

b) 304 Stainless steel has a high Yield strength which means that it is incredibly strong material, but it is too dense to be used for scuba diving.

Pre-Pregated carbon Fiber composite has a high Yield strength and it's incredibly dense, but the material will be ~~incredibly~~ incredibly expensive to make and buy

The material I would pick would be 6062 T6 Aluminium because I believe that the material is strong enough and dense enough to retain air and not drag me down to the sea bed.

I didn't choose carbon fiber because of the cost.

c)

~~For~~ A novel snack needs to be secure and Durable, Affordable, widely accessible and eco friendly to the environment. Taking these reasons into account, the material would need to ^{be} have:

Ductile - so the packaging can easily be opened

dense - it needs to be really light weight.

weld ability - to seal the snack in to avoid it going bad.

wear resistant - printing won't wear off.

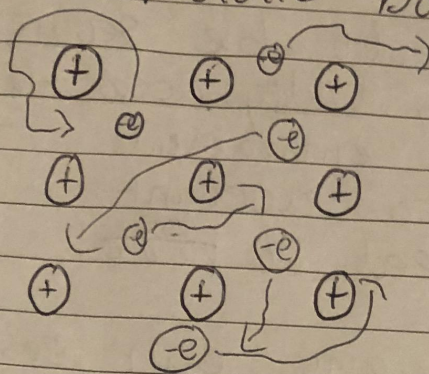
metallised film is a material commonly used in crisp packets as it is light, weld able and wear resistant, but because of the material and what it is made from, it is not recycled and is put in to landfills.

landfills effect the world by releasing Methane into the atmosphere, Methane is a green house gas that is 25 times more potent than Carbon Dioxide.

3. materials & processing

Question 2

a) metallic bonding



-e (Negative electrons) are thought to be like a cloud moving freely between positive charged ions.

Strength of a metallic bond is determined by electron sharing which bonds the positive metal ions together, a metal with a valency of 2 will have a stronger bond between ions as more electrons are ~~created~~ creating the bond compared to a metal with valency of 1.

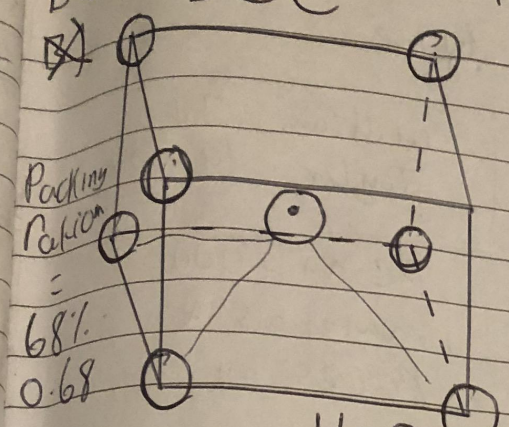
B) FCC is a ~~face~~ lattice with atoms ~~in~~ in each corner and faces.

BCC is a lattice with atoms in each corner and one atom in the center.

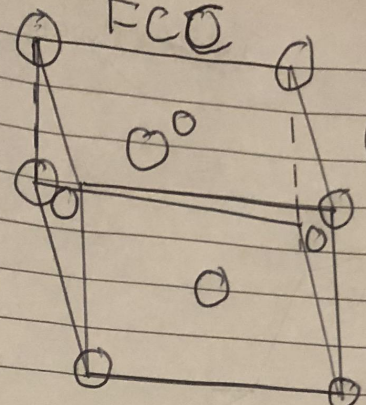
HCP is a lattice with atoms in all hexagonal corners, one on top and bottom and 3 in the center.

BCC

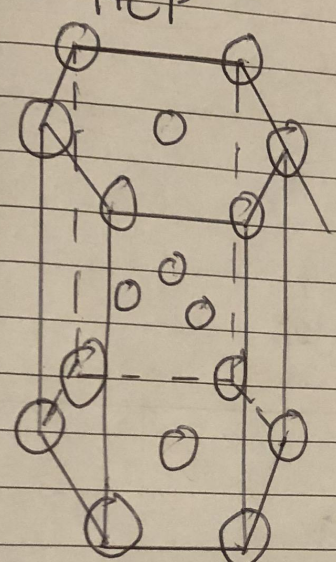
Key = $\bigcirc$ = Atom



FCC



HCP



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Packing ratio = 0.74
74%

1) At 1800 degrees the material will be in a liquid state.

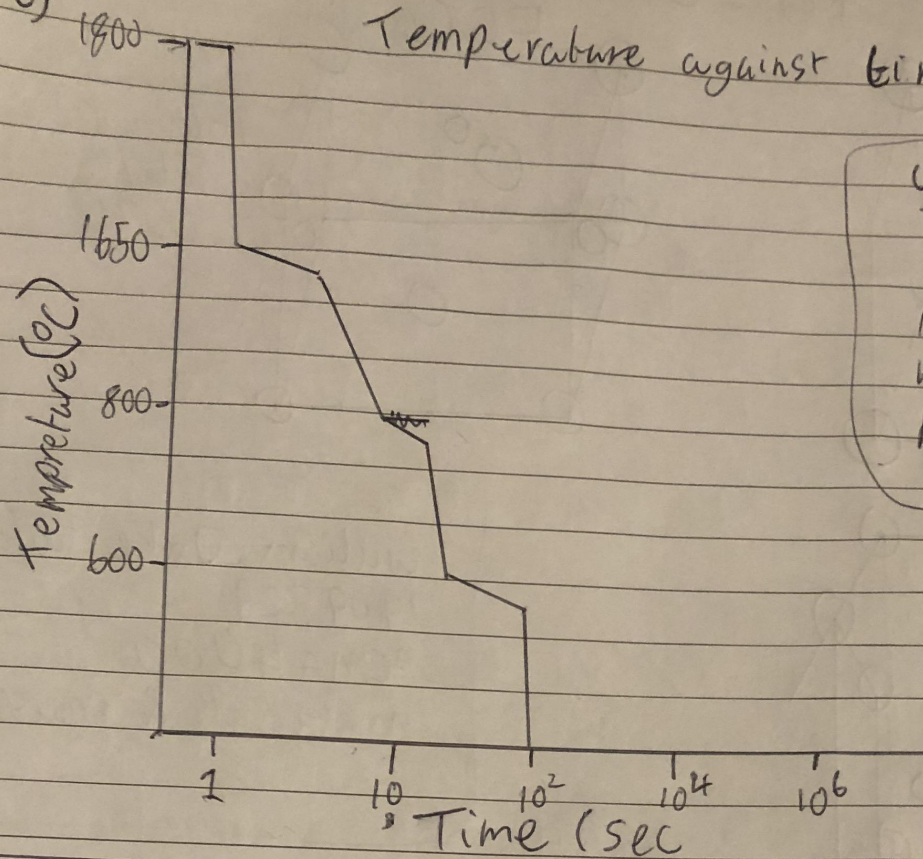
At 1650°C the material will change into a β Ti phase with a bit of liquid

At 800°C the material will be between a β Ti and α Ti phase

At 600°C the material will change to a α Ti phase.

e)

Temperature against time



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Question 3)

a) Technical ceramics, Composites and metal are the classes I'd consider when making a ~~ex~~ racing car chassis, because the material needs to be strong to with stand forces and load of the car weight, but also be light dense enough that it wouldn't effect the car's performance.

b) I would not consider Foams, woods, Polymers or Elastomers as these materials do not have the required strength to be able to hold the car together or with stand the forces or load the car will experience.

c) Carbon Fiber for the chassis as its ~~is~~ stronger ~~as~~ ^{than} common steel but will be highly expensive compared to steel. But steel dose impact the environment more.

d) welding and Brazing affect the mechanical properties in the weld area. The two parent metals are blasted with high temperature causing the material to heat up and cool down. This makes the material more ductile as the crystals have reformed bigger in the Heat affected Zone (HAZ). It also causes stress in the weld joint make the fatigue strength decrease.

e) I would suggest using TIG (Tungsten Inert Gas) welding as it because if its done correctly, the seam will be cleaner stronger with better performance. Resistance spot welding as they are commonly reliable welding methods of performance.

Question 4)

a) A Scuba Diver's air cylinder need to have a material that has the following properties:

Corrosive resistance

wear resistance

~~res~~ high hardness

~~ductile~~

density

I have chosen these properties as I believe the tank needs to resist rust and wear, needs to be strong enough to withstand some pressure and it needs to be incredibly dense so it doesn't drag the diver down to the sea bed.

b) 6062 T6 Aluminium is a material that has a high ~~tensile~~ Yield strength of 241 MPa but it is also dense weighing at 2.7 g/cm^3 , I think this is a good contender as it is strong and light

Steel Alloy 1020 is one of the ~~the~~ dense material on the list with a weight of 7.9 g/cm^3 and a Yield strength of 210 MPa. I think this will be too dense for a scuba diver.