

Concept Items

1.1 Physics: Definitions and Applications 1.

Which statement best compares and contrasts the aims and topics of natural philosophy had versus physics?

- a. Natural philosophy included all aspects of nature including physics.
- b. Natural philosophy included all aspects of nature excluding physics.
- c. Natural philosophy and physics are different.
- d. Natural philosophy and physics are essentially the same thing.

2.

Which of the following is not an underlying assumption essential to scientific understanding?

- a. Characteristics of the physical universe can be perceived and objectively measured by human beings.
- b. Explanations of natural phenomena can be established with absolute certainty.
- c. Fundamental physical processes dictate how characteristics of the physical universe evolve.
- d. The fundamental processes of nature operate the same way everywhere and at all times.

3.

Which of the following questions regarding a strain of genetically modified rice is not one that can be answered by science?

- a. How does the yield of the genetically modified rice compare with that of existing rice?
- b. Is the genetically modified rice more resistant to infestation than existing rice?
- c. How does the nutritional value of the genetically modified rice compare to that of existing rice?
- d. Should the genetically modified rice be grown commercially and sold in the marketplace?

4.

What conditions imply that we can use classical physics without considering special relativity or quantum mechanics?

- a.
 - 1. matter is moving at speeds of less than roughly 1 percent the speed of light,
 - 2. objects are large enough to be seen with the naked eye, and
 - 3. there is the involvement of a strong gravitational field.
- b.
 - 1. matter is moving at speeds greater than roughly 1 percent the speed of light,

- 2. objects are large enough to be seen with the naked eye, and
 - 3. there is the involvement of a strong gravitational field.
 - c. 1. matter is moving at speeds of less than roughly 1 percent the speed of light,
 - 2. objects are too small to be seen with the naked eye, and
 - 3. there is the involvement of only a weak gravitational field.
 - d. 1. matter is moving at speeds of less than roughly 1 percent the speed of light,
 - 2. objects are large enough to be seen with the naked eye, and
 - 3. there is the involvement of a weak gravitational field.
- 5.

How could physics be useful in weather prediction?

- a. Physics helps in predicting how burning fossil fuel releases pollutants.
- b. Physics helps in predicting dynamics and movement of weather phenomena.
- c. Physics helps in predicting the motion of tectonic plates.
- d. Physics helps in predicting how the flowing water affects Earth's surface.

6.

How do physical therapists use physics while on the job? Explain.

- a. Physical therapists do not require knowledge of physics because their job is mainly therapy and not physics.
- b. Physical therapists do not require knowledge of physics because their job is more social in nature and unscientific.
- c. Physical therapists require knowledge of physics know about muscle contraction and release of energy.
- d. Physical therapists require knowledge of physics to know about chemical reactions inside the body and make decisions accordingly.

7.

What is meant when a physical law is said to be universal?

- a. The law can explain everything in the universe.
- b. The law is applicable to all physical phenomena.
- c. The law applies everywhere in the universe.
- d. The law is the most basic one and all laws are derived from it.

8.

What subfield of physics could describe small objects traveling at high speeds or experiencing a strong gravitational field?

- a. general theory of relativity
- b. classical physics
- c. quantum relativity
- d. special theory of relativity

9.

Why is Einstein's theory of relativity considered part of modern physics, as opposed to classical physics?

- a. Because it was considered less outstanding than the classics of physics, such as classical mechanics.
- b. Because it was popular physics enjoyed by average people today, instead of physics studied by the elite.
- c. Because the theory deals with very slow-moving objects and weak gravitational fields.
- d. Because it was among the new 19th-century discoveries that changed physics.

1.2 The Scientific Methods 10.

Describe the difference between an observation and a hypothesis.

- a. An observation is seeing what happens; a hypothesis is a testable, educated guess.
- b. An observation is a hypothesis that has been confirmed.
- c. Hypotheses and observations are independent of each other.
- d. Hypotheses are conclusions based on some observations.

11.

Describe how modeling is useful in studying the structure of the atom.

- a. Modeling replaces the real system by something similar but easier to examine.
- b. Modeling replaces the real system by something more interesting to examine.
- c. Modeling replaces the real system by something with more realistic properties.
- d. Modeling includes more details than are present in the real system.

12.

How strongly is a hypothesis supported by evidence compared to a theory?

- a. A theory is supported by little evidence, if any, at first, while a hypothesis is supported by a large amount of available evidence.
- b. A hypothesis is supported by little evidence, if any, at first. A theory is supported by a large amount of available evidence.
- c. A hypothesis is supported by little evidence, if any, at first. A theory does not need any experiments in support.
- d. A theory is supported by little evidence, if any, at first. A hypothesis does not need any experiments in support.

1.3 The Language of Physics: Physical Quantities and Units 13.

Which of the following does not contribute to the uncertainty?

- a. the limitations of the measuring device
- b. the skill of the person making the measurement
- c. the regularities in the object being measured
- d. other factors that affect the outcome (depending on the situation)

14.

How does the independent variable in a graph differ from the dependent variable?

- a. The dependent variable varies linearly with the independent variable.
- b. The dependent variable depends on the scale of the axis chosen while independent variable does not.
- c. The independent variable is directly manipulated or controlled by the person doing the experiment, while dependent variable is the one that changes as a result.
- d. The dependent and independent variables are fixed by a convention and hence they are the same.

15.

What could you conclude about these two lines?

1. Line A has a slope of $\{-4.7\}$.
 2. Line B has a slope of 12.0.
- a. Line A is a decreasing line while line B is an increasing line, with line A being much steeper than line B.
 - b. Line A is a decreasing line while line B is an increasing line, with line B being much steeper than line A.
 - c. Line B is a decreasing line while line A is an increasing line, with line A being much steeper than line B.
 - d. Line B is a decreasing line while line A is an increasing line, with line B being much steeper than line A.

16.

Velocity, or speed, is measured using the following formula: $v = \frac{d}{t}$, where v is velocity, d is the distance travelled, and t is the time the object took to travel the distance. If the velocity-time data are plotted on a graph, which variable will be on which axis? Why?

- a. Time would be on the x-axis and velocity on the y-axis, because time is an independent variable and velocity is a dependent variable.
- b. Velocity would be on the x-axis and time on the y-axis, because time is the independent variable and velocity is the dependent variable.
- c. Time would be on the x-axis and velocity on the y-axis, because time is a dependent variable and velocity is an independent variable.

- d. Velocity would be on x-axis and time on the y-axis, because time is a dependent variable and velocity is a independent variable.

17.

The uncertainty of a triple-beam balance is 0.05 g . What is the percent uncertainty in a measurement of 0.445 kg ?

- a.
- b.
- c.
- d.

18.

What is the definition of uncertainty?

- a. Uncertainty is the number of assumptions made prior to the measurement of a physical quantity.
- b. Uncertainty is a measure of error in a measurement due to the use of a non-calibrated instrument.
- c. Uncertainty is a measure of deviation of the measured value from the standard value.
- d. Uncertainty is a measure of error in measurement due to external factors like air friction and temperature.