

Guide for Project Planning: Planning Labs and Group 4 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, 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: _____
