Capsule Design

Why did I choose this aspect?

- I am looking to study Chemistry at university
- In my last year I plan on specialising in material science
- I decided that designing the capsule was a relevant challenge to undertake
- It involves perseverance, problem solving, imagination, and a large amount of research into different materials
- Although what I have come up with is in no way a final solution I am proud of the simple yet innovative design

How I approached the problem

- I wrote down all of the properties that the material had to fit:
  - Withstand large temperature differences
  - Very strong ext.
- I researched different materials
- I used the density to figure out whether the materials selected would be of a suitable mass
- I designed the shape of the capsule and where the materials would go
- I decided on the way in which to decorate the capsule to ensure that is draws someone to look at it

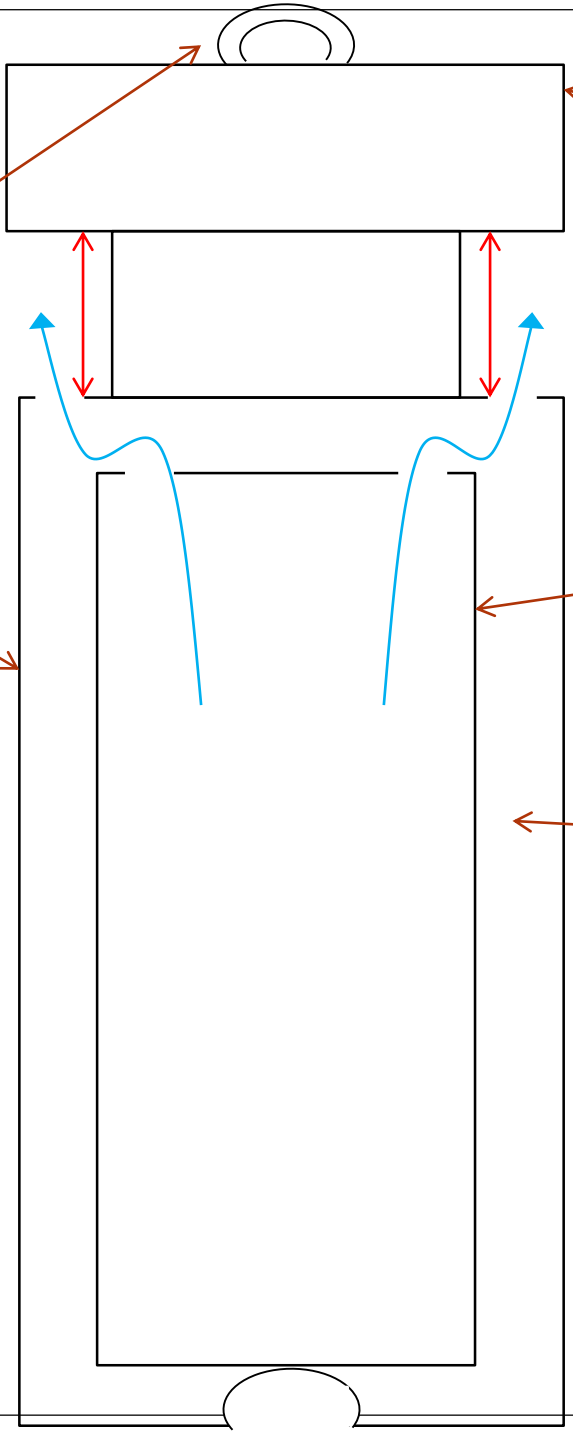
What I found hard

- To keep this capsule strong yet light enough to meet the specifications
- To know what materials to use
  - It is very hard to not know how the material will perform in the extreme conditions
  - To not have access to the exact properties or specifications of the material
- To find a way in which it could be easily opened when found – not just broken into

What I found interesting

- To be involved in such an amazing project that I know will be the talk of the world in a few months time
- To put my problem solving skills into practice
- To persevere with a problem even when I didn't know where I was going with it
- To follow through an idea from beginning to end and improve it
- I enjoyed finding new materials on the internet, some of which have only just been made

Idea 1



Iron core within

A cap that with little force will move up and down

Carbon Fibre

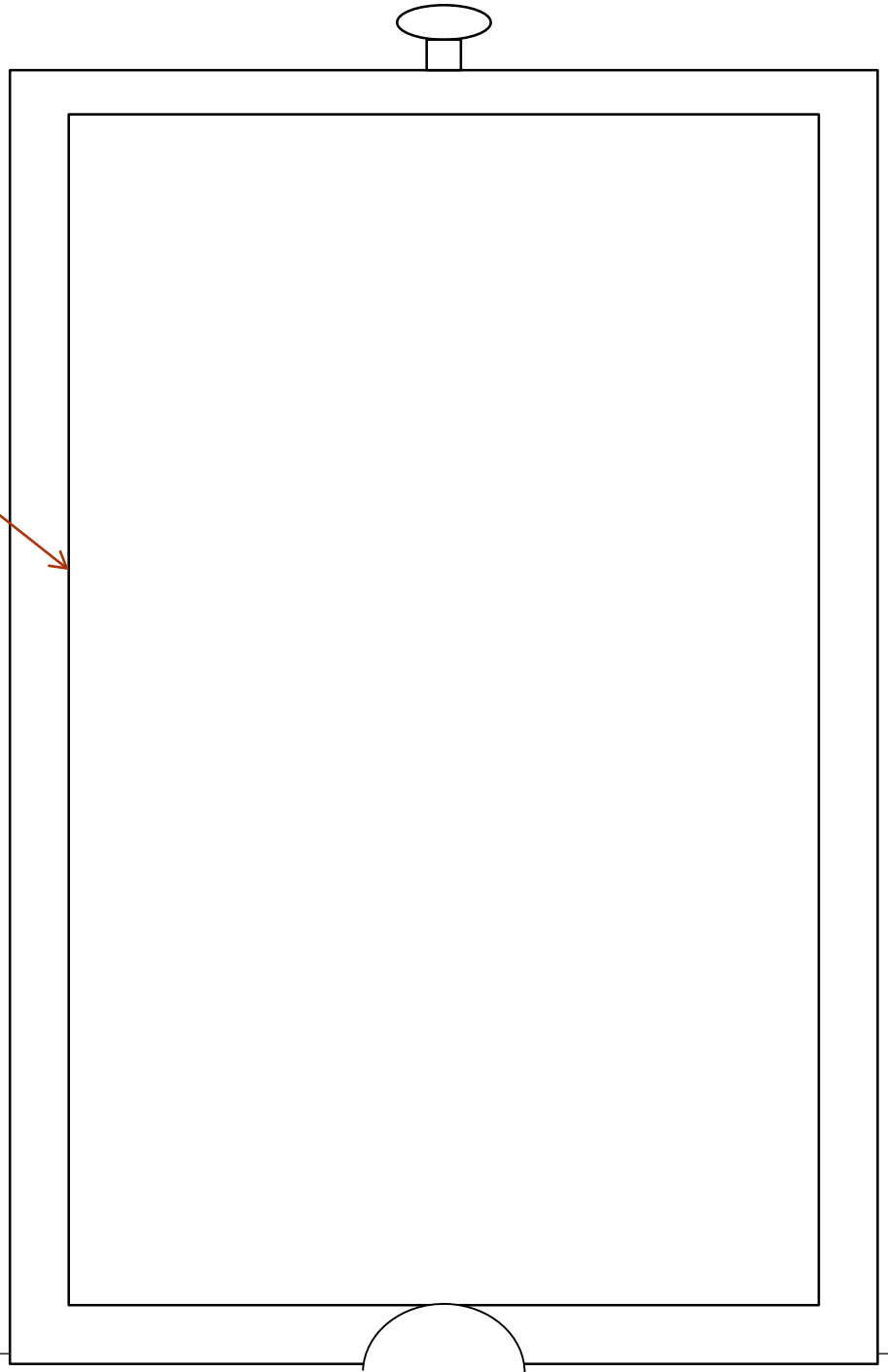
Titanium

D3o
The harder it is pressed the more solid it becomes

Evaluation

- Benefits
  - It would allow it to be sealed on Earth
  - It can be opened with relative ease when positioned on the surface of the Moon
  - It will close due to the weight of the container being positioned on top of it
- Problems
  - If it jams whilst on the moon there is no way to open/close it
  - Hook requires a large degree of accuracy
  - There is no easy way to disengage the hook from the hole

Idea 2



Carbon fibre
Nano pores to allow air to escape

Titanium
Nano pores to allow air to escape
Creates a vacuum inside

The claw:

Evaluation

- Benefits
  - It is a simple design
  - There is no need for opening/closing whilst on surface of the moon
  - Easy to lift/drop each container
    - Its orientation doesn't matter
- Problems
  - There is no way to easily open it when it is found
  - There is no way to seal it when taking off
  - It may take longer than a month for all the air to escape the capsule

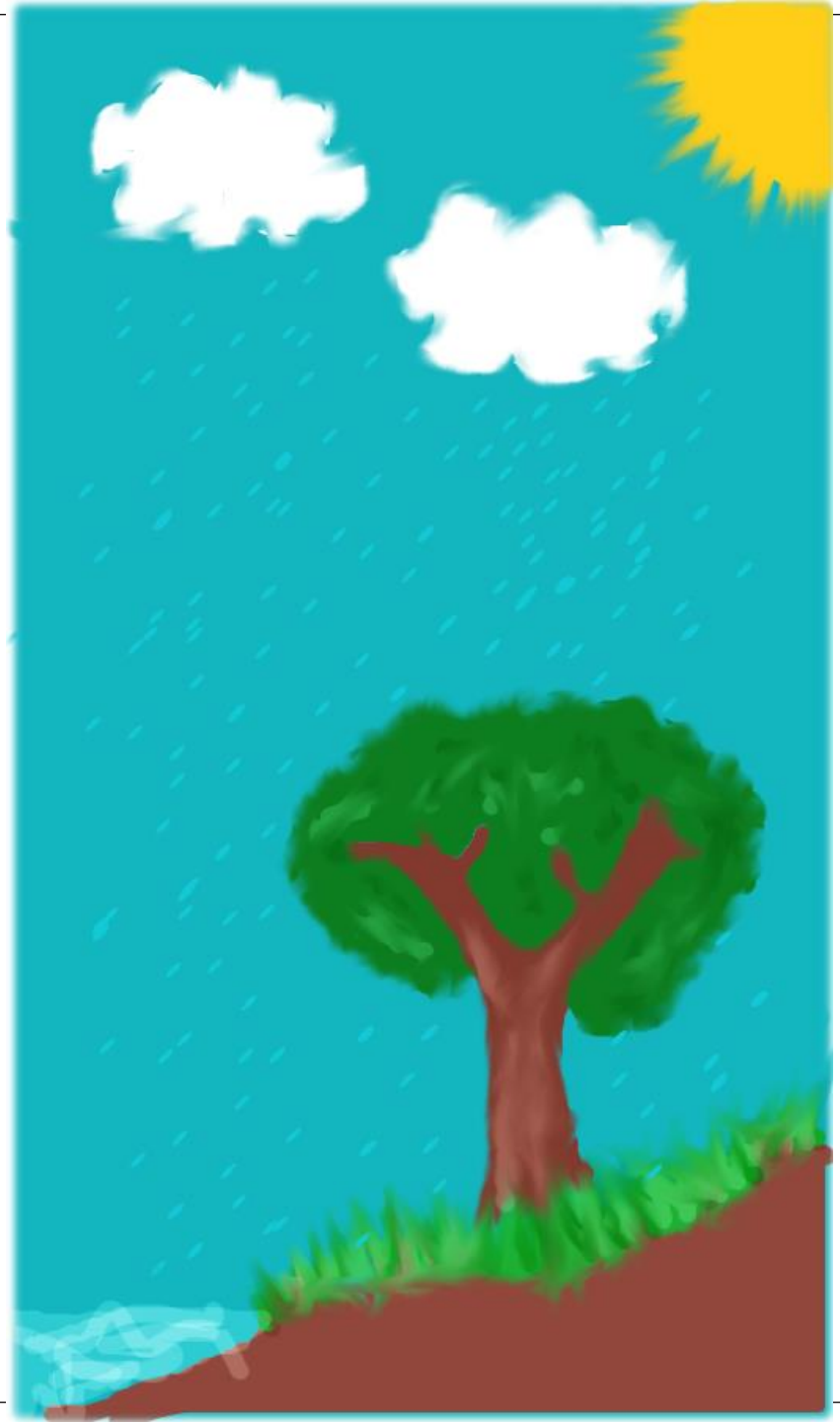
The Materials:

- Carbon Fibre
  - Density= 1740kgm^{-3}
- D3o
  - Density= 400-600kgm^{-3}
  - Temperature range -55°C to 120 °C
- Titanium
- Density=4570kgm^{-3}
- Aluminium honeycomb?

The design

- Primitive
  - like a child has drawn it
  - Evidence that there is a form of life?
    - Encourages people to open it
- Shows all the elements- an idea into what our world once was (or still is)
- Bright colours (that won't fade over time)
- That show our position in the solar system (back of capsule?)
  - And that show where we are in respect to the Moon.
- It could be held as a competition for primary school children

Example **front**



Unknowns

- Due to the inability to test the materials I was unable to know the thickness required for the desired strength, therefore unable to say the mass of each capsule
- The time taken for all the air to escape the capsule
  - Will it be within a month
- Whether the strength of the material will be maintained when it has micro pores
- Whether these materials will last for that length of time

Looking to the future

- Test the materials individually and in a vacuum
  - Allowing us to find the optimum width of each material
  - Make sure they can withstand the temperature difference
- Test the materials on a program to see if there are any major issues with the design
- Create a prototype and put it through vibration testing
- Making sure that nothing rattles
- Costing