Science Fair Materials

Table of Contents

TO THE PARENTS:

Welcome to the science fair! Through participation in our fair this year, your child can learn about science and experiments. I hope that you find this project fun, interesting, and rewarding.

Read through these materials with your child. The first decision you must make is whether to participate in our school fair. Most of the project will be done at home by you and your child. Basic information will be provided at school.

HOW TO USE THIS BOOKLET

Along with a list of ideas, this booklet provides an explanation of basic vocabulary and the steps in the scientific process. You will also find a copy of a display, which is part of a completed project. This is included only as a guide.

Students need to provide their own
<u>card table</u> on the day of the Science Fair.

<u>Display boards</u> are usually available at
teacher's stores, craft stores, or
business supply stores.

You must complete the *<u>Science Fair Project Registration Form</u>* in order to participate. This form tells us what your project will be about. You don't have to be started on your project to register. Please return this form by the requested date.

Good luck and have fun!

How can I help my child with a project?

1. Designing a science fair project is for any curious, interested child.

2. Be positive.

3. The project goals are to use and strengthen basic problem-solving skills. Your child may need guidance and encouragement. You may not know all the answers to questions that come up. Contact the science fair coordinator(s).

4. The basic science skills your child will use to complete this project are:
   - Asking a question and finding an answer (research)
   - Organization
   - Experimenting
   - Measuring
   - Writing the results or new knowledge, (What do you know now that you didn't before?)
   - Reporting or presenting to others

5. Stick to a schedule. Use the plan that is included to keep track of progress. A project may take between 4-8 weeks, depending on how difficult the question is.

6. Help your child with things like photography, construction, or tasks where safety is important. Your child should be able to print, draw, color, make a graph, or use a computer to complete the written report. Craft and scrap-booking stores offer die-cut machines to punch out letters or sell stick on letters.

7. Hands-on activities are the best way for your child to understand. It might get messy, but your child will enjoy mixing, growing plants or building objects. Use items that you can easily obtain.

8. Consider the cost as you select a topic. How difficult will it be to get the materials?

9. Allow plenty of time for thinking and exploring. Help your child stay relaxed. Be a good listener and learn along with your child. Be careful not to do for your child many things her or she can do for him/herself.

10. Check the project for neatness, good grammar, spelling and accuracy.

11. For the oral presentation, help your child practice, practice, practice ☺
    - Introducing him/herself
    - Telling about the project
    - Showing and explaining their display (pictures, graphs, written work)
    - Speaking loudly and clearly, and using eye contact

12. Your child's enthusiasm for his/her project is contagious. Whether telling classmates, friends, or a science fair judge about the project, showing excitement and interest in their project is important.

STAY ORGANIZED WITH A SCHEDULE

This may be the first time you have attempted a long, range project so it is very important to make a schedule and stay organized. Science fair projects often require several weeks for completion. Don't let a due date that is many weeks away throw your planning off; there are many things to do. Here is an example of a project plan for starting eight weeks before the Science Fair. This is the average amount of time a good project takes.

Check Off

( ) **Week 1** Think about your project. Talk to people, read, and collect ideas. Decide on the purpose of your project. Write an objective title. State a hypothesis. Describe what you will do. Do you need to check with an adult? Keep a journal of your thoughts. Begin now if plants or animals are involved.

( ) **Week 2** Change title or idea if necessary. Collect information. Conduct trials for experiments and record information.

( ) **Week 3** If doing an experiment, continue with trials. Make appointments with resource people who may help you with your ideas. Sort through your data and information to organize your thoughts.

( ) **Week 4** Continue experiments. Collect and check your data (answers) to see that your experiments are working. Write a rough draft of what you have done. Get opinions from a parent or other adult on what you have done. Take notes in your journal.

( ) **Week 5** Same as week 4, Continue experiments.

( ) **Week 6** Chart your results. Graph your data. Look for patterns in your answers. Takes notes in your journal in what you have done and on what you have learned.

( ) **Week 7** Write a summary of your experiments and conclusion about your results. Begin drawings and posters. Get all materials for your display.

( ) **Week 8** Finish your reports. Put together your exhibit. Show it to classmates, friends and family. Ask for ways to improve your exhibit. Make sure the topic and your results are easy to understand. Practice, practice, practice your oral presentation. Have others ask you questions about your project.

THERE IS NO SUBSTITUTE FOR GOOD PLANNING!

Kindergarten - Grade 2 Ideas

In grades K-2, student projects should illustrate, report, or model a science concept or subject area. At this level, students can choose from four categories.

Pick a category first:

- Model
- Collection
- Demonstration - explains how something works, or why something happens the way it does.
- Experiment - answers a question or solves a problem. If you choose an experiment be sure to follow the scientific method.

Examples of *models* are:

ant farm | human eye | human brain | rockets
parts of a plant | solar system | bird beaks and their functions
types of human joints | parts of an airplane

Examples of *collections* are:

Seeds | shells | rocks | minerals | fossils | insects
Animal tracks | soils | leaves | bugs | sand | fish

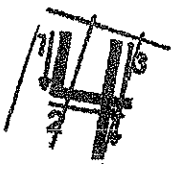
Examples of *demonstrations* are:

How a bicycle works | how we get drinking water | the rock cycle
How simple machines work | how bread rises | life cycle of a butterfly

Examples of an *experiment* are: (phrase title in the form of a question)

How does light affect bean growth? | Which color fades the fastest?
Does color affect taste? | Which gum blows the biggest bubble?
Does a more expensive battery last longer? | Which bread molds faster?

All students should be able to explain their projects orally. Remember, you'll have a display to show any helpful information.



Grades 3-5 Project Ideas

In grades 3, 4, and 5, students will choose from one of two areas for their projects.

Pick a project type first:

- Demonstration of a scientific principle - explains how something works, or why something happens the way it does (Some examples of scientific principles would include, gravity, inertia, force, power and energy.)
- Experiment - answers a question or solves a problem. If you choose an experiment, be sure to follow the scientific method.

Example of a *demonstration of a scientific principle*:
Gravity in relationship to an objects mass (dropping different objects from the same height and measuring the rate at which they fall).

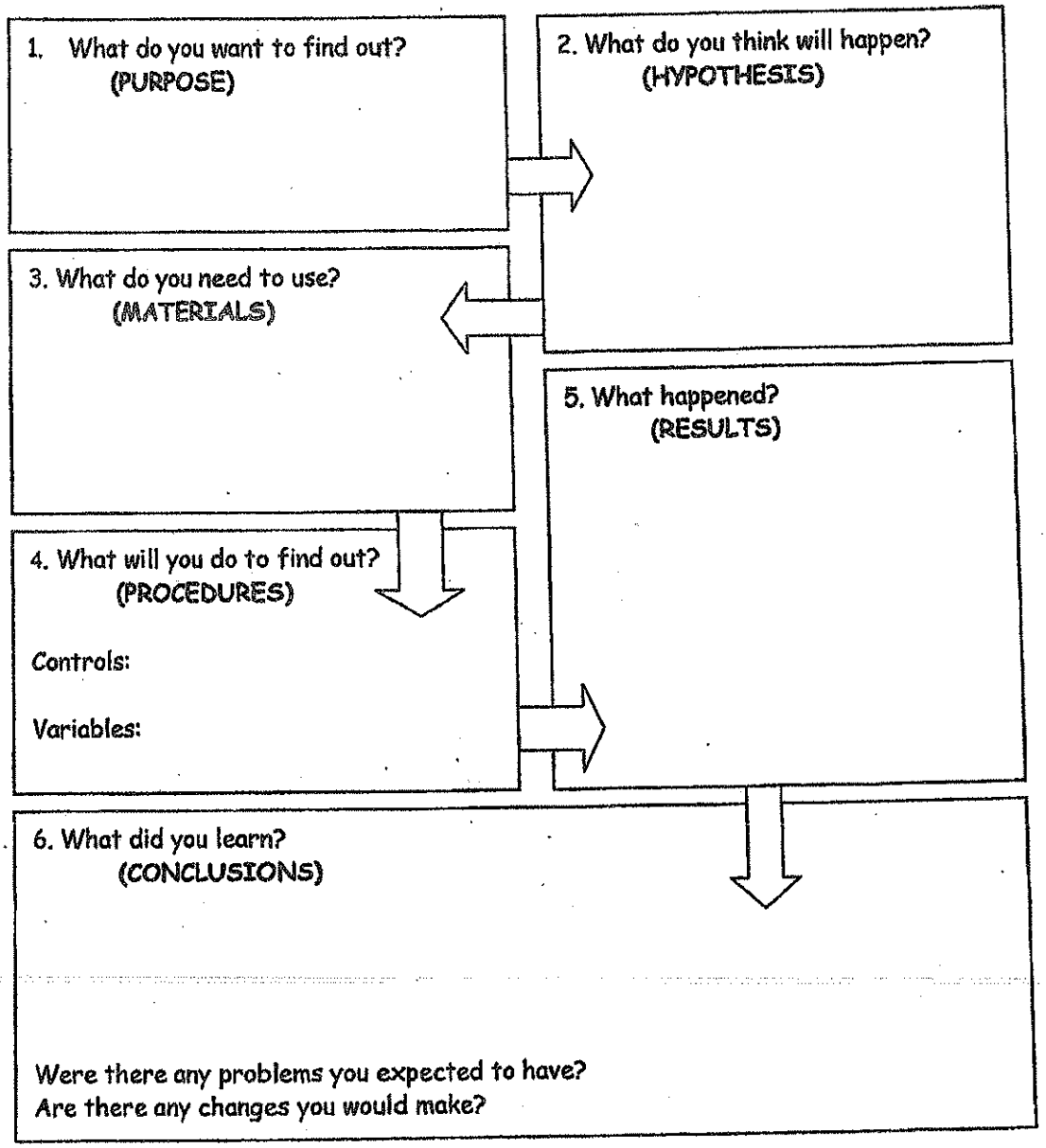
Examples of an *experiment* are (phrase title in the form of a question)
How does light affect bean growth? Which color fades the fastest?
Does color affect taste? Which gum blows the biggest bubbles?
Does music affect heart rate? Which bread molds faster?

PLEASE REFER TO PAGES 9 AND 10. ALL OF THE DIFFERENT SCIENCE FAIR PROJECT CATEGORIES ARE LISTED AS WELL AS MORE EXAMPLES OF PROJECT TITLES.

ADDITIONAL INFORMATION ON THE SCIENTIFIC METHOD CAN BE FOUND ON PAGE 6. THE STEPS IN FOLLOWING THE SCIENTIFIC METHOD ARE FOUND ON PAGES 6 THROUGH 17.

The Scientific Method

Use this as a student record sheet for an experiment.



On your display board, clearly label and define your purpose, hypothesis, materials, procedures, controls, variables, results, and conclusion(s). This will also help you with your presentation.

Scientific *Process*

Following is an example of the scientific process that we suggest you use.

1. TOPIC
2. PURPOSE
3. HYPOTHESIS
4. PROCEDURE (Experiment)
5. RESULTS (Data)
6. CONCLUSIONS
7. DISPLAY

KEEP A JOURNAL

TOPIC - Select a topic that can be answered only by experimenting.

1. Write your topic as a *question* to be investigated.

SELECTING A TOPIC

1. *HELP* in finding a topic. *READ* in science books, magazines, newspapers. *TALK* to your teacher, family, friends. *VISIT* professional people, museums, zoos.
2. Select a topic you know nothing about. Something new may arouse your curiosity.
3. Select a topic that you know something about but you want to investigate further.
4. Select a topic that genuinely interests you.

GOOD TOPICS

1. Do different colored mints dissolve at the same rate?

This is a good topic because it required experimentation that you can do yourself. You must use the scientific method in completing this project.

2. What surfaces do mealworms prefer?

This topic suggests the use of an experimental method. Asking a question is a good approach towards developing your topic.

3. Do all brands of paper towels absorb water at the same rate?

This is an investigation where only one variable is being manipulated.

POOR TOPICS

1. How volcanoes erupt.

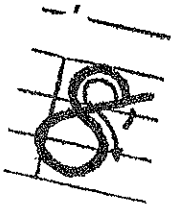
This topic will not allow experimentation without visiting real volcanoes. Making a model that erupts is a demonstration not an experiment.

2. Microscopes

The topic is too general. Telling how one works is not experimentation.

3. Do different brands of paper towels soak up different temperature of water at the same rate?

This topic needs to be narrowed down to on investigation. Only one variable should be manipulated in an investigation.



2008-2009 Elementary Science Fair Project Categories (Gr. 3-6)

On your entry materials, you must specify one of the following categories for your project.

Animal Sciences (AS): Animal life - worms, snails, insects, spiders, crustaceans, and other invertebrates, fish, amphibians, reptiles, birds, and non-human mammals. Includes animal behavior, life cycles, body structure and function, animal genetics, classification of animals, animal breeding, farm animals, veterinary medicine, etc.

Astronomy (AT): The universe, galaxies, stars, the sun, the planets and solar system, earth and moon interactions, comets, life on other planets, etc.

Behavioral and Social Sciences (BE): Human behavior, social and community relationships, psychology, sociology, anthropology, archaeology, ethnology, linguistics, learning, perception, urban problems, reading problems, public opinion surveys, educational testing, etc.

Biochemistry (BI): Chemistry of life processes, enzymes, photosynthesis, fermentation, metabolism, structure of organic compounds, etc.

Chemistry (CH): Study of nature and composition of matter and laws governing it - general chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, pesticides, metallurgy, soil chemistry, physical chemistry, acids and bases, testing of products of a chemical nature, etc.

Earth Science (EA): Geology, geography, meteorology, crystals, rocks, minerals, soils, volcanoes, weather, fossils, gravity, atmosphere, rivers, lakes, sea and oceans, earth resources, earth structure, early earth, etc.

Energy and Transportation (ET): Fossil fuel energy, alternative energy sources, including wood, wind, solar, nuclear, biofuels, non-renewable and renewable energy sources, energy efficiency in appliances, furnaces, air conditioners, insulation, batteries, automotive and aeronautical engineering, vehicle development, ships and boats, flight, aircraft design, engines, cars, motorcycles, rockets, space travel, etc.

Engineering, Computers and Math (EC): Technology projects that directly apply scientific principles to manufacturing and practical uses - civil, mechanical, chemical, electrical, photographic, sound, controls and thermostats, product testing of engineered products, thermodynamics, robotics, environmental engineering, computer hardware, software engineering, Internet networking and communications, graphics (including human interface), simulations/virtual reality or computational science (including data structures, encryption, coding, and information theory), statistics and probability, mathematics, etc.

Environmental Science (EV): Pollution (air, water, and land), pollution sources, waste disposal, measurement of air quality, soil and water contamination, bioremediation, ecology, ecosystem management, land resource management, pollution from farms and cities, herbicide and pesticide usage relative to species declines, acid rain, recycling, waste management, etc.

Family Consumer Science (FC): Interpersonal relationships, family issues and strengths, stress and crisis, food and nutrition, food and culture, dietics, food preservation, experimental food science, textiles and clothing, child development, product testing of foods, clothing, household products, etc.

Health Sciences and Human Performance (HS): Medicine, dentistry, pathology, ophthalmology, sanitation, pediatrics, dermatology, allergies, speech and hearing, human genetics, human anatomy and physiology, holistic health and wellness, human chronic and infectious diseases, health and aging, exercise, human performance and athletics, fitness for living, product testing of sports equipment, health and beauty aids, etc.

Microbiology (MI): Biology of microorganisms, bacteria, viruses, protozoans, bacterial genetics, yeast, molds, mildews, other fungi, antibiotics, animal and plant diseases, including agricultural diseases, soil microorganisms, etc.

Physical Science (PH): Theories, principles, and laws governing energy and the effect of energy on matter - solid state, optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, fluid and gas dynamics, electricity, magnets, simple machines, heat and heat transfer, motion, friction, gravity, pressure, sound, light, lenses, mirrors, buoyancy, levers, testing of products at physical science nature, etc.

Plant Sciences (PS): Plant life - flowering and non-flowering plants classification, plant structure and function. Includes agriculture, agronomy, horticulture, forestry, paper production and wood products, plant genetics, hydroponics, genetically modified crops, effects of light on plants, flower preservation, plant communities, etc.

TEAM PROJECTS: Research conducted by two or three students in any above category.

Categories & Titles of Science Experiments

*Please do not select any experiments that use live animals or dangerous materials. *These titles are listed only for ideas. You should come up with your own title.

Environmental Science

Does pollution affect plant growth?
What is the best way to store bananas?
Which paper towel is strongest?
What causes rust?
What are the effects of sunlight on colored paper?
Which plastic trash bag is the strongest?

Botany

How long does it take for bread to mold?
Which houseplant fertilizer works best?
How does music affect plant growth?
Which soil is best?
Do different liquids affect plant growth?
How does light affect plant growth?
Do plants need air?
Which kind of bread molds the fastest?

Earth and Space Science

How accurately is the temperature forecasted?
How long does it take to evaporate?
Is 12:00 noon the warmest part of the day?
Do all liquids evaporate at the same rate?
How much water does each soil hold?
Which materials keep ice cubes from melting for the longest time?

Engineering and Computers

Will a ball bounce higher if it is dropped farther from the floor?
Which type of paper airplane will fly the farthest?
What materials will a TV remote penetrate?
Which glue is the strongest?
Can a boat with holes float?
What is static electricity?
How can you prevent rust?
Which battery lasts the longest?
Does the width of a rubber band affect how far it will stretch?

Heath Science

How do video games affect heart rate?
How does smoke affect living things?

Behavior Science

What effect does music have on memory?
How can you teach a mouse to run a maze faster?

Purpose

One to three sentences that explains why *you are doing this investigation.*

"The purpose of this project is....."

If your purpose is well worded, you will have little difficulty writing a title for your project.

Hypothesis

A hypothesis states what you think is going to happen when you investigate a question.

Examples:

Question: *Does light affect the way plants grow?*

Hypothesis: Plants will grow toward the light.
Hypothesis: Plants will grow away from the light.
Hypothesis: Light will make no difference in the way plants grow.

Question: *What materials will a TV remote penetrate?*

Hypothesis: Solids, such as wood, cardboard or metals will not allow penetration of a TV remote.
Hypothesis: Flexible solids, such as plastic bags or fabric, will allow penetration.

Question: *Which glue is the strongest?*

Hypothesis: Sugar glue is stronger than all the others.
Hypothesis: Elmer's glue is stronger than Super glue.
Hypothesis: There is no difference between colored glue strength and white glue strength.

Procedure: Experiment

1. Materials
2. Variables
3. Step-by-Step Directions

Materials

List all materials used in your investigation. Include what, how much, and what kinds of materials you used. Keep in mind quantities are important. Be sure to use only metric units.

GOOD LISTING	POOR LISTING
3 – 15 x 15 cm. Sq. each of: Brawney, Gala, Scott, generic paper towels	Paper towels
250 ml. Graduated beaker	Measuring cup
750 ml. Water 20 C	Water
1 – 20 x 20 cm. sq. cake pan	Container
Celsius thermometer	Thermometer
Clock with a second hand	Clock

VARIABLES

There are three types of variables:

1. **Manipulated Variable** – What you change on purpose in an investigation.

2. **Responding Variable** – The responding variable is what changes by itself because you manipulated (changed) something in your investigation.

3. **Variable Held Constant** – Everything else in your investigation must be held constant (kept the same). This is often called *control.*

EXAMPLES:

Question.....*What materials will a TV remote penetrate?*

Manipulated
Variable.....Objects placed between the remote and the television

Responding
Variable.....Activation of the television (does it turn on with the remote)

Variables held
Constant.....Location of remote
Distance between remote and TV
Location of TV
Method of using remote

Question.....*Do all brands of paper towels absorb the same amount of water?*

Manipulated
Variable.....Brands of paper towels

Responding
Variable.....Amount of water that is absorbed by each towel.

Variables held
Constant.....Size of paper towel
Amount of water poured on each towel
Temperature of the water used
Container Towels are placed in
Method of pouring

Step-by-Step Directions

Your step-by-step directions are like a recipe. Anyone who reads them will be able to duplicate your investigation and get the same results.

QUESTION: *Do all brands of paper towels absorb the same amount of water?*

DIRECTIONS:

1. Cut 3 – 15 x 15 cm. sq. from each brand of paper towels.
2. Label each cut piece with brand name.
3. Pour 50 ml. of 20 C water into 20 x 20 cm. sq. pan.
4. Place one square of generic brand paper towel into water & pan.
5. Leave for 30 seconds.
6. Remove paper towel.
7. Measure water remaining in pan and record.
8. Dry the cake pan.
9. Repeat steps 4-8 for each brand of paper towel.
10. Repeat entire process twice more for each brand of paper towel.

Journal

A journal is like a diary of your scientific investigation. It will serve to help you document observations, problems and progress of your investigation.

** The judges at the Science Fair may wish to look through it.

Your journal should include:

1. Detailed day-by-day notes on the progress of your project.
    a. What you are actually doing each day (observations, progress).
    b. Problems you have with your investigation.
    c. Things you would change if you were doing this investigation again.
2. Any drawings/photos that you aren't using on the display that might help explain your work.

These are your rough notes, not to be redone.

Bibliography

List alphabetically all books, articles, people, or other sources used for researching.

AUTHORS

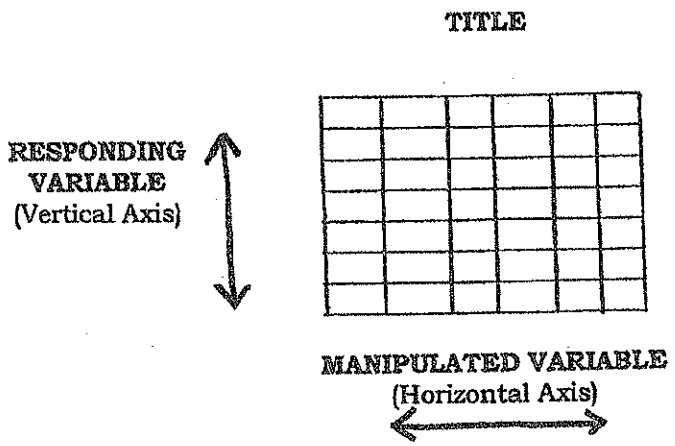
Last name, First name, Title of Book, City, Publisher, Date Published

Last name, First name, "Article," Magazine, Pages, Date Issued

Results – Data

1. Graphs
2. Charts
3. Illustrations
4. Photos

GRAPHS - MAKING A GRAPH



Title: The title is a short description of the data being displayed.

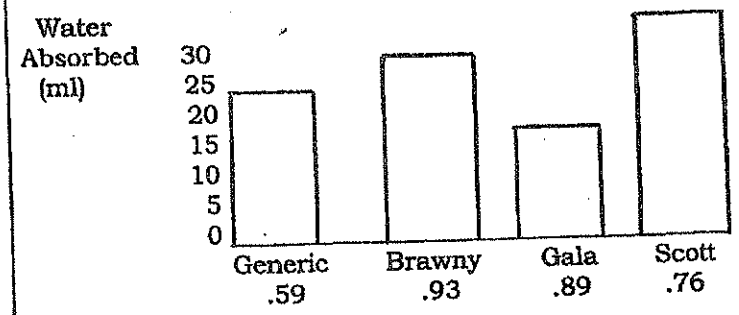
Horizontal Axis: The manipulated variable (what you changed on purpose) is displayed on the horizontal axis.

Vertical Axis: The responding variable (what happened as a result of what you changed) is displayed on the vertical axis.

There are two main types of graphs.

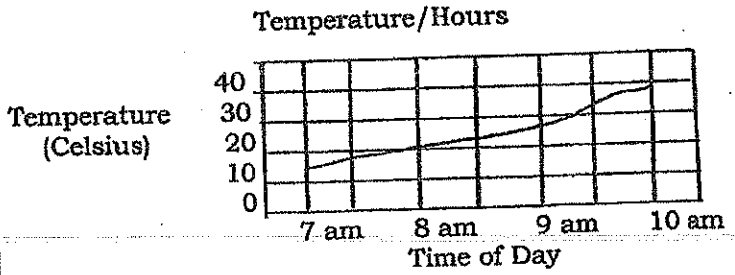
BAR GRAPH

A Bar Graph is used to display data that does not occur in a continuous manner.



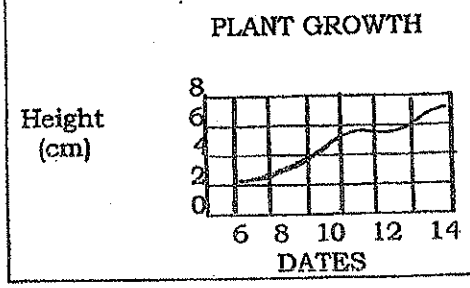
LINE GRAPH

A Line Graph is used to display data that occurs in a continuous manner.

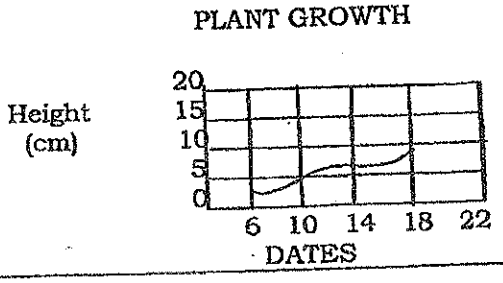


Graph Spacing - Plan your graph so that your data will be evenly distributed across the horizontal and vertical axes.

Correct Spacing



Incorrect Spacing



Writing a Conclusion.....

Before you write your conclusion, carefully examine all your data: graphs, charts, and tables. Ask yourself these questions:

1. Did you get the results you expected to get?
2. Were there any unexpected problems or occurrences that may have affected the results of your investigation?
3. Do you think you collected sufficient data? Were there enough trials? Samples?
4. Do I need to revise my original hypothesis? If you write a revised hypothesis, DO NOT use it to replace your original hypothesis for this project!

Your conclusion should include:

1. Statement of support or non-support of the original hypothesis.
2. Description of any problems or unusual events that occurred during your investigation.
3. What you would do differently next time.
4. Revised hypothesis – if data did not support your original hypothesis.

Example:

Questions: *Do all brands of paper towels absorb the same amount of water?*

Hypothesis: The cheaper the paper towel the less water it will absorb.

Conclusion: The data collected does not support the original hypothesis. The cheapest paper towel (generic) did not absorb the least amount of water. The higher priced paper towel (Brawny) did not absorb the most. My revised hypothesis is the price of the paper towels does not affect the amount of water absorbed.