Hypotheses and Experiments Worksheet
BIOL 01104, Dr. Spielman

I. Hypotheses: Below are several (alternative) hypotheses. For each, answer…

- Is it directional or nondirectional?
- *If directional*, what would the nondirectional version be?
- What is its corresponding null hypothesis?
- Come up with an entirely different alternative hypothesis that could be tested about the scenario.

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

2. Lower temperatures cause goosebumps on skin.

3. High amounts of iron (a key nutrient) lead to larger algal blooms in the Sargasso Sea.

4. More complex organisms have larger genomes.

5. Biological synthesis of glutamine requires ATP.

II. Experiments: On the next page 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.
- 2-3 confounding factors ("confounding variables")
- Experimental validity based on: a) Presence of a control group(s); b) Presence of replication, c) Presence of randomization.

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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.

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.