

Chapter 01 Physics, the Fundamental Science

Multiple Choice Questions

1. People sometimes have difficulty distinguishing between scientific explanations of common events and other kinds of explanation (superstition, prejudice, magic, etc.). Which of the following best helps to identify a scientific explanation?
 - A. The explanation goes against the results of public opinion polls.
 - B. The explanation changes according to the social status of the observer.
 - C. We can test the explanation by comparing its predictions to measurement results.
 - D. The explanation relies on local folklore.

2. The main reason that physics is perceived to be difficult is because people think that
 - A. all of its concepts seem incompatible with our everyday experience.
 - B. it frequently changes its explanations of common occurrences.
 - C. the laws of physics are often shown to be wrong.
 - D. math is required to understand its ideas.

3. The metric system of units is based on which number?
 - A. 2
 - B. 8
 - C. 10
 - D. 16

4. Which of the following is a correct metric unit for volume?
 - A. Smidgens.
 - B. Drops.
 - C. Microns.
 - D. Liters.

5. A new system of units is invented where the basic unit of length is the "dak." The "dak" is defined as equal to 2 inches, and there are 2.54 centimeters in an inch. How many "daks" are there in a centimeter?
 - A. 4
 - B. 0.197
 - C. 2
 - D. 0.254

6. Suppose that, as it evaporates in the upper atmosphere, a raindrop's diameter changes in one minute from one millimeter to one micrometer. Its diameter has decreased by a factor of

- A. 10, i.e., it is one tenth of the initial size.
- B. 100, i.e., it is one hundredth of the initial size.
- C. 1,000 (or, 10^3), i.e., it is one thousandth of the initial size.
- D. 1,000,000 (or, 10^6), i.e., it is one millionth of the initial size.

7. Your new weed-cutter requires, as fuel, a gas-to-oil mixture of 20-to-1 (20 parts of gas mixed with one part of oil). You have $\frac{1}{2}$ of a gallon of gas. How much oil, in gallons, should you add to make it all into fuel for the weed-cutter?

- A. 2
- B. $\frac{1}{2}$
- C. $\frac{1}{20}$
- D. $\frac{1}{40}$

8. Students often fail to include units with their answers. Science teachers say that units are important. In which one of the following situations would you insist that units be included?

- A. Your brother asks if you would like a large soda for lunch.
- B. A friend offers you two per mile to help pay for gas on a trip.
- C. Your manager says you can take a break when the project you are working on is halfway finished.
- D. A police officer says you did not stop at a red light.

9. In which of these relations will S double if T is doubled?

- A. $S = 10T$
- B. $T = \frac{1}{S}$
- C. $T = S \cdot S$
- D. $S = \frac{1}{T}$

10. Physics is considered the "Fundamental Science" because

- A. if a person understands physics, he or she does not need to know anything about other sciences.
- B. physics offers the only exact explanations of how things work; other sciences only provide approximate answers.
- C. it makes the most use of mathematics.
- D. the ideas and concepts of physics are an important part of the foundation of other sciences.

11. The development of physics concepts depends heavily on measurements because

- A. measurements are needed to prove ideas true or false.
- B. without measurements, we would not know what to explain with physics.
- C. measurements involve mathematics.
- D. physicists like numbers more than words.

12. The study of everyday phenomena allows us to

- A. develop an understanding of the concepts used to describe more abstract concepts.
- B. develop an appreciation of the physical universe around us.
- C. develop our intuition and adjust our "common sense" to understand these phenomena.
- D. All of the choices are correct.

13. A certain parcel of real estate is sold for 7.0 Mega dollars. What is the correct scientific notation for this selling price?

- A. 7.0×10^6 dollars
- B. 7×10^6 dollars
- C. 70×10^5 dollars
- D. 10×10^7 dollars

14. If a car travels at a constant speed, the distance the car travels in a certain time can be found using the relation $d = st$ where d represents distance, s speed, and t time. This relationship can be expressed in words as

- A. distance equals speed minus time.
- B. multiply speed and time to obtain the distance traveled.
- C. distance equals speed divided by time.
- D. speed is the reciprocal of time and the inverse of distance.

15.

If 2 people can knit a total of 12 socks per hour, how many socks can five people knit in an 8 hour work day?

- A. 200
- B. 240
- C. 120
- D. 36

16. One inch is defined as 2.54 centimeters. The correct expression for a one-inch length, expressed in meters, is

- A. 2.54×10^2 meters
- B. 2.54×10^1 meters
- C. 2.54×10^{-2} meters
- D. 2.54×10^{-1} meters

17. It's well known that lightning strikes tall objects more frequently than short objects. Which of the following explanations of this phenomenon could be checked for validity?

- A. Tall objects always contain more structural steel than short objects.
- B. Tall objects are always pointed at the top.
- C. Short objects do not attract lightning because they do not conduct electricity.
- D. All of these choices could be checked for validity.

18. Suppose a theory is used to make a prediction. A measurement is carried out to test the prediction. The measurement is found to have a value far larger than the prediction. This means

- A. the theory must be completely incorrect and must be rejected entirely.
- B. nothing because theories are not facts; theories often make incorrect predictions but are still regarded as true by scientists.
- C. the measurement must be incorrect; theories by definition cannot be incorrect.
- D. the theory might have correct elements but must be modified to account for some unforeseen influences.

19. By expressing relationships between quantities using mathematics, we can

- A. describe the relationships more exactly; words cannot possibly describe a relationship.
- B. avoid needing to be concerned with units.
- C. make our statements more compact and make manipulations easier.
- D. make understanding our ideas more comfortable for everyone, including nonscientists.

20. In order to gain a more scientific worldview, the student is encouraged to

- A. perform simple experiments at home.
- B. perform experiments, but only in the laboratory.
- C. refrain from experiments; they are all too complicated.
- D. consult the oldest books available.

21. Which of the following is not a major subfield of physics?

- A. Electricity and magnetism.
- B. Thermodynamics.
- C. Statistics.
- D. Optics.

22. A person claims that he can start fires by using his mental powers. If we start with the hypothesis that his claim is true, we can

- A. put him in a room with just a newspaper and watch him start a fire.
- B. do nothing; this is not a testable hypothesis.
- C. make him explain how he starts fires with his mind.
- D. watch a video of him starting a fire with his mind.

23. The study of rainbows would fall under what subfield of physics?

- A. Mechanics.
- B. Thermodynamics.
- C. Optics.
- D. Electricity and magnetism.
- E. Atomic physics.

24. The key distinction between explanations provided by science and religion is

- A. truth.
- B. simplicity.
- C. beauty.
- D. testability.

25. The principal advantage of metric units over English units is that

- A. metric units are of more convenient size.
- B. conversions between units are easier.
- C. metric units are more familiar.
- D. there are fewer metric units to remember than English units.

26. Suppose you are told that the force on a body (F) is given by the product of its mass (m) and the acceleration of the body (a). Which of the following mathematical equations is the correct expression of this relationship?

- A. $F = m/a$
- B. $F = m + a$
- C. $F = a/m$
- D. $F = m \times a$
- E. $F = 1/(m \times a)$

27. At night you get in your car to drive to the store. The car starts but none of the lights work. Which of the following activities would **not** be considered part of the scientific method?

- A. Slam the hood down hard.
- B. Check the fuse in the light circuit.
- C. Check the wiring from the battery to the lights.
- D. Replace the light bulbs with new bulbs.

28. A scout steps off a distance of 120 steps. If each step is 70 cm, what is the distance in meters?

- A. 8.4 m
- B. 84 m
- C. 840 m
- D. 8400 m

29. The metric unit most comparable in size to the English inch unit is the

- A. micrometer.
- B. millimeter.
- C. centimeter.
- D. meter.
- E. kilometer.

30. Which of the following units is **not** appropriate for measuring volume?

- A. cup.
- B. liter.
- C. centimeter.
- D. pint.
- E. milliliter.

31. If you start with the number 3.0 and move the decimal point one unit to the left, you wind up with 0.30. If you move the decimal point a total of five units to the left, the result is the same as that of dividing the original number by

- A. 10.
- B. 10^3 .
- C. 10^4 .
- D. 10^5 .

32. The liter is a metric unit of volume. The U.S. customary unit of volume most nearly equal to the liter is the

- A. quart.
- B. cup.
- C. teaspoon.
- D. gallon.

33. Which of these is not important to the development of scientific explanations?

- A. Measurement.
- B. Communication.
- C. Debate.
- D. All of these are important.

34. Two different hypotheses are developed to explain why balls bounce. Experiments using basketballs show each hypothesis works equally well. To decide which one is more likely to be correct, you could

- A. find out which one was developed by the more educated person.
- B. use the one that involved more mathematics.
- C. ask three physicists and choose the hypothesis that got the most votes.
- D. try an experiment using baseballs.

35. When a scientist wants to strengthen a theory, she can make predictions of measurable events. The theory becomes stronger when

- A. the theory is voted upon in a democratic process.
- B. she and other scientists observe and measure the events, and they find that the events agree with the prediction.
- C. her supervisor gives the prediction government funding.
- D. the measurement process goes against the prediction, thereby proving the theory valid.

36. In order to avoid cooking disasters, a numerical recipe has an advantage over purely verbal directions. That is, verbal directions can become longwinded and put the cook at risk of distraction. On the other hand, a numerical recipe like "two parts water to one part rice" is

- A. easily set to music.
- B. useful for any amount of rice, because it is a ratio.
- C. is also useful in the periodic table of elements.
- D. obeys Newton's three laws of motion.

37. When trying to make sense of the universe, it is useful to study everyday physics of things you see in your hometown, even in your own kitchen, because

- A. no one knows any of the physical principles that govern the universe outside our planet, Earth.
- B. we expect the same laws govern physics in your hometown and everywhere else in the universe.
- C. only astrology governs the planets.
- D. when you finish, you can eat the experiment.

38. The numerical factor 10^9 corresponds to what quantity?

- A. A million
- B. A billion
- C. A millionth
- D. A trillionth

39. Which of the following objects can you use to roughly visualize a length of 1 meter?

- A. The diameter of a human hair.
- B. The length of an ant on the sidewalk.
- C. The length of a 2 liter bottle of soda pop.
- D. The height of a kitchen counter.
- E. The length of a football field.

40. Scientists generally agree that global warming has resulted mostly from an increase in what substance in the atmosphere?

- A. Nitrogen
- B. Carbon monoxide
- C. Carbon dioxide
- D. Sulphur dioxide

41. The increase in the average atmospheric temperature for the entire planet Earth over the last few centuries can be explained by the

- A. greenhouse effect
- B. increase in size of gaps in the ionosphere
- C. melting of the polar icecaps
- D. change in the average salt levels in the oceans

42. Which of the following is not considered to be a fossil fuel?

- A. coal
- B. uranium
- C. natural gas
- D. crude oil

43. Historical measurements of the average surface temperature of the Earth have shown an accelerating pace since

- A. 1850
- B. 1900
- C. 1940
- D. 1980

44. Applications of semiconductor technology include

- A. more powerful antibiotics
- B. photovoltaic cells
- C. efficient car batteries
- D. fossil fuel burning electric generators

45. The reason we know the exact length corresponding to one meter today is because

- A. our cars can calculate distance traveled with highly calibrated odometers
- B. there is a metal rod exactly one meter long, kept at the National Bureau of Standards
- C. we know the exact distance in meters from the Earth to the Moon
- D. we can use the distance from the Queen of England's nose to her finger tips as the standard of length measurement

Fill in the Blank Questions

46. The metric unit of length closest to our English mile unit is the _____.

47. The distance around the earth at the equator is about 40,000 kilometers. This can be written as _____ mega meters.

48. The subfield of _____ is the study of forces and motion.

49. Four cars are required to take a group of 16 students on a trip. If there were 36 students to transport _____ cars would be needed.

50. After making observations and finding some rules as to how nature works, a scientist proceeds to make a _____ to explain the observed rules.

51. To prepare two servings of hot cereal, a cook mixes $\frac{1}{3}$ cup of ground cereal with one cup of hot water. To prepare six servings will require _____ cup(s) of cereal and _____ cup(s) of hot water.

Chapter 01 Physics, the Fundamental Science **Key**

1. C
2. D
3. C
4. D
5. B
6. C
7. D
8. B
9. A
10. D
11. A
12. D
13. A
14. B
15. B
16. C
17. D
18. D
19. C
20. A
21. C
22. A
23. C
24. D
25. B
26. D
27. A

- 28. B
- 29. C
- 30. C
- 31. D
- 32. A
- 33. D
- 34. D
- 35. B
- 36. B
- 37. B
- 38. B
- 39. D
- 40. C
- 41. A
- 42. B
- 43. D
- 44. B
- 45. B
- 46. kilometer
- 47. 40 *or* 40.0
- 48. mechanics *or* dynamics *or* kinetics
- 49. 9 *or* nine *or* 9.0
- 50. hypothesis *or* theory *or* model
- 51. 1 and 3 *or* 1, 3 *or* 1; 3

Chapter 01 Physics, the Fundamental Science Summary

<u>Category</u>	<u># of Questions</u>
Difficulty: Easy	40
Difficulty: Hard	1
Difficulty: Medium	10
Gradable: automatic	51
Topic: Physics and Everyday Phenomena	4
Topic: The Role of Measurement and Mathematics in Physics	28
Topic: The Scientific Enterprise	10
Topic: The Scope of Physics	5
Topic: What about Energy?	4
Type: Conceptual	13
Type: Definition	30
Type: Numerical	8