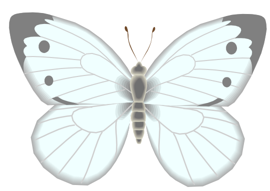
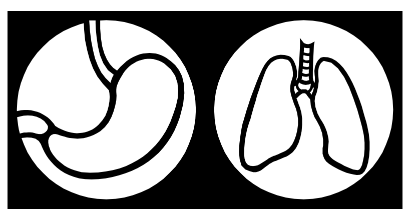
7th Grade Life Science Reference and Practice Booklet



for Experimentation, Graphing

and Writing Lab Reports

Name ___________________________________

Teacher______________________ Hour _______

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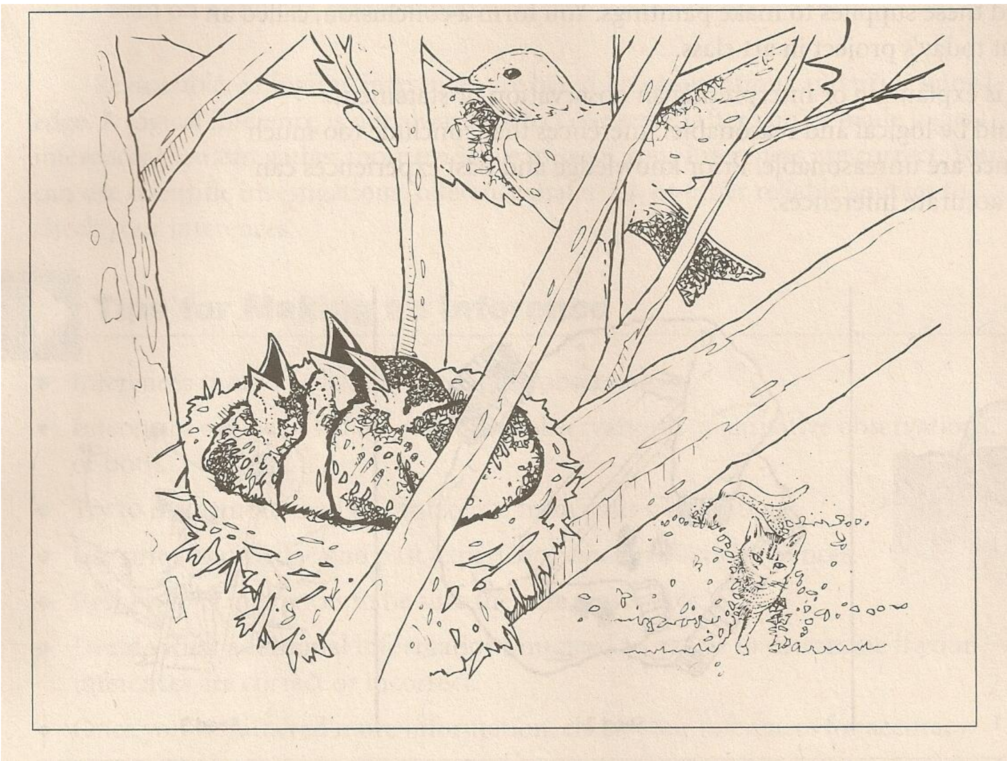
Observations and Inferences

Scientific observations are accurate and objective. They report exactly what information you can gather by using your senses while avoiding opinions, bias and explanations. Observations can be qualitative or quantitative. A qualitative observation a description of what is being observed, where as a quantitative observation is numerical. Quantitative observations are often made with tools.

Example 1. The classroom walls are gray. (qualitative)
Example 2. There are 21 students in the room. (quantitative)

After observations are made, scientists will often offer explanations for the observations. Trying to explain or interpret an observation is making an *inference*.

Discuss with your class the observations and inferences that can be made from this picture:



Qualitative:

Quantitative:

Inferences:

PRACTICE – Part I. Classify each statement as

A = Qualitative Observation
B = Quantitative Observation
C = Inference

___ 1. It must be cold outside, since most students are wearing coats.
___ 2. There are seven graduated cylinders on the teacher's desk.
___ 3. Tthe blackworm swims in a corkscrew pattern.
___ 4. The pencil is 12 cm long.
___ 5. I hear a dog barking.
___ 6. I smell smoke coming from the pile of wood.
___ 7. The water in the beaker is 22 °C.
___ 8. The plant must not have been given any fertilizer since its leaves are yellow.

SI units and prefixes

Measuring compares an object to a standard (a known amount). An ancient unit of measuring length, the cubit, was roughly the measure of one's forearm, which is NOT a standard. In science, a common set of measurement standards called the International System of Units (SI units) is used. It is an updated version of the metric system. Fill in the first three columns of the table of SI units below with your class.

Property and Definition	Tool(s)	Unit(s) and approximate size(s)
Length =		
Liquid Volume =		
Mass =		
Time =		
Temperature =		

Sometimes the basic SI units are too large or too small to be practical. For example, if a scientist wished to measure the length of a small animal such as a blackworm, meters are too large. Prefixes are added to the units to represent multiples (or fractions) of the base unit for large objects, and divisions of the base unit for smaller objects.

Common SI prefixes

mega (M) = million (1,000,000)
kilo (k) = thousand (1,000)
hecto (h) = hundred (100)
deka (D or da) = ten (10)
--- base units (1) ---
deci (d) = tenth (1/10 or 0.1)
centi (c) = hundredth (1/100 or 0.01)
milli (m) = thousandth (1/1000 or 0.001)
micro (u) = millionth (1/1000 000 or 0.000 001)

Practice: Which distance is the largest? Circle your answer for each pair.

(a) 14 mm or 1 cm

(b) 334 m or 1 km

(c) 1 m or 990 cm

(d) 1450 m or 145 km

(e) 3.4 cm or 30 mm

(f) 10 km or 1000 cm

PRACTICE – Choosing SI units and prefixes

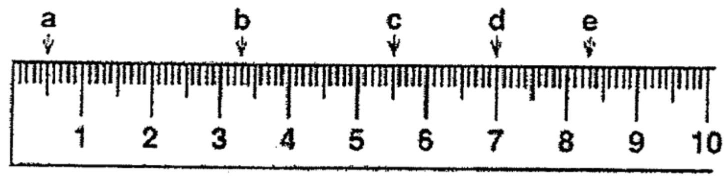
For each of the following measurements, choose which unit and prefix would be most appropriate to use. Circle your answer(s).

1. Length of a seashell: km, m, cm, mm, kg, g, mg, L, mL, °C
2. Mass of a car: km, m, cm, mm, kg, g, mg, L, mL, °C
3. Volume of a bottle of water: km, m, cm, mm, kg, g, mg, L, mL, °C
4. Temperature of boiling water: km, m, cm, mm, kg, g, mg, L, mL, °C
5. Mass of a small amount of powder: km, m, cm, mm, kg, g, mg, L, mL, °C
6. Volume of water in a pond: km, m, cm, mm, kg, g, mg, L, mL, °C
7. Length of a playing field: km, m, cm, mm, kg, g, mg, L, mL, °C
8. Your mass: km, m, cm, mm, kg, g, mg, L, mL, °C
9. Length of a tiny insect: km, m, cm, mm, kg, g, mg, L, mL, °C
10. Amount of space in a marble: km, m, cm, mm, kg, g, mg, L, mL, °C
11. Mass of a pinch of salt: km, m, cm, mm, kg, g, mg, L, mL, °C
12. Thickness of an eyelash: km, m, cm, mm, kg, g, mg, L, mL, °C
13. Length of a pencil: km, m, cm, mm, kg, g, mg, L, mL, °C
14. The mass of ten pennies: km, m, cm, mm, kg, g, mg, L, mL, °C
15. Amount of water in a bathtub: km, m, cm, mm, kg, g, mg, L, mL, °C

MEASURING LENGTH

Name __________

What lengths are marked on the following centimeter ruler?



	cm	mm
a)	________	________
b)	________	________
c)	________	________
d)	________	________
e)	________	________

Measure the following lines with a centimeter ruler.

f)

g)

h)

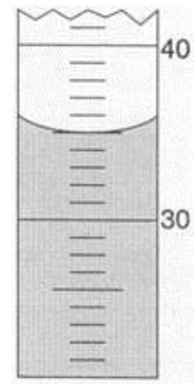
i)

j)

k)

Tips on Measuring Volume and Mass

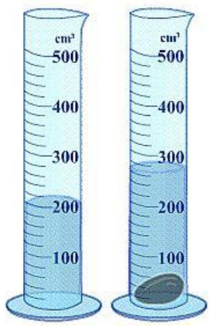
*When measuring **volume,** using a graduated cylinder is more accurate than a beaker, and the smaller cylinder you can use, the more accurate the measurement will be.



*Liquid in a graduated cylinder will stick to the plastic or glass and form a curved line called a meniscus. The measurement should be read from the bottom of the curve. In the example to the right, the cylinder contains 35 mL of liquid.

*Be sure to check the scale (what it "goes by") of the cylinder before determining the total.

*The cylinder will only read accurately if reading the cylinder on a flat, horizontal surface and at eye level.



*Using a cylinder to determine the volume of a solid object is called <u>water displacement</u>. Just be sure to subtract the amount of water you started with from the total of the water and the object to determine the volume of the object.

*If the volume of a regular solid object is required, then measurements can be taken (if there are clearly defined sides) and calculated using the formula B x h.

---

*When using a beam balance or an electronic balance to measure the **mass** of an object, make sure that the trays are clean and empty and the balance is reading zero (and level in the case of the beams) before you place an object on the tray.

The website below from the University of Wisconsin is a tutorial of how to work and read a triple beam balance.

http://www.wisc-online.com/objects/index_tj.asp?objID=GCH202

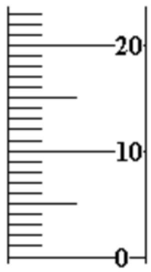
**Start with the heaviest beam first, working your way to the smallest.

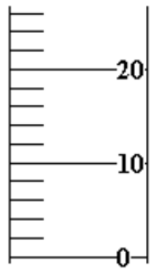
**The sliding weights of the heaviest arms need to be in the notches for the masses to be accurate.

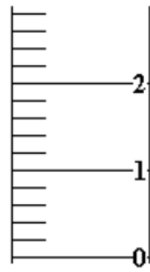
**Add the arms when you are finished to get the total mass of the object.

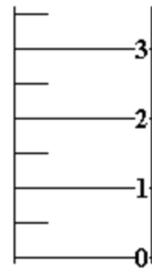
<u>Graduated Cylinder Worksheet</u>

A graduated cylinder can have numerous scales.
1) Determine the value for the minor grids on the cylinder.



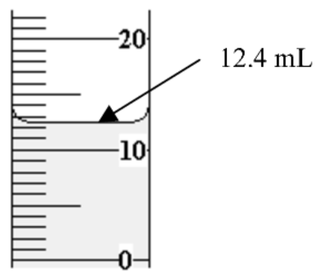




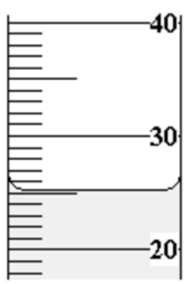


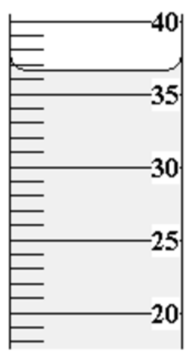
a) ______ b) _______ c) _______ d) _______

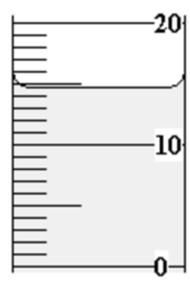
When reading a graduated cylinder you need to keep the graduated cylinder on the desk and lower your eyes to the level of the meniscus and you read where the bottom of the meniscus is. Be sure to include one point of estimation in your reading.



2) Determine the volume of the liquids in the following cylinders:

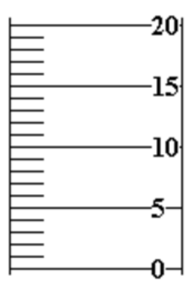


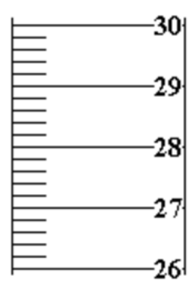


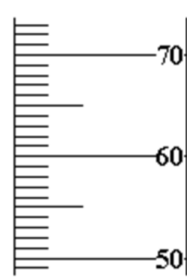


a) __________ b) _________ c) _______ d) _________

3) Draw in the meniscus for the following readings:







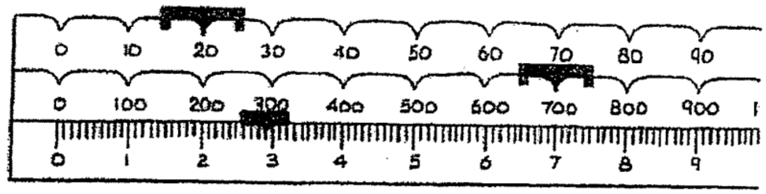
a) 49.21 mL b) 18.2 mL c) 27.65 mL d) 63.8 mL

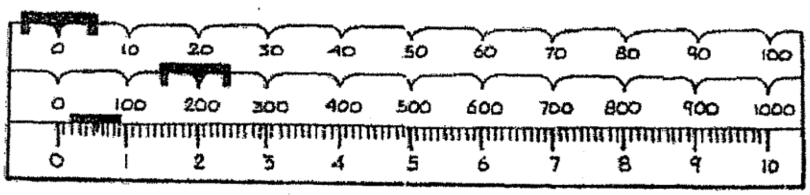
USING THE BALANCE

Name ____________________

The following balance measure mass is grams. What masses are shown on each of the following balances?

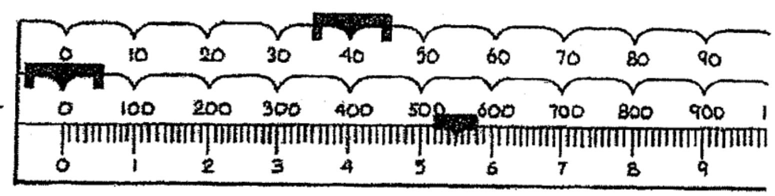
Answer: ____________________

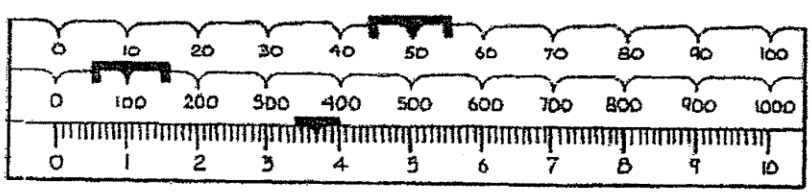




Answer: ____________________

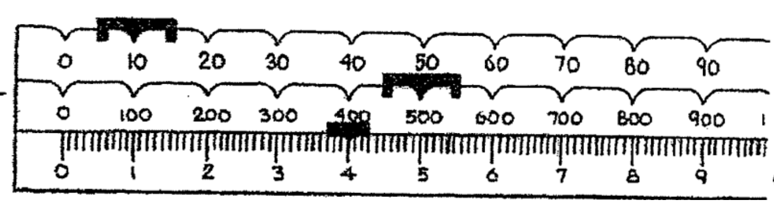
Answer: ____________________





Answer: ____________________

Answer: ____________________



Steps for Making a Scientific Drawing

1. Make sure you are using a pencil. Erase as cleanly as possible.
2. Draw your focused, centered specimen in the circle drawing area with the same proportion to the space as it appears in the field of view. Use shading and sketching techniques to show details as best you can.
3. Print the magnification (0x, 40x, 100x, 400x) you are using on the 1st line under the circle drawing area. In parenthesis, write the diameter of the field of view in mm of that magnification.
4. Print the title of your drawing on the 2nd line under the circle drawing area. In parenthesis, write the size of your specimen in mm. Use a clear ruler to help you, or the estimation strategies you learned in class.
5. Use a straight-edge to draw lines for the structures that need labeled. The lines should TOUCH but not point each structure, and they should finish OUTSIDE the circle. The writing for the labels should be printed horizontally, outside of the field of view.

LAB: Using a Light Microscope- The Letter "e"

Procedure:

1. Trace the following objects in the space:
   a. Slide b. coverslip
2. Make a wet mount slide:
   a. Cut out one letter "e" and place it on a microscope slide face up.
   b. Add 1-2 drops of water to the slide.
   c. Place a cover slip on top of the "e" and water at a 45 degree angle and lower slowly.
   d. Tap it gently with an eraser to release any air bubbles.
3. Raise your hand for your teacher to check your slide and to initial here before going on: _____
4. Place the slide on the stage of the microscope and view on low objective (40x). Center the "e" in the field of view.
5. Using the steps above for making scientific drawings, draw what you see in the 1st circle to the right. Use <u>THE LETTER "e"</u> as your title. Label: ink, paper, air bubble (if you have any)
6. Now unclip the slide, and move it on the stage the following directions. While moving it, observe and record what happens to the image of the specimen in the field of view.
   a. To the left ______________________ c. Move up ____________________________
   b. To the right _____________________ d. Move down _________________________
7. Re-center the letter "e." Without moving the specimen, switch to the medium objective (100x). Use the fine adjustment knob to focus the specimen.
8. Using the steps above for making scientific drawings, draw what you see in the 2nd circle to the right. Use the same title and labels as above.

Drawings:

______________________________ ______________________________

______________________________ ______________________________

Reflection questions:

1. Draw a picture, or series of pictures to explain to someone how a wet mount slide is made.

2. Why does a pencil need to be used when making a scientific drawing? ____________________
____
____

3. How does the letter “e” viewed through a microscope differ from the way an “e” normally appears (discuss size, shape, and the ink)? ______________________________________
____
____

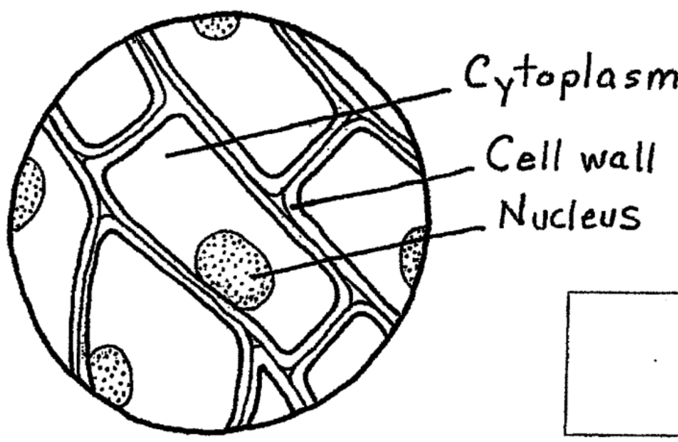
4. As you increase the magnification of the microscope, what happens to the specimen’s size in the field of view? ____
What happens to the amount of the field of view you can see?
____

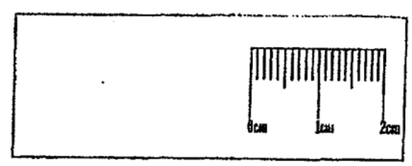
Student Sheet 2.3A
Guidelines for Scientific Drawings

An acceptable scientific drawing includes the following 10 elements:

1. The drawing is made with a sharp, No. 2 pencil.
2. The size of the drawing is proportional to the way it appears in the field of view.
3. The magnification and/or the diameter of the field of view is printed just below the circle.
4. The title appears in upper-case letters just below the magnification.
5. The lines used for labeling end at, or just inside of, the feature being identified.
6. A ruler is used to draw the lines for labels.
7. Labels are printed neatly outside the field of view and parallel to the bottom of the page.
8. The magnification, title, and labels are printed, not written in cursive.
9. There are no noticeable erasure marks.
10. Measurements are printed within parentheses to the right of the title.

This drawing of cells from the bulb (leaf) of the onion is considered acceptable because it follows each of the 10 guidelines.





400 X (.8mm)

magnification Measurement of field of view

ONION LEAF CELL (0.2 mm)

Title measurement of specimen

Scientific Methods for Inquiries - Notes

Scientists use a variety of methods to answer their questions. These include making models and conducting experiments. Most scientist recognize between 5 and 8 steps to answer a question. These steps are often referred to as the scientific method.

I. State the **Problem** (A question that can be answered by gathering evidence)

II. Collect “Background” **Information**
   A. Make observations about your test subjects
   B. Read other scientists’ research and scientific information

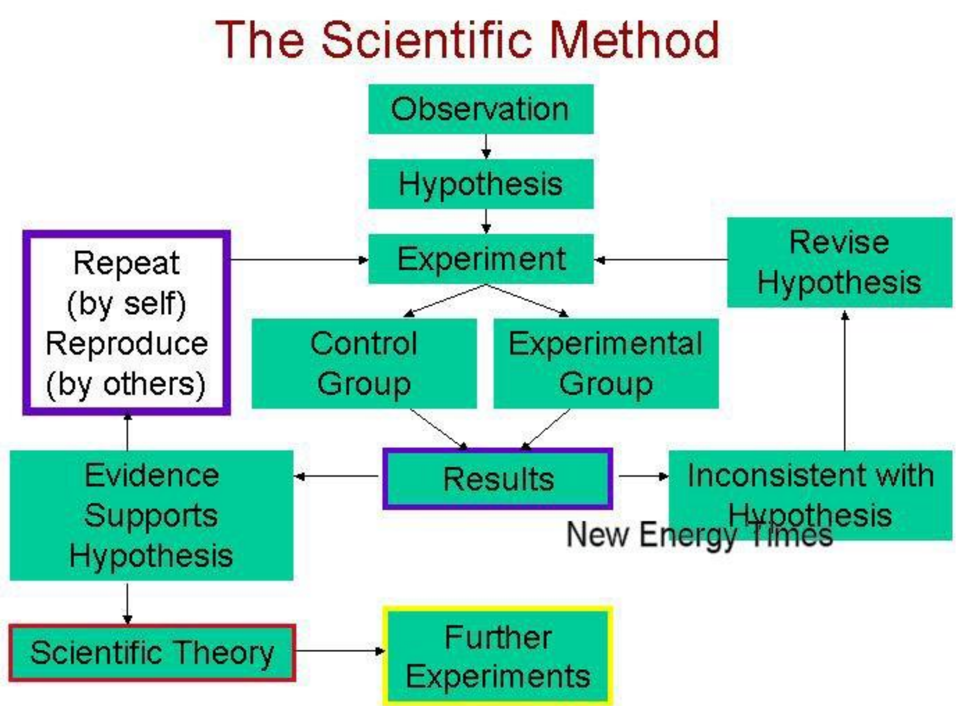
III. Form a **Hypothesis** (your prediction)

IV. Test the Hypothesis with a Controlled **Experiment**

V. Record and **Analyze** the Data
   A. Organize the Data into Charts and/or Graphs
   B. Interpret Graphs
   C. Take into account sources of error, including uncontrolled variables

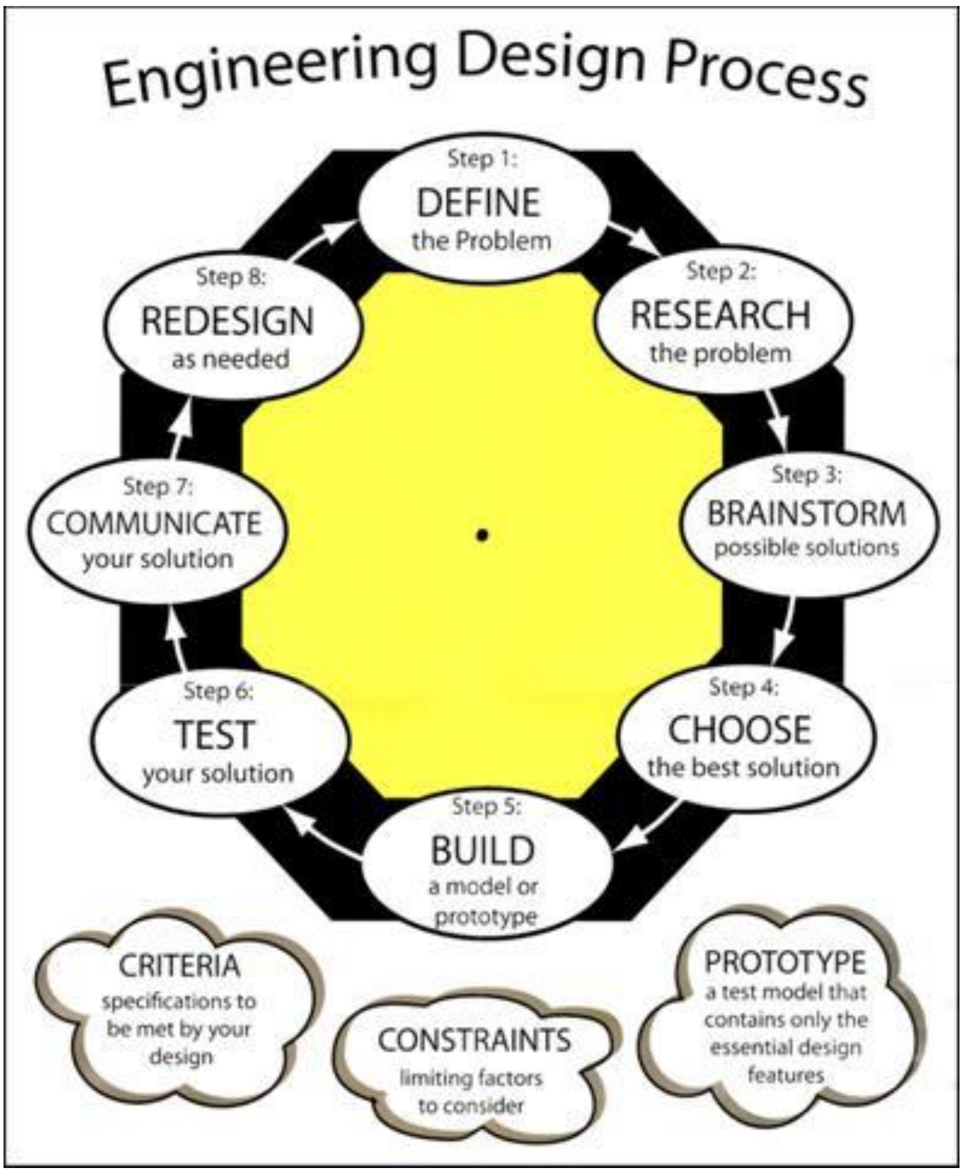
VI. Draw **Conclusions**
   A. State what was learned from the experiment, including if the hypothesis is supported by the data or not.
   B. Recognize inferences as well as applications and extensions of the topic

VII. **Communicate** Results



Engineering Design Process

So much of our daily lives is enhanced by products of engineering. The most successful people are able to solve problems, which often take multiple attempts and modifications, and don't give up if immediate success doesn't occur. The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times the solution involves designing a product (like a machine or computer code) that meets certain criteria within constraints and/or accomplishes a certain task.



Parts of Experiments

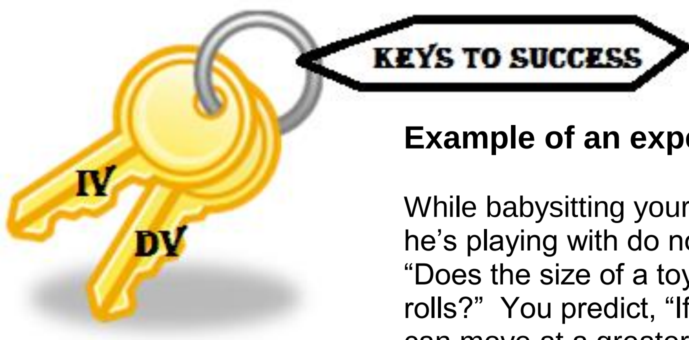
- *Independent variable* – the factor that is tested or changed by the experimenter. The I.V. should be the only starting difference between different groups tested.

- *Experimental group* = the subject(s) of the experiment that are receiving the tested condition (IV)

- *Control group* – An individual or group of subjects are used for comparison in analyzing the results of the experiment (often are NOT treated with the independent variable). The control gives you a baseline for the experiments to show you what the results look like without the tested condition(IV)

- *Dependent variable* – The factor that responds and is measured or observed.

- *Constants (controlled variables)* – Factors that are the same among ALL subjects tested. There should be only one changed variable. All others should be kept the same so the test is fair, and changes in results can be attributed to differences in the independent variable.



Example of an experiment with the parts explained.

While babysitting your little cousin, you notice that the toy cars he's playing with do not all roll at the same speed. You wonder, "Does the size of a toy car's wheels affect the rate at which it rolls?" You predict, "If a toy car is fitted with larger wheels, then it can move at a greater speed, because they will have better traction."

You test this with two cars of the same design and size, but with different wheel sizes. You release the cars from a ramp and record the time it takes them to cross the first meter at the end of the ramp to get a measurement of speed in meters per second.

Independent variable – The difference between the two cars tested is the wheel size
Experimental Group – Since the hypothesis predicts for larger wheels, then the toy car with larger wheels is the experimental group
Control Group – The car with smaller wheels will be compared to the larger ones, so the toy car with smaller wheels is the control group.
Dependent variable – The factor that is recorded and measured for results is the speed in m/s.
Constants- The unchanged factors between the groups are the car design, size and the ramp.

In an experiment, only the independent variable should affect the dependent variable. Would it be fair in the example with the toy cars to compare a toy semi with larger wheels and a race car with smaller wheels? Why not? The big semi might be heavier, or affected by its shape differently than the race car, which means differences in results might be due to something besides the wheel size. For a truly fair experiment, only ONE variable changes, and that the independent variable. However, in reality many variables cannot be controlled to be the same, so they are called **uncontrolled variables** and must be identified as possible sources of errors, and considered carefully in interpreting results.

Practice identifying the parts of an experiment.

Read each description of the hypothesis and experiment, then identify the experiment parts and variables. Refer back to page 16 for definitions and the other example.

1. The hypothesis "If water is in a metal container it will freeze more quickly than a plastic container because substances like to stick to metal when it is cold" is tested in an experiment. Four containers of equal shape and volume are used, but two are metal and two are plastic. They are filled with the same amount of water and put in the freezer at the same time. Each container has a thermometer, and the freezer has a clear door so the thermometers can be viewed without opening the door. A timer is started when they are put in the freezer.

   a. IV ____

   b. Experimental Group ____

   c. Control Group ____

   d. DV ____

   e. Constants ____

   ____

   f. Possible uncontrolled variables ____

   ____

2. The hypothesis "Fertilizer added to the soil does not affect how many seeds will sprout" is tested in an experiment. Does adding a lot, a little or no fertilizer to soil result in the most seed germination (sprouting)?

   a. IV ____

   b. Experimental Group ____

   c. Control Group ____

   d. DV ____

   e. Constants ____

   ____

   f. Possible uncontrolled variables ____

   ____

Writing a Lab Report

The ability to report technical information in a clear and concise manner is one of the most important practical skills that a technically trained person can develop. Results and conclusions drawn from experimental methods are of little value unless they can be communicated to others. These descriptions should guide you while writing lab reports for the seventh grade teachers. Pay attention to your teacher, though, as each teacher tends to make little changes to what they want you to do. See pages that follow for additional practice for each section of the report.

Title – Write the title at the top of the page. Make sure your name and the date are included in the upper right hand corner. The title is NOT catchy, but includes both IV and DV and describes what the experiment was about.

Purpose – (1 sentence): State the problem being tested in the experiment as a question. *(see p. 18 for more)*

Background Information / Introduction - (minimum of a paragraph): Record the scientific information (facts about specimens, concepts that are useful for the lab. Explain any new or complicated procedures, equipment or calculations. Include citations according to your teacher's directions.

Hypothesis – (1 – 3 sentences): Predict the outcome of the experiment based on the background information. You cannot just say something will change – you must predict what will change and how it will change. You should explain your reasons why. *(see p. 18 for more)*

Experimental Design– (A bulleted list) State the following: The Independent Variable, Dependent Variable, and at least 3 Constants, and any control group(s). *(see p.15-16 for more*)

Materials – (A bulleted list) State what was used in the experiment.

Procedure – Two possible options, so use teacher's directions:

A. State a list of directions for how to complete the experiment. Be clear and concise for each step. You do not need to explain where to find materials, or clean up directions.
B. Give a narrative summary of how the experiment was done. You do not need to explain where to find materials, or clean up directions.

Results – Provide the data / observations recorded from the experiment in an organized table, which should have a title. Any additional qualitative observations should be stated in sentence/paragraph format. *(see p.19 for more)*

Analysis –Graph the results *(see p. 19-21 for more)* AND (1-2 paragraphs) Analyze reliability of data by recognizing possible errors, uncontrolled variables ("loose" constants), or anything that happened during the activity that affected your data. Reflect on if sample size / number of trials provide adequate amount of data *(see p.22 for more)*

Conclusion – (1-2 paragraphs): Write an explanation of what was learned through the experiment in a Claim, Evidence and Reasoning format. Your teacher may also ask you to address application and/or extensions as well *(see p.22 for more)*

Experimental / Lab Report HINTS:

1. **Writing the Purpose**- Use a question starters:
   - What is the effect of ____________ on ___________?
   - How will _____ affect ______?
   - Which _____ will _______?
   - How long will _________?

****You can use any other question that makes sense to you, but it needs to include both variables that will be in the experiment.**

2. **Writing a hypothesis**

   A hypothesis must be testable and predict what you think would happen if you conducted an experiment on the subject. It is NOT a random guess: it should be based on gathered background information, observations and previous experience. Most of the time, you will need to provide a reason for your prediction.

Possible ways to write a hypothesis: (? Represents how the variable will change)

If ____(IV)____is ____?____, then the __(DV)__ will____?___, because _________.

I think the __(DV)__ will____?___ when __the (IV) ___?___ ,because _________.

I think that ___?___ the ___(IV)___ will cause the ____(DV)___ to _____ because ___.

PRACTICE *- From each (purpose) question below, complete the following steps:*
** Identify the independent variable by circling it, and the dependent variable by underlining it.*
** Write a testable hypothesis using one of the formats above.*
**Identify what the experimental and control groups would be in the experiment*
**State two additional variables that would need to be kept constant in the experiment.*

A. How does the depth at which bean seeds are planted affect how long germination (sprouting) takes?

H - ____

____

____

EG – ____

CG - ____

2 C - ____

____

B. How does the presence of fish affect the growth rate of aquarium plants?

H - ____

____

____

EG – ____

CG - ____

2 C - ____

____

MORE Experimental / Lab Report HINTS:

3. HINTS/Practice on making **Data Tables**: *This is the basic layout of a data table. The number of columns and rows should be adjusted to fit the number of groups tested and the number of trials conducted. A calculation (average, etc) would usually go on the right side of the table.*

TITLE

Heading and Unit for the IV	Heading and Unit for the DV			
	different	*trials*	*go*	*here*
groups				
tested/compared				
go				
here				

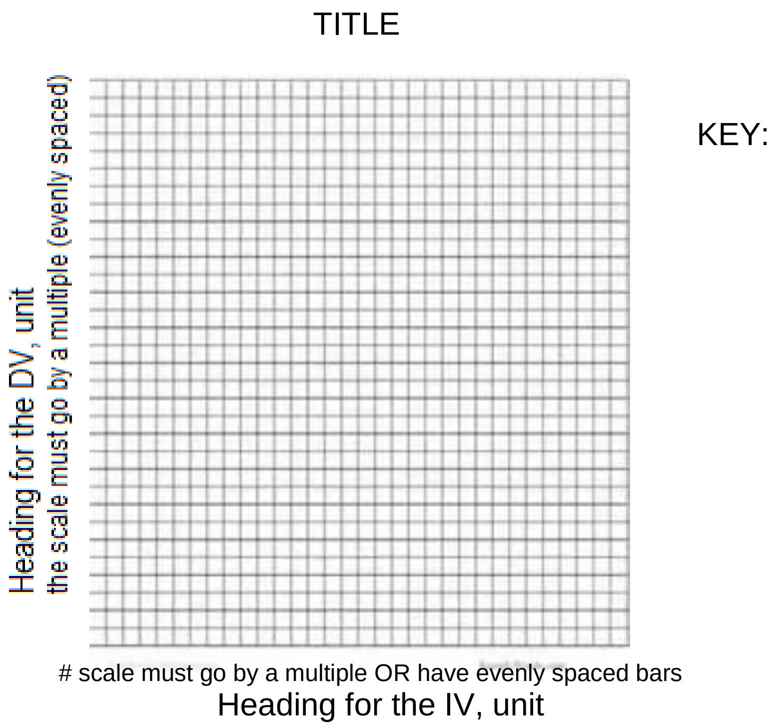
Writing a Title: If you've identified the IV and DV, then the title for a data table or a graph can be written with one of the following formats, or another one that makes sense to you.

- The effect of ___IV____ on _____DV_____
- Comparing the ______DV____ for different ____IV_____

Practice: Make a data table with a title in the space below from the following experimental results: Three middle school teams were compared over a three-day week to determine if their absence rates were different. On day 1, Team A had 4 absent, Team B had 3 absent and Team C had 4 absent. On day 2, Team A had 6 absent, Team B had 7 absent and Team C had 8 absent. On day 3, Team A had 6 absent, Team B had 6 absent and Team C and 5 absent. Make and fill in a data table for the data, including a total of the absences for each team.

MORE Experimental / Lab Report HINTS:

4. HINTS on making **Graphs**: *This is a “basic” graph guide that you can use:*



Tips:

- To determine what **type of graph** you will need to make. IF the independent variable (on the x axis) is qualitative or categorical, then make a BAR graph. IF the independent variable is quantitative or numerical (such as times, temperatures, lengths, masses, etc.), then make a LINE graph.

- To determine the **smallest number you can “go by”** on a graph, divide the range of your data (largest # - smallest) by the numbers of squares on your graph. OR use trial and error. If your scale uses less than half of the space you are given, then your graph is too small and you should “go by” a smaller number.

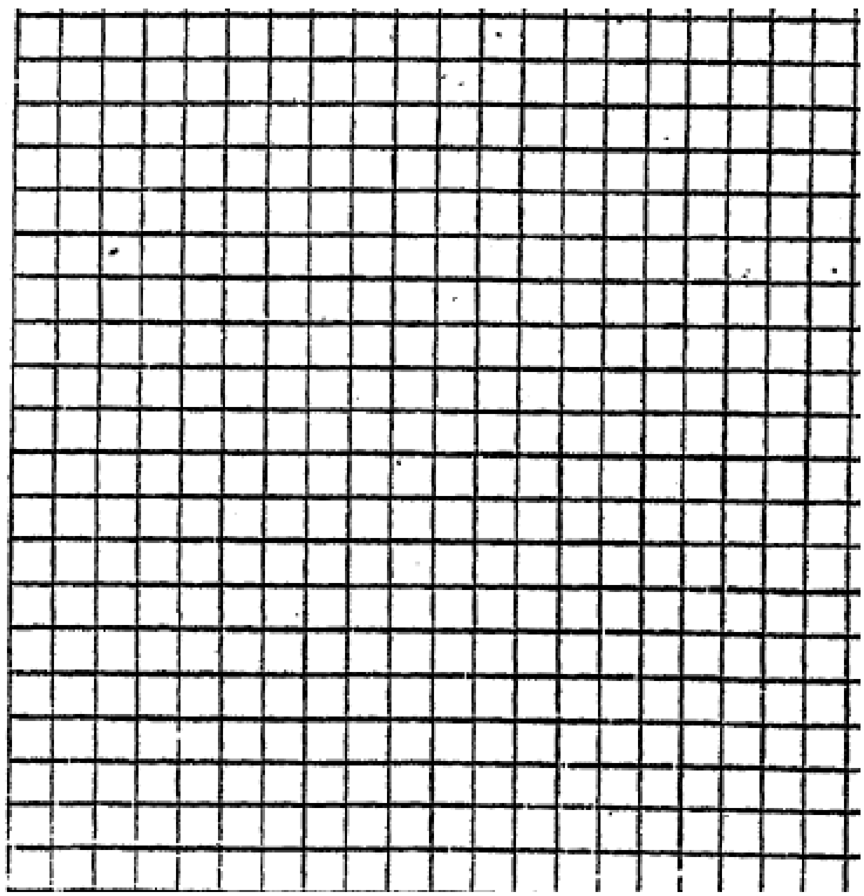
- Clearly **number the lines** on the graph paper, not the spaces, unless you are labeling bars for a bar graph.

- If you are graphing more than one trial, then you may need to include a key (colors, different types of lines, etc).

- For a line graph, pay attention to if you need to make a scatterplot, a best fit trend line OR to just connect the points with a ruler.

Graphing Practice : The distance of two cars was measured over 6 seconds. Make a line graph (include a key), and answer the questions that follow.

Car A → 0 seconds – 0 feet, 1 second – 20 feet, 2 seconds – 40 feet, 3 seconds – 60 feet, 4 seconds – 80 feet, 5 seconds – 100 feet, 6 seconds – 120 feet.
Car B → 0 seconds – 60 feet, 1 second – 64 feet, 2 seconds – 68 feet, 3 seconds – 72 feet, 4 seconds – 76 feet, 5 seconds – 78 feet, 6 seconds – 82 feet.



Time, seconds

Questions –

1. Which car started in front? ______
2. Which car was traveling the fastest? ________
3. How can you tell that the cars pass each other by looking at the graph?______________
   ____
4. At 8 seconds, car A would be at _________ feet, and car B would be at _________ feet.

MORE Experimental / Lab Report HINTS:

5. HINTS on writing an ANALYSIS
Writing the analysis can be approached in two parts. **First,** the results must be explained in words. What does the data mean and how do you know? Include any trends. **Second,** you must write about the sources of errors for your data, and the reliability of the experiment and the quality of the design.

**These are characteristics of a reliable experiment:

- A good sample size / lots or repeated trials
- Consistency within the data (same trend for different trials)
- Minimal uncontrolled variables

**Types of errors in an experiment:

- Uncontrolled variables (whether on purpose or by accident)
- Mistakes in following the procedures
- Errors in measurement (tiny unknown mistakes that add up from this are called "human error")
- Not having a wide enough range of values tested (doesn't cause error in the other values, but can decrease usefulness of the experiment) OR not testing enough values within the range
- Not having enough trials (the more trials you have, the better chance that effects of the uncontrolled variables are minimized and the actual relationship between the data can be determined)

6. HINTS on writing a CONCLUSION:
*The conclusion should be written as a cohesive paragraph. However, the parts will be written separately as you learn their meanings and how to approach them.

*Writing the conclusion can also be approached in 3-4 parts: CLAIM, EVIDENCE, REASONING, and possibly APPLICATION/EXTENSION. Here is a description for each part:

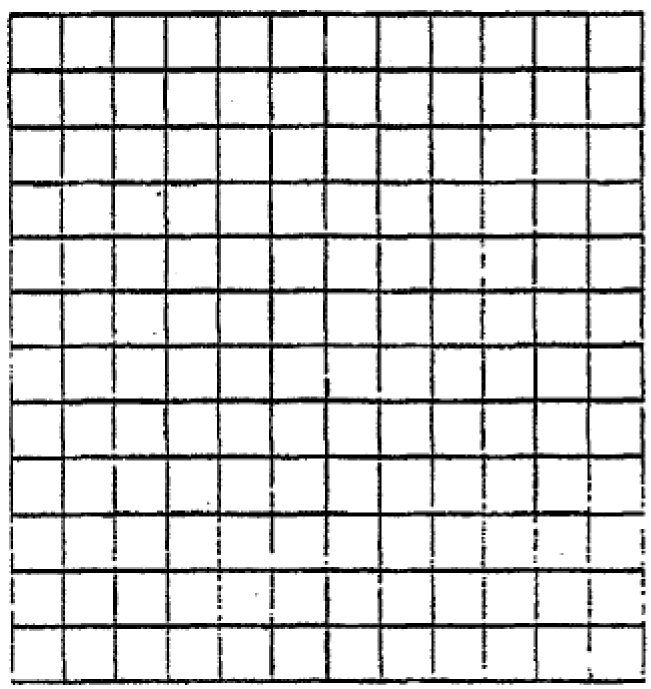
- Claim – The claim is the statement answering the question (purpose/problem) that the experiment is based on.
- Evidence – The evidence states general trends and the specific pieces of data that support this claim. This is similar to the "proof" needed in a courtroom.
- Reasoning – Explain what "rule", scientific principle, facts or knowledge explains why those results would occur.
- Application/Extension - These are ways that the experiment relates to everyday life, can be applied to different situations or additional related questions and ideas that could be experimented.

MORE PRACTICE on Variables and Making Tables and Graphs

Investigation 1. *Answer the questions, make a data table in the space provided, then make an appropriate graph. Give the data table and graph a title (one for both is fine).*

Six tomato plants were grown at various temperatures. The number of tomatoes that grew on each plant was counted. 8 °C had 4 tomatoes, 12 °C had 10 tomatoes, 16 °C had 14 tomatoes, 24 °C had 16 tomatoes, 18 °C had 18 tomatoes, and 22 °C had 24 tomatoes.

a. Write a purpose for this investigation: ____
____
b. What is the IV? ______________________________________
c. What is the DV? ______________________________________
d. What are two factors that SHOULD be constants? ______________________________
____
e. (After graphing the data) – What is learned from this experiment about the relationship between temperature and growth of tomato plants? ______________________________
____
____
____



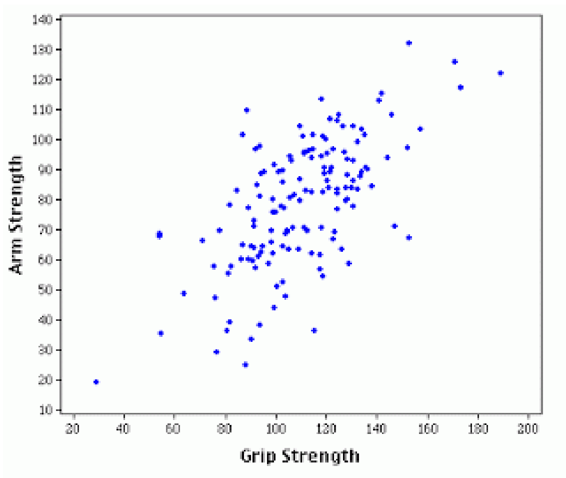
Investigation 2. *Read about the following experiment, graph the data so you can better interpret it, then write an analysis paragraph for the data.*

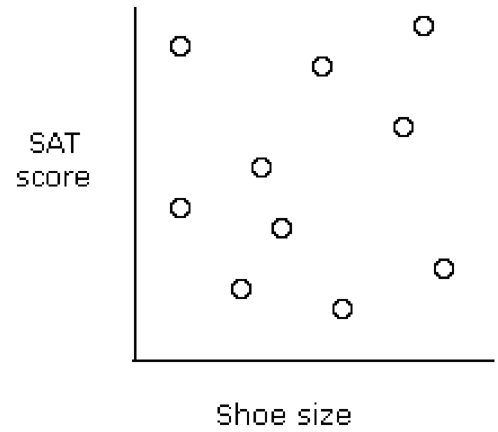
Sally divided 900 seeds into groups of 100 each. Each group of seeds was a mix of five different vegetables, and was placed in a different incubator under the same conditions except for temperature. The number of sprouted seeds was counted after 30 days.

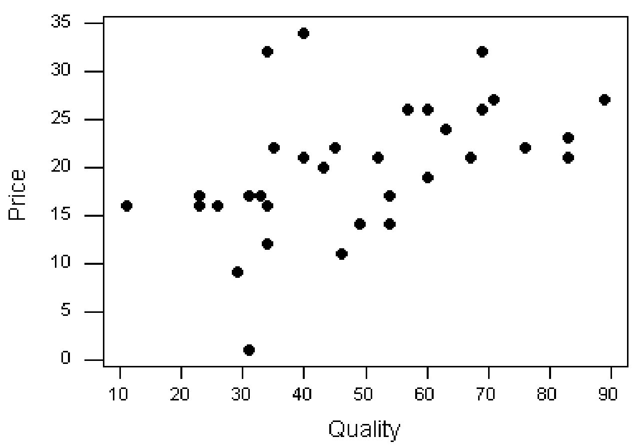
IV	Temperature °C	6°	8°	11°	13°	18°	25°	30°	35°	39°
DV	Sprouts	0	0	0	0	16	50	84	30	10

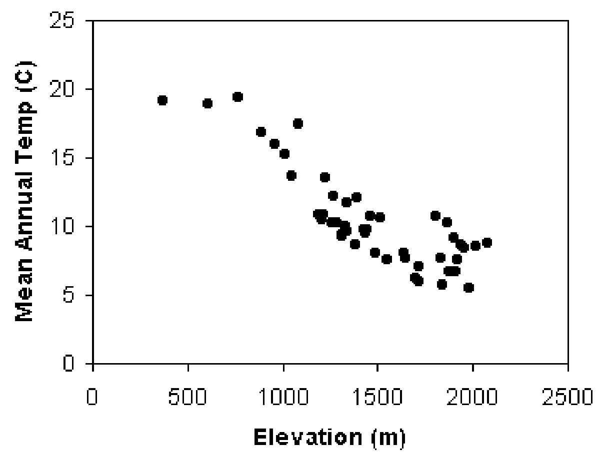
Analysis:

Interpreting Scatterplots. For each scatterplot, draw a trend line, and identify the relationship (correlation) between the variables as strong positive, weak positive, none, weak negative or strong negative.









1. There is a ________________________________ relationship between ________________________ and __________________________.

2. There is a ________________________________ relationship between ________________________ and __________________________.

3. There is a ________________________________ relationship between ________________________ and __________________________.

4. There is a ________________________________ relationship between ________________________ and __________________________.

Example Lab Report

Your name
Date
(partners)

The Effect of Air Temperature on Croaking Speed

Purpose – How does the air temperature affect the number of frog croaks?

Background Information – Since frogs are cold blooded, their body temperature is influenced by its external environment. Different frog species have adapted a variety of techniques to have better control over their body temperature. Frogs control their body temperatures depending on their species, size, age, sunbathing, time of year and skin color. Male frogs croak to attract females for mating. (Frogs: A Chorus of Colors, by Deborah A. Behler, Clyde Peeling, Chad (FRW) Peeling, 2005)

Hypothesis – I think that the frog will croak more often as the temperature increases because a warmer air temperature would increase the blood flow in the frog, increasing the likelihood of mating.

Variables –

Independent Variable – the air temperature
Dependent Variable – the number of frog croaks / minute
Constants – the frog's habitat, the frog itself, the same heat lamp
Control – the trial at room temperature

Materials –

*A terrarium set up appropriately for a frog
*An American bullfrog
*Heat lamp
*Thermometer
*Stopwatch

Procedure –

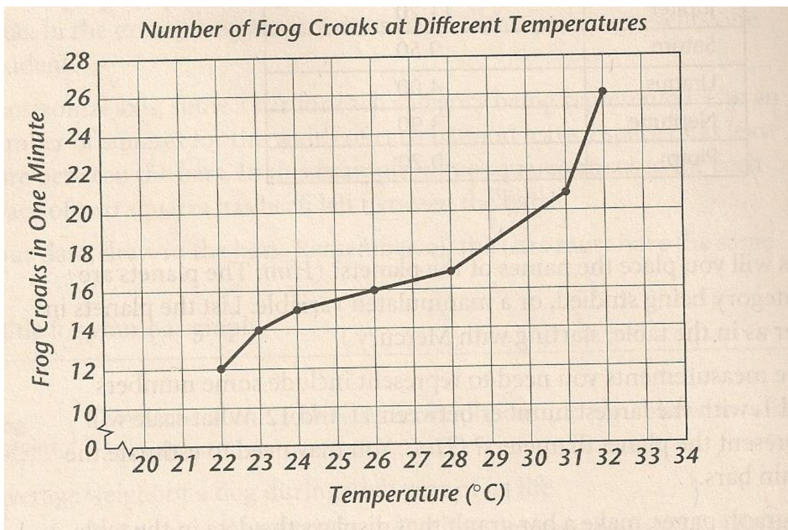
1. Record the indoor air temperature.
2. Count the number of times the frog croaks in one minute.
3. Turn on the heat lamp.
4. Clip the thermometer inside the aquarium.
5. As the temperature increases, monitor the thermometer and repeat step 2 as close to every degree increase as possible.

Data Table-

The effect of air temperature on the number of frog croaks.

Air temperature (°C)	Frog Croaks per minute
22	12
23	14
24	15
26	16
28	17
31	21
32	26

Analysis –



At the start of the experiment, the frog croaked 12 times at 22 °C, with a final count of 26 croaks at 32 °C. At no point did the number of croaks go down as the temperature was increasing, therefore that data shows the croaking rate increases as air temperature increases. The setup of this experiment is limited. Only one frog from one frog species was tested. Also, the heat lamp heated up very quickly, making the first few measurements very close together in time. The frog may not have had enough time to adjust to the temperatures. In addition, the temperature was increasing at such a fast rate that the degrees would increase by one more quickly than the number of croaks were counted in one minute, making it impossible to record data for only one temperature.

Conclusion – The number of frog croaks per minute increases as the temperature increases for the temperature range tested (20-32 °C). At the start of the experiment, the frog croaked 12 times at 22 °C, with a final count of 26 croaks at 32 °C. At no point did the number of croaks go down as the temperature was increasing, therefore that data shows the croaking rate increases as air temperature increases. As cold blooded animals, the blood flow would increase, which would also result in an increase in croaks to signal mates. Additional experiments should determine if there is an optimum temperature for croaking, and if the croaking rates actually do relate to their breeding patterns.