Covalent Bonding Knowledge Organiser

**Bonding**

Use the step by step in your book to draw a covalent bonding for: H₂, O₂, NH₃, CH₄. Use page 44+45 to check and mark your answers. H₂O has been done for you as an example.

**Common mistakes when drawing covalent bonds:**
- Not using dots and crosses
- More electrons in the final substance than the atoms you started with
- Odd number of electrons in the bond
- All atoms not having full outer shells (no more or less!)

**Major differences between ionic and covalent bonding:**

<table>
<thead>
<tr>
<th>Ionic</th>
<th>Covalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrons are transferred</td>
<td>Electrons are shared</td>
</tr>
<tr>
<td>Ions are formed</td>
<td>No ions are formed</td>
</tr>
<tr>
<td>Between metal atoms and non-metal atoms</td>
<td>Between non-metal atoms</td>
</tr>
</tbody>
</table>

**Properties**

- **State and explain three properties of giant covalent structures**
  1. **High melting and boiling points.** This is because it requires a lot of energy to break the strong covalent bonds between atoms.
  2. **Other than graphite do not conduct electricity:** due to there being no charged particles (electrons or ions) free to move and carry charge.
  3. **Other than graphite are hard:** the covalent bonds are strong and hard to break.

On the reverse of the sheet explain why:
- Diamond is used on the ends of industrial drills
- Silicon dioxide is used to make moulds for pouring molten metal into
- Graphite is used as a lubricant

**State and explain two general properties of simple molecular substances:**

1. **Low melting and boiling points:** forces holding molecules together are weak and easy to break. Note that bigger molecules have stronger intermolecular forces so higher melting and boiling points.
2. **Do not conduct electricity:** due to there being no charged particles (electrons or ions) free to move and carry charge.

On the reverse of the sheet draw a diagram and explain why water has a low melting and boiling point.

**State and explain two properties of fullerenes:**

1. **Fullerenes are very strong (they have a high tensile strength)** because of the strong covalent bonds holding the structure together.
2. **They can be used as lubricants** as there are only weak forces holding the fullerenes together (like with simple molecular).

State a use for graphene and for fullerenes
They can be used for drug delivery and graphene can be used for ultra-fast computer chips.

Extension: Do you think fullerenes should be classed as giant covalent or simple molecular? Give reasons for your answer.

**Future learning:** polymers, crude oil, A Level structure and bonding

**Key words:**
- Covalent bond
- Giant covalent
- Simple molecular
- Fullerene
- Graphene
- Diamond
- Graphite
- Delocalised electrons

**Previous learning:** atomic structure and ionic bonding