Conceptual Questions

1.1 Physics: An Introduction

1.

Models are particularly useful in relativity and quantum mechanics, where conditions are outside those normally encountered by humans. What is a model?

2.

How does a model differ from a theory?

3.

If two different theories describe experimental observations equally well, can one be said to be more valid than the other (assuming both use accepted rules of logic)?

4.

What determines the validity of a theory?

5.

Certain criteria must be satisfied if a measurement or observation is to be believed. Will the criteria necessarily be as strict for an expected result as for an unexpected result?

6.

Can the validity of a model be limited, or must it be universally valid? How does this compare to the required validity of a theory or a law?

7.

Classical physics is a good approximation to modern physics under certain circumstances. What are they?

8.

When is it *necessary* to use relativistic quantum mechanics?

9.

Can classical physics be used to accurately describe a satellite moving at a speed of 7500 m/s? Explain why or why not.

1.2 Physical Quantities and Units

10.

Identify some advantages of metric units.

1.3 Accuracy, Precision, and Significant Figures

11.

What is the relationship between the accuracy and uncertainty of a measurement?

12.

Prescriptions for vision correction are given in units called *diopters* (D). Determine the meaning of that unit. Obtain information (perhaps by calling an optometrist or performing an internet search) on the minimum uncertainty with which corrections in diopters are determined and the accuracy with which corrective lenses can be produced. Discuss the sources of uncertainties in both the prescription and accuracy in the manufacture of lenses.