Bonding: knowledge check

1. Use the words to complete the sentences:

covalent bonding ionic bonding metallic bonding

The image shows three diagrams, each representing a different type of bonding.

A. Shows the dot and cross diagrams for Li and F followed by the dot and cross diagram for Li+ and F-

B. Shows the dot and cross diagrams for four H atoms and one C atom followed by the dot and cross diagram for CH4.

C. Shows the outer shell dot and cross diagram for five Mg atoms followed by five circles containing Mg2+ surrounded by 10 crosses.

* 1. The type of bonding in figure A is \_\_\_\_\_\_\_­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  2. The type of bonding in figure B is \_\_\_\_\_\_\_­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  3. The type of bonding in figure C is \_\_\_\_\_\_\_­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Use the words to complete the sentences.

electrostatic forces ionic negatively

non-metal transferred

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonding – this bond is formed when electrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from a metal atom to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ atom, forming positively charged ions and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged ions. Strong \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ attract the oppositely charged ions to each other.

1. Use the words to complete the sentences. You can use words more than once.

covalent electron electrons

outer non-metal

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonding – this bonding occurs between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ atoms. In a single covalent bond, a pair of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is shared between two atoms.   
These shared electrons are found in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ shells of the atoms. Each atom contributes one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the shared pair of electrons.

1. Use the words to complete the sentences. You can use words more than once.

electrons electrostatic forces ions metallic

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonding – the electrons leave the outer shells of metal atoms, forming positive metal ions and a ‘sea’ of delocalised \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that are free to move. This bond is the result of the strong \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of attraction between the positive metal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the negative delocalised \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Bonding: test myself

Use the words to complete the sentences. You can use the words more than once.

1. What types of elements are involved in the following bonds?

metals and non-metals metals only non-metals only

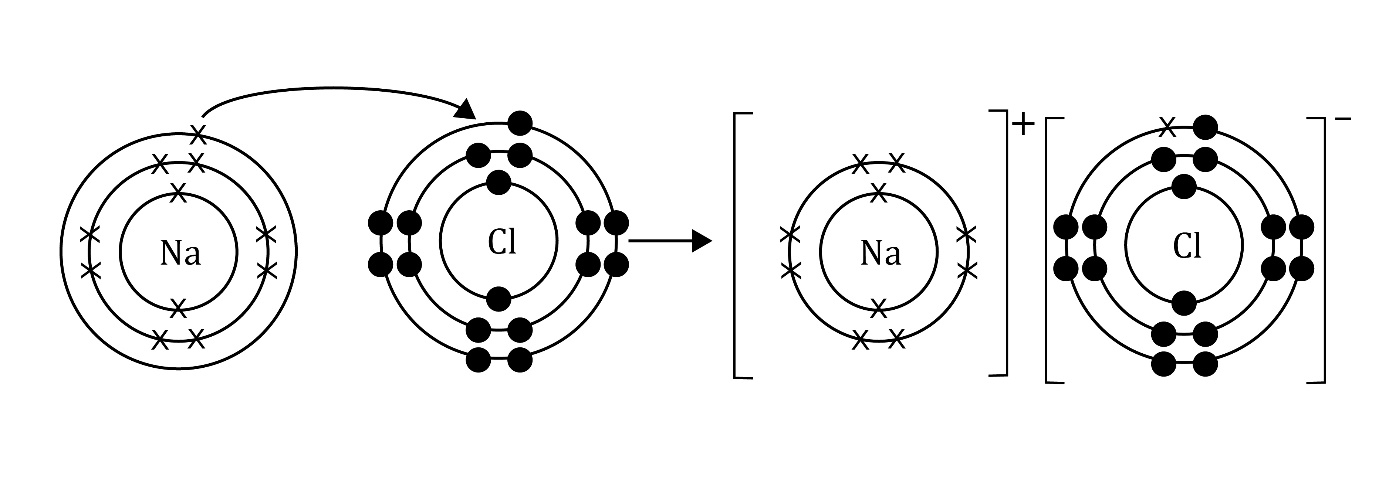
* 1. ionic bonding \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  2. covalent bonding \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  3. metallic bonding \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. In which type of bonding are electrons shared?

covalent ionic metallic

Electrons are shared in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonding.

1. What does the curved arrow represent in this diagram?



atom electron ion shared transferred

The arrow represents an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ being \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from one atom to another.

1. What type of forces hold the particles together in an ionic bond?

covalent forces electrostatic forces ionic forces

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of attraction hold the particles together in an ionic bond.

1. What does ‘delocalised’ mean?

allowed easy free produced

Delocalised means that the electrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to move around.

1. What are the charged particles called in an ionic compound?

electrons ions atoms protons

The charged particles in an ionic compound are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. What type of bonds do you find in a compound?

covalent electronic ionic metallic

The bonds in a compound can be either \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Why are metals good conductors of electricity?

delocalised electrons ions metallic move

Metals are good conductors of electricity because they contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that are free to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and carry the charge.

1. How do ionic compounds conduct electricity when solid, liquid and in solution?

Explain your answer.

gas ions liquid move

solid solution

Ionic compounds cannot conduct electricity when they are in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ state because the ions are not free to move.   
They can conduct electricity when they are in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   
or when they are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and carry the charge.

1. Why are most covalent substances non-conductors of electricity?

atoms charge charged

electrons ions

Most covalent compounds do not conduct electricity because they do not have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­\_\_ particles (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   
or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) that can move and carry the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Bonding: feeling confident?

For questions 3.1 and 3.2, complete the bonding diagrams.

1. The reaction between sodium and fluorine.

An incomplete diagram representing bonding.

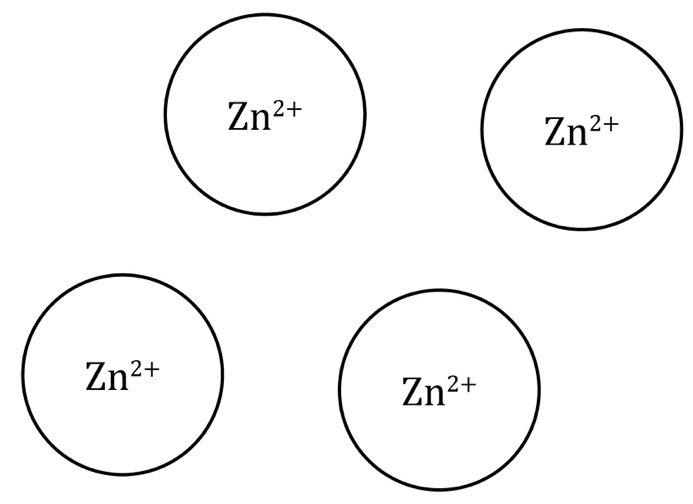
On the left is the electron configuration diagram of Na and F atoms. The Na atom is depicted with crosses and the F atom is depicted with dots. In the centre is an arrow pointing towards the right. On the right are two sets of square brackets. Inside the first square bracket are two concentric circles with Na in the centre. Inside the second square bracket are two concentric circles with F in the centre. 

1. The reaction between hydrogen and chlorine.

An incomplete diagram representing bonding.

On the left is the dot and cross electron configuration of H and Cl. The diagram for H uses crosses and the diagram for Cl uses dots. In the centre is an arrow pointing towards the right. On the right is a blank space for the learner to complete the diagram.

1. Add electrons to the diagram to show the metallic bonding in zinc.



Bonding: what do I understand?

Think about your answers and confidence level for each mini-topic. Decide whether you understand it well, are unsure or need more help. Tick the appropriate column.

|  |  |  |  |
| --- | --- | --- | --- |
| **Mini-topic** | **I understand  this well** | **I think I understand this** | **I need more  help** |
| I can identify ionic, covalent and metallic bonds from diagrams. |  |  |  |
| I know that there are ions in ionic bonds. |  |  |  |
| I know about electrostatic forces in ionic bonds. |  |  |  |
| I know that electrons are shared in covalent bonds. |  |  |  |
| I know that there are positive metal ions and negative delocalised electrons in metallic bonds. |  |  |  |
| I know the types of elements involved in:   * ionic bonds * covalent bonds * metallic bonds. |  |  |  |
| I can explain why metals conduct electricity. |  |  |  |
| I can explain the conditions required for ionic compounds to conduct electricity. |  |  |  |
| I can explain why covalent substances do not conduct electricity. |  |  |  |
| **Feeling confident? topics** | **I understand  this well** | **I think I understand this** | **I need more  help** |
| I can draw diagrams to represent ionic and covalent bonds. |  |  |  |