How to catch mosquitoes and its preferences for temperature and carbon dioxide

LUO, XIN YI HUANG, YU CHIN LIU, YU HSUAN
Teacher：CHEN, CHENG CHANG
Hsin Tien Senior High School
Taiwan
2022/03/07

新北市立新店高中
New Taipei Municipal Hsin Tien Senior High School

THE GLOBE PROGRAM TAIWAN
Global Learning and Observations to Benefit the Environment

Abstract:

Since the first year of high school participated in the science fair, we decided to study this related topic.

The main research is to observe the effects of temperature, color and taste on mosquitoes. This report will describe all of our research processes.

Research Question and Hypothesis:

1. We assume that mosquitoes move to warmer places.
2. We hypothesize that CO2 is attractive to mosquitoes.

Introduction and Review of Literature:

- Abstract
- Research Question and Hypothesis
- Research Methods and Materials
- Results
- Discussion
- Conclusion
- Bibliography/Citations
- Badge Descriptions/Justifications

Research Methods and Materials

get experiment target

1. Raised after catching mosquitoes.
2. Catch mosquitoes
3. Place artificial water.

1. Raised after catching mosquitoes.

Idea:

Initially, we wanted to observe larvae. But the larvae we catch quickly turn into mosquitoes, so we instead observe mosquitoes.

Location:

School Ditch.

Materials:

insect box, plastic spoon, dropper, plastic container.

step:

1. Fishing for water and larvae in ditch.
2. Remove larvae with a spoon and dropper into the bug box.

- Capture results

date	mosquitoes	pupa	larvae
2/12	0	0	0
2/13	1	0	51
2/14	1	12	40
2/15	2	41	9
2/16	14	38	0
2/17	41	11	0
2/18	52	0	0

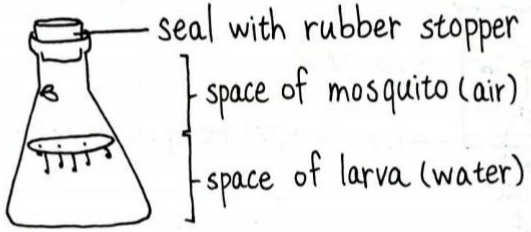
- keep mosquitoes

	LIU, YU HSUAN	LUO, XIN YI	HUANG, YU CHIN
Materials	Erlenmeyer flask rubber stopper water.	Plastic wrap paper tape insect box Erlenmeyer flask honey water.	Toilet paper rubber bands transparent plastic cups Erlenmeyer flask honey water (honey: water=2:1)
Mosquito causes of death	• no food • no air • No activity space • Bottle shakes easily	• Honey water get mouldy. • Accidental shaking	• Accidentally fly away when opening lid.
advantage	• Easy to carry.	• have food • Ample activity space • have air	• have air • have food

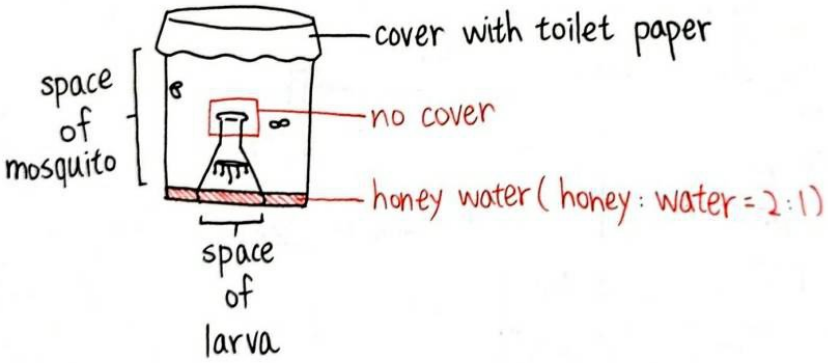
Keep mosquitoes

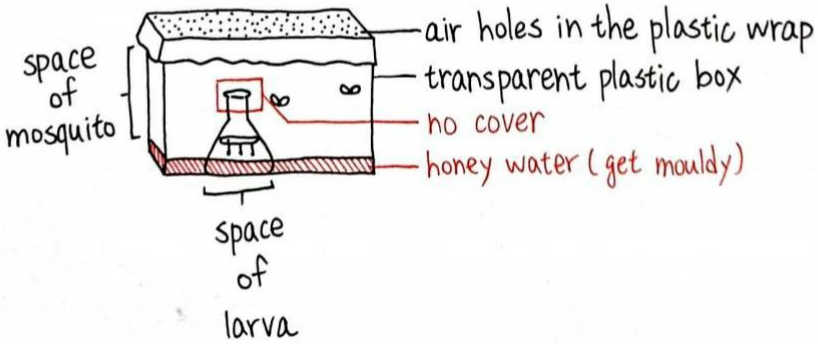
LIU, YU HSUAN

HUANG , YU CHIN



LUO, XIN YI





result:

A total of 52 larvae were caught. According to the observation, we found that it only took one to two days for the larvae to turn from pupae to mosquitoes.

Because we have artificial reasons to cause the mosquitoes we raise to die.

2. Catch mosquitoes.

Idea:

Skip raising the larvae and go straight to the ready-made mosquitoes.

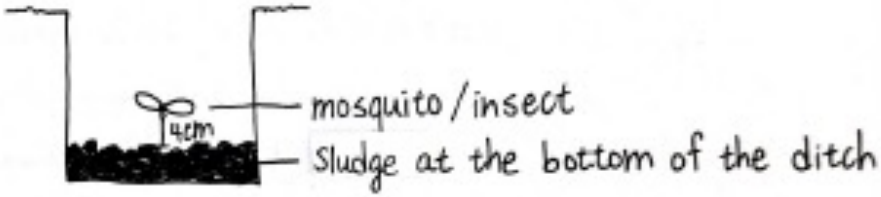
	Plan A	Plan B	Plan C
Location	School ditch	Two of toilets in school	Playground and recycling room
How mosquitoes appear	Flying 4cm off the ground along the ditch.	Staying at wall , door or ceiling.	Flying near people.
Material	Transparent plastic cups paper Insect box	Transparent plastic cup, paper, insect box	Transparent plastic cup Paper insect box

Step	1. Use two clear plastic cups to hold mosquitoes 2. Put the caught mosquitoes in the insect box	1. Cover mosquitoes with clear plastic cups 2. Put the caught mosquitoes in the insect box	1. Sports and stand still. 2. When mosquitoes flying over, cover with a plastic cup. 3. Put in the insect box.
Advantage	1. Learn more about the creatures in the ditch	1. Single background color 2. Sufficient lighting	1. Good for health
Shortcoming	1. Stereo space 2. Background color is rich 3. Poor light	1. Can't catch if mosquitoes fly too high	1. Spend more time
Results	Caught 8 mosquitoes	Caught 17 mosquitoes	Caught 3 mosquitoes

Location : Ditch

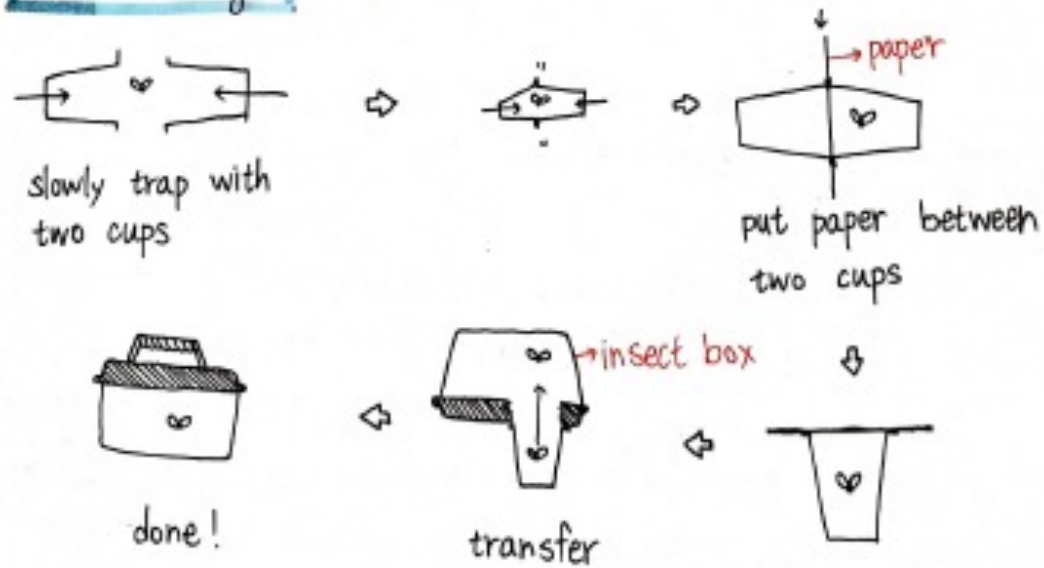
How mosquitoes appear

↳ Top view



↳ Flying 4 centimeter off the ground along the ditch.

How we caught



3. Place artificial water.

Idea:

Because it hasn't rained for many days, artificial stagnant water is created to catch mosquitoes.

Location:

Water ditches (three ditches were selected)

Material:

a container

Capture method:

1. Put a water container in the ditch
2. waiting for mosquitoes to lay eggs
3. After a day, observe the container for larvae

Number of leeches caught this way: 0

advantage:

No need to spend time and effort catching mosquitoes

shortcoming:

Wait for it lay eggs waste time

Risk of promoting mosquito breeding

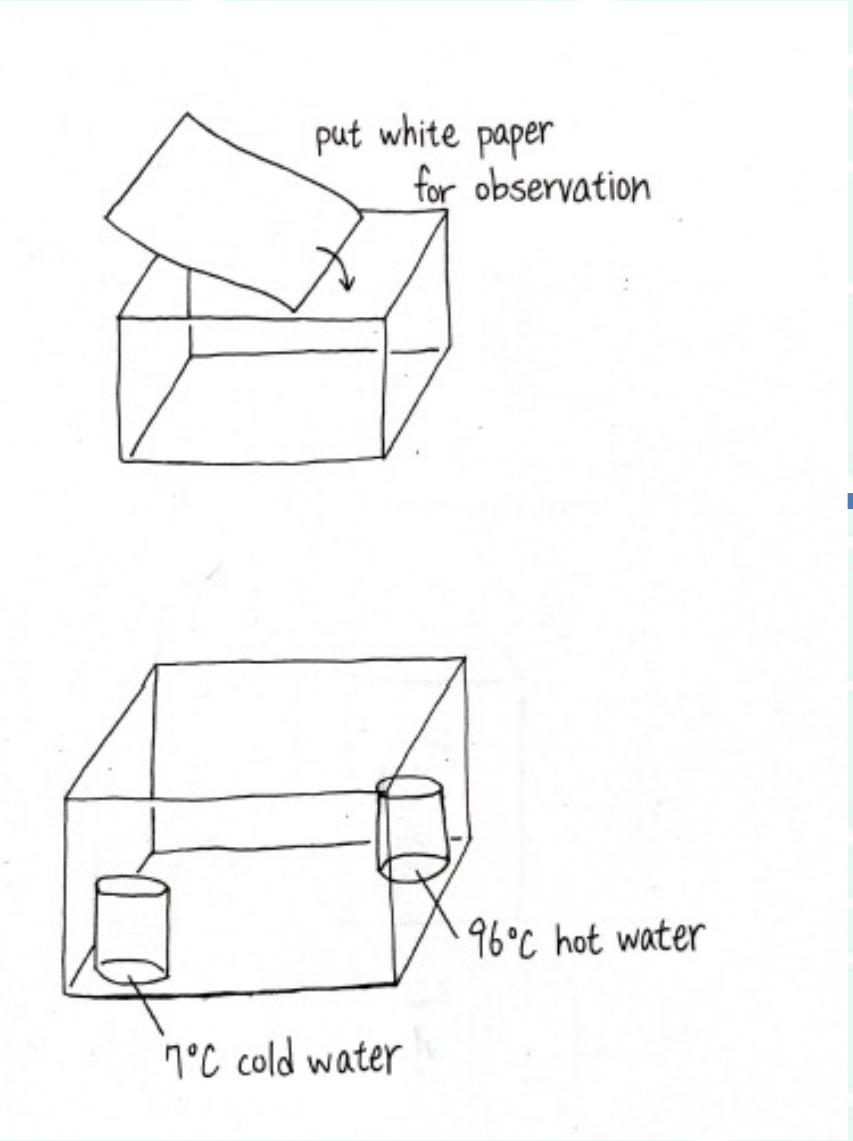
experiment

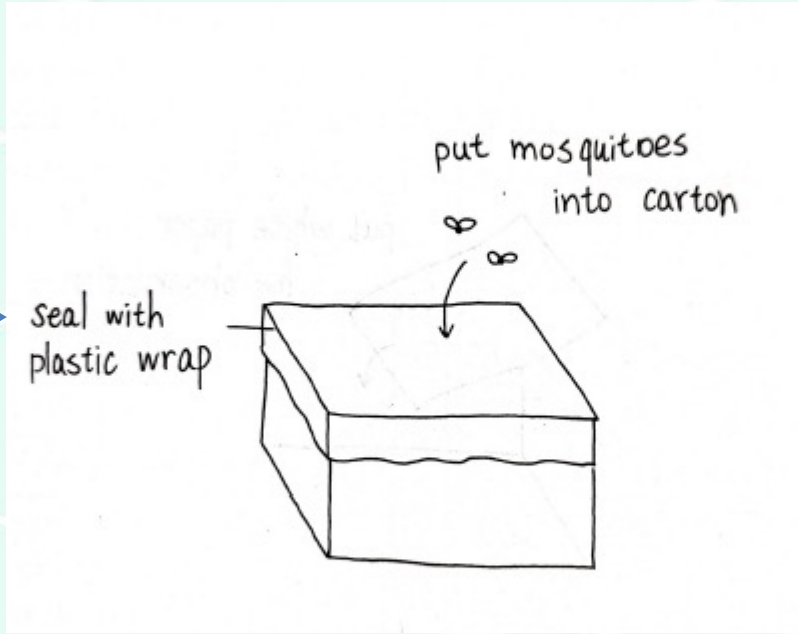
(1) Mosquito's preference for hot and cold

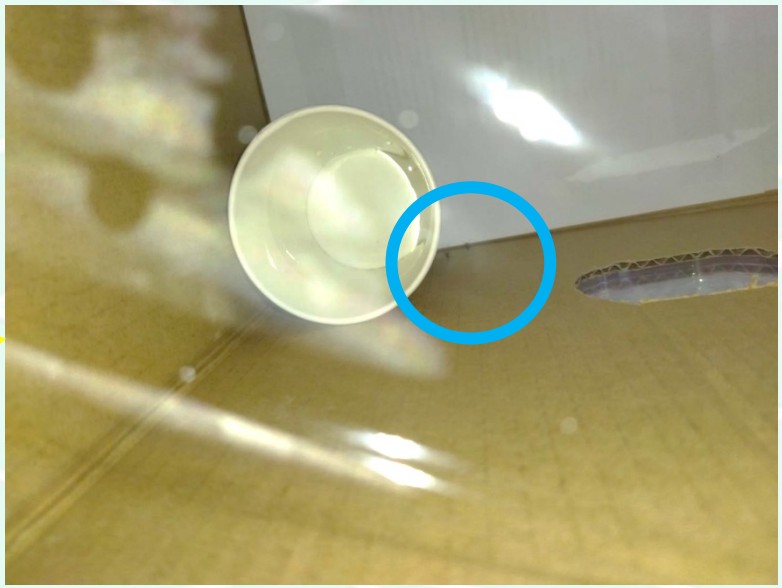
Material:

150ml hot water at 96°C
150ml cold water at 7°C
paper cup
carton, plastic wrap
rough tape
white paper
Graduated cylinder
Thermometer

step:


put white paper
for observation
96°C hot water
7°C cold water


put mosquitoes
into carton
seal with
plastic wrap



(2) Experiment of carbon dioxide's attraction to mosquito

Creature:

8 mosquitoes

Chemical material :

calcium carbonate(grams)、32% hydrochloric acid(50milliliters)

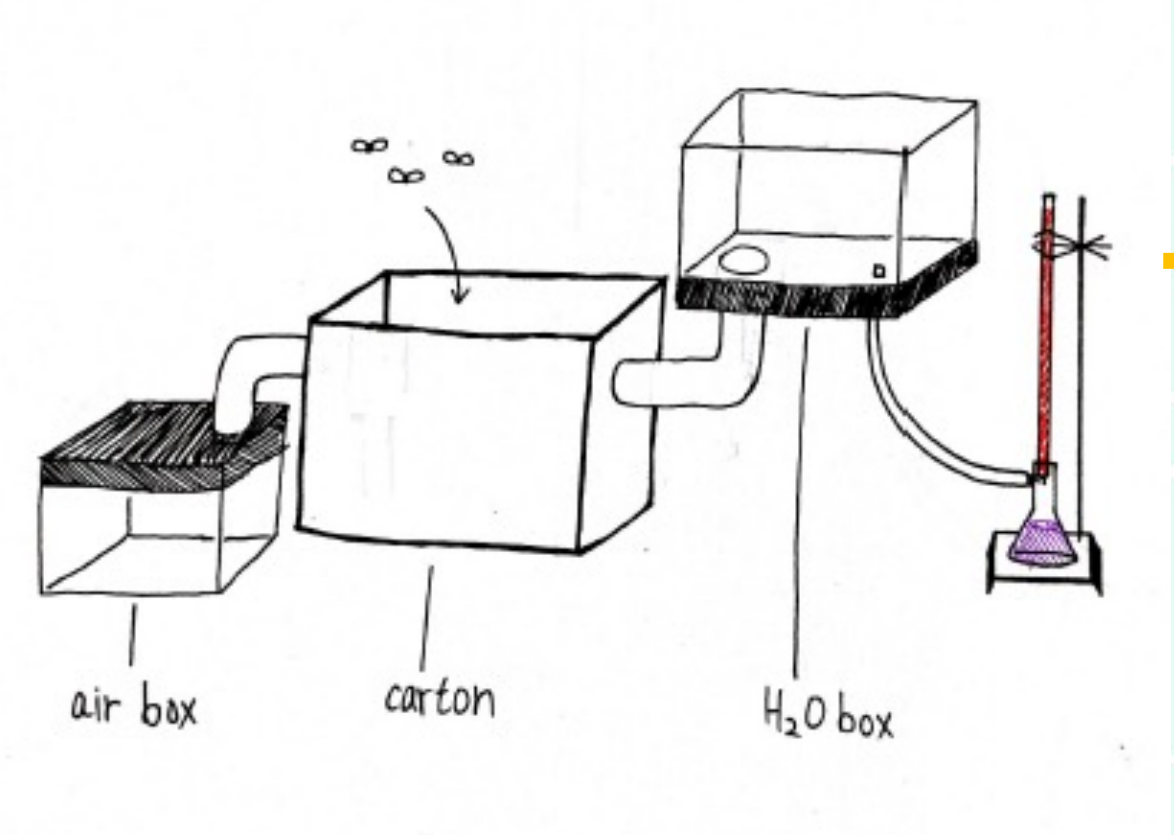
Material :

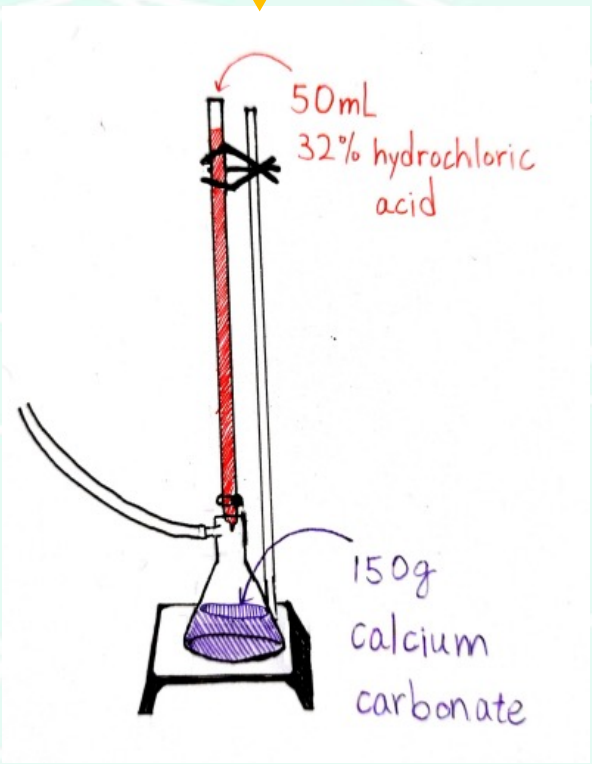
paper、carton、fine tape、thick tape、transparent plastic box、plastic wrap、transparent plastic cup、burette、burette holder、ring stand、three prong clamp、rubber stopper、rubber hose、spatula、electronic scale、scale paper、Styrofoam board、filtering flask

Principle:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2\uparrow$

step:


air box
carton
H_2O box


50mL
32% hydrochloric acid
150g
calcium carbonate


INTEX
風信子再生影印紙
Recycle Photocopy


TEL (03)842-1171

results:

- Six into the box with carbon dioxide, two in the carton.
- The mosquitoes that flew into the CO2 box all died, but the ones that stayed in the main box didn't.
- Mosquitoes fly around when exposed to carbon dioxide at first, and die quickly after a while.
- Carbon dioxide is indeed attractive to mosquitoes, but too much carbon dioxide can kill mosquitoes.

(3) Using yeast to produce carbon dioxide to capture mosquitoes

Material:

Two identical plastic bottles, yeast, sugar, heating panel, water, spoon, Dropper, Graduated cylinder, Beaker, utility knife, Thermometer, weighing paper, Petri dish, tape, electronic balance

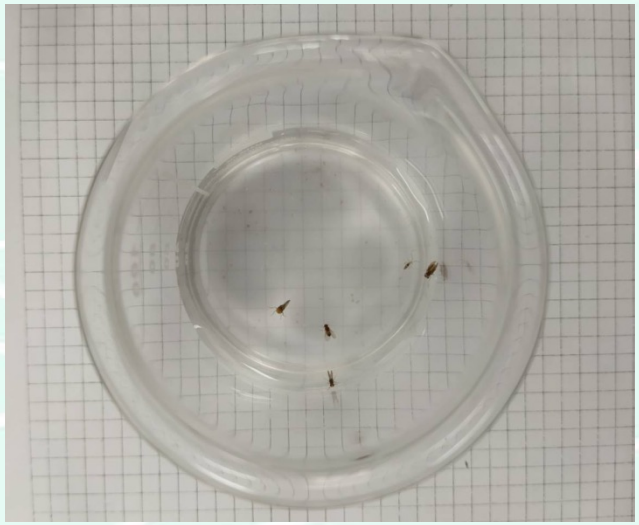
Pinciple:

Using the EMP (Embden-Meyerhof Parnas) approach

$C_6H_{12}O_6$ + yeast → 2 C_2H_5OH + 2 CO_2

Step:

1. Add 28ml of water and 2g of sugar to two beakers.
2. Heat to 40°C.
3. Cut two plastic bottles 5cm away from the bottle mouth.
4. Pour the heated sugar water into two plastic bottles.
5. Add 0.5g yeast to one of the cups.
6. Put the cut bottle mouth upside down on the bottle body.
7. Put in a dark place beside the ditch for one night.



Results:

No mosquitoes were caught, but other insects were caught.

	2022/2/25	2022/2/26
Sugar and water	Drosophila: 4	Big ant: 39 Small ant: 8 Drosophila: 17 Housefly: 1
Sugar water with yeast	Drosophila: 56	Big ant: 2 Drosophila: 48 Small Drosophila: 30 Housefly: 2

Discussion

(1)Mosquitoes' preference for hot and cold

Assumptions:

Mosquitoes will move closer to the warmer side.

Experimental results:

Mosquitoes move closer to cooler temperatures.

Speculated reason:

A shady place means that mosquitoes can lay their eggs there, so there are more mosquitoes in a shady place.

(2) Carbon dioxide's attraction to mosquito

Assumptions:

Mosquitoes will fly to places with high carbon dioxide levels.

Experimental results:

Mosquitoes fly to places with higher carbon dioxide concentrations, but die after a while.

Speculated reason:

A place with more carbon dioxide is usually a place where creature is infested. Mosquitoes need suck blood to reproduce, and they may link carbon dioxide to a food source.

(3) Using yeast to produce carbon dioxide to capture mosquitoes

Assumptions:

Mosquitoes fly into plastic bottles where carbon dioxide is produced by sugar water with yeast.

Experimental results:

No mosquitoes flew into two plastic bottles, but most Drosophila, Housefly flew into plastic bottles with yeast.

Speculated reason:

Carbon dioxide may be attractive to Drosophila. While sugar water with yeast can produce odors, Drosophila may be attracted to the smell, not the carbon dioxide.

Conclusion

- People who have just finished exercising attract mosquitoes.
- Compared to temperature , carbon dioxide is the main factor that attracts mosquitoes.
- Mosquitoes like shady places , because shady places usually have water.
- The easiest and most time-saving way to catch mosquitoes is captured with transparent plastic cup in toilet.

Bibliography/Citations

- Embden–Meyerhof–Parnas: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5440799/

- Embden-Meyerhof Parnas: https://zh.wikipedia.org/wiki/%E9%85%92%E7%B2%BE%E7%99%BC%E9%85%B5#%E5%8C%96%E5%AD%B8%E5%8F%8D%E6%87%89

- Calcium Carbonate and Hydrochloric Acid Reaction: https://www.chemistryscl.com/reactions/CaCO3+HCl/index.php

Division of labor

Team member	Assign work
LUO, XIN YI	catch mosquitoes Experiment 1 Mosquito's preference for hot and cold Experiment 2 Carbon dioxide’s attraction to mosquito ● Research question and hypothesis ● Research methods and materials ● Results ● Discussion ● Conclusion
HUANG, YU CHIN	catch mosquitoes Experiment 1 Mosquito's preference for hot and cold Experiment 2 Carbon dioxide’s attraction to mosquito Experiment 3 Using yeast to produce carbon dioxide to capture mosquitoes ● Research question and hypothesis ● Research methods and materials ● Results ● Discussion ● Conclusion
LIU, YU HSUAN	catch mosquitoes ● Abstract

Thanks For Listening.