



Scientific Inquiry Mission Folder Score Range – 301-400

Team Collaboration

How was your team formed? Was your team assigned or did you choose to work with each other?
Student 1, Student 2, and i got to chose our groups our team name is the "last 3 brain cells"

Provide a detailed description of each team member's responsibilities and jobs during your work on the Mission Folder.

we don't really have specific jobs but Student 1 and Student 2 have each hosted the 2 week experiment at their houses

Did your team face any problems working together? If so, how did you solve them? If not, why do you think you were able to work together so well?

it was hard to schedule dates to do our project because it consists of dailey measuring and care. i think we work well together because we are close friends

What were some possible advantages to working together as a team on this project? How would working as individuals have made this project more difficult?

if we worked individual all the work would rely on you, and it would mean that you could never rely on someone to help finish

Use of Scientific Inquiry

What problem in your community will your team be investigating through scientific inquiry using scientific practices? Specifically, based on this problem, what question will you be trying to answer?

We are trying to solve the amount of biogas that is produced into the atmosphere.

Research your problem. You must learn more about the problem you are trying to solve and also what testing has already been done. Find AT LEAST 10 different resources and list them here. They should include books, periodicals (magazines, journals, etc.), websites, experts, and any other resources you can think of. Be specific when listing them, and do not list your search engine (Google, etc.) as a resource.

1. <https://www.biogasworld.com/biogas-faq/>
2. https://www.homebiogas.com/Blog/141/Advantages_and_Disadvantages_of_Biogas
3. https://www.homebiogas.com/Blog/142/What_is_Biogas%7Cfq%7C_A_Beginners_Guide
4. <https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy>
5. <https://www.hindawi.com/journals/bmri/2015/494182/>
6. <https://www.isisvarese.edu.it/wp-content/uploads/2015/08/BIOGAS.BIOMASS.ERMICI-Copia.pdf>
7. https://americanbiogascouncil.org/wp-content/uploads/2019/02/ABCBiogasStateProfile_FL.pdf
8. <https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy>
9. <https://extension.psu.edu/biogas-from-manure>
10. <https://bigadan.com/p/biogas-technology/how-to-make-biogas>

What did you find out about your problem that you didn't know before? What kinds of experiments have been done by other people before you? Be sure to put this in your OWN words, do not just copy And paste information. Also, be sure to cite your sources.

Biogas is a flammable source that is made from 65% of methane, and 35% of CO₂. It is a renewable energy source. The university of North Florida has conducted experiments regarding biomass and biogas production. This is seen on the biogas state profile site: https://americanbiogascouncil.org/wp-content/uploads/2019/02/ABCBiogasStateProfile_FL.pdf.

Based on the question you are trying to answer, and your research, what is your team's hypothesis for this investigation? Be sure to include the independent and dependent variables and how they are related along with evidence of your research.

Our hypothesis was that cow manure would produce the most biogas, meaning the balloon would grow larger than any other waste we tested. The independent variable is the type of waste used in each 1 liter bottle, and the dependent variable is how large the balloons grew in each 14 day session.

Identify the independent and dependent variables in your investigation.

The independent variable is the different types of waste used during each session which is cow manure, alpaca feces, orange peels, and banana peels. The dependant variable is how much the balloons grow in each 14 day session.

What are the constants in your investigation?

The constants in our biogas experiment is the sizes of the bottles that the waste was put into, which is 1 liter, and the same amount of water and waste put into each bottle.



Will your investigation have a control group? If so, describe the control group. If not, why not?

We did not have a control group, instead we simply measured the balloons at the beginning of the experiment, before any biogas had been produced. We used this to compare the balloons growing throughout the 14 day session.

List all of the materials you used in your experiment. Be sure to include all physical materials as well as any technology or website used to collect data (not websites you used in your research).

4 1 liter soda bottles per session, masking tape, ruler, permanent marker, disposable plastic gloves, fresh cow, and alpaca feces, and banana, and orange peels. A plastic funnel, water, latex balloons, shipping tape, and lab notebook.

Explain your experimental process. Be sure to list all of the steps and ALL SAFETY PRECAUTIONS for your experiment. Remember to write it so someone else could follow the steps and recreate your experiment.

Wash and dry soda bottles, label each bottle with masking tape and the permanent marker as cow, alpaca, orange, and banana. Make a horizontal line 2 centimeters from the top of each bottle, Then putting on plastic gloves measure out 1/3 cup of cow and alpaca feces and 2 orange and banana peels. put on a fresh pair of gloves and put the funnel in the 1 liter bottle marked "cow". When finished carefully pore water into the bottle until it reaches the 2 centimeter mark. Stretch a balloon over the mouth of bottle and be very careful there is no excess air in the balloon. Secure with the packaging tape, then repeat this until every bottle is filled with the chosen waste then put the bottles in an area well ventilated for 14 days measuring the balloons at around the same time every day. If any bio gas is built up at the top of the bottle, you can carefully tip the bottles in order to ensure all the bio gas gets put into the balloons. Make sure all bottles are treated the same, so if one bottle is tipped, tip the other ones as well.

Present the data you collected from your experiment. Be sure to include all of the data you collected from your observations and measurements. Use of graphs and charts is HIGHLY encouraged. Explain how your data supports or refutes your hypothesis.

Days Bananas Oranges Cow Alpaca Temperature Days 1 2 cm 7/8 cm 2 1/8 cm 7/8 cm 61 degrees F Days 2 2 cm 1 cm 2 3/8 cm 7/8 cm 62 degrees F Days 3 2 1/2 cm 2 cm 2 5/8 cm 7/8 cm 62 degrees F Days 4 2 3/4 cm 2 cm 2 7/8 cm 7/8 cm 62 degrees F Days 5 2 3/4 cm 2 cm 3 cm 1 cm 62 degrees F Days 6 2 3/4 cm 2 cm 3 1/8 cm 1 1/2 cm 62 degrees F Days 7 2 3/4 cm 2 cm 3 1/8 cm 1 1/2 cm 62 degrees F Days 8 2 3/4 cm 2 cm 3 1/8 cm 1 1/2 cm 62 degrees F Days 9 3 1/2 cm 2 cm 4 cm 1 1/2 cm 58 degrees F Days 10 3 1/2 cm 2 1/4 cm 4 1/4 cm 1 1/2 cm 62 degrees F Days 11 4 cm 2 1/2 cm 5 cm 1 1/2 cm 62 degrees F Days 13 4 1/4 cm 3 2/3 cm 5 1/4 cm 1 1/2 cm 58 degrees F Days 14 3 1/2 3 2/3 cm 5 1/2 cm 2 cm 62 degrees F

Our data proves that our hypothesis is correct because we predicted that manure would produce the most biogas.

What are your potential sources of error? Remember, this doesn't mean "Did everything work?", all tests have potential sources of error, so make sure you understand what that means. Explain how these sources of error could have affected your results.

We ran our experiment two times, the first time all went well and the data came out as expected, and the second time doing the experiment a few variables were unintentionally changed and our experiment did not give accurate data. When our second experiment 's data did not turn out we decided to not include it in our final project. So we used our first experiment 's set of data so we could get accurate information

What conclusions can you draw based on the data you gathered during your experiment(s)? Be sure to include data and how it relates to the experiment(s) and the original question. Your conclusion should be related to your original problem and your experiment, include the data you collected, and discuss if your hypothesis was supported or refuted by your experiment.

In conclusion our experiment showed us that everyday waste can produce bio gas pollutants into our atmosphere. Our hypothesis was correct that cow manure would produce the most bio gas out of the 4 waste variables. We also predicted that the alpaca feces would be the runner up and produce the second most bio gas, and we were surprised when the second runner up was oranges instead. The end result in our data show manure producing the most bio gas and the alpaca feces producing the least. The cow manure caused the balloon to inflate the most with the end height being 5 1/2 cm, and the alpaca in last with the balloon height of 2 cm.

Benefit to the Community

Explain how investigating the problem your team chose will help the community. Be sure to include the impacts your research will have on individuals, businesses, organizations, and the environment in your community (if any). Make it very clear why solving this problem would help your community.

Our community is big on farming, which means there are a lot of cows. So we wanted to see how much biogas pollutant is released into our environment, a solution to this problem would impact the farmers, the agricultural businesses, but overall help our dying environment.

Abstract

Decaying organic matter, or biomass, can be turned to energy. In this project we took biomass that had methane gas and other biomass in it and measured it to find out which had the most biogas to try and see how much was produced. we help our farming community.