

INVESTIGATION 1

PURPOSE

To become familiar with the structure of graphite. To understand on the basis of this structure why graphite is a good electrical conductor.

METHOD

If a model of the graphite structure has been made available to you, look at it carefully as you answer the following questions. If you are to build the model yourself, follow the instructions on page 67 of the manual that accompanies the Solid State Model Kit..

ANSWERS TO THE FOLLOW-UP QUESTIONS

1. How many nearest neighbors does each carbon atom have in this structure?
2. How are the nearest neighbors arranged about any given central atom? What is the name of the shape these neighbors assume?
3. How many atoms are in the unit cell? (**HINT:** Recall from your earlier investigations that a unit cell is defined as a three dimensional, six sided figure having parallel faces. When a face is reproduced and moved along its entire edges a distance equal to the length of the edge, it generates the entire structure.)
4. Draw the z layer sequence showing the position of the atoms at $z = 0$, $1/2$, and 1 .
5. Consider your answer to (2) above and the following information. Carbon typically forms four bonds by sharing the four electrons in its outermost energy level (valence level). This bond formation “localizes” these valence electrons about the atom and restricts their movement throughout the remainder of the structure. In addition the formation of four bonds with other carbon atoms (such as the diamond structure) results in a completely filled band. Why then is graphite a conductor?