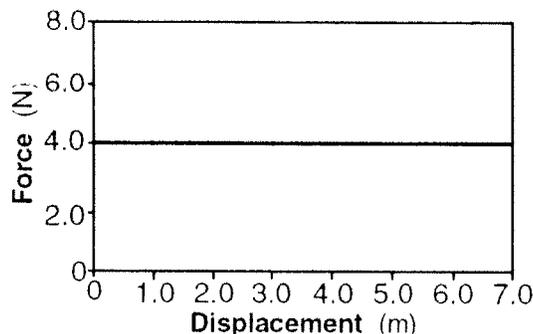


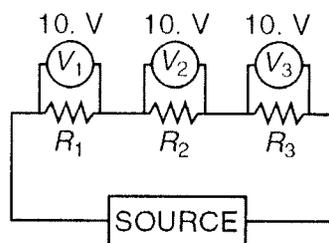
# Spring Final Study Guide

Name: \_\_\_\_\_

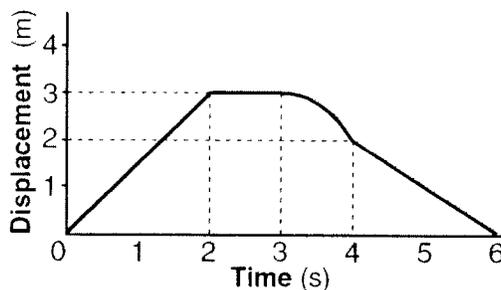
- 1) Which quantity must be the same for each component in any series circuit?  
A) voltage                      B) power                      C) resistance                      D) current
- 2) The graph below shows the force exerted on a block as a function of the block's displacement in the direction of the force.



- How much work did the force do in displacing the block 5.0 meters?  
A) 0 J                      B) 0.80 J                      C) 4.0 J                      D) 20. J
- 3) In the circuit shown below, what is the potential difference of the source?

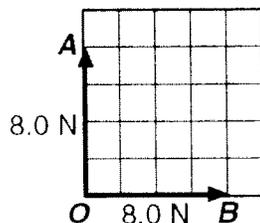


- A) 3.3 V                      B) 30. V                      C) 10. V                      D) 1,000. V
- 4) A net force of 5.0 newtons moves a 2.0-kilogram object a distance of 3.0 meters in 3.0 seconds. How much work is done on the object?  
A) 10. J                      B) 15 J                      C) 30. J                      D) 1.0 J
- 5) As a satellite is accelerated away from the Earth by a rocket, the satellite's mass  
A) decreases                      B) increases                      C) remains the same
- 6) The graph below represents the displacement of an object as a function of time.



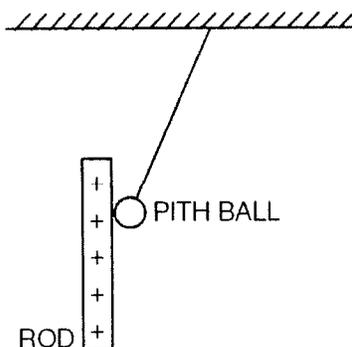
- What is the velocity of the object at  $t = 1$  second?  
A) 3.0 m/s                      B) 2.0 m/s                      C) 1.5 m/s                      D) 1.0 m/s
- 7) A 100-newton box rests on a horizontal surface. A force of 10 newtons parallel to the surface is required to start the box moving. What is the maximum coefficient of static friction between the box and the surface?  
A) 0.1                      B) 0.5                      C) 10                      D) 1000
- 8) A glass rod is given a positive charge by rubbing it with silk. The rod has become positive by  
A) losing electrons                      B) losing protons                      C) gaining electrons                      D) gaining protons

- 9) Two forces ( $\vec{OA}$  and  $\vec{OB}$ ) act simultaneously at point  $O$  as shown on the diagram below.



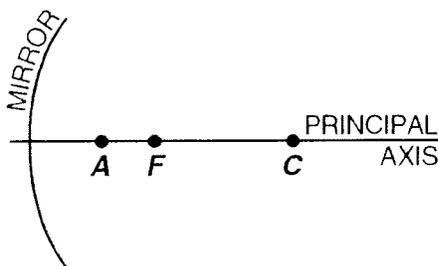
The magnitude of the resultant force is *closest* to

- A) 8.0 N                      B) 15 N                      C) 11 N                      D) 16 N
- 10) As shown in the diagram below, a neutral pith ball suspended on a string is attracted to a positively charged rod.



During contact with the rod, the pith ball

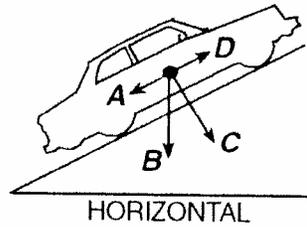
- A) loses protons                      B) gains electrons                      C) gains protons                      D) loses electrons
- 11) Which statement explains why a book resting on a table is in equilibrium?
- A) The acceleration due to gravity is  $9.8 \text{ m/s}^2$  for both the book and the table.  
 B) There is a net force acting downward on the book.  
 C) The weight of the book and the table's upward force on the book are equal in magnitude, but opposite in direction.  
 D) The weight of the book equals the weight of the table.
- 12) As the mass of a body increases, its gravitational force of attraction on the Earth
- A) remains the same                      B) decreases                      C) increases
- 13) The diagram below shows a concave (converging) spherical mirror having principal focus  $F$  and center of curvature  $C$ . Point  $A$  lies on the principal axis.



If an object is located at point  $A$ , its image is

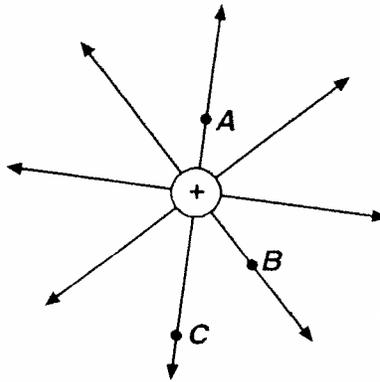
- A) virtual and erect                      C) real and erect  
 B) virtual and inverted                      D) real and inverted

- 14) The diagram below represents a car resting on a hill.



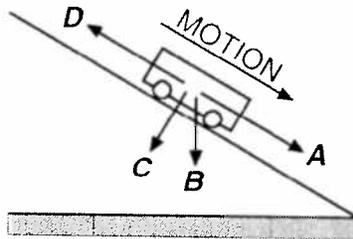
Which vector *best* represents the weight of the car?

- A) *A*                                      B) *B*                                      C) *C*                                      D) *D*
- 15) The diagram below shows some of the lines of electrical force around a positive point charge.



The strength of the electric field is

- A) greatest at point *A*                                      C) greatest at point *B*  
 B) equal at points *A*, *B*, and *C*                                      D) greatest at point *C*
- 16) An object with a mass of 0.5 kilogram starts from rest and achieves a maximum speed of 20 meters per second in 0.01 second. What average unbalanced force accelerates this object?  
 A) 10 N                                      B) 0.1 N                                      C) 1,000 N                                      D) 0.001 N
- 17) A table exerts a 2.0-newton force on a book lying on the table. The force exerted by the book on the table is  
 A) 0.20 N                                      B) 20. N                                      C) 0 N                                      D) 2.0 N
- 18) A cart rolls down an inclined plane with constant speed as shown in the diagram below. Which arrow represents the direction of the frictional force?



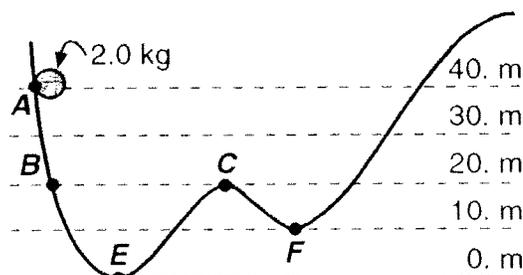
- A) *A*                                      B) *B*                                      C) *C*                                      D) *D*
- 19) The number of water waves passing a given point each second is the wave's  
 A) amplitude                                      B) velocity                                      C) wavelength                                      D) frequency
- 20) A stone is dropped from a bridge 45 meters above the surface of a river. Approximately how many seconds does the stone take to reach the water's surface?  
 A) 3.0 s                                      B) 1.0 s                                      C) 22 s                                      D) 10. s



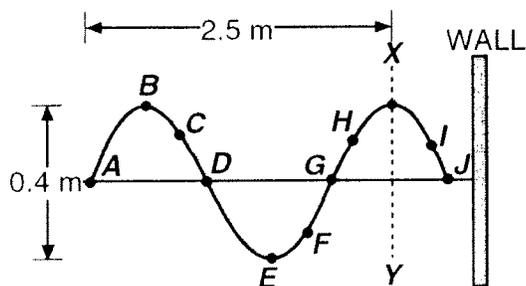


Questions 36 and 37 refer to the following:

The diagram below represents a 2.0-kilogram mass placed on a frictionless track at point *A* and released from rest. Assume the gravitational potential energy of the system to be zero at point *E*.



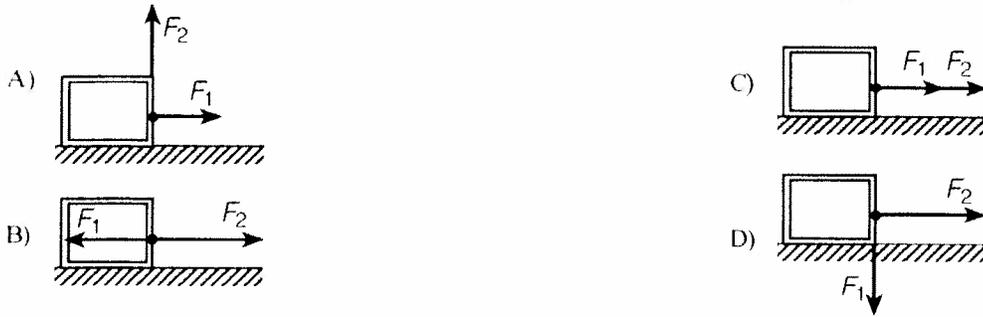
- 36) The gravitational potential energy of the system at point *A* is approximately
- A)  $7.0 \times 10^2$  joules      B) 20. joules      C) 80. joules      D)  $8.0 \times 10^2$  joules
- 37) Compared to the kinetic energy of the mass at point *B*, the kinetic energy of the mass at point *E* is
- A) \ as great      B) 4 times greater      C) twice as great      D) the same
- 38) Which diagram *best* represents the electric field of a point charge?
- A)      B)      C)      D)
- 39) A student weighing 500. newtons stands on a spring scale in an elevator. If the scale reads 520. newtons, the elevator must be
- A) accelerating upward      C) moving downward at constant speed  
B) moving upward at constant speed      D) accelerating downward
- 40) The rate of change of work with respect to time is called
- A) momentum      B) power      C) force      D) energy
- 41) As a longitudinal wave passes through a medium, the particles of the medium move
- A) in ellipses      C) perpendicular to the direction of wave travel  
B) parallel to the direction of wave travel      D) in circles
- 42) The diagram below represents a segment of a periodic wave traveling to the right in a steel spring.



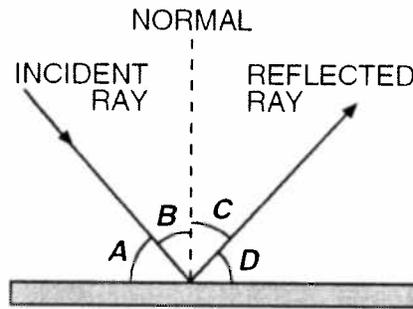
What type of wave is illustrated by the diagram?

- A) longitudinal      B) elliptical      C) torsional      D) transverse
- 43) A wave traveling at  $5.0 \times 10^4$  meters per second has a wavelength of  $2.5 \times 10^1$  meters. What is the frequency of the wave?
- A)  $5.0 \times 10^3$  Hz      B)  $2.0 \times 10^3$  Hz      C)  $5.0 \times 10^{-4}$  Hz      D)  $1.25 \times 10^6$  Hz

- 44) A 150.-newton force,  $F_1$ , and a 200.-newton force,  $F_2$ , are applied simultaneously to the same point on a large crate resting on a frictionless, horizontal surface. Which diagram shows the forces positioned to give the crate the *greatest* acceleration?

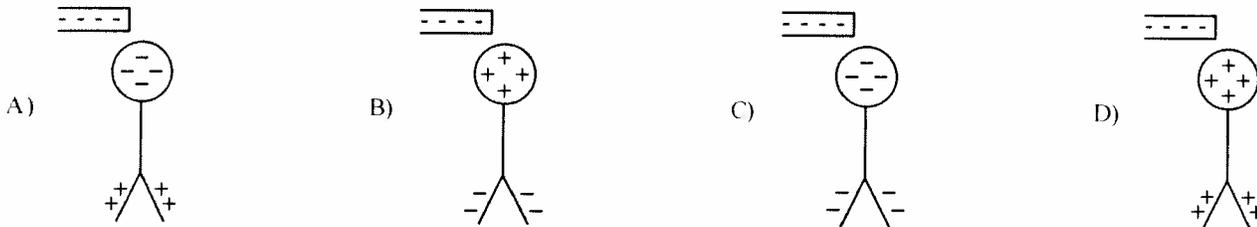


- 45) A ray is reflected from a surface as shown in the diagram below.



Which letter represents the angle of incidence?

- A) A                                      B) B                                      C) C                                      D) D
- 46) The weight of an apple is *closest* to  
 A)  $10^{-2}$  N                              B)  $10^0$  N                              C)  $10^2$  N                              D)  $10^4$  N
- 47) What is the frequency of a wave if its period is 0.25 second?  
 A) 12 Hz                                  B) 1.0 Hz                                  C) 0.25 Hz                                  D) 4.0 Hz
- 48) Which diagram *best* represents the charge distribution on a neutral electroscope when a negatively charged rod is held near it?



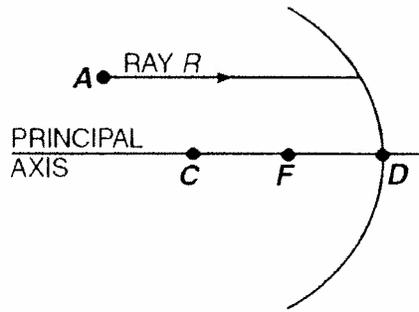
- 49) In the diagram below, A is a point near a positively charged sphere.



Which vector *best* represents the direction of the electric field at point A?

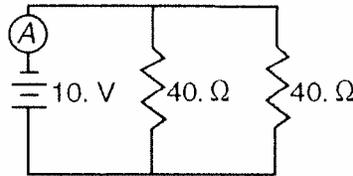
- A)                              B)                              C)                              D)

- 50) The diagram below shows light ray  $R$  parallel to the principal axis of a spherical concave (converging) mirror. Point  $F$  is the focal point of the mirror and  $C$  is the center of curvature.



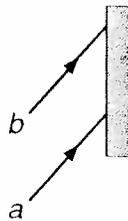
After reflecting, the light ray will pass through point

- A)  $A$                                       B)  $D$                                       C)  $F$                                       D)  $C$
- 51) In the circuit diagram below, ammeter  $A$  measures the current supplied by the 10.-volt battery.

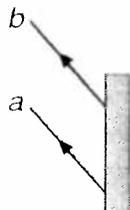
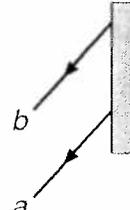
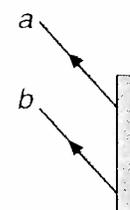
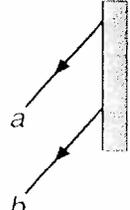


The current measured by ammeter  $A$  is

- A) 2.0 A                                      B) 0.13 A                                      C) 0.50 A                                      D) 4.0 A
- 52) The diagram below shows two rays of light striking a plane mirror.

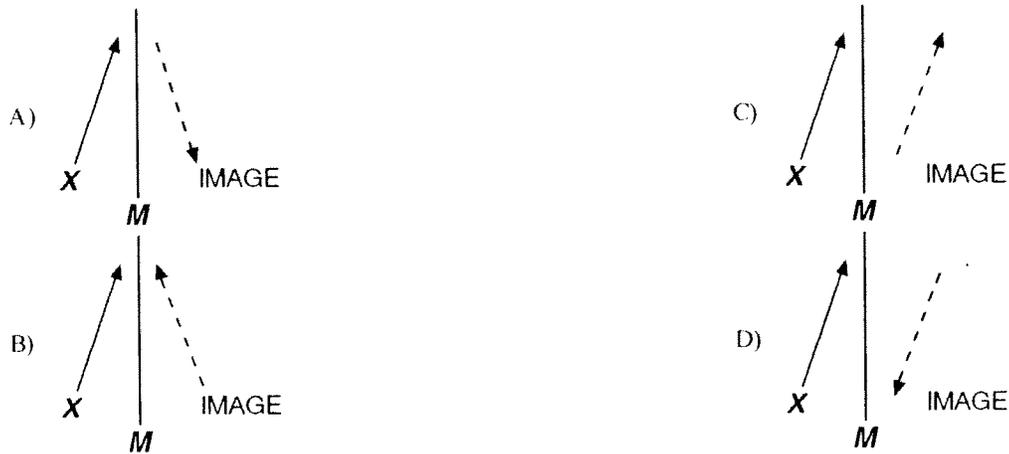


Which diagram below represents the reflected rays?

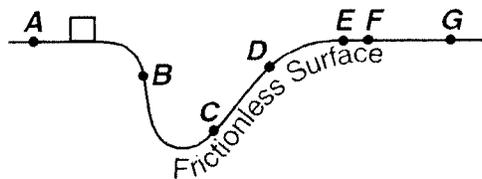
- A)       B)       C)       D) 

- 53) If the charge on each of two small spheres a fixed distance apart is doubled, the force of attraction between the spheres will be
- A) quadrupled                                      B) halved                                      C) quartered                                      D) doubled

- 54) Which diagram correctly shows the image of object  $X$  produced by plane mirror  $M$ ?

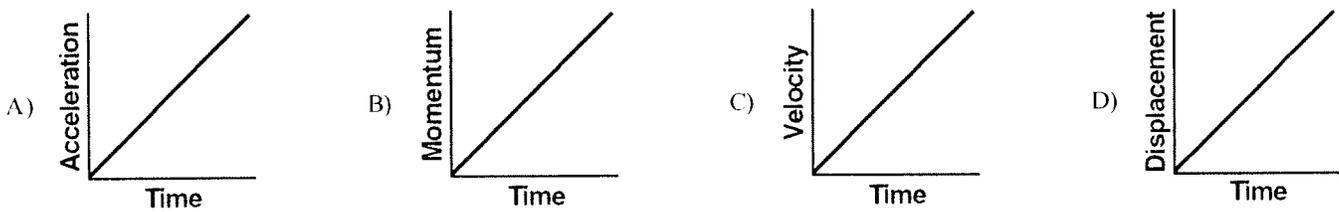


- 55) The diagram represents a block sliding along a frictionless surface between points  $A$  and  $G$ .



As the block moves from point  $A$  to point  $B$ , the speed of the block will be

- A) constant, but not zero  
 B) decreasing  
 C) increasing  
 D) zero
- 56) Which graph *best* represents the motion of an object that has *no* unbalanced force acting on it?

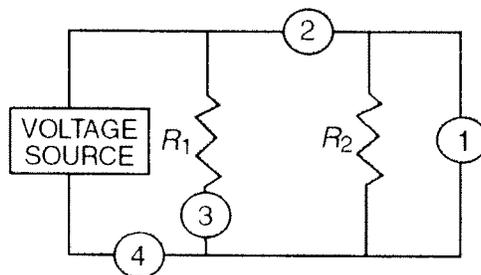


- 57) A force of 6.0 newtons north and a force of 8.0 newtons east act concurrently on an object. The magnitude of the resultant of the two forces is  
 A) 14. N  
 B) 10. N  
 C) 2.0 N  
 D) 1.3 N
- 58) A truck has the letters **OWOW** painted on the front of its hood. A person in a car driving ahead of the truck views these letters in the rear-view mirror. How do the letters appear?  
 A) **MOMO**  
 B) **OWOW**  
 C) **WOWO**  
 D) **OMOM**
- 59) A concave mirror with a focal length of 20. centimeters is used to examine a 0.50-centimeter-wide freckle on a person's face. The person's face is located 10. centimeters from the mirror.

The image of the freckle produced by the mirror is

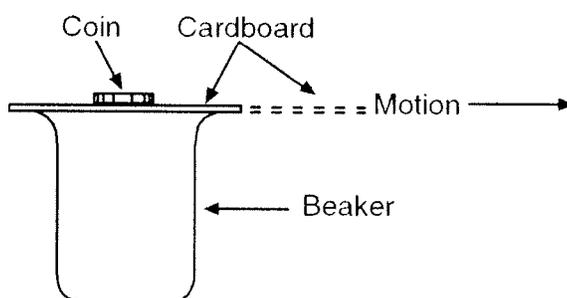
- A) virtual and inverted  
 B) virtual and erect  
 C) real and inverted  
 D) real and erect
- 60) A test booklet is sitting at rest on a desk. Compared to the force of the booklet on the desk, the force of the desk on the booklet is  
 A) less  
 B) greater  
 C) the same

- 61) Two resistors are connected to a source of voltage as shown in the diagram below.



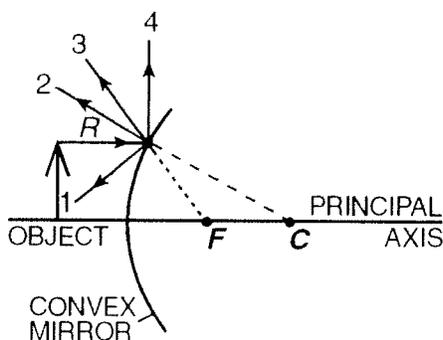
At which position should an ammeter be placed to measure the current passing only through resistor  $R_1$ ?

- A) 1                                      B) 2                                      C) 3                                      D) 4
- 62) A copper coin resting on a piece of cardboard is placed on a beaker as shown in the diagram below. When the cardboard is rapidly removed, the coin drops into the beaker.



The two properties of the coin which *best* explain its fall are its weight and its

- A) inertia                                      C) volume  
 B) electrical resistance                      D) temperature
- 63) In the diagram below, an object is located in front of a convex (diverging) mirror.  $F$  is the virtual focal point of the mirror and  $C$  is its center of curvature. Ray  $R$  is parallel to the principal axis.



Ray  $R$  will most likely be reflected along path

- A) 1                                      B) 2                                      C) 3                                      D) 4
- 64) What is the minimum power required for a conveyor to raise an 8.0-newton box 4.0 meters vertically in 8.0 seconds?
- A) 4.0 watts                                      B) 32 watts                                      C) 64 watts                                      D) 260 watts
- 65) A force of 3 newtons moves a 10-kilogram mass horizontally a distance of 3 meters at constant velocity. The work done against friction is
- A) 6 joules                                      B) 3 joules                                      C) 9 joules                                      D) 30 joules

66) Which pair of moving pulses in a rope will produce destructive interference?



67) A cart of mass  $m$  traveling at speed  $v$  has kinetic energy  $KE$ . If the mass of the cart is doubled and its speed is halved, the kinetic energy of the cart will be

- A) half as great                      B) twice as great                      C) four times as great                      D) one-fourth as great

68) When an opera singer hits a high-pitch note, a glass on the opposite side of the opera hall shatters. Which statement *best* explains this phenomenon?

- A) The vibrations of the note are polarized by the shape of the opera hall.  
 B) The frequency of the note and natural vibration frequency of the glass are equal.  
 C) The amplitude of the note increases before it reaches the glass.  
 D) The singer and glass are separated by an integral number of wavelengths.

69) As the distance between a man and a plane mirror increases, the size of the image of the man produced by the mirror

- A) increases                                      B) remains the same                                      C) decreases

70) If the frequency of a sound wave in air at STP remains constant, its energy can be varied by changing its

- A) period                                      B) amplitude                                      C) speed                                      D) wavelength

71) A 20.-kilogram object strikes the ground with 1,960 joules of kinetic energy after falling freely from rest. How far above the ground was the object when it was released?

- A) 14 m                                      B) 10. m                                      C) 98 m                                      D) 200 m

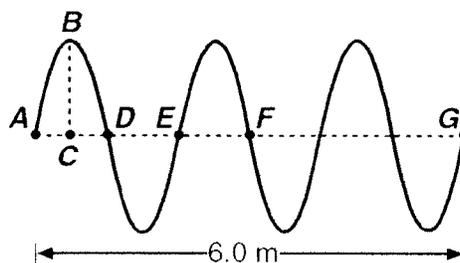
72) As an object falls freely in a vacuum, its total energy

- A) increases                                      B) decreases                                      C) remains the same

73) A small, uncharged metal sphere is placed near a larger, negatively charged sphere. Which diagram *best* represents the charge distribution on the *smaller* sphere?



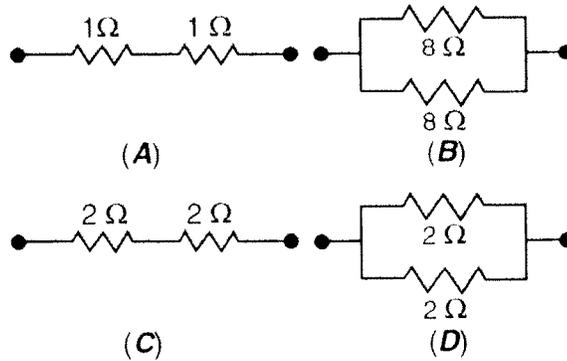
74) The diagram below represents a vibrating string with a periodic wave originating at  $A$  and moving to  $G$ , a distance of 6.0 meters.



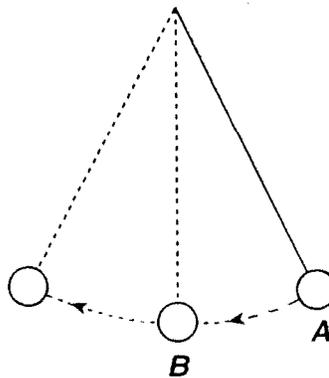
What is the wavelength of this wave?

- A) 1.0 m                                      B) 2.0 m                                      C) 3.0 m                                      D) 6.0 m

75) Which two of the resistor arrangements shown below have equivalent resistance?

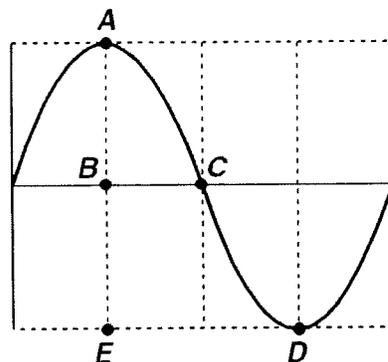


- A) C and D                      B) D and A                      C) B and C                      D) A and B
- 76) If a net force of 10. newtons acts on a 6.0-kilogram mass for 8.0 seconds, the total change of momentum of the mass is  
 A) 80. kgdm/s                      B) 60. kgdm/s                      C) 480 kgdm/s                      D) 48 kgdm/s
- 77) In the diagram below, an ideal pendulum released from point A swings freely through point B.



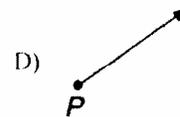
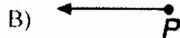
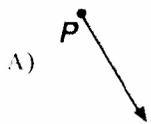
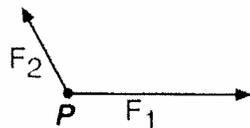
Compared to the pendulum's kinetic energy at A, its potential energy at B is

- A) twice as great                      B) half as great                      C) the same                      D) four times as great
- 78) Which diagram *best* illustrates a neutral electroscope being charged by conduction?
- 
- A)  $++$  rod,  $+$  electroscope.  
 B)  $++$  rod touching,  $+$  electroscope.  
 C)  $--$  rod touching,  $+$  electroscope.  
 D)  $--$  rod near,  $+$  electroscope.
- 79) Which distance on the diagram below identifies the amplitude of the given wave?

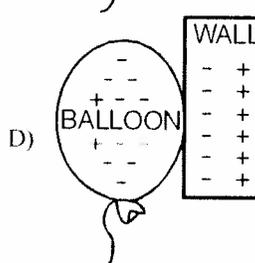
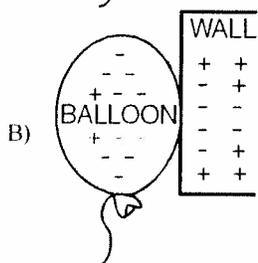
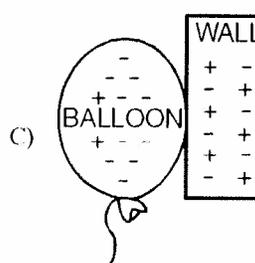
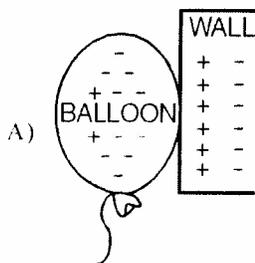


- A) AB                      B) AC                      C) AD                      D) AE

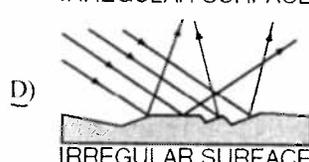
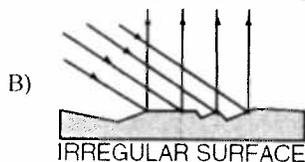
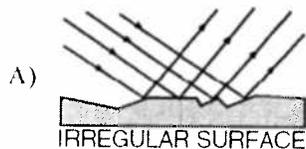
- 80) Which vector *best* represents the resultant of forces  $F_1$  and  $F_2$  acting concurrently on point  $P$  as shown in the diagram below?



- 81) A 60.-kilogram astronaut weighs 96 newtons on the surface of the Moon. The acceleration due to gravity on the Moon is
- A)  $1.6 \text{ m/s}^2$                       B)  $0.0 \text{ m/s}^2$                       C)  $4.9 \text{ m/s}^2$                       D)  $9.8 \text{ m/s}^2$
- 82) A 20-kilogram cart traveling east with a speed of 6 meters per second collides with a 30-kilogram cart traveling west. If both carts come to rest immediately after the collision, what was the speed of the westbound cart before the collision?
- A) 6 m/s                      B) 2 m/s                      C) 4 m/s                      D) 3 m/s
- 83) Compared to the mass of an object at the surface of the Earth, the mass of the object a distance of two Earth radii from the center of the Earth is
- A) the same                      B) one-fourth as great                      C) twice as great                      D) one-half as great
- 84) An inflated balloon which has been rubbed against a person's hair is touched to a neutral wall and remains attracted to it. Which diagram *best* represents the charge distribution on the balloon and wall?

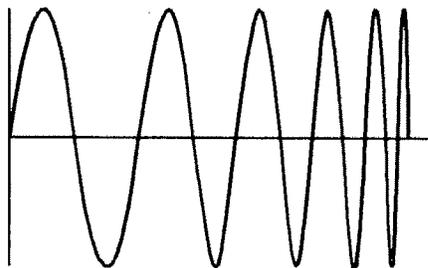


- 85) Which diagram *best* represents the reflection of light from an irregular surface?

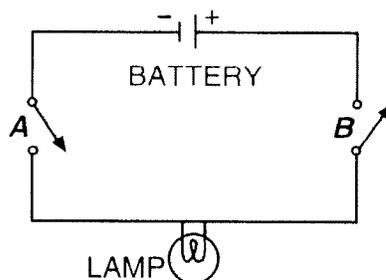




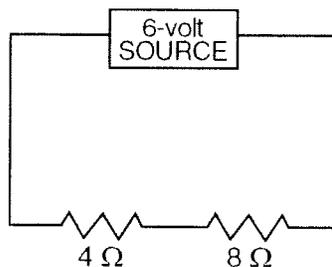
- 92) The diagram below represents a wave traveling in a uniform medium. Which characteristic of the wave is constant?



- A) amplitude                      B) period                      C) frequency                      D) wavelength
- 93) In the diagram below, which of the switches must be closed in order for the lamp to light?



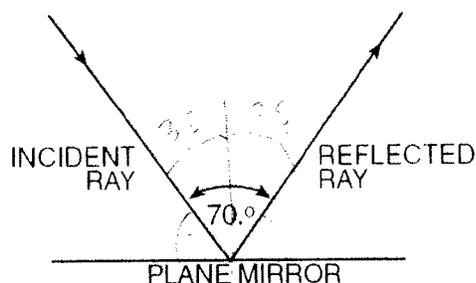
- A) *A*, only                      B) both *A* and *B*                      C) *B*, only
- 94) The diagram below shows a circuit with two resistors.



Compared to the potential drop across the 8-ohm resistor, the potential drop across the 4-ohm resistor is

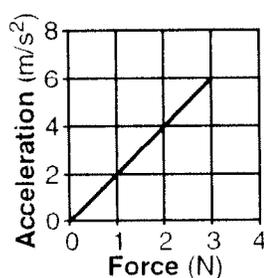
- A) twice as great                      B) the same                      C) four times as great                      D) one-half as great
- 95) What is an essential characteristic of an object in equilibrium?
- A) zero acceleration                      C) zero potential energy  
B) zero velocity                      D) zero kinetic energy
- 96) If 10 coulombs of charge passes a given point in a conductor every 2 seconds, the current at that point is
- A) 5 A                      B) 20 A                      C) 0.2 A                      D) 10 A
- 97) What is the magnitude of the velocity of a 25-kilogram mass that is moving with a momentum of 100. kilogram-meters per second?
- A) 2500 m/s                      B) 0.25 m/s                      C) 40. m/s                      D) 4.0 m/s
- 98) A student drops two eggs of equal mass simultaneously from the same height. Egg *A* lands on the tile floor and breaks. Egg *B* lands intact, without bouncing, on a foam pad lying on the floor. Compared to the magnitude of the impulse on egg *A* as it lands, the magnitude of the impulse on egg *B* as it lands is
- A) less                      B) the same                      C) greater

- 99) The diagram below represents a light ray being reflected from a plane mirror. The angle between the incident ray and the reflected ray is  $70^\circ$ .



What is the angle of incidence for this ray?

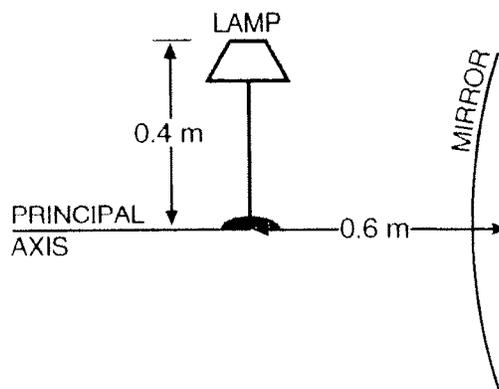
- A)  $35^\circ$                       B)  $55^\circ$                       C)  $70^\circ$                       D)  $20^\circ$
- 100) In the graph below, the acceleration of an object is plotted against the unbalanced force on the object.



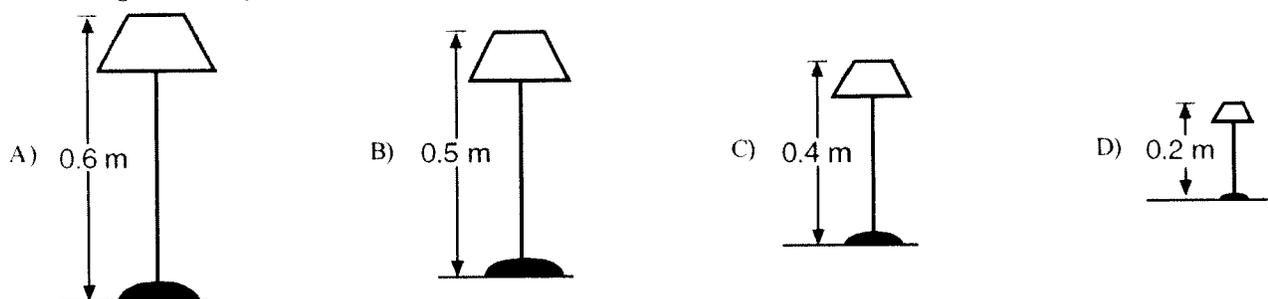
What is the object's mass?

- A) 0.5 kg                      B) 1 kg                      C) 0.2 kg                      D) 2 kg
- 101) Standing waves are produced by two waves traveling in opposite directions in the same medium. These two waves must have
- A) the same amplitude and the same frequency                      C) different amplitudes and different frequencies  
 B) the same amplitude and different frequencies                      D) different amplitudes and the same frequency
- 102) If the voltage across a 12-ohm resistor is 4.0 volts, the current through the resistor is
- A) 48 A                      B) 4.0 A                      C) 3.0 A                      D) 0.33 A
- 103) When a rod is brought near a neutral electroscope, the leaves diverge. Which statement *best* describes the charge on the rod?
- A) It must be negative.                      C) It must be positive.  
 B) It may be neutral.                      D) It may be positive or negative.
- 104) As the period of a wave decreases, the wave's frequency
- A) remains the same                      B) increases                      C) decreases

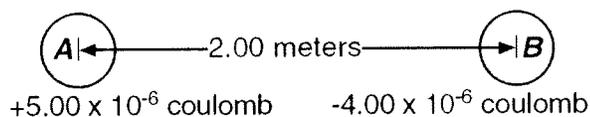
- 105) In the diagram below, a lamp 0.4 meter tall is placed 0.6 meter in front of a convex mirror.



Which diagram *best* represents an image of the lamp that could be formed by this mirror?



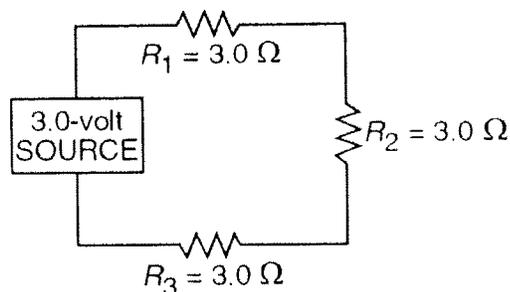
- 106) If the velocity of an automobile is doubled, its kinetic energy
- A) decreases to one-fourth  
B) decreases to one-half  
C) doubles  
D) quadruples
- 107) Neutral atoms *always* have equal numbers of
- A) electrons and neutrons  
B) protons and neutrons  
C) protons and positrons  
D) protons and electrons
- 108) The diagram below represents two small, charged conducting spheres, identical in size, located 2.00 meters apart.



The force between these spheres is

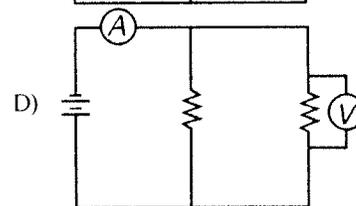
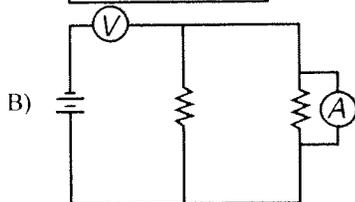
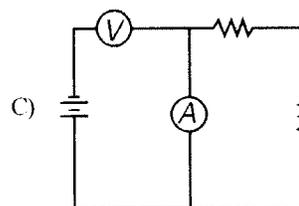
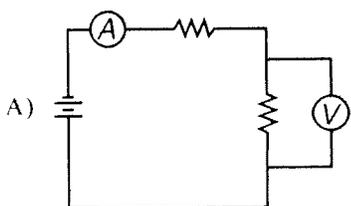
- A)  $4.50 \times 10^{-2}$  newton  
B)  $9.00 \times 10^{-2}$  newton  
C)  $1.80 \times 10^{-2}$  newton  
D)  $3.60 \times 10^{-2}$  newton
- 109) Which term represents a vector quantity?
- A) work  
B) distance  
C) power  
D) force
- 110) What is the wavelength of a 30.-hertz periodic wave moving at 60. meters per second?
- A) 20. m  
B) 0.50 m  
C) 2.0 m  
D) 1,800 m

- 111) The diagram below represents a series circuit containing three resistors.

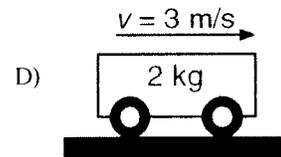
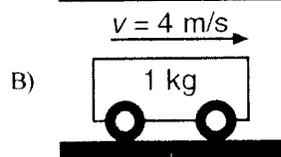
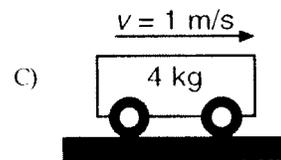
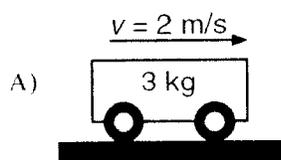


What is the current through resistor  $R_2$ ?

- A) 9.0 A                      B) 0.33 A                      C) 1.0 A                      D) 3.0 A
- 112) If the mass of one of two particles is doubled and the distance between them is doubled, the force of attraction between the two particles will
- A) remain the same                      B) increase                      C) decrease
- 113) Which circuit shown below could be used to determine the total current and potential difference of a parallel circuit?



- 114) Which cart shown below has the *greatest* kinetic energy?



- 115) The electrical force of attraction between two point charges is  $F$ . The charge on one of the objects is *quadrupled* and the charge on the other object is *doubled*. The new force between objects is
- A)  $8F$                       B)  $6F$                       C)  $\sqrt{F}$                       D)  $2F$
- 116) Which part of an atom is most likely to be transferred as a body acquires a static electric charge?
- A) electron                      B) positron                      C) proton                      D) neutron
- 117) A force of 50. newtons causes an object to accelerate at 10. meters per second squared. What is the mass of the object?
- A) 0.20 kg                      B) 500 kg                      C) 5.0 kg                      D) 60. kg
- 118) A 2.0-kilogram ball traveling north at 4.0 meters per second collides head on with a 1.0-kilogram ball traveling south at 8.0 meters per second. What is the magnitude of the total momentum of the two balls after collision?
- A) 16 kgdm/s                      B) 32 kgdm/s                      C) 8.0 kgdm/s                      D) 0 kgdm/s



