Mah Noor

PART- II

QUESTION 3

(A) CHEMICAL BOND AND COVALENT BOND IN H_2O

Chemical bonding refers to the attractive forces which hold various constituents together and stabilizes them by the overall loss of energy.

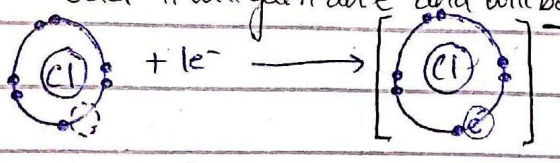
Chemical bonding involves the formation of a bond between two or more atoms, molecules or ions to give rise to a chemical compound. Chemical bonding stabilizes the atoms or molecules and the overall compound would be stable and not reactive ~~unlik~~ like the Group 8 elements of the periodic table.

Atoms need and form chemical bonds because:

1. Chemical bonding allow elements to make their outermost electronic shell STABLE.
2. It gives them MAXIMUM STABILITY.
3. Elements either lose or gain to attain the electronic configuration of the nearest noble gas through Octet or Duplet Rule.

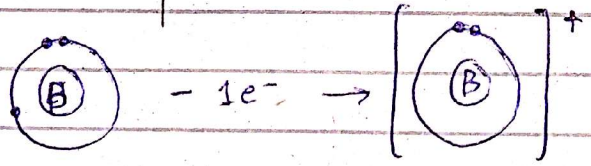
OCTET RULE: When an atom gains or loses electrons to achieve 8 electrons in its outermost shell to achieve the nearest noble gas configuration, it is said that the atom has achieved its octet.

For example, Cl with (7) e^- in its outermost it needs one e^- to complete its octet. It will gain an e^- and will become stable in nature.



DUPLET RULE: When an atom gains or loses an electron to complete 2 electrons in its outermost shell and become stable, it is said to have completed its duplet.

For example, B with $3e^-$s in its outermost shell will lose $1e^-$ to complete its duplet.



Atoms form different types of chemical bonds, including:

i. Ionic bonds - complete transfer of e^- from one atom to another.

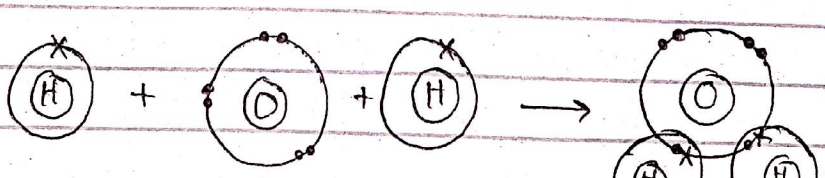
ii - Covalent bonds - sharing of e^-s (one or more pairs) between two atoms

iii - Coordinate Covalent bonds - sharing of e^-s but the shared pair of e^- come from one atom only.

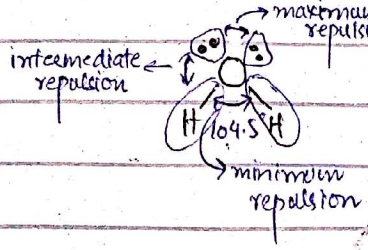
iv - Metallic Bonds - Occurs within metals between positive ions and e^-s

Covalent Bond in a water molecule:

Water molecule has 3 atoms with 2 H-atoms and 1 O-atom. Each H-atom shares an e^- with the e^- of O-atom to complete duplet for H-atoms and octet for O-atom.



The shape of water molecule is V-shape with 104.5° angle because of two lone pairs of O-atoms which lead to e^--e^- repulsion between those two lone pairs.



Non-linear
V-shape

(B) Doping and Types of CERAMICS

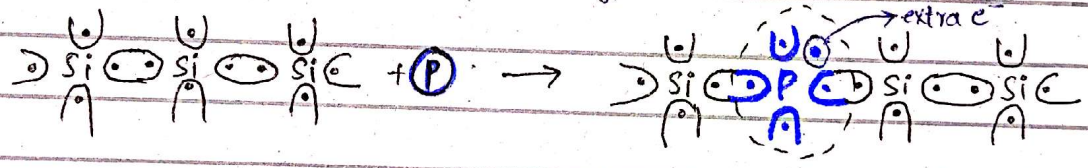
Doping is an addition of impurity to pure semiconductor to enhance electrical properties by addition of a neighbouring trivalent or pentavalent element.

Doping is in a ratio of $1 : 10^6$ — small amount.

Intrinsic Semiconductor (pure) $\xrightarrow{\text{DOPING}}$ **Extrinsic Semiconductor** (impure)

Example:

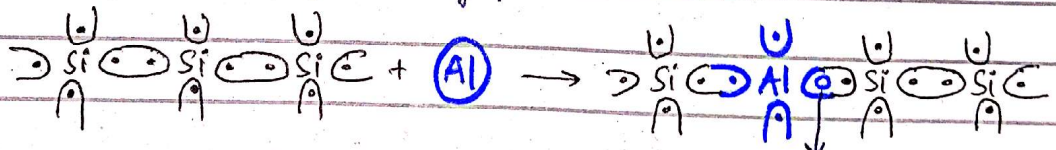
If (Si) a pure intrinsic semiconductor is taken and added with impurity of nearby pentavalent atom (P) (Phosphorus), it will become N-Type extrinsic semiconductor.



Added impurity

N-TYPE SEMICONDUCTOR

If (Si) is taken and added with a trivalent neighboring element, a P-Type semiconductor will be formed. e.g If we add (Al)



hole

P-TYPE SEMICONDUCTOR

CERAMICS:

Ceramics are inorganic + non-metallic solid that have been shaped and then hardened by heating at high temperature. Ceramics are hard, corrosion-resistant and brittle in nature. They are used in variety of applications e.g. in bricks, plates, tiles, glass, engine parts, space-shuttle enamel coatings. They are produced through molding, glazing and heating.

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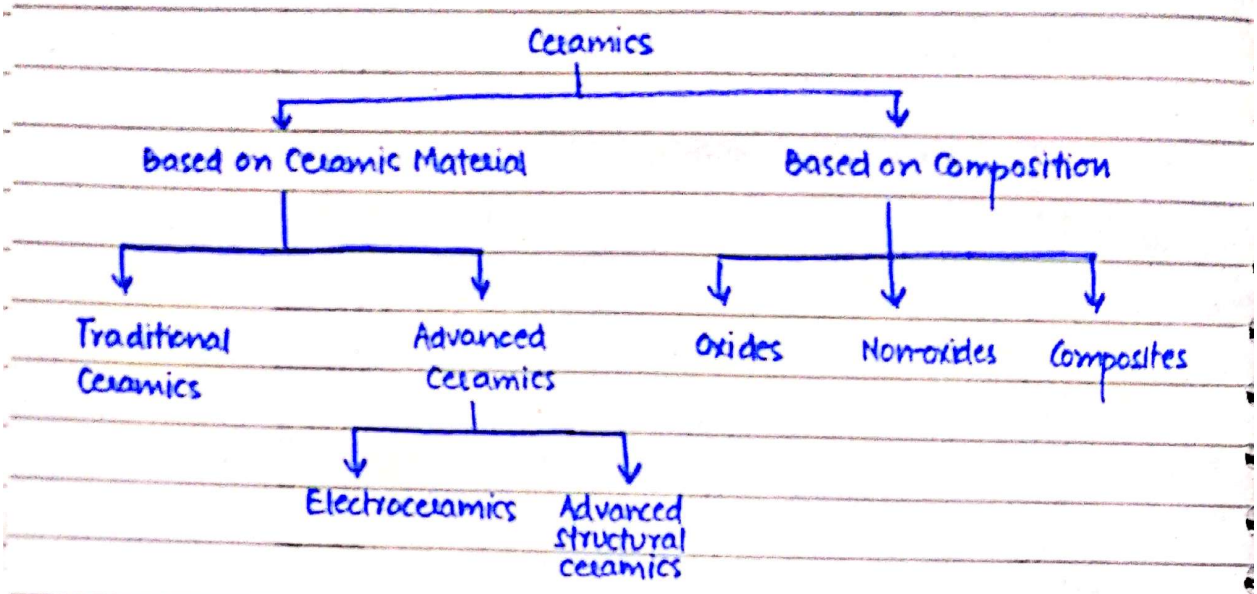

① Based on Ceramic Material

a. Traditional Ceramics: Materials made from natural materials and used in pottery, tableweares, and decorations. It includes whitewares, brick and tile, abrasives, cement, refractories and structural clay products.

b. Advanced Ceramics: Made of ceramic material which exhibit special properties.

i. Electroceramics: They have electrical properties and applications. They include capacitor, magnetic ceramics, optical ceramics and conductive ceramics.

ii. Advanced Structural Ceramics: They have enhanced mechanical properties. They include nuclear ceramics, automotive ceramics and bioceramics

② Based on Composition

a. Oxides: Inorganic ~~oxides~~ compounds made up of metallic or metalloid elements like aluminium, silicon and zirconia. They are used

in industries e.g. electronics, automotives and aerospace. They include alumina, iron oxide and zirconia.

b. Non-Oxides: Chemical compounds made from metals and ~~non~~ oxygen free elements e.g carbon, nitrogen and silicon. They are composed of carbides, nitrides and borides etc.

c. Composites: Chemical compounds with a combination of both oxides and non-oxides.

© Merits and demerits of global warming

Global warming refers to long-term rise in Earth's average temperature, primarily due to increased levels of greenhouse gases like CO_2 in the atmosphere. It significantly impacts the environment and human activities bringing both advantages and disadvantages.

Merits of Global Warming

1. Extended Growing Seasons.
   Warmer climate in some regions allow crops to grow for longer periods

2. Arctic Opportunities
   Melting ice open new shipping routes and access to mineral and energy resources leading to surge in globalization.

3. Increased Forest Growth
   Higher levels of CO_2 in the atmosphere can enhance photosynthesis, boosting plant growth.

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4. Milder winters

It could lead to reduced heating costs and fewer cold-related illnesses in colder regions.

De-merits of global warming

1. Rising sea level

Coastal areas face increased flooding due to melting glaciers and ice caps.

2. Extreme Weather

More frequent and severe hurricanes and heatwaves and droughts disrupt lives.

3. Loss of Biodiversity

Many species are unable to adapt to rapid environmental changes, leading to extinction.

4. Impact to Agriculture

While some regions benefit, other suffer from reduced crop yields due to drought and soil degradation.

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Polio

- Poliomyelitus is a highly infectious viral disease which mainly affects young children.
- Polio cases decreased over 99% since 1988 from an estimated 350,000 cases to **17 cases in 2024**. (Acc. to Pakistan Polio Eradication Programme)
- Pakistan and Afghanistan have never stopped its transmission b/c of its poor sanitation, weak health systems and insecurity, can spread from these endemic countries to others.
- can be completely eradicated, (3) strains of wild poliovirus and can't survive out of body for long, if no unvaccinated body - polio will die out.

Symptoms:

- highly infectious, invades nervous system and cause total paralysis in hours
- initial symptoms: fever, fatigue, headache, vomitting, stifness in neck and pain in limb
- 1 in 200 infections - irreversible paralysis (in legs)
- 5% - 10% die when their breathing muscles get immobilized.
- affects children under (5)

Spread and Development:

- spread in human faeces, get infected with contaminated food and water where poor sanitation and sewage disposal
- Enters body through mouth → proceeds to digestive tract → intestines
- multiplies in body and shed in faeces where more spreading might occur
- if infected people don't wash hands and touch foods — adults when change diapers and touch mouth

Prevention:

- No cure, only prevention
- Immunization - (working) (memory through vaccine)

Polio Vaccine:

(2) types: inactivated polio vaccine (IPV) - infection in leg/arm
oral polio vaccine (OPV) - by mouth

get while other vaccines as child

Children (4) doses:
① At 2 months
② At (4) months
③ At 6-18 "
④ Booster dose at 4-6 years

Q# 7

(A)

Principal (P) = Rs. 1200

Simple Interest (SI) = Rs. 432

Rate of Interest (R) = Time (T)

$$SI = (R \times P \times T)/100$$

$$432 = \frac{(R \times 1200 \times R)}{100} \qquad (R = T)$$

$$432 = 12R^2$$

$$R^2 = 36$$

$$R = 6$$

Rate of Interest = 6%

(B)

Average visitors on Sundays = 510

Average visitors on other days = 240

Month has 30 days starting with a Sunday → 5 Sundays + 25 other days

Total visitors in 5 Sundays = 510 × 5 = 2550

Total visitors in other days = 240 × 25 = 6000

Total visitors in 30 days = 2550 + 6000 = 8550

Average visitor per day = $\frac{8550}{30}$ = 285

Average visitors per day = 285

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(C)

Let the first number = x and second number = y

Given: 40% of x = $\frac{2}{3}$ of y

$$\frac{40}{100}x = \frac{2}{3}y$$

$$\frac{2}{5}x = \frac{2}{3}y \Rightarrow \frac{1}{5}x = \frac{1}{3}y \text{ (divided 2 on both sides)}$$

$$3x = 5y$$

$$\frac{x}{y} = \frac{5}{3} \Rightarrow x \div y = \frac{5}{3} \text{ (ratio)}$$

(D)

2 dices have outcomes = 1, 2, 3, 4, 5, 6

Total outcomes = $6 \times 6 = 36$

A product is even if at least one number is even.

Odd no.s = 1, 3, 5 (3 numbers)

Total odd pair outcomes = $3 \times 3 = 9$ (Product is odd)

Outcomes where product is even = $36 - 9 = 27$

Probability = $\frac{27}{36} = \frac{3}{4}$

Probability = $\frac{3}{4}$