Beckfoot

Chemistry | Structure and Bonding | Year 10

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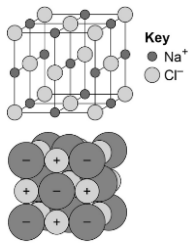
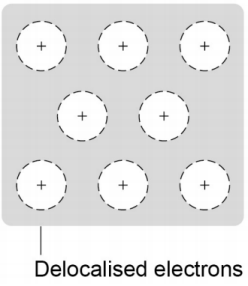
Ionic bonding

1	**Particles involved**	Oppositely charged ions
2	**Elements involved**	Compounds made from metals and non-metals
3	**Caused by**	Transfer of electrons from metal to non-metal, creating oppositely charged ions.
4	**Representation**	

Properties of ionic compounds

1	**Structure**	Giant ionic lattice
2	**Do they conduct electricity?**	When solid, no – ions cannot move. When molten or in solution, yes – ions can move.
3	**Melting and boiling points**	High – strong forces of attraction between oppositely charged ions

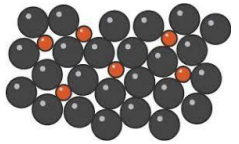
Metallic bonding

1	**Particles involved**	Atoms sharing delocalised electrons
2	**Elements involved**	Metallic elements and alloys
3	**Representation**	

Properties of metals

1	**Structure**	Regular lattice of positive metal ions in an 'sea' of delocalised electrons
2	**Do they conduct electricity?**	Yes, delocalised electrons can move through the metal
3	**Melting and boiling points**	High – strong forces of attraction between positive metal ions and delocalised electrons
4	**Hardness**	Metals are relatively soft – layers can slide. Alloys are hard.

Alloys

1	Structure	Metal atoms mixed with another element (metal or non-metal)
2	Representation	
3	Hardness	Harder than pure metal as layers are distorted and cannot slide

Key Vocabulary

1	**Melting point**	Temperature at which a solid turns to liquid.
2	**Boiling point**	Temperature at which a liquid turns to gas.
3	**Cation**	Positively charged particle
4	**Allotropes**	Different structural forms of an element.
5	**Delocalised**	Electrons that are no longer bound to a single atom, and are free to move

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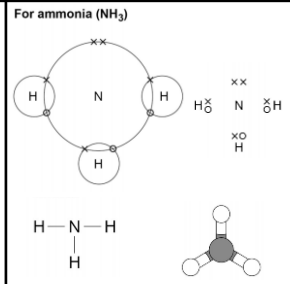
Covalent bonding

1	**Particles involved**	Atoms sharing a pair of electrons
2	**Elements involved**	Non-metallic elements and compounds
3	**Representation**	

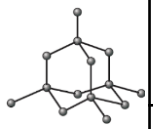
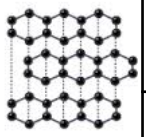
Properties of molecular compounds

1	**Bonding**	Strong covalent bonds between atoms, weak intermolecular forces between molecules.
2	**Do they conduct electricity?**	No, as there are no charged particles.
3	**Melting and boiling points**	Low – weak forces of attraction between molecules

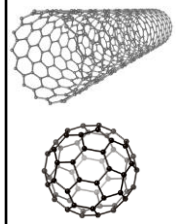
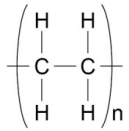
Giant covalent structures

1	**Bonding**	Strong covalent bonds between atoms
2	**Do they conduct electricity?**	Only those with delocalised electrons
3	**Melting and boiling points**	High – strong covalent bonds between atoms

Carbon

	Property	**Explanation**
Diamond 	Hard, high melting point	Every carbon bonded to 4 others with strong covalent bonds.
	Does not conduct electricity	No ions or delocalised electrons.
	Soft	Layers of carbon atoms can slide.
	Conducts electricity	Each carbon has a delocalised electron, which can carry charge.

Other giant structures

Fullerenes 	Structure	Molecules of carbon atoms with hollow shapes
	Uses	Fullerenes – drug delivery. Nanotubes – strengthen composite materials.
Polymers 	Structure	Repeating monomers connected by strong covalent bonds
	Properties	Relatively high melting points due to strong intermolecular forces.

Nanochemistry (chemistry only)

1	**Nanoscience**	Study of particles between 1 and 100 nm in size.
2	**Nanometre**	A billionth of a metre (1×10^{-9} m)
3	**Uses of nanotechnology**	Medicine, electronics, cosmetics, catalysts.
4	**Advantages**	Wide range of applications due to increased surface area to volume ratio and therefore reactivity
5	**Disadvantages**	Long-term impact on health not fully understood.