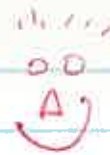


Welcome to my SRP Logbook



Hello & welcome to Lauren Lancaster's Year 9 SRP logbook. This logbook, from now until the end of Term 2, will chronicle my Student Research Project & describe the thoughts & methods behind my scientific investigation.

I have brainstormed some ideas I could potentially use as my topic:

- * How does the age of a house affect the mineral content of the water from its taps?
- * How does the colour of a wax candle affect its burning rate?
- * How does temperature affect bovine waste decomposition & the subsequent production of methane gas?

I have decided to investigate the following topic:

How does temperature affect bovine waste decomposition & the subsequent production of methane gas?

This week we are required to submit a preliminary plan for our investigation so I am going to go do that & I will report back later.

Week 7 Term 1

Good news! Mr Bridge has accepted my topic idea with no queries whatsoever! I now have to start my actual weighted plan & research assessment task (worth 30% of semester mark).

I am looking forward to investigating this topic because it has relevance to climate change & global warming, issues I am quite passionate about. *as you should be!*

Please see the next page for my approved preliminary plan!

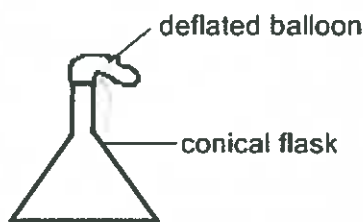
Student Research Project 2015 - Preliminary Plan for Investigation

In my SRP I plan to investigate the following question:

How does temperature affect bovine waste decomposition and the subsequent production of methane gas?

I intend to conduct the following experiment to ascertain my results.

- Four samples of cow manure will be placed in four large conical flasks.
- A balloon (from the same packet) will be placed over each of the four flasks and sealed with tape as shown in this diagram:



oops 23/11/15

- The flasks will then be placed in four locations at 5°C, 15°C, 25°C and 35°C
- The manure will then be left to decompose for 5 days.
- After this period the balloons will be inflated with methane gas that has been produced during decomposition.
- The circumference of each balloon will be measured and the amount of methane gas inside each balloon will be calculated using the density of methane gas (0.000656 g/cm³) and the approximate volume of the balloon (with other equations which will be shown in my logbook and results):

$$V = \frac{4}{3} \pi r^3$$

- These results will be recorded and analysed to find out how temperature affects methane gas production (which balloon was largest after 5 days of decomposition).

I need to find out the following to conduct my experiment well:

- The exact equations I need to know to calculate the amount (g) of methane gas in each balloon
- Where I can source fresh cow manure
- Where I can place my flasks so they are in a temperature controlled environment

I like it. JB

31/3/15 Wk 10

Tomorrow our Research & Plan assessment is due. I am confident that my work is of a high standard & that I will get a good mark (I hope!) *Bribery?*
Below I have attached a copy of the formula I calculated for finding the amount of methane (g) in the balloons.

Final equation: ** 15/6/15 not using this equation any more as not using balloons in experiment. ✓*

Amount (g) of methane gas in balloon is =

$$(0.00066g) \times \left(\frac{4}{3} \pi \left[\frac{c}{2\pi}\right]^3\right)$$

where 0.00066g = the density of methane (g/cm³)
& c = circumference (cm) of balloon

(They leak! :D)

good move!

23/4/15 Wk 1

Yesterday in our science lesson we got handed back our marked Preliminary Plan & Research task (30% of semester marks). I got $\frac{24}{25}$ which I'm happy with! I went to talk to Mr Bridge about it & he said I should be using a plastic bag or something that doesn't stretch as gas can stretch a balloon & escape through holes in the balloon. ✓

15/6/15 - This changed & I ran it @ school & at home with 5 samples all together! ☺

8/6/15

Hi logbook, sorry I haven't written in a while. So basically, I am going to run my investigation / experiment this week if all goes smoothly. Tomorrow I will seek a loan of 54 conical flasks, a chemical balance scale & two hot plates. I will then set them up at my house & run my experiment. I have also

changed the method by which I will ascertain how much methane is produced by each sample of cow manure. ✓

Instead of using a balloon I will use plastic bags as these fill with gas without expanding & creating tiny holes in the plastic like a balloon. This means my results will be far more reliable. ✓

I will weigh each plastic bag prior to the investigation & then weigh each bag after the investigation to ascertain the amount of methane ~~it~~ produced by each sample of manure. ✓

I'm looking forward to running my investigation!

go "foo bear"!

12/6/15

I have just gotten home from Pymble Ladies College, Pymble where I collected the cow manure for my experiment. I triple plastic bagged it & it thankfully didn't stink up the train on the way home.

So as an update on where I am running my experiment: ✓

35°C samples - in incubator at school

25°C samples - in water bath (set @ 25°C) at school

15°C samples - in water bath (at 15°C) at school

5°C samples - in fridge at my house (set @ 5°C) ✓

Also I have said samples above because I am running two samples at each temperature for better result reliability. ✓ good.

Mr Bridge has been v. helpful with providing me with the means to create temperature controlled environments for the samples so that is great!
pay rise coming??

I am set to run my experiment on Monday so will write then!



sample artist's impression... ☺ yeh!

Monday 15/6/15

Yay, my experiment is now up & running!! The set up & prep at school was painless, but very smelly ☹️. Also my classmates (who were in the room when I was scooping manure into the conical flasks etc.) & Mr Bridge were surprisingly tolerant with my odorous experiment. To compensate for the stinkiness I am bringing in lollies for everyone next science class! ✓

So the samples are going right now & will run for 4 days. Please note this change to my original plan. I had to change it from 5 days to 4 days because I was running it at school & that was the only way I could do it. It shouldn't really affect my results because I don't know what the results would be at 5 days anyway! Anyway, now I have a painless 4 days waiting for the samples which is great for me!

Check out these photos of the 5°C samples in the fridge at home & the samples at school: ✓



↑
5°C
samples



← my hand ☺

↑
15°C samples ✓✓



↑
35°C samples
(post-investigation)

Wednesday 17/6/15

The experiment is going very well, all running smoothly so that is a great relief. I brought lollies to school today to thank AK for being so tolerant with the manure smell on Monday! This should be a valid note in my experiment ✓

NB. Use lollies to win back support of friends if they are exposed to cow manure stench as if you don't, you won't have any friends at the end of the investigation!! 😊 *politics, eh!*

I'm excited to see ~~my~~ my results so will write after I have collected them on Friday.

Friday 19/6/15

I am finished my experiment!! At school in Period 1, I successfully measured the plastic bags full of gas & at home I also did this successfully. Now I have to input these numbers into my calculator to produce the amount of methane in each sample. ✓

I am considering expressing the amount of methane produced in mg instead of g as the amounts will be quite small considering the small sample sizes used in my investigation, & mg more accurately represents this. Also I noted the 35°C samples grew mould in days 3 & 4 & that there was condensation from water baths on 15°C & 25°C one. The samples & clean up / disposal ~~was~~ were ~~acc~~ actually OK to handle afterwards. At school I used water ^{& disinfectant} to make the manure watery & then I poured it out of the conical flasks into a plastic bag which I double bagged & disposed of. It was quite interesting to see the large amount of mould that had grown on the 35°C samples & it was also interesting that there was no sign of mould on the other samples & I will address this in my discussion in my scientific report. *QB*

I have really enjoyed doing my SRP & I hope my report turns out well. ✓

Below are the recorded weights of the plastic bags before the experiment was run & the weights of the strings used to seal the bags when they had gas inside. (By the way - I recorded these as I weighed them so please excuse messy handwriting!) I said in my report that the weights of these materials were recorded for future reference & at the beginning of the experiment & they are recorded here. ✓✓

14/6/15

Plastic Bags Weight

Sample 1 - 35°C - 1.85g
Sample 2 - 35°C - 1.95g
Sample 3 - 25°C - 1.87g
Sample 4 - 25°C - 2.02g
Sample 5 - ~~25~~°C - ~~2.03g~~ 1.96g
Sample 6 - 15°C - 1.92g
Sample 7 - 5°C - 1.93g
Sample 8 - 5°C - 2.04g

SB

strings Weight



Date. 18/6/15

No. _____

string 1 : 0.17g
2 : 0.17g
3 : 0.19g
4 : 0.18g
5 : 0.18g
6 : ~~0.19g~~ 0.20g
7 : ~~0.19g~~ 0.20g
8 : 0.2g

I'm a "frayed knot"!

Full results recording / calculations

SRP

19 6 15

Sample 6: 2.91g
5: 2.90g

Sample 3: 3.26g
4: 3.73g

7: 2.22g
8: 2.19g

2: 2.44g
1: 2.44g

Amount of methane in each sample

35° {

#1 = $2.44 - (1.85 + 0.17)$
~~= 2.44~~ $0.42 \times 0.268 = 0.11256$ AVG. = ~~0.37~~ 0.09916 ✗

#2 = $2.44 - (1.95g + 0.17)$
 $= 0.32 \times 0.268 = 0.08576$

25° {

#3 = $3.26 - (1.87 + 0.14)$
 $= 1.25 \times 0.268 = 0.335$

#4 = $3.73 - (2.02g + 0.18)$
 $= 1.53 \times 0.268 = 0.41004$ AVG. = 0.37252 ✗

15° {

#5 = $2.90 - (1.96 + 0.18)$
 $= 0.76 \times 0.268 = 0.20368$

#6 = $2.91 - (1.92 + 0.20)$
 $= 0.79 \times 0.268 = 0.21172$ AVG. = 0.2077 ✗

5° {

#7 = $2.22 - (1.93 + 0.20)$
 $= 0.09 \times 0.268 = 0.02412$

#8 = $2.19 - (2.04 + 0.12)$
 $= 0.03 \times 0.268 = 0.00804$ AVG. = 0.01608 ✗

SB

Please see my scientific report for more photographs & my table & graph.

In conclusion, I have really enjoyed doing my SRP 2015 as it has taught me heaps about methane gas & bovine decomposition & it has also taught me how to run a sophisticated scientific investigation with organisation & practicality. I have had the opportunity to expand my creativity into science by investigating a unique & complex & relevant topic that not only has depth & importance in the real world but is also a fun & interesting topic to investigate practically. GB
Thank you.

A. Lancaster 2015

Quality log book ✓✓ GB

Units?