Spectrophotometry

By

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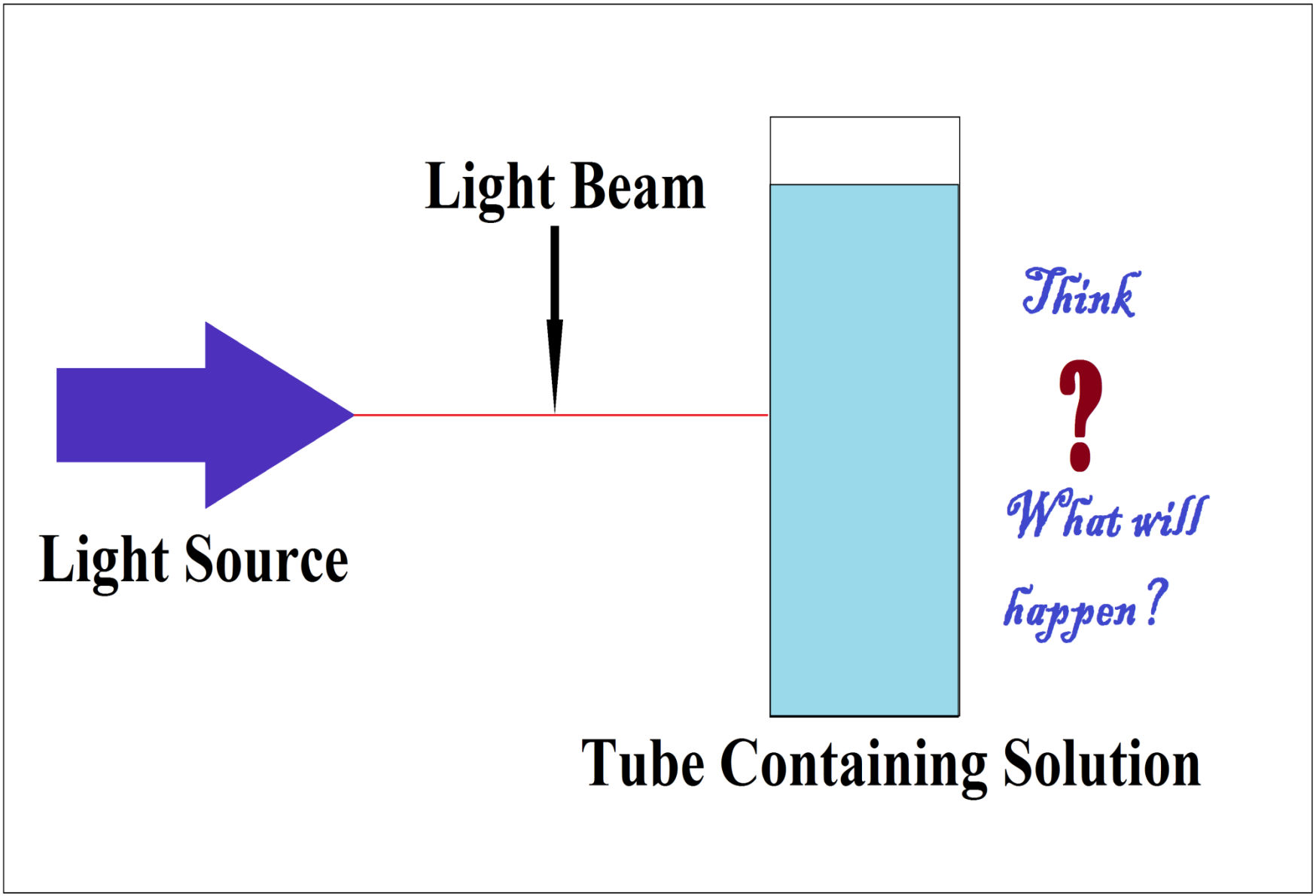
Concept


Light Beam
Light Source
Tube Containing Solution
Think
?
What will happen?

1. Absorbed
2. Scattered
3. Transmit
4. Reflect

Q- How the light will absorbed?

Q- Which are the factors that decides how much light will absorbed?

Electromagnetic Radiation and Interaction of Radiation with Matter:-

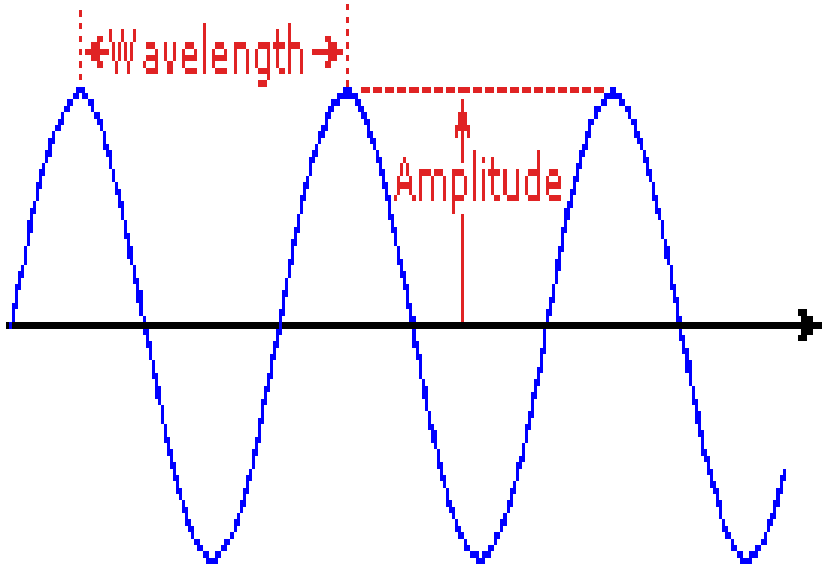


Fig:- The Concept of Travelling of Wave

Spectroscopy:- It is the branch of science which deals with the study of interaction of electromagnetic radiation with matter.

Electromagnetic radiation:- A simple harmonic wave propagated from a source and travelling in straight lines except when reflected.

This radiation will be associated with the properties of wave.

a) **Wavelength (λ):-** It is the distance between two successive maxima or minima on an electromagnetic wave.

$$1\mu = 10^{-4}cm = 10^{-6}m = 10^{-3}nm$$

$$1m\mu = 1nm = 10A^{0}$$

b) Frequency (ν):- The number of complete wavelength units passing through a given point in unit time is called the frequency of radiation.

$$1 \text{ Hertz} = 1 \text{ cycle } sec^{-1}$$

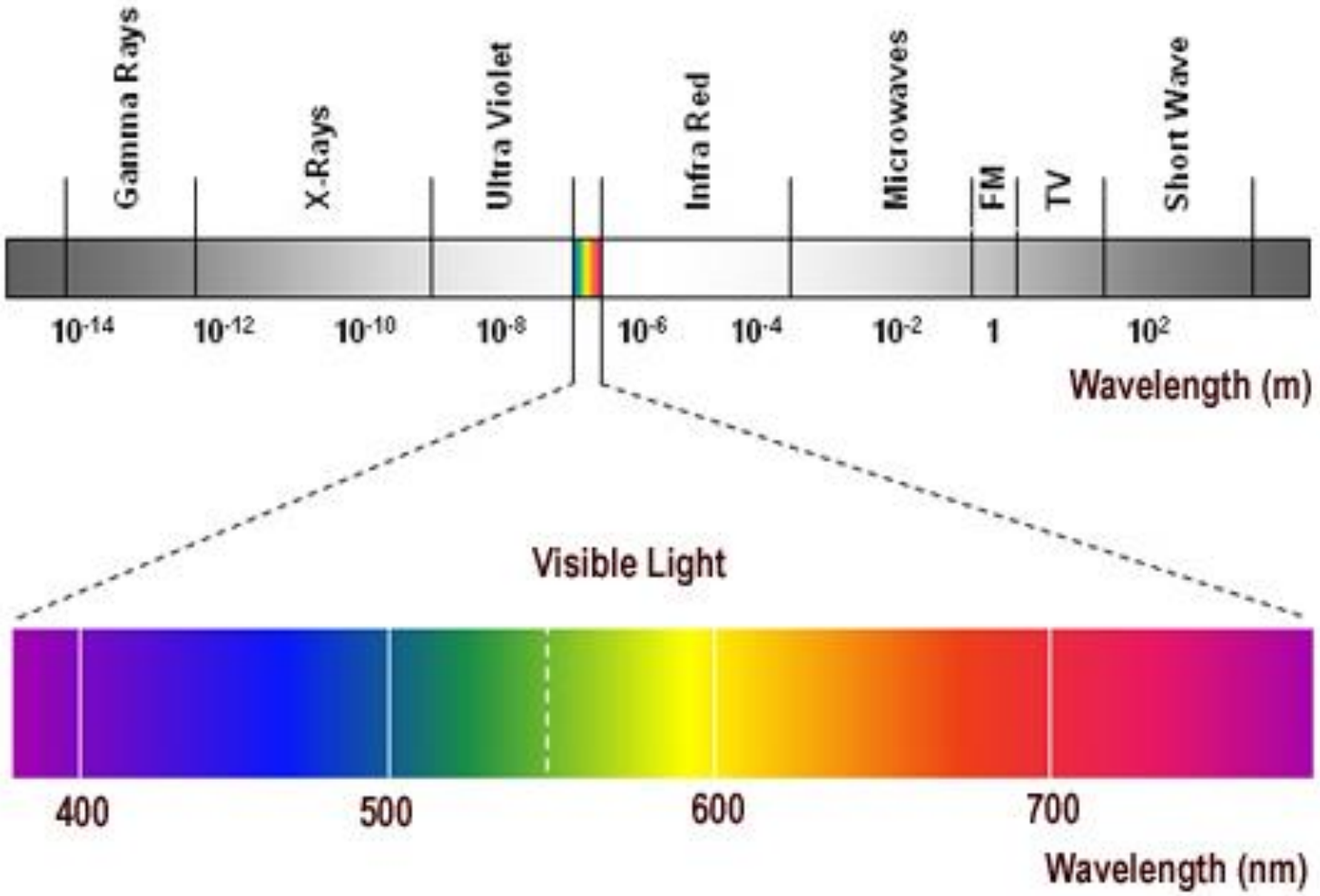
c) Wave Number ($\bar{\nu}$):- It is the number of waves per centimeter in vacuum.

$$\bar{\nu} = 1/\lambda \ cm^{-1}$$

Relation between frequency, wave number and wave length:-

$$\bar{\nu} = 1/\lambda = \nu/c$$

Regions of Electromagnetic Spectrum-the “colour” of light:-



Terminology Used in Absorption Measurements:-

a) **Radiant Energy:-** Energy transmitted as electromagnetic radiation.

$$\nu = c/\lambda \quad \text{or} \quad \lambda = c/\nu$$

b) **Radiant Power:** It is the rate at which radiant energy is transmitted as electromagnetic radiations

Instrumentation:-

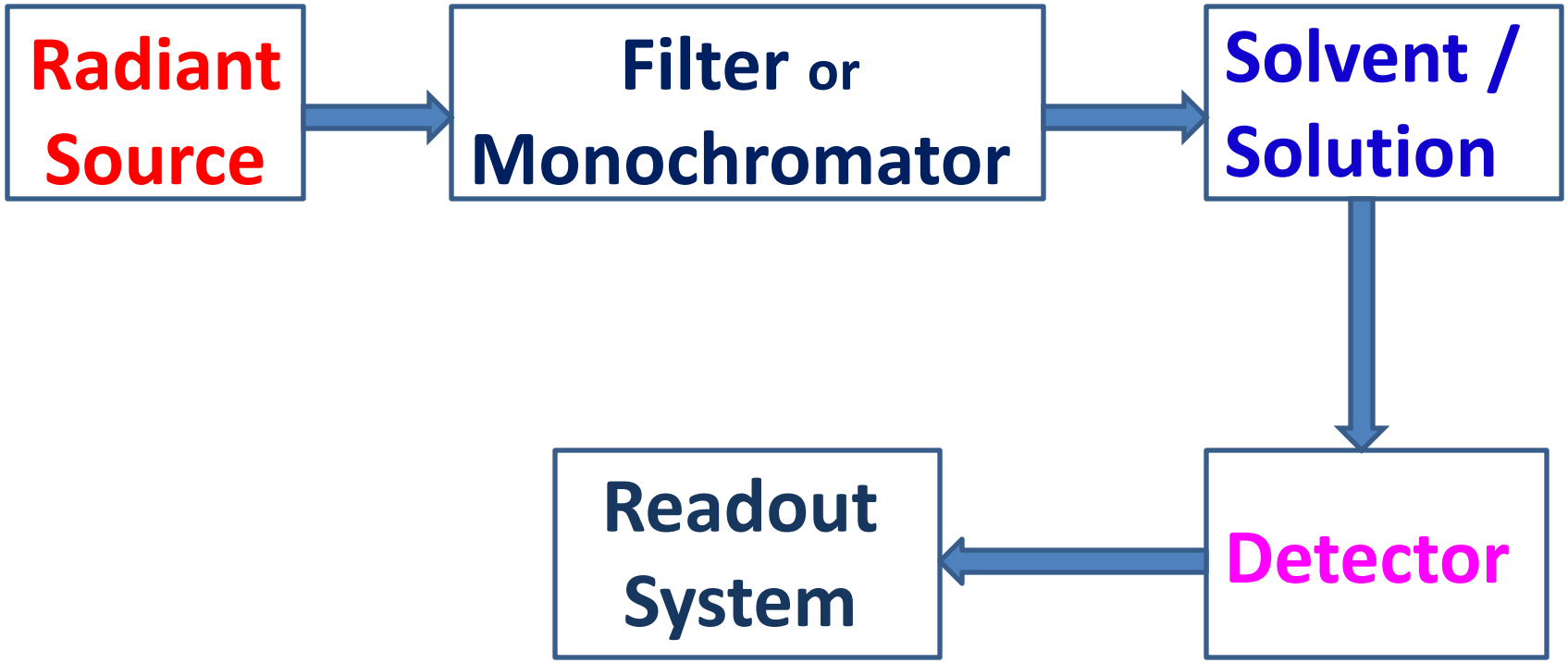


Fig:- Block diagram of the basic components of colorimeter and spectrophotometer.

Absorption filters:-

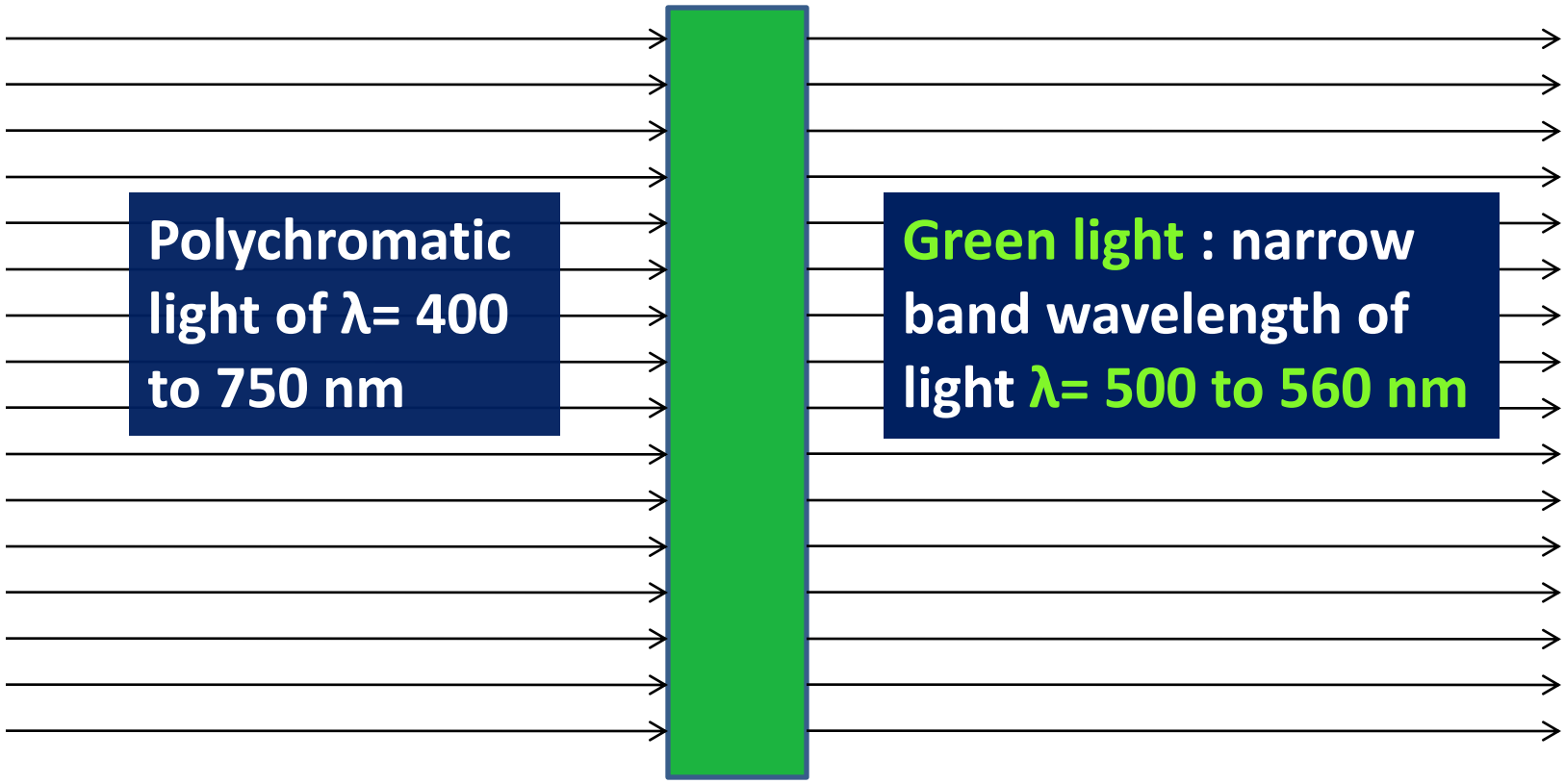


Fig: Selective absorption of wavelengths

Interference Filter:-

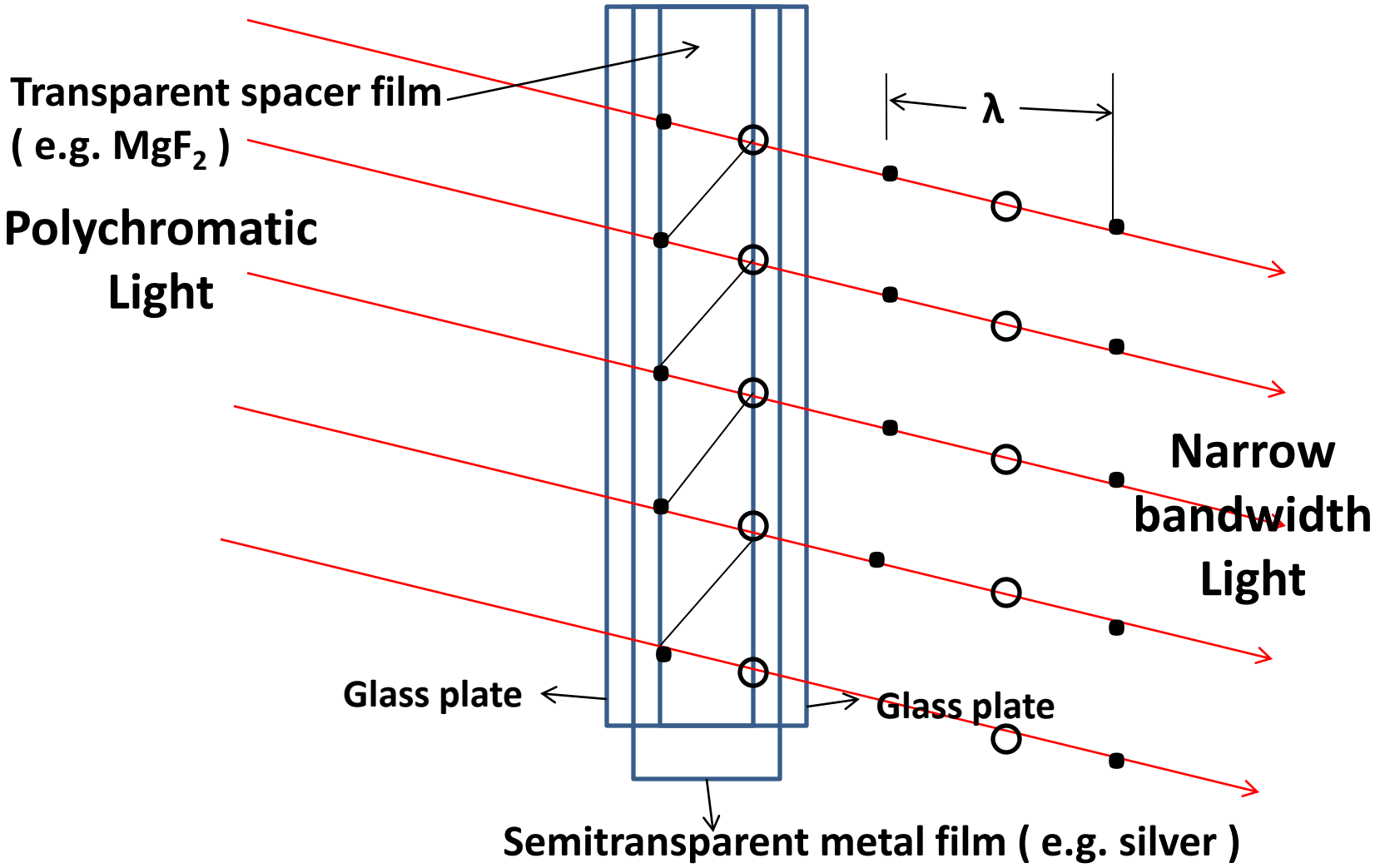


Fig: Schematic cross-section of interference filter.

Prism:-

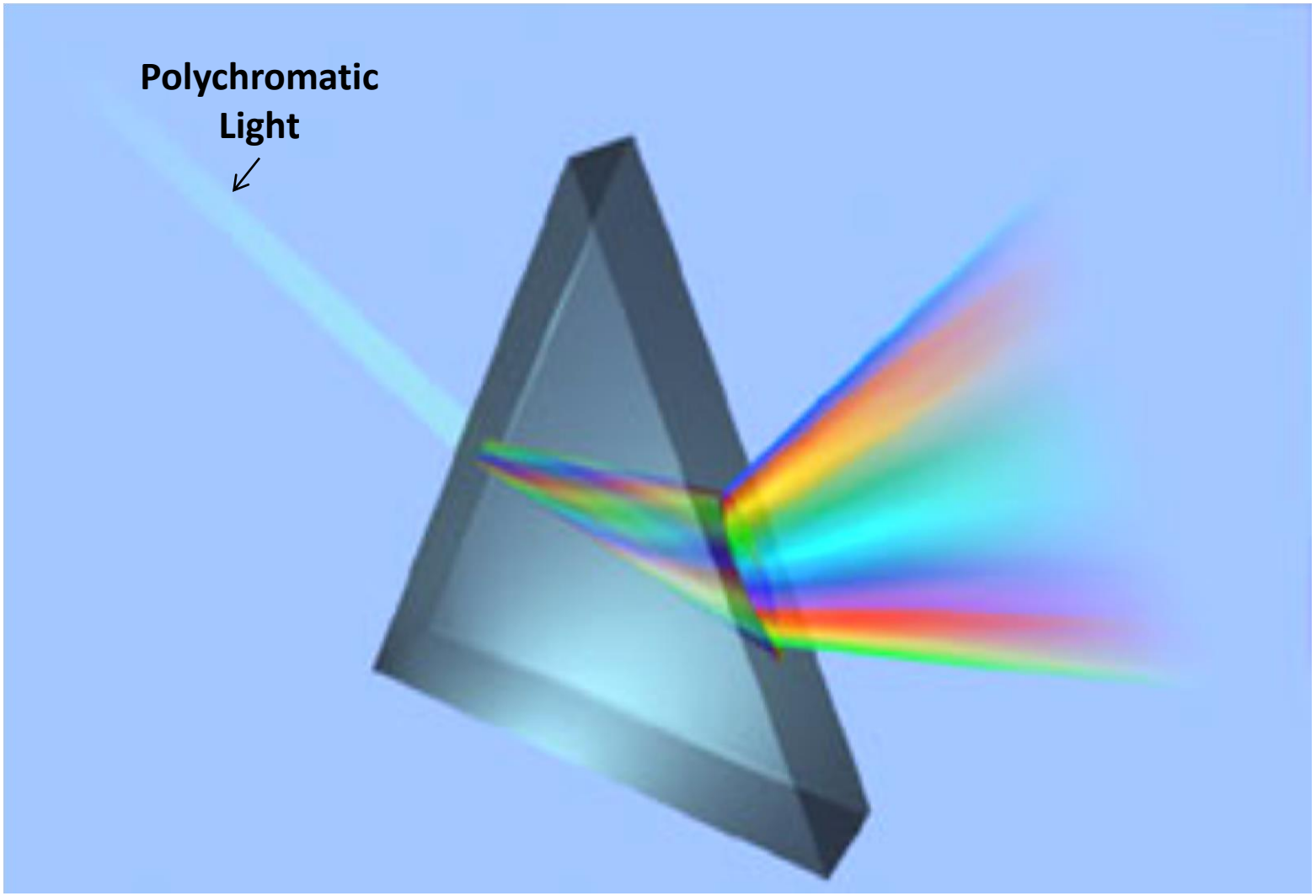


Fig: A Prism Monochromator

Diffraction Grating:-

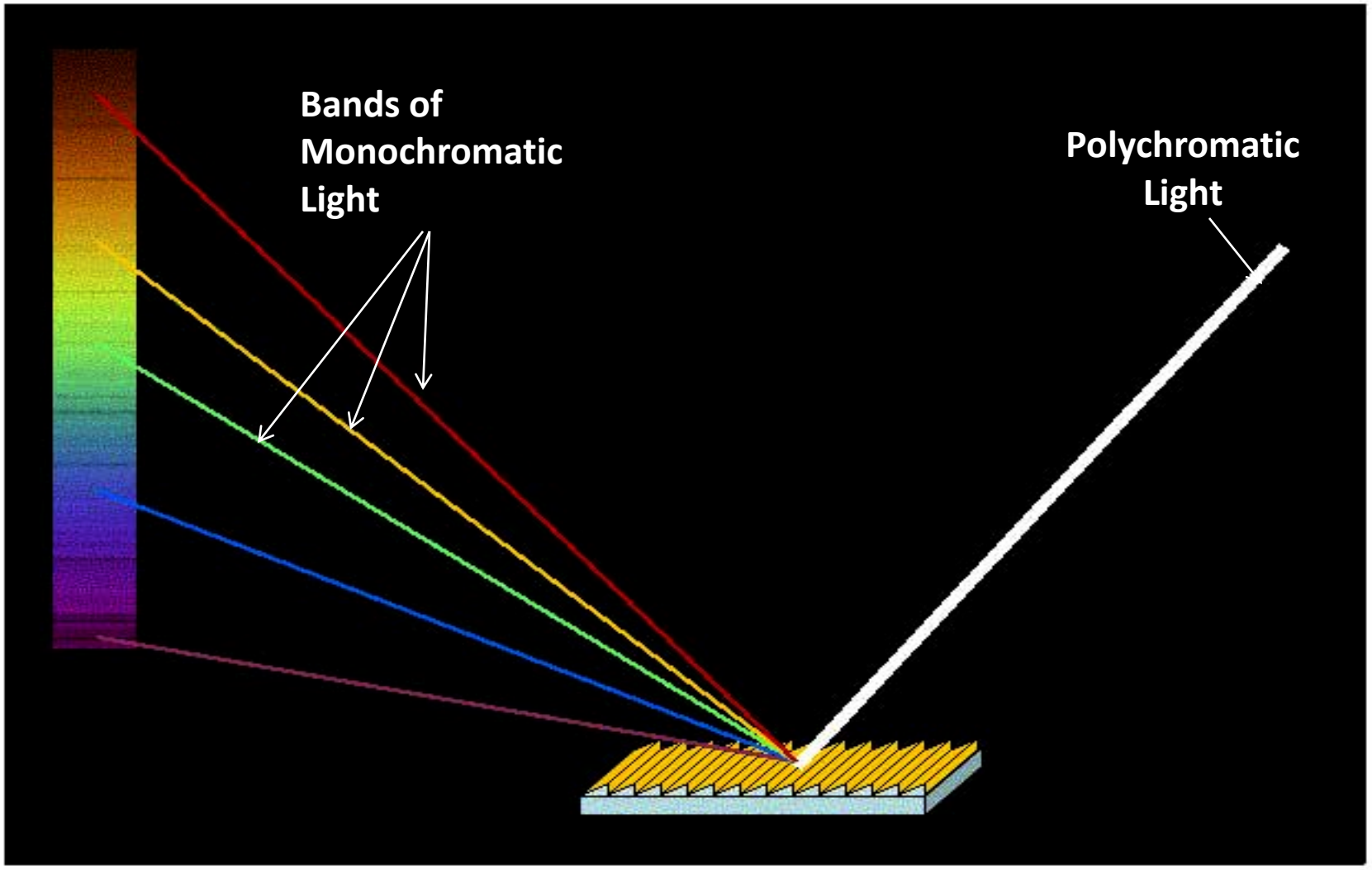


Fig: Diffraction of radiation from a grating

a) Photovoltaic Cell:-

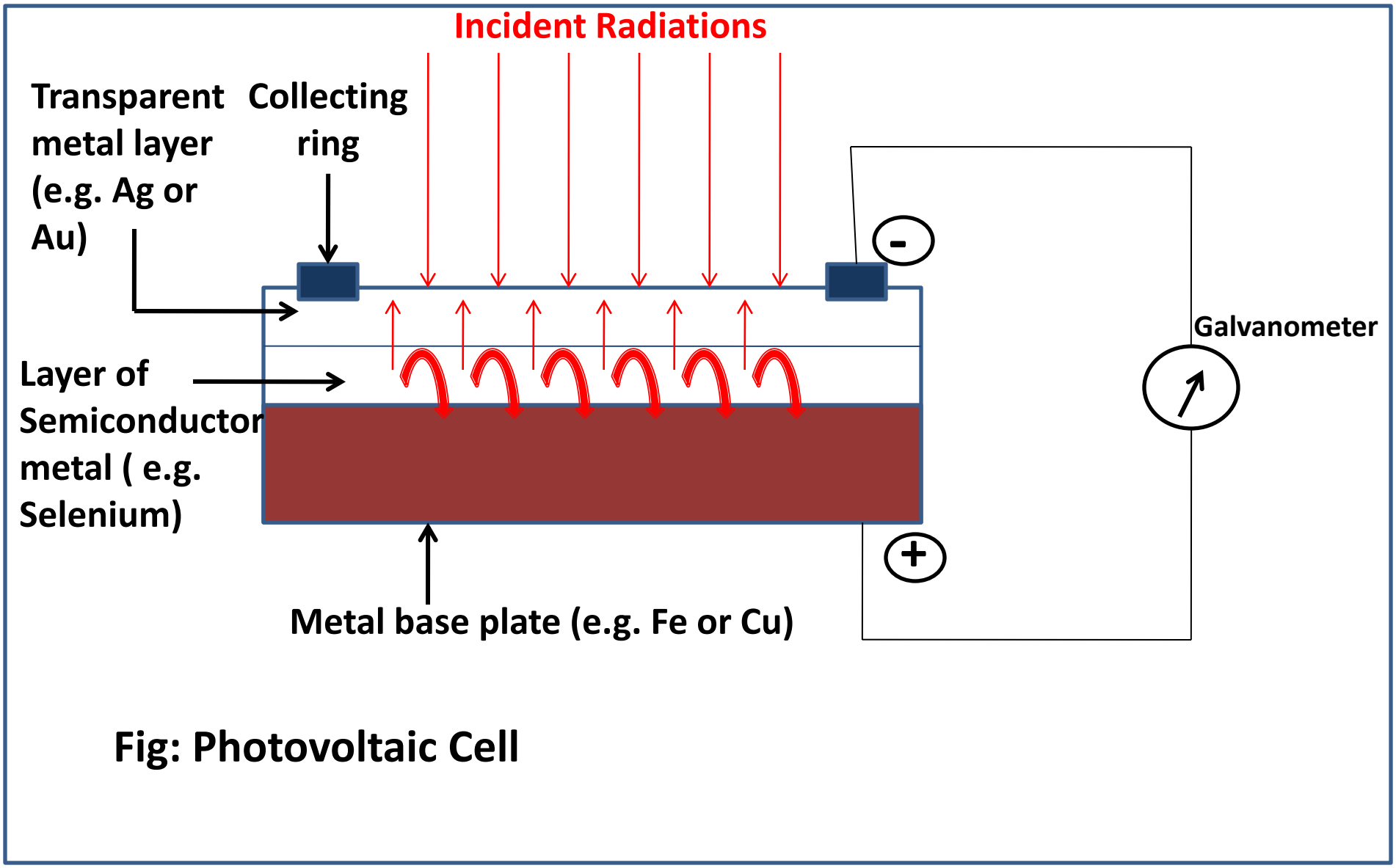


Fig: Photovoltaic Cell

b) Phototube:-

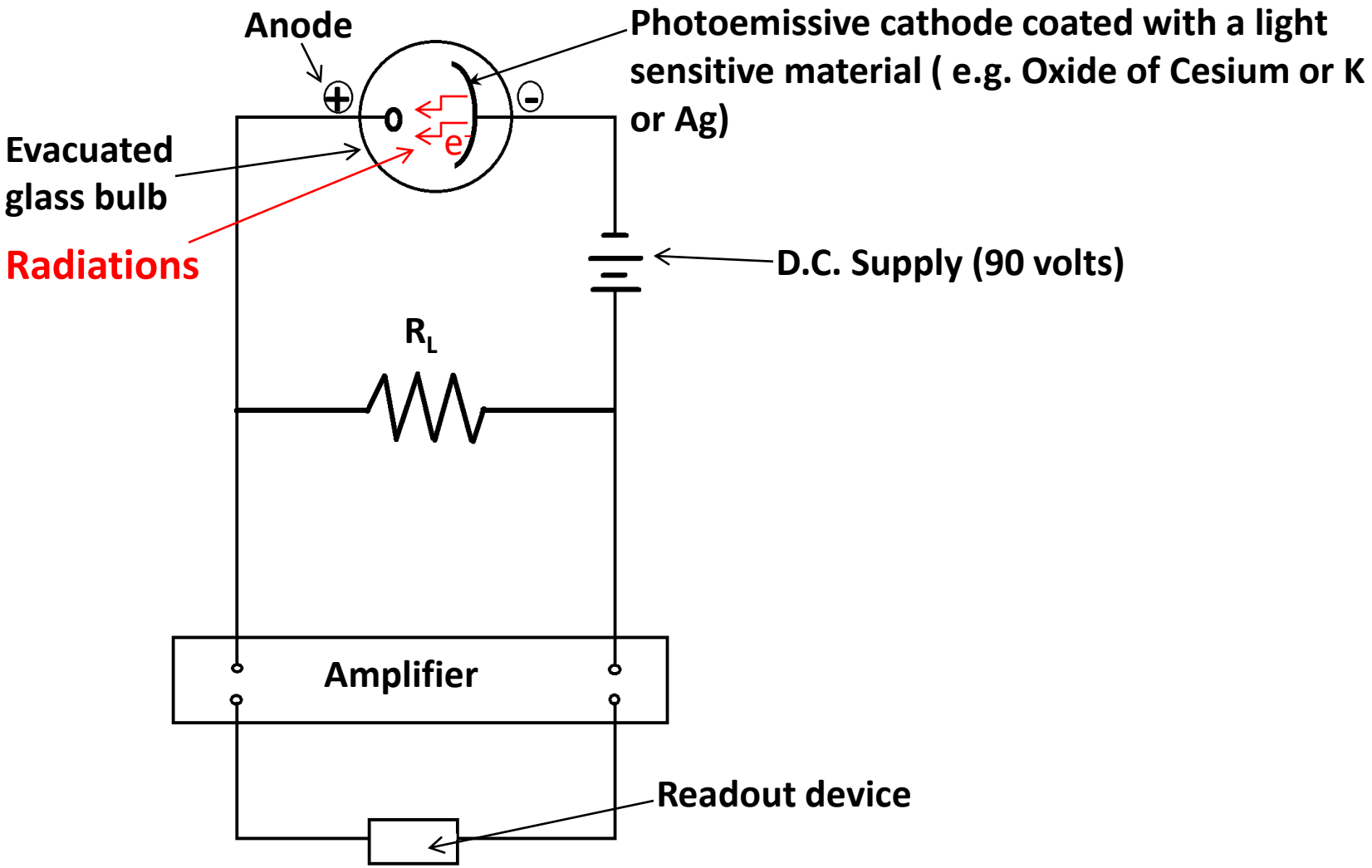


Fig:- Phototube

Photomultiplier Tubes:-

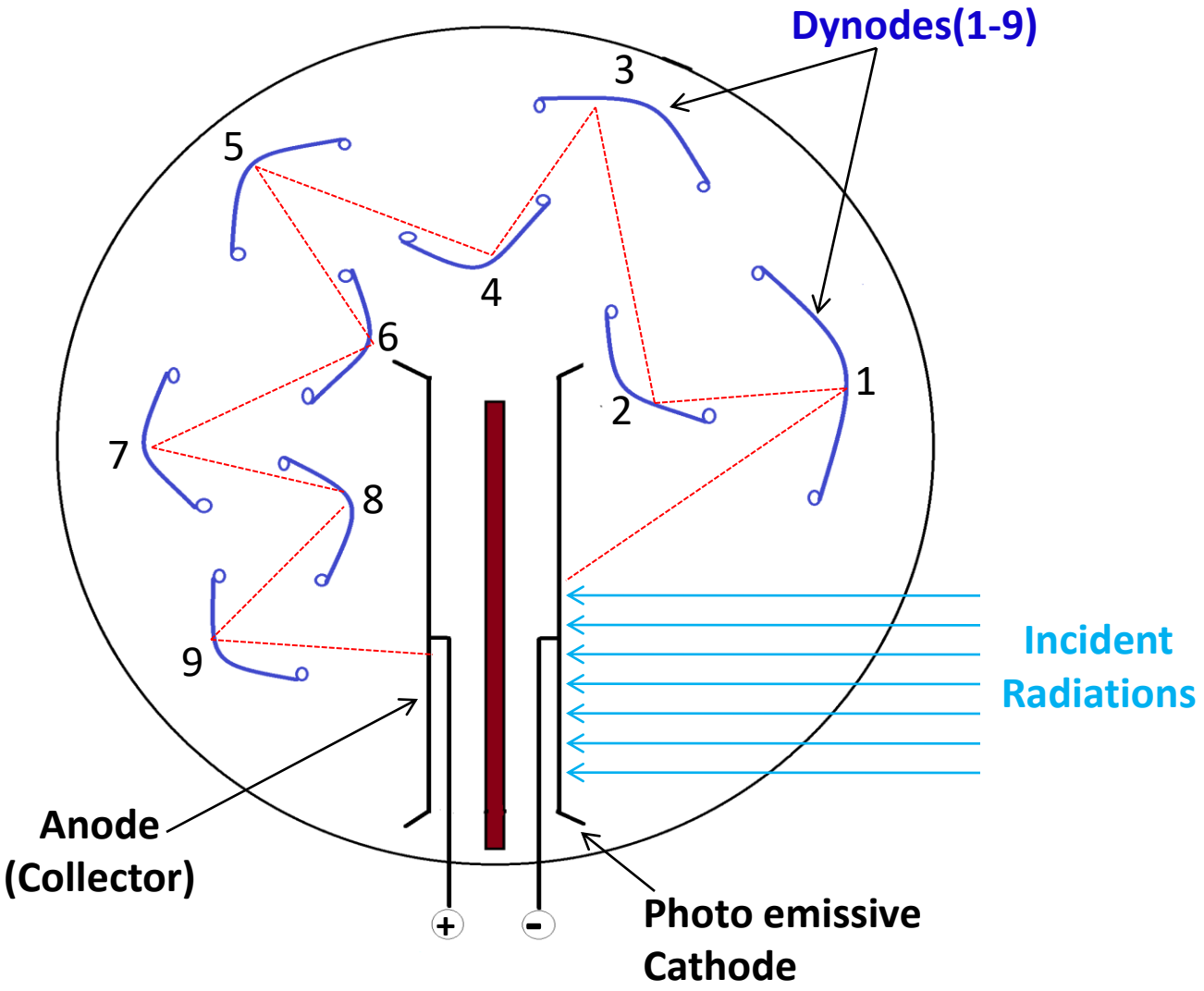


Fig:- Photomultiplier tube, schematic cross section

Single Beam Photoelectric Colorimeter:-

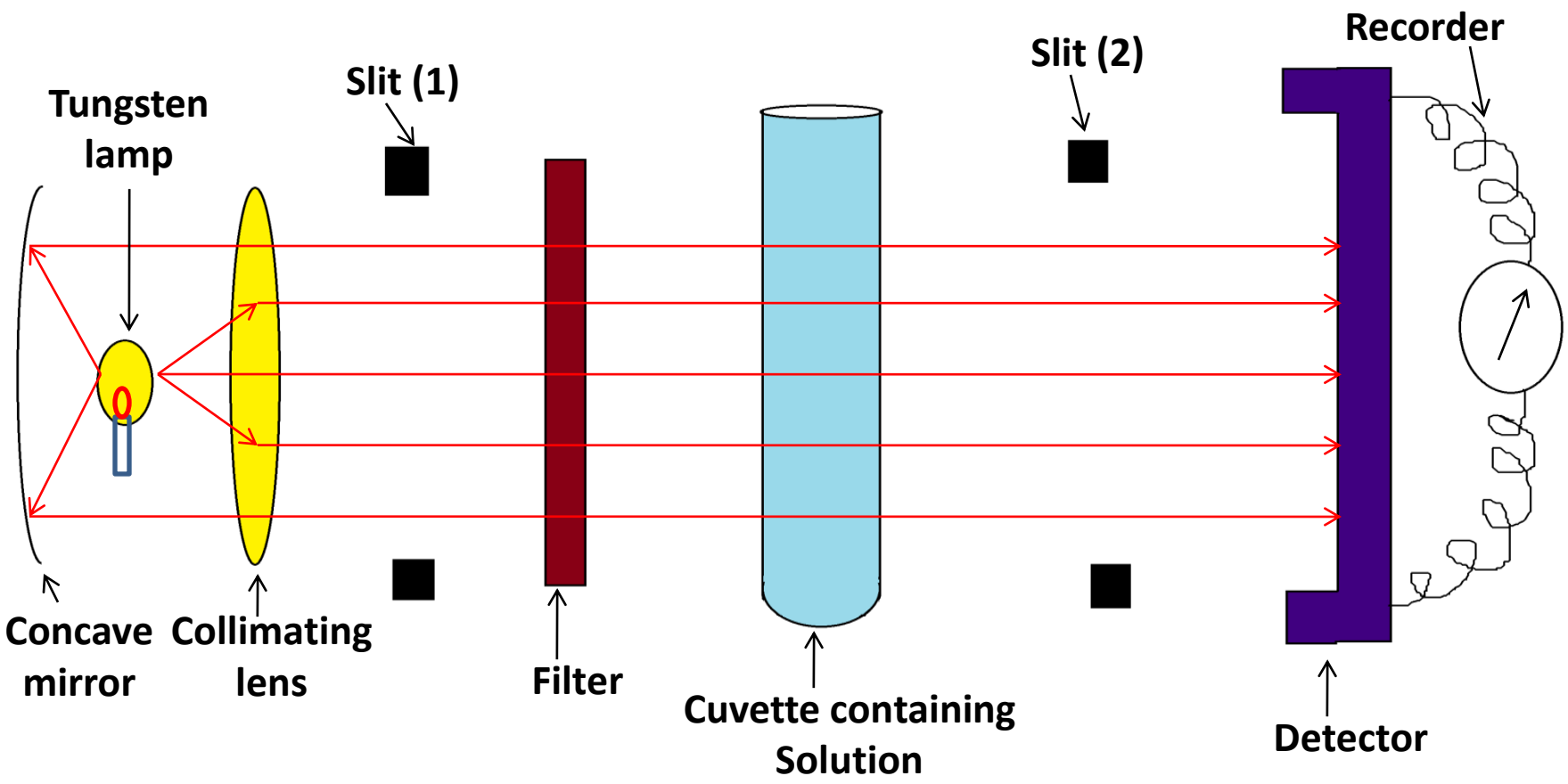
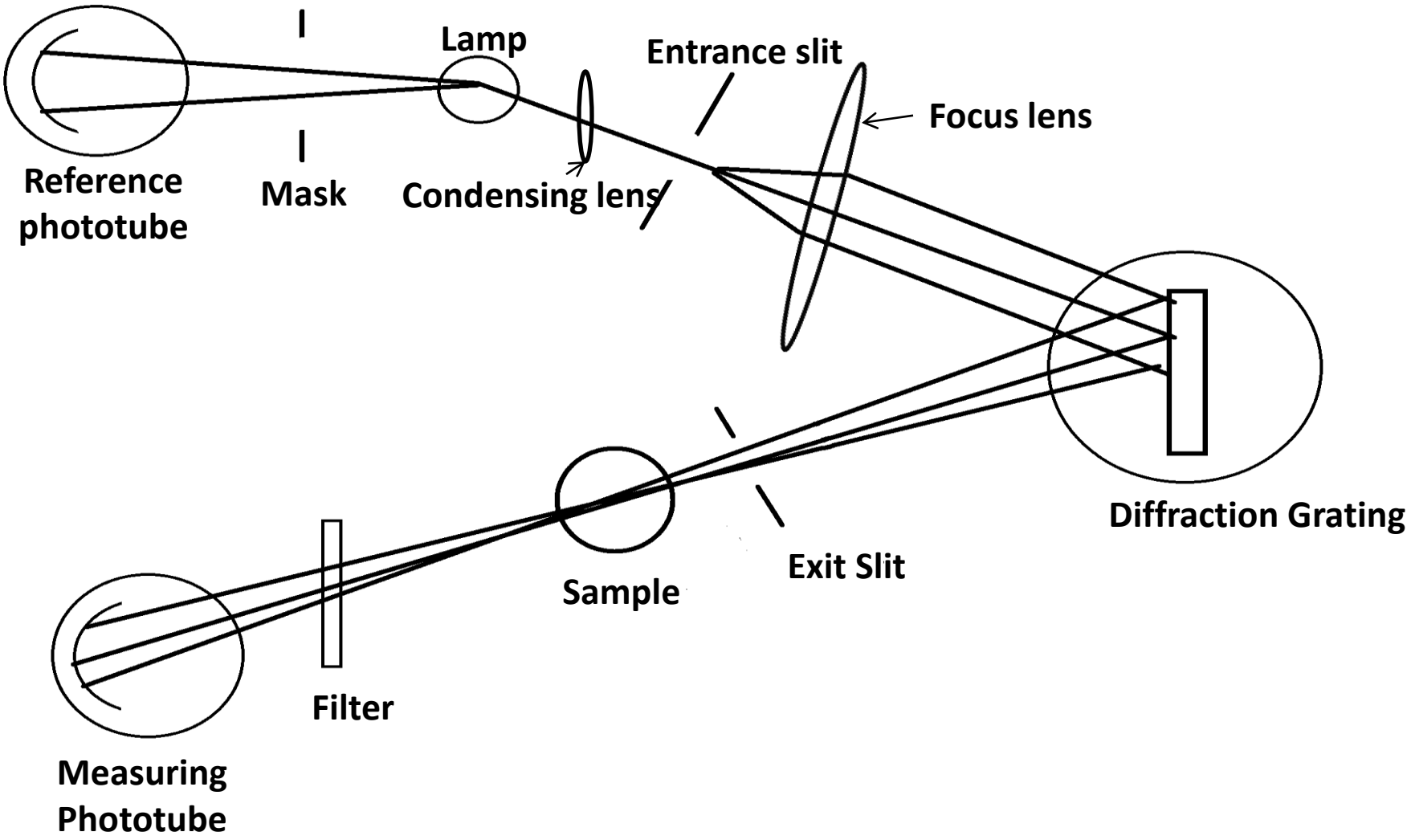


Fig:- Schematic representation of single beam photoelectric colorimeter

Single Beam Spectrophotometer:-



Thankyou