CS'24

SECTION—A

Q-No-2

(a)

What is Tuberculosis and Hepatitis? Explain briefly.

Explaining Tuberculosis

The definition

Bacterial infection caused by Mycobacterium tuberculosis that primarily effects the lungs, but can also affect other parts of body

Symptoms

- Coughing
- Chest pain
- May be bloody
- Fever
- Night sweat
- Fatigue
- Weight loss.

Types of TB

Latent TB: Bacteria are present in body but inactive

Active TB: Bacteria active and causing symptoms

Diagnosis

- Chest x-ray
- Sputum test
- Blood test

Treatment

- Antibiotics (usually a combination of 4-6 drugs)
- Treatment typically lasts 6-9 months.

Prevention

- Vaccination (BCG vaccine)
- Avoid close contact with infected individuals
- Wear mask in crowded places.

Complications

- Lung damage
- Can spread to other body parts
- Risk of other infections

Explaining Hepatitis

Hepatitis refers to inflamatory condition of the liver caused by viral infection. Hepatitis caused by drugs, medications, toxins and alcohol is called autoimmune hep. hepatitis.

Symptoms

- Muscle and joint pain
- High body temperature
- Headache, yellow eyes and skin

Types of Hepatitis

- Hepatitis A
- Hepatitis B
- Hepatitis C

Hepatitis diagnosis

(1) Liver biopsy: sample of tissues from liver (see inflamation of liver)

(2) Liver function test: Blood sample test how efficient blood is working.

(3) Ultrasound: reveal fluid in abdomen, enlarged liver, or liver damage.

(4) Blood test: Detects HIV antigens and antibodies.

(5) Viral antibody test: Determine presence of Hepatitis virus.

Treatment

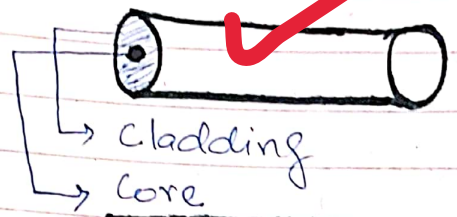
- Anti viral medications
- Liver transplant.

Prevent Hepatitis

- Contaminated blood
- Syringes.
- infected mother to Child.
- Unsafe sex.

(2) Explain the mechanism of fiber optics cable for signal. Explain its construction

Optical fibre is the strands of glass used to transmit light signal from one point to an other point. In actual its equal to a structure of hair



Draw a better structure

fig(1) optic fibre

Parts of optic fibre

Cladding

It surrounds the core has low density and refrective index

Core

Central part of optic fibre with High density and refrective index

Working of Optic Fibre

It works on total internal reflection principle, normal point is reference line through which angle is measured and critical

angle is angle of incident at which angle of refraction becomes equal to 90° degrees only after critical angle total internal reflection is attained.

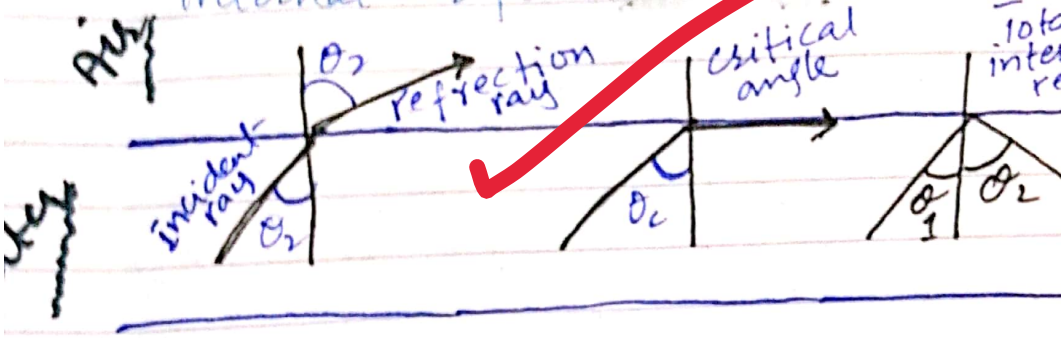


figure (2) working of optic fibre

Types of Optical Fibre

(i) single mode step index fibre

Core diameter equals to 5 micrometer (μm)

(ii) Multimode step Index fibre

Core equals 50-100 μm

(iii) Multimode graded index fibre

Core upto 1000 (μm)

3.5

(c) Explain the difference between middle latitude Cyclones and Tornadoes.

Cyclone

It is a system of rotating winds around a low pressure core due to pressure gradient and coriolis effect of spin of motion of the earth.

Tornado

It is also type of cyclone which is funnel shaped which extends from earth's crust to the clouds.

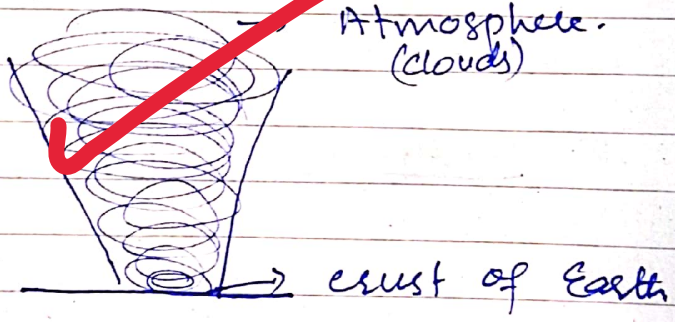


figure (3) Tornado.

DIFFERENCE

TORNADO	M. L. CYCLONE
Formation	
Form with thunderstorm	Form in middle

near weather front } latitude (30°-60°)

	SCALE	
Small Scale		Large Scale
	WIND SPEED	
320 km/h		30-60 km/h
	DURATION	
few minutes to hours.		Can last for several days
	PRECIPITATION	
Associated with heavy rain, hailstorm,		associated with rain, snow, sleet
	IMPACT	
Cause catastrophic damage		Brings significant weather changes
	PLACE	
On dry land - start from ground - smoke like.		On water body - Doesn't touch ground - Colourless

(4)

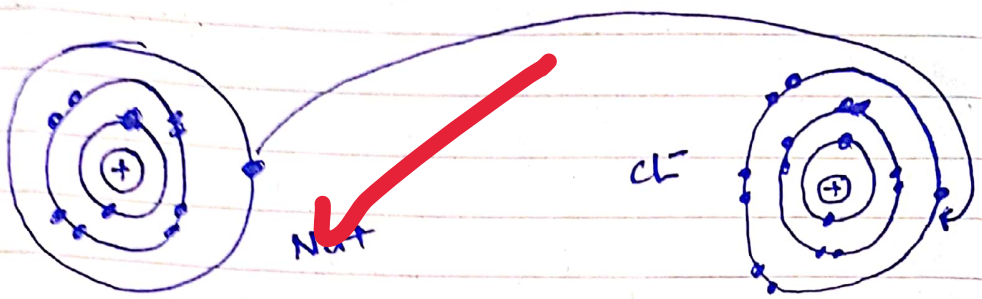
(d) what is difference between Ionic and covalent bonding? Give examples.

IONIC BOND

Ionic bond is formed when electron is lost. It is a chemical bond which is formed by the complete transfer of electron from one atom to another atom.

Explanation Example

Table salt — NaCl



Na → 2=11 Cl → 2 = 17

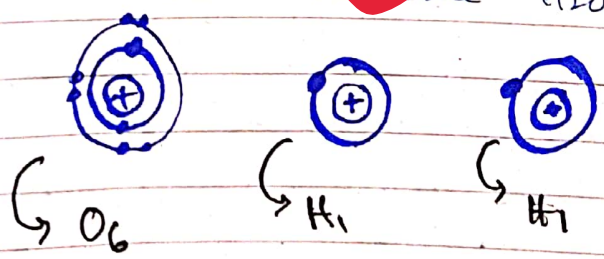
To bring the stability in the shell according to Octate rule "Na" will loss its last electron and will possess positive charge, on ther side "Cl" will gain electron and possess negative ~~sign~~ charge.

Covalent bond

Covalent bond is formed by the mutual sharing of electron between atoms.

Explanation Example

water molecule $H_2O \rightarrow H_1 + H_1 + O_6$



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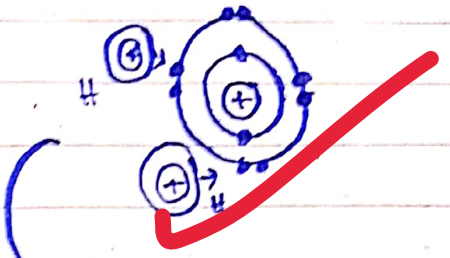


Covalent bonding

DIFFERENCE

Write full sentences and add more arguments

COVALENT	IONIC
- Share electrons	- Transfer electro
- Molecular structure	- Crystalline str
- Neutral in charge	- Positive and Negative charg
Examples	
- H_2O, methane (CH_4)	- Sodium chlor
- Ammonia NH_3	- Calcium carbo ($CaCO_3$)
	- Potassium K$_2$O

Attempt and upload a single qs at a time for evaluation

Q-No 3 (a)

Difference between Plastics and elastics? Explain briefly.

Plastics

Definition

A large organic molecule

that can be formed into a variety of products. (molded)

Properties

Rigid, hard and non-elastic

Examples

Polyethylene, Poly propylene, Polyvinyl chloride (PVC)

Uses

Packaging, containers, automobile parts and construction material.

Elastics (Elastomers)

Definition

Elastics are polymers that can stretch and recover their shape.

Properties

Flexible, Elastic,

Example

Natural rubber, Synthetic rubber, Polyurethane

Uses

Tires, seals, gaskets, hoses

DIFFERENCE

Plastics		Elastics
	Elasticity	
Rigid		can stretch
	Flexibility	
Hard & brittle		Flexible
	Recovery	
Deform permanently.		can recover their shape

~~Q. No~~. (b)

What is role of remote sensing and GIS in environmental sciences? Discuss briefly.

Remote Sensing

Remote sensing is the science of acquiring information about Earths surface without actually being in contact with it. This is done by sensing, recording reflected or emitted energy and processing, analyzing and applying that information.

Geographic Information Systems (GIS)

GIS store and present information in the forms of maps.

Role of R.S and GIS in environmental sciences.

- It helps in recognition of macro pattern (Mountain, dessert, Ocean).
- Helps in forest management and monitoring of forest.
- Helps to locate and manage Ice cover, pollution, urban management, environmental policing, disaster and rescue missions
- They are smarter tools to gather information timely and help in tuff areas.

(c) Kepler laws related to the motion of planets.

Definition

Kepler's law are three fundamental principles that describe the motion of planets in our solar system. Discovered by Johannes Kepler

(1) Kepler's first law (Law of Ellips

The orbits of the planets are elliptical in shape, with the sun at one of the two foci. This means the distance between the planet and the sun varies as the planet moves around its orbit.

(2) Kepler's second law (Law of equal areas)

The line connecting the plane to the sun sweeps out equal are in equal times. This means that the planet moves faster when its closer to sun and slower when its farther away.

(3) Kepler's third law (Law of Harmonies)

This law suggest that planet that are farther away from the sun have longer orbital periods.

Conclusion

Kepler's law were major breakthrough in understanding the motion of planets and paved the way for Isaac Newton to develop the laws of gravity and motion.

(d) What is difference between preservatis and antioxidants? Discuss briefly with examples.

Preservatives

Definition

Substances added to food, cosmetics, or pharmaceuticals to prevent spoilage, decay or growth of micro organisms.

Functions

Inhabits / Kill bacteria

Yeast, mold or micro organisms that can cause harm

Examples

- Sodium benzoate (food perseval
- Parabens (cosmetic perservative)
- Formaldehyde (pharmaceutical perservative)

Antioxidants

Definition

Substances that prevent or slow down oxidation reactions, which can cause damage to cell tissues or molecules.

Functions.

Neutralize free radicals, whi cause oxidative stress and damage.

Example

- Vitamin C (food antioxidant)
- Vitamin E (cosmetic antioxidant)
- Polyphenols (plant-based antioxidan

Key Differences

Perseservatives
- Prevents spoilage

Oxidants
- Prevent oxidatio

- Kill microorganisms
- Used in food, cosmetic, pharmaceutical

- Neutralize free radicals.
- Food, cosmetic dietry

Q — No — 4 (a)
Role of carbohydrates and vitamins in body? discuss briefly.

Carbohydrates

Definition

Carbohydrates are one of three main macronutrients, along with protein and lipids. They are primary source of energy for body.

Types of Carbohydrates

- Sugars (simple carbohydrate)
  - Sucrose (table sugar)
  - Fructose (fruit sugar)
  - Glucose (blood sugar)
- Starches (complex carbohydrates)
  - found in grains, legumes and starchy vegetables
  - Broken down in simple sugars during digestion.

- Fiber (complex carbohydrates)
  - Found in plant based food fruit, vegetables whole grains.
  - Not digestible by body, help with satiety and bowel health

Role of Carbohydrates in the body.

- Functions
  - Energy source.
  - Structural role → found in connective tissues i-e Cartilage & bo
  - Storage
    Stored in liver and mus as glycogen, which can broken do for energy when needed.

- Importance
  - Brain function
    Carbohydrates are brain primary source of energy
  - Physical Performance
  - Gut health
    Fibre helps promote a healthy gut micro biome.

Vitamins

· Definition

They are organic compounds that are required in small amount to maintain good health, but can not be produced by body in sufficient quantities.

Types of vitamins.

- Fat Soluble vitamins
  - Examples - Vitamin A, D, E and K.
- Water Soluble vitamins.
  Examples - Vitamin C, B complex

Role of vitamins in human body

- Energy Production
  Mainly B complex.
- Immune function
  Vitamin A, C, D and E help support immune function.
- Bone health
  Vitamin D & K for bone health
- Skin health
  Vitamin A, C & E

- Eye health
  Vitamin A.

Sources of Vitamins.

- Fruits
- Vegetable
- Protein
- Dairy
- whole grain

(b) Discuss functioning of liver and Pancreas.

Liver

- Detoxification

Liver filters blood and removes toxins - i-e alcohol, medication and environmental pollutants.

- Metabolism

Liver metabolise carbohydrates, protein and fats and convert them in energy.

- Protein Synthesis

Liver produces many essential proteins i-e albumin, globulins and

clotting factors.

- Storage

Stores glycogen, vitamins and minerals and releases as needed.

- Production of bile

Bile helps in digest fat and absorb fat soluable vitamins.

Regulation of harmones.

Regulate harmones i-e insulin thyriod and sex harmone.

Functions of liver

- Filters the blood
- Regulate blood sugar levels
- Produces bile
- Store glycogen
- Detoxifies the body
- Produces proteins.

Pancreas

. Production of insulin and glucagon.

Insulins helps regulate blood sugar levels

. Production of digestive enzymes

Amylase, lipase and trypsin which break down carbohydrates and fats and proteins.

• Regulations of blood sugar levels

Sugar releases by insulin and glucagon.

Importance of liver & Pancreas

- Maintaining Overall Health
- Regulating blood sugar levels
- Digesting food
- Detoxification of body
- Producing essential proteins
- and hormones.

(d) What are longitudinal waves electromagnetic and gamma radiations? Discuss them.

Longitudinal Waves

Definition:

These waves propagates in the same direction as the displacement of the particles.

Characteristics

- Compressional waves
- Partical move back and forth along the direction of propagation.
- Can travel through solids, liquids and gases.

Examples:

- Sound waves
- Seismic P waves
- Pressure waves in a gas.

Electromagnetic Radiation

Definition:

Electromagnetic radiation is a form of energy that propagates

through electromagnetic field.

Characteristics

- Transverse waves
- Electric and magnetic fields oscillate perpendicular to each other.
- Can travel through a vacuum

Types:

- Radio waves
- Microwaves
- Infrared radiation
- Visible light
- UV radiation
- X-ray
- Gamma ray

Properties

- Frequency and wavelength are related by the speed of light. ($C = \lambda \nu$)
- Energy is proportional to frequency ($E = h\nu$)

Gamma Radiation

Definition:

Gamma radiation are type of electromagnetic radiation with the highest frequency and shortest

wavelength.

Characteristics

- Ionizing radiation
- Can penetrate thick material
- Can cause DNA damage & cancer

Sources

- Radioactive decay
- Nuclear reaction
- High energy astrophysics processes.

Application

- Cancer treatment
- Food irradiation
- Scientific research.

(c) What are types of earth-quake wave? Discuss them

Earthquake

It is the temporary trembling and shaking of ground due to release of energy stored inside the earth.

Earthquake OR Seismic waves

1 - Body waves

These are the waves which are measured from focus point which is point earthquake started

(a) P or Primary waves

These are high speed waves.

(b) S or Secondary waves

These are also part of body waves which are slow speed waves.

2 - Surface waves

These waves are measured from the epicentre of an

Earthquake

(a) Love waves

These are part of surface wave which move the particles of medium linearly.

(b) Rayleigh waves

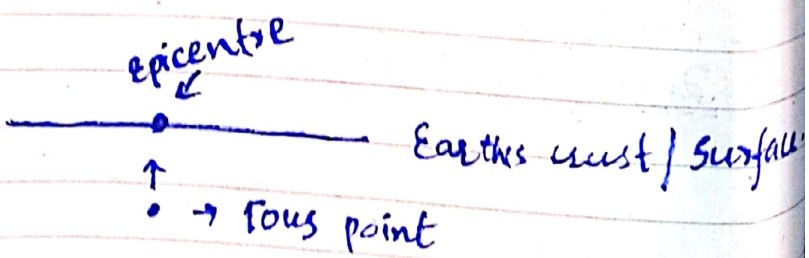
These are one of dangerous kind of seismic waves. They move the particle in circular just as curved path.

Causes of earth quake.

The movement of tectonic plates causes the earthquake. The main force of movement is gravity.

Measurement of earthquake.

Richter magnitude scale measures the intensity of earthquake that is a logarithm scale.



(c) What are standards of drinking water? How heavy metals in the water affect the living organisms?

Standards of drinking water

The World Health Organization (WHO) and Environmental protection Agency (EPA) have established guidelines for drinking water qualities

Physical Parameters

- Temperature: 10-30°C
- pH: 6.5 - 8.5
- Turbidity: <1 NTU

Chemical Parameters

- Total dissolved solids: <500 mg/L
- Hardness <200 mg/L as $CaCO_3$
- Chloride <250 mg/L
- Sulfate <250 mg/L

Micro biological parameters.

Pathogens should be absent.

Radiological parameters

- Gross Alpha activity <0.1 Bq/L
- Gross beta activity <1 Bq/L

Heavy metals in Water

Heavy metals are elements with high density and atomic weight which can be toxic to living organism.

Common Heavy Metals in Water

- lead (PB)
- Mercury (Hg)
- Arsenic (As)
- Cadmium (Cd)
- Chromium (Cr)

Effects of heavy metals on living organism.

Toxicity

can be toxic to living organisms causing damage to organs and tissues.

Bio accumulation

Can accumulate in body and cause damage in long-term.

Bio magnification

Can be magnified in food chain and can cause higher damage.

Genotoxicity

can damage DNA

leading to genetic mutation and Cancer

Neurotoxicity can damage the nervous system leading to neurological disorders and developmental delays.

Sources of heavy metals.

- Industrial & Effluent
- Agricultural Runoff
- Waste water treatment
- Natural resources.

(d) What is radioactivity? Discuss the laws of radioactivity Name two radioactive elements.

~~Definition~~ **What is radioactivity?**

Radioactivity is the process by which unstable atomic nuclei lose energy and stability by emitting radiations in the form of particles or electromagnetic waves. This process occurs when an item's nucleus has an excess of energy or an imbalance of protons and neutrons, causing it to decay into more stable state.

Laws of Radioactivity

Law of radioactive decay

The rate of radioactive decay is proportional to the number of unstable nuclei present.

Law of Half life

Time it takes for half of the unstable nuclei to decay is constant.

Law of alpha, beta, Gamma.

Radioactive elements emit three type of radiations

- Alpha particles: High energy helium nuclei
- Beta Particles: High energy Electrons.
- Gamma rays: High energy electromagnetic waves.

Two Radioactive Elements

Uranium: (U)

Naturally occuring radioactive element with half life of approx

4.5 billion years. Used as fuel in nuclear power plants and found in small amount in soil, water and air.

Radium (Ra)

Highly radioactive element with half-life of approx 1600 years - Used uses has been discontinued due to high toxicity and radioactivity.

Q - No - 5 (a)

What are the Plant nutrition elements? Enumerate them

Plant nutrition element

These are 14 essential nutrition which are necessary for plant growth, development and reproduction. Deficiencies in any of these elements can lead to reduced plant growth, lower yield, increased susceptibility to disease and pests.

Enumerating Plant nutrition elements

There are 8 micro nutritions and

6 macronutrients.

Macronutrients

Nitrogen (N):

Essential for leaf growth, protein synthesis and chlorophyll production.

Phosphorus (P):

Root development, flower and fruit formation, Energy transfer

Potassium (K):

Overall plant health, resistance to disease and water balance.

Calcium (Ca):

Cell wall development, root growth and nutrient uptake.

Magnesium (Mg):

Photosynthesis, cell wall development and nutrient uptake.

Sulfur (S):

Protein synthesis, enzyme activity and resistance to disease.

Micronutrients

Boron (B):

Cell wall, root growth, nutrients.

Copper (Cu):

Enzyme activity, plant-defence, connective tissue development.

Iron (Fe):

chlorophyll production, plant-defence, energy transfer.

Maganese (Mn):

Enzyme activity, phot, synthesis and plant defence.

Molybdenum (Mo):

Nitrogen fixation

Nickel (Ni):

Nitrogen metabolism.

Zinc (Zn):

Enzyme, protein and plant growth.

Chlorine (Cl):

Water balance, plant-growth