Date

Section - I

Q.No.2:

(a) What is dengue? Give a brief account of its causative agents and its symptoms.

Answer: **Dengue:**

Dengue is a mosquito-borne viral disease that has spread rapidly in recent years. Dengue fever is a severe, flu-like illness that affects infants, young children and adults.

Causative Agents:

Dengue is caused by the dengue virus and its primary vector is the Aedes mosquito

a - Causative Organism:

The dengue virus (DENV) is a member of the Flavivirus genus, which is part of the Flaviviridae Family. There are four distinct serotypes of the dengue virus: DENV-1, DENV-2, DENV-3 and DENV-4. Infection with one serotype provides lifelong ~~immunity~~

Signature _____ No. _____

Date

to that serotype but only short-term immunity to the others. Subsequent infections with a different serotype increase the risk of severe dengue.

b- Vector:

Aedes Mosquito:

The primary vectors for dengue are Aedes aegypti and Aedes albopictus mosquitoes. Aedes aegypti is the most efficient vector of the dengue virus that lives in urban habitats. This virus spreads through the bite of the female mosquito. Aedes albopictus is also known as the Asian tiger mosquito, it is a secondary vector for dengue. It has a wider geographical range and can survive in both urban and rural environments.

Symptoms:

① The symptoms for dengue virus usually last for 2-7 days, after an incubation period of 4-10 days after the bite from an infected mosquito.

Signature

Date

② Sudden high fever, severe headache, pain behind the eyes, and intense muscle and joint pain known as "break bone fever."

③ Skin rash appearing 2-5 days after the onset of fever, along with mild bleeding (nosebleeds, gum bleeding, easy bruising).

④ Nausea, vomiting and abdominal pain

⑤ Persistent vomiting, severe abdominal pain, rapid breathing, severe fatigue and bleeding gums or nose bleeds, which indicate potential progression to severe dengue.

⑥ Dengue Haemorrhagic fever (DHF) with severe bleeding and low platelet count, and Dengue Shock Syndrome (DSS) with weak, rapid pulse, cold clammy skin and shock.

Date

(c) Discuss structure and function of mitochondria. (How is it a powerhouse)

Ans: Mitochondria:

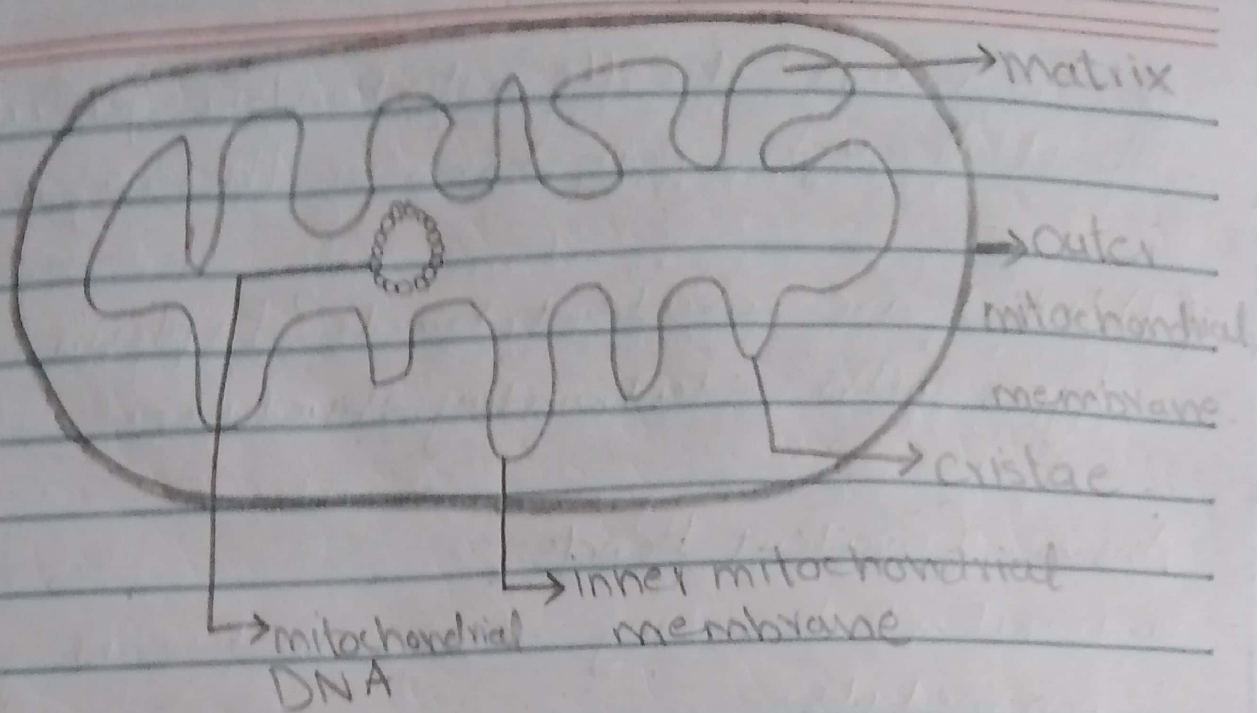
1- Mitochondria, found only in eukaryotic cells, are crucial for energy production.
2- Their size and number vary among different cells.
3- Mitochondrial membranes are composed of lipids and proteins, similar to other cell membranes.

Structure:

1- The mitochondria may be vesicle rod or filament shaped.
2- Mitochondria are bounded by two membranes.
3- The outer membrane is smooth. The inner membrane forms many foldings, called cristae.
4- The inner surface of cristae contains small knob like structure, called F1 particles.
5- The F-1 particles are suspended inside the matrix.

Signature

Date



Function:

Mitochondria are crucial for energy production, thus called "powerhouse of the cell."

① They generate ATP through oxidative phosphorylation, providing energy for cellular activities.

② They are involved in various metabolic pathways including the citric acid cycle and fatty acid oxidation.

③ They play a key role in programmed cell death by releasing cytochrome c and other factors.

④ They help regulate intracellular calcium levels, crucial for various cellular processes.

Signature _____ No. _____

Date

⑥ In brown fat cells, mitochondria generate heat through non-shivering thermogenesis

(d) What are covalent bonds? Explain types with elaborating structures.

Answer: Covalent bonds:

1- Covalent bonding occurs between non-metals.
2- This involves the shaving of one or more pair of electrons between atoms.
3- The shared electrons allow each atom to attain a stable electron configuration.
4- Covalent bonds can be single, double, or triple depending on the number of shared electron pairs.
5- Example: Water H_2O
   - where oxygen shares electrons with two hydrogen atoms.

Date

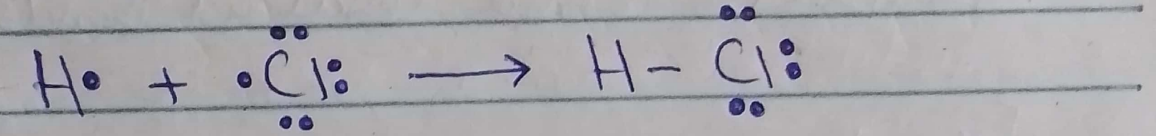
Types of covalent bonds:

a- Single bonds:

Here, only one pair of electrons are shared between the atoms. The bond is denoted with a (—). It is a stable configuration but ~~with~~ weaker than the other two types.

Example:

The HCl molecule has one hydrogen atom that has one valence electron and one chlorine atom has 7 valence electrons. Here the single bond formed is by sharing one electron from each atom.



b- Double bonds:

A double bond will have two pairs of electron sharing between the involved atoms. The double bond is represented as (=). It is stronger than a single bond but less stable.

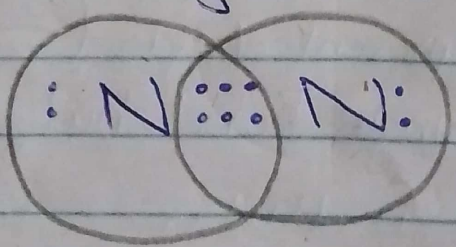
Date

Example: Carbon dioxide.
Here the carbon atom shares two electrons with each oxygen atom, while each oxygen atom shares two electrons with the carbon atom. The carbon forms double bond with each of the oxygen molecules.

$$O = C = O$$

c- Triple bond:
When three pairs of electrons are shared between atoms, it forms a triple bond. Such bonds are written as three dashes ($\equiv$). These are the least stable form of covalent bonds.

Example:
In a nitrogen molecule (N_2), each nitrogen atom shares three electrons forming a triple bond.



$$:N \equiv N: \quad :N \equiv N:$$

x

Date

Q No. 3

(a) What is lunar eclipse? Explain in detail with apt diagrams.

Ans: Lunar Eclipse:

The moon moves in an orbit around Earth and at the same time, Earth orbits the sun. Sometimes Earth moves between the sun and the moon. When this happens, Earth blocks the sunlight that normally is reflected by the moon.

Instead of light hitting the moon's surface, Earth's shadow fall on it. This is an eclipse of the moon - a lunar eclipse.

Characteristics of a lunar eclipse:

a- A lunar eclipse can occur only when the moon is full. A lunar eclipse can be seen from Earth at night.

b- The earth casts a long, conical shadow in space. At any point within that core the light of the sun is wholly obscured. Surrounding the shadow core, also

Signature

No.

Date

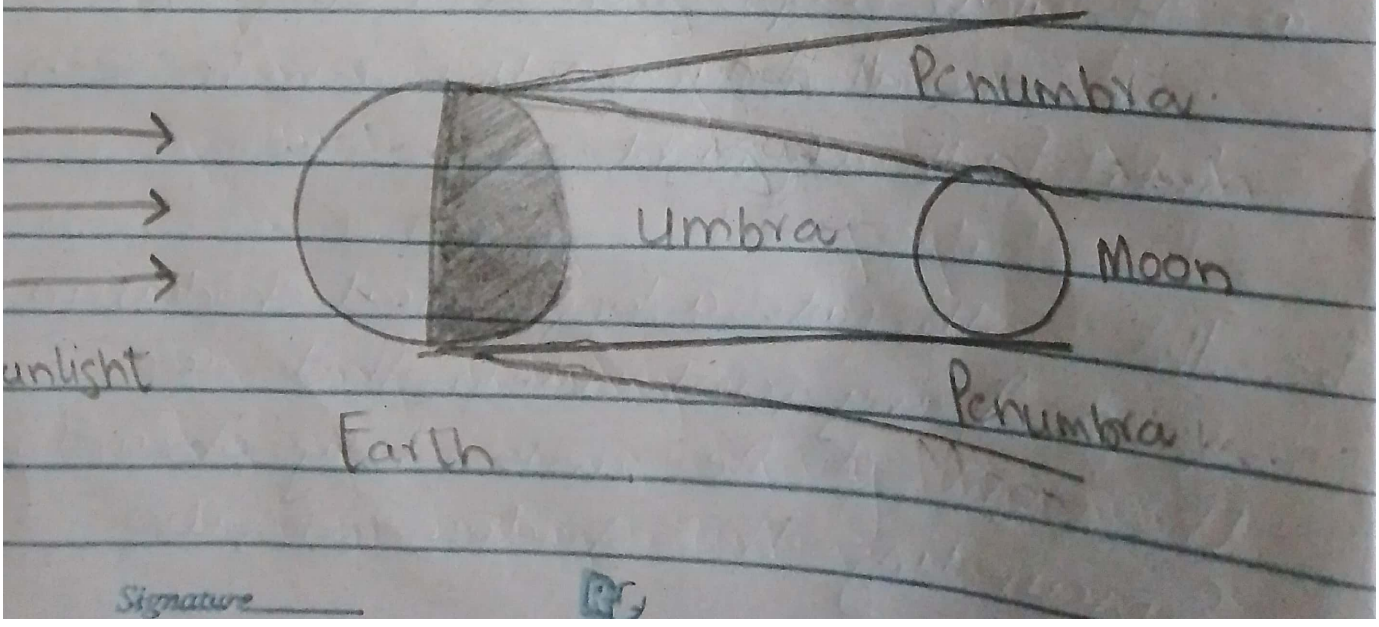
called the umbra, is an area of partial shadow called the penumbra.

c- A lunar eclipse usually lasts for a few hours. At least two partial lunar eclipses happen every year.

d- Total lunar eclipses are rare. It is safe to look at a lunar eclipse.

Types of lunar eclipses:

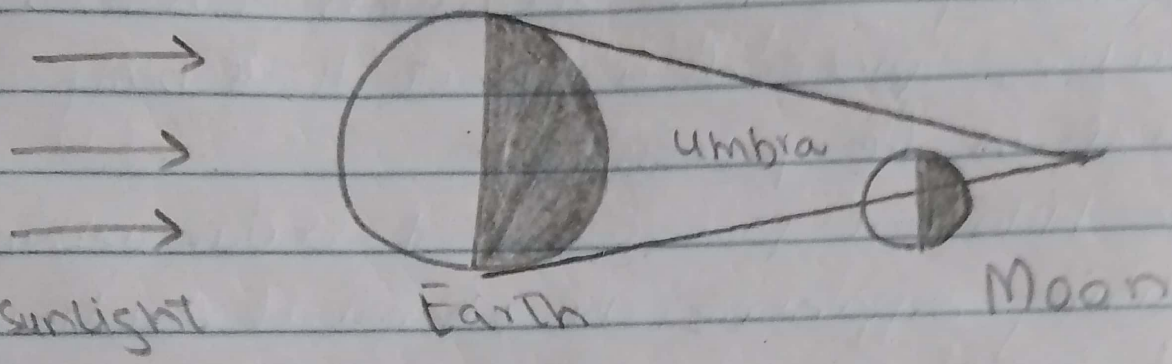
a- Penumbral lunar eclipse:
The moon only passes through the penumbra of Earth's shadow. It is rarely visible from earth as there is slight change of colour of the moon.



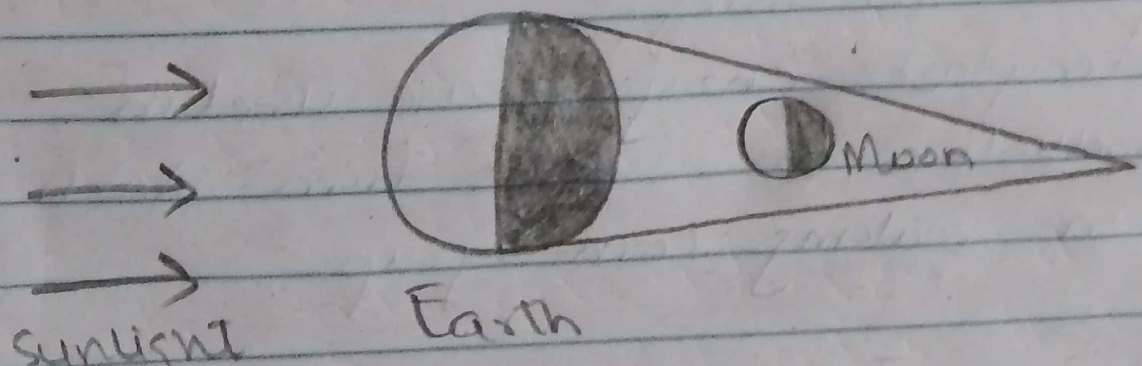
Signature

Date

b- Partial lunar eclipse:
When part of the Moon passes through the umbra of Earth's shadow. Then it is termed as partial lunar eclipse as its whole area is not obscured by the shadow.



c- Total lunar eclipse:
When the entire Moon passes through the umbral region of Earth's shadow and moon is totally obscured.



Date

b- Explain functions of enzymes in detail with examples.

Ans: Enzymes:

An enzyme is a substance that acts as a catalyst in living organisms, regulating the rate at which chemical reactions proceed without itself being altered in the process.

The biological processes that occur within all living organisms are chemical reactions, and most are regulated by enzymes.

Functions of enzymes:

a- Industrial applications:

1- Food Processing:-

Amylases enzymes are used in production of sugars from starch in making corn-syrup.

2- Brewing Industry:-

Enzymes from barley are widely used in brewing industries.

Signature

No.

Amylases, glucanases, proteases, betaglucanases are useed in production of beer industries.

3- Dairy Industry:-
Renin is useed in the manufacture of cheese, most particularly parmesan cheese.

4- Detergents:
Biological detergent Proteases, amylases, lipases assist in removal of protein stains, oily stains and act as fabric conditioners.

b- Digestion of Food:
The digestive system in the case of human beings begins from the mouth and extends up to the anus. This digestion process becomes easier with the help of enzymes which are biocatalysts.

~~In case of~~ Protein digestion

Date

Enzymes that assist the protein digestion are listed below.

Protein digestion:

1- Pancreatic proteases (trypsin, chymotrypsin) continue digestion breaking peptides into smaller chains and amino acids.

2- Amino acids are absorbed into the bloodstream and transported to the liver.

3- These amino acids are used for protein synthesis, energy production or stored as glucose or fat.

This process ensures that dietary proteins are broken down into amino acids, which can be absorbed and utilized by the body for various essential functions.

Date

c- Give a brief account of ~~elec~~ electromagnetic radiations. What is EMR spectrum?

Ans: Electro magnetic radiations:

EMR can be defined as a form of energy that is generated when electrically charged particles move through matter or ~~vacc um~~ vacuum.

It includes a wide range of frequencies and wavelengths, collectively known as the electromagnetic spectrum.

Electromagnetic radiation is fundamental in various fields including physics, chemistry and communication technology.

EMR spectrum:

The EMR spectrum encompasses all types of EM radiations, organized by wavelength and frequency. It ranges from long wavelength, low frequency radio waves to short-wavelength, high frequency gamma rays.

Signature _____ No. _____

Date

1- Radio waves:-

Radio waves are longer than 1mm to several kilometers. Since these are longest waves they have the lowest energy. These waves are used in communication. Radio waves are often used to transmit data and have been used for all sorts of applications including satellites, radar and computer networks.

2- Microwaves:-

Their wavelength ranges from 1mm to 1 meter. Microwaves are used to cook food, transmit information and in radar to predict the weather. The universe is filled with cosmic microwave background radiation that scientists believe to give clues ~~abt~~ about the origin of the universe.

3- Infra-red:-

Infra-red wavelengths span from 710 nm to 1 mm. Infra-red radiations are used to diagnose tumors. This works

Signature _____ No. _____

Date

because a tumor emits more infra-red radiation than heealthy tissue does. Infra-red radiations can't be seen, therefore these are also used in security lights and burglar alarms.

4- Visible light:-
Wavelengths range from 400nm to 700nm. It is the part of the spectrum visible to the human eyes, including all the colors from violet to red.

5- Ultra-violet:
Their wavelength ranges from 10nm to 400nm. Ultra-violet light is used by powerful telescopes like the Hubble space telescope to see far away stars. UV light synthesizes vitamin-D in skin, controls the endocrine system and is a painkiller. UV light is also used to identify items outside visible spectrum areas, known as black lighting.

Date

6- X-rays:

X-rays range in wavelength from 0.01 to 10nm. These rays are used in medical imaging and security scanners. X-rays have even shorter wavelengths than ultra-violet rays. These can penetrate sd tissues like skin and are also used to take X-ray pictures of bones in body.

7- Gamma rays:

Gamma rays have the shortest wavelengths, less than 0.01 nm. These rays are sometimes used in treating cancer and in taking detailed images for diagnostic medicine. Gamma rays are also used to sterilize foods and research equipment.

Date

d- Are earthquakes and volcanic eruptions interconnected? If yes, then how?

Ans: Earthquake is a sudden release of energy in the form of seismic waves that create vibrations in the earth crust as a result of abrupt movement of tectonic plates.

Earthquake can also occur due to volcanic eruptions. Earthquakes and volcanic eruptions are both caused by the movement of tectonic plates. When plates shift, they can create cracks and release energy, triggering earthquakes.

This movement ~~etc~~ also allows magma to rise toward the surface, sometimes causing volcanic eruption. Large earthquakes can add pressure to nearby volcanoes, increasing the chances of an eruption.

Earthquakes and volcanic eruptions are interconnected as both events are common near plate tectonics.

—— X ——

Signature

Pg

No.