1. In developing the modern form of the periodic table which two important factors did Mendeleev take into account when arranging the elements in order of increasing atomic mass? **Their physical and chemical properties**

2. a) Which arrow (A) or (B) indicates correctly a decrease in atomic size?

   **Arrow B**

   b) Explain why atomic size decreases in this way

   The increasing nuclear charge causes electrons to be pulled in tighter due to stronger electrostatic attraction, leading to smaller atoms as no extra electron shells are added across the period.

3. The bar chart shows the melting points of chlorides of elements 3 to 20 (with no bars for 10, 15 and 18).

   a) In general what happens to the melting point of the chloride as the Group Number increases. **The melting point decreases as group number increases.**

   b) Explain why no values are given for elements 10 and 18. **These are Noble gases and do not form compounds with chlorine.**

   c) From the bar chart, state which of the chlorides has the weakest forces between the molecules. **Chloride 9 – Fluorine chloride.**
d) Predict a value for the melting point of the chloride of element 15.
-80-85°C

4. a  What is meant by "The first ionisation energy"? The energy required to remove one mole of electrons from one mole of atoms in their gaseous state.

b. Which arrow (A) or (B) indicates correctly a decrease in the first ionisation energy of elements? A

c. Give two reasons why the ionisation energy decreases in this way.
The atoms become larger as new electron shells are added, leading to a greater distance between the nucleus and the outer electrons, and therefore a weaker electrostatic attraction. There is also a shielding effect from the increasing number of inner electrons.

5. Explain why the third ionisation energy of magnesium (7750 kJ mol⁻¹) is so much greater than the third ionisation energy of aluminium (2760 kJ mol⁻¹). To remove a third electron from magnesium, an electron is being removed from an energetically stable full outer shell. It is also being removed from the 2nd energy level, which is closer to the positive nucleus. The third electron in aluminium leaves a stable full shell and is removed from the third energy level, which is further from the nucleus.

6. a  Copy and complete the following statements.

i. Electronegativity is a measure of the attraction of an atom involved in a covalent bond has for the shared electrons of the bond.

ii. In the periodic table, electronegativity increases across a period and decreases down a group.

b  In each of the following pairs determine the element with the greater electronegativity. (you may wish to use a data booklet.)

i  phosphorus or carbon  ii) silicon or nitrogen