- Identify one property used by Mendeleev to organise elements in his periodic table. **2**

One from: atomic volume, stoichiometry of oxides, hydroxides, chloride and other compounds, melting points of elements and compounds, chemical reactivity and atomic mass

Provide a brief explanation of the origin of the periodicity of this property in terms of the quantum theory of atomic structure.

For atomic volume: atomic volume increases going down the groups of the table as new valence shells are filled.

For stoichiometry of compounds: compounds of elements in the same group show the same stoichiometry because they have the same configuration of valence electrons and therefore combine with the same number of atoms of another element to form a stable electronic configuration. Moving across a period, the stoichiometry changes as the number of valence electrons changes.

For melting points of elements and compounds: the type of bonding found in an element (metallic, covalent, dispersion) and in compounds (ionic, covalent, intermolecular) depends on the number of electrons in the outer shell. Elements on the left hand side of the periodic table have few valence electrons and relatively low nuclear charges favouring formation of metallic bonds in the element and ionic bonds in compounds. Elements on the right hand side have configurations just short of stable ones and tend to form covalent bonds with each other and ionic bonds with the metals.