Aluminium can be represented as $^{27}_{13}\text{Al}$.

What is its atomic number? _______

What is its mass number? _______

Complete the table below for aluminium:

<table>
<thead>
<tr>
<th>Number of protons</th>
<th>Number of electrons</th>
<th>Number of neutrons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What type of particle has the smallest mass? ______________________

What is the charge on the proton? ______________________

What is the charge on a neutron? ______________________

Draw the electrons of the aluminium atom on the diagram opposite.

Discuss how aluminium forms an ion with a 3+ charge.

Include
- A comparison of the electron configuration (arrangement) of the atom & ion
- A mathematical explanation of why it forms a 3+ ion
- What is achieved by the aluminium by forming this ion
A fluorine atom has an electron arrangement of 2.7. Explain why the formula of aluminium fluoride is $\text{AlF}_3$.

Comparing magnesium and calcium, discuss how the position of the element in the periodic table and the charges on the ion are related.

Comparing oxygen and fluorine, discuss how the position of the element in the periodic table and the charges on the ion are related.
Write the formulae for

- zinc nitrate
- sodium sulfide
- silver sulfate
- iron(III) chloride
- calcium hydrogen carbonate

Name these compounds

- $\text{Na}_2\text{SO}_4$
- $\text{Cu(OH)}_2$
- $(\text{NH}_4)_2\text{CO}_3$
- $\text{Fe}_2(\text{SO}_4)_3$
- $\text{KCl}$
- $\text{Ba(NO}_3)_2$

Balance these equations (if they need it).

- $\text{Ca} + \text{O}_2 \rightarrow \text{CaO}$
- $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$
- $\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- $\text{Mg} + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
- $\text{Al}_2\text{O}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$
- $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
Aluminium can be represented as $^{27}_{13}$Al.

What is its atomic number? 13
What is its mass number? 27

Complete the table below for aluminium:

<table>
<thead>
<tr>
<th>Number of protons</th>
<th>Number of electrons</th>
<th>Number of neutrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>

What type of particle has the smallest mass? ELECTRON
What is the charge on the proton? POSITIVE
What is the charge on a neutron? NO CHARGE/NEUTRAL

Draw the electrons of the aluminium atom on the diagram opposite.

Discuss how aluminium forms an ion with a 3+ charge.
Include
- A comparison of the electron configuration (arrangement) of the atom & ion
- A mathematical explanation of why it forms a 3+ ion
- What is achieved by the aluminium by forming this ion

The atom has an electron arrangement of 2,8,3. It loses 3 electrons to become an ion with an electron arrangement of 2.8. This way it has a full valence shell which is a stable arrangement.

Since the ion has 13 protons (+) and now only 10 electrons (-), it has an overall charge of 3+
A fluorine atom has an electron arrangement of 2.7. Explain why the formula of aluminium fluoride is AlF₃.

Fluorine will gain an electron to achieve a full valence shell (2.8) and because it has one more (−) than (+) now, the charge on the ion is F. Since the aluminium ion has a 3+ charge, then three F ions are needed so that the charges cancel out. So the formula is AlF₃.

Comparing magnesium and calcium, discuss how the position of the element in the periodic table and the charges on the ion are related.

They are both in the same group of the periodic table (group 2) although they are in different periods (periods 3 & 4). They both have 2 valence electrons because they are both in group 2, and they lose these to form ions, which is why they both form ions with a 2+ charge, i.e., Mg²⁺ & Ca²⁺.

Comparing oxygen and fluorine, discuss how the position of the element in the periodic table and the charges on the ion are related.

Oxygen and fluorine are in the same period (period 2) of the periodic table but are in groups 16 & 17 respectively. This means that O has 6 valence electrons and F has seven. To achieve a full valence shell (of 8) they need to gain different numbers of electrons. O will gain 2 electrons to become the oxide ion, O²⁻ (electron arrangement 2.8) & F will gain 1 electron to become the fluoride ion, F⁻ (electron arrangement 2.8).
Write the formulae for

- zinc nitrate \( \text{Zn(NO}_3\text{)}_2 \)
- sodium sulfide \( \text{Na}_2\text{S} \)
- silver sulfate \( \text{Ag}_2\text{SO}_4 \)
- iron(III) chloride \( \text{FeCl}_3 \)
- calcium hydrogen carbonate \( \text{CaHCO}_3 \)

Name these compounds

- \( \text{Na}_2\text{SO}_4 \) sodium sulfate
- \( \text{Cu(OH)}_2 \) copper hydroxide
- \( (\text{NH}_4)_2\text{CO}_3 \) ammonium carbonate
- \( \text{Fe}_2(\text{SO}_4)_3 \) iron(III) sulfate
- \( \text{KCl} \) potassium chloride
- \( \text{Ba(NO}_3\text{)}_2 \) barium nitrate

Balance these equations (if they need it).

- \( 2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO} \)
- \( \text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O} \)
- \( 2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \)
- \( \text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2 \)
- \( \text{Al}_2\text{O}_3 + 3\text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{H}_2\text{O} \)
- \( \text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 \)