

## Short Answer

### 1.1 Physics: Definitions and Applications 51.

Describe the aims of physics.

- a. Physics aims to explain the fundamental aspects of our universe and how these aspects interact with one another.
- b. Physics aims to explain the biological aspects of our universe and how these aspects interact with one another.
- c. Physics aims to explain the composition, structure and changes in matter occurring in the universe.
- d. Physics aims to explain the social behavior of living beings in the universe.

52.

Define the fields of magnetism and electricity and state how they are related.

- a. Magnetism describes the attractive force between a magnetized object and a metal like iron. Electricity involves the study of electric charges and their movements. Magnetism is not related to the electricity.
- b. Magnetism describes the attractive force between a magnetized object and a metal like iron. Electricity involves the study of electric charges and their movements. Magnetism is produced by a flow electrical charges.
- c. Magnetism involves the study of electric charges and their movements. Electricity describes the attractive force between a magnetized object and a metal. Magnetism is not related to the electricity.
- d. Magnetism involves the study of electric charges and their movements. Electricity describes the attractive force between a magnetized object and a metal. Magnetism is produced by the flow electrical charges.

53.

Describe what two topics physicists are trying to unify with relativistic quantum mechanics. How will this unification create a greater understanding of our universe?

- a. Relativistic quantum mechanics unifies quantum mechanics with Einstein's theory of relativity. The unified theory creates a greater understanding of our universe because it can explain objects of all sizes and masses.
- b. Relativistic quantum mechanics unifies classical mechanics with Einstein's theory of relativity. The unified theory creates a greater understanding of our universe because it can explain objects of all sizes and masses.
- c. Relativistic quantum mechanics unifies quantum mechanics with Einstein's theory of relativity. The unified theory creates a greater understanding of our universe because it is unable to explain objects of all sizes and masses.
- d. Relativistic quantum mechanics unifies classical mechanics with the Einstein's theory of relativity. The unified theory creates a greater under-

standing of our universe because it is unable to explain objects of all sizes and masses.

54.

The findings of studies in quantum mechanics have been described as strange or weird compared to those of classical physics. Explain why this would be so.

- a. It is because the phenomena it explains are outside the normal range of human experience which deals with much larger objects.
- b. It is because the phenomena it explains can be perceived easily, namely, ordinary-sized objects.
- c. It is because the phenomena it explains are outside the normal range of human experience, namely, the very large and the very fast objects.
- d. It is because the phenomena it explains can be perceived easily, namely, the very large and the very fast objects.

55.

How could knowledge of physics help you find a faster way to drive from your house to your school?

- a. Physics can explain the traffic on a particular street and help us know about the traffic in advance.
- b. Physics can explain about the ongoing construction of roads on a particular street and help us know about delays in the traffic in advance.
- c. Physics can explain distances, speed limits on a particular street and help us categorize faster routes.
- d. Physics can explain the closing of a particular street and help us categorize faster routes.

56.

How could knowledge of physics help you build a sound and energy-efficient house?

- a. An understanding of force, pressure, heat, electricity, etc., which all involve physics, will help me design a sound and energy-efficient house.
- b. An understanding of the air composition, chemical composition of matter, etc., which all involves physics, will help me design a sound and energy-efficient house.
- c. An understanding of material cost and economic factors involving physics will help me design a sound and energy-efficient house.
- d. An understanding of geographical location and social environment which involves physics will help me design a sound and energy-efficient house.

57.

What aspects of physics would a chemist likely study in trying to discover a new chemical reaction?

- a. Physics is involved in understanding whether the reactants and products dissolve in water.
- b. Physics is involved in understanding the amount of energy released or required in a chemical reaction.
- c. Physics is involved in what the products of the reaction will be.
- d. Physics is involved in understanding the types of ions produced in a chemical reaction.

## 1.2 The Scientific Methods 58.

You notice that it takes more force to get a large box to start sliding across the floor than it takes to get the box sliding faster once it is already moving. Create a testable hypothesis that attempts to explain this observation.

- a. The floor has greater distortions of space-time for moving the sliding box faster than for the box at rest.
- b. The floor has greater distortions of space-time for the box at rest than for the sliding box.
- c. The resistance between the floor and the box is less when the box is sliding than when the box is at rest.
- d. The floor dislikes having objects move across it and therefore holds the box rigidly in place until it cannot resist the force.

59.

Design an experiment that will test the following hypothesis: driving on a gravel road causes greater damage to a car than driving on a dirt road.

- a. To test the hypothesis, compare the damage to the car by driving it on a smooth road and a gravel road.
- b. To test the hypothesis, compare the damage to the car by driving it on a smooth road and a dirt road.
- c. To test the hypothesis, compare the damage to the car by driving it on a gravel road and the dirt road.
- d. This is not a testable hypothesis.

60.

How is a physical model, such as a spherical mass held in place by springs, used to represent an atom vibrating in a solid, similar to a computer-based model, such as that predicting how gravity affects the orbits of the planets?

- a. Both a physical model and a computer-based model should be built around a hypothesis and could be able to test the hypothesis.
- b. Both a physical model and a computer-based model should be built around a hypothesis but they cannot be used to test the hypothesis.
- c. Both a physical model and a computer-based model should be built around the results of scientific studies and could be used to make predictions about the system under study.

- d. Both a physical model and a computer-based model should be built around the results of scientific studies but cannot be used to make predictions about the system under study.

61.

Explain the advantages and disadvantages of using a model to predict a life-or-death situation, such as whether or not an asteroid will strike Earth.

- a. The advantage of using a model is that it provides predictions quickly, but the disadvantage of using a model is that it could make erroneous predictions.
- b. The advantage of using a model is that it provides accurate predictions, but the disadvantage of using a model is that it takes a long time to make predictions.
- c. The advantage of using a model is that it provides predictions quickly without any error. There are no disadvantages of using a scientific model.
- d. The disadvantage of using models is that it takes longer time to make predictions and the predictions are inaccurate. There are no advantages to using a scientific model.

62.

A friend tells you that a scientific law cannot be changed. State whether or not your friend is correct and then briefly explain your answer.

- a. Correct, because laws are theories that have been proved true.
- b. Correct, because theories are laws that have been proved true.
- c. Incorrect, because a law is changed if new evidence contradicts it.
- d. Incorrect, because a law is changed when a theory contradicts it.

63.

How does a scientific law compare to a local law, such as that governing parking at your school, in terms of whether or not laws can be changed, and how universal a law is?

- a. A local law applies only in a specific area, but a scientific law is applicable throughout the universe. Both the local law and the scientific law can change.
- b. A local law applies only in a specific area, but a scientific law is applicable throughout the universe. A local law can change, but a scientific law cannot be changed.
- c. A local law applies throughout the universe but a scientific law is applicable only in a specific area. Both the local and the scientific law can change.
- d. A local law applies throughout the universe, but a scientific law is applicable only in a specific area. A local law can change, but a scientific law cannot be changed.

64.

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?

- a. Models, theories and laws must be universally valid.
- b. Models, theories, and laws have only limited validity.
- c. Models have limited validity while theories and laws are universally valid.
- d. Models and theories have limited validity while laws are universally valid.

### 1.3 The Language of Physics: Physical Quantities and Units 65.

The speed of sound is measured at  $342 \text{ m/s}$  on a certain day. What is this in  $\text{km/h}$ ? Report your answer in scientific notation.

- a.  $1.23 \times 10^4 \text{ km/h}$
- b.  $1.23 \times 10^3 \text{ km/h}$
- c.  $9.5 \times 10^1 \text{ km/h}$
- d.  $2.05 \times 10^{-1} \text{ km/h}$

66.

Describe the main difference between the metric system and the U.S. Customary System.

- a. In the metric system, unit changes are based on powers of 10, while in the U.S. customary system, each unit conversion has unrelated conversion factors.
- b. In the metric system, each unit conversion has unrelated conversion factors, while in the U.S. customary system, unit changes are based on powers of 10.
- c. In the metric system, unit changes are based on powers of 2, while in the U.S. customary system, each unit conversion has unrelated conversion factors.
- d. In the metric system, each unit conversion has unrelated conversion factors, while in the U.S. customary system, unit changes are based on powers of 2.

67.

An infant's pulse rate is measured to be  $130 \pm 5 \text{ beats/min}$ . What is the percent uncertainty in this measurement?

- a. 2%
- b. 3%
- c. 4%
- d. 5%

68.

Explain how the uncertainty of a measurement relates to the accuracy and precision of the measuring device. Include the definitions of accuracy and precision in your answer.

- a. A decrease in the precision of a measurement increases the uncertainty of the measurement, while a decrease in accuracy does not.
- b. A decrease in either the precision or accuracy of a measurement increases the uncertainty of the measurement.
- c. An increase in either the precision or accuracy of a measurement will increase the uncertainty of that measurement.
- d. An increase in the accuracy of a measurement will increase the uncertainty of that measurement, while an increase in precision will not.

69.

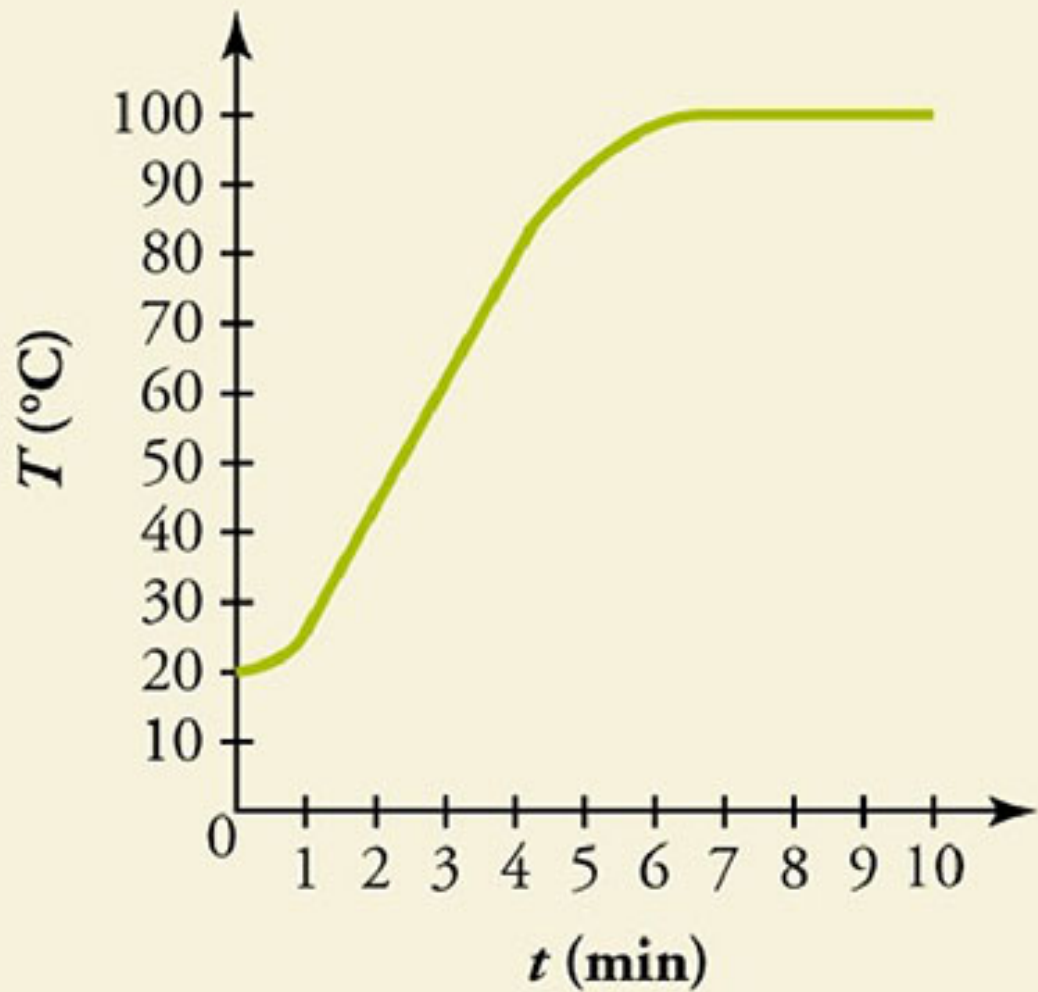
Describe all of the characteristics that can be determined about a straight line with a slope of  $\{-3\}$  and a y-intercept of 50 on a graph.

- a. Based on the information, the line has a negative slope. Because its y-intercept is 50 and its slope is negative, this line gradually rises on the graph as the x-value increases.
- b. Based on the information, the line has a negative slope. Because its y-intercept is 50 and its slope is negative, this line gradually moves downward on the graph as the x-value increases.
- c. Based on the information, the line has a positive slope. Because its y-intercept is 50 and its slope is positive, this line gradually rises on the graph as the x-value increases.
- d. Based on the information, the line has a positive slope. Because its y-intercept is 50 and its slope is positive, this line gradually moves downward on the graph as the x-value increases.

70.

The graph shows the temperature change over time of a heated cup of water.

## Temperature Change of Water Over Time



What is the slope of the graph between the time period 2 min and 5 min?

- a.  $-15^\circ\text{C}/\text{min}$
- b.  $-0.07^\circ\text{C}/\text{min}$
- c.  $0.07^\circ\text{C}/\text{min}$
- d.  $15^\circ\text{C}/\text{min}$