

## UNIT-1

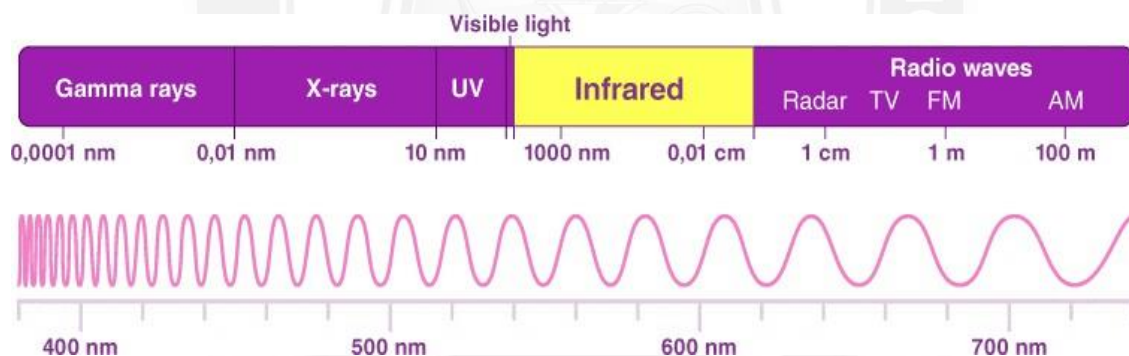
## NON-IONIZING RADIATION

**1.3 INFRARED RADIATIONS AND ITS BIOLOGICAL EFFECTS AND APPLICATION**

Infrared radiations are also known as thermal or heat waves. The range of wavelength is between 710 nm to 1 mm. The rays also characterize as near and far-infrared rays. The near-infrared rays have use in photography and TV remote sensor.

Far infrared rays are thermal. The human body also generates heat or infrared radiation of approximately 800 nm wavelength.

Infrared rays have lower frequencies and photon energies than visible light. They are associated with thermal radiation and are commonly used in night vision, remote sensing, and infrared spectroscopy applications.

**Infrared Radiation Wavelength and Frequency**

We already know that the wavelength of infrared radiation is between 700 nm to 1 mm, which is between the red limit of the visible spectrum. But the following is the classification of bands based on the spectral range 1 $\mu$ m and 50 $\mu$ m:

- 1 $\mu$ m to 3 $\mu$ m, which is known as Band I or Short Wave Infrared
- 3 $\mu$ m to 5 $\mu$ m, which is known as the Band II or Middle Wave Infrared
- 8 $\mu$ m to 14 $\mu$ m, which is known as the Band III or Long Wave Infrared

### Characteristics of Regions of Infrared

Near-infrared	<ul style="list-style-type: none"> <li>The wavelength ranges from 0.75 to 1.4 micrometres.</li> <li>This is used in material science, fibre optic communication, and in the medical field.</li> </ul>
Short wavelength infrared	<ul style="list-style-type: none"> <li>The wavelength ranges from 1.4 to 3 micrometres.</li> <li>This is used in telecommunications and for military purposes.</li> </ul>
Medium infrared	<ul style="list-style-type: none"> <li>The wavelength ranges from 3 to 8 micrometres.</li> <li>This is used in the chemical industry and in astronomy.</li> </ul>
Long-wavelength infrared	<ul style="list-style-type: none"> <li>The wavelength ranges from 8 to 15 micrometres.</li> <li>Astronomical telescopes and optical fibre communications are possible with the help of long-wavelength infrared</li> </ul>
Far infrared	<ul style="list-style-type: none"> <li>The wavelength ranges from 15 to 1000 micrometres.</li> <li>It is used mainly in the treatment of cancer therapy.</li> </ul>

### Absorption and Reflection

The absorption and reflection of infrared waves depend on the nature of the substance that the waves are made to strike. Materials such as ozone, carbon dioxide, and water vapour absorb infrared radiation. Snow and aluminium foil are materials that reflect infrared radiation.

### Applications of Infrared Radiation

- Heat source-** Medical sector and manufacturing industries use this radiation as a heat source. The infrared saunas can treat rheumatoid arthritis, high blood pressure, and other chronic health problems. It is also a safe method for physical therapy. The manufacturing unit uses infrared heaters in curing of coating, the formation of plastics, and plastic welding.
- Cosmetology-** We use this radiation for treating dandruff, skin injuries, blackhead, and smoothing wrinkles. They also improve oxygen supply, blood circulation, and the supply of nutrients to the skin.

- **Astronomy-** Astronomers use optical devices like digital detectors, mirrors, and lenses to analyze space objects via infrared waves. We can obtain the images of these devices from the infrared telescope.
- **Massage therapy-** This radiations warm the skin and help to relax the muscles. We use them because of the penetration attribute.
- **Infrared photography-** The infrared filters can capture pictures. The imaging is performed for objects in the near-infrared spectrum.
- **Infrared communication-** The transmission of data through infrared rays is quite common in the communication of the short-range. We utilize the light-emitting diodes for emitting this radiation. Further, the focus is done on a narrow beam with the support of a plastic lens. At the end of the receiver, the photo-diode converts radiations into electric current.

