

Solutions

2.1 Four.

2.2 The layers of hexagonal rings have no covalent bonds between them; so the layers slide easily over one another.

2.3 A single layer of graphite, one atom thick.

3.1 In diamond every carbon atom is joined to four others by strong covalent bonds in a rigid giant covalent network; a lot of energy is needed to break the many strong bonds, making diamond very hard; there are no free/delocalised electrons to carry charge.

3.2 In graphite each carbon forms only three bonds, leaving one electron per atom delocalised; these free electrons move through the structure and carry charge. In diamond all four outer electrons form covalent bonds; none is free, so there is no charge carrier and no conduction.

3.3 A carbon nanotube is a cylindrical fullerene, with a very high length-to-diameter ratio. Uses of fullerenes – any two: carriers for targeted drug delivery in medicine; catalysts; lubricants; strengthening composite materials; electronics/semiconductors.