

Q: What is optical fibre? Discuss its working.

Optical Fibre

definition:

Optical fibre also known as fibre optic is a thin, flexible fibre with a glass core in which light signals are transmitted with minimal loss of strength and more data is transmitted over long distances.

Components of Optical Fibre

- i- Core
- ii- Core Cladding
- iii- Buffer
- iv- Jacket

Working Principle of Optical Fibre

Fibre optic works on the principle of total internal reflection. Total Internal Reflection occurs in fibre optic when light travelling in the core hits the core cladding boundary at an angle greater than the critical angle. Thus, light signal is totally reflected back within the core rather than refracting out of the core. So, light signals are

transmitted over long distances with minimum loss of signals.

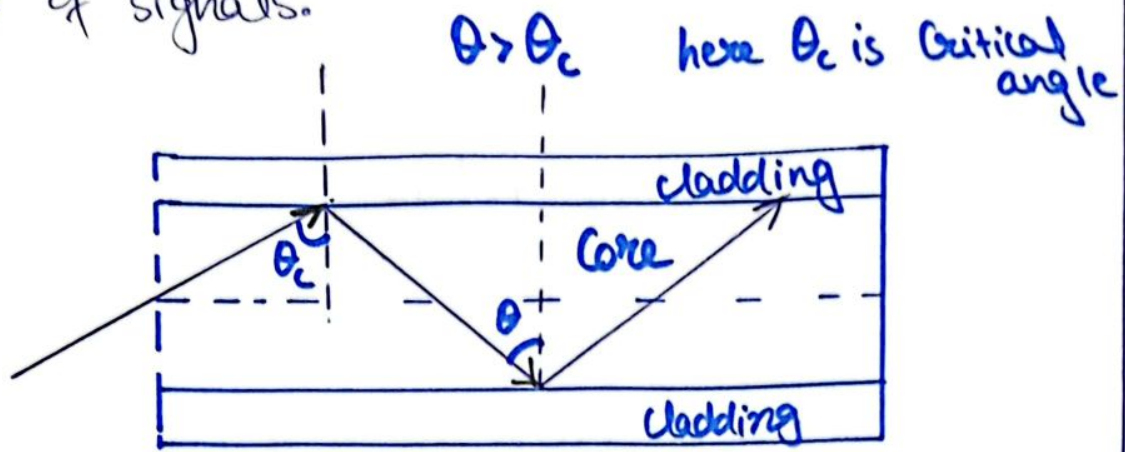


Figure : Total Internal Reflection

Uses of Optical Fibre

- i- Telecommunication
- ii- Internet infrastructure
- iii- Industry automation
- iv- Military and Aerospace technology
- v- Medical Imaging
- vi- Undersea cables
- vii- Security systems

Advantages of Optical Fibre

- i- Offers high bandwidth
- ii- Offers long distance transmission
- iii- Has Thin size and light weight
- iv- Offers resistance to electromagnetic interference

- v- Fibre optic is highly secured so suitable for sensitive information transmission
- vi- Offers high signal quality

Disadvantages of fibre optic

- i- Highly expensive
- ii- Fragile
- iii- It has complex installation and maintenance procedure.
- iv- Highly expensive manufacturing
- v- Susceptible to physical damage

Q: What is polio? What are causes and symptoms of polio? Differentiate between IPV and OPV.

Polio

definition:

Polio also known as poliomyelitis is a highly infectious disease occurring in children ^{under} age of five. It is caused by poliovirus transmitted person to person contact via fecal-oral contact and less commonly through contaminated food and water."

Causes of Polio:

Polio is caused by poliovirus that is of three types. Type 1 and 3 wild poliovirus are posing threat to few countries. While type 2 has been cured to great extent.

Symptoms of Polio:

→ ^{Symptoms} Non-paralytic of polio: In this polio, there is minor illness that a patient

suffers. Symptoms are headache, fatigue, vomiting, stiffness of neck, pain in limbs.

Symptoms of
→ Paralytic polio: This polio has severe symptoms including paralysis of legs. This can sometimes lead to death if poliovirus paralyzes the muscles that are used for breathing.

Difference between IPV and OPV

IPV (Inactivated Polio Vaccine)

Type of vaccine:

IPV is an inactivated vaccine.

Type of pathogen in this vaccine:

IPV uses killed or inactivated pathogen (disease causing microbe i.e. poliovirus).

Formation: IPV is formed by (killed) killing poliovirus with chemicals, heat, radiations.

Immune response: IPV shows a weak immune response, thus needs additional doses or booster shots to maintain person's immunity.

Storage and Transportation: IPV can be stored without refrigeration and can be transported in freeze-dried form.

Administrative route: It is given on a leg or arm with injection.

Risk of reversion: IPV does not have any risk of reversion of poliovirus.

OPV (Oral Polio Vaccine)

Type of vaccine: It is a live attenuated vaccine.

Type of pathogen: OPV uses a ^{live} version of disease causing microbe (poliovirus).

Formation:

OPV is formed by reducing virulence of disease causing microbe by keeping it alive.

Immune response: OPV offers strong and long-lasting immune response.

Storage and transportation: OPV requires refrigeration and are sensitive to temperature.

Administrative route: OPV is given to children orally.

Risk of Reversion: As it is live attenuated vaccine so it has risk of reversion of poliovirus because poliovirus can mutate back to its disease causing stage.

Q: Discuss five renewable energy sources in detail.

Renewable Energy Sources

a. **Solar Energy**: Solar energy is defined as electrical energy produced by transformation of sun's heat and light into electrical energy by using technologies like Photovoltaics (PVs).

Uses: Solar energy is used for :-
i- heating purposes: Solar heaters are used as replacement of electric heaters and gas heaters.

ii- Cooking purposes: Solar cookers are used to cook food.

iii- Keeping pools warm: Solar blankets keep swimming pools warm.

b. **Wind energy**: Wind energy is electrical energy produced from naturally flowing air in Earth's atmosphere.

Uses: Wind energy is used to pump water, irrigate farms, lower electricity bills and to reduce air pollution.

c. **Tidal energy**: Tidal energy is (used) electrical energy produced by the surge of oceans during rise and fall of tides.

Uses: Tidal energy is used to generate electricity.

→ It is used for energy storage purposes in hydro power plants.

→ It is used to protect coast against damage caused by storms.

d. Geothermal Energy

“Geothermal Energy is electrical energy produced from the energy taken from Earth's crust.”

As of 2021, 27 countries including United States were obtaining 92 billion kWh of energy from geothermal energy.

Uses: Geothermal heat pumps are used in buildings because they use constant temperatures near the surface of Earth to heat and cool the buildings.

e. Hydel Energy

“Hydel energy is electrical energy produced from transformation of mechanical energy of water into electrical energy.”

Uses: This energy is used to irrigate fields. Moreover, beyond electricity production

this is used for providing flood controls,
clean drinking water etc.