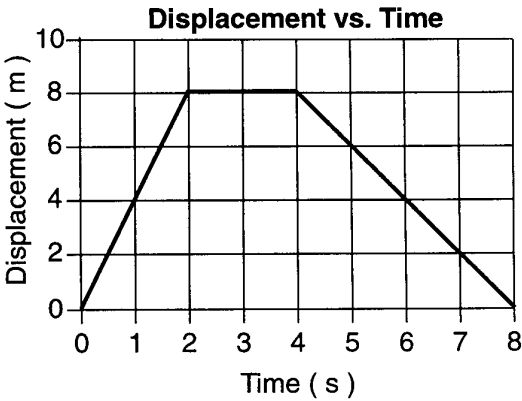


1. Base your answer to the following question on the graph below, which represents the relationship between the displacement of an object and its time of travel along a straight line.



What is the magnitude of the object's total displacement after 8.0 seconds?

- A) 0 m
- B) 2 m
- C) 8 m
- D) 16 m

2. In a race, a runner traveled 12 meters in 4.0 seconds as she accelerated uniformly from rest. The magnitude of the acceleration of the runner was

A) 0.25 m/s²

B) 1.5 m/s²

C) 3.0 m/s²

D) 48 m/s²

3. A baseball dropped from the roof of a tall building takes 3.1 seconds to hit the ground. How tall is the building? [Neglect friction.]

A) 15 m

B) 30. m

C) 47 m

D) 94 m

4. A 5.00-kilogram block slides along a horizontal, frictionless surface at 10.0 meters per second for 4.00 seconds. The magnitude of the block's momentum is

A) 200. kg●m/s

B) 50.0 kg●m/s

C) 20.0 kg●m/s

D) 12.5 kg●m/s

5. A motorcycle being driven on a dirt path hits a rock. Its 60.-kilogram cyclist is projected over the handlebars at 20. meters per second into a haystack. If the cyclist is brought to rest in 0.50 second, the magnitude of the average force exerted on the cyclist by the haystack is

A) 6.0×10^1 N

B) 5.9×10^2 N

C) 1.2×10^3 N

D) 2.4×10^3 N

6. When a 1.0-kilogram cart moving with a speed of 0.50 meter per second on a horizontal surface collides with a second 1.0-kilogram cart initially at rest, the carts lock together. What is the speed of the combined carts after the collision? [Neglect friction.]

A) 1.0 m/s

B) 0.50 m/s

C) 0.25 m/s

D) 0 m/s

7. Ball *A* of mass 5.0 kilograms moving at 20. meters per second collides with ball *B* of unknown mass moving at 10. meters per second in the same direction. After the collision, ball *A* moves at 10. meters per second and ball *B* at 15 meters per second, both still in the same direction. What is the mass of ball *B*?

A) 6.0 kg

B) 2.0 kg

C) 10. kg

D) 12 kg

8. Which object has the greatest inertia?

A) a 0.010-kg bullet traveling at 90. m/s

B) a 30.-kg child traveling at 10. m/s on her bike

C) a 490-kg elephant walking with a speed of 1.0 m/s

D) a 1500-kg car at rest in a parking lot

9. A 750-newton person stands in an elevator that is accelerating downward. The upward force of the elevator floor on the person must be

A) equal to 0 N

B) less than 750 N

C) equal to 750 N

D) greater than 750 N

10. A student pulls a 60.-newton sled with a force having a magnitude of 20. newtons. What is the magnitude of the force that the sled exerts on the student?

A) 20. N

B) 40. N

C) 60. N

D) 80. N
11. The gravitational force of attraction between two objects would be increased by

A) doubling the mass of both objects, only

B) doubling the distance between the objects, only

C) doubling the mass of both objects and doubling the distance between the objects

D) doubling the mass of one object and doubling the distance between the objects

12. The weight of a 2.0-kilogram mass on planet *A* is 40 Newtons. The acceleration due to gravity on planet *A* is closest to

A) 20 m/s²

B) 2.0 m/s²

C) 80 m/s²

D) 40 m/s²

13. As the distance between two objects increases, the gravitational force of attraction between them will

A) decrease

B) increase

C) remain the same

14. What is the magnitude of the force needed to keep a 60.-newton rubber block moving across level, dry asphalt in a straight line at a constant speed of 2.0 meters per second?

A) 40. N

B) 51 N

C) 60. N

D) 120 N

15. A soccer player kicks a ball with an initial velocity of 10. meters per second at an angle of 30.° above the horizontal. The magnitude of the horizontal component of the ball’s initial velocity is

A) 5.0 m/s

B) 8.7 m/s

C) 9.8 m/s

D) 10. m/s

16. An object weighing 15 Newtons is lifted from the ground to a height of 0.22 meter. The increase in the object’s gravitational potential energy is approximately

A) 310 J

B) 32 J

C) 3.3 J

D) 0.34 J

17. An object moving at a constant speed of 25 meters per second possesses 450 joules of kinetic energy. What is the object’s mass?

A) 0.72 kg

B) 1.4 kg

C) 18 kg

D) 36 kg

18. A 60.-kilogram student climbs a ladder a vertical distance of 4.0 meters in 8.0 seconds. Approximately how much total work is done against gravity by the student during the climb?

A) 2.4×10^3 J

B) 2.9×10^2 J

C) 2.4×10^2 J

D) 3.0×10^1 J

19. A 40.-kilogram student runs up a staircase to a floor that is 5.0 meters higher than her starting point in 7.0 seconds. The student’s power output is

A) 29 W

B) 280 W

C) 1.4×10^3 W

D) 1.4×10^4 W

20. A horizontal force of 5.0 newtons acts on a 3.0-kilogram mass over a distance of 6.0 meters along a horizontal, frictionless surface. What is the change in kinetic energy of the mass during its movement over the 6.0-meter distance?

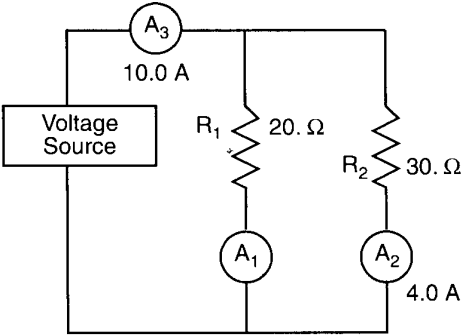
A) 6.0 J

B) 15 J

C) 30. J

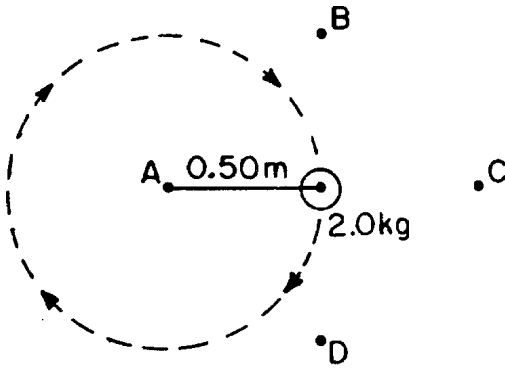
D) 90. J

21. As a ball falls freely (without friction) toward the ground, its total mechanical energy
- A) decreases B) increases
C) remains the same
22. Two electrons are separated by a distance of 3.00×10^{-6} meter. What are the magnitude and direction of the electrostatic forces each exerts on the other?
- A) 2.56×10^{-17} N away from each other
B) 2.56×10^{-17} N toward each other
C) 7.67×10^{-23} N away from each other
D) 7.67×10^{-23} N toward each other
23. In a simple electric circuit, a 24-ohm resistor is connected across a 6.0-volt battery. What is the current in the circuit?
- A) 1.0 A B) 0.25 A C) 140 A D) 4.0 A
24. A 100.-ohm resistor and an unknown resistor are connected in series to a 10.0-volt battery. If the potential drop across the 100.-ohm resistor is 4.00 volts, the resistance of the unknown resistor is
- A) $50 \, \Omega$ B) $100 \, \Omega$ C) $150 \, \Omega$ D) $200 \, \Omega$
25. Base your answer to the following question on the diagram below, which shows two resistors and three ammeters connected to a voltage source.



- What is the potential difference across the source?
- A) 440 V B) 220 V C) 120 V D) 60. V
26. What is the wavelength. of X-rays with a frequency 1.5×10^{18} hertz traveling in a vacuum?
- A) 4.5×10^{26} m B) 2.0×10^{-10} m
C) 5.0×10^{-10} m D) 5.0×10^9 m

27. Which wavelength is in the infrared range of the electromagnetic spectrum?
- A) 100 nm B) 100 mm
C) 100 m D) 100 μm
28. What is the speed of light ($f = 5.09 \times 10^{14}$ Hz) in flint glass?
- A) 1.81×10^8 m/s B) 1.97×10^8 m/s
C) 3.00×10^8 m/s D) 4.98×10^8 m/s
29. A baseball player throws a ball horizontally. Which statement best describes the ball's motion after it is thrown? [Neglect the effect of friction.]
- A) Its vertical speed remains the same, and its horizontal speed increases.
B) Its vertical speed remains the same, and its horizontal speed remains the same.
C) Its vertical speed increases, and its horizontal speed increases.
D) Its vertical speed increases, and its horizontal speed remains the same.
30. A ball thrown vertically upward reaches a maximum height of 30. meters above the surface of Earth. At its maximum height, the speed of the ball is
- A) 0.0 m/s B) 9.8 m/s C) 3.1 m/s D) 24 m/s
31. Base your answer to the following question on the diagram below which represents a 2.0-kilogram mass moving in a circular path on the end of a string 0.50 meter long. The mass moves in a horizontal plane at a constant speed of 4.0 meters per second.



The centripetal force acting on the mass is directed toward point

A) A B) B C) C D) D