Scholars Of Calgary Northwest

Science 10, Entire Course, 25 Questions

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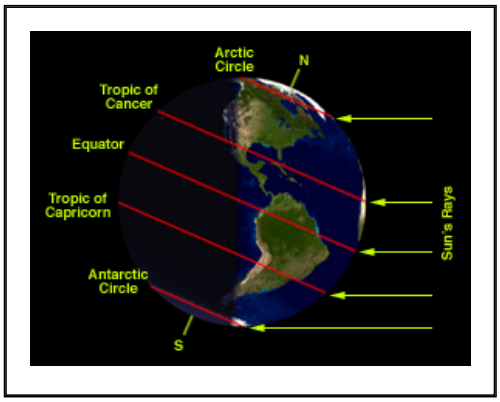
1. The process during which a cell brings in larger materials into a vesicle or vacuole is called

   ○A) exocytosis
   ○B) facilitated diffusion
   ○C) osmosis
   ○D) phagocytosis

2. 

   Which region in the diagram should have the coldest temperatures?

   ○A) Arctic circle
   ○B) Equator
   ○C) Tropic of Capricorn
   ○D) Antarctic circle

3. Which one of the following equations is correctly balanced?

   ○A) $N_2 + 2H_2 \longrightarrow 2NH_3$
   ○B) $C_2H_2 + 2O_2 \longrightarrow 2CO_2 + H_2O$
   ○C) $2H_2O_2 \longrightarrow 2H_2O + O_2$
   ○D) $Br_2 + KI \longrightarrow I_2 + 2KBr$

4. Molecules that are not attracted to water are called

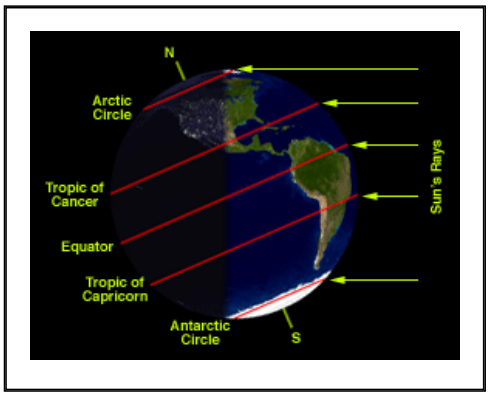
   ○A) hydrophobic
   ○B) hydrophylic
   ○C) miscible
   ○D) immiscible

5. Which of the following forces is responsible for ice being less dense than water?

   ○A) ionic
   ○B) covalent
   ○C) intramolecular
   ○D) intermolecular

6. Which of the following is the most common form of copper ion?

○A) Cu^{2+}
○B) Cu^{4+}
○C) Cu^{+}
○D) Cu

7. 

This diagram represents which season in the southern hemisphere?

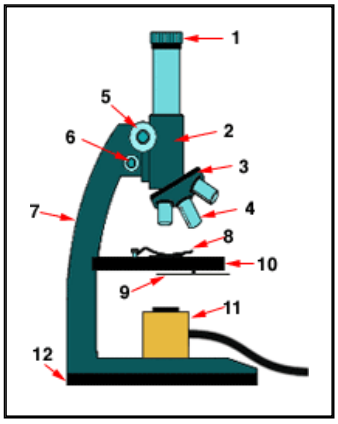
○A) spring
○B) summer
○C) fall
○D) winter

8. An ion that has 18 e^{-} and a net charge of +2

○A) has 18 protons
○B) is an anion
○C) has the same number of electrons as an argon atom
○D) has 16 protons

9. A vertical column on the periodic table is called

○A) a period
○B) a group
○C) a non-metal
○D) a metal

10. 

What is the name of the part labelled as number 4?

○A) coarse focus
○B) fine focus
○C) objective lens
○D) stage clip

11. Refer to the information in question 10.

What is the name of the part labelled as number 9?

○A) lamp
○B) iris
○C) base
○D) stage

12. Which of the following is the most common form of iron ion?

○A) Fe^{2+}
○B) Fe^{4+}
○C) Fe^{3+}
○D) Fe

13. The type of organelle that is responsible for storage within the cell is the

○A) endoplasmic reticulum
○B) vacuole
○C) nucleolus
○D) lysosome

14. What is the deceleration of a truck travelling at +22.5 m/s that is slowed down to +5.0 m/s in 4.80 s?

○A) 100 m/s^2
○B) 5.73 m/s^2
○C) 3.65 m/s^2
○D) 3.94 m/s^2

15. Which biome would be characterized with the largest number of different species of plants?

○A) deciduous forest
○B) rain forest
○C) grasslands
○D) tundra

16. The second shell in an atom has a maximum of how many electrons?

○A) 16
○B) 8
○C) 2
○D) 18

17. **Efficiency of Lamps**

Bulb Type	Efficiency(%)
Incandescent light bulb	~5%
Quartz-halogen light bulb	~18%
Fluorescent light bulb	~22%
Light emitting diode (LED)	~35%

Which of the following bulbs would give off the most light if given the same amount of input energy?

○A) Incandescent light bulb
○B) Quartz-halogen light bulb
○C) Fluorescent light bulb
○D) Light emitting diode (LED)

18. What are the products of the following reaction?

$Pb + 2AgNO_3 \longrightarrow$?

○A) lead and silver nitrate
○B) silver and lead (II) nitrate
○C) lead, oxygen, nitrogren, and silver
○D) lead, nitrate, and silver

19. Passive transport through cell membranes requires

○A) ATP
○B) energy from glucose
○C) energy from ADP
○D) no energy

20. Which of the following forces is responsible for the bond between H and O in a water molecule?

○A) ionic
○B) covalent
○C) nuclear
○D) intermolecular

21. Which type of system does a permeable membrane create?

○A) an open system
○B) a closed system
○C) an isolated system
○D) a partially open system

22. Given $Al_2(SO_3)_3 + BaF_2 \longrightarrow BaSO_3 + AlF_3$, what is the reaction type?

○A) single replacement
○B) double replacement
○C) combustion
○D) decomposition

23. The molar mass of aluminum hydroxide is

○A) 100.01 g/mol
○B) 78.01 g/mol
○C) 61.00 g/mol
○D) 43.99 g/mol

24.

Ion	**Group 1 NH_4^+ H_3O^+ (H^+)**	**ClO_3^- NO_3^- ClO_4^-**	**CH_3COO^-**	**Cl^- Br^- I^-**	**SO_4^{2-}**	**S^{2-}**	**OH^-**	**PO_4^{3-} PO_3^{3-} CO_3^{2-}**
Very Soluble	all	all	most	most	most	Only: Group 1 Group 2	Only with: Group 1 NH_4^+ Sr^{2+} Ba^{2+}	Only with: Group 1 NH_4^+
Slightly Soluble	none	none	Only: Ag^+ Hg_2^{2+}	Only: Ag^+ Hg_2^{2+} Hg^{2+} Pb^{2+} Cu^+	Only: Ag^+ Ca^{2+} Sr^{2+} Pb^{2+} Ba^{2+}	most	most	most

Which one of the following salts is least soluble in water?

○A) NaCl
○B) Hg_2Cl_2
○C) NH_4Cl
○D) $CaCl_2$

25. A X^+ ion would be classified as a

○A) cation
○B) anion
○C) non-metal
○D) metal

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Physics 20, Entire Course, 25 Questions

Please wait until the exam has fully loaded in your web browser before starting. **Do not** press "Submit" at the end of the exam until you are sure of your responses, as your test will be graded immediately. Good luck!

1. A pendulum bob of mass 2.15 kg is raised 3.00 cm above the equilibrium position. Once released, how fast will it be travelling when it passes through the equilibrium position?

   ○A) 7.7 m/s
   ○B) 59 cm/s
   ○C) 77 cm/s
   ○D) 0.43 m/s

2. During an experiment, a student sent a 0.65 m wave down a spring. If the frequency of this wave is 4.0 Hz, what is the wave's speed?

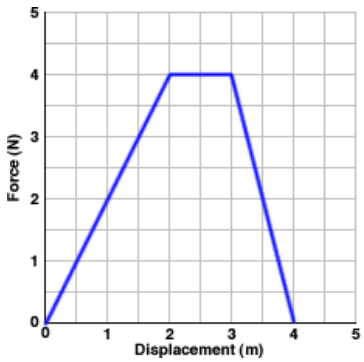
   ○A) 2.6 m/s
   ○B) 6.2 m/s
   ○C) 0.16 m/s
   ○D) 0.38 m/s

3. A node is where two or more waves produce

   ○A) constructive interference with no displacement
   ○B) destructive interference with no displacement
   ○C) destructive interference with maximum amplitude
   ○D) constructive interference with maximum amplitude

4. If a truck moving at 15.0 km/h accelerates at 2.50 m/s^2 to 60.0 km/h, how long does it take?

   ○A) 8.33 s
   ○B) 18.0 s
   ○C) 5.00 s
   ○D) 30.0 s

5. 

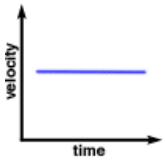
   The total work done by the object represented in the graph is

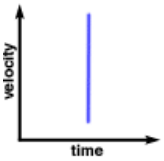
   ○A) 16 J
   ○B) 40 J
   ○C) 10 J
   ○D) 80 J

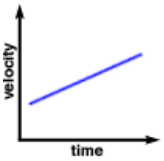
6. A car moving at 16.2 m/s in a straight line is accelerated at 7.00 m/s^2 to a velocity of 35.4 m/s. The time taken to attain this velocity is

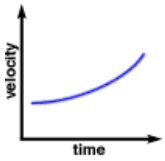
   ○A) 2.74 s
   ○B) 1.96 s
   ○C) 5.26 s
   ○D) 7.37 s

7. Which graph represents an object undergoing uniformly accelerated motion?

○A)


○B)


○C)


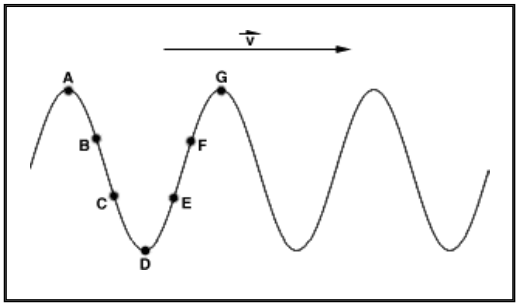
○D)


8. A roller coaster of mass 800 kg is raised to a height of 15.0 m above the ground. How much work was required (ignoring friction)?

○A) 1.18×10^5 J
○B) 800 J
○C) 7.85×10^3 J
○D) 1.20×10^4 J

9. An object was subjected to several forces: 50N from the east, 40N from the south, 85N from the west, and 55N from the north. What size is the resultant force?

○A) 230 N
○B) 38 N
○C) 21 N
○D) 15 N

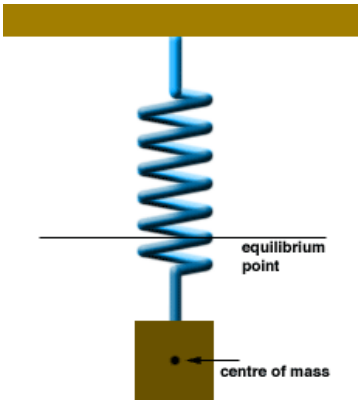
10.


Which of the following points would be moving downwards?

○A) A and C
○B) E and F
○C) B and C
○D) D, E, and F

11.

The diagram shows a mass on a spring oscillating around its equilibrium point with simple harmonic motion. The mass has reached its maximum downward displacement.



The velocity and the force on the mass are, respectively,

○A) maximum, maximum
○B) minimum, maximum
○C) minimum, minimum
○D) maximum, minimum

12. From the top of a cliff 40 m high, a ball is thrown horizontally at a velocity of 15 m/s. What distance from the base of the cliff does the ball hit the ground?

○A) 122 m
○B) 43 m
○C) 2.9 m
○D) 40 m

13. A 256 Hz tuning fork and a 272 Hz tuning fork are struck at the same time. The beat frequency is

○A) 12 Hz
○B) 8 Hz
○C) 26 Hz
○D) 16 Hz

14. A ball is kicked at a velocity of 35 m/s at an angle of 20° with the ground. After how long does the ball reach its greatest height?

○A) 3.4 s
○B) 3.6 s
○C) 1.2 s
○D) 12 s

15. An object travelling in a straight line at 50 m/s accelerates at $-4.5\ m/s^2$ for 8.5 s. The final velocity of the object is

○A) 50 m/s
○B) 88 m/s
○C) 38 m/s
○D) 12 m/s

16. Which of the following quantities is a *scalar* quantity?

○A) acceleration
○B) work
○C) velocity
○D) force

17. A 2.8×10^3 kg truck is travelling through a highway curve that has a radius of 170 m. If the coefficient of friction between the highway and the truck's tires is 0.45, what is the maximum speed, in km/h, that the truck can go before sliding off of the road?

○A) 208 km/h
○B) 27 km/h
○C) 58 km/h
○D) 99 km/h

18. A student weighing 350 N stands on a lab scale in a moving elevator. At one point during the experiment the reading on the scale is 300 N. What inference can be made about the motion of the elevator?

○A) The elevator is stationary.
○B) The elevator is moving at constant velocity upwards.
○C) The elevator is accelerating upwards.
○D) The elevator is accelerating downwards.

19. A student driving his 1.70×10^3 kg car at 85.0 km/h presses on the brake and slows down to 50.0 km/h. If the average net force applied by the car's brakes during this time interval is 3.80×10^3 N, what is the braking distance in metres?

○A) 81.6 m
○B) 130.2 m
○C) 98.8 m
○D) 1057 m

20. An object vibrating at the end of a spring has maximum acceleration when

○A) the object is at $x = 0$.
○B) the object is at the equilibrium position.
○C) the object is at maximum velocity.
○D) the object is at the spring's maximum displacement.

21. In a ripple tank, a wave travels from deep to shallow water. Which of the following would occur during this transition?

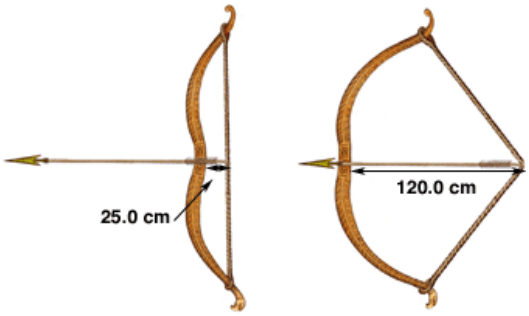
○A) The speed and wavelength of the waves would increase
○B) The frequency and wavelength of the waves would increase
○C) The frequency and wavelength of the waves would decrease
○D) The speed and wavelength of the waves would decrease

22. In a ripple tank, a wave travels from shallow to deep water. Which of the following would occur during this transition?

○A) The speed and wavelength of the waves would increase
○B) The frequency and wavelength of the waves would decrease
○C) The frequency and wavelength of the waves would increase
○D) The speed and wavelength of the waves would decrease

23.

A "draw" is the distance that an archer pulls back an arrow. For the bow shown, a force of 180 N is required to pull by the amount indicated.



The maximum speed of a 22.5 g arrow leaving this bow from a full draw is

○A) 98.0 m/s
○B) 123 m/s
○C) 87.2 m/s
○D) 139 m/s

24. A ball rolls on top of a lab table at a constant velocity of 2.5 m/s and then falls off the edge. After 0.45 s of free fall, the vertical velocity of the ball is

○A) 2.5 m/s
○B) 6.9 m/s
○C) 4.4 m/s
○D) 8.8 m/s

25. Which of the following are correct units for kinetic energy?

- ○ A) $kg \cdot m/s$
- ○ B) $kg \cdot m^2/s^2$
- ○ C) $kg \cdot m/s^2$
- ○ D) $0.5\ kg \cdot m/s$

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Physics 20, Entire Course, 25 Questions

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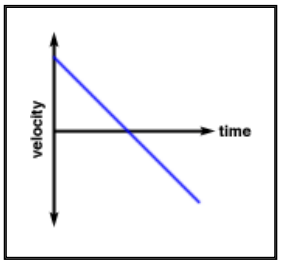
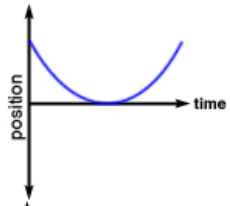
1. Which of the following quantities is a *vector* quantity?

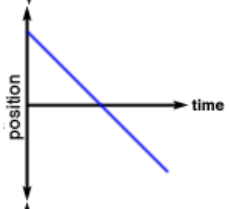
   ○A) distance
   ○B) displacement
   ○C) potential energy
   ○D) work

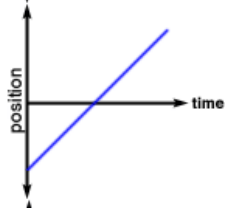
2. 

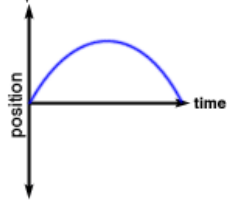
   The graph above describes the velocity of an object that has been thrown vertically into the air.

   Which graph represents the displacement of the object?

   ○A) 

   ○B) 

   ○C) 

   ○D) 

3. What is the acceleration of a truck travelling in a straight line at +31.5 m/s that is slowed down to +7.0 m/s in 4.75 s?

   ○A) –5.16 m/s^2
   ○B) +8.10 m/s^2

○C) +5.16 m/s^2
○D) –8.10 m/s^2

4. A parked truck slips out of gear and rolls over a cliff of height *h*. When the truck hits the base of the cliff, what is its velocity? Neglect the truck's velocity at the beginning of the fall.

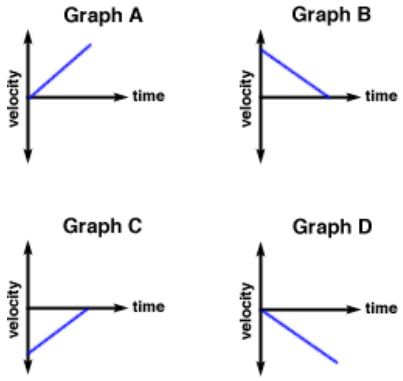
○A) $(2gh)^{0.5}$
○B) $0.5mv^2$
○C) mgh
○D) $2gh$

5. A student weighing 350 N stands on a lab scale in a moving elevator. At one point during the experiment the reading on the scale is 300 N. What inference can be made about the motion of the elevator?

○A) The elevator is moving at constant velocity upwards.
○B) The elevator is accelerating upwards.
○C) The elevator is stationary.
○D) The elevator is accelerating downwards.

6.

The graphs describe objects travelling in a straight line with different accelerations.



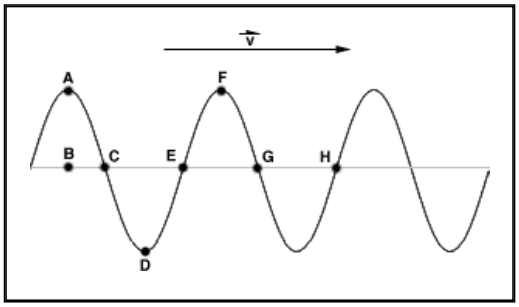
Which graphs represent objects travelling with a negative acceleration?

○A) C and D
○B) A and C
○C) B and C
○D) B and D

7. A vehicle decelerating at 7.0 m/s^2 travels a distance of 550 m in 6.0 s. The initial velocity of the vehicle was

○A) 126 m/s
○B) 92 m/s
○C) 71 m/s
○D) 113 m/s

8.



The period of the wave can be found by measuring the time it takes the wave to travel from

○A) point A to point D
○B) point C to point G

○C) point E to point F
○D) point B to point C

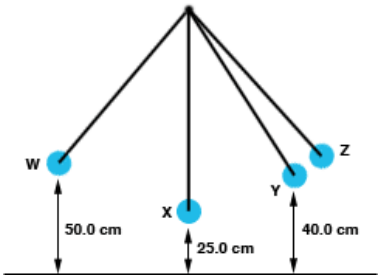
9. Refer to the information in question 8.

The wavelength of the wave can be found by measuring the distance between

○A) A and C, E and F, F and G
○B) A and F, C and G, E and H
○C) C and E, G and H
○D) B and E

10.

A student constructed a pendulum using a 1.0 kg ball attached to a string 70 cm long. The ball was pulled back and released from Point W. It made one swing to Point Z and is shown at various heights above a table.



The speed of the pendulum bob at point X is

○A) 4.91 m/s
○B) 2.21 m/s
○C) 9.81 m/s
○D) 3.13 m/s

11.

The graph shows the change in position of an object over a 8.0 s period.

According to the graph, the object is moving fastest through which one of the following time intervals?

○A) 0 s to 1 s
○B) 2 s to 3 s
○C) 5 s to 6 s
○D) 4 s to 5 s

12. An object on the end of a string is whirled around with uniform circular motion in the horizontal plane. The acceleration of the object is directed toward the

○A) center of the motion in the direction of the string.
○B) direction the object is travelling.
○C) tangent of the curve the object is travelling on.
○D) outside of the circle in the direction of the string.

13. In a system, resonance occurs when an external vibration causes a vibration with a large

○A) velocity
○B) wavelength
○C) amplitude
○D) frequency

14.

The diagram shows three 25.0 kg carts tied together, pulled by a force of 600 N.

What are the tensions in the ropes between the carts?

○A) 500 N between X and Y and 100 N between Y and Z
○B) 600 N between X and Y and 300 N between Y and Z
○C) 400 N between X and Y and 200 N between Y and Z
○D) 300 N between X and Y and 300 N between Y and Z

15. A box is pushed along a floor with a force of 32.0 N through a distance of 11.0 m. The work done on the box is

○A) 352 J
○B) 2.91 J
○C) 35.9 J
○D) 3.45×10^3 J

16. When an object on a spring vibrates through the equilibrium position, it has

○A) maximum velocity
○B) no energy
○C) zero velocity
○D) maximum potential energy

17. Which of the following quantities is a scalar quantity?

○A) force
○B) velocity
○C) work
○D) acceleration

18. Which of the following are correct units for potential energy?

○A) N·m
○B) kg·m/s
○C) $kg\cdot m^2/s$
○D) $kg\cdot m/s^2$

19. A student driving his 1.70×10^3 kg car at 85.0 km/h presses on the brake and slows down to 50.0 km/h. If the average net force applied by the car's brakes during this time interval is 3.80×10^3 N, what is the braking distance in metres?

○A) 81.6 m
○B) 98.8 m
○C) 130.2 m
○D) 1057 m

20. A 2.8×10^3 kg truck is travelling through a highway curve that has a radius of 170 m. If the coefficient of friction between the highway and the truck's tires is 0.45, what is the maximum speed, in km/h, that the truck can go before sliding off of the road?

○A) 99 km/h
○B) 208 km/h
○C) 27 km/h
○D) 58 km/h

21. A 62 kg student rides up in an elevator with an acceleration of 2.0 m/s^2. During the time of this acceleration, what is his apparent weight?

○A) 608 N
○B) 484 N
○C) 124 N
○D) 732 N

22. On an inclined plane, an object starting at rest rolls to the bottom in 5.0 s. At what time would the object be rolling at its average speed?

○A) 2.5 s
○B) 10.0 s
○C) 0.0 s
○D) 5.0 s

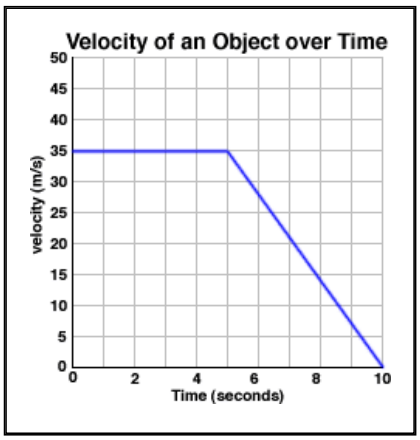
23. A 3.20×10^{3} kg truck starts from rest and accelerates for 27.0 s. If the truck travels with constant acceleration for a distance of 280 m, what force is exerted on the truck during this time interval?

○A) 2.46×10^{3} N
○B) 3.47×10^{3} N
○C) 6.63×10^{4} N
○D) 1.23×10^{3} N

24. In a longitudinal wave, a region of low particle density occurs as a

○A) compression
○B) trough
○C) crest
○D) rarefaction

25.



In the time interval described by the graph, the total displacement of the object is

○A) 350 m
○B) 263 m
○C) 87.5 m
○D) 175 m

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Scholars Of Calgary Northwest

Physics 20, Entire Course, 25 Questions

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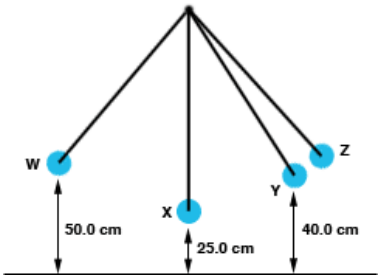
1. In diagrams of wave reflection, the normal is the

   ○A) line drawn perpendicular to the reflecting surface
   ○B) line drawn parallel to the reflecting surface
   ○C) angle of the reflected wave from the surface
   ○D) angle from the wave to the reflecting surface

2. A student constructed a pendulum using a 1.0 kg ball attached to a string 70 cm long. The ball was pulled back and released from Point W. It made one swing to Point Z and is shown at various heights above a table.



   The kinetic energy of the pendulum bob at point Z is

   ○A) 0.98 J
   ○B) 0 J
   ○C) impossible to determine
   ○D) 2.44 J

3. A sailboat is trapped in the middle of a large lake with no wind. If a portable electric fan (and battery to power it) were available, how should it be used to get the sailboat back to shore?

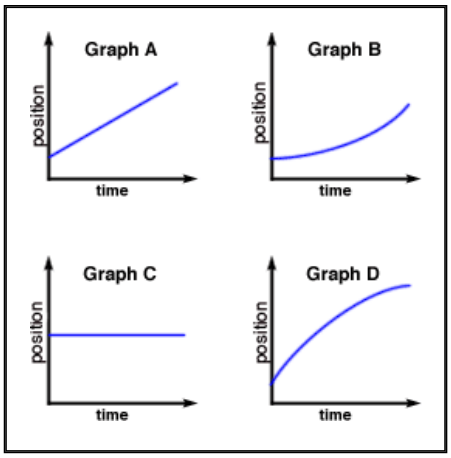
   ○A) Point the fan directly towards the back of the sail, from the back of the boat.
   ○B) Drop the fan into the water and use as a propeller.
   ○C) Point the fan towards the back of the boat from the back of the boat.
   ○D) Point the fan directly towards the front of the sail, from the front of the boat.

4. At the top of a 250 m cliff above a river, a hiker drops a 2.50 kg backpack over the edge.

   At what speed would the backpack impact the water?

   ○A) 49.5 m/s
   ○B) 35.0 m/s
   ○C) 78.3 m/s
   ○D) 70.0 m/s

5.



Which graph represents the linear motion of an object that is decreasing its velocity?

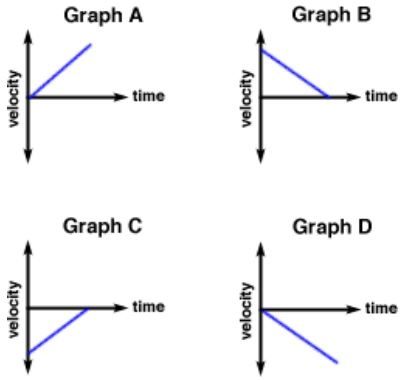
- A) C
- B) D
- C) B
- D) A

6. When an object on a spring vibrates through the equilibrium position, it has

- A) maximum potential energy
- B) no energy
- C) maximum velocity
- D) zero velocity

7.

The graphs describe objects travelling in a straight line with different accelerations.



Which graphs represent objects decreasing in speed?

- A) B and C
- B) A and D
- C) A and B
- D) C and D

8. A truck with a mass of 2.00×10^4 kg is travelling at 120.0 km/h. If the driver reduces the truck's speed to 50.0 km/h, then the truck's kinetic energy has changed by

- A) 4.90×10^7 J
- B) 9.18×10^6 J
- C) 3.78×10^6 J
- D) 1.19×10^8 J

9. In a ripple tank, a wave travels from shallow to deep water. Which of the following would occur during this transition?

- A) The frequency and wavelength of the waves would increase
- B) The speed and wavelength of the waves would increase

○C) The speed and wavelength of the waves would decrease
○D) The frequency and wavelength of the waves would decrease

10. A student driving his 1.70×10^3 kg car at 85.0 km/h presses on the brake and slows down to 50.0 km/h. If the average net force applied by the car's brakes during this time interval is 3.80×10^3 N, what is the braking distance in metres?

○A) 98.8 m
○B) 130.2 m
○C) 81.6 m
○D) 1057 m

11.

The graph shows the change in position of an object over a 8.0 s period.

According to the graph, the object is moving slowest during which one of the following time intervals?

○A) 0 s to 1 s
○B) 2 s to 3 s
○C) 6 s to 7 s
○D) 4 s to 5 s

12. Newton's First Law of Motion states that an object will

○A) repel another object with a force proportional to the force given to it
○B) create an equal and opposite reaction force when an external force is exerted on it
○C) accelerate when a net force is applied to it
○D) stay at rest or in uniform motion unless an net force acts on it

13. Which statement describes some features of Newton's second law of motion?

○A) An object will experience a larger acceleration as the net force increases or mass decreases.
○B) A force that acts on an object produces an equal and opposite net force.
○C) An object at rest tends to remain at rest unless acted on by a net force.
○D) An object in motion tends to maintain that motion unless acted on by a net force.

14. If a ball thrown westward hits a wall with a force of 20 N, what force does the wall exert on the ball?

○A) 40 N westward
○B) 20 N eastward
○C) 40 N eastward
○D) 20 N westward

15. A tug-of-war team pulls on a long rope being held by another team. If they exert a force of 150 N and the other team pulls back with a force of 150 N, what is the tension in the rope?

○A) 0 N
○B) 300 N
○C) 600 N
○D) 150 N

16. A student was given the following observations of a truck.

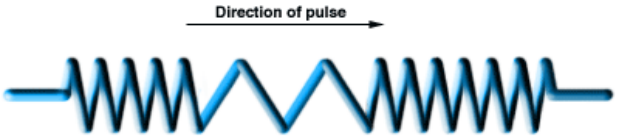
1. The truck changes speed travelling around a curve.
2. The truck coasts around a curve at a constant speed.

3. The truck decreases speed while moving in a straight line.
4. The truck coasts down an incline at constant speed.

Which observations represent acceleration?

○A) 1, 2, and 3 only
○B) 1, 2, 3, and 4
○C) 2 and 4 only
○D) 1 and 2 only

17. Which of the following describes the pulse as it moves along the spring?



○A) the motion of the particles is parallel to the direction of the pulse
○B) the speed of the pulse changes as it moves towards the right
○C) the motion of the particles is at right angles to the direction of the pulse
○D) the amplitude changes as it moves towards the right

18. A baseball is hit with a velocity of 25.0 m/s at an angle of 37.0° with the ground. When the ball reaches its maximum height, what is the horizontal distance from where it was hit?

○A) 30.5 m
○B) 25.0 m
○C) 23.1 m
○D) 61.2 m

19. What is the frequency of a pendulum with a length of 0.850 m?

○A) 1.83 Hz
○B) 0.544 Hz
○C) 0.541 Hz
○D) 1.85 Hz

20. In a system, resonance occurs when an external vibration causes a vibration with a large

○A) velocity
○B) frequency
○C) wavelength
○D) amplitude

21. An object is thrown up from the roof of a building at 22.0 m/s and falls over the side of the building. It strikes the ground 6.00 s after being thrown. The height of the building is

○A) 103 m
○B) 44.4 m
○C) 177 m
○D) 132 m

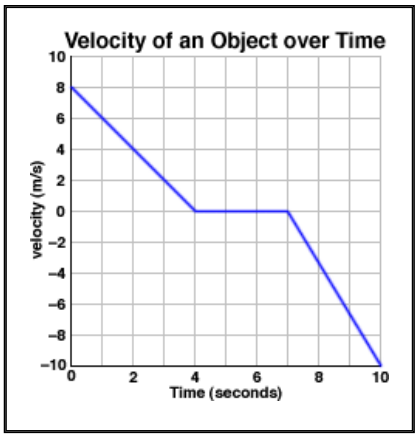
22. In still water, a person can paddle a canoe at 2.5 m/s. They wish to cross a river which flows at 5.5 m/s and is 120 m wide. If the person points the canoe directly across the river, then the time required to cross is

○A) 48 s
○B) 15 s
○C) 22 s
○D) 20 s

23. Two balls, A and B, are thrown off a cliff. Ball A is thrown vertically upward at a velocity of 5 m/s and Ball B is thrown vertically downward at a velocity of 5 m/s. Air resistance is neglected. On reaching the bottom of the cliff, how does the velocity of Ball A compare to the velocity of Ball B?

○A) Twice that of Ball B
○B) Less than Ball B
○C) One half of Ball B
○D) Equal to Ball B

24.



The graph describes the motion of an object moving in a straight line. At the beginning it is going north. What is the total displacement represented by the graph?

- ○ A) 0.0 m
- ○ B) 2.0 m [S]
- ○ C) 2.0 m [N]
- ○ D) 1.0 m [N]

25. A pendulum bob of mass 2.15 kg is raised 3.00 cm above the equilibrium position. Once released, how fast will it be travelling when it passes through the equilibrium position?

- ○ A) 77 cm/s
- ○ B) 59 cm/s
- ○ C) 0.43 m/s
- ○ D) 7.7 m/s

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Physics 20, Entire Course, 25 Questions

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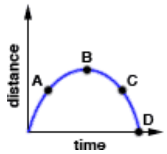
1. An elevator with a mass of 1.5×10^3 kg accelerates upward at 2.5 m/s^2. What is the tension in the elevator cable?

   ○A) 3.8×10^3 N
   ○B) 1.5×10^4 N
   ○C) 1.1×10^4 N
   ○D) 1.8×10^4 N

2. The mass of an object can be defined as the

   ○A) measure of the inertia of the object.
   ○B) amount of volume taken up by the object.
   ○C) density of material in the object.
   ○D) force of attraction on the object by gravity.

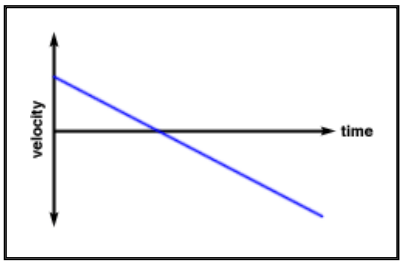
3. Which of the following is true of the graph below, representing a ball thrown in the air?



   ○A) The potential energy is lowest at point B.
   ○B) The potential energy is greatest at point D.
   ○C) The potential energy is the same at points A and C.
   ○D) The potential energy is the same at points B and C.

4. A bungee jumper who jumps from a 100.0 m high platform stops at a distance of 8.0 m from the ground. The energy transformations would best be described as

   ○A) E_p changes to E_k, then changes to E_p with no loss of energy due to friction.
   ○B) E_p changes to E_k, then changes to E_{spring} with a loss of energy due to friction.
   ○C) E_p changes to E_k, then the final energy is 0.
   ○D) E_p changes to E_{spring} with a loss of energy due to friction.

5. 

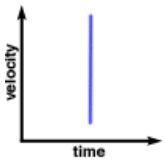
   According to the graph, the object could be considered to

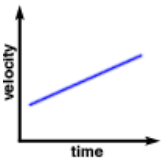
   ○A) speed up then slow down.
   ○B) travel north, change direction, and then not make it back to its starting point.
   ○C) travel east, change direction, and travel west farther than the starting point.
   ○D) slow down then speed up.

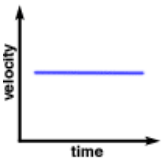
6. The Moon takes approximately 27.3 days to circle the Earth and its centre is located 3.83×10^8 m from the centre of the Earth. What is the Moon's acceleration?

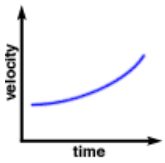
○A) 0.230 m/s^2
○B) 2.72×10^{-3} m/s^2
○C) 2.66×10^{-6} m/s^2
○D) 9.81 m/s^2

7. Which graph represents an object undergoing uniformly accelerated motion?

○A)


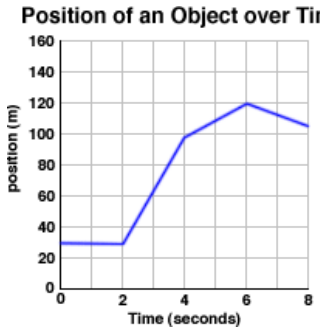
○B)


○C)


○D)


8.

The graph shows the change in position of an object over a 8.0 s period.



According to the graph, the object is moving fastest through which one of the following time intervals?

○A) 2 s to 3 s
○B) 0 s to 1 s
○C) 4 s to 5 s
○D) 5 s to 6 s

9. Refer to the information in question 8.

According to the graph, the object is moving slowest during which one of the following time intervals?

○A) 0 s to 1 s
○B) 2 s to 3 s
○C) 4 s to 5 s
○D) 6 s to 7 s

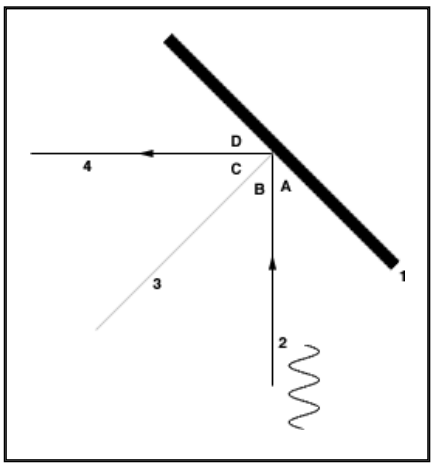
10. A pendulum swings back and forth 50 times in 1.00 min. What is the period of this motion?

- ○A) 50 s
- ○B) 1.2 s
- ○C) 0.83 s
- ○D) 0.020 s

11. Which of the following quantities is a scalar quantity?

- ○A) acceleration
- ○B) force
- ○C) work
- ○D) velocity

12.



Which of the following angles would *always* add up to 90°?

- ○A) A and B
- ○B) A and D
- ○C) B and C
- ○D) 1 and 3

13. In still water, a person can swim at a speed of 1.4 m/s. She swims perpendicularly across a 62 m wide river, landing 45 m downstream. In crossing the river, what was her displacement?

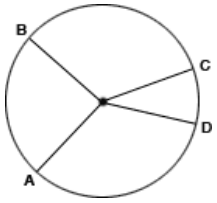
- ○A) 62 m
- ○B) 107 m
- ○C) 45 m
- ○D) 77 m

14. A dart in a dart gun is shot straight up. What can be said about the dart when it is at the highest point in its trajectory?

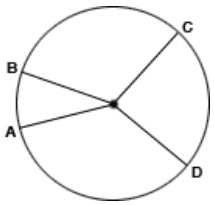
- ○A) The velocity of the dart is equal to the velocity at which it will eventually impact the ground.
- ○B) The kinetic energy of the dart is 0.
- ○C) The kinetic and potential energy are equal.
- ○D) The potential energy of the dart is 0.

15. If a planet moves from A to B in the same amount of time as from C to D, which diagram represents Kepler's law of areas for a planet revolving around the Sun?

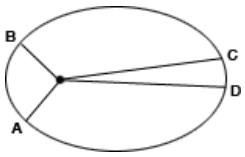
○A)



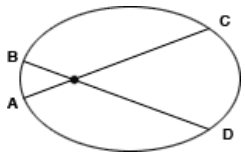
○B)



○C)



○D)



16. A ball is thrown straight up into the air with a velocity of +23.5 m/s. After 4.5 s, the velocity of the ball is

○A) +44.1 m/s
○B) –44.1 m/s
○C) +20.6 m/s
○D) –20.6 m/s

17. A pendulum bob of mass 2.00 kg is raised above the equilibrium position. Once released, it travels at 120 cm/s when it passes through the equilibrium position. What was the starting height?

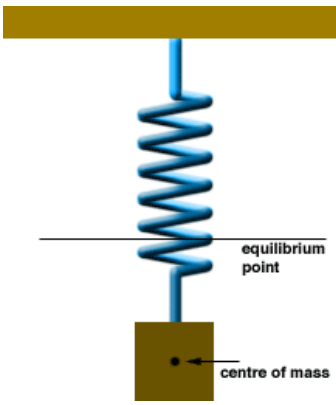
○A) 7.34 cm
○B) 6.12 cm
○C) 12.2 cm
○D) 14.6 cm

18. A box is pushed along a floor with a force of 32.0 N through a distance of 11.0 m. The work done on the box is

○A) 2.91 J
○B) 352 J
○C) 3.45×10^3 J
○D) 35.9 J

19.

The diagram shows a mass on a spring oscillating around its equilibrium point with simple harmonic motion. The mass has reached its maximum downward displacement.



The acceleration and force on the mass are, respectively,

○A) maximum, minimum
○B) maximum, maximum
○C) minimum, maximum
○D) minimum, minimum

20. Refer to the information in question 19.

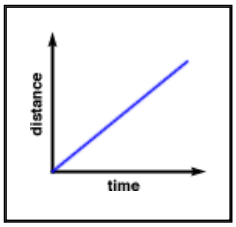
The kinetic and potential energy of the mass are, respectively,

- ○ A) minimum, maximum
- ○ B) maximum, minimum
- ○ C) minimum, minimum
- ○ D) maximum, maximum

21. Which of the following are correct units for work?

- ○ A) $kg \cdot m/s^2$
- ○ B) $kg \cdot m/s^2 \cdot m$
- ○ C) N/m
- ○ D) $kg \cdot m/s$

22.



Which event could the graph be illustrating?

- ○ A) The motion of a sports car starting from rest and increasing its speed.
- ○ B) The motion of a laboratory tractor moving with uniform motion.
- ○ C) A ball rolling down a ramp.
- ○ D) An object falling from the top of a building.

23. A ball is hit with a velocity of 40.0 m/s at an angle of 32.0° with the ground. What is the maximum height reached by the ball?

- ○ A) 58.6 m
- ○ B) 22.9 m
- ○ C) 45.8 m
- ○ D) 21.9 m

24. An object is thrown up from the roof of a building at 22.0 m/s and falls over the side of the building. It strikes the ground 6.00 s after being thrown. The height of the building is

- ○ A) 44.4 m
- ○ B) 177 m
- ○ C) 103 m
- ○ D) 132 m

25. The frequency of middle C is 256 Hz and its wavelength is 1.35 m in room temperature air. At what speed does the vibration travel?

- ○ A) 190 m/s
- ○ B) 346 m/s
- ○ C) 343 m/s
- ○ D) 320 m/s

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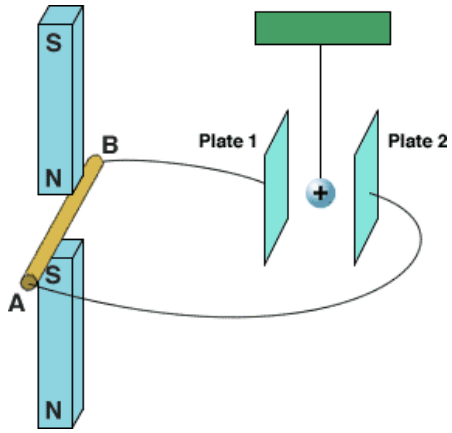
Physics 30, Entire Course, 25 Questions

Please wait until the exam has fully loaded in your web browser before starting. **Do not** press "Submit" at the end of the exam until you are sure of your responses, as your test will be graded immediately. Good luck!

1. The process of induced charge separation involves the

   ○A) removal of charge
   ○B) addition of charge
   ○C) redistribution of charge
   ○D) addition and redistribution of charge

2. 

   A wire **AB** is located in a strong magnetic field and is connected to two parallel metal plates, 1 and 2, between which a light, positively-charged conducting sphere is hung on an insulating thread.

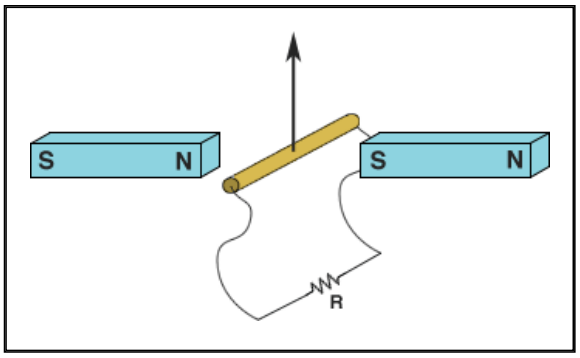
   With wire **AB** at rest, the charged sphere is moved so as to touch Plate 2. The wire **AB** will experience a force which will tend to move it:

   ○A) to the left
   ○B) to the right
   ○C) upward
   ○D) downward

3. The volt is the SI unit of potential difference. This is the same as

   ○A) N·m
   ○B) N/C
   ○C) J/C
   ○D) V/m

4.



The bar in the diagram is moving up through the magnetic field. The force, due to Lenz's law, acts:

- ○A) upward
- ○B) downward
- ○C) into the page
- ○D) out of the page

5. An expanding magnetic field must produce:

- ○A) accelerated charges.
- ○B) an electric charge.
- ○C) a current.
- ○D) an electric field.

6. In the photoelectric equation, the symbol *W* represents the

- ○A) minimum energy needed to release an electron from the metal
- ○B) stopping voltage of the emitted electron
- ○C) wavelength of the electromagnetic equation
- ○D) energy of the target metal

7. The number of excess electrons on a ball that has a charge of -2.01×10^{-16} C, expressed as scientific notation, is $\mathbf{a.bc \times 10^{d}}$. The values of **a**, **b**, **c**, and **d** are _____ , _____ , _____ , and _____.
Write the four digits separated by commas, in the blank provided

8. The electric field strength 2.5×10^{-10} m from an alpha particle is

- ○A) 4.6×10^{10} N/C
- ○B) 11.5 N/C
- ○C) 2.3×10^{10} N/C
- ○D) 5.8 N/C

9. An electric motor is basically the same as an electric generator, but a motor converts

- ○A) electrical energy to EMR
- ○B) electrical energy to mechanical energy
- ○C) mechanical energy to EMR
- ○D) mechanical energy to electrical energy

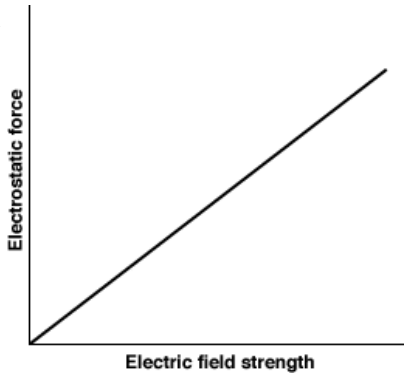
10. The number of decays per second in a sample of radioactive material is its

- ○A) half-life
- ○B) activity
- ○C) gamma decay
- ○D) quark

11. If a metal leaf electroscope is charged positively, and then a negatively charged rod is slowly brought near the top of the electroscope, the leaves will

- ○A) slowly diverge further.
- ○B) immediately converge and later collapse.
- ○C) slowly diverge and later collapse.
- ○D) slowly collapse

12.



The slope on the graph represents

○A) Coulomb's Law
○B) the distance between two parallel charged plates
○C) the magnitude of the charge on a particle in an electric field
○D) the voltage between two plates

13. A voltage of 1.50 V is induced in a 30.0 m long wire as it moves perpendicularly to a 3.50×10^{-3} T magnetic field. At what speed is the wire moving?

○A) 14.2 m/s
○B) 0.158 m/s
○C) 571 m/s
○D) 7.78×10^{-5} m/s

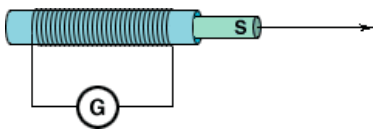
14. Which of the following types of radioactive decay occurs when a neutron is changed to a proton within a nucleus?

○A) alpha decay
○B) beta decay
○C) gamma decay
○D) both A and B

15. The energy of an electron in the fourth energy level of hydrogen (to the nearest hundredth) is _____ eV.

16.

The diagram shows a permanent bar magnet moving out of an open-core solenoid.



As the permanent magnet is withdrawn from the solenoid as shown in the diagram, it will induce a

○A) north pole in the solenoid on its left and a conventional current in the galvanometer from left to right
○B) south pole in the solenoid on its left and a conventional current in the galvanometer from left to right
○C) north pole in the solenoid on its right and a conventional current in the galvanometer from right to left
○D) south pole in the solenoid on its right and a conventional current in the galvanometer from right to left

17. A photon has a momentum of 3.5×10^{-22} N·s. The frequency of the photon, expressed in scientific notation, is $\mathbf{a}.\mathbf{b}\times 10^{\mathbf{cd}}$ Hz. The values of **a**, **b**, **c**, and **d** are _____ , _____ , _____ , and _____ .
Write your answer as a four digit number

18. In a photoelectric effect experiment, some students *increased* the intensity of the electromagnetic radiation on a photocell, while keeping its *frequency* constant. Which of the following is true?

○A) I = Increase, E_k = Increase
○B) I = Increase, E_k = No change
○C) I = No change, E_k = Increase
○D) I = No change, E_k = No change

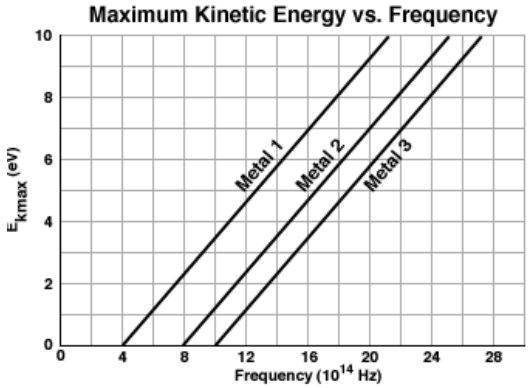
19. A photoelectric current is produced by an incident light striking the cathode of a photocell with a work function of 2.70×10^{-19}J. If 15.8 V are required to cut off the flow of photoelectrons, what is the frequency of the incident light?

○A) 3.21×10^{15} Hz
○B) 3.13×10^{15} Hz
○C) 4.23×10^{15} Hz
○D) 4.33×10^{15} Hz

20. A Michelson-Morley experiment is set up. If an eight-sided mirror is rotating at 560 revolutions per second, and the light travels out 37.0 km and back, then what is the calculated speed of light?

○A) 1.66×10^8 m/s
○B) 3.32×10^8 m/s
○C) 3.00×10^8 m/s
○D) 4.14×10^8 m/s

21.



The graph above shows the maximum kinetic energy of photoelectrons emitted from three different metals

Which of the metals will emit photoelectrons when illuminated by visible light?

○A) 1 only
○B) 1 and 2 only
○C) 3 only
○D) 1, 2, and 3

22. The energy of an electron in the sixth energy level of hydrogen (to the nearest hundredth) is _____ eV.

23. A charge of 2.0×10^{-6} C experiences a force of 8.0×10^{-2} N at a certain point in an electric field. The strength of the field at this point is _____ N/C.

○A) 2.0×10^6
○B) 4.0×10^4
○C) 2.5×10^{-5}
○D) 1.6×10^{-7}

24. If an object is placed 10.0 cm in front of a concave mirror with a focal length 5.00 cm, what are the characteristics of the image?

○A) The image is larger, inverted, and virtual
○B) The image is smaller, inverted, and real

○C) The image is the same size, inverted, and real
○D) No image can be formed at this point

25. Convex lenses cause

○A) parallel light waves to diverge from a virtual focal point
○B) parallel light waves to converge to a focal point
○C) virtual images to appear on the opposite side of the lens
○D) real images to appear on the same side of the lens

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Physics 30, Entire Course, 25 Questions

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1. In an inelastic collision between two bodies

   ○A) momentum is not conserved
   ○B) kinetic energy is conserved
   ○C) neither momentum nor kinetic energy is conserved
   ○D) momentum is conserved but kinetic energy is not conserved

2. If $^{228}_{88}\text{Ra}$ emits an alpha particle, the decay product is:

   ○A) $^{232}_{90}\text{Th}$

   ○B) $^{224}_{86}\text{Rn}$

   ○C) $^{222}_{86}\text{Ra}$

   ○D) $^{224}_{84}\text{Po}$

3. The volt is the SI unit of potential difference. This is the same as

   ○A) N·m
   ○B) N/C
   ○C) J/C
   ○D) V/m

4. Which of the following are correct units for kinetic energy?

   ○A) 0.5 kg·m/s
   ○B) kg·m/s
   ○C) $\text{kg}\cdot\text{m}^2/\text{s}^2$
   ○D) $\text{kg}\cdot\text{m}/\text{s}^2$

5. A step down transformer changes

   ○A) electrical energy into mechanical energy
   ○B) mechanical energy into electrical energy
   ○C) low voltage DC to high voltage DC
   ○D) high voltage AC to low voltage AC

6. An expanding magnetic field must produce:

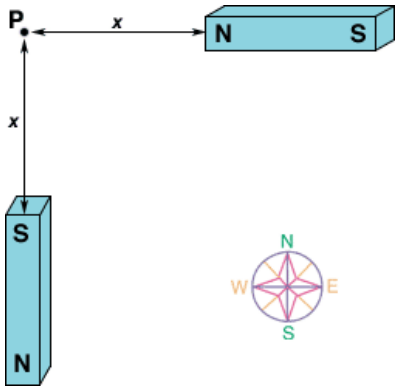
○A) accelerated charges.
○B) an electric charge.
○C) a current.
○D) an electric field.

7. An electric motor is basically the same as an electric generator, but a motor converts

○A) electrical energy to EMR
○B) electrical energy to mechanical energy
○C) mechanical energy to EMR
○D) mechanical energy to electrical energy

8.

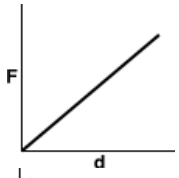
Two bar magnets of equal strength are placed, one directly east of point **P**, and the other the same distance and directly south of point **P**.

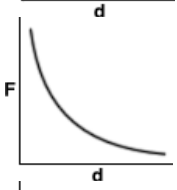


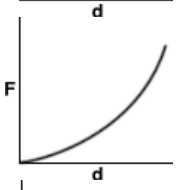
The direction of the resulting magnetic field at **P** is:

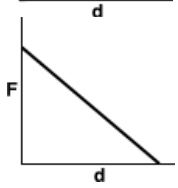
○A) southeast
○B) southwest
○C) northwest
○D) northeast

9. Which of the following graphs represents the relationship between the force and the distance between two charged metal spheres?

○A)


○B)


○C)


○D)


10. If an object is placed 10.0 cm in front of a concave mirror with a focal length 12.00 cm, what are the characteristics of the image?

○A) The image is larger, erect, and virtual
○B) The image is larger, inverted, and virtual

○C) The image is smaller, erect, and virtual
○D) No image can be formed at this point

11. When an object is placed in front of a concave lens, then the image is

○A) virtual, erect, and larger
○B) virtual, erect, and smaller
○C) virtual, inverted, and larger
○D) virtual, inverted, and smaller

12. The property of cathode rays that provides the **best** evidence to suggest that they are not electromagnetic radiation, is that they

○A) are emitted by many different cathode materials
○B) can move at speeds other than 3.00×10^{8} m/s
○C) can heat up an anode as they collide with it
○D) travel in straight lines unless acted upon by an electric or magnetic field

13. A photon has a momentum of 3.5×10^{-22} N·s. The frequency of the photon, expressed in scientific notation, is $\mathbf{a}.\mathbf{b}\times 10^{\mathbf{cd}}$ Hz. The values of **a**, **b**, **c**, and **d** are _____ , _____ , _____ , and _____ .
Write your answer as a four digit number

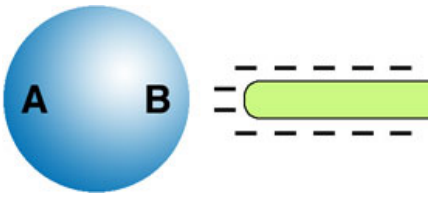
14. In a wave tank experiment, waves are generated at a wavelength of 1.5 cm and a speed of 8.0 cm/s. If the waves move into shallow water and have a new wavelength of 1.2 cm, what is their new speed?

○A) 6.4 cm/s
○B) 10 cm/s
○C) 12 cm/s
○D) 9.6 cm/s

15. In a nuclear reaction, the mass of the products was determined to be considerably less than the mass of the reactants. A correct explanation of this is that

○A) the reaction was a beta-decay
○B) a large amount of energy was released in the reaction
○C) the mass of the alpha and beta particles was not accounted for
○D) a large amount of energy was required to cause the reaction to occur

16.



A negatively charged rod is placed near a neutral metal sphere without touching it.

As a result of the rod's position, side A of the sphere becomes relatively

○A) negative and the sphere is repelled from the rod
○B) positive and the sphere is repelled from the rod
○C) negative and the sphere is attracted to the rod
○D) positive and the sphere is attracted to the rod

17.

Different colours in fireworks are produced by using different elements:

Element	Color
Strontium	Red
Potassium	Purple

Copper	Blue-Green
Barium	Green

The colours are emitted by atoms whose electrons are:

- ○A) undergoing transitions from higher to lower energy levels.
- ○B) undergoing transitions from lower to higher energy levels.
- ○C) colliding within energy levels.
- ○D) accelerating around the nucleus.

18. When high speed electrons hit a metallic plate and stop suddenly, the EMR primarily produced are called:

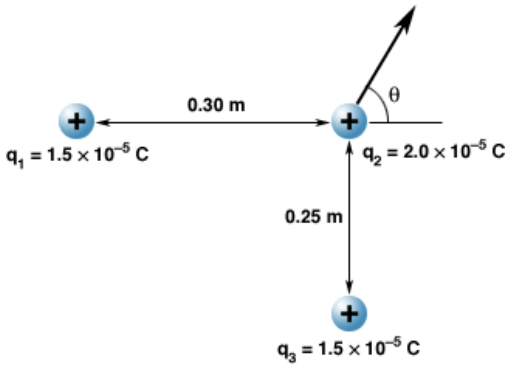
- ○A) X-rays.
- ○B) gamma rays.
- ○C) ultraviolet rays.
- ○D) light rays.

19. When catching a baseball barehanded, you move your hand in the same direction as the moving ball because:

- ○A) this decreases the momentum of the ball in order to reduce the force
- ○B) this increases the momentum of the ball in order to reduce the force
- ○C) this increases the time of "collision" in order to reduce the force
- ○D) this decreases the time of "collision" in order to reduce the force

20.

The charge q_1 is placed 0.3 m to the left of q_2, and q_3 is placed 0.25 m below q_2, as shown in the picture below:



The angle labeled θ indicates the net electrostatic force on q_2. The value of θ (to the nearest tenth) is _____°.

21. If electrons in a cathode-ray tube are accelerated by a potential difference of 1900 V, what is the maximum frequency of the emitted X-rays?

- ○A) 4.58×10^{17} Hz
- ○B) 5.00×10^{17} Hz
- ○C) 4.58×10^{18} Hz
- ○D) 5.00×10^{18} Hz

22. Which of the following kinds of radioactivity has the greatest penetrating power?

- ○A) alpha radiation
- ○B) beta radiation
- ○C) gamma radiation
- ○D) omega radiation

23. The first nuclear model of the atom was proposed by:

- ○A) Planck
- ○B) Bohr

○C) Rutherford
○D) Thomson

24. When an object is placed slightly farther away from the principle focus of a complex lens, then the image is

○A) larger and inverted
○B) smaller and inverted
○C) the same size and inverted
○D) virtual

25. An electron in a hydrogen atom is in the fourth orbital and jumps down to the second orbital. The energy released (to the nearest hundredth) is _____ eV.

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Physics 30, Entire Course, 25 Questions

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1. When a rock climber falls, they are usually saved from serious injury by a climbing rope that is slightly elastic. The climbing rope serves to

   ○A) decrease the force while increasing the stopping time.
   ○B) decrease the force while decreasing the stopping time.
   ○C) increase the force while increasing the stopping time.
   ○D) increase the force while decreasing the stopping time.

2. In an experiment, sparks are produced at a frequency of 4.5×10^{10} Hz. The wavelength of the radiation produced is

   ○A) 3.3×10^{-3} m
   ○B) 1.4×10^{19} m
   ○C) 1.5×10^{2} m
   ○D) 6.6×10^{-3} m

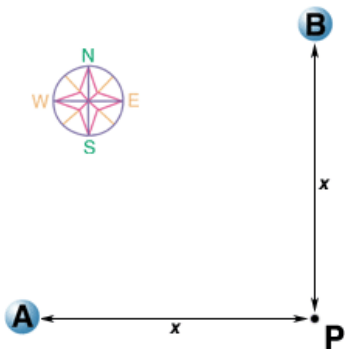
3. Diffraction at a small opening occurs because

   ○A) each point on the wave acts as an individual point source
   ○B) the speed of the wave changes upon entering a new medium
   ○C) the wave amplitude increases going through the opening
   ○D) the wave amplitude decreases going through the opening

4. A freight car of mass 1.0×10^{4} kg is coasting along the track at 2.0 m/s. A second freight car of 2.0×10^{4} kg mass comes toward it in the opposite direction. If both cars come to rest upon collision, how fast was the second car moving?

   ○A) 1.0 m/s
   ○B) 2.0 m/s
   ○C) 2.8 m/s
   ○D) 4.0 m/s

5. Two charges are placed at an equal distance *x* from point **P**, as shown in the following diagram. Charge **A** is placed directly west of **P** and **B** is placed directly north of **P**.



   If **A** is given a charge of $-Q$ and **B** is given a charge of $+Q$, what is the direction of the resulting electric field at point **P**?

   ○A) southeast
   ○B) northwest

○C) northeast
○D) southwest

6. In a wave tank experiment, waves are generated at a wavelength of 1.3 cm and a speed of 7.0 cm/s. If the waves move into deeper water and have a new wavelength of 1.8 cm, what is their new speed?

○A) 5.1 cm/s
○B) 9.7 cm/s
○C) 9.1 cm/s
○D) 13 cm/s

7.

An electron drops from the third energy level to the second energy level of an excited hydrogen atom.

This emitted photon is a part of the:

○A) Balmer series.
○B) Lyman series.
○C) Bracket series.
○D) Pfund series.

8. The direction of the magnetic field **below** a wire carrying electrons due east is

○A) up
○B) parallel to the current
○C) south
○D) north

9. When waves are sent towards a barrier with an adjustable opening, which of the following should be observed?

○A) The width of the opening will not affect diffraction
○B) As the width of the opening increases, diffraction increases
○C) As the width of the opening decreases, diffraction increases
○D) As the width of the opening decreases, diffraction decreases

10. When the voltage across a photoelectric effect apparatus is adjusted so that the photoelectric current becomes zero, this measures the photoelectron's maximum:

○A) potential energy.
○B) work function.
○C) kinetic energy.
○D) wavelength.

11. A light pulse is sent to an object 80.0 km away. The time it takes for the light to go there and return is

○A) 2.67×10^{-4} s
○B) 5.33×10^{-4} s
○C) 2.67×10^{-7} s
○D) 5.33×10^{-7} s

12. The force between the spheres was F. If the separation is changed to $3r$, then the force between two spheres would have become

○A) $3F$
○B) $\frac{1}{3}F$
○C) $\frac{1}{9}F$
○D) $9F$

13. The wavelength of radiation generated by a standard 60 Hz alternating current in a house wire is

○A) 1.8×10^{10} m
○B) 5.0×10^{10} m
○C) 5.0×10^{6} m
○D) 2.0×10^{-7} m

14. The radius of the fifth Bohr orbit of hydrogen is

○A) 1.3×10^{-9} m
○B) 1.1×10^{-10} m
○C) 2.6×10^{-11} m
○D) 5.3×10^{-11} m

15. The charge and the approximate diameter of a nucleus could be found from:

○A) alpha particle scattering experiments.
○B) electron collision experiments.
○C) photoelectric tube experiments.
○D) an oil drop experiment.

16. The number of decays per second in a sample of radioactive material is its

○A) half-life
○B) activity
○C) gamma decay
○D) quark

17. An unbalanced force of 10.0 N acts north against a 1.0 kg object initially moving south at 30.0 m/s. After 5.0 s the magnitude of the object's momentum will be

○A) 10 kg·m/s
○B) 20 kg·m/s
○C) –20 kg·m/s
○D) 50 kg·m/s

18. The direction of the magnetic field **below** a wire carrying electrons due west is

○A) up
○B) parallel to the current
○C) south
○D) north

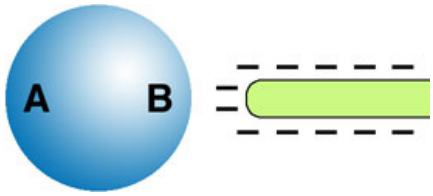
19. In the photoelectric equation, the symbol *W* represents the

○A) minimum energy needed to release an electron from the metal
○B) stopping voltage of the emitted electron
○C) wavelength of the electromagnetic equation
○D) energy of the target metal

20. The frequency of light emitted when an electron drops from energy level n = 3 to n = 1 is

○A) 2.9×10^{15} Hz
○B) 2.2×10^{15} Hz
○C) 1.8×10^{15} Hz
○D) 8.8×10^{14} Hz

21.



A negatively charged rod is placed near a neutral metal sphere without touching it.

As a result of the rod's position, side A of the sphere becomes relatively

○A) negative and the sphere is repelled from the rod
○B) positive and the sphere is repelled from the rod
○C) negative and the sphere is attracted to the rod
○D) positive and the sphere is attracted to the rod

22.

Selected Energy Levels of an Unknown Atom

Level	Energies (eV)
∞	0
.	.
.	.
.	.
Z	–2.1
Y	–3.8
X	–4.9
W	–11.8

What frequency of electromagnetic radiation is required to excite the atoms from energy level W to energy level Z?

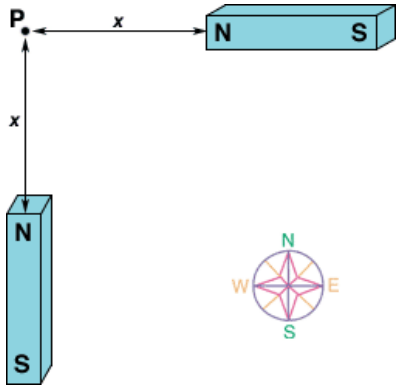
○A) 2.3×10^{15} Hz
○B) 1.9×10^{15} Hz
○C) 1.0×10^{15} Hz
○D) 9.9×10^{14} Hz

23. Roemer predicted the speed of light using data collected from timing the travel time of light

○A) from Jupiter's moon Io to the Earth
○B) between lanterns on two hills
○C) reflecting from an octagonal mirror
○D) from a laser

24.

Two bar magnets of equal strength are placed, one directly east of point **P**, and the other the same distance and directly south of point **P**.



The direction of the resulting magnetic field at **P** is:

○A) southeast
○B) southwest
○C) northwest
○D) northeast

25. The magnitude of the momentum of a 15.0 eV photon is

○A) 1.07×10^{-20} kg·m/s
○B) 9.38×10^{19} kg·m/s
○C) 5.00×10^{-8} kg·m/s
○D) 8.00×10^{-27} kg·m/s

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Physics 30, Entire Course, 25 Questions

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1. The energy carried by an electric current depends on which of the following?

   ○A) the charge transferred
   ○B) the potential difference
   ○C) the total number of charges in the circuit
   ○D) both A and B

2. What is the wavelength of a light source with a period of 2.80×10^{-15} s?

   ○A) 1.19×10^{6} m
   ○B) 8.40×10^{-7} m
   ○C) 1.07×10^{23} m
   ○D) 9.33×10^{-24} m

3. A magnetic field always exerts a force on a/an:

   ○A) stationary charge.
   ○B) stationary wire.
   ○C) plastic rod.
   ○D) nickel bar.

4. If a light ray travelling through air enters glass and is refracted,

   ○A) the light ray speeds up and bends towards the normal
   ○B) the light ray speeds up and bends away the normal
   ○C) the light ray slows down and bends towards the normal
   ○D) the light ray slows down and bends away the normal

5. The secondary coil of a transformer has 875 turns while the primary coil has 200 turns. The input voltage is 35.0 V and the input current is 5.00 A. The output current would be (to the nearest tenth) _____ A.

6. The energy of an electron in the sixth energy level of hydrogen (to the nearest hundredth) is _____ eV.

7. The volt is the SI unit of potential difference. This is the same as

   ○A) N·m
   ○B) N/C
   ○C) J/C
   ○D) V/m

8. In hydrogen, the radius of the fifth Bohr orbital is

   ○A) 5.08×10^{-11} m
   ○B) 1.06×10^{-11} m
   ○C) 2.12×10^{-12} m
   ○D) 9.60×10^{-10} m

9. If a generator produces only a *small* current, then the opposing force on the armature will be _____ and the armature will be _____ to turn.

○A) large, easy
○B) large, hard
○C) small, easy
○D) small, hard

10.

An electron drops from the third energy level to the second energy level of an excited hydrogen atom.

The frequency of the photon emitted is

○A) 4.57×10^{14} Hz
○B) 1.89 Hz
○C) 4.84×10^{-38} Hz
○D) 3.88×10^{15} Hz

11. A mass undergoes a change in momentum of 40 kg m/s in 5.0 s. The magnitude of the average force causing this change is

○A) 8 N
○B) 40 N
○C) 200 N
○D) 8.0×10^{2} N

12. In an inelastic collision between two bodies

○A) momentum is not conserved
○B) kinetic energy is conserved
○C) neither momentum nor kinetic energy is conserved
○D) momentum is conserved but kinetic energy is not conserved

13. A conducting sphere A that has an initial charge of $+2.5 \times 10^{-6}$ C and an identical conducting sphere B that has an initial charge of -3.0×10^{-6} C are touched together. After they are separated, the charge on sphere A is

○A) -5.0×10^{-7}
○B) -2.5×10^{-7}
○C) -5.5×10^{-6}
○D) -2.8×10^{-6}

14.

If $^{228}_{88}\text{Ra}$ emits an alpha particle, the decay product is:

○A)

$^{232}_{90}\text{Th}$

○B)

$^{224}_{86}\text{Rn}$

○C)

$^{222}_{86}\text{Ra}$

○D)

$^{224}_{84}\text{Po}$

15. Which of the following describes an electron in the ground state?

○A) It has the lowest allowable amount of energy.
○B) It may not accept any more photons.

○C) It can remain in that level only a short time.
○D) It can make a transition to a higher energy level.

16. Which of the following units are correct units for impulse?

○A) J·C
○B) N·s
○C) N·m
○D) N/C

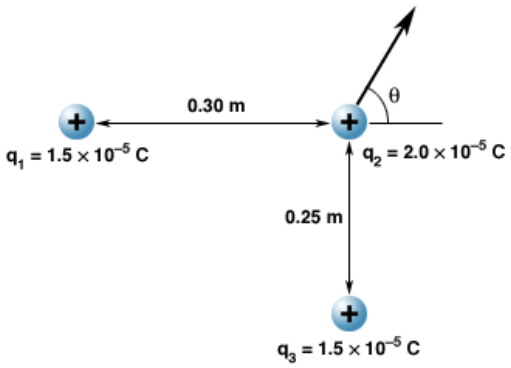
17. Which of the following types of radioactive decay occurs when a neutron is changed to a proton within a nucleus?

○A) alpha decay
○B) beta decay
○C) gamma decay
○D) both A and B

18. A photon has a momentum of 3.5×10^{-22} N·s. The frequency of the photon, expressed in scientific notation, is $\mathbf{a}.\mathbf{b}\times 10^{\mathbf{cd}}$ Hz. The values of **a**, **b**, **c**, and **d** are _____ , _____ , _____ , and _____ .
Write your answer as a four digit number

19.

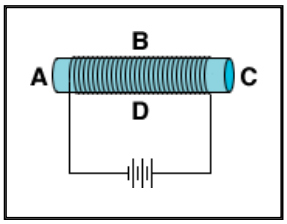
The charge q_1 is placed 0.3 m to the left of q_2, and q_3 is placed 0.25 m below q_2, as shown in the picture below:



The magnitude of the net electrostatic force acting on q_2 is

○A) 43.2 N
○B) 30.0 N
○C) 52.5 N
○D) 0.00 N

20.



Where is the south pole in the solenoid shown above?

○A) A
○B) B
○C) C
○D) D

21. The direction of the magnetic field **below** a wire carrying electrons due east is

○A) up
○B) parallel to the current

○C) south
○D) north

22. A voltage of 1.50 V is induced in a 30.0 m long wire as it moves perpendicularly to a 3.50×10^{-3} T magnetic field. At what speed is the wire moving?

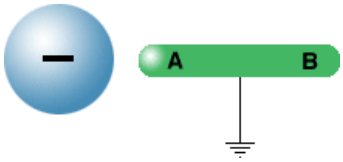
○A) 14.2 m/s
○B) 0.158 m/s
○C) 571 m/s
○D) 7.78×10^{-5} m/s

23. A magnetic field never exerts a force on a/an:

○A) magnet.
○B) unmagnetized nickel bar.
○C) current.
○D) stationary charge.

24.

A grounded metal rod is brought near a negatively charged sphere without touching it.



The distribution of charge on the rod is

○A) positive at end A and electrons move off the rod into the ground
○B) positive at end A and electrons move onto the rod from the ground
○C) negative at end A and electrons move off the rod into the ground
○D) negative at end A and electrons move onto the rod from the ground

25. An electron is in an n = 3 energy level. The number of different possible frequencies of radiation that may be emitted when it falls back to n = 1 is

○A) 1
○B) 2
○C) 3
○D) infinite

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