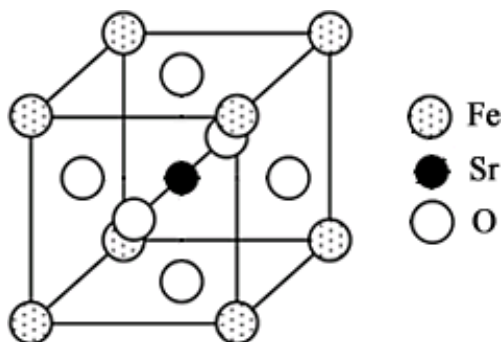


- SrFeO_3 crystallises with the perovskite structure, shown below. The structure is cubic with iron atoms on each corner, oxygen atoms at the centre of each face and a strontium atom at the centre of the cube. Mixed metal oxides such as this are of current research interest because of their magnetic and possible superconducting properties.



Show the structure is consistent with the formula SrFeO_3 and give the coordination numbers of the Sr, Fe and O atoms.

Using the box notation to represent atomic orbitals, work out how many unpaired electrons are present on the iron cation in this compound.

It is possible to substitute the Sr^{2+} ions at the centre of the unit cell by La^{3+} ions to make a series of compounds with the formula $\text{La}_{1-x}\text{Sr}_x\text{FeO}_3$ with $0 \leq x \leq 1$. Suggest why this substitution is achieved without significant change to the unit cell dimensions and describe how charge balance is achieved in these compounds.