

Question no: 03

14/40

Part (a)Chemical Bonding

It is defined as:

The formation of a chemical bond between two or more atoms, molecules or ions to form a chemical compound.

Chemical bonding is, therefore, a force of attraction developed between atoms to form a new compound.

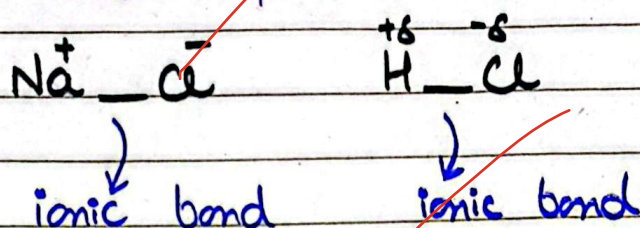
It reflects the Stability of a compound. If the chemical bonding between bonded atoms is strong, more stable will be a compound and vice versa.

Types of Chemical Bonding:1) Ionic bonding

It is a type of chemical bonding which involves transfer of electrons between two bonded atoms.

One of the bonded atom, loses an electron and the other atom gains an electron. The atom which loses an

electron gains positive charge, and the other atom which gains an electron acquire negative charge. Later, the force of attraction develops between positively and negatively charged species.



Strength of an ionic bond depends on charged difference between bonded atoms.

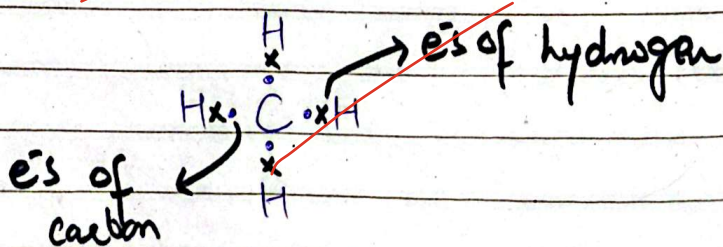
iii) Covalent bond

A covalent bond is formed by the mutual sharing of electrons between bonded atoms.

In this bonding, electrons are mutually shared between bonded atoms, leading to the creation of a new molecule.

For instance;

in case of CH_4 molecule;

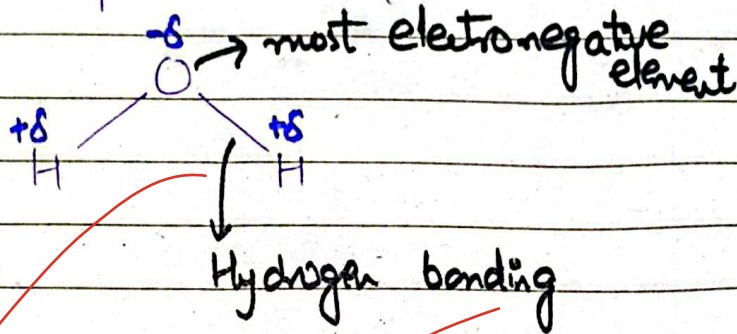


(iii) Hydrogen bonding ✓

Hydrogen bonding is the force of attraction between hydrogen atom and the most electronegative atom.

The atom which is most electronegative withdraws its electrons more towards itself thereby acquiring negative charge. For instance;

In case of water molecule



Part (c) :

Galaxies Formation

Galaxies are formed through a long and complex process that began after Big Bang around 13.8 billion years ago. Here is a stepwise formation of galaxies.

(i) The beginning of galaxies after Big Bang

After Big Bang, the universe was filled with hot gases, mostly hydrogen

and Helium, that spread everywhere, evenly. Tiny fluctuations in the density of gases existed here.

ii) formation of matter clumps

Due to gravity, the slightly denser regions began to attract more gas particles, slowly growing larger over millions of years. These tiny clumps of matter became the first protogalaxies.

iii) Star formation

As the gas clouds collapsed further, their centres heated and formed the first stars. These early stars grouped together, creating star clusters. These star ~~gala~~ clusters are formed within protogalaxies.

iv) Galaxy building

Over time, these small protogalaxies merged and combined under the gravitational pull to form larger structures — the first galaxies.

Different merging patterns result in the formation of different galaxy shapes — spiral, elliptical or irregular.

Evolution of galaxies :

Galaxies continue to change and grow;

• They ~~collide~~ and ~~merge~~ like the Milky way and Andromeda

• New stars form from interstellar gas

Old stars die, and its constituents enrich the galaxies with heavier elements to form new stars

Part (d) :

Big Bang Theory

Big Bang theory explains the formation of Universe.

It states that about 14 billion years ago, the Universe began from an extremely hot, dense and tiny point (a singularity) and has been expanding and cooling ever since.

1. Stages of the Big Bang

Planck Epoch ($0 - 10^{-43}$ seconds)

— earliest moments, all forces were unified

Inflation (10^{-36} - 10^{-32} second)

- Universe expanded faster than speed of light, for very short time

Formation of Basic particles

- Universe cooled, protons, neutrons and electrons formed
- matter and radiation separated

Formation of atoms

- Hydrogen and Helium atoms are formed.
- light was able to travel freely

Formation of stars and galaxies

- Gravity pulled stars together, forming stars and galaxies.

Evidence Supporting the Big Bang:

a) Expansion of Universe

Edwin Hubble discovered that galaxies are moving away from us - that is detected by means of redshift of light.

This means that the space itself is expanding.

b) Cosmic microwave background radiation

- Discovered in 1965 by Wilson
- States that faint radiations left over from the Big Bang the afterglow of the universe

c) Abundance of light elements

The predicted amount of hydrogen, helium, and lithium match what we observe today.

Part (b)

1. Causes of floods in Pakistan

Followings are the major causes of floods in Pakistan.

a) Heavy monsoon rains

Pakistan receives intense monsoon rains from July to September, especially in Sindh, Punjab and Khyber Pakhtunkhwa.

When rains exceeds the river, flashfloods occur.

The 2010 and 2022 floods resulted from heavy monsoon rains.

b) melting of glaciers

Pakistan has over 7,000 glaciers in Gilgit Baltistan region. Rising temperature due to climate change cause rapid glacial melting.

Glacial lake outburst floods in Hunza

c) Deforestation

Large scale cutting of forests in northern Pakistan reduces the land's ability to absorb rain water. It increases surface run-off, soil erosion, and sedimentation in rivers.

Pakistan loses around 27,000 hectares of forest annually.
(UNDP)

d) Climate change

Pakistan ranks among the top 10 most climate-vulnerable countries.

Erratic rainfall patterns, intense heatwaves and glacial melt led to unpredictable floods.

2. Suggestions to cope floods:

- Improve river and drainage infrastructure
- Building dams to enhance water storage capacity
- Launching reforestation and afforestation campaigns
- Develop urban master plans for proper drainage
- Integrate climate resilience into national development planning

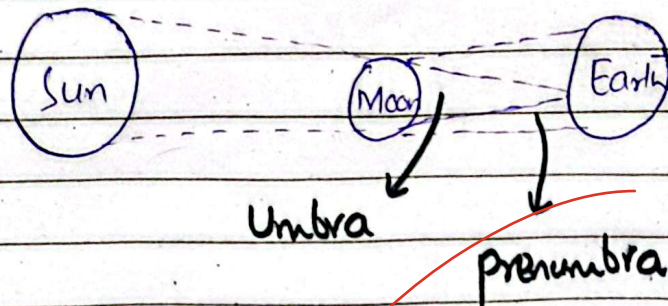
Question no: 01

Solar Eclipse

A Solar eclipse occurs when the moon comes between the Earth and the Sun, thereby partially or completely blocking the sun's light from reaching the Earth.

Solar eclipse can happen only during the new moon phase — a condition when moon, sun and Earth are all aligned in a straight

Line — called as Syzygy.



Umbra — the dark central part — total shadow

Penumbra — the lighter outer region — partial shadow.

a. Types of Solar eclipse

a) Total ^{Solar} ~~lunar~~ eclipse

In this, moon completely covers the sun as viewed from Earth, resultant, day completely turns into night in the eclipse path.

Its duration is about 7.5 minutes.

b) Partial solar eclipse

In this moon partially covers the sun, only penumbral shadow is observed.

c) Annular solar eclipse

The moon covers the sun leaving a bright spot, and forming a ring around it, also called **ring of fire**.

It happens when moon is farther from Earth in its orbit.

3. Lunar eclipse

A lunar eclipse occurs when the Earth comes between the Sun and the Moon and the Earth's shadow falls on the Moon.

It can happen during full moon.

Part CC):

Food contamination

Definition

The unintentional presence of harmful or unwanted substances (like bacteria, chemicals or toxins) in food during production, storage and processing.

Food adulteration

The intentional addition of non-edible and harmful substances in food to increase quantity, shelf life

Cause

contaminants can cause infections and food poisoning.

It can cause Chronic diseases or toxicity

Detection

It may occur accidentally and can be detected by lab tests

It often requires chemical testing

Example

Bacterial contamination of milk

mixing water or detergent in milk

Examples of food contaminants:

- Bacteria — E. coli
- Pesticide residue — on fruits and vegetables
- Heavy metals — lead, mercury, arsenic
- mycotoxins — Produced by molds on nuts and grains
- Cleaning agents or packaging chemicals

Examples of food adulterants:

- Urea or detergent — added in milk to enhance whiteness
- Artificial colours
- Brick dust
- Used oils
Water

Part(c):

Inbalanced diet:

It is defined as;

The diet in which one or more of essential nutrients are missing, deficient or in excess, leading to various health problems.

It lacks or exceeds essential nutrients required for growth, energy and proper development.

Consequences:

- leads to stunted growth and weakness
- Obesity
- Vitamin deficiency - A - night blindness.
- weak immunity