CHEMISTRY QUESTION BANK FOR CLASS TEST 1 COA AND COB

1. **Describe Acharya Kanad's philosophy of the atom.**

Answer: Acharya Kanad, an ancient Indian philosopher, proposed that

- Matter composed of tiny indivisible particles (anu/atoms)

- Atoms indestructible

- Atoms combine to form molecules

- Properties depend on atomic arrangement, giving rise to all forms of matter.

- His philosophy was one of the earliest atomic theories.

2. **State the assumptions of electronic theory of valency.**

Answer: The electronic theory of valency is based on these key assumptions:

- Atoms are stable when they have a full outer electron shell.
- Atoms tend to gain, lose, or share electrons to achieve stability.
- The interactions that stabilize atoms (such as electron transfer or sharing) result in chemical bonds like ionic and covalent bonds.

3. **Explain the characteristics of hydrogen bonding**.

Answer: Hydrogen bonding is a type of intermolecular force that occurs between a hydrogen atom attached to a highly electronegative atom (such as nitrogen, oxygen, or fluorine) and another electronegative atom. Characteristics include:

- It is a weak bond compared to covalent or ionic bonds.
- It is responsible for unique properties of compounds, like the high boiling point of water.

4. **Describe the types of intermolecular forces.**

Answer: Intermolecular forces are the forces between molecules and include:

- Dipole-dipole interactions: Forces between polar molecules.
- London dispersion forces: Temporary attractive forces in non-polar molecules due to momentary charge distributions.
- Hydrogen bonds: A strong type of dipole-dipole force involving hydrogen and highly electronegative atoms.

5. **Explain the formation of electrovalent bonds and their characteristics.**

Answer: Electrovalent or ionic bonds form when one atom transfers electrons to another, creating oppositely charged ions that attract each other. Characteristics include:

- Formed between metals and nonmetals (e.g., NaCl).
- Ionic compounds are solid at room temperature and have high melting and boiling points.
- They conduct electricity when dissolved in water or molten, as ions are free to move.

6. **Compare and contrast crystalline and amorphous solids**.

	Crystalline solid		Amorphous solid
(i)	They have a definite geometrical shape	(i)	They have an irregular shape
(ii)	They have a sharp melting point	(ii)	They melt over a range of temperature
(iii)	They are anisotropic	(iii)	They are isotropic
(iv)	They are pure solid	(iv)	They are supercooled liquid.
(v)	They have long-range order of regular pattern of arrangement of constituent particles.	(v)	They have short-range order of regular pattern of arrangement of constituent particles.
(vi)	They have definite heat of fusion.	(vi)	They do not have a definite heat of fusion.

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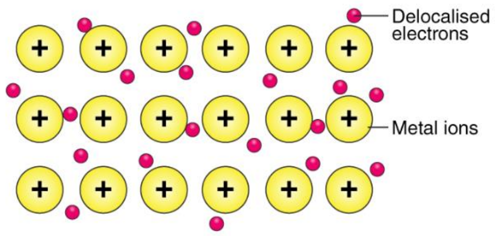
7. **Describe the properties of metallic solids and their unit cells.**



Answer:

Metallic solids are characterized by:

- High electrical and thermal conductivity due to a “sea” of delocalized electrons.
- Malleability and ductility, allowing them to be shaped without breaking.
- High melting points due to strong metallic bonding.

Unit cells: Common metallic unit cells include body-centered cubic (BCC), face-centered cubic (FCC), and hexagonal close-packed (HCP).

8. **Explain the different types of covalent bonds (polar, non-polar, coordinate) and provide examples.**

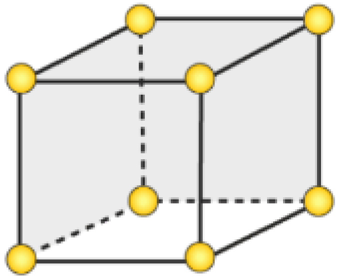
Answer: • Polar covalent bonds: Unequal sharing of electrons between atoms, resulting in partial charges (e.g., HCl).

• Non-polar covalent bonds: Equal sharing of electrons between atoms, leading to no charge separation (e.g., O2).

• Coordinate covalent bonds: One atom donates both electrons in the bond (e.g., NH4+ in ammonium ion).

9. **Define unit cell and describe simple cubic unit cell.**

Answer: A unit cell is the smallest repeating structure of a crystal lattice that retains the overall symmetry and properties of the entire crystal.



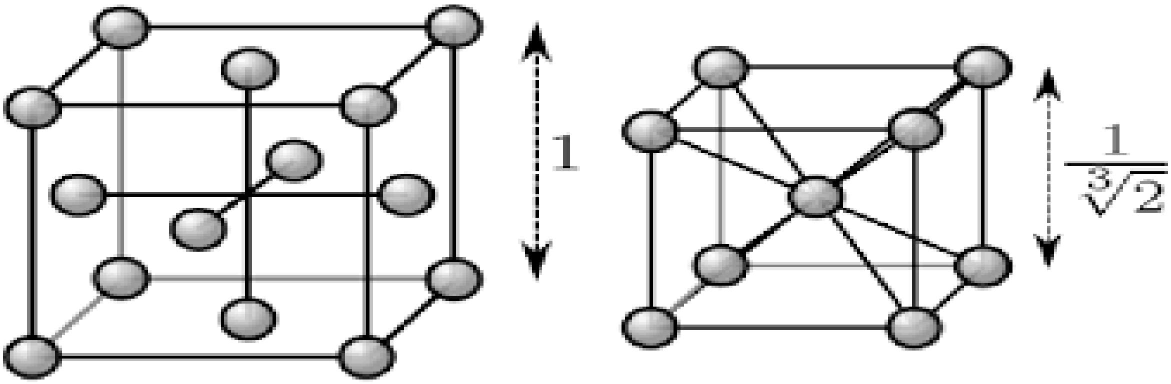
In a simple cubic unit cell, atoms are positioned at the cube's corners. Each corner atom is shared with eight neighbouring cells, resulting in low packing efficiency.

10. **Differentiate between BCC and FCC unit cells.**

BCC	FCC
The term BCC stands for the body-centered cubic arrangement of spheres (atoms, molecule or ions from which the lattice is made of).	The term FCC stands for the face-centred cubic arrangement of spheres.
BCC has spheres in the eight corners of a cube and one sphere in the centre of the cube.	FCC has spheres in the eight corners of a cube and also in the centres of the cubic faces.
The coordination number of the BCC structure is 8.	The coordination number of the FCC structure is 12.
The packing factor of BCC is 0.68	The packing factor of FCC is 0.74
A unit cell of BCC has a net total of 2 spheres.	A unit cell of FCC has a net total of 4 spheres.
Some examples of metals that have the BCC structure include Lithium (Li), Sodium (Na), Potassium (K), Chromium (Cr) and Barium (Ba).	Some examples of the metals having FCC structure are Aluminum (Al), Copper (Cu), Gold (Au), Lead (Pb) and Nickel (Ni).

11.Explain the differences between face-centered cubic (FCC) and body-centered cubic (BCC) unit cells with diagrams.

Answer:

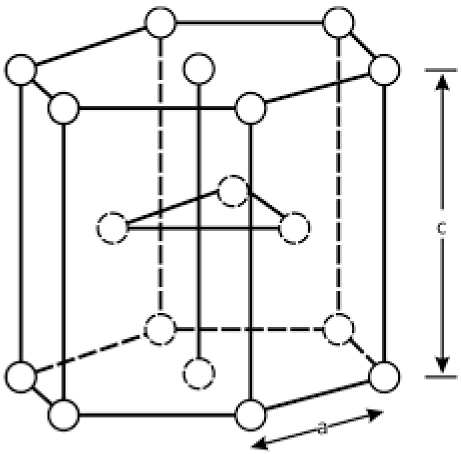


• FCC: Contains atoms at each of the cube’s corners and the centers of each face. It has a higher packing efficiency of 74% and is more stable. Found in metals like aluminum and copper.

• BCC: Contains atoms at each corner and a single atom in the center of the cube. It has a packing efficiency of 68% and is less stable than FCC. Found in metals like iron.

12.Explain the characteristics and applications of hexagonal close pack (HCP) crystals.

Answer: Characteristics of HCP crystals:



• High packing efficiency due to layers that stack in an ABAB pattern.

• Hexagonal symmetry with a coordination number of 12, contributing to its stability.

Applications: HCP structures are common in metals like magnesium and titanium, used in applications requiring strength and light weight, such as aerospace and automotive industries.

13.Define valency and what are types of valency?

Valency, also known as valence, refers to the number of electrons an atom loses, gains, or shares to form chemical bonds with other atoms. It represents the combining capacity of an atom.

Types of Valency:

There are several types of valency, classified based on the way atoms interact:

1. **Electrovalency (Ionic Valency):**

Atoms lose or gain electrons to form ions with opposite charges, resulting in electrovalent bonds. Example: Sodium (Na) loses one electron to form Na^+ ion, while Chlorine (Cl) gains one electron to form Cl^- ion.

2. **COvalency:**

Atoms share one or more pairs of electrons to form covalent bonds. Example: Hydrogen (H) shares two electrons with Oxygen (O) to form H2O.

3. **Coordinate Valency (Dative Valency):**

One atom donates a pair of electrons to another atom, forming a coordinate bond. Example: Ammonia (NH3) donates a pair of electrons to Boron (B) to form NH3-B.