

## **Hot water in a immersion heater.**

### **Background Knowledge:**

Water may be used to heat up water during the night using an immersion heater this is to take advantage of the cheap rate of electricity. But the problem is to keep the water's heat till the time when it is used. E.g. for a bath or washing up. Immersion heaters are used in many homes and are very efficient. They insulate heat well, this is because most of them have an insulated jacket which is mainly made out of a fibre glass wool and are coated with a bright colour this is because fibre glass wool is very thick and does have many air holes in it. This is good because heat air is a good conductor of heat and a bad insulator of heat, therefore the fewer the air holes the fewer the heat is that is conducted. Also the being as the wool has an outer colour coat which is bright this is also good as bright colours are good emitters of heat. I will conduct my own experiment to see if what other materials are good insulators of heat, by making my own mini boiler jackets and testing them.

### **Key Factors:**

Immersion heaters that we are using are tin cans which are filled with heated water. Therefore I also will have to consider in my experiment what will effects that the types of materials will have on my results. Due to this I will consider the size and shape of my tins that I will put the water in, also I will have to keep the same volume to make it a fair test. I will boil my water to 70°C, for each material I test. I will also consider the type of material I use, considering the cost of each one.

**Aim:**

I have to also consider the mass and the thickness of my material as if it is too thin then my experiment will not be very efficient or work very well. This may cause me to have flexural results which I will discuss in my evaluation.

**Prediction:**

I predict that the best insulator of heat will be a thick solid material which does not have many air holes as the air holes will conduct the heat.

**Explanation:**

**Equipment:** Bunsen burner, beaker, thermometer, heat mat, tripod, tin cans, cotton wool, foil, velvet and water.

In my experiment I will keep the same the volume of the water as if I have different volumes it will effect the heat that is contained in the can, I will also keep the shape of the tin the same as if I change it might effect the way the heat is spread finally I will not change the size of the cans this is because the size of the cans will effect the way the heat is spread and the amount of heat that the water has got. I will also put lids on my cans; this is because heat rises so I will put a lid on the top to stop the heat from rising and escaping. The lid will be made out of foil and I will make a hole in the lid to place the thermometer in. I will record the temperature every minute for ten minutes and see how the insulator affects the drop in temperature if there is any drop. I will have one tin with no insulation to see how the effective the insulation really is.

**Results:**

**Cotton Wool:**

Time(Min)	Temperature(°C)
0	70
1	70
2	68
3	67
4	66
5	65
6	65
7	64
8	63
9	62
10	61

**No Insulation:**

Time(Min)	Temperature(°C)
0	70
1	68
2	64
3	62
4	61
5	60
6	59
7	59
8	58
9	57
10	57

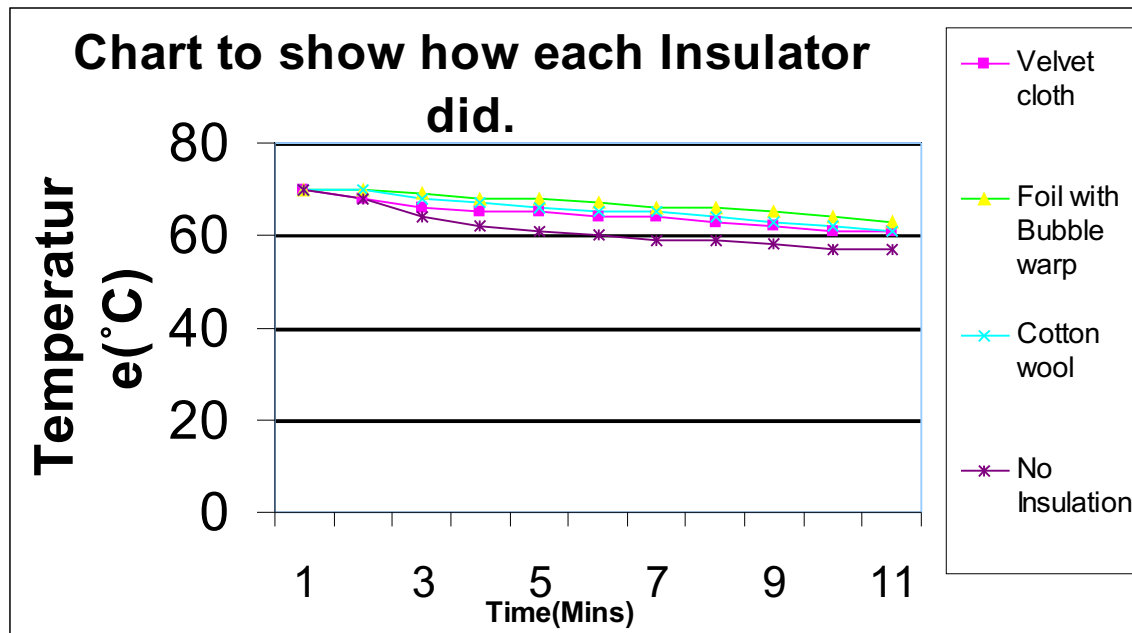
Velvet Cloth:

Time(Min)	Temperature(°C)
0	70
1	68
2	66
3	65
4	65
5	64
6	64
7	63
8	62
9	62
10	61

Foil with bubble wrap:

Time(Min)	Temperature(°C)
0	70
1	70
2	69
3	68
4	68
5	67
6	66
7	66
8	65
9	64
10	63

### Graph:



### Conclusion:

My results show that foil with bubble wrap was the best insulator, the heat escaped gradually over the course of ten minutes. My graph shows that there was no major drop in the temperatures, and also that the no insulation experiment dropped to the lowest temperature out of all of them. This shows that the insulation actually does work. However there was no major difference in all of the temperature drops. My prediction not fully correct, but I was correct in saying that a solid material will insulate the heat well.

### Evaluation:

Overall my experiment went well and I found that what I thought was correct, however next time I would work with more people to help get more results. If I was to do this experiment again I would also use a lot more colors for the coating so I could see what effect a range of colours would have on the insulation of heat. I would also use more materials to find the perfect insulator of heat.