**Practice test 2 - Answers**

(1)Explain why carbon can form 3 dimensional structures, like diamond, but sulfur cannot. (3 marks)

* **Carbon has 4 valence electrons which means it has a bonding capacity of 4.**
* **4 bonds would repel each other according to the VSEPR theory to produce a 3-D tetrahedral structure.**

Graphene sheet

**- Sulfur has only 3 bonding pairs which would repel into**

**a 2-D planar structure.**

(b) Explain why Graphene is a good conductor of electricity and

yet diamond does not conduct at all. (2 marks)

-**In graphene carbon is only using 3 of its 4 valence electrons for bonding and hence each**

**carbon atom has a spare electron available for conduction (delocalised).**

**- Diamond uses all 4 of its valence electrons for bonding and hence has none available to conduct charge.**

Many women’s make-up products contain nanoparticles of titanium dioxide which give the skin an attractive bright sheen. The size of the TiO2 particles is around 100 nanometres.

Skin pores are small holes in the skin which allow entrance to the blood stream and are about 50 micrometres wide (50 x 10-6 m). (1 nanometre = 10-9 m)

(c) Explain why there might be concern over the use of nanoparticles in women’s make-up. (2 marks)

* **The pores (holes) in the skin are much larger than the nanoparticles used in make-up**
* **This means that nanoparticles can pass through the skin pores into the bloodstream and might cause medical problems.**

Graphene is over 300 times stronger than steel and can be used in bulletproof jackets. Diamond can be used to cut glass and gems but charcoal is an allotrope of carbon that is very soft.

1. Explain why the charcoal allotrope is not as strong and hard as diamond and graphene

(2 marks)

* **Charcoal is an amorphous solid i.e. has no network structure linking atoms together which would give overall strength.**
* **Graphene and diamond have a giant network structure holding atoms in place with strong forces which makes for macroscopic properties of strength and hardness.**