Chapter 4

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1. At what point during the process of designing an experiment should you write the hypothesis?
   1. You should write it after you have done background research on the entity you are studying, and the independent and dependent variables
2. What is the importance of a prediction in a hypothesis?
   1. The prediction is the relationship that you will test in your experiment.

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Write 2 hypotheses for each statement, underline independent variable, and highlight dependent variable.

1. Electromagnetic fields have an effect on algae cells.
   1. If the algae cells are exposed to a stronger electromagnetic field, then they will reproduce faster.
   2. Algae cells exposed to a strong electromagnetic field will absorb carbon dioxide slower than those that are not exposed.
2. The shape of solar reflector cells has an effect on the amount of light collected.
   1. If the number of sides of a solar reflector is increased, then more it will collect more light.
   2. Triangle-shaped solar cells absorb more light than circular solar cells.
3. The local news station is more accurate in predicting the weather than the National Weather Service is.
   1. The local news station will have more accurate predictions for rainfall in march than the NWS will have.
   2. The local news station will more accurately predict the time of the first snowstorm this winter than the NWS will.
4. Temperature has an effect on crickets.
   1. If temperature increases, then the crickets will chirp louder.
   2. Crickets exposed to lower temperatures will move slower than crickets exposed to higher temperatures.
5. Changing the angle at which the hockey or soccer goal is attempted has an effect on the number of goals made.
   1. If I shoot goals at a 30degree angle, then I will score more goals than goals I shoot at a 90degree angle.
   2. The ratio of goals scored : goals attempted will be higher for goals shot at 30degrees than for goals shot at 90degrees in professional soccer games.
6. Temperature may cause deciduous leaves to change color.
   1. Oak trees living in warmer climates will have greener leaves than those living in cooler climates.
   2. Leaves on maple trees living in a greenhouse at 0degrees C will turn yellow earlier than leaves on maple trees living in a greenhouse at 30degrees C.
7. The use of GPSs has improved field yields.
   1. Farmers equipped with a GPS will grow more produce than those without.
   2. Field yields increased significantly directly after the development of the GPS.
8. The performance of gasoline at different octane levels differs.
   1. If the octane level of the gasoline is increased, then the car will drive slower.
   2. Cars using gasoline with higher octane levels will be more efficient than those using lower levels.
9. Is there a statistical advantage to the team who scores first in a game?
   1. If my baseball team scores first in most of their games, then they will win more times.
   2. More soccer games have been won by the team that scores first than by the other team.

Writing hypotheses for my research topic:

* There is a statistically significant increase in maximum recorded hurricane wind gust speeds between 1900 and 2020.
* Climate models predict a reduction of rainfall in the east pacific during El Nino from 2000 to 2100.
* There has been a significant increase in the number of hail-producing thunderstorms in the continental United States during the summer from 1900 to 2000.
* Climate models predict an overall weakening of the Antarctic Circumpolar ocean current during the next 50 years.

Chapter 5

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1. What is the purpose of writing a research proposal? Who benefits from your writing of a research proposal?
   1. The purpose is to create a plan for your project and to show your teacher and mentor that you understand your project.
   2. You benefit from writing a proposal because you have a plan for how to carry out your experiment. Your mentor benefits because they are able to advise you about the experiment.
2. Why must the methods section in a research proposal be so detailed?
   1. It must be detailed so that your experiment is reproducible.
3. How might pretrials apply to your own research project?
   1. Experimenting with various statistical analysis methods might help me to determine the most effective one for my project.
4. Why do you think scientists and journal editors disagree about various aspects of scientific writing?
   1. Different formats might be best suited for different fields and types of research.