

(Q:2)

(a)

What is tuberculosis & hepatitis? Explain briefly. (5)

Tuberculosis

Definition = Bacterial infection caused by Mycobacterium tuberculosis, primarily affecting lungs, but can affect other organs.

Causes =

- Inhaling affected droplets from coughing/sneezing.
- Close contact with infected person.
- Weakened immune system.
- Poor ventilation and hygiene.

Symptoms =

- Persistent cough for almost 2 weeks or more.
- Chest pain.
- Fever
- Coughing up blood or phlegm.
- Fatigue
- Weight loss
- Night sweats.

Treatment =

- Antibiotic (6-12 months)
- Combination therapy (Rifampicin, Isoniazid, etc.)
- Directly observed treatment, short-course (DOTS)

Hepatitis

Definition = Inflammation of liver caused by viral infection, toxins, or autoimmune disorders.

Causes =

- Viral transmission (blood, bodily fluids, contaminated food/water)
- Liver damage from toxins (alcohol, drugs)
- Autoimmune disorders

Symptoms

- Yellowing of skin/eyes (Jaundice)
- Fatigue
- Loss of appetite
- Abdominal pain
- Nausea
- Vomiting
- Dark urine

Types & Treatments

- 1- Hepatitis A: Supportive care, rest, hydration
- 2- Hepatitis B: Antiviral medications (interferon, Entecavir)
- 3- Hepatitis C: Antiviral medications (interferon)
- 4- Hepatitis D: Antiviral medications (sofosbuvir, Ledipasvir)
- 5- Hepatitis E: Supportive care, hydration, rest.

Prevention

- Vaccination (HAV, HBV)
- Safe blood transfusions
- Proper hygiene
- Avoid sharing needles
- Balanced diet & Exercise

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(Q2)

(b)

Explain the mechanism of Fiber Optic Cable for signal.

Explain its construction.

Fiber Optic Cable

A fiber optic cable is a network cable that contains strands of glass fibers inside an insulated casing.

They provide higher bandwidth and transmit data over long distances. It supports much of the world's internet, cable television and telephone systems.

→ Mechanism :

Fiber optic cables transmit signals as light waves through thin glass or plastic fibers. The process :

1 → Conversion = Electrical signal → Light signal (using laser or LED).

2 → Transmission : Light signal travels through fiber optic cable.

3 → Reception = Light signal → Electrical signal (using photodetector).

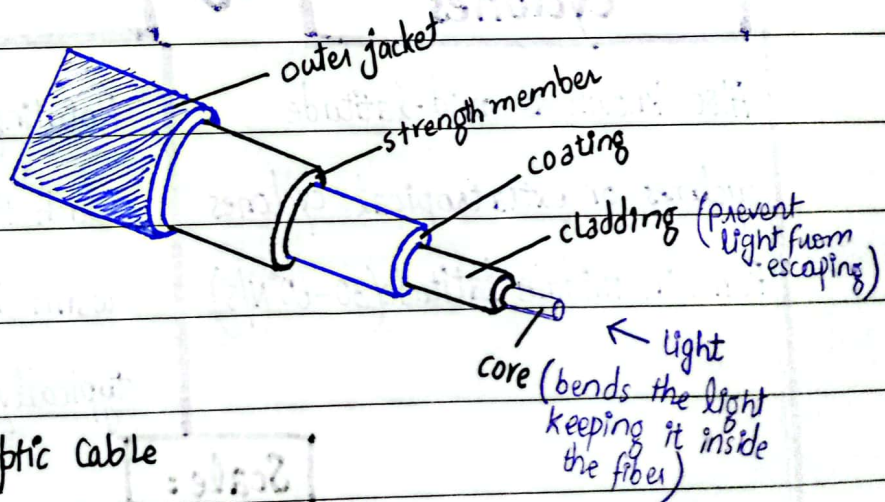


Figure :
Fiber optic cable

→ Construction :

Fiber optic cable consists of :

Core : Thin glass or plastic centre (diameter: 8-10 microns).

Cladding : Surrounding layer around core (diameter: 125 microns).

Coating : Protective layer surrounding cladding (diameter: 250 microns)

Strength Member : Kevlar or fiberglass fiber for mechanical strength.

Outer jacket : Outer protective covering.

(Q2)

(C)

Explain the difference between Middle Latitude Cyclones and Tornadoes.

Middle Latitude Cyclones

VS

Tornadoes

Also known as mid-latitude cyclones or extratropical cyclones
Form in middle latitude (30-60° N/S)

Rotating columns of air that touch the ground, form in warm, humid environment (typically in tropical & sub-tropical regions)

Scale:

Large-scales low-pressure systems
(100-1000 km diameter)

Small scale, localized phenomenon
(100-1000 m) diameter.

Formation :

Form when cold & warm air masses meet (fronts)

Form when warm, moist air rises rapidly, creating instability.

Wind Speed :

Lower wind speed relatively

High wind speed (upto 320 mph)

Damage :

It can just produce severe weather, & less intense damage.

It can cause catastrophic damage & loss of life.

Duration :

It can last for days.

It typically last for minutes to hours.

(Q 2)

(d)

What is the difference between ionic and covalent bonding? Give examples.

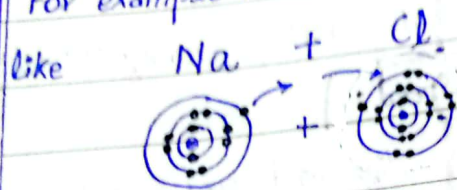
The key difference between ionic and covalent bonding is that, in ionic bonding, there is complete transfer of electrons, while in covalent bonding, there is mutual sharing of electrons. Here is the explanation of both types of chemical bonding with their examples:

Ionic Bonding

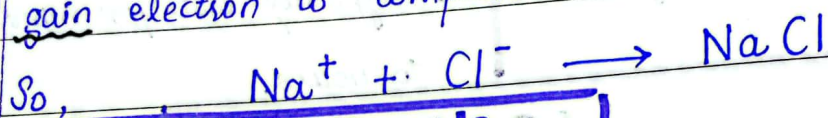
Definition: A chemical bond which is formed by the complete transfer of electrons from one atom to another atom.

Explanation:

For example: when sodium and chlorine come together,



As Na has $1 e^-$ in its outermost shell, it's easy for Na to lose that electron to fulfill its octet rule for stability. Similarly, Cl has $7 e^-$ in its outermost shell, it's easier for chlorine to gain electron to complete octet rule for stability.



Covalent Bonding

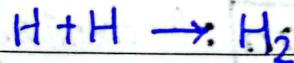
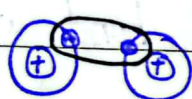
Definition: A bond which is formed by the mutual sharing of electrons between the atoms.

Explanation:

For example; in hydrogen gas, when two H atoms come together. like $\text{H} + \text{H}$



Unlike ionic bonding, there will be mutual sharing. Because if H completely loses its only electron, there will be no any stability for it. So, they both share electrons and follow duplet rule and become stable



Ionic Bonding

Covalent Bonding

Vs

Transfer of e⁻

complete Transfer

Mutual Sharing

Formation

Forms btw anions & cations.

Forms between anions.

E.N Difference

Large electronegativity difference

Small Electronegativity diff.

M.P / B.P

Higher Melting/Boiling point

Lower Melting/Boiling point.

Conductivity

Good conductors

Bad conductors

Solubility

Soluble in water

Variable solubility.

Strength

Strong type of bonding

Weak bonding

