**C1 Atoms and the Periodic Table Pack for Year 9 Part 2**

**Facts**

**C1.2 The Periodic Table**

* The elements in the periodic table are arranged in order of atomic number
* Columns in the Periodic Table are called Groups
* Rows in the Periodic Table are called Periods
* It is called the Periodic Table because elements with similar properties appear at regular intervals.
* Elements is the same group have similar chemical properties because they have the same number of electrons in their outer shell.
* Before electrons, protons and neutrons were discovered, scientists put the elements in order of their atomic weights.
* They did not know about all the elements we know today.
* Some elements did not fit the groups they were put in, if the order of atomic weights was followed exactly.
* Mendeleev left gaps for elements that he thought had not been discovered
* He also swapped the order of some elements so they fitted into the right groups.
* When new elements were discovered that fitted in the gaps in the Periodic Table, their properties were very similar to what Mendeleev had predicted.
* When scientists discovered isotopes, they could explain why the order based on atomic weights was not always correct.
* When elements that are metals react, they form positive ions.
* When elements that are non-metals react, they form negative ions.
* Most elements are metals. They are found on the left and towards the bottom of the periodic table.
* Non-metals are near the top, right of the periodic table.

**C1.2 Group 1 and 7 of the Periodic Table**

* Group 1 elements are called alkali metals and have one electron in their outer shell.
* They are very reactive metals, and react vigorously in water.
* They are soft and have low density
* Their compounds are white (e.g. sodium chloride, which is table salt)
* As you go down Group 1, the reactivity increases.
* Group 7 elements are called halogens and have seven electrons in their outer shell.
* They are non-metals
* When they react they form ions with a 1- charge called halides.
* They make molecules made of pairs of atoms (these are called diatomic molecules)
* As you go down the group, the relative molecular mass, melting point and boiling point increase.
* But the reactivity of the elements decreases going down the group.
* A more reactive halogen can displace a less reactive halogen from its compounds.

**C1.2 Group 0 and the Transition Elements**

* Group 0 elements are called noble gases.
* They are unreactive and do not easily form molecules because their atoms have full electron shells.
* As you go down Group 0, the boiling points of the noble gases increase as the relative atomic mass increases.
* The transition elements found in the middle of the Periodic Table
* They are dense, hard metals which are less reactive than the alkali metals.
* Most of them have high melting points.
* Transition elements can form ions with different charges.
* They form coloured compounds and can be used as catalysts.

**Task 1: Watch Free Science lessons (if you can) and do a mind map of the information**

### GCSE Science Chemistry (9-1) Development of the Periodic Table

### GCSE Science Chemistry (9-1) Group 0

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

### GCSE Science Chemistry (9-1) Group 1 Part 1

### GCSE Science Chemistry (9-1) Group 1 Part 2

### GCSE Science Chemistry (9-1) Group 7 Part 1

### GCSE Science Chemistry (9-1) Group 7 Part 2

### GCSE Science Chemistry (9-1) Group 7 Part 3

### GCSE Science Chemistry (9-1 Triple) Transition Elements

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

1. How did Mendeleev organise his periodic table?
2. Why did Mendeleev gaps in his periodic table?
3. On which side (left/right) of the periodic table are metals found?
4. On which side (left/right) of the periodic table are non-metals found?
5. What is another name for group 1?
6. How reactive are group 1 elements?
7. How does reactivity change as you go down group 1?
8. How does sodium react with water, oxygen and chlorine?
9. What is another name for group 0/8?
10. How reactive are group 0 elements?
11. How does boiling point change as you go down group 0?
12. What is another name for group 7?
13. How reactive are group 7 elements?
14. How does boiling point change as you go down group 7?
15. How does reactivity change as you go down group 7?

**Task 3: The structure of the periodic table**

The modern periodic table lists approximately 100 elements, but has changed a lot over time as scientists have organised the elements differently. The changes are summarised below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **First lists of elements** | **Mendeleev’s periodic table** | **Modern periodic table** |
| **Elements placed in order by:** | Atomic mass | Normally atomic mass, but some elements were swapped around | Atomic number |
| **Completion:** | Showed no gaps | Left gaps for undiscovered elements (Mendeleev made predictions about the properties of these elements) | No gaps (all elements up to a certain atomic number have been discovered) |
| **Grouping:** | Elements were not grouped | Elements grouped according to chemical properties | Elements grouped according to number of electrons in outer shells |
| **Metals and non-metals:** | No clear distinction | No clear distinction | Metals to the left, non-metals to the right |

Use the table above and the modern periodic table to help you answer the questions below. The idea of a periodic table of the elements was started by John Newlands about 140 years ago. He wrote down the elements he knew about in order, starting with the lightest atoms. Then he arranged them into seven groups, like this:

(a)     Write down **three** differences between the groups in Newlands’ periodic table and the groups in the modern periodic table (up to the element Ca, which is calcium). **(3)**

(b)     Suggest **one** reason why this part of Newlands’ table was different from the modern one. **(1)**

(c)     Dimitri Mendeléev later developed the periodic table of the elements. He arranged the elements according to their properties and their relative atomic masses. The diagram shows where Mendeléev put tellurium (Te) and iodine (I) in his table because of their properties. (The diagram uses present day symbols and the atomic numbers of the elements have been added to Mendeléev’s table.)



(i)      What is wrong with this arrangement of tellurium and iodine in terms of their relative atomic masses?

(ii)     Explain why this is not a problem in the modern periodic table.

**Task 4: Answer this question about John Newland who produced another periodic table in 1866.**

The 21 elements in his table are shown in the diagram.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|    |   |   | **Column** |   |   |   |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| H | Li | Be | B | C | N | O |
| F | Na | Mg | Al | Si | P | S |
| Cl | K | Ca | Cr | Ti | Mn | Fe |

(a)     In which **two** columns of Newland’s periodic table do all the elements have similar properties?

(b)     The modern periodic table is arranged in a different order to Newland’s table.

(i)      What order is used in the modern periodic table?

(ii)     Argon has a higher relative atomic mass than potassium.  Explain why.

(iii)     Describe the changes in the number of electrons in the atoms of elements in the period which begins with potassium and ends with krypton.