

<b>Topic</b>	Bonding, structure and physical properties	<b>Level</b>	GCSE
<b>Outcomes</b>	<ol style="list-style-type: none"><li>1. To describe the structure and bonding of metallic, ionic and covalent compounds</li><li>2. To relate the structure and bonding of a substance to its properties</li></ol>		

**Progress:** further resources on bonding are available here [www.thescienceteacher.co.uk/bonding/](http://www.thescienceteacher.co.uk/bonding/)

	<b>Metallic</b>	<b>Ionic</b>	<b>Giant Covalent</b>	<b>Simple Molecular</b>
<b>Present</b>	Metals only	Metals and Non-metals	Non-metals only	Non-metals only
<b>Bonding</b>	Metallic	Ionic	Covalent	Covalent
<b>Structure</b>	Giant lattice	Giant lattice	Giant lattice	Simple molecular
<b>Made up of</b>	Positive metal ions and delocalized electrons	Positive metal ions and negative non-metal ions	Atoms	Molecules
<b>Diagram</b>			See specific examples of diamond, graphite and silicon dioxide	
<b>Properties</b>	<ol style="list-style-type: none"> <li>1. High melting and boiling point</li> <li>2. Good conductor of electricity</li> <li>3. Malleable (easy to be bent and shaped)</li> </ol>	<ol style="list-style-type: none"> <li>1. High melting and boiling point</li> <li>2. Good conductor of electricity when dissolved in water or molten</li> </ol>	<ol style="list-style-type: none"> <li>1. High melting and boiling points</li> <li>2. Most do not conduct (the exception is Graphite)</li> </ol>	<ol style="list-style-type: none"> <li>1. Low melting and boiling points</li> <li>2. Do not conduct electricity</li> </ol>
<b>Explanation of properties</b>	<ol style="list-style-type: none"> <li>1. Lots of energy needed to break strong metallic bonds</li> <li>2. Metals have delocalized electrons that are free to move throughout and carry an electric current</li> <li>3. Metal atoms are arranged in layers that are able to slide over each other.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lots of energy needed to break the strong bonds between the positive and negative ions.</li> <li>2. When Ionic compounds dissolve or melt the ions are free to move and carry an electric current.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lots of energy needed to overcome the strong covalent bonds.</li> <li>2. No free electrons (except in graphite)</li> </ol>	<ol style="list-style-type: none"> <li>1. Weak intermolecular forces that require very little energy to be broken.</li> <li>2. No free electrons</li> </ol>
<b>Examples</b>	gold, platinum, iron	sodium chloride, potassium fluoride, magnesium oxide	diamond, graphite, silicon dioxide	chlorine, oxygen, hydrogen, helium