Hypotheses and Experiments Worksheet
BIOL 01104 Spring 2019, Dr. Spielman

I. Hypotheses: Determine the null hypothesis for each alternative hypothesis given below.

1. Calcium is required for the proper functioning of neurons.

2. The Earth is about 4.6 billion years old.

3. Replication of DNA occurs only during the “S” phase of the cell cycle.

4. Iron (a key nutrient) availability determines the size of algal blooms in the Sargasso Sea.

5. The size of an organism's genome is determined by the complexity of the organism.

6. Biological synthesis of glutamine requires ATP.

II. Experiments: On the following pages are two experimental scenarios. Each scenario contains an alternative hypothesis and a description of the experiment performed. For each scenario, determine the following:

- The null hypothesis.
- The independent and dependent ("response") variables.
- Any confounding variables you can think of.
- Experimental validity based on: a) Presence of a control group(s); b) Presence of replication, c) Presence of randomization.
- Predict results if the alternative hypothesis is *true.*
- Predict results if the alternative hypothesis is *false.*
- Suggest any way(s) the experiment could be improved.

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1. Hypothesis: Thyroxin (a thyroid hormone) release triggers amphibian metamorphosis.

   Researchers collect 100 tadpoles. They randomly place fifty tadpoles into a tank with just water, and they place the other fifty tadpoles into a tank with thyroxin. After four days, they count how many tadpoles have undergone metamorphosis in each tank.

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2. Hypothesis: Acetylcholine stimulates muscle contraction.

   Researchers prepare fifty identical replicate cell cultures of muscle fibers. They randomly divide these cultures into five groups with 10 dishes each. Three of the groups are treated with an acetylcholine solution of a different concentration. The fourth group receives a treatment of the solvent without acetylcholine, and the fifth group receives no treatment.