

## 2023 Science Challenger D1 Physical Science QUESTIONS

1. A car is traveling at a constant speed of 60 kilometers per hour. How many meters will it travel in 60 seconds?
  - a. 1000 m
  - b. 1500 m
  - c. 2000 m
  - d. 3000 m
2. Elemental oxygen has an atomic number of 8 and an average atomic mass of 16.00 amu. How many protons does it have?
  - a. 4
  - b. 8
  - c. 16
  - d. 24
3. Chris travels 15 meters east to buy some ice cream. With his ice cream in hand, he then travels 15 meters west. What is his total displacement?
  - a. 0 m
  - b. -15 m
  - c. 15 m
  - d. 30 m
4. The metric prefix that means one thousandth is?
  - a. mega-
  - b. kilo-
  - c. centi-
  - d. milli-
5. After 15 minutes of being out in the sun, Julia's popsicle starts dripping onto the ground. What type of change is this?
  - a. Physical change; change in state
  - b. Physical change; combustion
  - c. Chemical change; change in state
  - d. Chemical change; combustion
6. Andrew is riding a sled down the hill. As he reaches the bottom, he notices that his sled naturally stops without having to touch the snow. What force is responsible for his gradual stop?
  - a. Rotational
  - b. Gravitational
  - c. Magnetic
  - d. Frictional
7. What is the most common element in air?

- a. Nitrogen
  - b. Carbon
  - c. Oxygen
  - d. Argon
8. Fireworks are commonly used in July 4th celebrations. Which chemical process do they mostly utilize?
- a. Neutralization
  - b. Evaporation
  - c. Sponification
  - d. Combustion
9. After the campfire Leena set up dies down, she notices that the animal bones thrown in which were previously white are now completely black and falls apart when she touches them. What element are these charred animal bones mainly comprised of?
- a. Calcium
  - b. Carbon
  - c. Magnesium
  - d. Sulfur
10. Derek and Shrey are engaged in a game of tug-of-war. Derek, on the left end of the rope, is pulling on the rope with 500 newtons while Shrey, standing on the right end of the rope, is pulling on the rope with 300 newtons of force. To which side does the rope move and who wins the game?
- a. To the left; Shrey
  - b. To the left; Derek
  - c. To the right; Shrey
  - d. To the right; Derek
11. While making red velvet cake, Sharon adds 1 tbsp of baking soda and 2 tbsp of vinegar to her mixing bowl which initially contained just flour. What immediate change does she notice in the mixing bowl?
- a. Color change from white to red
  - b. Color change from red to white
  - c. Fizzing
  - d. Explosion
12. As a ball is thrown and is traveling upward, what is its velocity and acceleration?
- a. positive; positive
  - b. positive; negative
  - c. negative; positive
  - d. negative; negative

13. When a body moves in circular motion at constant speed, how is its velocity and acceleration always related?
- they are parallel to each other
  - its acceleration is double its velocity
  - they are opposite of each other
  - they are perpendicular to each other
14. Which of the following is the strongest acid?
- sulfuric acid
  - oxalic acid
  - formic acid
  - hydrofluoric acid
15. Which of the following is a form of energy?
- A book
  - Sunlight
  - A pencil
  - A chair
16. Which of the following materials is a good conductor of electricity?
- Plastic
  - Rubber
  - Metal
  - Wood
17. When you rub a balloon against your hair, it becomes negatively charged. This is an example of:
- Conduction
  - Convection
  - Radiation
  - Induction
18. Which of the following objects will produce a shadow?
- Transparent glass
  - Mirror
  - Opaque book
  - Shiny metal plate
19. Which of the following forces is responsible for holding atoms together in a solid object?
- Gravitational force
  - Magnetic force
  - Electric force
  - Nuclear force
20. A box weighing 20 kilograms is pushed with a force of 50 Newtons. What is the acceleration of the box?
- $2.5 \text{ m/s}^2$
  - $5 \text{ m/s}^2$
  - $10 \text{ m/s}^2$
  - $25 \text{ m/s}^2$

21. An object is initially at rest. If it accelerates at a rate of 5 meters per second squared for 10 seconds, what is its final velocity? Assume that there is no friction.
- 5 m/s
  - 10 m/s
  - 50 m/s
  - 100 m/s
22. The temperature outside is currently 25 degrees Celsius. What is the temperature in Fahrenheit?
- 32°F
  - 50°F
  - 77°F
  - 98.6°F
23. A circuit consists of a 12-volt battery and a resistor with a resistance of 4 ohms. What is the current flowing through the circuit?
- 3 amperes
  - 4 amperes
  - 8 amperes
  - 48 amperes
24. A wave has a frequency of 50 Hz and a wavelength of 2 meters. What is the speed of the wave?
- 25 m/s
  - 50 m/s
  - 100 m/s
  - 200 m/s
25. What is the primary distance between a longitudinal wave and a transverse wave?
- The amplitude of the wave
  - The wavelength of the wave
  - The speed at which the wave travels
  - The direction the particle is moving
26. What is the difference between AC (alternating current) and DC (direct current)?
- The direction of current flow
  - The voltage level of the current
  - The resistance of the circuit
  - The presence of magnetic fields
27. A student measures the length of a pencil using a ruler. The ruler has markings in millimeters. The student reads the length as 15.5 mm. However, the actual length of the pencil is known to be 15.0 mm. How many millimeters off from the actual length is the measurement?
- 0.5 mm
  - 1 mm
  - 1.5 mm
  - 2 mm
28. A roller coaster is designed to reach its maximum height at the midpoint of its track. As the roller coaster descends from this height, which of the following energy changes occur primarily?
- Kinetic energy to potential energy
  - Potential energy to kinetic energy
  - Mechanical energy to thermal energy

- d. Electrical energy to potential energy
29. A person pushes a box with a force of 50 Newtons for a distance of 5 meters along a horizontal surface. What is the work done on the box?
- a. 125 Joules
  - b. 150 Joules
  - c. 250 Joules
  - d. 400 Joules
30. A car travels a distance of 200 kilometers in 4 hours. What is the average velocity of the car during this time?
- a. 20 km/h
  - b. 25 km/h
  - c. 30 km/h
  - d. 50 km/h