EVALUATING STUDENT ANSWERS

Comment on each of the answers to the questions given. Decide whether each is a good answer, and if not, what is wrong with it and how it could be improved.

a) Explain why monatomic substances all have very low melting and boiling points. (2)

a) Monatomic substances all have very low melting and boiling points, this is because there are very weak bonds between the atoms meaning that little is needed to break them. Monatomic substances

a. Monatomic substances all have low melting and boiling points because they only have weak ~~inter~~ forces bonding them together so not much energy is needed to break ~~them~~

a) Monatomic substances all have very low melting & boiling points because they only have very weak forces between the atoms.

b) Explain why simple molecular substances:

i) usually have low melting and boiling points (2)

ii) do not conduct electricity (1)

b.

i Simple molecular Substances have low melting and boiling points due to very weak intermolecular forces of attraction.

ii Simple molecular Substances cannot conduct electricity as they are not made up of charged ions that can carry charge.

b)i) Simple molecular substances usually have low melting and boiling points because there are weak forces between the molecules and therefore not a lot of energy is needed to overcome the forces.

ii) Simple molecular substances do not conduct electricity because molecules are neutral (no charge).

b) Simple molecular substances usually have very low melting and boiling points because there are very weak intermolecular forces between these atoms, therefore it takes little energy to boil or melt the substance.

ii) Simple molecular substances do not conduct electricity because they have a neutral charge - covalent bonding.

c) Explain why giant covalent substances:

i) have very high melting and boiling points (3)

ii) do not conduct electricity (except graphite) (4)

ci) Giant covalent substances have very high melting and boiling points because there are very strong bonds between them.

c) i) Giant covalent substances have very high melting and boiling points because the lattice structure is very strong and to melt or boil all the bonds have to be broken and this requires a large amount of energy and a higher temperature.

c) Giant covalent substances
ii) Have very high melting and boiling points because they contain very strong covalent bonds which need to be broken
ii) do not conduct electricity (except graphite) because they are neutral, however, graphite has delocalised electrons therefore, it can conduct electricity

ii) Doesn't conduct ~~tect~~ electricity because the atoms are neutral. In the case of graphite, it does conduct because it has a delocalised electron between the the different layers.

ii Giant covalent substances do not conduct electricity because the electrons are fixed graphite is an exception because it's outer shell of electrons are delocalised and can move around therefore a charge can flow through.

d) Explain why metallic substances:

i) usually have high melting and boiling points (2)

ii) can conduct electricity (3)

iii) are malleable and ductile **(2)**

d

i Metallic substances usually have high melting and boiling points due to the strong electrostatic forces that hold the structure together

d) Metallic substances
i) have very high melting and boiling points because the forces of attraction between the positive ions & the delocalised electrons are very strong
ii) can conduct electricity because they have delocalised electrons. These are electrons which are free to move, enabling them to carry a charge.

e) Explain why ionic substances

i) have high melting and boiling points (2)

ii) can conduct electricity when molten or dissolved, but not when solid (3)

iii) are brittle (3)

e. ionic substances

i) Strong electrostatic attraction between the ~~atom~~ nucleus and the electron which need a lot of energy to break.

ii) Conductive when molten or dissolved because in this forms, the substances contain delocalised electrons. ~~With only the ions~~

iii) Brittle because the atoms can't slide over each other.

ii) Ionic substances can conduct when molten or dissolved but not when ~~molten~~ solid because the ions cannot move.

5) a) Aluminium oxide is an ionic substance with formula Al_2O_3. Explain what this formula means. It means there are two aluminium ions and three oxygen ions.

b) Explain why aluminium oxide has a high melting point. due to the strong attraction between the ions

c) Explain why aluminium oxide does not conduct electricity as a solid but does when melted. because the ions can't move in a solid

a) Silicon dioxide, also known as silica, has a giant covalent structure with the formula SiO_2. In your own words, explain what the formula SiO_2 tells you about silicon dioxide. (2)

b) Sulphur dioxide has a simple molecular structure with the formula SO_2. In your own words, explain what the formula SO_2 tells you about sulphur dioxide. (2)

c) Sodium oxide has an ionic structure with the formula Na_2O. In your own words, explain what the formula Na_2O tells you about sodium oxide. (2)

d) Explain why it would be wrong to describe Na_2O as "a molecule". (1)

(Total 7)

a) The formula SiO_2 tells you that the ratio of silicon atoms to oxygen atoms in the giant covalent structure silicon dioxide is 1:2. For every silicon atom in the structure there are 2 oxygen atoms.

b) The formula SO_2 tells you that the ratio of sulphur molecules to oxygen molecules in sulphur dioxide is 1:2, so for every sulphur molecule there is in the structure, there are 2 oxygen molecules. Sulphur dioxide has 2 double covalent bonds.

c) The formula Na_2O tells you that the ratio of Na^+ ions to O^{2-} ions in sodium oxide is 2:1, therefore for every oxygen 2- ion in the structure, there are 2 sodium 1+ ions.

d) It would be wrong to describe Na_2O as a molecule because the substance itself is not a molecule, it is a compound made up of positively and negatively charged ions.

Phosphorus exists in several different forms, two of which are white phosphorus and red phosphorus. White phosphorus consists of P_4 molecules, and melts at 44°C. Red phosphorus is macromolecular, and has a melting point above 550°C.

Explain what is meant by the term *macromolecular*. By considering the structure and bonding present in these two forms of phosphorus, explain why their melting points are so different. **(Total 5)**

(116) Macromolecular means a very large molecule such as a polymer or protein consisting of many small structural units linked together.
Red phosphorus is a macromolecule so is in a giant lattice structure made of covalent bonds so requires more energy to break the bonds whereas white phosphorus is a simple molecular substance and can be broken easier so the boiling point and melting points are lower

116) Macromolecular is another term for a Giant Covalent structure, therefore red Phosphorus is a giant lattice of covalent bonds whereby the bonds need to be broken in order to melt the substance which needs a vast amount of energy. White phosphorus is a simple molecular substance whereby there are weak forces between the molecules, making white phosphorus easier to break down/ melt as covalent bonds are stronger than van der Waals forces.

116 A macromolecular form is where many molecules are joined by sharing electrons. This means that there are stronger bonds between the molecules and more energy would be required to break them. This is why the melting point of red phosphorus is so much higher than that of white phosphorus.