Types of bonding and Forces in solid

1. (b) In electrovalent crystal has cation and anion are attached by electrostatic forces.

2. (d) Mercury has very weak interatomic forces so it remains in liquid state.

3. (c) The melting and boiling points of argon is low hence, in solid argon atoms are held together by weak Vander Waal's forces.

4. (c) *NaF* is the strongest ionic crystal so its melting point would be highest.

5. **(d) The exchange energy of mobile electrons**
Explanation: Metals have a "sea of mobile electrons" that move freely among positive metal ions. This delocalization leads to strong cohesive forces known as **metallic bonding**.

6. **(a) CO**
Explanation: Carbon monoxide (CO) exists as small **diatomic molecules**.
Graphite and copper are **giant structures**, while dry ice (solid CO_2) consists of discrete molecules but forms a **molecular solid** — if question asks for single molecular species, **CO** fits better.

7. **(d) Highly directed bonds**
Explanation: Metallic bonds are **non-directional** because the delocalized electrons are shared by all metal ions equally.

8. **(b) Changes**
Explanation: On melting, the **ordered lattice** of a solid is **disrupted**, and the particles become randomly arranged while remaining close together.

9. (b) Diamond is the hardest substance it's melting point would be highest.

10. (c) Bond is formed by attractive and repulsive forces of both the atoms.

11. **(b) Neon (Solid)**

Explanation:
Solid **neon** is held together only by **weak van der Waals (London dispersion) forces**, since it is a **noble gas** with completely filled orbitals.
Other substances have much stronger bonds:

- **Diamond** → strong **covalent bonds** (each carbon bonded tetrahedrally).
- **KCl** → strong **ionic bonds** between K^+ and Cl^-.
- **Ice** → moderate **hydrogen bonds** between water molecules.

Hence, **solid neon** has the *weakest* bonding among the given options.

12. (a) Generally zero group elements are linked by the Vander Waal' s force. Hence these show weakest intermolecular forces.

13. (d) Glycerol has a three *OH* group hence it is viscous in nature.

14. (c) Vander waal's forces is the weakest force of attraction.

15. **(a) LiCl > NaCl > KCl > RbCl > CsCl**

Explanation:
Lattice energy **decreases down the group** as the **cation size increases**.
Smaller cations can approach the anion more closely, leading to **stronger electrostatic attraction** and **higher lattice energy**.

Thus, for alkali metal chlorides:
$Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$ (in size)

16. (b) NH_4^+ contain all three types of bond in its structure $\left[\begin{array}{c} H \\ | \\ H-N\rightarrow H \\ | \\ H \end{array}\right]^+$

17. (d) In $NaOH$ covalent bond is present in $O-H$ bond while ionic bond is formed between OH^- and Na^+.

18. (a) Bond formation is an exothermic reaction so there is decrease in energy of product.

19. **(d) Both (a) and (b)**

Explanation: A chemical bond forms due to the **balance between attractive and repulsive forces** between atoms. Attraction binds the atoms, while limited repulsion prevents collapse.

20. **(c) Chemical bond formation takes place when forces of attraction overcome the forces of repulsion**

Explanation: Bonding occurs when the **net attractive force** between atoms (nucleus–electron attraction) is **greater than the repulsive forces** (nucleus–nucleus and electron–electron repulsion).

21. **(d) It has electrovalent, covalent and coordinate bonds**

Explanation:

- **Electrovalent bond** between Cu^{2+} and SO_4^{2-} (ionic part).
- **Coordinate bonds** between Cu^{2+} and NH_3 ligands.
- **Covalent bonds** within NH_3 molecules.

22. (d) Blue vitriol is $CuSO_4.5H_2O$ and it has all types of bonds.

23. (a) $\left[\begin{array}{c} H \\ | \\ H-N\rightarrow H \\ | \\ H \end{array}\right]^+ Cl^-$

Ionic bond = 1, Covalent bond = 3

Co-ordinate bond = 1.

24. (d) **Van der Waals' attraction**

Explanation:

Covalent molecules in the solid or crystalline state — such as **iodine (I_2), sulfur (S_8), or carbon dioxide (CO_2)** — are held together by **weak Van der Waals forces**.

These are **intermolecular forces** caused by **temporary or induced dipoles**, and are **much weaker** than covalent or ionic bonds.