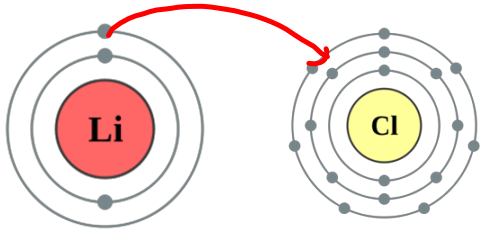
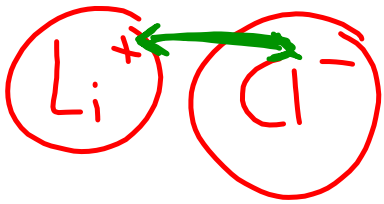
The 3 types of bonding

The type of bonding in a substance is related to the electronegativity of the atoms involved and the number of electrons in their outer shell.

The magic number for deciding the type of bonding that will occur is 1.8.

Take the example of lithium and chlorine.



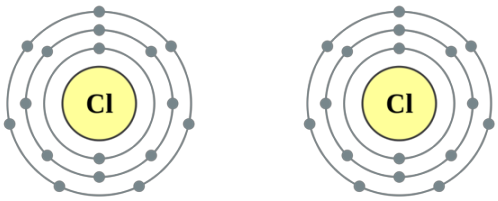


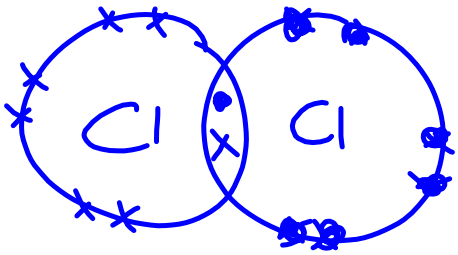
1.0 ⟷ 3.2

2.2

2.2 > 1.8 → Ionic bonding

Take the example of chlorine and chlorine.



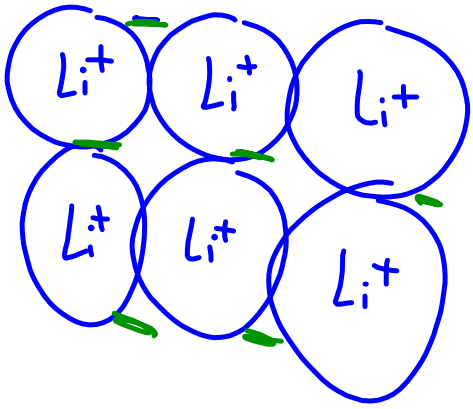


3.2 ⟷ 3.2

0

0 < 1.8 → Covalent bonding

Take the example of lithium and lithium.



1.0 1.0

Any metals --> metallic bonding

State the type of bonding in these molecules by calculating the difference in electronegativity

A.

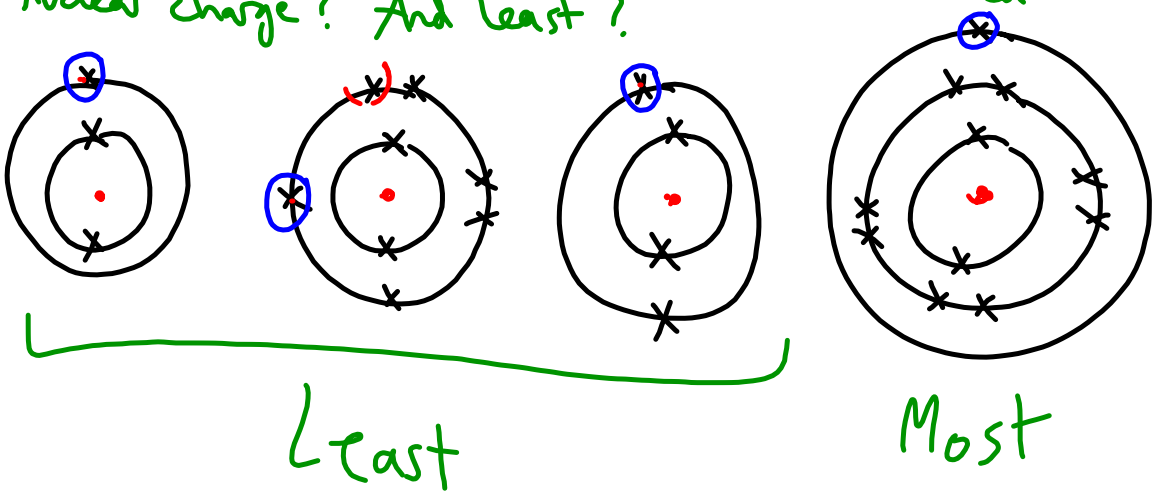
		Difference	Bonding
1.	HCl	0.9	C
2.	KBr	2.0	I
3.	Mg metal	—	M
4.	N_2	0	C
5.	Rb_3N	2.2	I
6.	$AlCl_3$	1.5	C
7.	MgS	1.2	C
8.	Fe_2O_3	1.7	C

1.8

1.8 < Ionic

1.8 > Covalent

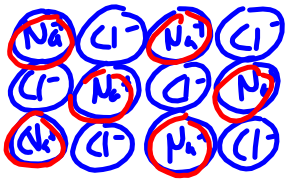
B. Which of the outer electrons is the most "shielded" from nuclear charge? And least?



Type of bonding vs. properties

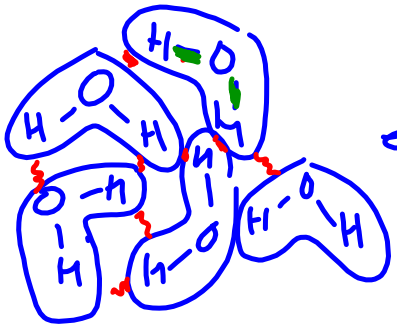
Melting point - Low, medium or high

Ionic - High



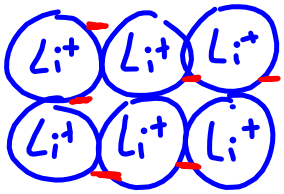
Because we need to break all of the strong electrostatic attractions. This requires a lot energy.

Covalent - Low



Because I only need enough energy to overcome the weak forces of attraction (~) the melting point is low.

Metallic - High

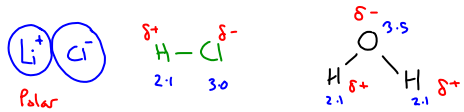


Because we must break the strong electrostatic attractions between the Li^+ ions and the sea of electrons.

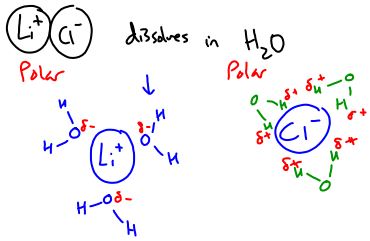
Solubility in water and acetone

Like dissolves like

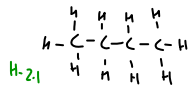
By 'like' we are talking about substances with similar polarity. We say a molecule is polar if one side of the molecule experiences more negative charge than another.



Dissolving ionic compounds in water:



Covalent compounds such as butane:

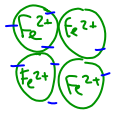


Non-polar

does not dissolve in H_2O

Polar

Metallic compounds in water:



Do not dissolve in water due to the strength in metallic bonding.

How is their solubility in <u>covalent solvents</u> such as acetone?
Non-polar

Ionic compounds (Polar) ⟶ Do not dissolve

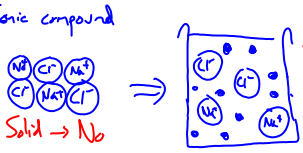
Covalent compounds (Non-polar) ⟶ Dissolve

Metallic compounds ⟶ Do not dissolve

Conductivity

We need the free movement of charged particles.

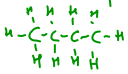
Ionic compound



Solid → No

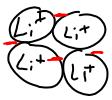
In aqueous solutions (dissolved in H_2O) YES

Covalent compounds



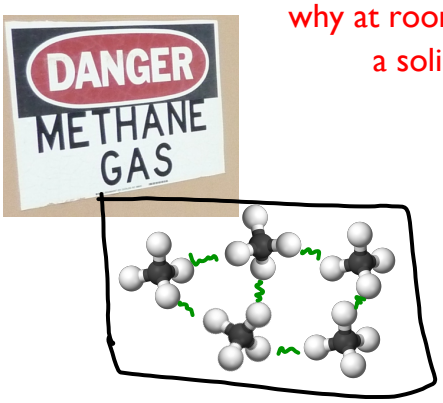
NO

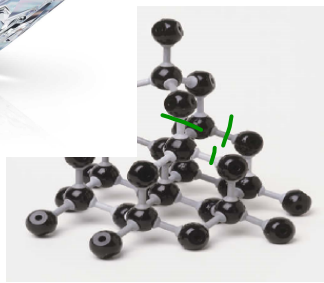
Metallic compounds



YES

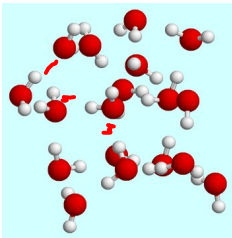
Both methane (CH4) and diamond (C) are covalent compounds so why at room temp is methane a gas and diamond a solid?

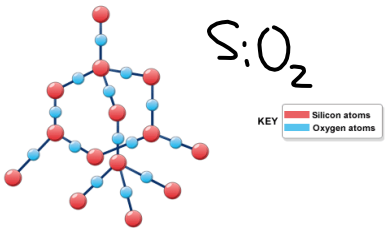




Simple covalent molecules

Giant covalent structures





Very low mp and bp

Very high mp and bp