

Research Plan Instructions

A complete research plan is required and must accompany Checklist for Student (1A)

Provide a typed research plan and attach to Student Checklist (1A).

The research plan for ALL projects is to include the following:

A. Question or Problem being addressed

B. Hypothesis/Engineering Goals

C. Description in detail of method or procedures (The following are important and key items that should be included when formulating ANY AND ALL research plans.)

- **Procedures:** Detail all procedures and experimental design to be used for data collection
- **Data Analysis:** Describe the procedures you will use to analyze the data that answer research question or hypothesis

D. Bibliography: List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

- Choose one style and use it consistently to reference the literature used in the research plan
- Guidelines can be found in the Student Handbook

Items 1-4 below are guidelines to be followed when applicable:

1. **Human subjects research** (See instructions on p. 13 of the International Rules):

- **Subjects.** Describe who will participate in your study (age range, gender, racial/ethnic composition). Identify any vulnerable populations (minors, pregnant women, prisoners, mentally disabled or economically disadvantaged).
- **Recruitment.** Where will you find your subjects? How will they be invited to participate?
- **Methods.** What will participants be asked to do? Will you use any surveys, questionnaires or tests? What is the frequency and length of time involved for each subject?
- **Risks.** What are the risks or potential discomforts (physical, psychological, time involved, social, legal etc) to participants? How will you minimize the risks?
- **Benefits.** List any benefits to society or each participant.
- **Protection of Privacy.** Will any identifiable information (e.g., names, telephone numbers, birthdates, email addresses) be collected? Will data be confidential or anonymous? If anonymous, describe how the data will be collected anonymously. If not anonymous, what procedures are in place for safeguarding confidentiality? Where will the data be stored? Who will have access to the data? What will you do with the data at the end of the study?
- **Informed Consent Process.** Describe how you will inform participants about the purpose of the study, what they will be asked to do, that their participation is voluntary and they have the right to stop at any time.

2. **Vertebrate animal research** (See instructions on p.17 of the International Rules):

- Briefly discuss **POTENTIAL ALTERNATIVES** and present a detailed justification for use of vertebrate animals
- Explain potential impact or contribution this research may have
- Detail all procedures to be used
 - Include methods used to minimize potential discomfort, distress, pain and injury to the animals during the course of experimentation
 - Detailed chemical concentrations and drug dosages
- Detail animal numbers, species, strain, sex, age, etc.
 - Include justification of the numbers planned for the research
- Describe housing and oversight of daily care
- Discuss disposition of the animals at the termination of the study

3. **Potentially Hazardous Biological Agents** (See instructions on p.21 of the International Rules):

- Describe Biosafety Level Assessment process and resultant BSL determination
- Give source of agent, source of specific cell line, etc.
- Detail safety precautions
- Discuss methods of disposal

4. **Hazardous Chemicals, Activities & Devices** (See instructions on p.25 of the International Rules):

- Describe Risk Assessment process and results
- Detail chemical concentrations and drug dosages
- Describe safety precautions and procedures to minimize risk
- Discuss methods of disposal

Problem

Will a goldfish change from gold to white because they are not getting enough sunlight? And will goldfish that get sunlight but don't get food that helps coloration turn from gold to white as well?

HYPOTHESIS

In a complete darkness environment, a goldfish would eventually lose all coloration from lack of sunlight.

PROCEDURE

1. At home, use small closet/cabinet for dark area. Must be able to hold multiple bowls. Important: The area must be able to be accessed in a low-light or complete-darkness environment.
2. Acquire two ten gallon fish tanks, and ten gallon capacity fish tank filters.
3. Use only natural spring water, and only spring water, to fill tanks. Add decoration, if felt necessary. Only use plastic plants, not gravel, for ease of cleaning. Alternative: use de-chlorination chemicals to de-chlorinate tap water. Follow instructions on bottle.
4. After habitats set for fish, go to your friendly neighborhood fish store. Unless you already own supplies, purchase food and a net.
5. Fish selection: For this experiment we will be using three types of Goldfish: Comet and Fantail. In order to find healthy fish, look for these signs of health:
 - a. Swims strongly.
 - b. Eats vigorously
 - c. Not bleary-eyed
 - d. Not visible fungus or parasites.
 - e. No damage to tail, body, or fins.

Purchase the following: 6 small-but-mature comet goldfish; 6 large-but-mature comet goldfish; and four fantail goldfish. Make sure all fish are completely golden; ask sales associate to make sure that they are mature.
6. Feeding instructions: once a day, only feed the fish two tablets per inch of fish. (One inch fish= two flakes, four inch fish = six flakes.)
7. Daily checklist:
 - a. Are fish fed?
 - b. Are all fish alive? (important)
 - c. Any color change?
 - d. (Weekly) water changed correctly?
 - e. Are Fish eating?
8. Cleaning instructions:
 - a. Using net, carefully scoop fish into separate vessel, containing spring water.
 - b. Using large cup or other vessel, scoop out approximately 25% of the water in the tank.
 - c. ***USE ABSOLUTELY NO SOAP***
 - d. Fill tank with spring water.

9. Clean once every week, or as needed.
10. Every day, record color changes or deaths. Do not replace fish if only one dies.

TIPS

1. Buy spring water at any grocery store. Do not buy individual bottles; purchase the large two-gallon jugs.
2. Comet goldfish are usually sold as feeder fish, but if you pick your own fish, some stores will charge you more.
3. "Pet Smart" has comet goldfish, and they only cost \$0.23.
4. Don't buy fish that are dead.
5. Don't pour the water from the bag into the tank. Always a bad idea.

Bibliography

1. (I) Anne Marie Helmenstine, Ph.D. About.com. 2009. 14 December 2009
<<http://chemistry.about.com/od/chemistryfaqs/f/goldfish.htm>>.
2. (B) Bathroom Reader's Institute. "Page facts." John, Uncle. Uncle John's Bathroom Reader. Ashland: Bathroom Readers' Press, 2004. ?
3. (M) BBC U.K. "R.I.P. Goldfish in a bag." BBC 14 July 2004.
4. (P.I.) Hartman, Michael. Petsmart Aquatics Extraordinaire Alex Curry. 23 December 2009.
5. (I) "Ingrid". www.thegab.org/goldfish. 16 August 2009. 14 December 2009
<www.thegab.org/goldfish>.
6. (B) Ommanney, F. D. The Fishes. Alexandria: Time-Life-Books, Inc., 1979.
7. (M) Ray, C. Claiborne. "Q&A Goldfish." New York Times (1990): c12.
8. (I) "Rick". The Goldfish Connection. 11 November 2007. 14 December 2009
<www.goldfishconnection.com>.
9. (B) Scott, Peter W. The Complete Aquarium. New York: DK Publishing, 1991.