WORKING OUT THE TYPE OF STRUCTURE

(I will tell you in each case what the actual substance was. You wouldn't be expected to work this out.)

A: A has a fairly low melting point suggesting a molecular structure, but a fairly high boiling point which suggests a giant structure. In this sort of case, always put more weight on the boiling point. It isn't until the substance boils that all the forces between the particles are broken It conducts electricity, suggesting a metal (or graphite – but the other data doesn't support this). Its other information suggests a reactive (probably Group 1) metal. The data is actually for sodium.

B: B has a very high sublimation temperature, and so has to be a giant structure. B conducts electricity (so has mobile electrons), but its other information suggests it isn't a metal. For example, no metal could be described as a grey, flaky solid. All metals will always melt and then boil – not sublime. This data is for graphite – a giant covalent structure.

C: C is a liquid at room temperature and a non-conductor of electricity, and so must be a simple molecular structure. Its solubility in water suggests either it has a small polar molecule or can undergo hydrogen bonding, in which case somewhere in the molecule it would have either an oxygen or a nitrogen attached directly to a hydrogen. The data is actually for ethanol, CH_3CH_2OH.

D: D has low melting and boiling points, and so will be a simple molecular structure. Its lack of solubility in water, and solubility in organic solvents suggests that it probably only forms van der Waals dispersion attractions, or fairly weak dipole-dipole interactions. D is benzene, C_6H_6.

E: E has high melting and boiling points, and so must be a giant structure of some kind. All the other data points to a giant ionic structure. The compound is sodium bromide.

F: F has lowish melting and boiling points, suggesting a simple molecular structure. Everything else is consistent with this, but doesn't give you any more clues unless you happen to recognise the description. It is actually white phosphorus. ("White" is a misleading word in this context - I have never seen it look anything other than yellowish! It is also called yellow phosphorus.)

G: G has high melting and boiling points suggesting a giant structure. It obviously can't be metallic because it doesn't conduct electricity when it is solid. It isn't an ionic structure because that would undergo electrolysis when it was molten, and so would conduct electricity under those conditions. That makes it a giant covalent structure. The data is for silicon dioxide.

H: H has a fairly low melting point, suggesting a simple molecular structure. Its solubility in water suggests that it can hydrogen bond with the water. It chars when it is heated, suggesting that it contains carbon. The data is for sucrose (sugar), $C_{12}H_{22}O_{11}$.

I: I has reasonably high melting and boiling points, suggesting a giant structure. It undergoes electrolysis when molten, and so must be a giant ionic structure. Don't be put off by the lack of solubility in water – not all ionic compounds are soluble. The compound is lead(II) bromide.

J: Although J is a liquid at room temperature, it conducts electricity. It must be a metallic structure. It is one of the oddities – mercury.