

## Pre-Lab: Scientific Models

To learn about scientific models and the nature of science, please watch the following video:

<https://youtu.be/Im-3AJ4dQzE>

Then answer the questions below.

1. According to the video, what is the goal of science? Choose all that apply.
  - a) To confirm hypotheses about nature
  - b) To know how the universe really works
  - c) To develop models of nature that are useful
  - d) To develop theories about nature that are true
2. What do *law* and *theory* mean in the sense that *scientists* use them? Choose all that apply.
  - a) A theory is an educated guess that has little or no experimental evidence supporting it yet
  - b) A law stands on more firm scientific footing than a theory
  - c) A law is true and can't be violated
  - d) We call something a law when it seems to work but we don't know why
  - e) A theory is a robust framework for understanding experimental evidence
3. Is the following a valid scientific hypothesis?

"All fruits have seeds."

  - a) Yes, because it could possibly be proven true.
  - b) Yes, because it could possibly be proven false.
  - c) No, because it can never be proven true beyond all doubt.
  - d) No, because it is untrue.
4. True or False: Science is in the business of proving that some things are true and some things are false.
  - a) True
  - b) False
5. Imagine that you've developed a model for understanding how planets and planetary systems form. Your model works very well for predicting and describing the planetary systems that we see.

A few years later, a new observation comes along that suggests that your model makes the wrong prediction, at least for that one particular observed case. This observation is verified numerous times by numerous different parties.

What do you do?

- a) Insist that your model can't be incorrect because it has already proven itself to work in numerous situations
  - b) Abandon your old model and start building a new one from scratch
  - c) Extend your model, if possible, to include the new observational evidence
6. True or False: Modeling the Earth using a flat model is completely useless and should be thrown out entirely.
- a) False, because the Flat Earth model could still be useful in specific situations
  - b) True, because the Flat Earth model could never make an accurate prediction
  - c) True, because the Spherical Earth model is also inaccurate. We should only be using the Spheroidal Earth model from now on because it is the most accurate
  - d) True, because we know that the Earth is round
7. True or False: There are some accurate predictions that a Flat Earth model can make that a Spherical Earth model cannot make.
- a) True
  - b) False
8. True or False: There are occasions when we might want to use a less accurate model (like Newton's Laws) to make predictions about nature even though a more accurate model (like quantum physics) exists.
- a) True
  - b) False
9. String theory is... (choose all that apply)
- a) a model for quantum gravity
  - b) a model of gravity at the smallest scales
  - c) the only contender for a model of quantum gravity
  - d) incomplete and still a work in progress