

Covalent bonding

21. (a) Two identical atoms are joined with covalent bond so H_2 will be covalent.
22. (a) Covalent in CCl_4 and electrovalent in CaH_2

Explanation:

- In **carbon tetrachloride (CCl_4)**, carbon and chlorine share electrons, forming **covalent bonds**.
- In **calcium hydride (CaH_2)**, calcium (a metal) donates two electrons to two hydrogen atoms (nonmetals), forming **Ca^{2+} and H^- ions**, which are held together by **electrovalent (ionic) bonds**.

Hence, the bonding is **covalent in CCl_4** and **electrovalent in CaH_2** .

23. (c) Element 'X' has atomic no. 7 so its electronic configuration will be 2, 5. So its electron dot symbol would be $\cdot \ddot{X} \cdot$.
24. (c) C-S will be most covalent. Covalent character depend on the size of cation and anion.
25. (c) HCl has ionic character yet it has covalent compound because electronegativity of chlorine is greater than that of hydrogen.
26. (c) Order of polarising power $Be^{++} > Li^+ > Na^+$
Hence order of covalent character $BeCl_2 > LiCl > NaCl$.
27. (a) Greater than bond energy of H-bond

Explanation:

The **O-H covalent bond** in water is much stronger (bond energy ≈ 460 kJ/mol) than a **hydrogen bond** (bond energy $\approx 10-40$ kJ/mol).

Hence, the **bond energy of the O-H covalent bond is greater** than that of a hydrogen bond.



28. (a) Molecular solid

Explanation:

Solid **methane** (CH_4) consists of **neutral CH_4 molecules** held together by weak **van der Waals forces** (London dispersion forces).

Such solids are called **molecular solids**.

29. (a) Have similar electronegativities

Explanation:

A **covalent bond** forms when two atoms **share electrons**.

This sharing is possible only when both atoms have **similar or nearly equal electronegativities**, preventing electron transfer.

30. (d) Equally shared between them

Explanation:

When two **identical non-metal atoms** (e.g., H_2 , Cl_2 , O_2) bond together, their **electronegativity is the same**, so the **shared electron pair is equally attracted** to both atoms.

Thus, the electrons are **equally shared**, forming a **pure covalent bond**.

31. (b) Valency of phosphorus in H_3PO_4 is supposed 'x' then $3 + x - 8 = 0$, $x - 5 = 0$,
 $x = 5$.

32. (a) Germanium

Explanation:





- **Germanium (Ge)** is a **metalloid** that forms a **giant covalent (network) structure**, similar to silicon.
- **Sodium chloride (NaCl)** has **ionic bonding**.
- **Solid neon (Ne)** is held by **weak van der Waals forces** (no bonding between atoms).
- **Copper (Cu)** exhibits **metallic bonding**.

Hence, **Germanium** shows **covalent bonding**.

33. (d) $(+1) + x + 3(-2) = 0 \Rightarrow 1 + x - 6 = 0 \Rightarrow x = 6 - 1 = 5$.

34. (a) HCl molecule has covalent bond.

35. (d) Electrovalent compounds have high melting point and high boiling point.

36. (b) Middle length of $H_2 = 74 \text{ pm}$

$$\text{Length of } H = \frac{74}{2} = 37 \text{ pm}$$

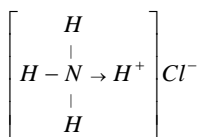
$$\text{Middle length of } Cl_2 = 198 \text{ pm}$$

$$\text{Length of } Cl = \frac{198}{2} = 99 \text{ pm}$$

$$\begin{aligned} \text{Bond length of } HCl &= \text{Length of } H + \text{Length of } Cl \\ &= 37 + 99 = 136 \text{ pm} \end{aligned}$$

37. (d) Compound has 254 gm of I_2 means $\frac{254}{127} = 2$ mole, while 80 gm O_2 means $\frac{80}{16} = 5$ mole so they will form compound I_2O_5 .

38. (c) NH_4Cl has covalent as well as ionic bond.



39. (d) Covalent character increases when we come down a group so CaI_2 will have highest covalent character.
40. (c) Low boiling point

Explanation:

Covalent compounds consist of **neutral molecules** held together by **weak intermolecular forces** (like van der Waals or dipole-dipole interactions).

As a result:

- They generally have **low melting and boiling points**.
- They are **poor conductors of electricity**.
- They are usually **insoluble in water** but soluble in organic solvents.

Hence, covalent compounds **commonly exhibit low boiling points**.

