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Introduction

Science Fair Projects and Research Activities is organised to provide ideas for students, parents and teachers who are looking for science fair project topics. These science projects and research activities, which normally take twelve to fourteen weeks to complete, are a wonderful way to provide students with some of their most valuable learning experiences based on biochemistry, botany, chemistry, computer science, earth and space sciences, environmental sciences, medicine and health, microbiology, physics and zoology.

Some of the featured activities, such as taking notes, making an outline, creating a bibliography and preparing an abstract have been designed so that they can be used as individual or group activities; however, other activities require individual participation. Carefully read the instructions before beginning each chapter.

Since research is an integral part of a science project, students will be carefully guided through a step-by-step process of developing the abstract, the introductory paragraph, the body and the conclusion of their research paper. Included in this book is an example of a research paper for teachers to use as a guide for students.

A backboard section, also included in this book, is especially important for the actual science fair. Even though a student's knowledge and understanding in writing the research paper may be excellent, if the backboard materials are not correctly displayed, the science fair project will not receive the proper recognition. To further assist students, the authors have included examples of various types of lettering, design elements and sample backboard sketches.

The Appendix contains a collection of forms: tips for parents, sample letters to parents and students, a research proposal sheet, a judges' score sheet, a list science project resources, and a reproducible certificate.

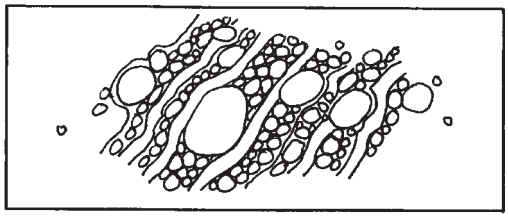
Science Fair Categories

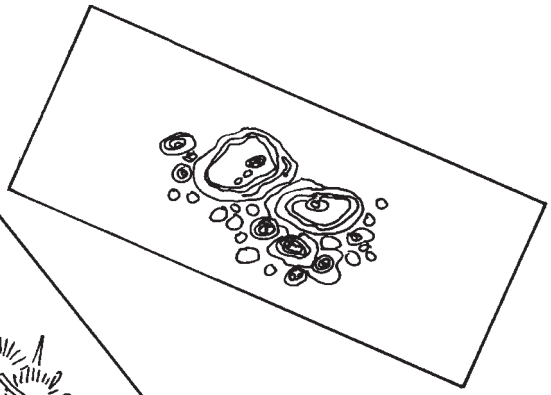
When beginning work on a science fair project, it is important to focus on the various categories. On this and the following pages, there are descriptions of each category. Following each category are pictures, charts, graphs or headlines representing the category that might inspire a topic choice. Chapter Fifteen has backboard project examples for each category.

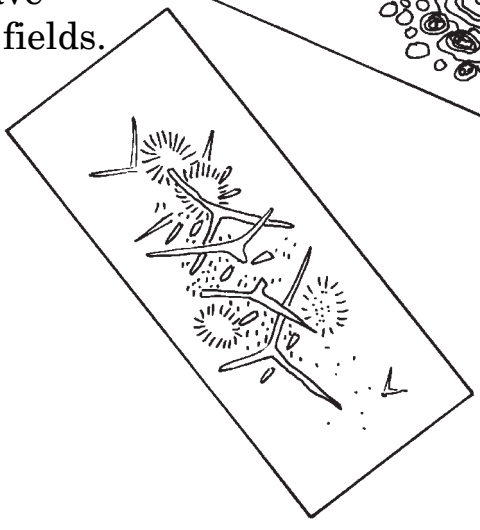
1. Biochemistry

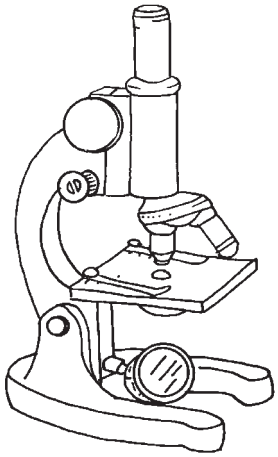
Biochemistry is the branch of biology that involves the chemistry of life processes, such as molecular biology, molecular genetics, blood chemistry, photosynthesis, protein chemistry and food chemistry. In recent years, due to the evolution of powerful scientific instruments, biochemistry now includes ways to synthesise molecules that duplicate those of living systems as well as molecules that are able to perform entirely new functions.

Therefore, biochemistry, while increasingly significant in our modern society as a distinct field of research, is also combining with other biological disciplines. The development of such new areas of study as cell biology and molecular biology reflects this integration. Increasingly, present problems in the biological sciences are being resolved by team efforts of skilled scientists from many disciplines who have mastered their once-separate fields.









Planning an Experiment

When planning an experiment, think about the topic. Can the topic question be answered by researching information only? If so, then it is material for a report, not for a science experiment that can be used for a science project. One topic that is considered for science fairs is 'What are Gamma Rays?' This topic might make a good report; however, there is no experimentation needed to answer the question.

Here are some examples of questions that can be answered through experimentation:

- Do Different Coloured Jelly Babies Taste Different?
- Which Toothpaste Works Best?
- Does Fresh Water Hold Heat Longer than Salt Water?
- What Are the Effects of a Low-Fat Diet on Cholesterol?

To understand what scientists do, complete experiments rather than reports.

Here is an example of the correct way to set up and conduct an experiment. This experiment involves testing the effect of practising on the ability to jump higher. Make a prediction, the hypothesis, about what will happen.

Materials: pencil, ruler, calendar, masking tape, data table

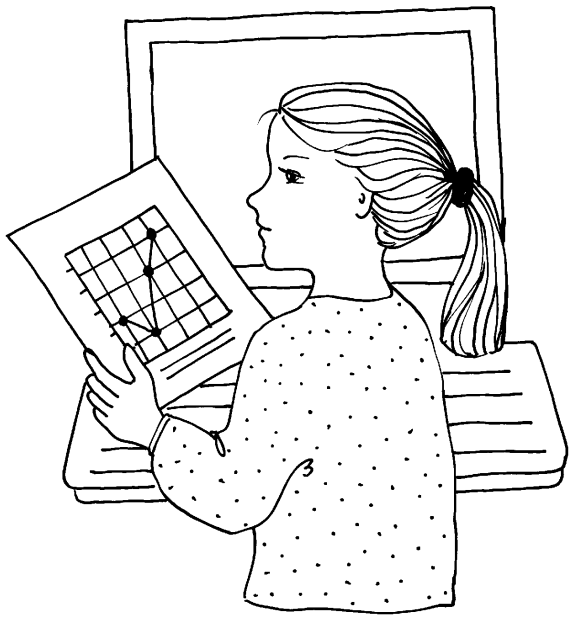
Procedure:

Record your current vertical jump. (Take an average of six jumps.) To perform a vertical jump: Stand flat-footed against the wall and mark the height of your fingertips. Then jump and record the height of your fingertips. The difference between the two heights is your vertical jump.

Perform a vertical jump every second day for two months. For practice, drop jump daily. Begin by standing on the first step of a set of stairs. Jump to the ground and back. The next time, jump from the ground to the second step and back. Finally, jump from the ground to the third step and back. Record the results of your vertical jumps for the two-month period.

Analysis of Data:

Use your data table to determine the results of your experimentation. Look at your hypothesis to decide if the results supported your predictions. Use the data table to create a graph, chart or diagram, showing the results of your experimentation.



Conclusion:

Write a paragraph describing your results and the reason(s) for those results. This paragraph should include one or more sentences that either support or reject the hypothesis of the experiment. A successful science project will usually suggest further experiments that can be conducted based on the results. In most experiments, scientists have difficulties with the variables, gathering data or other parts of the scientific method. Any problems experienced should be recorded in the conclusion section.

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Making a Hypothesis

The best way to explain what will be learned from the scientific investigation is to write a question. The next step is to guess what will happen in the experiment. Scientists call this guess a hypothesis. A clearly written hypothesis answers the question and is brief and to the point. The following is an example:

Topic: Factors That Affect Tooth Decay
Question: Which liquid causes teeth to decay faster?
Hypothesis: Orange juice will cause a tooth to decay faster than other liquids.

Write a hypothesis for each of the following questions.

1. What are the effects of bleach and dye on hair?

   Hypothesis:_____

2. Which type of food moulds the fastest?

   Hypothesis: _____

3. What are the effects of soft drink on teeth?

   Hypothesis: _____

4. Does the use of computers improve student performance?

   Hypothesis: _____

5. Does soil type change how well plants grow?

   Hypothesis: _____

6. What factors affect the bounce of a dropped ball?

   Hypothesis: _____

7. Which mouthwash kills the most microbes?

   Hypothesis: _____

8. Which types of treats do dogs prefer?

   Hypothesis: _____