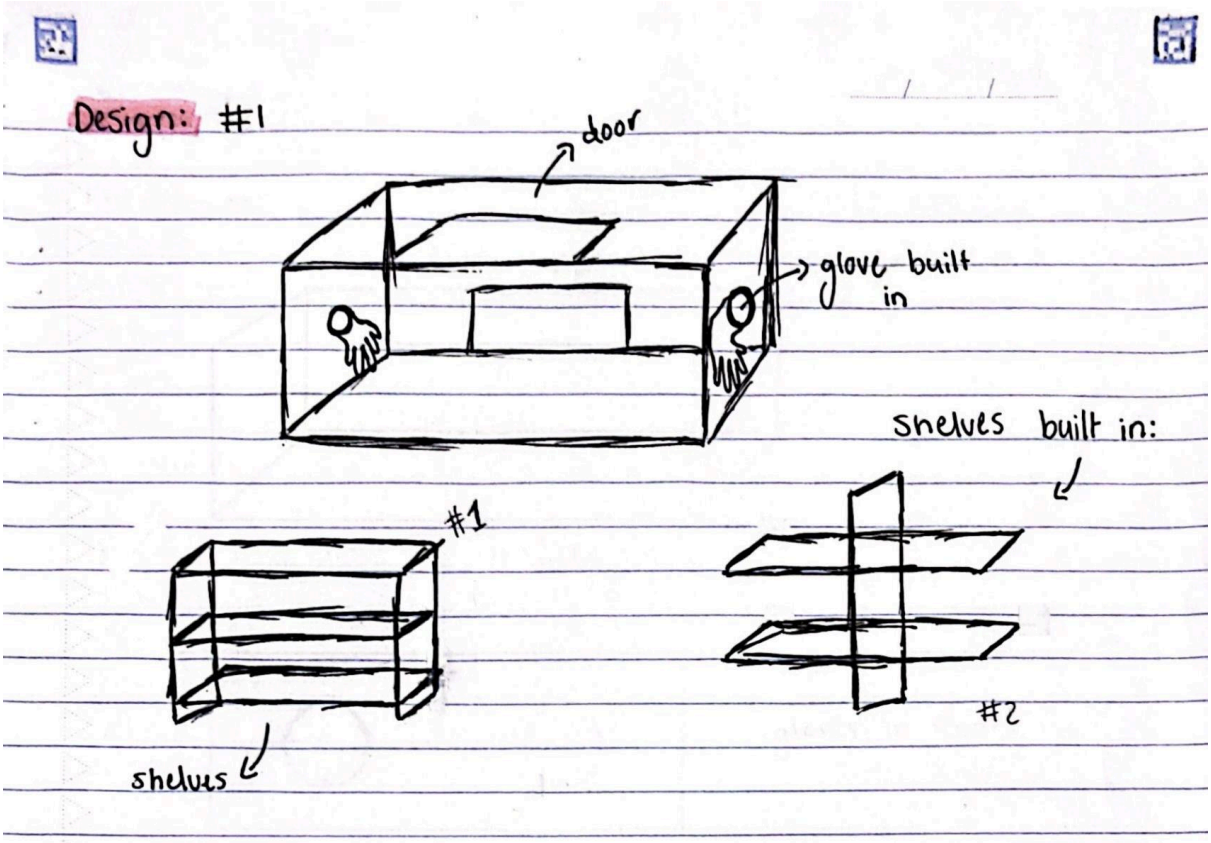
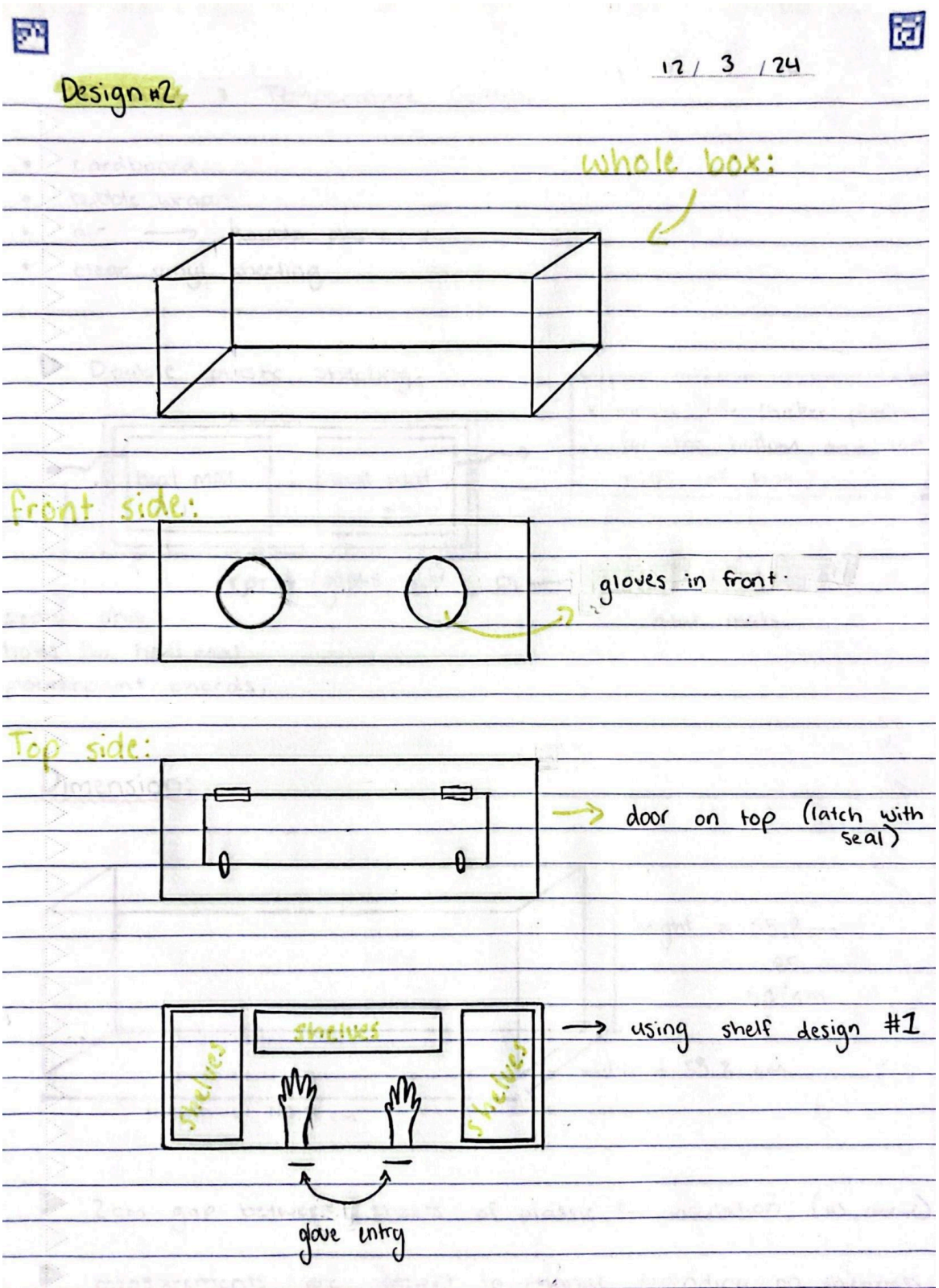
A huge component of my Senior Thesis Project was the design and construction of my very own incubator which would be able to simulate the environment of the human oral cavity.

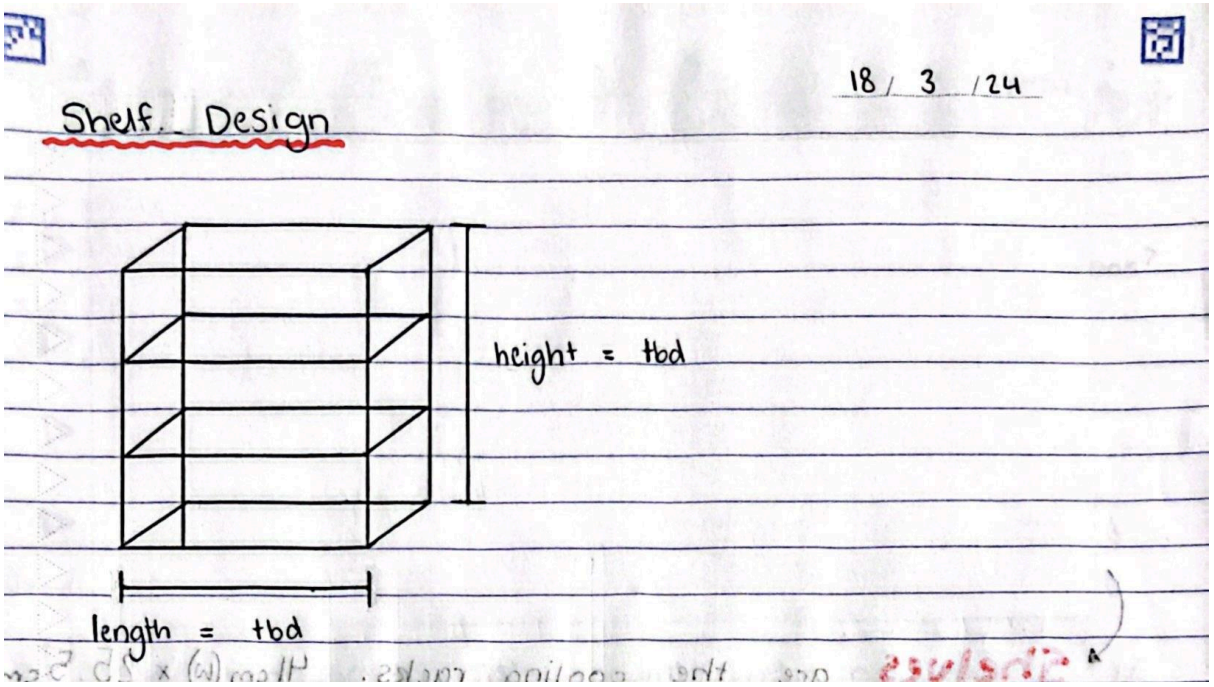
Design Process:

When I began the design process for my incubator, I knew I had a clear vision and idea of what I wanted it to look like, and what sort of 'accessories' it would include. For example, I really wanted it to have gloves which were built into it. I knew it would need shelves for the petri dishes/my experiments to sit on, I knew I wanted it to be clear/see-through for easy observation, as well as have an easy access door either on the roof, or on the side of the box. I ended up experimenting with different ways I could build the shelves as well.



After creating my first design, I wanted to reevaluate it, and see if I could make it better. Using a ruler this time, I wanted to map out what the incubator would look like from every perspective, top to bottom, side to side. I was still very keen on the built in gloves, and decided that I wanted the box to be made of plastic sheeting. I chose the most practical shelf design and wanted to include as many details as I could into the second design.

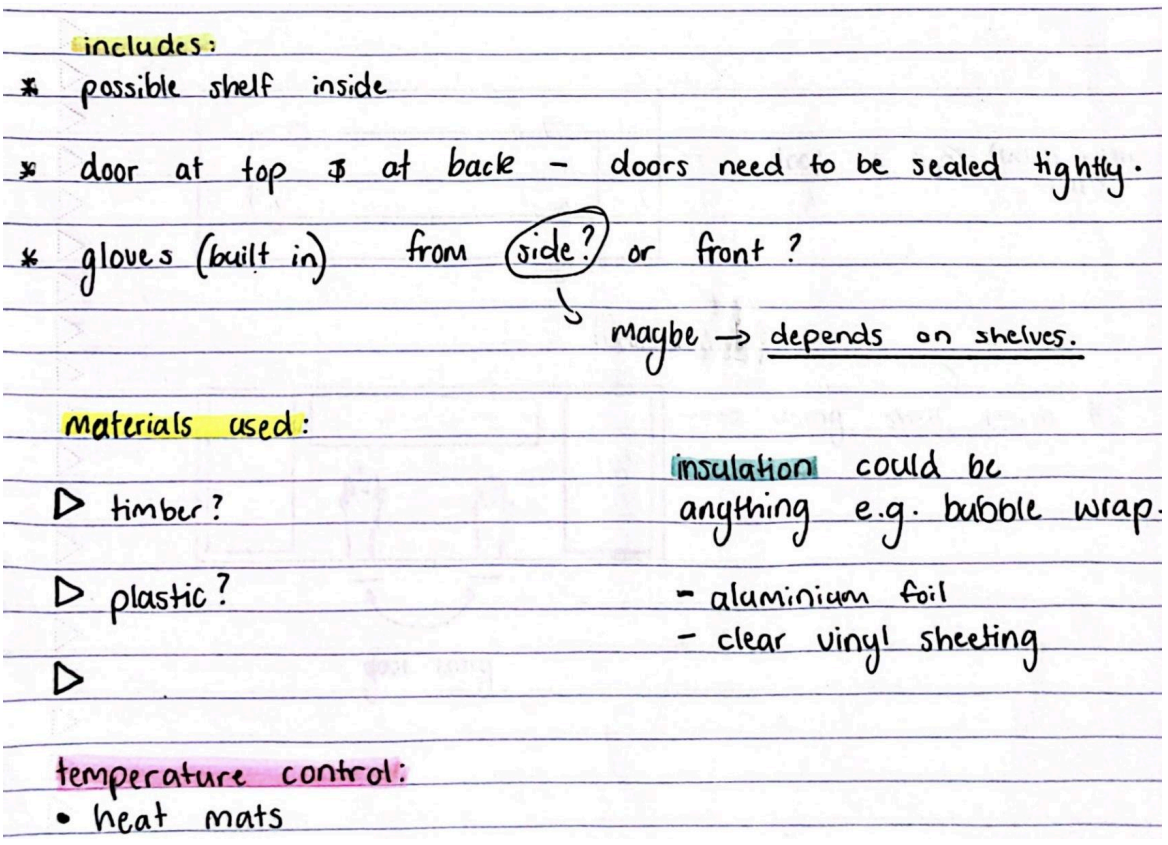




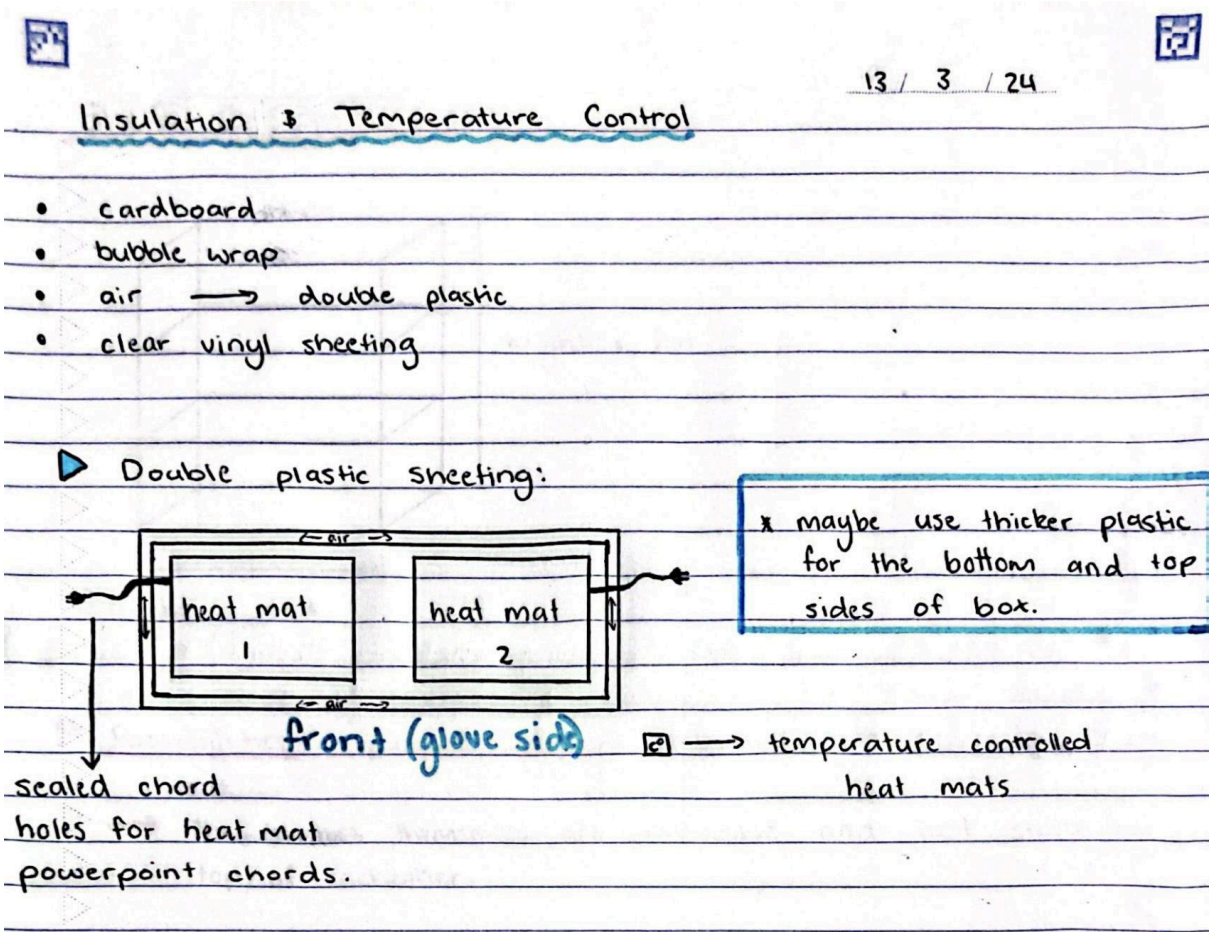
Practicality of the Incubator & Variables to Consider:

When designing the incubator, I took many different factors and variables into consideration, including:

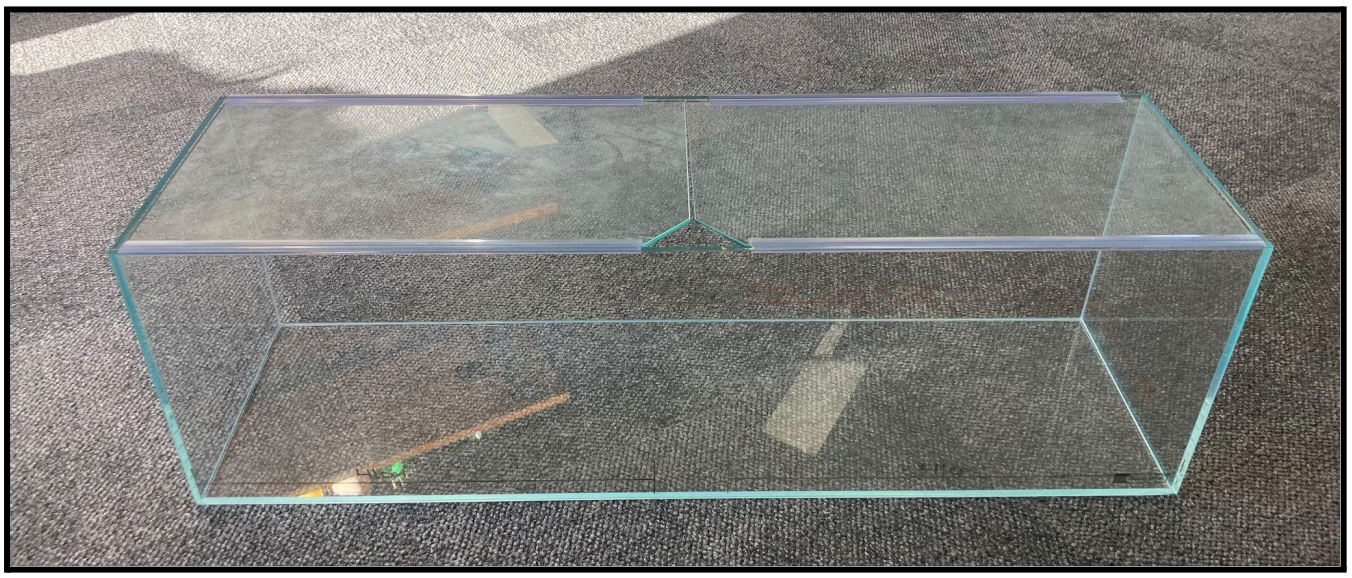
- Insulation
- Condensation
- Temperature control
- Materials



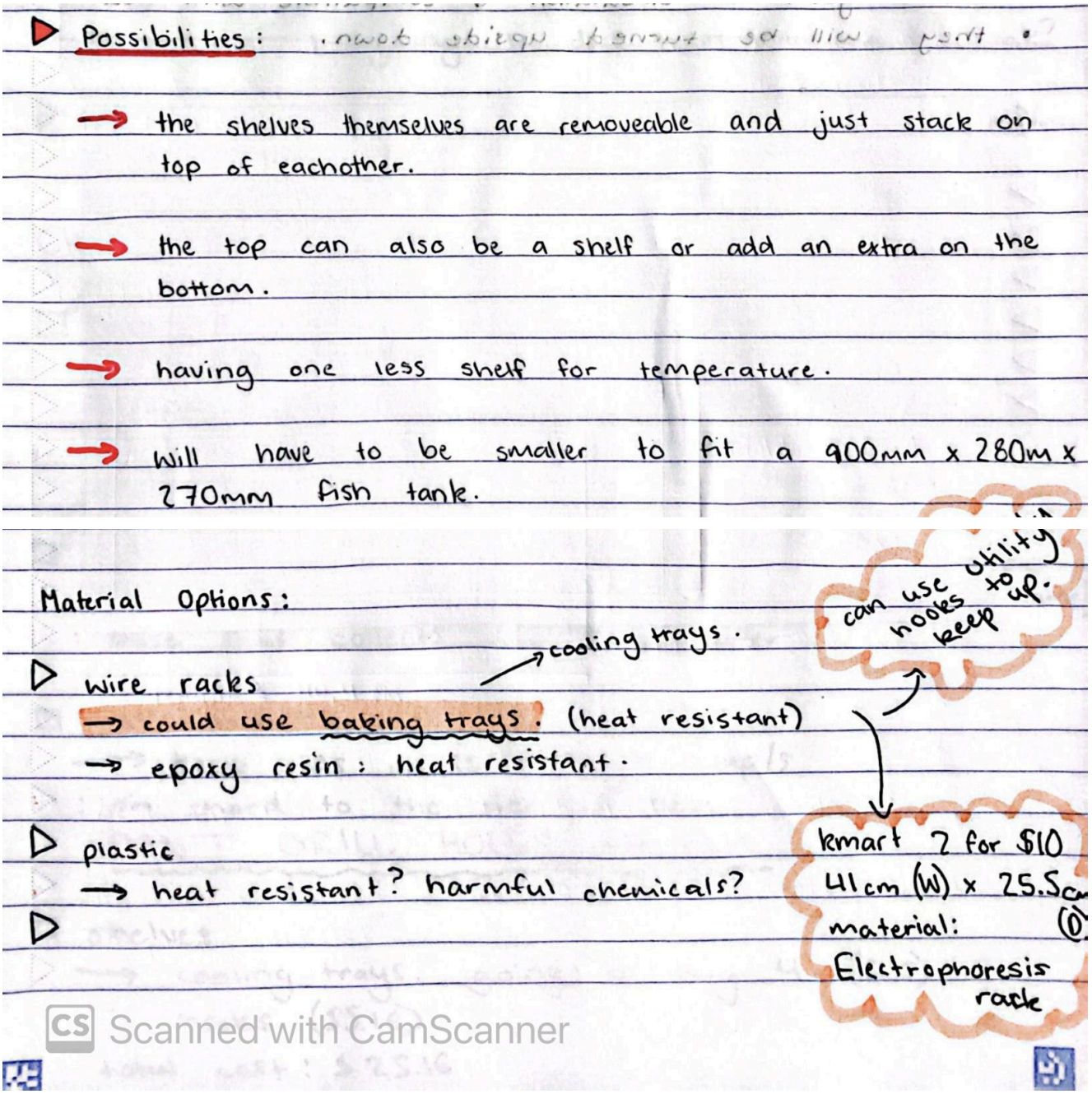
With the help of my science mentor, Grant Arthur, we were able to come up with solutions for each variable/factor which would have to be controlled in order to create the most efficient incubator for what I wanted to achieve within my senior thesis project.



One day when I was planning out my incubator, debating which materials would be the best choice to use, my teacher came up to me and said “Hey, why don’t you use a fish tank?”. Before then I hadn’t even considered that. I immediately got onto facebook marketplace and looked for cheap and affordable fish tanks which were close to me. Taking into account the rough dimensions the fish tank would need to be in order to fit the heat mats I had already collected.



The approach taken with the shelves was to have them easily removable from the incubator if needed, to be easily accessible, and to be affordable. With the two lids of the fish tank being easily removable, it made it easier and opened up new possibilities for the shelves.



I decided to use wired baking trays which were heat resistant, meaning that the risk of them being damaged or disrupting any future experiments was taken care of. Plastic hooks which can tolerate heavy loads were used to hold the shelves up. The measurements of all of the materials used were also taken into account during this process.

Measurements

fish tank glass thickness : 6mm

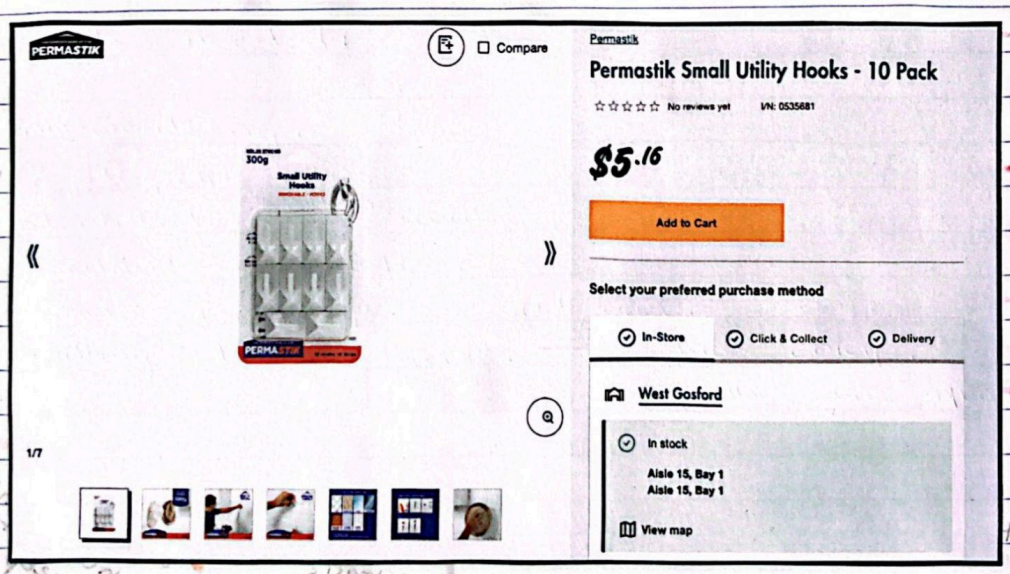
heat mat dimensions: 25.4cm x 52.705

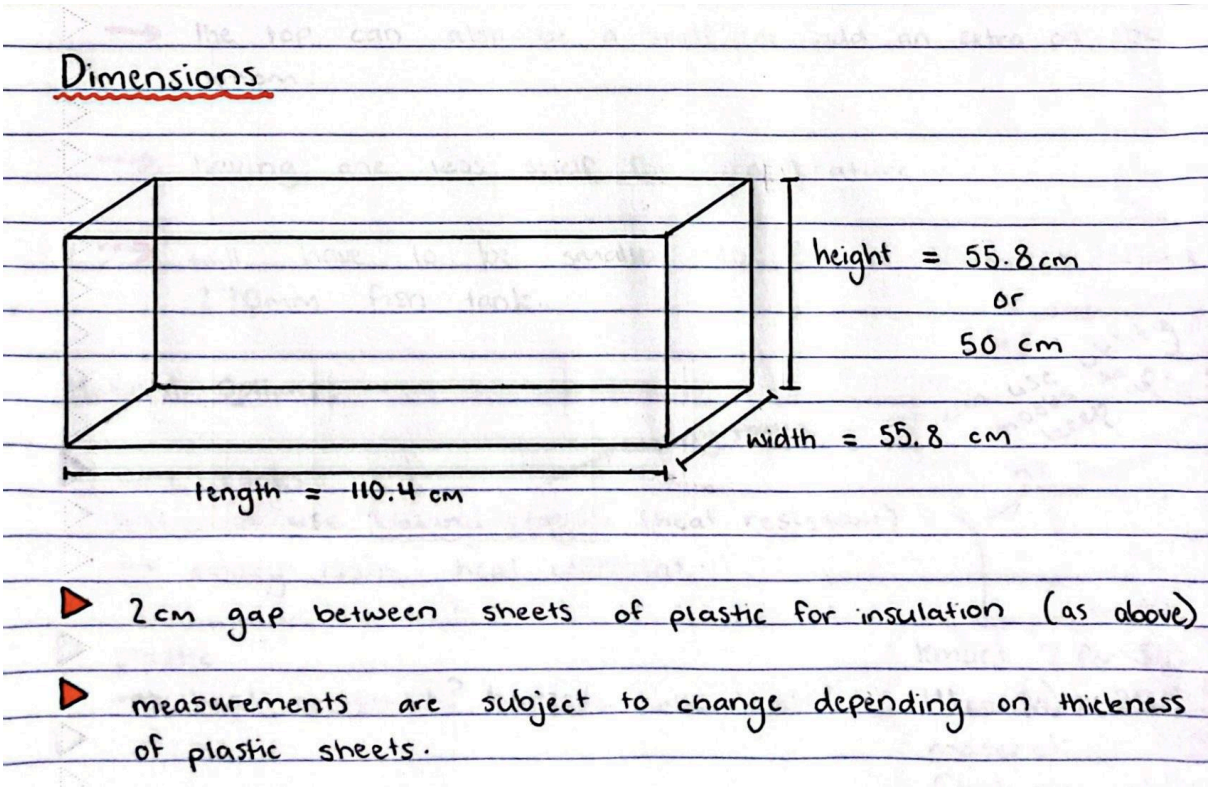
fish tank dimensions: 900mm x 280mm x 270mm

shelf cooling trays dimensions: 41cm x 25.5cm

Shelves are the cooling racks. 41cm (w) x 25.5cm(

- allows good air circulation & compatible with heat
- they will be turned upside down.

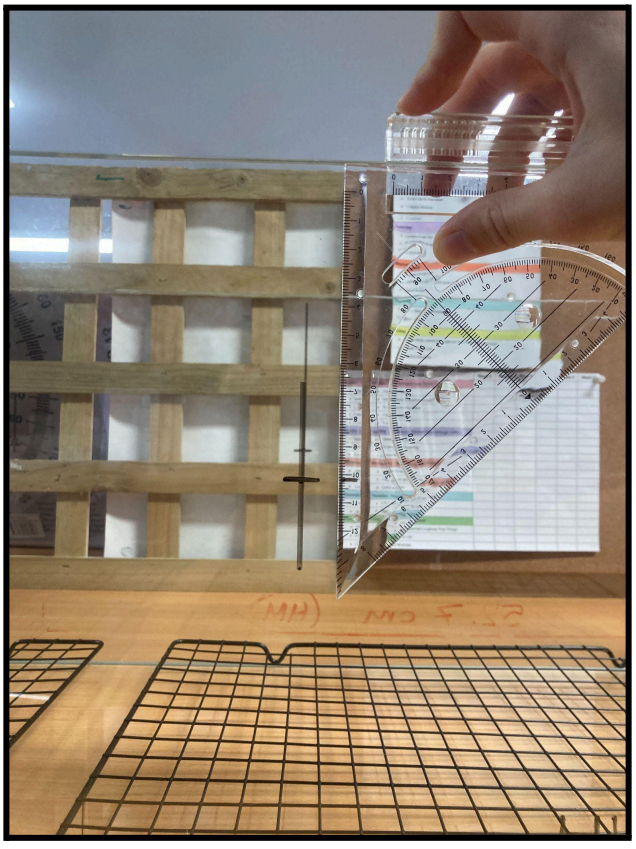




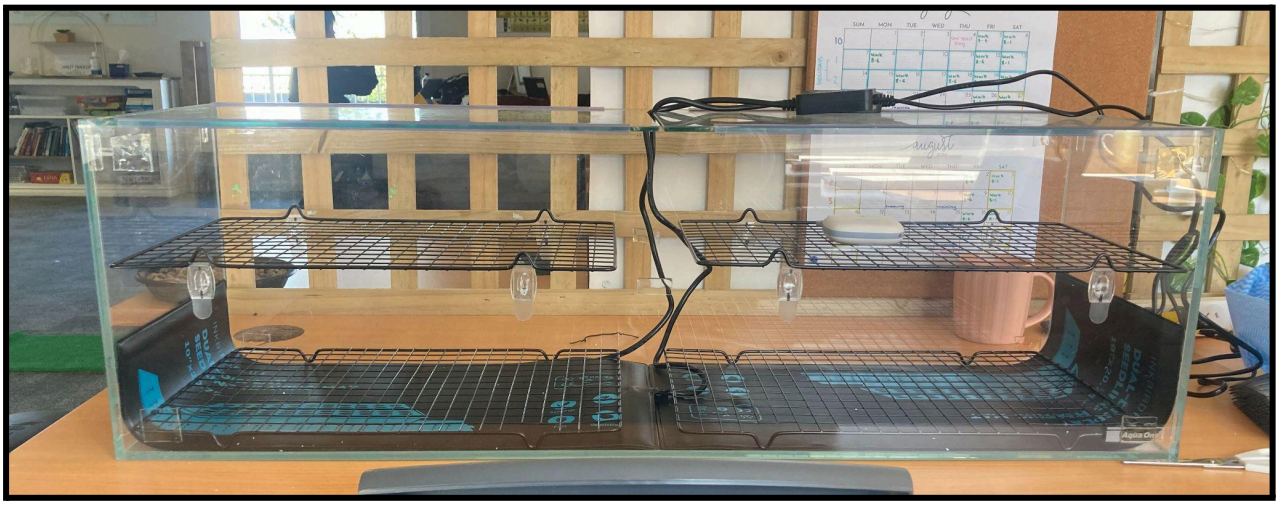
Construction:

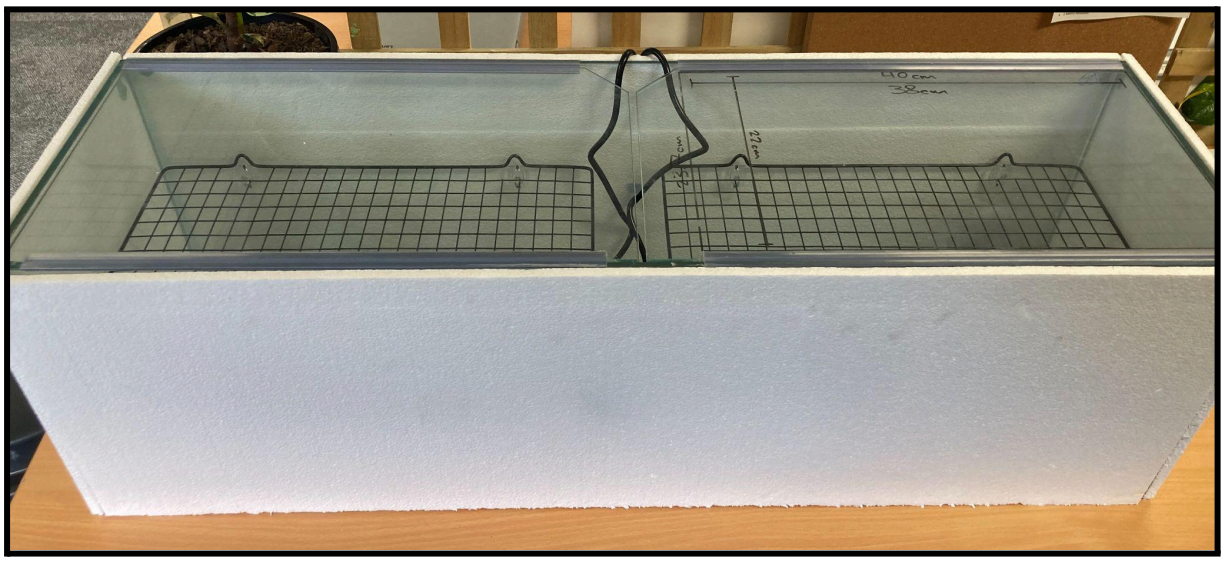
After collection of all materials, it was time to construct the incubator.

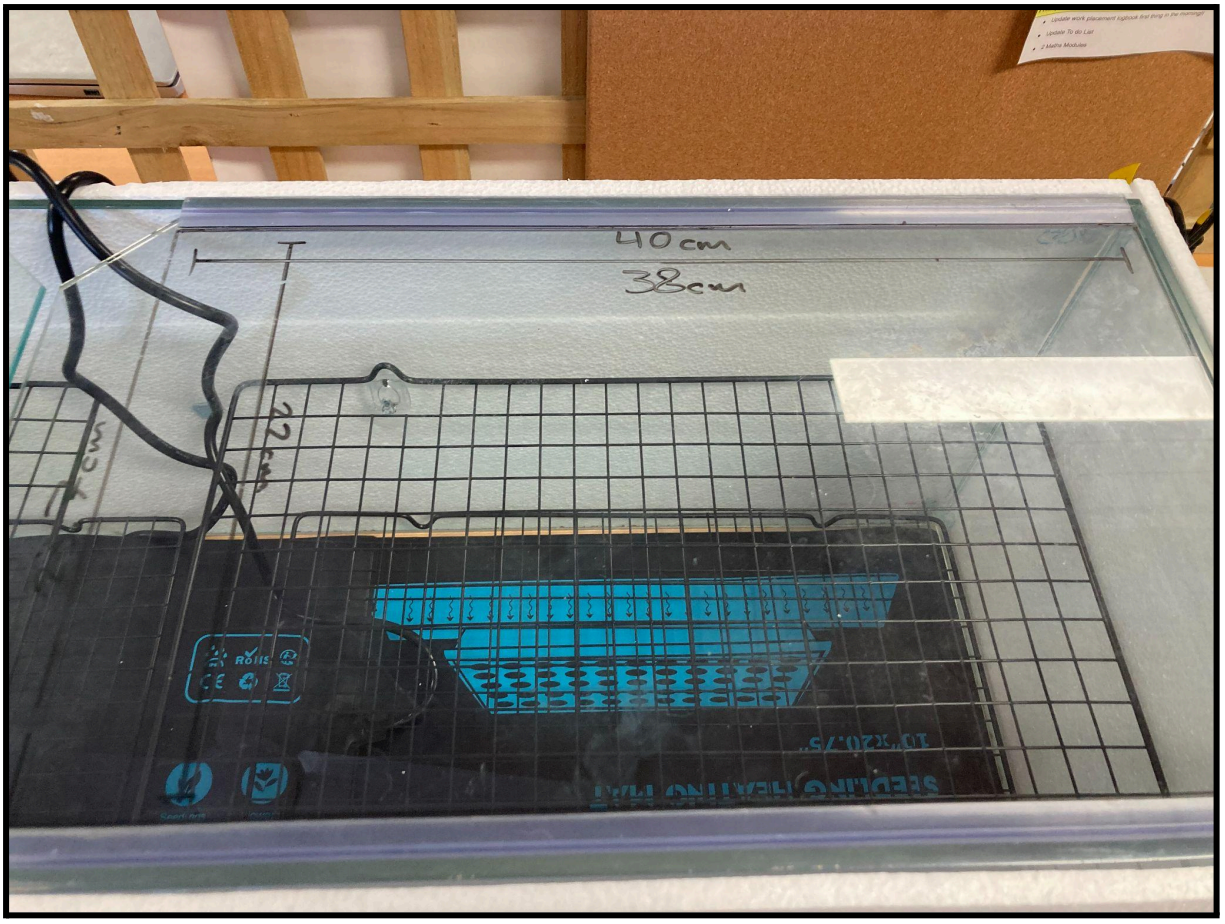
Measuring out where the hooks will be positioned:



Installing heat mats, shelves, and insulation:






40cm
38cm
22cm
7cm


INKBIRD PLUS
DUAL-DISPLAY
SEEDLING HEATING MAT
40cm
38cm

Finished Incubator - Otherwise Known as 'The Spitbox'