

Glen A. Wilson High School

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Science Project: IB Biology 1-H, IB/AP Chemistry 2003-2004

The **IB Science Project** allows students to appreciate the environmental, social and ethical implications of science. It may also allow them to understand the limitations of scientific study, for example, the shortage of appropriate data, the lack of resources. The project requires the use of the **process of the scientific method**. The emphasis is on interdisciplinary cooperation and the processes involved in scientific investigation, rather than the products of such investigation. The exercise should be a collaborative experience where concepts and perceptions from across the science disciplines are shared. The intention is that students analyze a topic or problem which can be investigated in each of the science disciplines offered by a school. The topic can be set in a local, national, or international context.

This is a research project that you will design and carry out. You will determine the goals, hypothesis, purposes, methods and materials. You will work in groups to conduct the research; however, each of you is required to make an **individual contribution** to the project and demonstrate that contribution. As in all lab reports, **each student must write an individual formal lab report. The report is not to be a shared effort**. Copying of other student's work or sharing of computer files is not allowed. The report is the individual student's write-up.

I. Project Stages

The **10** hours allocated to the Group 4 Project can be divided into four stages: **Planning, Definition of Activities, Action, and Evaluation**

- 1. Planning:** This stage, lasting **2 - 3 hours**, is crucial to the whole exercise. It must involve **all** students in "brainstorming" and discussing selection of an appropriate topic, with ideas, scientific concepts, and information being shared. Select a **subject area** (evolution, ecology, genetics, etc), Select a **topic** (see examples); Define a **problem/question**; Define the **hypothesis**, select **variables** (independent and dependent) to be measured or controlled.
- 2. Definition of Activities:** The activities to be carried out must be clearly defined before moving from the **planning** stage to the **action** and **evaluation** stages. Plan the **tasks** to be carried out. Assign responsibilities to students. Develop a **procedure**. Select the **equipment and materials** to be used.
- 3. Action:** This stage should take **5 - 6 hours**. This is when the project is carried out. Data is collected. Observations are made. Hypotheses are tested. Procedures and materials may be modified; however, remember to plan well before **action** is carried out.
- 4. Evaluation:** **2 - 3 hours** are probably necessary. This is when you present the data, evaluate the results, draw conclusions, explain your findings, and discuss your hypotheses. You will need to write a **formal lab report**, individually.

III. Selection of groups

1. You may select groups of no less than three and no more than four students. No more than two students of the same discipline may be in a group.

III. What you need to turn in

1. Project Planning Sheet - Due: **November 17, 2003**
2. Journal of all activities. Dates, names, time spent, what you did - Due: **January 30, 2004**
3. Full lab report - **Due: January 30, 2004**
4. Questionnaire - Due: **January 30., 2004**

Guide for Project Planning: Planning Labs and IB Science Project

I. Planning (a)

1. **Define the problem(s) or research question(s).** The problem/research question must be stated clearly (not vaguely) and completely.
Examples: Vague: "What is the effect of pH on enzymes?"
Clearer: "What effect does changing the pH have on the activity of salivary amylase?"
2. **Formulate hypothesis(es).** The hypothesis (prediction) must be directly related to the research question and must be explained (quantitatively where appropriate). A hypothesis must contain more than just an expected observation. It must include a proposed relationship between two or more variables. What factors influence or effect your "x". Give a rational explanation for the expected observation, which can be investigated experimentally. "If y is done, then x will occur". Why? Other variables that might affect outcome should also be mentioned, even if they are not to be specifically investigated.
3. **Select relevant variables.** In controlled experiments, scientists perform parallel trials. In one set of trials is the **experimental variable**. This is the factor the will be changed. In **the control group(s)** all of the factors remain identical to the experimental group, except for the experimental variable. They are subject to the same conditions except the changes in the experimental variable. The **independent variable** is the variable manipulated by the experimenter. The **dependent variable** is the variable that is measured to see if it depends on the independent variable. Eg., Does orange juice cause hair growth? Orange juice = **independent variable**; hair growth = **dependent variable**.

II. Planning (b)

1. **Design realistic procedures** to include appropriate **apparatus, materials and methods**. Diagrams may be used.
2. **Design a realistic method for control of the variables**
3. **Design a method for the collection of raw data.** The method should allow for collection of sufficient relevant data and excludes the collection of irrelevant data. Measurement techniques must be described.

Group Number _____

Project Planning Sheet

Date _____

Group Members:

	Names	Discipline	Period
1.			
2.			
3.			
4.			

Subject Area: (eg., ecology, evolution, muscular system, botany, etc) _____

Topic: _____

Research problem/question to be studied _____

Explanation and justification: (You may write on the back or a separate sheet)

Hypothesis/es: (Explain) _____

Select Relevant Variables: (controlled, experimental, dependent, independent) _____

Procedure and Tasks: (Give a general description of what you plan to do) _____

Equipment and materials: _____

Project Questionnaire (confidential)

Name _____

Period _____

1. List members of your team, including yourself. Next to each person's name describe the contributions of each person

Name	Contribution

2. Did you get to try something new? If so, what?

3. Who filled each of the following roles? Were any roles shared?

Organizer/leader _____

Equipment manager _____

Helper _____

Recorder _____

Encourager _____

Other _____

Circle the number that best describes each statement

I contributed my ideas and information	Always			Sometimes			Never
	7	6	5	4	3	2	1
I asked others for their ideas and information	Always			Sometimes			Never
	7	6	5	4	3	2	1
I summarized all of our ideas and information	Always			Sometimes			Never
	7	6	5	4	3	2	1
I asked for help whenever I needed it	Always			Sometimes			Never
	7	6	5	4	3	2	1
I helped the other members of my group learn	Always			Sometimes			Never
	7	6	5	4	3	2	1
I made sure everyone in my group understood how to do the task/work we were studying	Always			Sometimes			Never
	7	6	5	4	3	2	1
I helped keep the group studying/working	Always			Sometimes			Never
	7	6	5	4	3	2	1
I included everyone in our work	Always			Sometimes			Never
	7	6	5	4	3	2	1