

1 About Science

Solutions to Chapter 1 Exercises

2. (a) This is a scientific hypotheses, for there is a test for wrongness. For example, you can extract chlorophyll from grass and note its color. (b) This statement is without a means of proving it wrong and is not a scientific hypothesis. It is speculation. (c) This is a scientific hypothesis. It could be proved wrong, for example, by showing tides that do not correspond to the position of the Moon.
3. Aristotle's hypotheses were partially correct, for material that makes up the plant comes partly from the soil, but mainly from the air and water. An experiment would be to weigh a pot of soil with a small seedling, then weigh the potted plant later after it has grown. The fact that the grown plant will weigh more is evidence that the plant is composed of more material than the soil offers. By keeping a record of the weight of water used to water the plant, and covering the soil with plastic wrap to minimize evaporation losses, the weight of the grown plant can be compared with the weight of water it absorbs. How can the weight of air taken in by the plant be estimated?
6. The Sun's radius is approximately 7×10^8 m. The distance between the Earth and Moon is about 4×10^8 m. So the Sun's radius is much larger, nearly twice the distance between the Earth and Moon. The Earth and Moon at their present distance from each other would easily fit inside the Sun. The Sun is *really* big—surprisingly big!
8. The shadow would be longer because on the smaller planet the angle of the pole would be greater relative to the sunlight. The ratio of the shadow to pole height would be greater than 1:8 as in the previous answer.
9. What is likely being misunderstood is the distinction between theory and hypothesis. In common usage, "theory" may mean a guess or hypothesis, something that is tentative or speculative. But in science a theory is a synthesis of a large body of validated information (e.g., cell theory or quantum theory). The value of a theory is its usefulness (not its "truth").