Physics Investigation: How does insulation effect the loss of heat?

In this investigation I am going to try and find out what difference it makes if you wrap newspaper round a beaker with hot water in it and see if the heat loss is different with different thickness layers of newspaper.
I carried out a preliminary experiment and found out that by only increasing the layers of thickness by 1 layer each time, that wont make enough difference to make a good graph because the trends will be too similar. So I chose to increase the layers by five sheets each time.

Apparatus:
* Beaker
* Stopwatch
* Newspaper
* Polystyrene
* Thermometer
* Kettle
* Stand and clamp

I will also take a number of safety precautions whilst conducting the investigation. I will ensure the kettle is used safely through out the experiment, and hot water is transferred securely. . I will use protection when handling the boiling tubes when the hot water is present. Safety precautions are needed because I am dealing with hot water, which can scald. The following things need to be acknowledged, in order to keep this experiment safe. I will be careful not to knock over the beaker with the hot water in and will probably hold it in a stand and clamp. I will be careful not to knock over other people's beakers. Care is needed when pouring hot water. I will not run with the beaker of hot water.

To make this a fair test I will have to do the following. I will keep the volume of water the same. I will wrap the beaker with newspaper in the same way each time because some ways can effect the heat loss more that others. I will place the thermometer in the beaker at the same place each time. I will place the beakers on polystyrene when they are being tested because it insulates the heat. I will use the same type of newspaper for each experiment. I will use the same size beaker, which is made out of the same material. The factors I will change are. I will change the layers of newspapers on the beaker.

I will get 6 beakers. I will record two at a time. I will put polystyrene on the top and bottom of the beakers when I have filled the beakers up with 150 ml of boiling water. There is a little hole in the polystyrene on the top of the beaker to stick the thermometer through. I will then take results every five minutes for a total of 30 minutes. There will be 6 readings taken for each newspaper layer range. I will record 6 different layers. 0 layers, 5 layers, 10 layers, 15 layers, 20 layers and 25 layers. This should give me a good range of results.

I predict that the more layers of newspaper round the beaker, the less quickly the water will lose heat. I say these because the more layers there are the more air pockets there are to keep the heat in. If there are more air pockets the more

hot air is trapped in the newspaper. This air acts as an insulator. I also predict that more heat will be lost at the start of the experiment because the water is hotter, so there is more of a heat difference between the inside and outside. Therefore, more heat is conducted out the beaker because of the cooler temperature outside the beaker. But as the temperatures even out the heat loss gets less, because less heat is being conducted away from the beaker. So you should see a graph looking like this.

Results:
(Temp in C)

Minutes	0 layers	5 layers	10 layers	15 layers	20 layers	25 layers
1	77	78	76	78	76	77
2	76	76	75	77	75	76
3	74	75	74	76	74	75
4	73	74	73	75	73	75
5	72	73	72	74	73	74
6	70	72	71	74	72	73
7	69	71	70	73	71	72
8	68	70	70	72	70	71
9	67	69	69	71	69	71
10	66	68	68	70	68	70
11	65	66	67	69	68	69
12	64	66	66	69	67	68
13	63	65	65	68	66	67
14	63	64	65	67	65	67
15	62	63	64	66	64	66
16	61	62	63	65	64	65
17	60	61	62	64	63	64
18	59	61	61	63	63	63
19	59	60	60	62	62	62
20	58	59	59	61	62	62
21	57	59	58	60	61	62
22	56	58	57	60	60	61
23	55	57	57	59	59	60
24	55	56	56	58	58	59
25	54	55	55	57	58	58

Analysing evidence and conclusion:
My results went down in a good trend. All apart from the 25 layers which cooled quicker than the 20 layers. All the results are clear that they gradually decrease in the graph, In a fairly straight line. The more they are insulated, the slower the temperature falls. It is because the newspaper traps air in between it and the beaker, this insulates the beaker and traps hot air from escaping.

Evaluation:

My results were good. I conclude that the more layers around the beaker, the slower the temperature falls. I could have measured the results more accurately, by taking more time and recording each result twice but I didn't have time.

By William malbon.