**C1 Atoms and the Periodic Table Pack for Year 9 Part 1**

**Facts**

* **There are three types of strong chemical bonds: ionic, covalent and metallic.**
* **For ionic bonding the particles are oppositely charged ions.**
* **For covalent bonding the particles are atoms which share pairs of electrons.**
* **For metallic bonding the particles are atoms which share delocalised electrons.**
* **Ionic bonding occurs in compounds formed from metals combined with non-metals.**
* **Covalent bonding occurs in most non-metallic elements and in compounds of non-metals.**
* **Metallic bonding occurs in metallic elements and alloys.**
* **When a metal atom reacts with a non-metal atom electrons in the outer shell of the metal atom are transferred.**
* **Metal atoms lose electrons to become positively charged ions.**
* **Non-metal atoms gain electrons to become negatively charged ions.**
* **The ions produced by metals in Groups 1 and 2 and by non-metals in Groups 6 and 7 have the electronic structure of a noble gas (Group 0).**
* **The electron transfer during the formation of an ionic compound can be represented by a dot and cross diagram.**
* **The charge on the ions produced by metals in Groups 1 and 2 and by non-metals in Groups 6 and 7 relates to the group number of the element in the periodic table.**
* **An ionic compound is a giant structure of ions.**
* **Ionic compounds are held together by strong electrostatic forces of attraction between**

**oppositely charged ions. These forces act in all directions in the lattice and this is called ionic bonding.**

* **When atoms share pairs of electrons, they form covalent bonds. These bonds between atoms are strong.**
* **Covalently bonded substances may consist of small molecules.**
* **Some covalently bonded substances have very large molecules, such as polymers.**
* **Some covalently bonded substances have giant covalent structures, such as diamond and silicon dioxide.**
* **Metals consist of giant structures of atoms arranged in a regular pattern.**
* **The electrons in the outer shell of metal atoms are delocalised and so are free to move through the whole structure.**
* **The sharing of delocalised electrons gives rise to strong metallic bonds.**

**Task 1: Watch Free Science lessons and do a mind map of the information of some of them.**

### GCSE Science Chemistry (9-1) Ionic Bonding 1

### GCSE Science Chemistry (9-1) Ionic Bonding 2

### GCSE Science Chemistry (9-1) Covalent Bonding 1

### GCSE Science Chemistry (9-1) Covalent Bonding 2

### GCSE Science Chemistry (9-1) Covalent Bonding 3

### GCSE Science Chemistry (9-1) Metals and Alloys

**Task 2: Test yourself! Answer these quick fire questions.**

1. **What is ionic bonding?**
2. **How are ions formed?**
3. **What type of ions with a metal form?**
4. **What type of ions will a non-metal form?**
5. **Where are metals on the periodic table**
6. **Where are non-metals on the periodic table?**
7. **What is an ionic bond?**
8. **Draw a dot and cross diagram to show the bonding in magnesium oxide.**
9. **What is covalent bonding?**
10. **List six simple covalent compounds.**
11. **Give the formula of oxygen gas.**
12. **Draw the bonding in water.**
13. **In a covalent bonding diagram what does each line represent?**
14. **Give two examples of giant covalent compounds.**
15. **How does metallic bonding arise?**
16. **Why do metals have high boiling and melting points?**
17. **How are atoms in a pure metal arranged?**
18. **How are atoms in an alloy arranged?**
19. **Why do people use alloys and not pure metals?**
20. **How do metals conduct electricity?**

**Task 3: Draw a diagram of a metal.**

* Research first and then draw a diagram. Add the labels:
*metal ions, delocalised electrons, layers, giant structure, electrostatic attraction between ions and delocalised electrons*
* Explain how the particles are held together in a metal

**Task 4:**

For each of the elements below, state which type of bond would be formed. The first two have been done for you.

|  |  |  |
| --- | --- | --- |
| **Element 1** | **Element 2** | **Type of bond** |
| Sodium | Sodium | Metallic |
| Carbon | Silicon | Covalent |
| Carbon | Carbon |  |
| Oxygen | Lithium |  |
| Silver | Fluorine |  |
| Magnesium | Chlorine |  |
| Magnesium | Calcium |  |
| Beryllium | Nitrogen |  |
| Phosphorous | Oxygen |  |

**Task 5: Answer these short answer questions**

1. Explain why metals have high melting and boiling points
2. Copper is used to make wires for household circuits. Give two reasons why.
3. Explain why graphite can conduct electricity
4. Explain why most covalent substances do not conduct electricity
5. State the conditions under which an ionic substance will conduct electricity
6. Define malleable
7. Explain why sodium atoms and potassium atoms cannot form ionic bonds
8. *Challenge: which of sodium or magnesium do you think has the highest melting point? Explain your answer.*

**Task 6: Answer these questions about alloys.**

1. Explain how electricity is conducted in a metal. To gain full marks you must include a description of the structure and bonding of a metal. (4)
2. Describe how the structure of an alloy is different from the structure of a pure metal. (2)
3. Suggest one reason why coins are not made of pure copper. Do not give cost as a reason. (1)
4. Iron is used (as steel) to make the body panels for cars. Explain how the structure and bonding of iron:
	1. allows the body panels to conduct electricity;
	2. allows the body panels to be bent into shape;
	3. gives the body panels strength.

**Task 7: Complete the table below:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Complete the table:Substance | Melting point (°C) | Boiling point (°C) | Conductor of electricity when: | Type of structure and bonding (simple molecular, giant covalent, giant ionic lattice, metallic) |
| solid | liquid | in solution |
| **A** | 1083 | 2567 | yes | yes | insoluble |  |
| **B** | –107 | 13 | no | no | no |  |
| **C** | 2300 | 4000 | no | no | insoluble |  |
| **D** | 605 | 1350 | no | yes | yes |  |
| **E** | 6 | 80 | no | no | insoluble |  |

**Task 8: Identify which of the substances in the table below could be:**

**i** sodium chloride (NaCl) **ii** aluminium metal (Al)

**iii** diamond (C) **iv** carbon chloride (CCl4).

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | Melting point (°C) | Boiling point (°C) | Electrical conductor as… |
| solid (s) | liquid (l) | solution (aq) |
| **A** | 660 | 2467 | yes | yes | insoluble |
| **B** | –23 | 77 | no | no | insoluble |
| **C** | 801 | 1413 | no | yes | yes |
| **D** | 3550 | 4827 | no | no | insoluble |

Challenge: Explain why metals are good conductors of electricity and suggest why this conductivity increases across the periodic table from sodium to magnesium to aluminium. (4)

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