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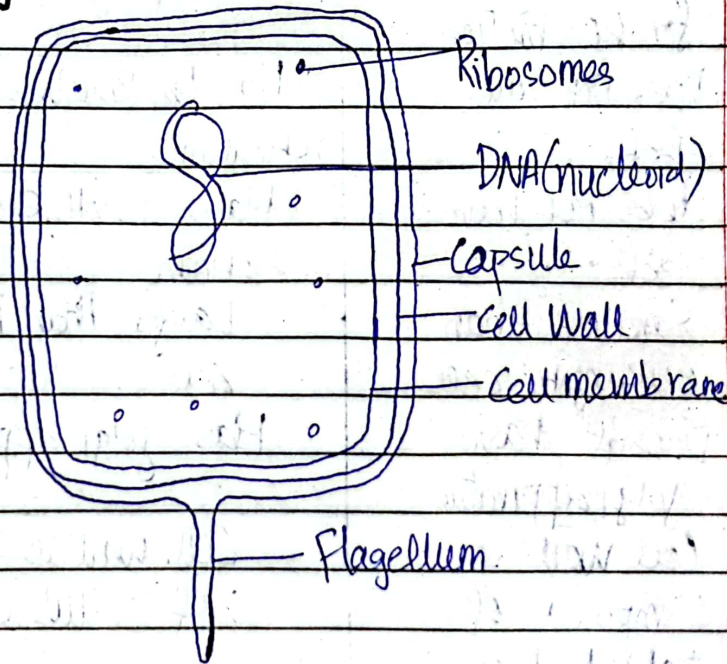
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GSA MOCK

PART II
SECTION I

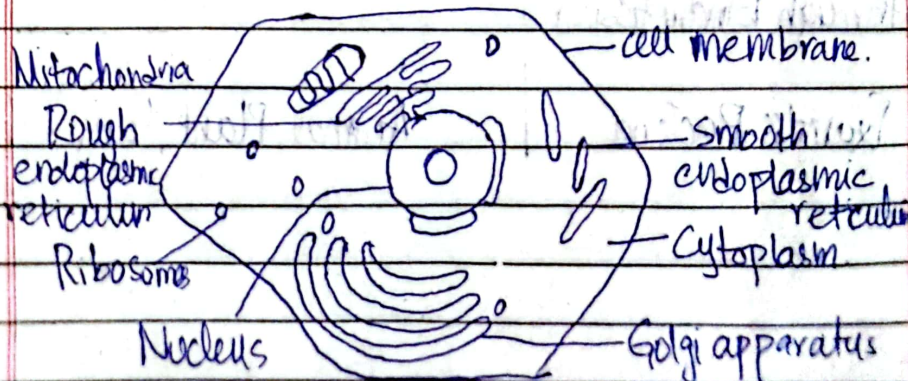
Question 5

Part a Difference between Prokaryotic and Eukaryotic cell

a) Prokaryotic cell



b) Eukaryotic cell (Animal cell)



	Prokaryotic Cell	Eukaryotic cell
(i)	Do not have nucleus	Have Nucleus
(ii)	DNA suspended in cytoplasm	DNA held with histone proteins within nucleus
(iii)	Non membrane bound organelles	Membrane bound Organelles
(iv)	Has capsule for protection	Lack capsule
(v)	Has flagellum for locomotion	Lack flagellum
(vi)	Does not have RER	Has had Rough endoplasmic reticulum
(vii)	does not have SER	Has Smooth endoplasmic reticulum
(viii)	Smaller than Eukaryotic cell	Larger than Prokaryotic cell
(ix)	Doesn't have golgi apparatus	Has golgi apparatus
(x)	Cell wall is composed of peptidoglycan.	Cell wall is composed of cellulose
(xi)	Asexual reproduction through Binary fission	Mitosis
(xii)	Examples Bacteria	Animal, Plant, fungi

Part b

Global Warming

a) **Global Warming** refers to the heating up of earth's atmosphere. When **Green house gases** trap heat. This heat comes from sun is absorbed by earth's surface and re-radiated back as Infra-red radiation.

This Infrared radiation is captured by Green house gases such as CO_2 , CH_4 , Ozone.

b) Causes of Global Warming

(i) Burning of fossil fuels

Combustion of fossil fuels such as coal, oil and natural gas release large amounts of CO_2 .

(ii) Deforestation

Trees act as carbon-absorbers. Lack of trees increases the carbon index of atmosphere.

(iii) Industrial processes

Cement production and chemical manufacturing release large amount of greenhouse gases.

(iv) Agriculture

Livestock and crops release large amounts of methane (CH_4) which contributes to global warming.

(V) Volcanic eruptions
Emit gases like CO_2 into the atmosphere contributing to global warming.

(L) Effects of Global Warming

(i) Melting of Glaciers and ice caps
Extreme warm temperatures causes the glaciers and ice caps to melt.

(ii) Rising sea levels

The melted glaciers cause global sea levels to rise, threatening coastal communities.

(iii) ~~Ex~~ Erratic weather conditions

Global warming causes erratic weather conditions at different parts of the world such as floods and droughts.

(iv) Raises temperature of earth

It increases the temperature of earth due to the heat trapped by GHG in the atmosphere.

(v) Loss of biodiversity

Rising temperatures disrupt ecosystems leading to species extinction for e.g. Polar bears are threatened in the Arctic.

(vi) Health issues

Global Warming causes respiratory diseases due to ground level ozone.

(d) Kyoto Protocol

Kyoto Protocol was signed in 2005 under the United Nations Framework Convention on Climate Change (UNFCCC).

Objectives of Kyoto Protocol

- (i) It sets binding targets for reducing GHG emissions. The goal is to stabilize GHG concentrations in the atmosphere.
- (ii) Countries invest in clean energy projects and claim the emissions reduction as credits.
- (iii) Countries can also buy and sell emission rights through Emission trading.

Impact of Kyoto Protocol

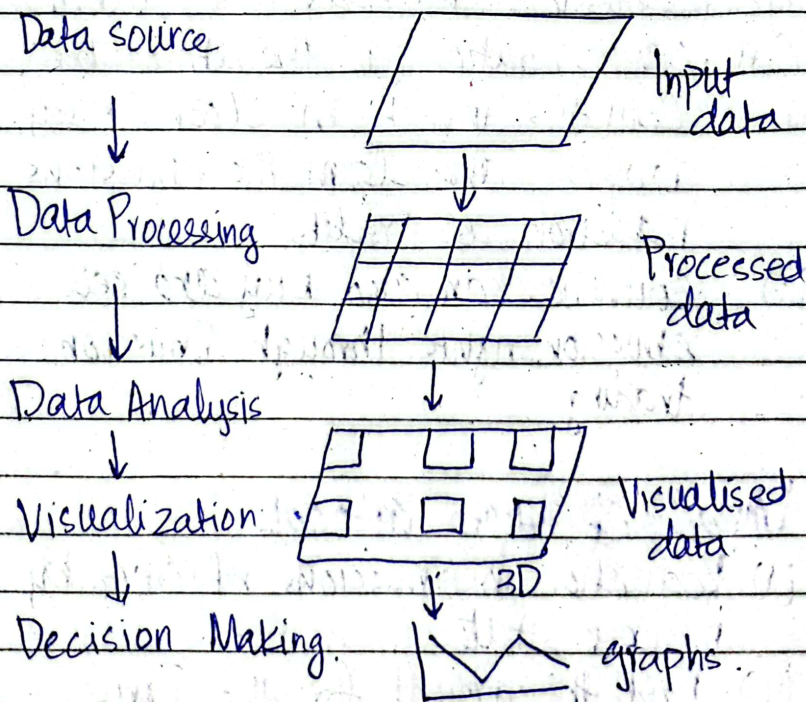
- (i) Reduction in emissions of GHG by member states.
- (ii) Laid the ground for the Paris Agreement.
- (iii) Countries started investing in clean energy.
- (iv) Carbon markets were introduced for the first time to allow member states to trade carbon.

Part C

Detailed Note on GIS

- (a) **Geographic Information System** is a computer-based system used to collect, analyze and visualize spatial and geographical data. It integrates layers of information to provide insights into patterns, relationships etc.

(b) How does GIS work?



(i) Data collection

GIS gathers spatial and non spatial data from sources like satellite images, GPS data and field surveys.

(ii) Data Input

Collected data is digitized and stored in GIS compatible forms.

(iii) Data Storage

GIS stores data in its databases and sorts it in attributes (information about features) and coordinates (geographic information)

(iv) Data Processing

GIS processes the raw data, analyses it to find relationships for e.g. flood zones over population density

(v) Visualization

Data is then visualized in the form of maps, graphs, 3D models.

(vi) Decision making

Insights from data visualized are used to make decisions regarding urban planning, disaster management and environment conservation.

Part d

Antioxidants

- a) Antioxidants are molecules that prevent or slow down the damage of cells caused by free radicals. Free Radicals are unstable molecules produced as a result of cellular metabolism due to external factors such as pollution, UV radiation and smoking. When free radicals accumulate, they cause **Oxidative stress**, leading to cell damage and contributing to aging, cancer and other diseases.

b) Types of Antioxidants

↓
Endogenous Antioxidants

↓
Exogenous Antioxidants

(i) Endogenous antioxidants

These are naturally occurring antioxidants in human body. for e.g. Uric acid and glutathione.

(ii) Exogenous antioxidants

These antioxidants are derived from external sources, primarily food like vitamin C and carotenoids (carrots)

(C) Uses of antioxidants

(i) Prevent Chronic diseases

Antioxidants prevent cancer, diabetes and heart disease.

(ii) Protects skin

They protect skin from UV damage and reduce wrinkles.

(iii) Strengthen immunity

They strengthen the immune response by protecting immune cells from oxidative damage.

(iv) Antiaging

These are antiaging as they protect cells from damaging, keeping them healthy.

(v) Eye health

Protect eye from age-related degeneration and cataracts.

Question 9 Part a

Lipids:

Lipids are diverse group of organic compounds which are insoluble in water (Hydrophobic) and non-polar.

They are found in animals, plants and microorganisms. Lipids can be mainly categorised into fats, oils and waxes.

(ii) Basic Structure of Lipids

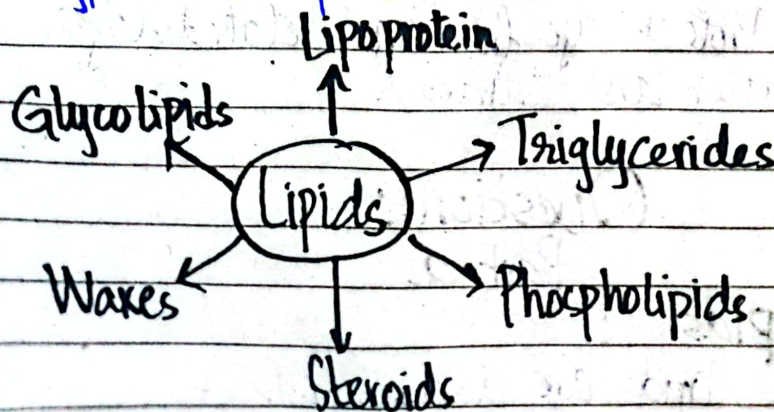
Basic unit of lipid is composed of ^{glycerol} triglyceride molecule and three fatty acids. In human body, lipids exist in the form of Triglyceride molecules.

Triglyceride = Glycerol + 3 fatty acids

Lipids can only exist as Phospholipids which are found in membranes of plants and animals.

Phospholipid = glycerol + fatty acids + Phosphoric acid.

(iii) Types of Lipids



(i) Triglycerides

Composed of one glycerol molecule and three fatty acids.

(ii) Phospholipids

Composed of glycerol, fatty acids and Phosphoric acid.

(iii) Steroids

A common steroid in human body is Cholesterol which is essential for cell stability and precursor for steroid hormones.

(iv) Waxes

These are long chain fatty acids attached to long chain alcohols. They form a water proof layer in plants (leaves) and animals (ear wax).

(v) Glycolipids

Lipids attached to carbohydrates, these are found in cell membrane and used for cell signalling and recognition.

(vi) Lipoproteins

Lipid molecules attached with proteins. In human body, they transport lipids like cholesterol and triglycerides through blood.

(iv) Functions of Lipids

(i) Energy Storage

Lipids store 9 Kcal/g of energy, making them the most energy-dense micronutrient.

(ii) Structural role

Glycolipids found in cell membrane and phospholipid bilayer in cell membrane are essential for cell signalling and fluidity of cell membrane respectively.

(iii) Insulation and Protection

Lipids in human body form an insulating layer around organs, protecting them from external shocks and injury.

(iv) Hormone production

Steroids act as a precursor for steroid hormones like sex hormones.

(v) Transport

Lipoproteins carry lipids such as triglyceride and cholesterol in human blood, ensuring their distribution within the body.

Part b

(i) Energy Conservation

Energy conservation refers to the processes and practices of using less energy and preventing loss of energy. In the modern times, energy conservation is of paramount importance due to depletion of natural sources of energy.

(ii) Methods of Energy Conservation

(a) Improve Energy efficiency

Using energy efficient infrastructure like LEDs, smart energy systems can optimize energy use.

(b) Use of renewable energy

Renewable energy sources like solar and hydal conserve energy while ensuring a sustainable supply of energy.

(c) Encourage Public Transport

The use of buses and trains instead of private vehicles conserve fuel energy.

(d) Energy saving practices

Switching off lights and fans when not in use and use of natural daylight preserves energy.

(e) Energy efficient Urban planning

Green roofs, forests and pedestrian footpaths are means to conserve energy as less energy will be consumed in cooling.

(f) Public awareness campaigns

Educating communities about energy conservation practices and afforestation

(g) Promote circular economy

The use of recycling and reusing material will ~~reduce~~^{save} the energy required for new production.

(iii) Sustainable impact of Energy Conservation

(a) Reduce our dependence on fossil fuels with our use of renewable energy sources.

(b) Lower greenhouse gas emissions through the use of clean energy like solar, wind, hydropower.

(c) Save costs in the long term as forests and plants significantly control carbon index, reducing cooling costs.

(d) Ensure an equitable and continuous source of energy for future generation.

(e) Ensure an adequate source of supply of natural resources like water for future generation.

Part d

Hydrogen bonding.

- (i) Hydrogen bonding is a type of intermolecular force when hydrogen atoms, covalently bonded to a highly electronegative atom (oxygen, nitrogen etc) is attracted to another electronegative atom in a different molecule. This bond is weaker than covalent bonding.

(ii) Characteristics of Hydrogen bonding

(a) Involves electronegative atoms

Highly electronegative atoms like Fluorine, Nitrogen and oxygen are involved.

(b) Partial Charges

The hydrogen atom has a positive charge partially and the electronegative atom has a partial negative charge.

(c) Directional

Hydrogen bonds are highly directional which affects the physical properties of substances.

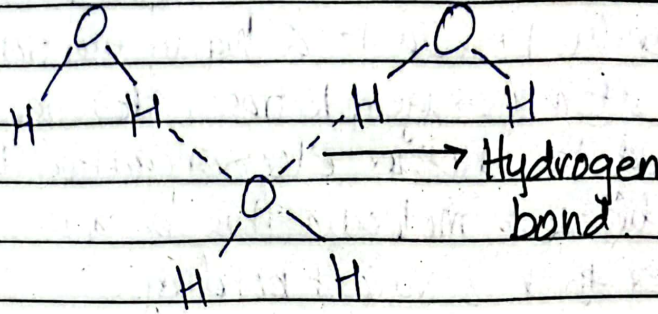
(iii) Examples of Hydrogen bonding with structures

(a) H_2O

In H_2O molecule, oxygen being the highly electronegative atom, has a partial negative charge and is attracted to the partial positively charged hydrogen atom.

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Hydrogen of one molecule is attracted to oxygen of other molecule

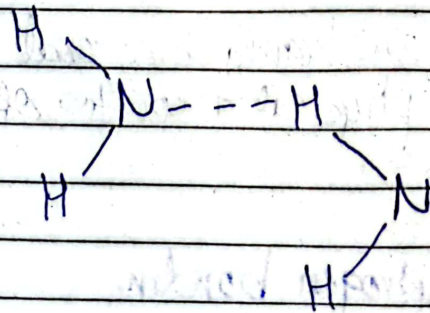


(b) NH_3

Ammonia has a nitrogen atom covalently bonded to three hydrogen atoms.

Nitrogen has a high electronegativity, thus a partial positive charge and hydrogen atoms are partially positive.

The hydrogen of one ammonia molecule forms a hydrogen bond with nitrogen of another ammonia molecule.



(c) DNA base pairs

In DNA, DNA bases also form pairs through hydrogen bonding.

Adenine with Thymine has 2 hydrogen bonds.

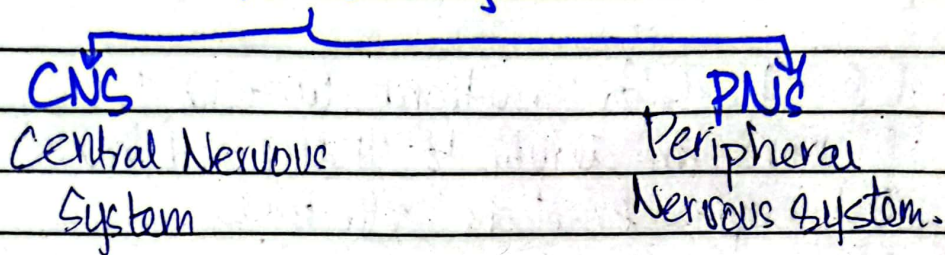
Guanine pairs with cytosine through 3 hydrogen bonds.

Part d

Nervous System

The human nervous system contains network of cells and tissues that controls and coordinates body functions. It is categorised into:

Nervous System



CNS

CNS consists of brain and spinal cord. It is responsible for processing information, controlling activities and coordinating responses. They are responsible for generating motor responses.

PNS

PNS consists of neural structures outside CNS such as nerves, sensory receptors and ganglia. They transmit sensory information from body to CNS and motor control for voluntary and involuntary functions.

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Section III

Q7 Part a

IQ stands for Intelligence quotient & measures cognitive abilities like learning, problem solving and mathematical skills.

EQ stands for emotional quotient and measures the ability to understand, manage and express emotions effectively.

Part b

$$x + 20 = 10(x - 10)$$

$$x + 20 = 10x - 100$$

$$120 = 9x$$

$$x = \frac{120}{9} = 13 \frac{1}{3} \text{ years.}$$