



# SCIENCE FAIR KIT: WHICH CAME FIRST? THE FLY OR THE EGG?

## Project Summary: Observing the Fruit Fly's Life Cycle

For this project, you will observe fruit flies and their life cycle (Phase One). You will find the fruit fly has a very short life cycle and life span. In fact, these creatures are a favorite animal for scientists to study as it is easy to manage a large quantity of fruit flies because they are small in size, and they quickly reproduce, which allows more experimentation.

After the observational period, you will follow the scientific method to test how temperature effects fly development during their life cycle (Phase Two).

### Difficulty:

Easy to Moderate, suggested for grades 4-8.

### Time Required:

Two weeks to One month, longer if you choose.

### Safety:

Although rare, some fruit flies can make people sick, because they carry disease. You should always wash your hands after each observation of the flies.



Fruit flies mature and reproduce quickly and in large numbers. Pay attention to this symbol as some steps should be done outdoors to avoid a fruit fly infestation in your house!

### Time of Year:

Try spring, summer or fall for easier collection of flies.

### Material Availability:

Most materials are readily available in your home or grocery store. The fruit flies can be found in your yard hovering near ripening or rotten fruit, fruit that has fallen off a fruit tree onto the ground, and compost piles. You can also order fruit flies from a biological supply or exotic pet food supply companies. These are called, *Drosophila melanogaster*.

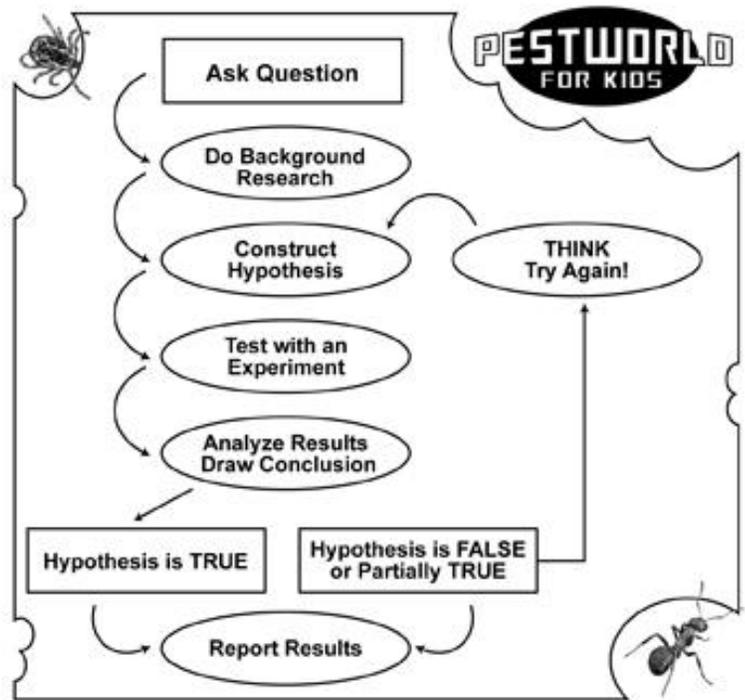
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## How Scientists Think

What's great about scientific investigations is that there can be many answers to a single **question**. To figure out which answer is most correct, scientists follow a process called *The Scientific Method*. The Scientific Method is a series of steps that helps scientists identify a question, think of a possible answer (the **hypothesis**) and then use **experiments** to test that answer (the **hypothesis**) to see if it is true.

*The important thing to remember is that all scientists often need to try several experiments until one can be sure a hypothesis (a possible answer) is true or not.*

These steps walk you through how to think like a scientist. As you think like a scientist, you'll test how lowering the temperature of the flies' environment changes the length of time for a complete life cycle.





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## ***Ask a Question***

Each scientific investigation begins by asking a question. Picking a good question to ask helps you to define the problem you want to investigate and develop a hypothesis to test. A good question meets the following criteria:

- Is the answer to the question something you can measure?
- Does the question ask one or more of the following: who, what, when, where, why, how, or which?

Before deciding on a question, consider the difficulty level of the project you'd like to undertake as well as the amount of time you have. Here are some from which you can choose:

### **Easy:**

Observe the fruit flies through one generation.  
Approximate time = 2 weeks

Sample Question: How long will it take for fruit flies to complete their life cycle at room temperature?

### **Medium:**

Observe the fruit flies throughout more than one generation.  
Vary the temperatures in which the flies are living and reproducing.  
Approximate time = 2 – 4 weeks

Sample Question: How will decreasing the temperature of the flies' environment effect their life cycle?



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## ***Do Background Research***

Next, you'll need to do a little background research to find the necessary information about the organism.

To begin to answer your question, you'll need general information about fruit flies as well as specific information about their diet, habitat, impact and how to prevent an infestation.

## **Glossary | Terms To Know**

It will be helpful to know some or all of these terms so you can be sure to understand everything you read. You can research these terms on the PestworldforKids.org glossary [ [www.pestworldforkids.org/glossary](http://www.pestworldforkids.org/glossary) ], using another online dictionary like Merriam-Webster.com [ <http://www.merriam-webster.com> ], or at a local library.

- Development
- Egg
- Fruit fly
- Fly
- Instar (a word scientists use to define the developmental stage of a larva)
- Larva (or the plural Larvae; also called Maggot)
- Life Cycle
- Metamorphosis
- Molt
- Pupa (Pupae)
- Generation



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## General Information on Fruit Flies

There are more than 120,000 species of flies worldwide. Most flies live about 21 days and take on various shapes throughout their short lives. Baby flies are called larvae but they are also known as maggots. Medical doctors use a special species of fruit fly maggots to help patients with flesh wounds, especially burn victims. Maggots eat away the damaged flesh, which helps the wound heal.

Fruit flies live for 8-10 days. In that time, females lay around 500 eggs, using rotting fruit or vegetables as their nest.

Size	1/8"
Shape	Small oval
Color	Tan
Legs	6
Wings	Yes
Antenna	Yes

Common Name	Fruit Fly
Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Diptera
Family	Drosophilidae
Genus Species	<i>Drosophila melanogaster</i>

### Diet

Fruit flies feed on decaying fruits and vegetables.

### Habitat

Fruit flies are commonly found in homes, restaurants and other facilities where food is processed. They are especially attracted to garbage that has just been sitting around.

### Impact

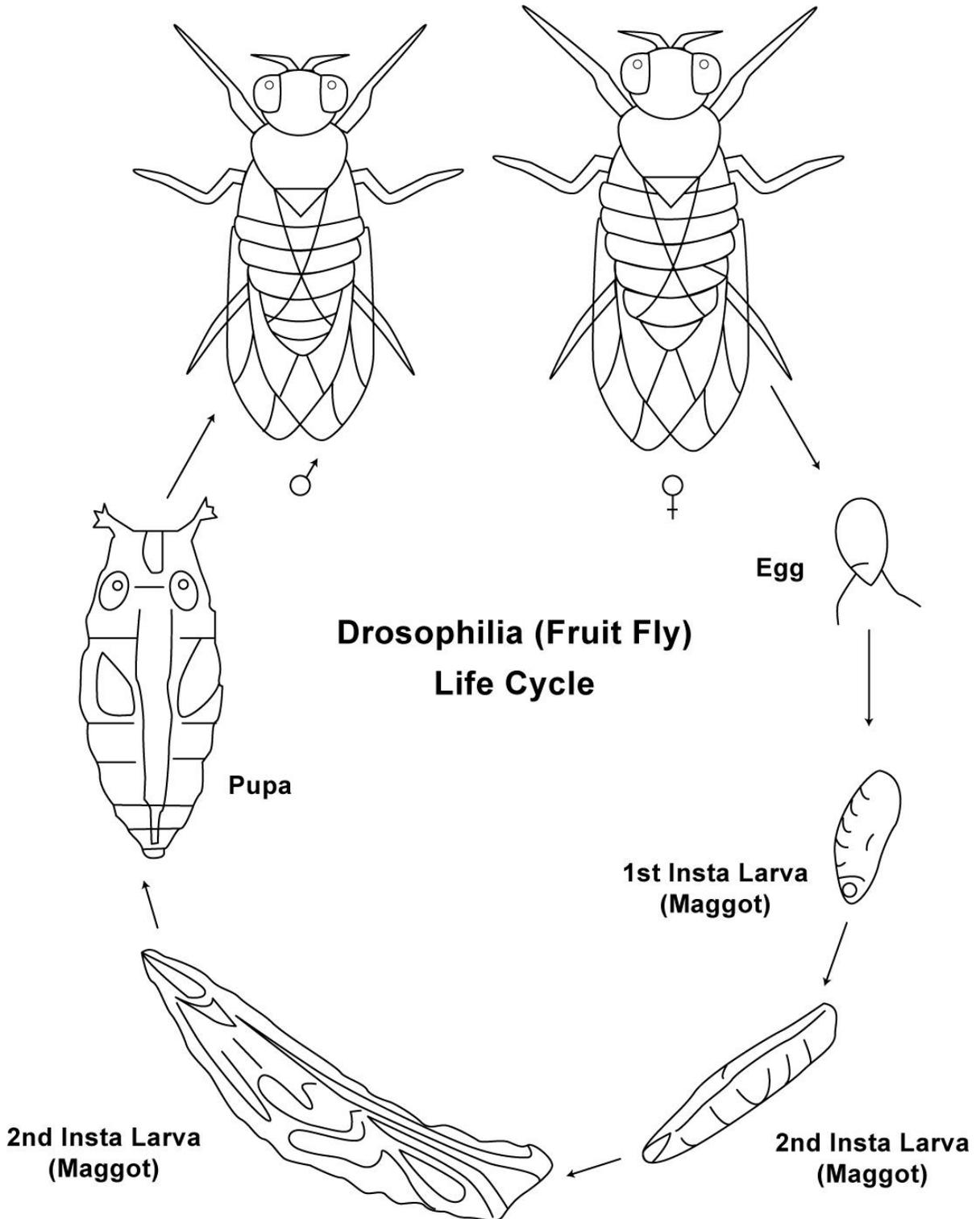
Fruit flies are found in unsanitary conditions like garbage dumps and trashcans. When they are around, humans can become very sick.

### Prevention

- \* Keep your home clean.
- \* Remove kitchen trash every day and keep kitchen counters clean.
- \* Immediately remove rotting food from your home.

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**Fruit Fly: Life Cycle**





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Fruit flies have been a favorite animal for scientists to study for over 100 years. There are many advantages to studying the fruit fly for scientists. They are small in size so many flies can fit into one laboratory. They have a short life span, it only takes about 8-15 days for an egg to develop into an adult, meaning many generations of flies can be studied within just a few months' time. They reproduce in large numbers, each adult female can lay about 500 eggs. That's potentially 500 babies! In addition, the developing larvae, or maggots, are transparent, which means that they it is easy to observe their insides while they are still alive.

The life cycle of fruit flies is very similar to butterflies. Both insects undergo complete metamorphosis,

This means that the fruit fly youngsters look nothing like the adult fruit flies. Unlike human babies, who look much like adults, meaning they have some of the same structures, like arms, legs and noses, the baby fruit flies look very different from their parents after they hatch. They are small larvae or maggots that grow and develop while crawling around like tiny caterpillars. They do not have adult fruit fly parts, no compound eyes or wings.

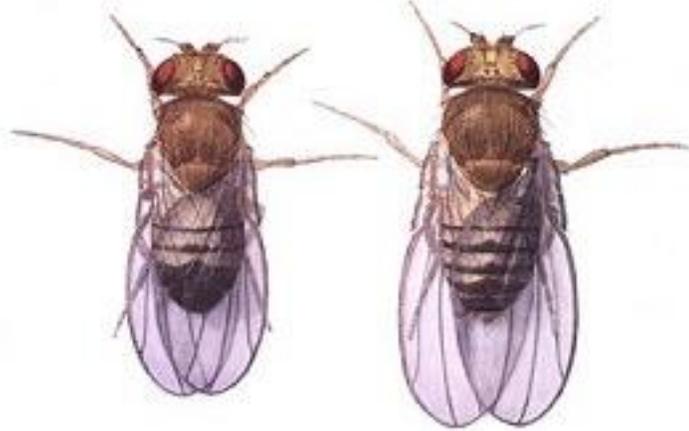
Female fruit flies produce eggs and male fruit flies produce sperm. Like many other animals these insects reproduce when the egg and sperm combine to form an embryo, or developing fruit fly. The eggs are fertilized and laid on a food source, so that they have food to eat when they hatch.

Fruit flies begin their lives as an embryo in an egg. This stage lasts for about one day. During this time, the embryo develops into a larva. The first instar larva hatches out of the egg, crawls into a food source, and eats. The larva in each stage eats as much as possible! After a day, the first instar larva molts and becomes the second instar larva. Again, the larva in this stage eats and eats! After two days in this stage, the larva molts again to become the third instar larva. After three days of eating in this stage, the larva crawls out of the food source and molts again.

Following this molt, the larva stops moving and forms a pupa. *Drosophila* stays in the pupa for about five days. During this time, the metamorphosis, or change, from larva to adult is occurring. Adult structures, like wings, legs and eyes develop.

When the adults emerge from the pupa, they are fully formed. They become fertile after about ten hours, copulate, the females lay eggs and the cycle begins again. The whole life cycle takes about 12-14 days.

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In the photo above, you can tell male and female fruit flies apart. By looking carefully at their tail end, you can notice that one fruit fly is all black at the base of the tail (males) and the other has very narrow black bands at the base of the tail (females).



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## ***Construct a Hypothesis***

A hypothesis is an educated guess about how things work. A good hypothesis is based on research that gives you the information to make the best guess possible. Once you've gathered as much information as you can, you are ready to make a prediction or guess about what you think the answer will be to your question.

To put together the best possible guess that might answer your question, consider these factors:

- How does temperature effect the development of insects in general and fruit flies specifically?
- What information did you find in your background research that helped you to come to this hypothesis?
- What evidence do you have to test this hypothesis.

You should state your hypothesis (guess) in a way that you can **easily measure**. For example:

***If I \_\_\_\_\_, then \_\_\_\_\_ will \_\_\_\_\_.***

***If I place one fly jar in a cold basement (or near an air conditioning duct or unit) and the other jar in a warmer location in the house, both for 9 days then there will be NO adult flies hatched yet in the cold jar, but many flies hatched in the warmer jar.***

## ***Test Hypothesis with an Experiment***

Testing with an experiment is the fourth part of the Scientific Method. There are two extremely important tasks you should be sure you do.

1) Make sure the test you are using is a **fair test**. A **fair test**, or experiment, is one that clearly changes only one factor (variable) while keeping all other conditions the same. The steps in your experiment should be clear and specific so that anyone could follow them and answer your question the same way you did.

2) It is also important to start with some **baseline observations**. For example, observe the pill bugs in their preferred habitat outside. What do you notice about their habitat? Is it in a shady or sunny location? Is it dry or moist? In this experiment you will select one (or more) changes to the pill bugs environment and test their preferences. Once you decide what to test, you will need to make your **baseline observations** so you know with what to compare your end results. To begin to put together your experiment, consider the following:

- How does temperature effect fruit fly development?
- How do cold temperatures effect fruit fly development?



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## Materials and Equipment

- Observation and test site, your yard or other locations outdoors.
- 4 Clear glass or plastic jars with lids (Wide mouth, 1 quart)
- Blender (to make the fly food)
- Spoon or rubber scraper
- Mixing Bowl
- Paper towels
- 4 or more Rubber bands
- Food for your flies, see recipe below
  - Bananas
  - White Sugar
  - Rolled oats (oatmeal)
  - Bakers yeast
  - Calcium Propionate (optional – it prevents mold growth in breads)
- Lamp or flashlight - to observe flies under better light (optional)
- Notebook and pencil for data collection
- Magnifying lens to observe the flies up close at all stages
- Digital Camera (optional)
- Fruit Fly Trap – (see instructions below)
  - A jar (any size)
  - Piece of paper
  - Part of a banana
- 10-20 Male and female fruit flies (see below)



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## Procedure

*\*\*Remember to take digital photos at each step of the procedure to use in your final report.\*\**

### Step 1: Prepare a batch of fly food.

(You may choose to make less fly food and prepare only one **Fly Jar** at this time, if so, reduce the ingredients by about one third.)

- 4 bananas
- 2 Tablespoons sugar
- rolled oats (oatmeal)
- pinch calcium propionate (optional)
- 1 packet bakers yeast (you will use a few grains per jar)

1. Place the bananas and sugar in a blender and blend until the mixture is a liquid.
2. Pour the banana mixture from the blender into a mixing bowl.
3. Slowly add oatmeal and stir with a spoon or rubber scraper until it becomes firm, but still moist.

You do not want it sloshing or spilling up the sides of the jar, if it is, add more oatmeal. The amount of oatmeal you add depends on how big the bananas are and the type of oats you use. Add oatmeal in small amounts, mixing after each addition.

Optional, you can also mix in 1/8 t calcium propionate to prevent mold growth. Divide the mixture between 2-3 of your quart jars.

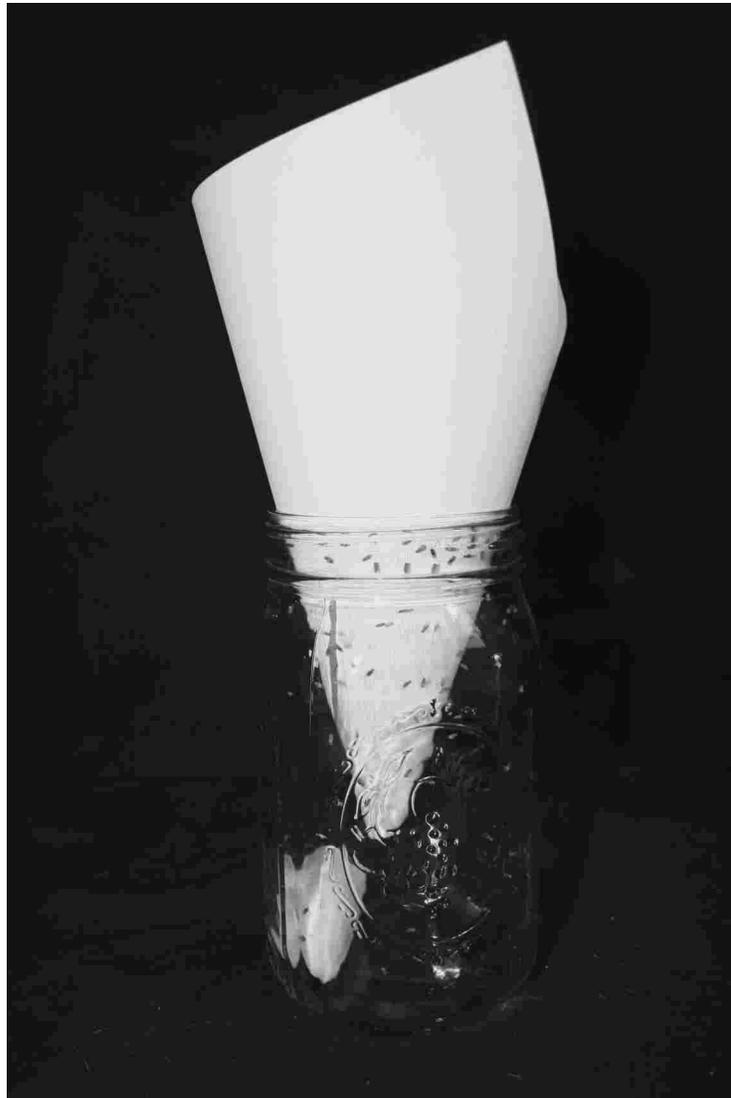
4. Fill the jars up about ¼ of the way, you may have extra.
5. Sprinkle a few grains of bakers yeast on top of the food.
6. Cover the jars with a paper towel folded in fourths and secure it in place with a rubber band. These will be referred to as your "**Fly Jars**".
7. Store the two extra jars with tight screw-on lids (instead of paper towels) in the refrigerator. They may last until your Second Phase of observation.

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**Step 2: Capture (or purchase) some fruit flies.**

In order to capture them, first make a **Fruit Fly Trap**.

1. Place a small piece of banana in the bottom of a jar.
2. Roll a piece of paper into a funnel shape (or an open cone) and place it narrow-end down into the jar. You may need to tape the cone into place if it's a windy day, check to make sure that the only opening at the top is through your hole in the cone, or the fruit flies will escape. (see photo below)



3. Place the **Fruit Fly Trap** outside near rotting or fallen fruit or a compost pile for a few hours. If you see lots of fruit flies buzzing around, leave it for less time. Fruit flies will fly in, but most will not be able to fly out again. Try to capture 10-20 flies.



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**NOTE:** The next step should be done **OUTSIDE**, because some flies will escape.

4. Make sure you have the **lid** for your jar. Once you've captured enough fruit flies, carefully tap the bottom of the **Fruit Fly Trap** on the grass or a wooden table to "encourage" most of the flies to fall to the bottom of trap.
5. Quickly, remove the cone and attach a screw-on lid.
6. Observe your flies for a few moments. Can you see male flies? Can you see female flies? Remember to use your magnifying glass and a flashlight or lamp to check the flies.
7. Look at their back ends – some should be all black at the base of the tail (males) and some should have very narrow black bands at the base of the tail (females). Watch them as they climb along the walls of the jar, or are sitting on the food.
8. Place the Fruit Fly Trap in the refrigerator for about 10-20 minutes. The refrigerator is set at a temperature that is too cold for fruit flies to fly. Therefore, they will slow down and settle on the bottom and sides.
9. Try to count the number of males and females you see, it's difficult when they continue to move around, so you don't need an accurate count, an estimate will be fine. You should have at least 5 females the other 5 to 15 flies can be males. If you do not have 10-20 fruit flies, keep these flies in the jar and set another trap. If you have many more than 10-20, be prepared to let some go as you move to the next step.



**NOTE:** This step should also be done **OUTSIDE**, because some fruit flies will escape. You should also ask an adult to help, because you will need to work quickly and hold two jars at once.

It's time to transfer your 10-20 males and females into your **Fly Jar** that contains the fly food so you can begin *PHASE ONE* to observe the fruit fly life cycle.

10. First, set your **Fruit Fly Trap** in the refrigerator for about 10 -20 minutes, this will cause the fruit flies to slow down.
11. Then take both jars (**Fruit Fly Trap** and **Fly Jar**), a fork, a paper towel folded in fourths, and a rubber band **OUTSIDE**. Tap the **Fruit Fly Trap** on the grass or wooden table, remove the lid of the **Fruit Fly Trap** and using the fork quickly remove the piece of banana, then replace the lid. Hopefully, you've only lost one or two flies.
12. You'll need two people for next step.
13. Open the **Fly Jar** (this is the jar with the fly food in it) and tap the bottom of **Fruit Fly Trap** once again, to knock the flies to the bottom.
14. Quickly remove the lid and invert the **Fruit Fly Trap** over the **Fly Jar** matching the openings.



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15. Continue gently tapping the bottom of the **Fly Jar** on the table or grass to knock the fruit flies down into the jar with the food.
16. Once all or most of the flies have been moved into the **Fly Jar**, slide the folded paper towel between the jars and secure it to the bottom jar. You should now have a **Fly Jar** with food and about 10-20 male and female fruit flies.
17. Clean the fork and empty jar with hot soapy water. Discard the piece of banana.

### PHASE ONE:

Now you are ready to set your **Fly Jar** in a safe place indoors, at room temperature, and begin to observe the Fruit Fly Life Cycle. You will observe them each day for about two weeks.

For the next 4 days, make daily observations of the fruit flies in the jar. What are the adult males and females doing? Also watch for *eggs*, these are very small and usually laid in the food. You may not be able to see them.

(To see what each stage of the fruit fly life cycle looks like, refer back to diagram above in the **General Information** section.) Also watch carefully for *larvae* crawling on and in the food. They are easiest to find along the walls of the jar. They are nearly all-white, except their moving mouth parts, which are black.

Watch for the black mouth parts moving through the food. Use your magnifying lens and flashlight or lamp to assist you. Record your observations on a data table/chart like the one below, be certain to *record the first day* you see each stage: *egg*, *larvae* (first instar, second instar, and third instar if you can), *pupae*, and *new adults*.



**NOTE:** This step should be done **OUTSIDE**.

After observing on the fourth day, take your **Fly Jar OUTSIDE** and open the jar, let the living adults fly out. There may be some dead ones on the food, leave them in the jar. Then recover the **Fly Jar** with the paper towel and secure with the rubber band. Removing all of the living adults allows you to observe the next generation of fruit flies when they hatch, if the “parents” are still flying around, you won’t know which flies are of the new generation.



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PHASE ONE – FRUIT FLY LIFE CYCLE AT ROOM TEMPERATURE		
Days Observed	Behavior of Adult Fruit Flies	First appearance of <b>eggs, larva, pupae</b> and new generation of <b>adult</b> fruit flies
Day 1		
Day 2		
Day 3		
Day 4		<i>remove adults today</i>
Day 5		
Day 6		
Day 7		
Day 8		
Day 9		
Day 10		
Day 11		
Day 12		
Day 13		
Day 14		

1. Continue observing your **Fly Jar** each day. Record when you first see each stage of the life cycle, for instance the *pupae*. You will notice one day, that some of the larger third instar *larvae* will climb up onto the sides of the jar and some have turned into *pupae*. The *pupae* are light brown in color, and have a pointed “tail” end and two tufts on their “head” end. The *larvae* change into adult fruit flies while in the *pupae* stage, remember this process is called *metamorphosis*.
2. Record the first day you see *adults* hatched and flying around in the jar! This may take 8-14 days. You have just observed the full life cycle of fruit flies! The number of days it took for adults to hatch in your **Fly Jar** is the number of days it takes your fruit flies to complete one generation of their life cycle at room temperature. Circle this day on your data table/chart.
3. Wait another day or two to start the next observation, until you have LOTS of newly hatched fruit flies. Now you are ready to test how temperature effects the length of the fruit fly life cycle, or *PHASE TWO*. You may complete steps 11 and 12 in preparation for the next phase of observations at differing temperatures.
4. Begin by testing different areas in your house for higher and lower temperatures. A basement (or an air-conditioning unit or air duct) may have a colder temperature, while a sunny window (heat duct or radiator) may have a higher temperature. Place the thermometer in the area you are testing for about 10 minutes to be certain you get an accurate temperature reading. Record



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the temperatures of various locations in your home to locate two good testing sites. Try to find two locations with the widest temperature variation, one “WARM” and one “COLD”.

Location tested	Temperature in morning	Temperature at noon	Temperature at night
<i>Sunny window</i>			
<i>In front of air cond.</i>			
<i>Etc...</i>			

## PHASE TWO

When you’ve found two good locations, prepare two more **Fly Jars**. (Pull the two remaining **Fly Jars** from the refrigerator and check for mold growth. If none, you may proceed. If there is mold present, discard the moldy fly food and prepare another batch of fly food as in Step 1 and pour it into *two* clean **Fly Jars**. Label the jars. One should be labeled “**COLD**” and the other “**WARM**”.



*This step should be done **OUTSIDE**.*

1. Place your **Fly Jar** in the refrigerator for 10-20 minutes to slow down the flies. Then take your newly hatched fruit flies in their **Fly Jar** outside, along with your two new **Fly Jars: COLD** and **WARM**.
2. **DO NOT INVERT** your jar full of flies, as the food (and all of the remaining larvae, eggs, and pupae) will fall into your new jars. Instead, lay both jars, the **COLD** and the **Fly Jar** full of flies on their sides, remove the lids and place them together matching their openings.
3. Allow about 20 flies to enter your new **COLD** jar, they will eventually wander (or fly) toward the new food.
4. Slide the paper towel in between and secure with a rubber band. You may need to tap the flies down into the **Fly Jar** and the repeat with the **WARM** jar. You may even need to return the **Fly Jar** to the refrigerator if your flies are flying again.
5. Once you have about 20 flies in each jar. Check to be sure you have at least 5 females in each jar, **COLD** and **WARM**.
6. Now place your jars in their respective cold and warm locations you chose in step 11. Double check the temperature today and each day you observe.
7. Repeat your life cycle observations as in steps 6-9. However, your data table/ chart will look more like the following one:



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<b>PHASE TWO – FRUIT FLY LIFE CYCLE AT COLD AND WARM TEMPERATURES</b>				
	<b>COLD JAR</b>		<b>WARM JAR</b>	
Days Observed	Behavior of Adult Fruit Flies and temperature today	First appearance of <b>eggs, larva, pupae</b> and new generation of <b>adult</b> fruit flies	Behavior of Adult Fruit Flies and temperature today	First appearance of <b>eggs, larva, pupae</b> and new generation of <b>adult</b> fruit flies
1				
2				
3				
4		<i>Remove adults</i>		<i>Remove adults</i>
5				
6				
7				
8				
9				
10				
Etc..	Continue rows for all	Observations until	Adults appear in	COLD Jar too.

8. Record the first day you see *adults* hatched and flying around in the **WARM** jar! This may take less than 8-14 days. The number of days it took for adults to hatch in your **WARM** jar is the number of days it takes your fruit flies to complete one generation of their life cycle at the WARM temperature. Circle this day on your chart.
9. Continue to observe the **COLD** jar until adults hatch. Circle this day on your chart too.



**NOTE:** This step should be done **OUTSIDE**.

When you are **all done** with your research and Report (see below) return the flies to the wild, **OUTSIDE**.

**Do not release your flies until you are certain you are done with your research phase.**

If any fruit flies escaped in the house, simply set a fruit fly trap to capture them again and take them **OUTSIDE** to release them. All of the food and remaining fly larvae etc... in the jars can be discarded in a plastic bag in an outdoor trash can. The jars can be cleaned, preferably outside with a garden hose, and recycled.



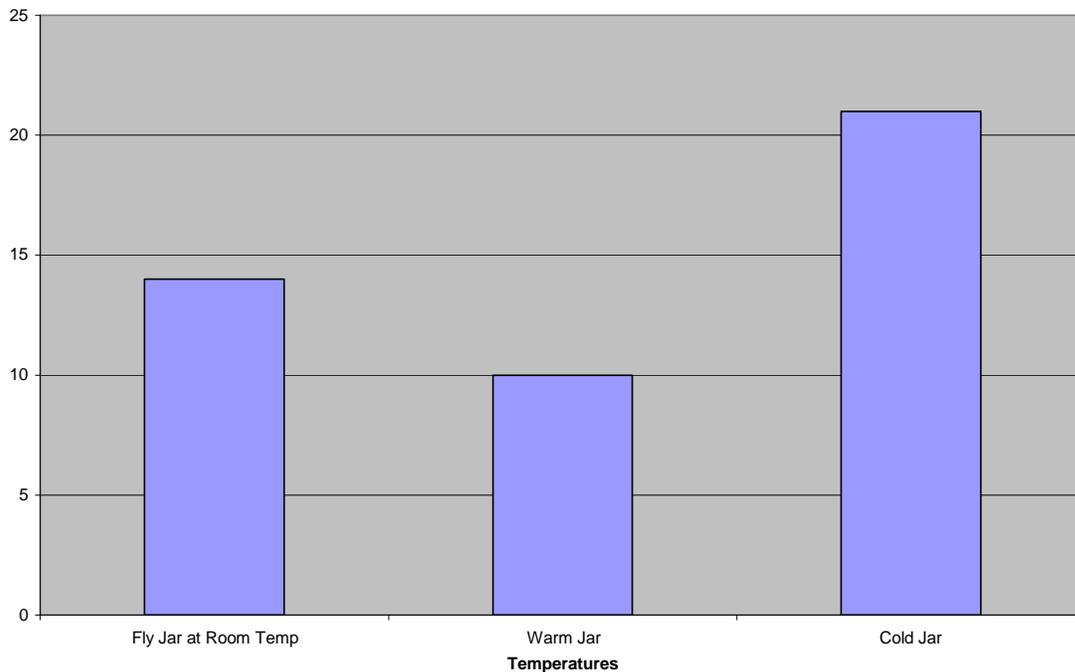
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## Analyze Data

Do you think your hypothesis (guess) was correct? Analyzing (reviewing) your data is the fifth step of the Scientific Method. Once you gather all of your data together you can figure out whether your experiment proves your hypothesis as true or disproves your hypothesis as false.

1. Make a bar graph of your data to evaluate the length of time it takes for one life cycle of the fruit fly to be completed at room temperature, a warmer temperature and at the colder temperature. Label the bottom (X-axis) as temperature of the three jars you observed. Make the side (Y-axis) the number of days it took for each jar of flies to complete their life cycle, this is the number you circled on your data table/chart. See example below:

Length of Fruit Fly Life Cycle at Different Temperatures



2. Review the graph. Does it show that a lower temperature environment slowed down the completion of the fruit flies' life cycle?
3. Think about how your data confirm or challenge your hypothesis? Was your chosen timeline proven correct?
4. Are you satisfied with the results? Is there something you could do different in the experiment to get a different answer?
5. If you're not completely satisfied with the results, consider doing the experiment AGAIN but trying something slightly different.

For instance, you could place a jar of flies indoors and outdoors (if the weather proves to be



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warm enough and you have air conditioning, and therefore a larger variation in temperatures).

REMEMBER, scientists often change one little thing and repeat an experiment to be sure the data is providing enough information to conclude whether a hypothesis is true or not.

6. Once you're confident you have enough evidence to confidently say your hypothesis is true or not, you're ready to communicate your results.

## ***Communicate Results***

Share what you found out. The final step of the Scientific Method is to pull together everything you learned into a presentation to teach others.

Gather your data, pictures, and graphs. Then follow these steps to create your poster, written report, or other project:

1. Restate your question,
2. List your background research
3. State your hypothesis
4. List your procedure and all the data you collected.
  - a. Be sure to include any additional tests you did in case you weren't satisfied with the first test.
5. Write up a concluding statement of 2 – 3 sentences that summarizes whether your prediction about how temperature effects fruit fly development was correct.
6. Include additional questions you (or other scientists) could research in the future. See the variations for further research listed in the "variations" section for possible ideas to include.

Make sure to label each step of the Scientific Method in your poster, report, or project:

- Ask a Question,
- Background Research,
- Hypothesis,
- Experimental Procedure,
- Analyze Results and Draw Conclusions.

## ***Variations***

- Test how fruit fly development is effected if they spend their entire life cycle in the dark.
- Test how a change in diet effects the life cycle of fruit flies.
- Determine how many adult fruit flies could hatch from one female.
- Test whether a cold snap (sudden chillier temperature followed by room temperature) has an effect on fruit fly development.



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## **Correlations with NSTA Science Education Standards:**

This Kit correlates with the following:

### **Grade K-4**

***Unifying Concepts and Processes Standard:** As a result of activities in grades K – 12, all students should develop understanding and abilities aligned with the following concepts and processes:*

- *Systems, order, and organization*

#### **Content Standard C: The Characteristics of Organisms:**

*Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.*

Students observe fruit flies during a complete life cycle, they observe their food and space requirements and changes of temperature to their environment.

***Content Standard C: Life Cycles Of Organisms:** Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.*

*Plants and animals closely resemble their parents.*

Students observe house flies during one or more complete life cycles, from adult to egg, larva, pupa and to adult again.

#### **Science As Inquiry Standards:**

- *Abilities necessary to do scientific inquiry*
- *Ask a question about objects, organisms, and events in the environment.*
- *Plan and Conduct a simple investigation.*
- *Employ simple equipment and tools to gather data and extend the senses.*
- *Use data to construct a reasonable explanation.*
- *Communicate investigations and explanations.*
- *Understanding about scientific inquiry, scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.*

Students design and implement a scientific investigation, including all steps of the scientific method and graphing the data they collect.



# SCIENCE FAIR KIT: WHICH CAME FIRST? THE FLY OR THE EGG?

**Grades 5-8**

## ***Reproduction And Heredity***

*Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.*

*In many species, including humans, females produce eggs and males produce sperm. Plants also reproduce sexually--the egg and sperm are produced in the flowers of flowering plants. An egg and sperm unite to begin development of a new individual. That new individual receives genetic information from its mother (via the egg) and its father (via the sperm). Sexually produced offspring never are identical to either of their parents.*

Students observe fruit flies during a complete life cycle, they observe their food and space requirements and changes of temperature to their environment.

## **Science As Inquiry Standards**

- *Abilities necessary to do scientific inquiry*
- *Identify questions that can be answered through scientific investigations.*
- *Design and conduct a scientific investigation.*
- *Use appropriate tools and techniques to gather, analyze, and interpret data.*
- *Develop descriptions, explanations, predictions, and models using evidence.*
- *Think critically and logically to make the relationships between evidence and explanations.*
- *Recognize and analyze alternative explanations and predictions.*
- *Communicate scientific procedures and explanations.*
- *Use mathematics in all aspects of scientific inquiry.*
- *Understandings about scientific inquiry*
- *Mathematics is important in all aspects of scientific inquiry.*

Students design and implement a scientific investigation, including all steps of the scientific method and graphing the data they collect.

All standards listed above are quoted from: <http://www.nsta.org/publications/nses.aspx>