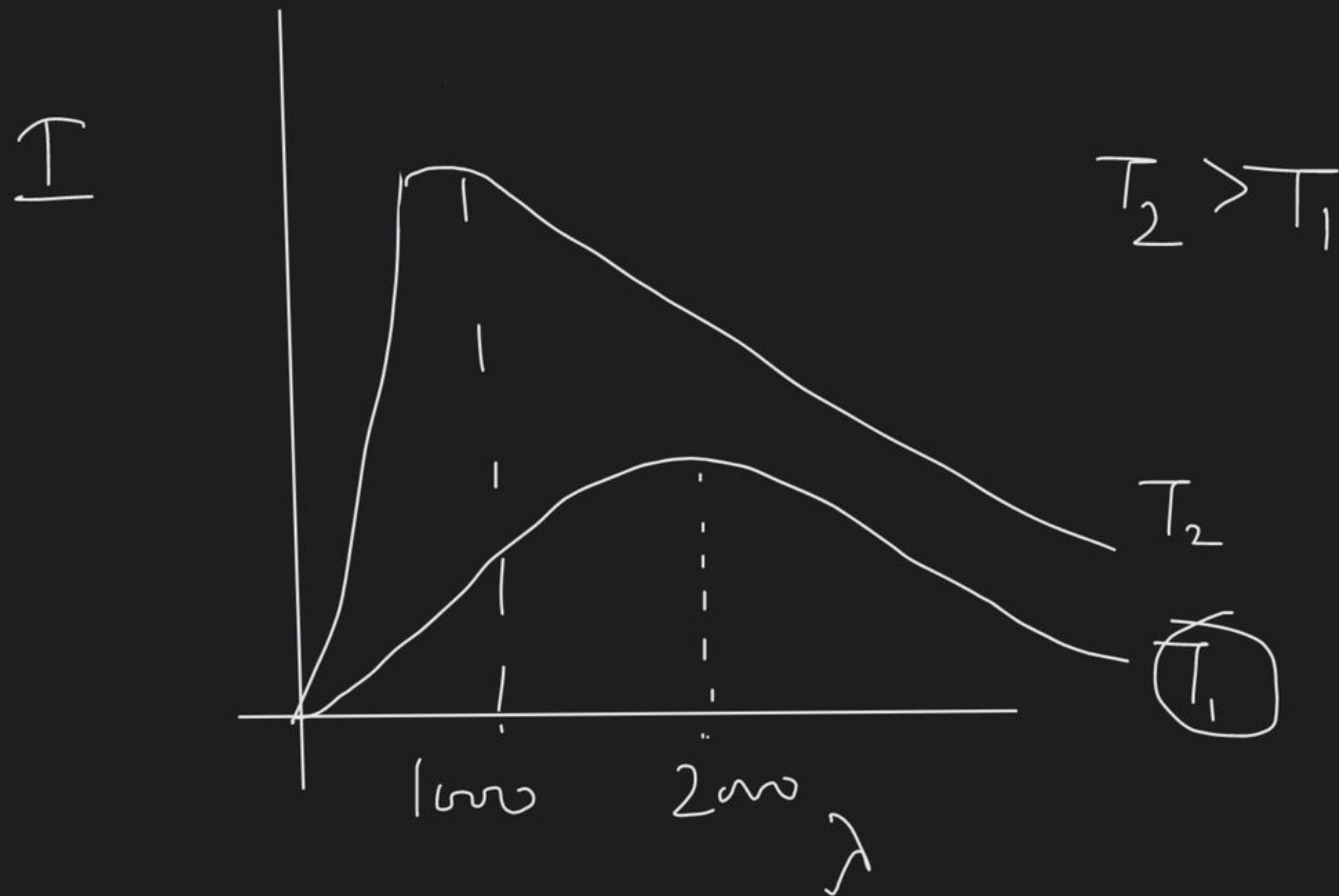


400 — 750

It is a well known fact that a substance absorb all the radiations at lower temperature, which are emitted by the substance at higher temperature. When a beam of white light is passed through a substance

It absorbs radiations of some specific wavelength. When such absorbed light is passed through the prism, we get dark line corresponding to the radiations absorbed by the substance.

Planck's Quantum theory $\therefore \rightarrow$



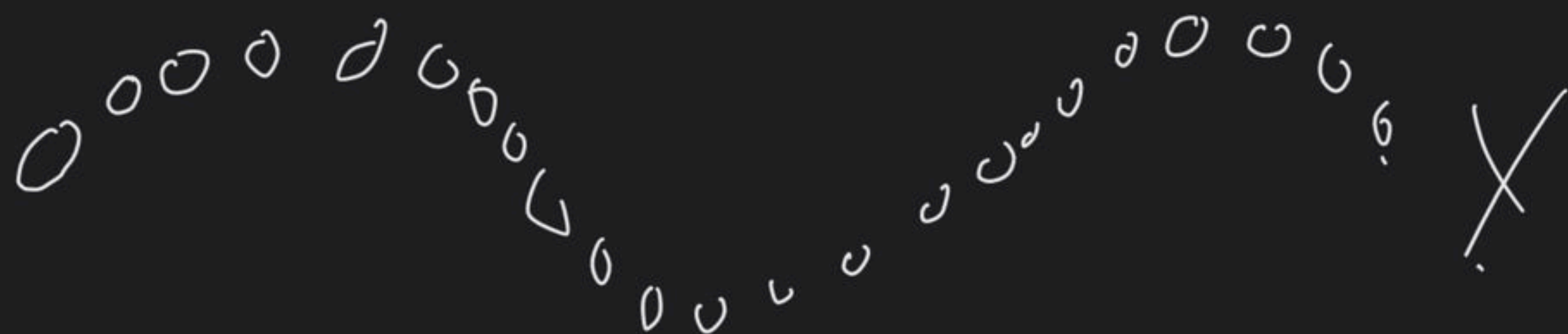
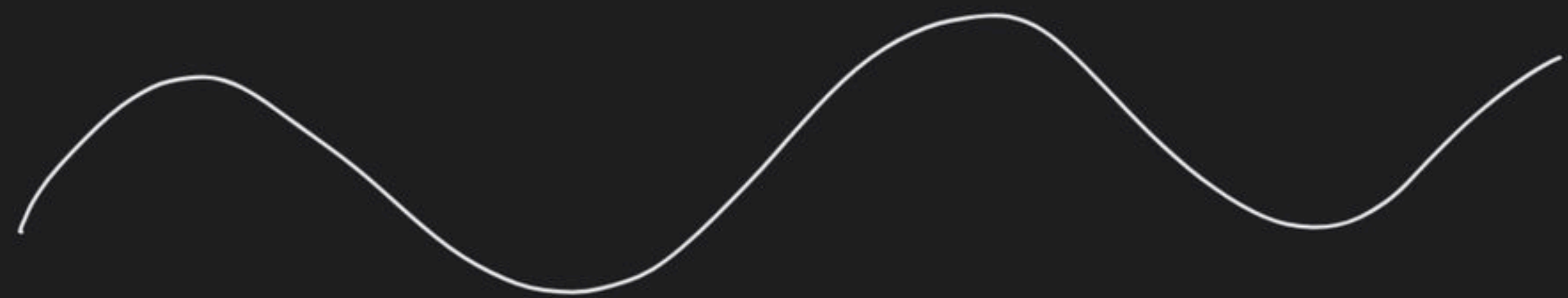
Black Body
radiation
exp.

Planck suggested that atoms and molecules could emit or absorb energy only in discrete quantities and not in continuous manner.

Planck gave the name quantum or photon to the smallest quantity of energy that can be

light possesses dual nature

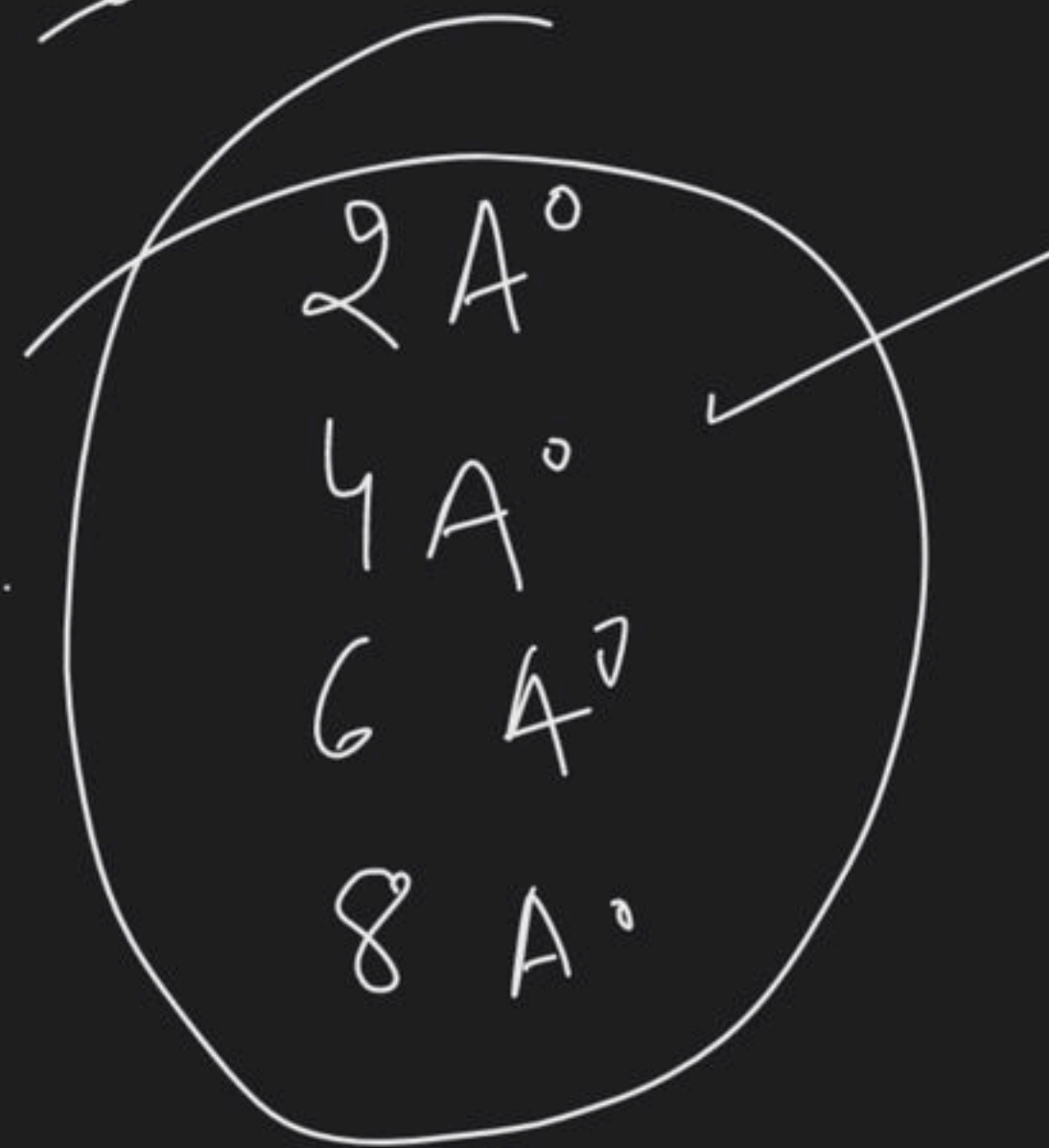
i.e. wave as well as particle





$$\pi \times 10^{-6} \text{ km/m}$$

$$\begin{aligned} & \swarrow \\ & 2\pi \times 10^{-6} \\ & 3\pi \end{aligned}$$



2m

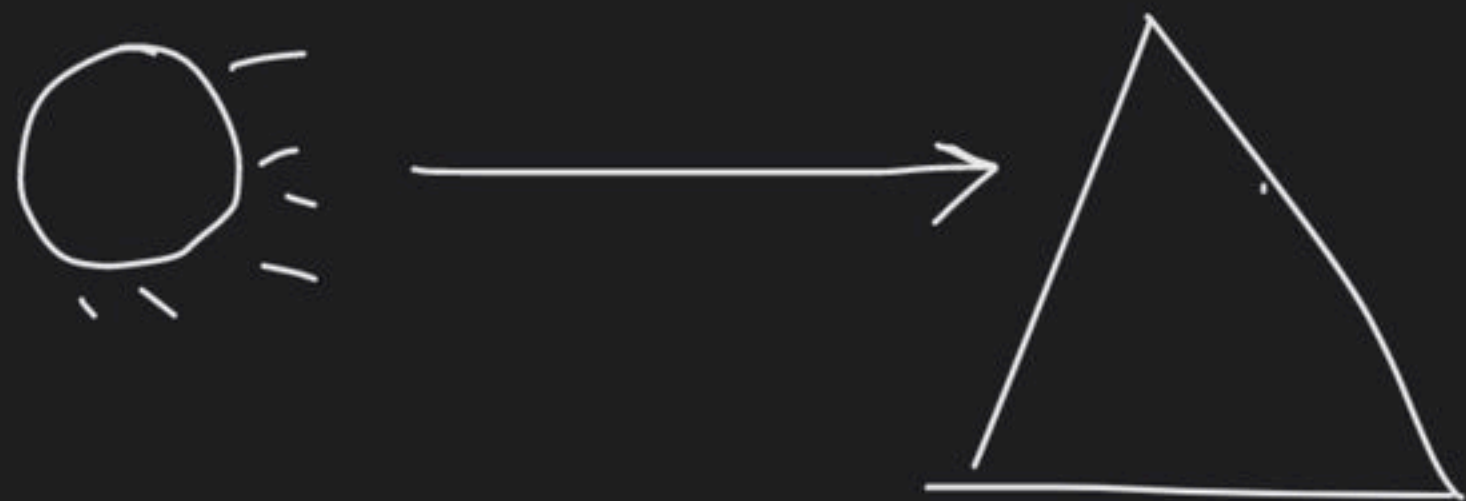
3m

4m

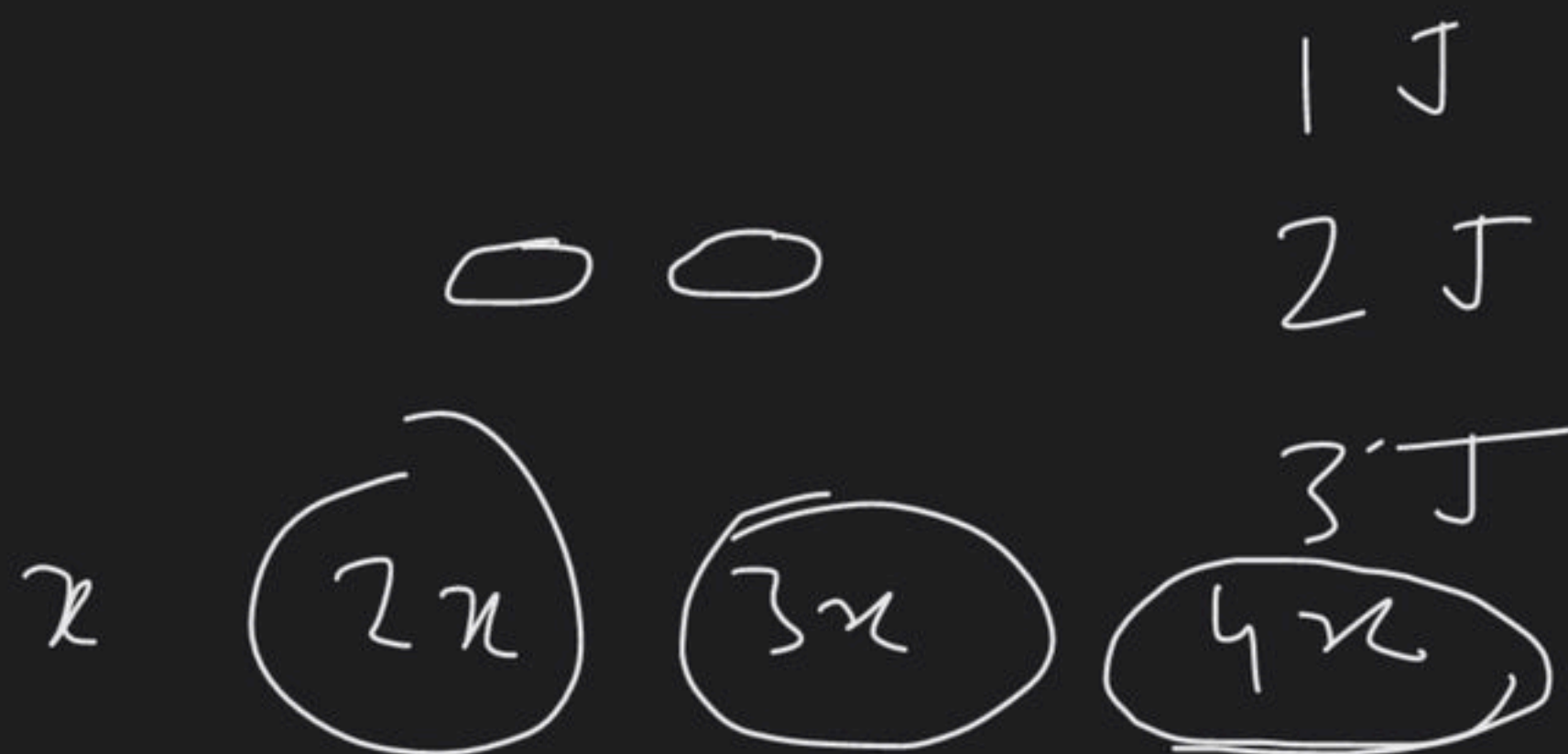
2.1m

2.2m

2.3



emitted or absorbed



$40J$

$40.1J$

$40.01J$

Energy of a photon

$$E = h\nu = \frac{hc}{\lambda}$$

$$h = 6.62 \times 10^{-34} \text{ J-s}$$

$$E = \frac{1240 \text{ nm.eV}}{\lambda (\text{nm})}$$

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

$$\underline{\underline{60\text{ W}}} \equiv \underline{\underline{60\text{ J/sec}}}$$

A monochromatic source of light
emits light of wavelength 6626 \AA .
find the no. of photons emitted by
 60 W capacity per second.

197 amu

300 amu



$$E = \frac{\cancel{6.62} \times 10^{-34} \times 3 \times 10^8}{\cancel{6620} \times 10^{-10}}$$

$$= 3 \times 10^{-19} \text{ J}$$

$$E = \frac{60}{3 \times 10^{19}}$$

$$= 20 \times 10^{+19}$$

$$= 2 \times 10^{20} \text{ Ans}$$

R