Part II - Section A

Q No. 2. a. What is the octet rule in chemical bonding? –

Chemical Bonding

In order to achieve stability, atoms form bonds. Atoms combine through bonds to form molecules. The total energy of a molecule is lower than that of the two or more atoms combined which makes molecules more stable.

Octet Rule in Chemical Bonding

The octet rule in chemical bonding is when atoms form bonds ~~active~~ achieve the 8-electron valency in their outer shells.

For Example. The water molecule is made up of hydrogen and oxygen. The oxygen atom has 6 electrons in its outer shell. By the octet rule, the oxygen atom forms a bond with to hydrogen atoms to become stable by having 8-electron valency in its outer shell.

Covalent Bond

A covalent bond is a type of bond in which an atoms

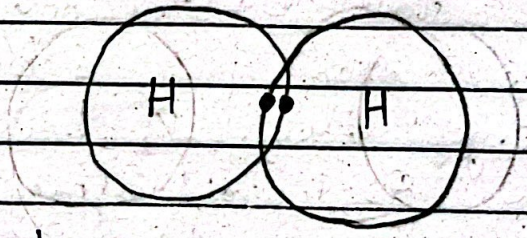
forms a bond by sharing one or more pairs of electrons between them. As opposed to an ionic bond, in a covalent bond electrons are not transferred but shared between two atoms.

Example:

A water molecule is formed by covalent bonds between two hydrogen atoms and one oxygen atom. Diatomic Hydrogen, Oxygen and Nitrogen have covalent bonds between them.

Polar Covalent Bond

A polar covalent bond is formed when the atoms in a molecule have a slight positive and a slight negative charge. This unequal distribution of charges lead to the formation of a polar covalent bond as in the case of a water molecule (H_2O) where Oxygen has a slight negative charge and hydrogen a slight positive charge.



A Hydrogen molecule with a Covalent bond.

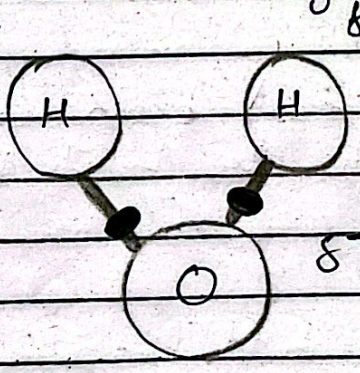
b. Why water molecule is an angular structure?

Composition of a water molecule

A water molecule is formed when two hydrogen atoms and a single oxygen atom combine through covalent bonds between them. Oxygen gains an 8-electron valency in its outer shell and the hydrogen atoms gain a two-electron valency in their outer shells by sharing two pairs of electrons.

Angular structure of a water molecule due to a Polar Covalent bond

A water molecule is held together by covalent bonds which are polar in nature whereby the oxygen has a slight negative charge and the hydrogens a slight positive charge due to an unequal force attracting the electron pairs. The electrons are attracted more towards oxygen than the hydrogen atoms. The molecule has an overall neutral charge.



$-H_2O$

C. Write a note on Structures and functions of human brain?

Human Brain

The human brain is a highly specialized organ of the human body. It is associated with cognitive functioning. It is the most complex organ of the human body responsible for nearly everything that happens within a human body. It is protected by the skull.

Structure of a human brain

The human brain can be broadly divided into three parts.

i- Fore brain

The fore brain consists of Cerebrum. It is the largest part of of human brain. The right cerebrum controls the left side of the body and the left cerebrum controls the right side of the body. The cerebrum is divided into two hemispheres.

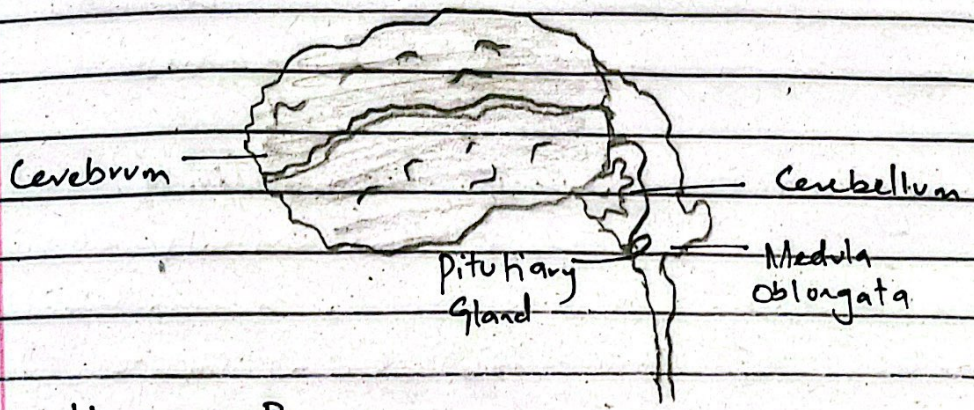
ii- Mid brain

The mid brain connects fore brain with the hind brain

Hind Brain

The hind brain is the lower

part of the human brain which connects to the central nervous system. It consists of medula oblongata, Pituitary gland and other specialized structures like the cerebellum.



- Human Brain

Functions of the human brain

Memory and retention

A major fuction of the human brain is memory and retention. A number of structure are responsible for memory and retention. Memory can either be long-term or short-term.

Harmonal Balance

The human brain is responsible for maintaining a harmonal balance in the human body. The Pituitary gland is called the master gland which fo regulates the fuctions of other glands in the body.

Sensory and motor activities

The brain makes it possible for the humans to carry out sensory and motor activities. It works as a relay station for all such activities where messages are conveyed to the brain which are then processed in the brain for a suitable response.

Regulation of respiratory activity

The brain also controls the respiratory activity of a human body determining its rate and a smooth functioning.

There are multiple other functions of the human brain like controlling emotions, regulating body temperature, controlling the flight or fight responses and much more.

d- Describe the 'Cell Structure'.

Cell structure:

Cells are the basic structural and functional units of all the living organisms. Cells can be differentiated into animal and plant cells generally but even within these two categories there can be specialized cells like the muscle and brain cells in human bodies and

those found in the roots, stems and leaves of the plants.

Basic Cell Structure

Cells can be specialized but the all share a basic cell structure. Cells have an outer membrane which is partially permeable. Inside the membrane is water intensive fluid with in which cell organelles are embedded and nourished. Cells have a nucleus which can either be membranous or non membranous.

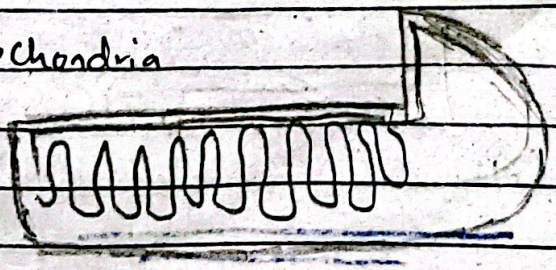
Subcellular Organelles

Sub-cellular organelles are embedded in the the cellular fluid inside the cell membrane. There are a number of specialized cell structures responsible for carrying out cellular functions in living organisms.

Mitochondria

Mitochondria is called the Power-house of the cell. It is tasked with energy production. It is a membranous structure with a folded structures inside the organelle.

- Mitochondria

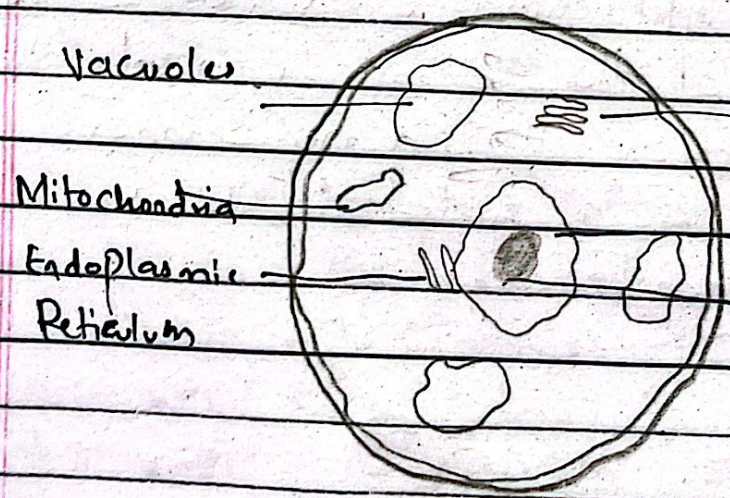


Subcellular Vacuoles

Vacuoles can either be large or small. In plant cells they are very large pushing the nucleus to the side but in animal cells they are comparatively smaller and in multiple numbers. The main function of vacuoles is to carry out the cellular waste and to bring in nutrients to the cell.

Cell Membrane

The cell membrane is a very important cellular structure. It allows some products to pass through it while others are prevented from passing through because of its semi permeability. The cell membrane protects the cell and subcellular organelles while also maintaining the shape of the cell



- Animal Cell

Q.4.a. What is Solid Waste management?

Solid Waste Management

Solid waste management is the treatment of industrial and municipal solid was as to reduce its adverse impacts on the environment including its living components. Solid waste can be divided in to non-toxic municipal waste and often hazardous industrial waste.

Methods of Solid Waste Management (SWM)

There are different methods in which solid waste can be managed and its harmful effects minimized.

Landfill

Landfill is the most widely used method for management of municipal solid waste. In this method solid waste is collected and then dumped into a landfill spot which is must a have a soil cover of at least 3meters. The criteria for selecting a suitable landfill spot must be strictly met which takes the water table of the area, distance from residential and commercial areas, soil quality etc into account which hardly met in Pakistan.

Incineration

Incineration is another method for solid waste management. In this method, solid waste is burned at very high temperatures ranging between 900°C and 10,000 °C to reduce the bulk of solid waste which can then be dumped into landfill areas.

Reusing and Recycling

The most environment~~t~~ friendly method of solid waste management is reusing and recycling solid waste to reduce its harmful effects. Plastics, for example, can be remolded and reused in the form of new products.

Pyrolysis

Another method for managing solid waste is through Pyrolysis in which waste products are burned at high temperatures in the absence of oxygen, reducing their quantity and toxicity.

Solid Waste Management in Pakistan

In Pakistan the most widely used method for SWM is landfill. Landfill spots often do not fulfill the internationally accepted criteria. Open dumping is rampant in Pakistan

There is hardly ever a soil cover on top of landfill spots. They are very close to residential areas and are poorly managed. Toxic and non-toxic waste is dumped into landfills. There is almost no concept of waste treatment to reduce its toxicity. All these areas need improvement in Pakistan through strict and widespread regulations in solid waste management programs.

b. What is GIS? :—

GIS:

A Geographic Information System is a computer system for capturing, storing and displaying data related to geography. It captures data through satellites and other remote sensing methods with a large network of computers and programs. The data is displaced in the form of maps or photographical information displays.

Component of GIS

The three essential components of GIS are related to capturing, storing and displaying of data.

Data Capture

In GIS system, data is captured through a vast network of computers which are connected to satellites and other remote sensing objects.

Data Storage

Data Storage is an essential component of GIS. It is important to store and be able to retrieve data for comparative study of any phenomenon. Data is stored in massive data bases.

Data Display

Data can be displayed in different forms. Photographic displaying is the most widely used one. Through data displays, important changes in geography including topography, demography and environment can be observed.

C. Pakistan is the 5th _____ ?

Population of Pakistan

According to the 2023 national Census, the population of Pakistan stood at 241.5 million people. An increase of some 40 million souls as compared to the 2017

head-count.

Reasons behind Pakistan's growing population and ways to control it

There are several reasons responsible for the high population growth rate in Pakistan.

Early marriages

According to the UNICEF, 18 percent of women in Pakistan are married before the age of 18. Early marriages increase the number of ~~Prod~~ reproductive years of a couple. In order to control population growth early marriages must be discouraged and stopped

Low literacy rate

Educated people tend to have lower reproduction rate. The literacy rate of Pakistan is significantly low as compared other developing nations which is a key factor behind is high population growth rate. In rural areas the literacy rate drops to as low as 7 percent for women and these areas have a very high fertility rates. In order to curb the population growth in Pakistan, its literacy rate must be brought up

A lack of use of Contraceptive

The Pakistani population has one of the lowest ratios of population that uses contraceptives in any form. Use of contraceptive should be encourage and its awareness spread among the public.

No family planning

The religious nature of the Pakistani society often conflicts with family planning practices, which has resulted in a fertility rate of 3.238 children per woman as per the World Bank estimates in 2023.

These and many other factors must be improved for controlling the population growth of Pakistan.

d. What are Montreal and Kyoto ---- ?

The Montreal protocol

The Montreal Protocol is an environmental agreement concerned with the depletion of the ozone layer It came into being in 1987 after two scientists identified more than 90 ozone depleting substances of which chlorofluorocarbons (CFCs) were the most harmful. The world

Come together under this protocol to eliminate the use of ozone depleting substances and has been in the words of former UN Secretary General Kofi Anan, "perhaps the single most successful international treaty."

The Kyoto protocol

The Kyoto Protocol is an environmental agreement concerned with controlling greenhouse gase emissions like that of carbon dioxide, Carbon monoxide, methane, nitrous oxides and Sulfer oxides. The Kyoto Protocol Come into force in 2005 but it has so far failed to achieve anything significant. It is associated with the United Nation Framework Convention on Climate Change (UNFCC). The world continues to emit greenhouse gases and heat up its climate.

Carbon Market.

Under recent UNFCCC agreements, a formal framework has been set up for Carbon Credit which can be bought and Sold in the Carbon market. It is a major component of the Net-Zero emission targets set by nations and by the UNFCCC for individual countries

Section B.

Q. No. 6. b. Kashif required ——— ?

Solution.

Needed amount = 800 rs

Amount borrowed from brother = $\frac{20}{100}$ (800)

Amount borrowed = 160

Remaining amount = 800 − 160 = 640

Mother's share = $\frac{30}{100}$ 640 = 192 rs

Money in bank = 200

Needed amount = 800 − (160 + 192 + 200)

= 800 − 550

= 250

Kashif needs = 250 rs more.