1. Identify which element is which, explain how you decided this, and describe the element.

<table>
<thead>
<tr>
<th>Element</th>
<th>Number</th>
<th>Justification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>6</td>
<td>It is metallic shiny grey, stored in a liquid (oil). Labelled as flammable and corrosive.</td>
<td>Shiny, grey solid under oil/liquid.</td>
</tr>
<tr>
<td>Magnesium</td>
<td>8</td>
<td>It is metallic shiny grey and Mg is often found in ribbon form.</td>
<td>Shiny, grey solid ribbon.</td>
</tr>
<tr>
<td>Aluminium</td>
<td>2</td>
<td>It is metallic shiny grey. Malleable and non-hazardous.</td>
<td>Shiny, grey solid strip.</td>
</tr>
<tr>
<td>Silicon</td>
<td>1</td>
<td>Dark grey solid, looks different from the metals. Non-hazardous.</td>
<td>Dark grey shiny rock/solid.</td>
</tr>
<tr>
<td>Phosphorus (P₄)</td>
<td>7</td>
<td>Phosphorus is white/yellow. Labelled as flammable and toxic.</td>
<td>White solid with yellow inside. In a liquid (water).</td>
</tr>
<tr>
<td>Sulfur (S₈)</td>
<td>4</td>
<td>Sulfur is yellow.</td>
<td>Yellow pieces of solid.</td>
</tr>
<tr>
<td>Chlorine (Cl₂)</td>
<td>5</td>
<td>Chlorine is a green gas.</td>
<td>Green gas.</td>
</tr>
<tr>
<td>Argon</td>
<td>3</td>
<td>Argon is a colourless gas.</td>
<td>Colourless gas.</td>
</tr>
</tbody>
</table>
2. Identify the structure and bonding in each element (clues are available). What happens to the structure when you boil the element?

<table>
<thead>
<tr>
<th>Element</th>
<th>Structure and bonding</th>
<th>What happens to the structure when you boil it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>Giant metallic lattice</td>
<td>Break strong metallic bonds/overcome the attraction between the metal ions and the delocalised electrons.</td>
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</tr>
<tr>
<td>Silicon</td>
<td>Giant covalent lattice</td>
<td>Break strong covalent bonds.</td>
</tr>
<tr>
<td>Phosphorus (P₄)</td>
<td>Simple molecular (lattice/covalent)</td>
<td>Break weak London forces between the molecules.</td>
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</tr>
<tr>
<td>Argon</td>
<td>Simple atomic</td>
<td>Break weak London forces between the atoms.</td>
</tr>
</tbody>
</table>
### Teacher Resource 1

3. The melting points (K) for period 3 elements are 84, 172, 317, 371, 392, 922, 934, 1683 K. Which goes with which element? Justify your answer.

Assign the melting points to the correct elements and justify your answers.

<table>
<thead>
<tr>
<th>Element</th>
<th>Melting point (K)</th>
<th>Justification in terms of structure and bonding. Compare to other elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>371</td>
<td>Giant metallic lattice, lots of strong metallic bonds to break so high melting point.</td>
</tr>
<tr>
<td>Magnesium</td>
<td>922</td>
<td>Giant metallic lattice, lots of strong metallic bonds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More delocalised electrons added to sea of electrons, 2e per atom. Mg$^{2+}$ rather than Na$^+$ so stronger attraction between the metal ions and delocalised e, harder to separate. Mg &gt; Na.</td>
</tr>
<tr>
<td>Aluminium</td>
<td>934</td>
<td>Giant metallic lattice, lots of strong metallic bonds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More delocalised electrons added to sea of electrons, 3e per atom. Al$^{3+}$ rather than Na$^+$ so stronger attraction between the metal ions and delocalised e, harder to separate. Al &gt; Mg &gt; Na. Al$^{3+}$ is smaller than the others so packs more closely together.</td>
</tr>
<tr>
<td>Silicon</td>
<td>1683</td>
<td>Giant covalent lattice, lots of strong covalent bonds to break, takes lots of energy.</td>
</tr>
<tr>
<td>Phosphorus ($P_4$)</td>
<td>317</td>
<td>Simple molecular, breaking weak London forces between molecules. $P_4$ &gt; Cl$_2$ &gt; Ar, so has more e$^-$, so stronger London forces, so higher melting point.</td>
</tr>
<tr>
<td>Sulfur ($S_8$)</td>
<td>392</td>
<td>Simple molecular $S_8$ &gt; $P_4$ &gt; Cl$_2$ &gt; Ar, more electrons, stronger London forces.</td>
</tr>
<tr>
<td>Chlorine ($Cl_2$)</td>
<td>172</td>
<td>Simple molecular, only breaking weak London forces between molecules to boil. $S_8$ &gt; $P_4$ &gt; Cl$_2$ &gt; Ar, less e than $S_8$ and $P_4$, so weaker London forces.</td>
</tr>
<tr>
<td>Argon</td>
<td>84</td>
<td>Only London forces holding atoms together, fewer electrons than other molecular elements.</td>
</tr>
</tbody>
</table>