

## ELEMENTS OF AN HYPOTHESIS

An hypothesis is an explanation for an observation or a phenomenon. A good scientific hypothesis contains the following elements:

1. Description of the observation/phenomenon to be explained.
2. A clear, logically coherent description of the process(es) hypothesized to cause the observation/phenomenon.
3. A description of the consistency of the above descriptions with known facts and Accepted theories.
  - a. What relevant observations/phenomena are explained?
  - b. What relevant observations/phenomena are not explained?
  - c. What observations/phenomena are incompatible with the explanation?
4. A description of how the hypothesis may be falsified.

## **HYPOTHESIS DESCRIPTION FORM**

1. Describe phenomenon to be explained.
2. Describe process(es) that you hypothesize to cause the phenomenon and describe how they do so.
3. Are there relevant observations/phenomena your hypothesis does not account for? If so, what are they?
4. Are there known facts that are inconsistent with your hypothesis? If so, what are they?
5. Describe what experimental results or observations could falsify your hypothesis.

## EVALUATING AN HYPOTHESIS

To evaluate the reasonableness of an hypothesis, we use the following criteria:

1. Is the observation/phenomenon to be explained clearly stated?
2. Is the description of the process(es) hypothesized to cause the observation/phenomenon clear and logical?
3. Does the hypothesis fail to explain relevant observations/phenomena?
4. Is the hypothesis inconsistent with other known phenomena?
5. Is the hypothesis falsifiable?



## HYPOTHESIS TESTING

There are two ways to "test" the validity of an hypothesis:

1. by attempting to falsify it
2. by attempting to distinguish it from another hypothesis

To falsify an hypothesis, one needs to identify a novel phenomenon that is expected to occur if the hypothesis is true, and either observationally or experimentally determine if that phenomenon actually occurs. If it doesn't, the hypothesis is falsified and we reject it. If it does, we tentatively accept the hypothesis, pending further testing.

To distinguish between two hypotheses, one needs to identify a phenomenon about which the hypotheses make different predictions. Using experiments or observations, that phenomenon is examined. The hypothesis making the correct prediction is accepted as more correct than the other hypothesis.

# HYPOTHESIS TESTING PROPOSAL

1. State the observation(s) the hypotheses are purporting to explain.
2. State one or two hypotheses purporting to explain those observations.

**Skip to 3a. or 4a., as appropriate.**

- 3a. If you state one hypothesis in (2.) above, describe a prediction of that hypothesis that can be used to falsify the hypothesis.
- 3b. Describe how you would perform an experiment or observation to determine whether that prediction is upheld or not.
- 4a. If you state two or more hypotheses in (2.) above, describe contrasting predictions of the hypotheses that can be used to distinguish among them.
- 4b. Describe how you would perform an experiment or observation to distinguish among the contrasting predictions.