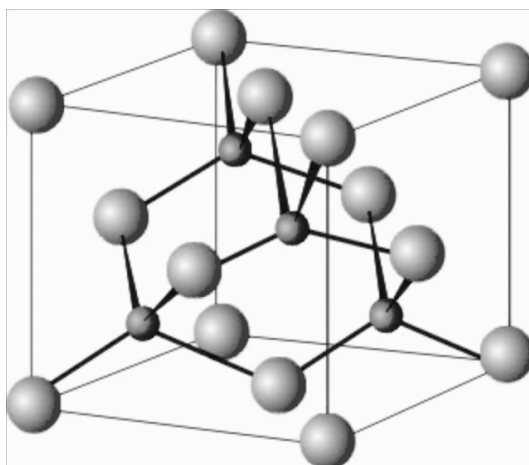


- The cubic form of boron nitride (borazon) is the second-hardest material after diamond and it crystallizes with the structure shown below. The large spheres represent nitrogen atoms and the smaller spheres represent boron atoms.



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

There are N atoms on the corners and on the faces of the unit cell:

- There are 8 N atoms on the corners. These contribute $1/8$ to the unit cell giving a total of $8 \times 1/8 = 1$ N atom.
- There are 6 N atoms on the faces. These contribute $1/2$ to the unit cell giving a total of $6 \times 1/2 = 3$ N atoms.
- There are a total of $1 + 3 = 4$ N atoms in the unit cell.

There are B atoms inside the unit cell:

- There are 4 B atoms completely inside the cell. These contribute only to this unit cell giving a total of $4 \times 1 = 4$ B atoms.

The formula is therefore B_4N_4 which simplifies to BN.

Answer: **BN**

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.