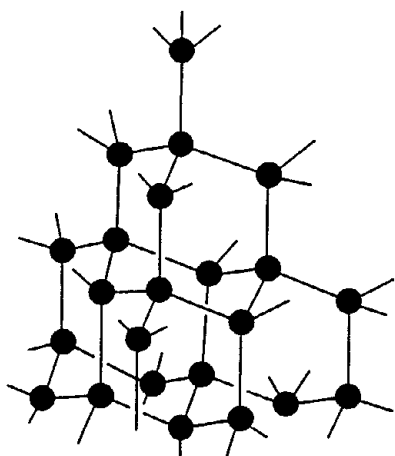
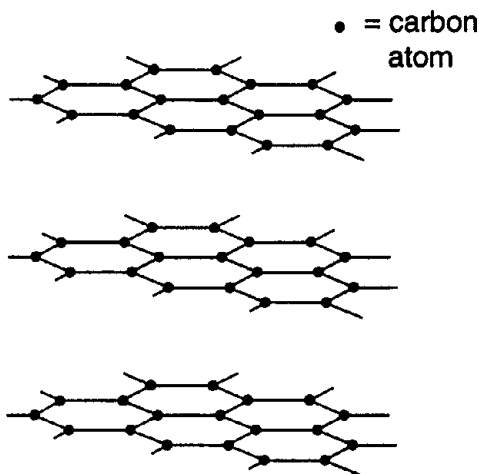


Core 1

Diamond and graphite are each forms of the element carbon. Their structures are shown below.



diamond



graphite

(a) Explain the meaning of the term *element*.

.....[1]

(b) In the diamond structure, how many bonds does each carbon atom make with other carbon atoms?

.....[1]

(c) Diamond is a giant structure. Explain what is meant by the term *giant structure*.

.....
.....[1]

(d) Diamond is used in tools for cutting and drilling rocks.

(i) Suggest a property of diamond that makes it suitable for these jobs.

.....

(ii) Explain your answer by referring to the bonding in diamond.

.....
.....

(iii) Silicon carbide, SiC, has a structure like that of diamond. Use your knowledge of the Periodic Table to suggest why silicon carbide has a similar structure to diamond.

.....[4]

Extension 1

The element scandium, proton (atomic) number, $Z = 21$, was discovered by L Nilson in Sweden in 1879.

(a) It forms only one ion which has the formula ${}_{21}^{45}\text{Sc}^{3+}$.

(i) How many electrons, protons and neutrons are there in this ion?

number of electrons

number of protons

number of neutrons

(ii) Predict the electron distribution of this ion.

.....

[4]

Core 1

- a substance containing only one type of atom / substance which can not be broken down to a simpler substance
- b 4
- c idea of many bonds / many atoms joined together (almost) indefinitely
- d(i) hard
- (ii) strong bonds
between atoms
- (iii) C and Si are in the same group in Periodic Table / C and Si have same number of electrons in outer shell
- e layers of atoms
weak forces between layers / layers slide over each other
- f(i) inert / conducts electricity
- (ii) positive – chlorine
negative – hydrogen

Extension 1

- a(i) 18e
21p
24n
- (ii) 2.8.8