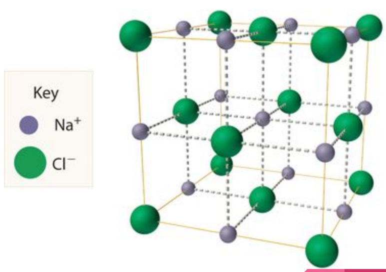
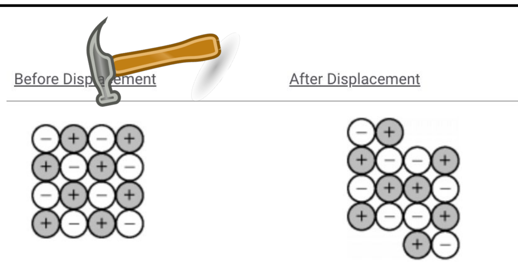
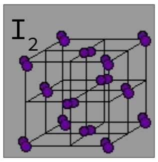
Ionic, Molecular, and Network Structures

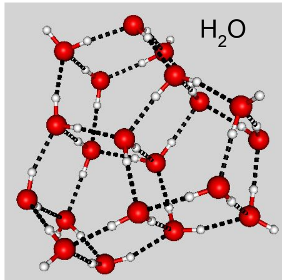
Ionics



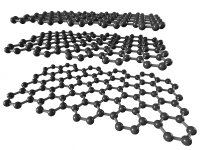


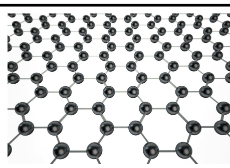
Moleculars

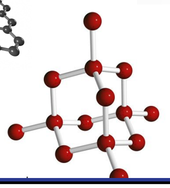


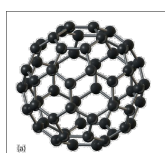


Allotropes of Carbon









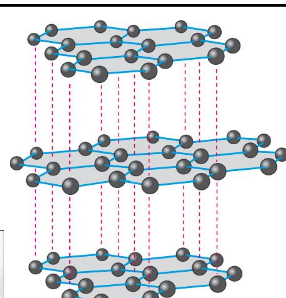
Graphite

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

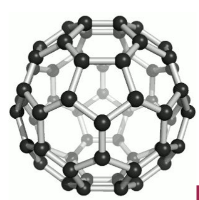
Strong but brittle

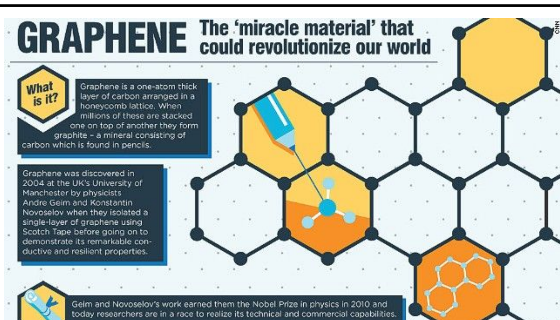
Fullerene C_{60}

Pentagons and hexagons (soccer ball)

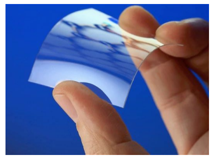
Applications- nanotubes, cancer treatment

Sublimation point at ~525*C





Graphene



1 atom thick, trig planar geometry

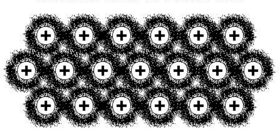
Strong

Great conductor of heat and electricity

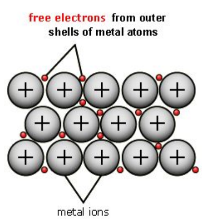
Applications may include- nanotubes, display screens, flexible solar cells

Metals

Metallic Sea of Electrons



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



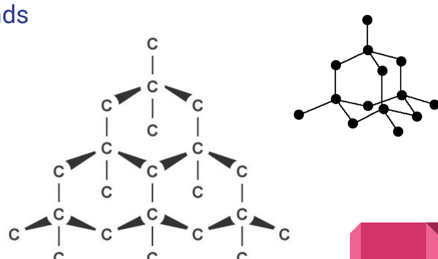
Network Covalent Compounds

Ex. C and SiO_2

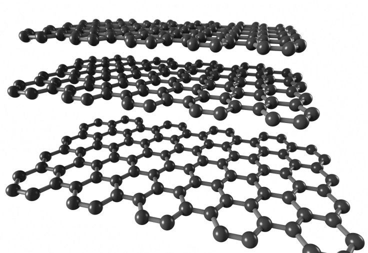
Diamonds

What is so special about them?

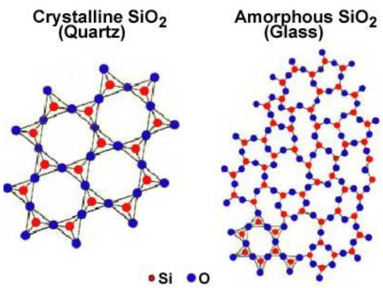
Diamonds



Graphite



SiO_2



Writing Explanations on the AP Exam

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

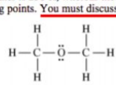
The first point comes from correct statements about each species and the second point comes from a correct comparison between them.

You may need to explain

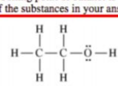
- Size of atoms/ions
- Periodic trends
- Bond lengths
- Polar molecule or not
- Melting point and boiling point
- Heat of Vaporization
- State of matter at room temperature
- Solubility in a solvent
- Why something defies an expectation

Here is a sample:

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



Dimethyl Ether

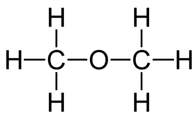


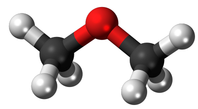
Ethanol

For this problem you will want to

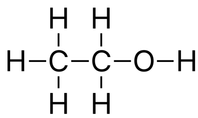
1) Identify the intermolecular forces present in each molecule

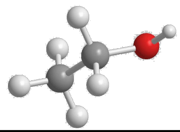
2) Compare the strength of the IMF and relate it to the property mentioned.





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 stron... dipole-di... must b... are to ...ecules from one ...er.

Be careful! In no way should you lead them to believe that you think covalent bonds are broken during boiling!

Let's consider this example on polarity of molecules

Consider the molecules CF_4 and SF_4

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