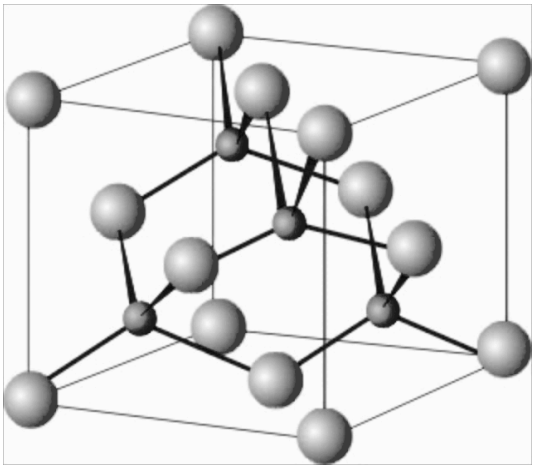
Marks
2

- The cubic form of boron nitride (borazon) is the second-hardest material after diamond and it crystallizes with the structure shown below. The large spheres represent nitrogen atoms and the smaller spheres represent boron atoms.



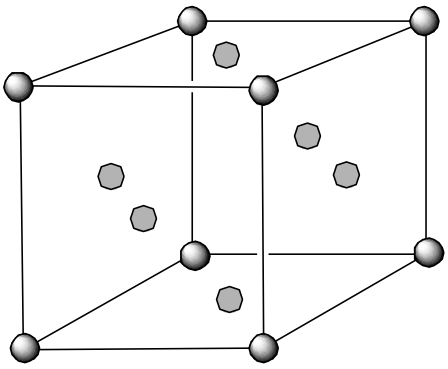
From the unit cell shown above, determine the empirical formula of boron nitride. Show your working.

Answer:

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.

Marks
2

- The diagram below shows the structure of an alloy of copper and gold with a gold atom at each of the corners and a copper atom in the centre of each of the faces.



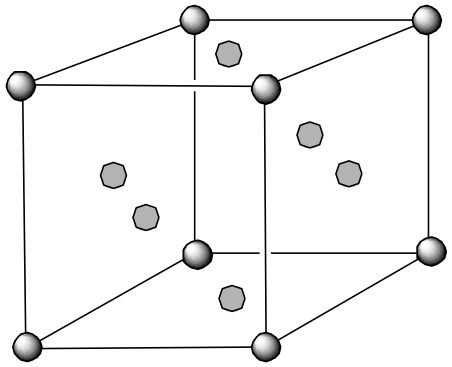
= Au = Cu

What is the chemical formula of the alloy?

Answer:

Marks 6

- The diagram below shows the structure of an alloy of copper and gold with a gold atom at each of the corners and a copper atom in the centre of each of the faces. The length of the side of the cubic unit cell is 0.36 nm.



= Au = Cu

What is the chemical formula of the alloy?

Answer:

Pure gold is 24 carat, whilst gold alloys consisting of 75 % gold by weight are termed 18 carat gold. What carat gold is this alloy?

Answer:

What is the volume (in cm^3) of the unit cell?

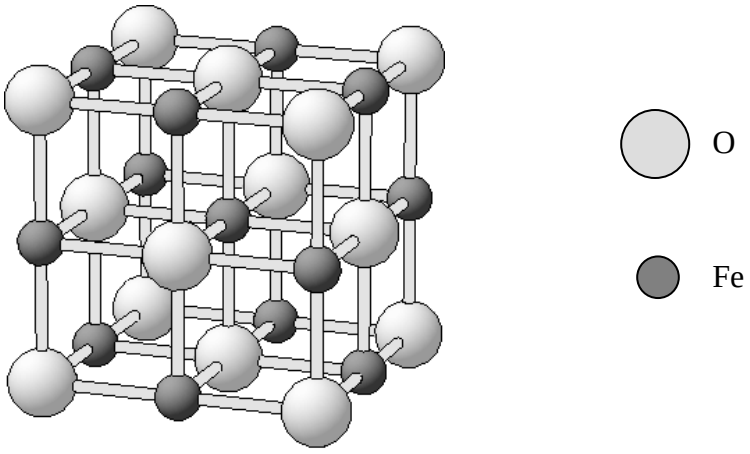
Answer:

What is the density (in g cm^{-3}) of the alloy?

Answer:

Marks
8

- Iron forms three common oxides, FeO, Fe_3O_4 and Fe_2O_3. The unit cell for one of these oxides is shown below.



Explain which oxide the structure represents and describe the nature of the packing of the ions and their coordination numbers.

The mineral magnetite, Fe_3O_4, is found in the beaks of homing pigeons. It contains a mixture of Fe^{2+} and Fe^{3+} ions. What is the ratio of Fe^{2+} to Fe^{3+} in Fe_3O_4?

How many unpaired electrons are there in an Fe^{2+} ion and in an Fe^{3+} ion? Explain your answer using the box notation.

Fe^{2+}:	Fe^{3+}:

Page Total: