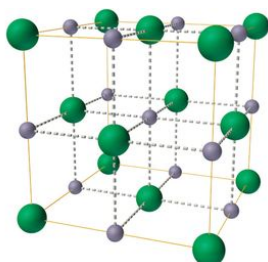
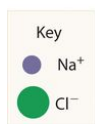


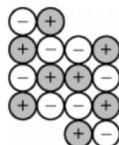
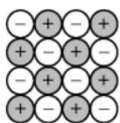
Ionic, Molecular, and Network Structures

Ionics

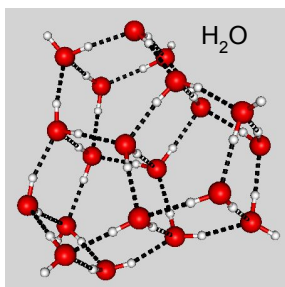
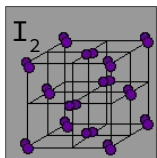


Before Displacement

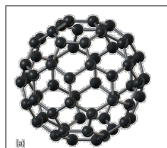
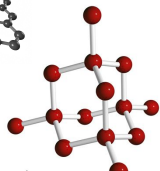
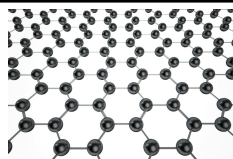
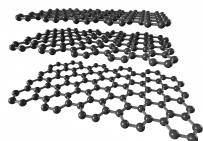
After Displacement



Molecular



Allotropes of Carbon



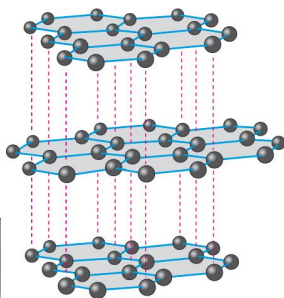
Graphite

Trig planar with delocalized electrons

Weak IMFs between sheets

Brittle, very high melting point

Conducts electricity but not heat unless parallel to sheets



Diamond

3D Tetrahedral bonds

Conducts heat well

Doesn't conduct electricity

Very high melting point

Strong but brittle



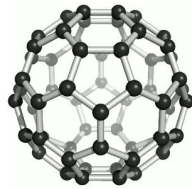
Fullerene



Pentagons and hexagons (soccer ball)

Applications- nanotubes, cancer treatment

Sublimation point at $\sim 525^{\circ}\text{C}$



GRAPHENE The 'miracle material' that could revolutionize our world

What is it?

Graphene is a one-atom thick layer of carbon arranged in a honeycomb lattice. When millions of these are stacked one on top of another they form graphite - a mineral consisting of carbon which is found in pencils.

Graphene was discovered in 2004 at the UK's University of Manchester by physicists Andre Geim and Konstantin Novoselov when they isolated a single-layer of graphene using Scotch Tape before going on to demonstrate its remarkable, conductive and resilient properties.



Geim and Novoselov's work earned them the Nobel Prize in physics in 2010 and today researchers are in a race to realize its technical and commercial capabilities.



Graphene

1 atom thick, trig planar geometry

Strong

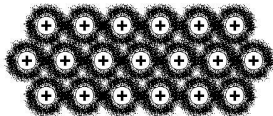
Great conductor of heat and electricity

Applications may include- nanotubes, display screens, flexible solar cells

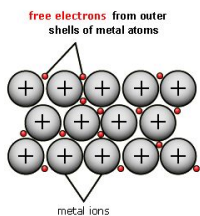


Metals

Metallic Sea of Electrons



Electrons are not bonded to any particular atom and are free to move about in the solid.



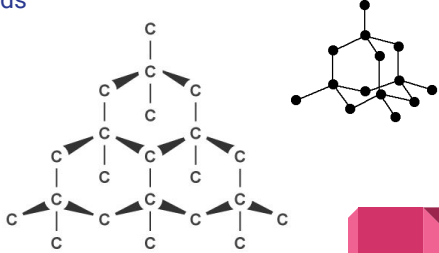
Network Covalent Compounds

Ex. C and SiO_2

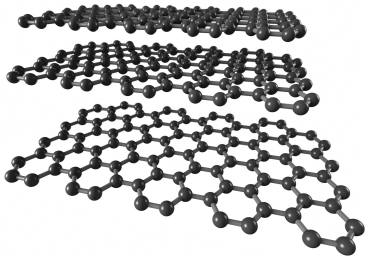
Diamonds

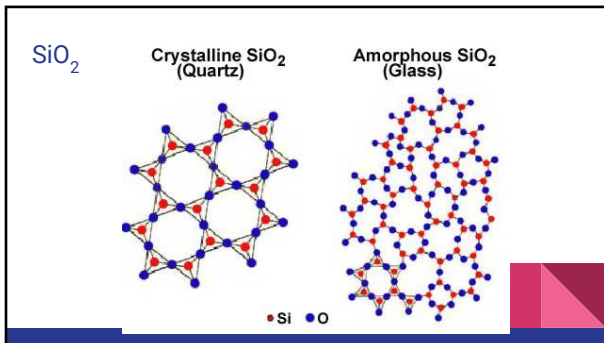
What is so special about them?

Diamonds



Graphite





Writing Explanations on the AP Exam

Explanations based on molecular or atomic structure are usually worth 2 points.

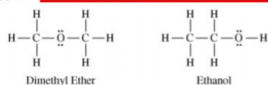
The **first point** comes from correct statements about each species and the **second point** comes from a correct comparison between them.

You may need to explain

- Size of atoms/ions
- Periodic trends
- Bond lengths
- Polar molecule or not
- Melting point and boiling point
- Heat of Vaporization
- State of matter at room temperature
- Solubility in a solvent
- Why something defies an expectation

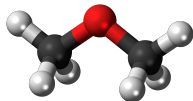
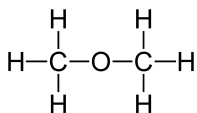
Here is a sample:

(b) Structures of the dimethyl ether molecule and the ethanol molecule are shown below. The normal boiling point of dimethyl ether is 250 K, whereas the normal boiling point of ethanol is 351 K. Account for the difference in boiling points. You must discuss both of the substances in your answer.

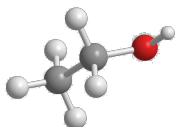
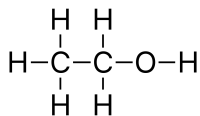


For this problem you will want to

- 1) Identify the intermolecular forces present in each molecule
- 2) Compare the strength of the IMF and relate it to the property mentioned.



Dimethyl ether is a polar molecule and experiences dipole-dipole (and LDF) forces. Ethanol experiences hydrogen bonding (and LDF) forces.



Step 2- Compare the strength of the IMF and relate it to the property mentioned.

H bonds are stronger than dipole-dipole forces. Must to break more bonds are broken during boiling!

Let's consider this example on polarity of molecules

Consider the molecules CF_4 and SF_4

- Draw the complete Lewis electron dot structure for each molecule
- In terms of molecular geometry, account for the fact that the CF_4 molecule is nonpolar, whereas the SF_4 molecule is polar
