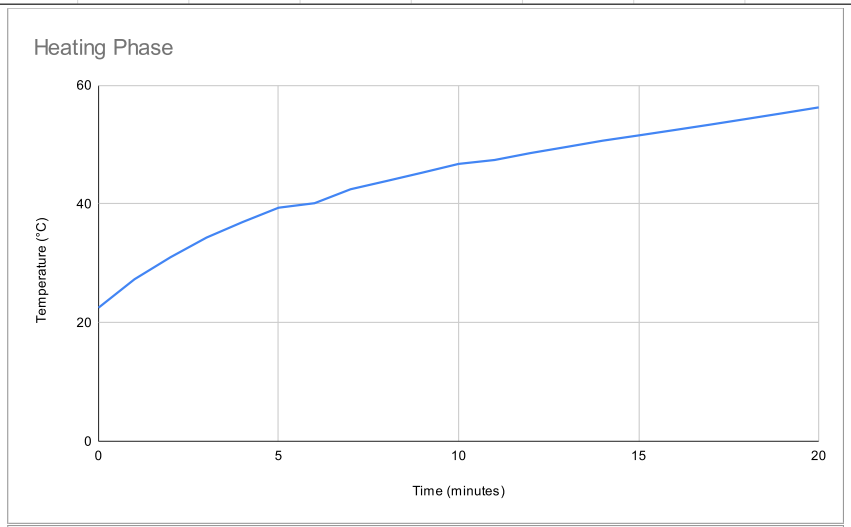
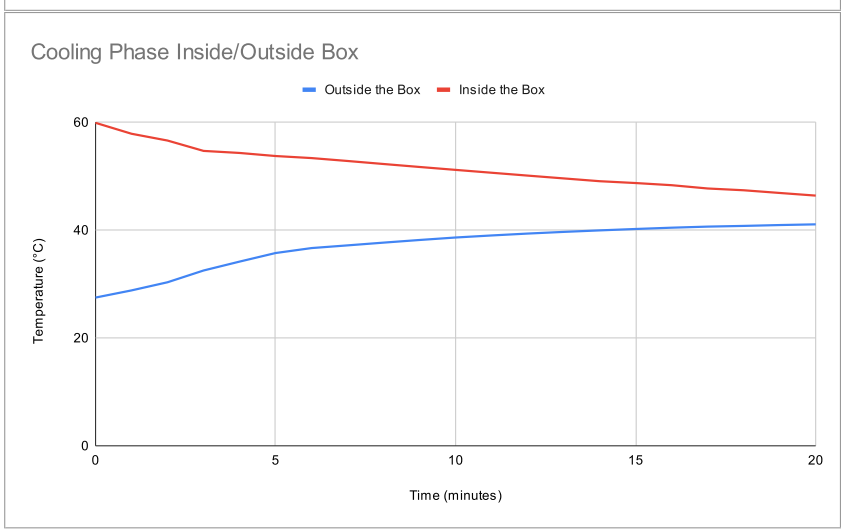
# 1.3.4 Renewable Insulation

Data Collection and Analysis

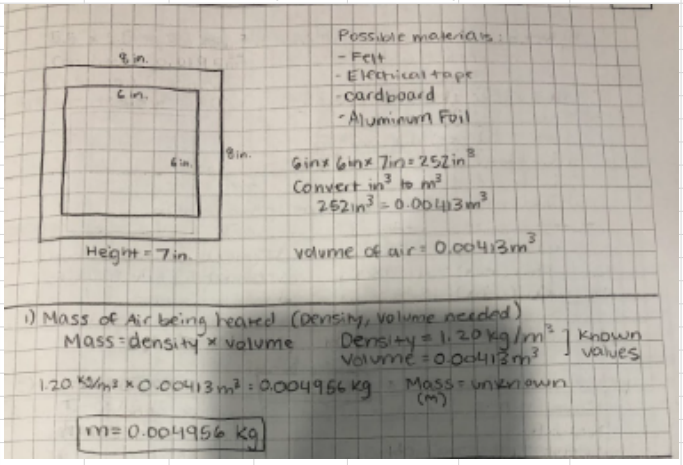
| Data | | | | |
|---|---|---|---|---|
| # | Heating Phase | | | |
| | Time (min) | Temp (C) | | |
| 1 | 0 | 22.51 | | |
| 2 | 1 | 27.31 | | |
| 3 | 2 | 31.02 | | |
| 4 | 3 | 34.33 | | |
| 5 | 4 | 36.94 | | |
| 6 | 5 | 39.36 | | |
| 7 | 6 | 40.12 | | |
| 8 | 7 | 42.47 | | |
| 9 | 8 | 43.86 | | |
| 10 | 9 | 45.28 | | |
| 11 | 10 | 46.74 | | |
| 12 | 11 | 47.4 | | |
| 13 | 12 | 48.57 | | |
| 14 | 13 | 49.6 | | |
| 15 | 14 | 50.65 | | |
| 16 | 15 | 51.54 | | |
| 17 | 16 | 52.45 | | |
| 18 | 17 | 53.37 | | |
| 19 | 18 | 54.32 | | |
| 20 | 19 | 55.28 | | |
| 21 | 20 | 56.26 | | |
| # | Cooling Phase (out) | | Cooling Phase (in) | |
| | Time (min) | Temp (C) | Time (min) | Temp (C) |
| 1 | 0 | 27.5 | 0 | 59.91 |
| 2 | 1 | 28.83 | 1 | 57.88 |
| 3 | 2 | 30.34 | 2 | 56.62 |
| 4 | 3 | 32.52 | 3 | 54.7 |
| 5 | 4 | 34.17 | 4 | 54.32 |
| 6 | 5 | 35.76 | 5 | 53.75 |
| 7 | 6 | 36.68 | 6 | 53.37 |
| 8 | 7 | 37.18 | 7 | 52.83 |
| 9 | 8 | 37.69 | 8 | 52.27 |
| 10 | 9 | 38.18 | 9 | 51.72 |
| 11 | 10 | 38.64 | 10 | 51.18 |
| 12 | 11 | 39.02 | 11 | 50.65 |
| 13 | 12 | 39.37 | 12 | 50.12 |
| 14 | 13 | 39.68 | 13 | 49.6 |
| 15 | 14 | 39.96 | 14 | 49.08 |
| 16 | 15 | 40.22 | 15 | 48.74 |
| 17 | 16 | 40.46 | 16 | 48.34 |
| 18 | 17 | 40.66 | 17 | 47.73 |
| 19 | 18 | 40.79 | 18 | 47.4 |
| 20 | 19 | 40.95 | 19 | 46.9 |
| 21 | 20 | 41.08 | 20 | 46.41 |



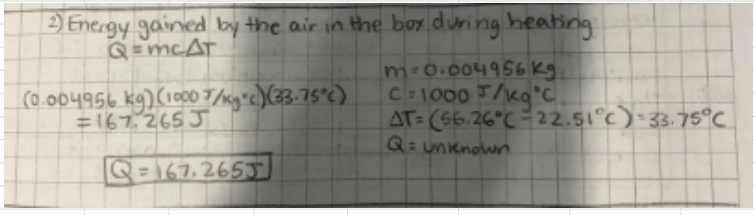
**Problems:** Work each problem showing all work. For each problem, select equation(s), list all knowns and unknowns, substitute known values into equation(s), simplify and solve for desired value.

1 Mass of air being heated m = 0.004956 kg



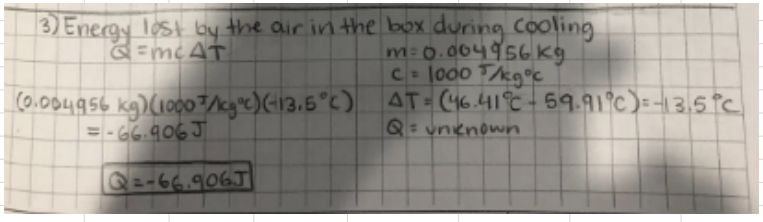

2 Energy gained by the air in the box during heating - Q (heat) in J (joules)

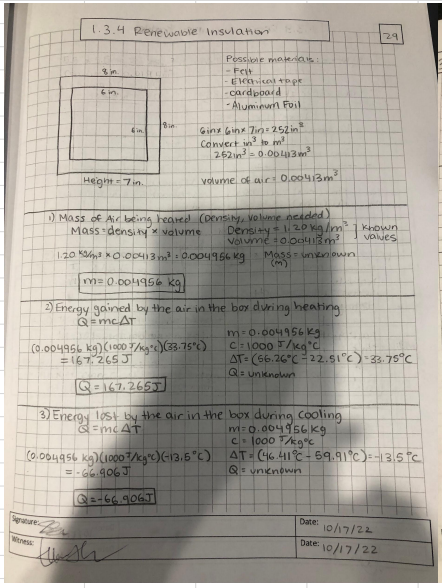
Q = 167.265 J

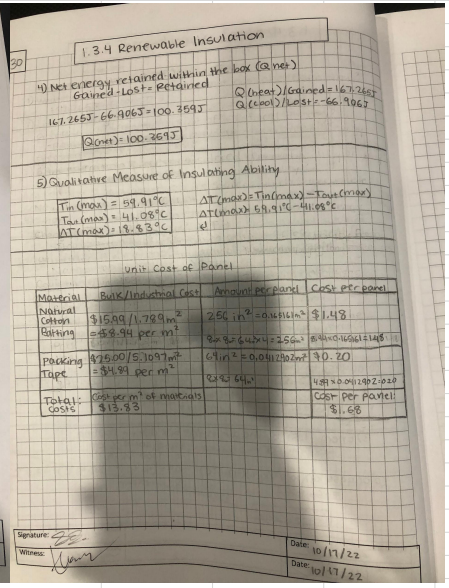



3 Energy lost by the air in the box during cooling - Q (heat) in J (joules)

Q = -66.906 J (Energy is being lost, so answer should be negative)

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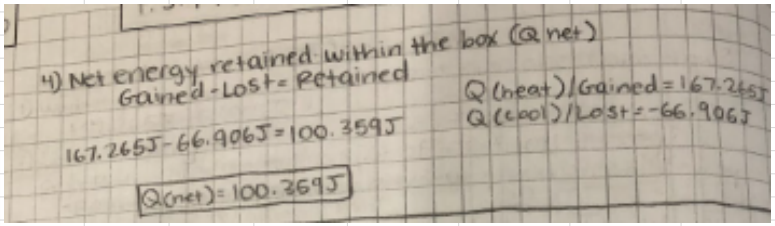
4 Net energy retained within the box - Q (heat) in J (joules)

Q(net) = 100.369 J




5 A qualitative measure of your insulating ability is the difference between the maximum inside temperature and the maximum outside temperature (larger is better)

| | | | |
|---|---|---|---|
| Tin (max) | = | 59.91°C |
| Tout (max) | = | 41.08°C |
| Change in T (max) | = | 18.83°C |