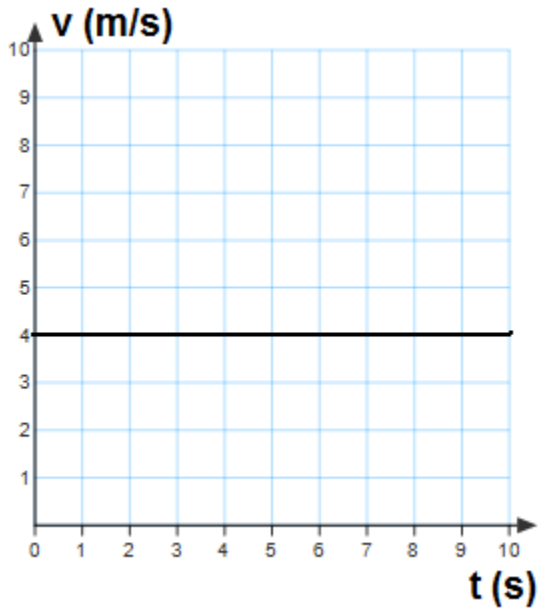
Honors Final Multiple Choice Review

1. An object moves at a constant speed of 6 m/s. This means that the object:
   A. Increases its speed by 6 m/s every second
   B. Decreases its speed by 6 m/s every second
   C. Doesn't move
   D. Has a positive acceleration
   E. Moves 6 meters every second

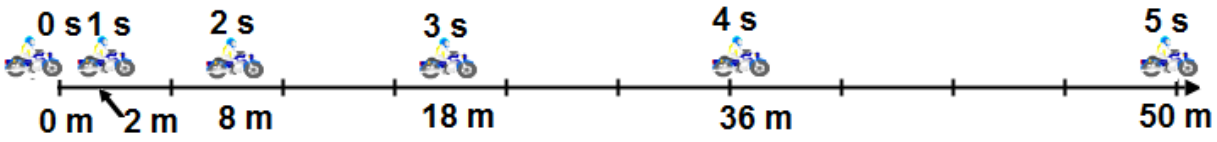



2. The graph represents the relationship between velocity and time for an object moving in a straight line. What is the traveled distance of the object at 9 s?
   A. 10 m  B. 24 m  C. 36 m  D. 48 m  E. 56 m


3. A motorbike travels east and begins to slow down before a traffic light. Which of the following is the correct direction of the motorbike's acceleration?

A. 
B. 
C. 
D. 
E. 

4. A car and a delivery truck both start from rest and accelerate at the same rate. However, the car accelerates for twice the amount of time as the truck. What is the traveled distance of the car compared to the truck?
   A. Half as much
   B. The same
   C. Twice as much
   D. Four times as much
   E. One quarter as much



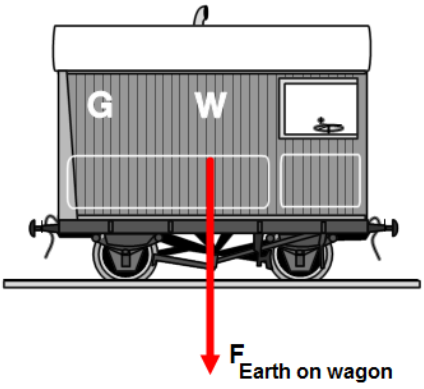

5. The position and the elapsed time of a motorbike are presented by the diagram. The motorbike starts from rest and accelerates at a constant rate. What is the acceleration of the motorbike?
   A. 0 $m/s^2$ B. 2 $m/s^2$ C. 4 $m/s^2$ D. 6 $m/s^2$ E. 8 $m/s^2$

6. When a cat sleeps on a table, the net force on it is

   A. zero
   B. directed upward
   C. directed downward
   D. directed in the horizontal direction
   E. more information is required

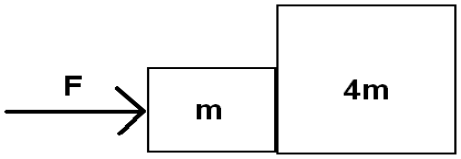
7. The acceleration of an object is inversely proportional to
   A. the net force acting on it
   B. its position
   C. its velocity
   D. its mass
   E. its displacement

8. The Earth pulls down on a railroad wagon with a force of 200 kN. Which of the following is the "reaction force"?
   A. The wagon pulls up the Earth with 200 kN
   B. The wagon pushes down the railroad with 200 kN
   C. The railroad pushes up the wagon with 200 kN
   D. The buoyant force pushes up the wagon with 200 kN
   E. The wagon pushes down the Earth with 200 kN

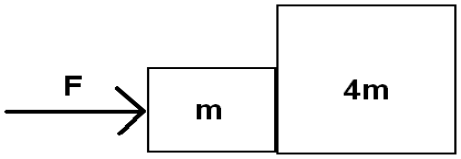


9. An elevator of mass M is pulled upwards by a cable; the elevator has a positive, but decreasing, velocity. What is the tension in the cable (neglecting the mass of the cable)?
   A. less than zero
   B. between zero and Mg
   C. equal to Mg
   D. greater than Mg
   E. zero

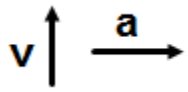
10. In the figure to the right, two boxes of masses m and 4m are in contact with each other on a frictionless surface. What is the acceleration of the more massive box?
   A. F/m
   B. F/(2m)
   C. F/(4m)
   D. F/(5m)
   E. F/(6m)

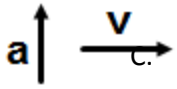



11. In the figure to the right, two boxes of masses m and 4m are in contact with each other on a frictionless surface. What is the force causing the acceleration of the more massive box?
   A. 4F
   B. 3F/2
   C. 5F/4
   D. 4F/5
   E. F/6

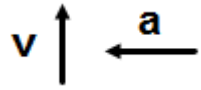


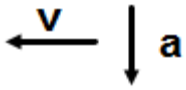

12. A small sphere is swung in a vertical circle. Which of the following combinations represents the direction of the velocity and acceleration at the point where the sphere is located?

A. 

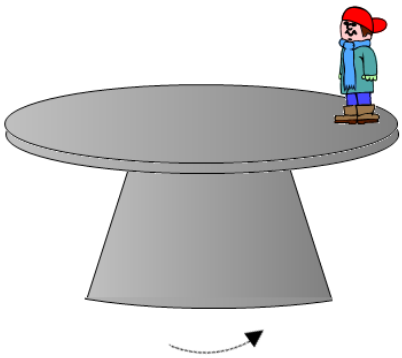

B. 


C. 


D. 


E. 

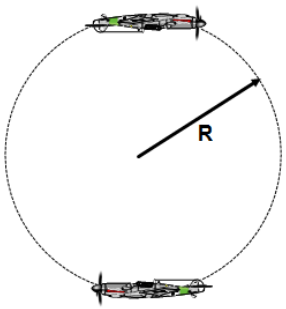

13. A boy stands at the edge of a rotating table. Which of the following forces prevents him from sliding of the table?
   A. The force of gravity
   B. The normal force
   C. The static friction
   D. The kinetic friction
   E. None from the above



14. An object rotates with a period of 10 s. How many revolutions will it make in 25 s?
    A. 10 B. 15 C. 5 D. 2.5 E. 2

15. An object rotates with a frequency of 300Hz. How many revolutions will it make in 15 s?
    A. 1000 B. 1500 C. 2000 D. 3500 E. 4500

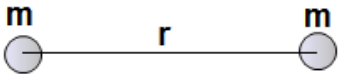
16. A pilot performs a vertical maneuver around a circle with a radius R. When the airplane is at the lowest point of the circle pilot's weight is 4 mg. What is the velocity at the lowest point?

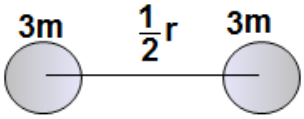



    A. $\sqrt{Rg}$
    B. $\sqrt{2Rg}$
    C. $\sqrt{3Rg}$
    D. $\sqrt{4Rg}$
    E. $\sqrt{5Rg}$

17. Two objects with equal masses of 1 kg each are separated by a distance of 1 m. The gravitational force between the objects is:
    A. Slightly less than G
    B. Slightly greater that G
    C. Equal to G
    D. Half as much of G
    E. Twice as much of G

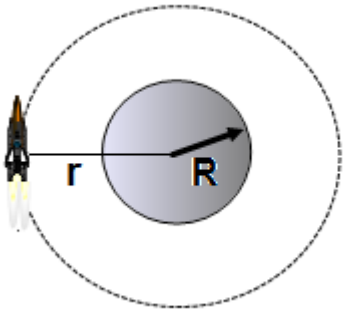
18. Two objects are attracted to each other by a gravitational force F. If each mass is tripled and the distance between the objects is cut in half, what is the new gravitational force between the objects in terms of F?
    A. 24 F B. 36 F C. 16 F D. 1/16 F E. 1/24 F




19. A spacecraft starts on Earth is moving to Mars. Which of the following is correct about the gravitational force on the spacecraft due to Earth' attraction?
    A. The force becomes zero when the spacecraft is half way between the planets
    B. The force becomes zero when the spacecraft is closer to the surface of Mars
    C. The spacecraft is never beyond the Earth's gravitational attraction
    D. The force becomes zero when the spacecraft land on the surface of Mars
    E. More information is required

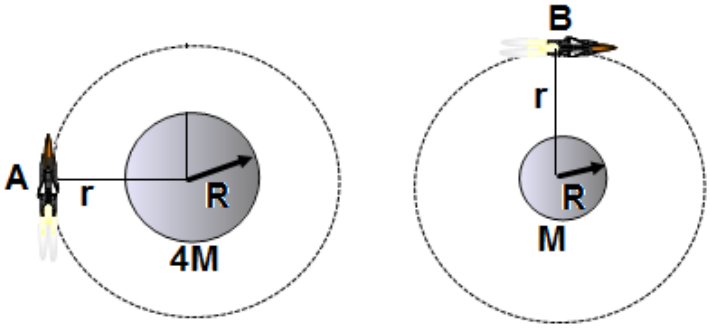
20. A satellite is orbiting a planet of mass M with an orbital radius r. Which of the following represents the orbital velocity of the satellite?




A. $v = \sqrt{\frac{GM}{R}}$ B. $v = \sqrt{\frac{GM}{r^2}}$ C. $v = \sqrt{\frac{GM}{r}}$

D. $v = \sqrt[3]{\frac{GM}{r}}$ E. $v = \sqrt{\frac{GM}{r^3}}$

21. A satellite A moves around a planet of mass 4M, another satellite B moves around a planet of mass M. What is the orbital period of satellite A in terms of that of satellite B if the orbital radius is the same for both cases?




A. $T_A = \frac{1}{4}T_B$

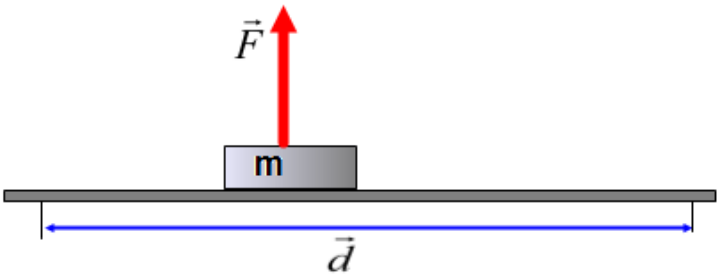
B. $T_A = \frac{1}{\sqrt{2}}T_B$

C. $T_A = \frac{1}{2}T_B$

D. $T_A = 2T_B$

E. $T_A = 4T_B$

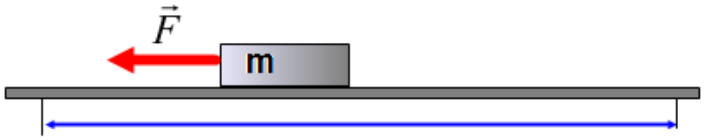
22. A block of mass m is moved over a distance d. An applied force F is directed perpendicularly to the block's displacement. How much work is done on the block by the force F?




A. mFd B. zero C. Fd

D. $\frac{F}{d}$ E. –Fd

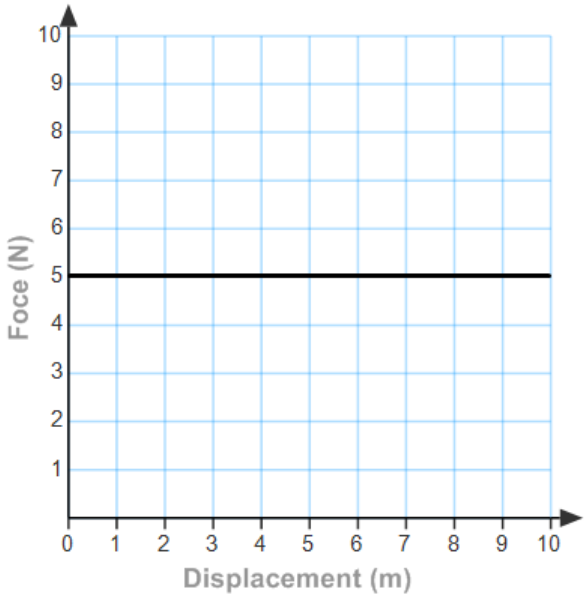
23. A block of mass m is moved over a distance d. An applied force F is opposite to the block's displacement. How much work is done on the block by the force F?



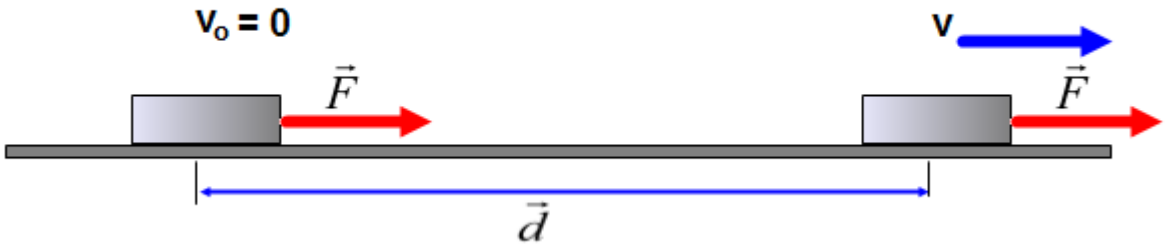

A. mFd B. zero C. Fd

D. $\frac{F}{d}$ E. –Fd

24. The force as a function of displacement of a moving object is presented by the graph. How much work is done when the object moves from 0 m to 8 m?



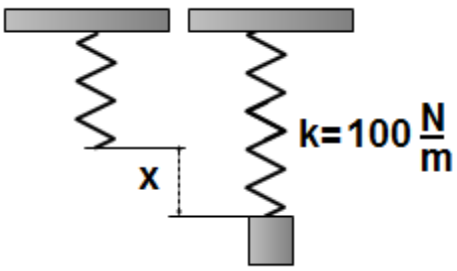

A. 40 J B. 20 J C. 0 J
D. 10 J E. 5 J




25. An applied force F accelerates an object from rest to a velocity v. How much work is done by the applied force F?

A. ½ $mv^2$ B. mgh C. ½ $kx^2$ D. mFd E. Zero

26. A heavy block is suspended from a vertical spring. The elastic potential energy is stored in the spring is 0.8 J. What is the elongation of the spring if the spring constant is 100 N/m?

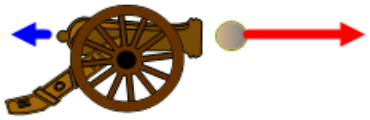



A. 2 cm B. 4 cm C. 8 cm
D. 11 cm E. 13 cm

27. A truck drives slams on the brakes of a moving truck with a constant velocity v, as a result of his action the truck stops after traveling a distance d. If the driver had been traveling with twice the velocity, what would be the stopping distance compared to the distance in the first trial?
    A. Two times greater
    B. Four times greater
    C. The same
    D. Half as much
    E. One-quarter as much

28. A 500 kg sailboat moves with a momentum of 150,000 kg·m/s? What is the velocity of the boat?
    A.300 m/s  B. 3 m/s  C. 30 m/s  D. 3,000 m/s  E. 30,000 m/s

29. A cannon fires a cannonball and recoils backward. Which of the following statements is true about the cannon recoil?

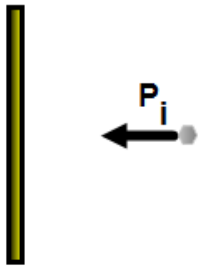


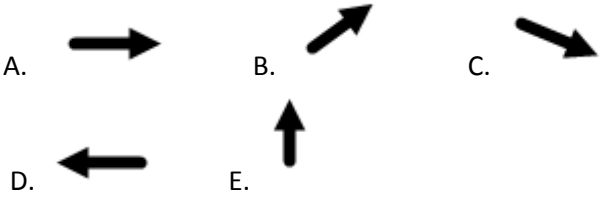
    A. It happens because the energy of the system is conserved
    B. It happens because the energy of the system is increased
    C. It happens because the momentum of the system is not conserved
    D. It happens because the momentum of the system is conserved
    E. It happens because the momentum of the system is increased

30. An 80 kg diver jumps off a moving boat. The boat has a mass of 400 kg and moves at a constant velocity of 2 m/s. What is the velocity of the boat after the jump if the diver jumps with a velocity of 3 m/s in opposite direction to the initial velocity of the boat?


    A. 2 m/s  B. 3 m/s  C. 4 m/s  D. 5 m/s  E. 6 m/s

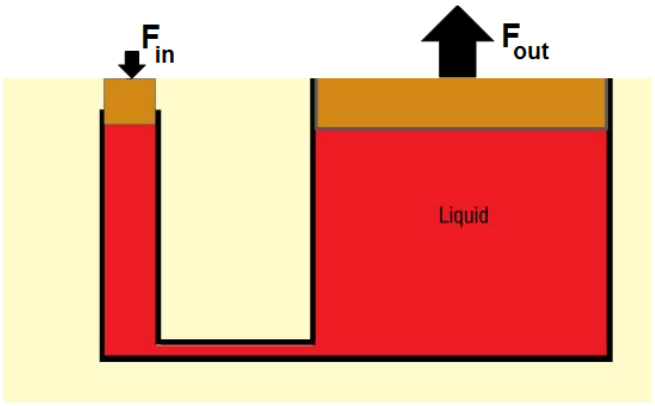
31. A piece of clay moving with an initial momentum $P_i$ collides with a vertical wall and sticks to it. Which of the following is correct about the vector of impulse that the clay experiences during the collision?



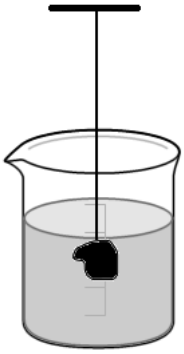




32. There are two round tables in the physics classroom: one with the radius of 50 cm the other with a radius of 150 cm. What is the relationship between the two forces applied on the tabletops by the atmospheric pressure?
    (A) $F_1/F_2 = 1/3$  (B) $F_1/F_2 = 1/9$  (C) $F_1/F_2 = 3/1$  (D) $F_1/F_2 = 9/1$  (E) $F_1/F_2 = 1/6$

33. What is the difference between the pressure on the bottom of a pool and the pressure on the water surface?
    (A) ρgh (B) ρg/h (C) ρ/gh (D) gh/ ρ (E) zero




34. In a hydraulic lift the small piston has an area of 2 $cm^2$ and large piston has an area of 80 $cm^2$. What is the mechanical advantage of the hydraulic lift?
    (A) 40 (B) 4 (C) 2 (D) 1 (E) 20

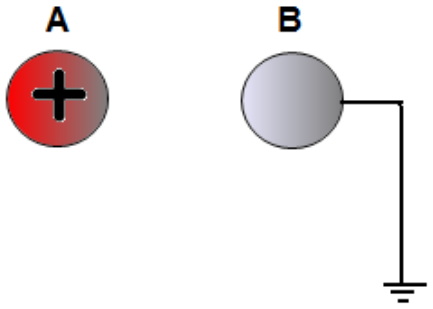


35. Physics students use a spring scale to measure the weight of a piece of lead. The experiment was performed two times one in air the other in water. If the volume of lead is 50 $cm^3$, what is the difference between two readings on the scale?
    (A) 0.5 N (B) 5.0 N (C) 50 N (D) 500 N (E) 0 N

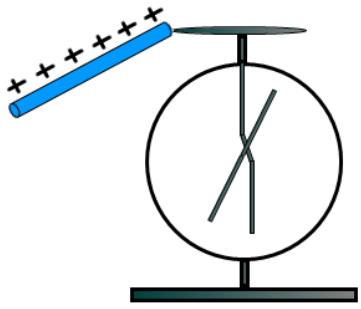
36. Three blocks of equal volume are completely submerged into water. The blocks made of different materials: aluminum, iron and lead. Which of the following is the correct statement about the buoyant force on each block? ($P_{aluminum}$ = 2700 kg/$m^3$, $\rho_{iron}$ = 7800 kg/$m^3$, $\rho_{lead}$ = 11300 kg/$m^3$)
    (A) $F_{aluminum} > F_{iron} > F_{lead}$
    (B) $F_{aluminum} < F_{iron} < F_{lead}$
    (C) $F_{aluminum} < F_{iron} > F_{lead}$
    (D) $F_{aluminum} = F_{iron} = F_{lead}$
    (E) $F_{aluminum} > F_{iron} < F_{lead}$

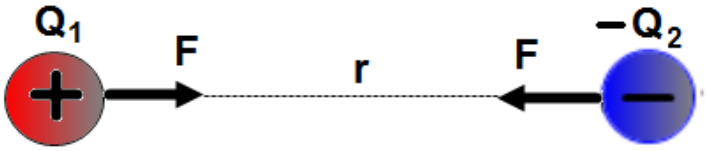
37. A plastic rod is rubbed with a piece of animal fur. The plastic rod acquires a negative charge during this process. Which of the following is true about the charge on the piece of fur?
    A. It acquires a positive charge but greater in magnitude than the rod
    B. It acquires a positive charge but less in magnitude than the rod
    C. It acquires a negative charge but greater in magnitude than the rod
    D. It acquires a negative charge but less in magnitude than the rod
    E. It acquires a positive charge with the same magnitude as the rod

38. A positively charged sphere A is brought close without touching to a neutral sphere B. Sphere B is briefly touched with a grounded wire. What is the charge on sphere B after the wire is removed?
    A. Positive
    B. Negative
    C. It stays neutral
    D. It depends on the contact time
    E. It depends on the material that sphere B is made of



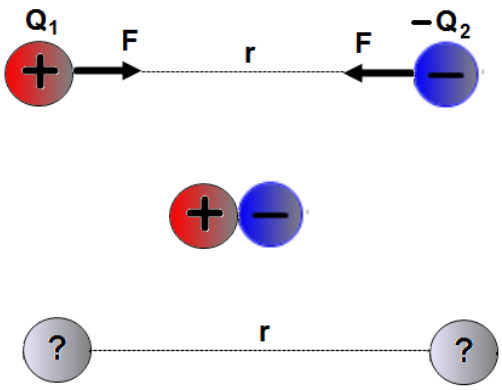

39. A neutral electroscope is touched with a positively carged rod. After the rod is removed the electroscope is charged positively because of:
    A. Induction
    B. Conduction
    C. Thermoemission
    D. Photoemission
    E. None from the above






40. Two charges $Q_1$ and $-Q_2$ are separated by a distance r. The charge attract each other with a force F. What is the new force between the charges if the distance is cut to one-fourth and the magnitude of each charge is doubled?
    A. 16 F  B. 64 F  C. 48 F  D. $\frac{1}{48}$ F  E. $\frac{1}{64}$ F

41. A positively charged sphere with a charge of +8Q is separatred from a negatively charged sphere -2Q by a distance r. There is an attractive force F exerted on each sphere. The spheres briefly touch each other and move to the original distance r. What is the new force on each sphere in terms of F?

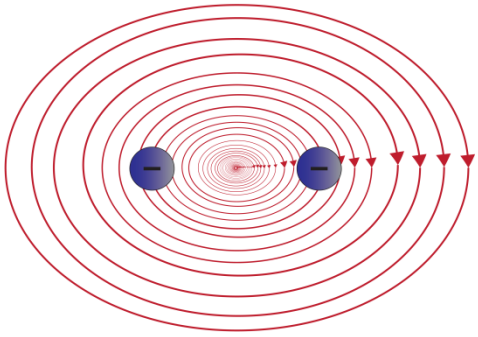



A. $\frac{9}{16}$ F  B. $\frac{16}{9}$ F  C. $\frac{9}{4}$ F

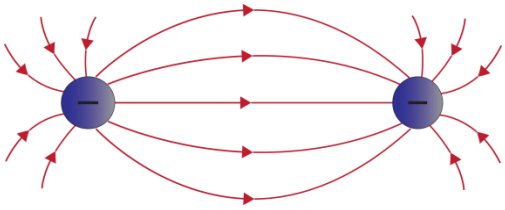
D. $\frac{4}{9}$ F  E. $\frac{2}{3}$ F

42. Which of the following represents the electric field map due to a combination of two negative charges?

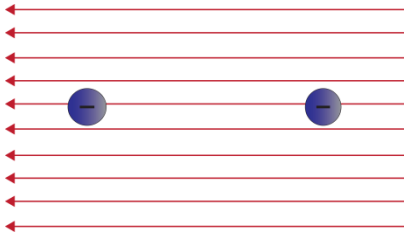
A)



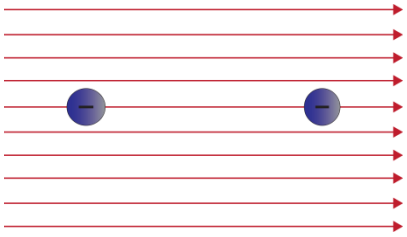
B)



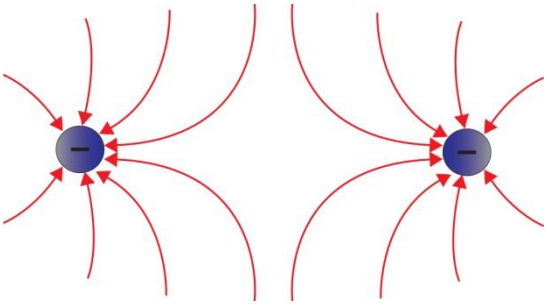
C)



D)

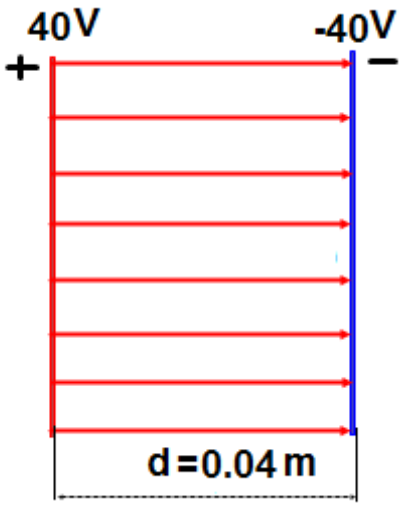


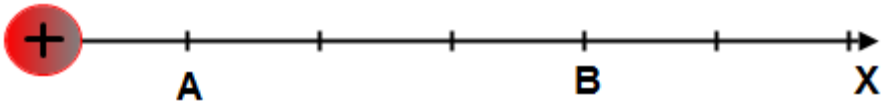
E)



43. A uniform electric field is created by two parallel plates separated by a distance of 0.04 m. What is the magnitude of the electric field established between the plates?

A. 20 V/m B. 200 V/m C. 2,000 V/m
D. 20,000 V/m E. 0 V/m




44. The electric potential at point A is V. What is the electric potential at point B in terms of V?

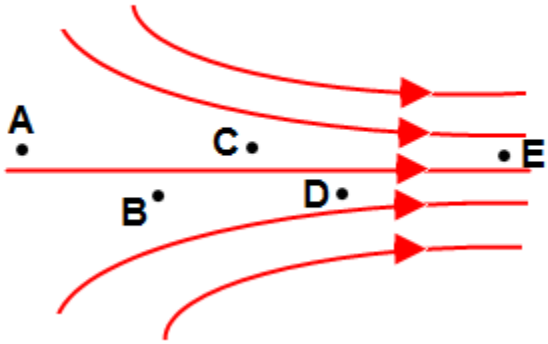
A. 2 V B. 4 V C. V D. $\frac{1}{2}$ V E. $\frac{1}{4}$ V

45. A conducting sphere is negatively charged. Which of the following statements is true?

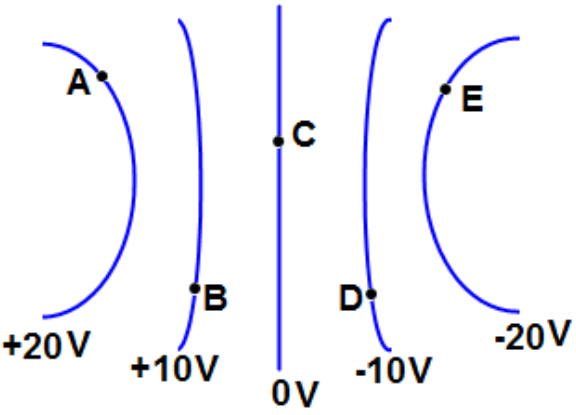
A. The charge is uniformly distributed throughout the entire volume
B. The charge is located at the center of the sphere
C. The charge is located at the bottom of the sphere because of gravity
D. The charge is uniformly distributed on the surface of the sphere
E. The negative charge is neutralized by the positive charge

46. A non-uniform electric field is represented by the diagram. At which of the following points the electric field is greatest in magnitude?

A. A B. B C.C
D.D E.E



47. A non-uniform electric field is represented by equipotential lines. What is the direction of the electric field at point A?




A.  B.  C. 

D.  E. 

48. A wire of length L and cross-sectional area A has a resistivity ρ. Which of the following formulas can be used to calculate the resistance of the wire?

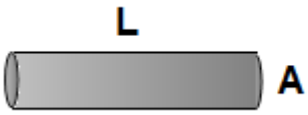
A. $R = \frac{\rho L}{A}$

B. $R = \frac{\rho A}{L}$

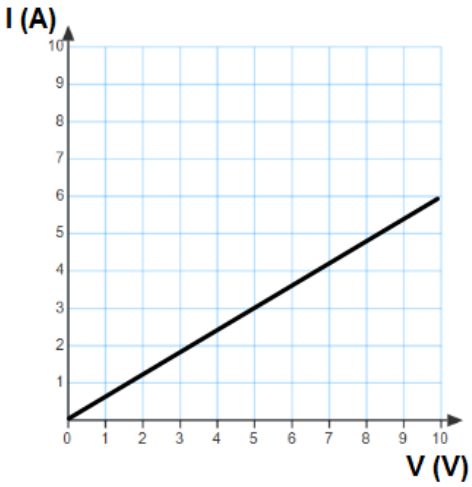
C. $R = \frac{L}{\rho A}$

D. $R = \frac{A}{\rho L}$

E. $R = \frac{\rho}{A}$




The electric current as a function of voltage of a wire is presented by the graph to the right. Use this graph for questions 49 and 50.




49. What is the resistance of the wire?

A. 1Ω B.0.8 Ω C.1.6 Ω

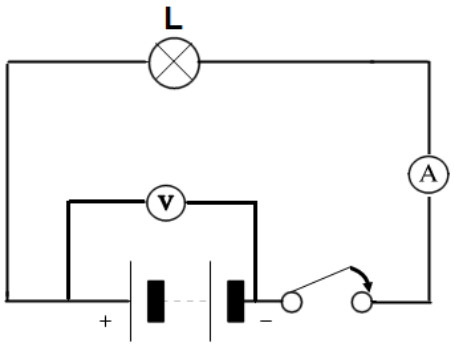
D. 0.4 Ω E. 0.2 Ω

50. The electric current as a function of voltage of a wire is presented by the graph. What is the power dissipated in the resistor when the applied voltage is 5 V?

A. 5 W B.10 W C.15 W

D. 20 W E. 25 W

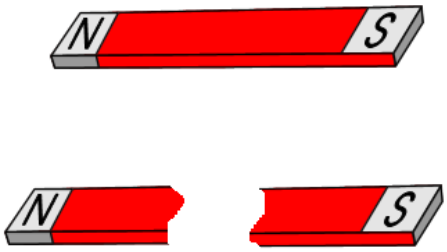
51. When the switch in the circuit presented by the diagram above is closed, the voltmeter reading is referred to:




A. Terminal voltage B. EMF C. Current

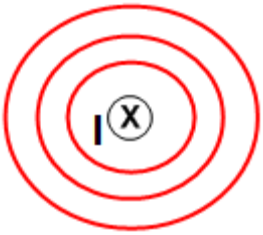
D. Resistance E. Power

52. A magnet bar is divided in two pieces. Which of the following statements is true?



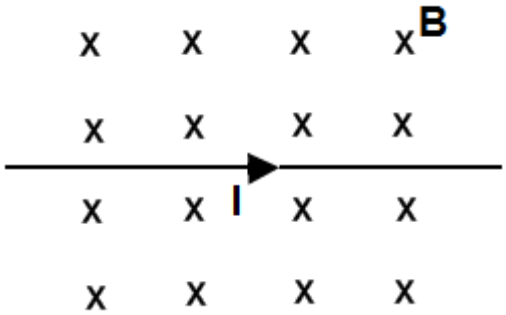

A. The magnet bar is demagnetized
B. The magnetic field of each separated piece becomes stronger
C. The magnetic poles are separated
D. The two magnets are created
E. The electric field is created

53. An electric current flows into the page. What is the direction of the magnetic field?



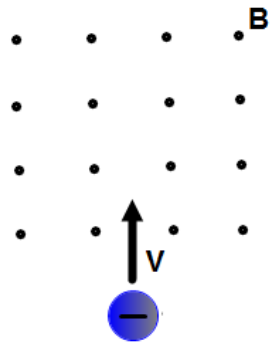

A. To the bottom of the page
B. To the top of the page
C. Clockwise
D. Counter-clockwise
E. To the right

54. A straight long wire carries an electric current to the right. The current is placed in a uniform magnetic field directed into the page. What is the direction of the magnetic force on the current?



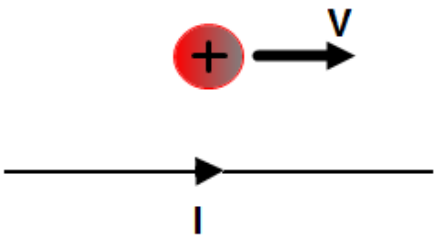

A. Left
B. Right
C. To the bottom of the page
D. To the top of the page
E. Out of the page

55. A negative charge moving with a constant velocity v enters a region of a uniform magnetic field pointing out the page. What is the direction of the magnetic force on the charge?



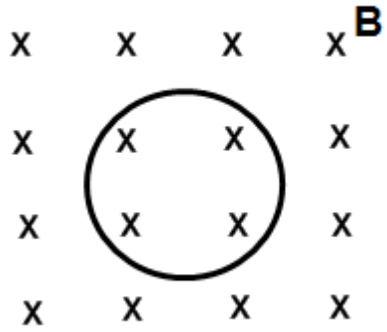

A. Left
B. Right
C. To the bottom of the page
D. To the top of the page
E. There is no magnetic force on the current

56. A positive charge moves in parallel to a current carrying wire. What is the direction of the magnetic force on the charge?

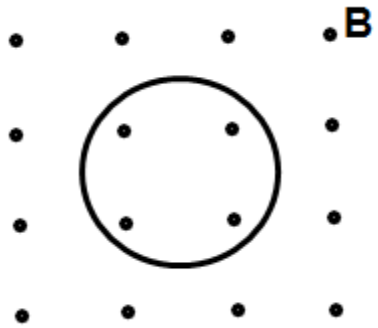



A. Left
B. Right
C. To the bottom of the page
D. To the top of the page
E. There is no magnetic force on the charge

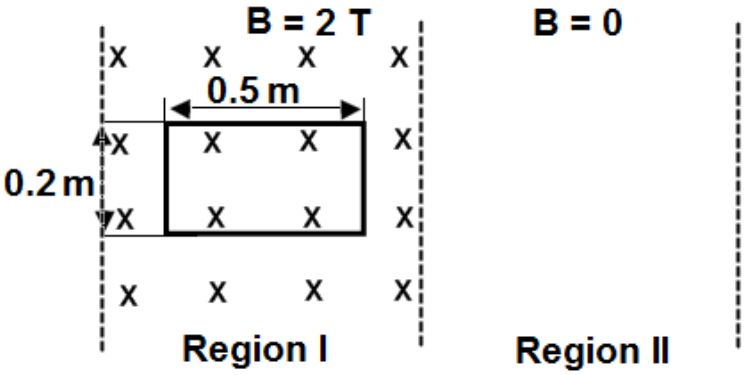
57. A loop of wire is placed in a perpendicular magnetic field. Suddenly, the magnitude of the magnetic field begins to increase, what is the direction of the induced current?
    A. Clockwise
    B. Counter-clockwise
    C. Out of the page
    D. Into the page
    E. There is no induced current in the loop



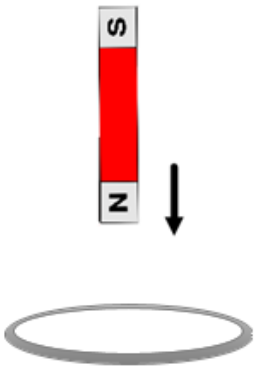

58. A loop of wire is placed in a perpendicular magnetic field. Suddenly, the magnitude of the magnetic field begins to decrease, what is the direction of the induced current?
    A. Clockwise
    B. Counter-clockwise
    C. Out of the page
    D. Into the page
    E. There is no induced current in the loop



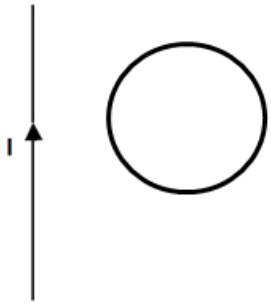

59. A rectangular loop of wire with dimensions 0.2 m x 0.5 m is placed in a uniform magnetic field of magnitude 2 T. The magnetic field is perpendicular to the plane of the loop. The loop is moved from region I to region II in 0.05 s? What is the induced emf in the loop?
    A. 1 V  B. 2 V  C. 3 V
    D. 4 V  E. 5 V



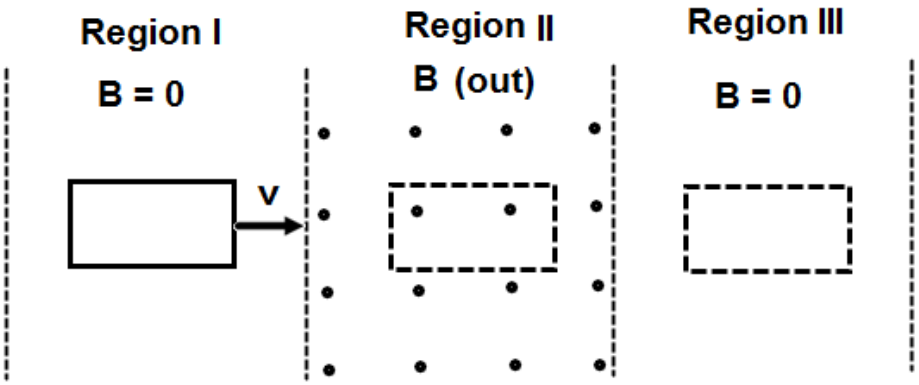

60. A magnet bar with the north pole faced downward is dropped above a horizontal circular coil. Which of the following statements about the induced current is true? (viewed from above)
    A. The induced current flows in clockwise direction
    B. The induced current flows in counter-clockwise direction
    C. The induced current flows first in clockwise and then in counter-clockwise direction
    D. The induced current flows first in counter-clockwise and then in clockwise direction
    E. There is no induced current in the coil



61. A current-carrying wire lies on a horizontal table. A circular coil is placed next to the loop. The current vanishes suddenly. What is the direction of the induced current in the coil?




A. Clockwise
B. Counter-clockwise
C. There is no induced current in the coil
D. The induced current changes its direction from clockwise to counter-clockwise
E. The induced current changes its direction from counter-clockwise to clockwise




62. A rectangular loop of wire is moved at a constant speed from region I to region II and then to region III. Which of the following is true about the magnetic force direction acting on the loop when it crosses the boundary between the regions?

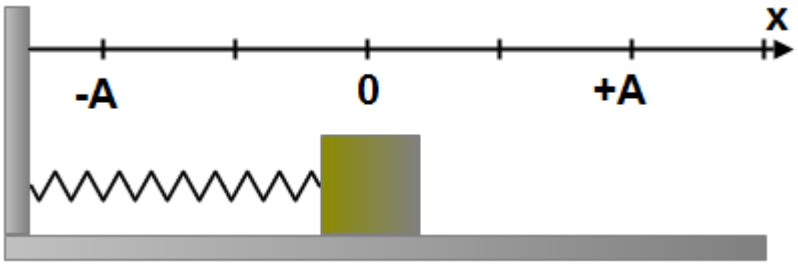
| | Region I→ Region II | Region II→ Region III |
|---|---|---|
| A. | Left | Right |
| B. | Left | Left |
| C. | Right | Right |
| D. | Right | Left |
| E. | Zero | Zero |

63. A mass M suspended from a string L undergoes SHM. Which of the following is true about the period of oscillations?
A. The period increases with increasing amplitude
B. The period increases with increasing mass
C. The period increases with decreasing length
D. The period increases with increasing length
E. The period doesn't depend on acceleration due to gravity

64. The length of a simple pendulum oscillating with a period T is quadrupled, what is the new period of oscillations in terms of T?

A. 2 T B. 4 T C. T D. $\frac{1}{2}$ T E. $\frac{1}{4}$ T

A mass in the diagram to the right undergoes simple harmonic motion. Use this diagram to answer questions 65 through 68.




65. When the mass reaches point x = +A its instantaneous velocity is?

A. Maximum and positive B. Maximum and negative
C. Zero D. Less than maximum and positive
E. Less than maximum and negative

66. When the mass reaches point x = 0 its instantaneous velocity is?

A. Maximum and can be positive or negative
B. Constant and doesn't depend on the location
C. Zero
D. Slightly less than maximum and positive
E. Slightly less than maximum and negative

67. When the mass reaches point x = +A its instantaneous acceleration is?

A. Maximum and positive B. Maximum and negative
C. Zero D. Slightly less than maximum and positive
E. Slightly less than maximum and negative

68. When the mass reaches point x = 0 its instantaneous acceleration is?

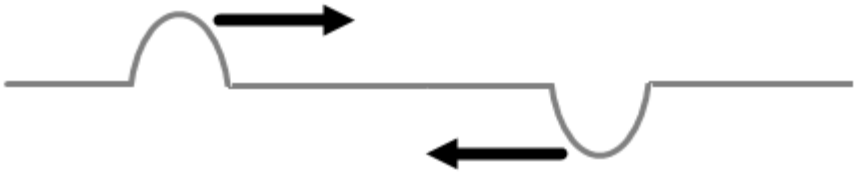
A. Maximum and positive B. Maximum and negative
C. Zero D. Slightly less than maximum and positive
E. Slightly less than maximum and negative

69. The frequency of a wave is doubled when the wavelength remains the same. What happens to the speed of the wave?

A. It doubles B. It quadruples C. Remains unchanged
D. It is cut to one-half E. It is cut to one-fourth

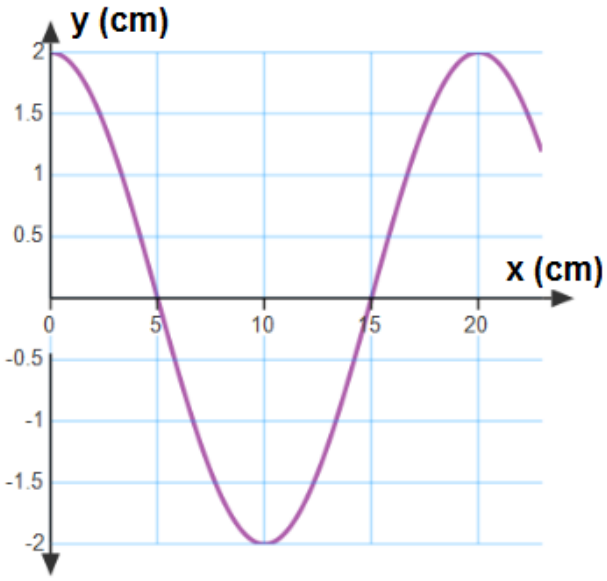
70. A wave pulse travels a long a thick part of a horizontal cord and reaches another part of the cord which is much thinner and lighter. Which of the following is true about the reflected and transmitted pulse by the boundary in the cord?

| | Reflected pulse | Transmitted pulse |
|---|---|---|
| A. | Upright | Upright |
| B. | Inverted | Inverted |
| C. | Upright | Inverted |
| D. | Inverted | Upright |
| E. | Zero amplitude | Zero amplitude |



71. Two wave pulses one with a positive amplitude the other with equal negative amplitude travel on a cord approaching each other. What is the result of the oscillations when the pulses reach the same point?
    A. It is constructive interference with twice the amplitude
    B. It is destructive interference with zero amplitude
    C. It is constructive interference with slightly greater amplitude
    D. It is constructive interference with the negative amplitude
    E. The standing wave is produced

A "snapshot" of a wave at a given time is presented by the graph to the right. Use this graph for questions 72 and 73.




72. What is the amplitude of oscillations?
    A. 0.5 cm B. 1 cm C. 2 cm
    D. 5 cm E. 20 cm

73. What is the wavelength of the wave?
    A. 0.5 cm B. 1 cm C. 2 cm
    D. 5 cm E. 20 cm

74. Two sound sources $S_1$ and $S_2$ produce waves with frequencies 1000 Hz and 500 Hz. When we compare the speed of wave 1 to the speed of wave 2 the result is:
(A) Twice as great (B) One-half as great (C) The same
(D) Four times great (E) One-fourth as great

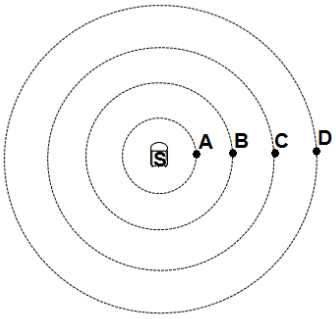
75. A sound wave resonates in a tube with two open ends. What are the wavelengths of the three lowest resonating frequencies generated in the tube?
(A) L, 2L, 3L (B) 2L, L, 2L/3 (C) L/2, L/3, L/5
D) L/3, L/5, L/7 (E) 4L, 4L/3, 4L/5

76. The lowest frequency in an open tube is 250 Hz. What are the three following frequencies will resonate in the tube?
(A) 500Hz, 750Hz, 1000Hz (B) 100Hz, 200Hz, 400Hz (C) 250Hz, 500Hz, 750Hz
(D) 150Hz, 450Hz, 850Hz (E) 50Hz, 100Hz, 150Hz

77. A sound wave resonates in a tube with one open end. What are the wavelengths of the three lowest resonating frequencies generated in the tube?
(A) L, 2L, 3L (B) L, 2L, 2L/3 (C) L/2, L/3, L/5
(D) L, 3L, 5L (E) 4L, 4L/3, 4L/5

78. The lowest frequency in a closed tube is 200 Hz. What are the three following frequencies will resonate in the tube?
(A) 600Hz, 1000Hz, 1400Hz (B) 100Hz, 200Hz, 400Hz (C) 400Hz, 600Hz, 800Hz
(D) 900Hz, 1500Hz, 2100Hz (E) 50Hz, 100Hz, 150Hz

79. A sound source S radiates a sound wave in all directions. The relationship between the distances is SA = AB = BC = CD. Which of the following points oscillates at the highest frequency?
(A) Point A (B) Point B
(C) Point C (D) Point D
(E) All points have the same frequency




80. A beam of light has a wavelength of 600 nm in air. What is the frequency of light? ($c = 3 \cdot 10^8$ m/s)
(A) $5.0 \cdot 10^{14}$ Hz (B) $2.0 \cdot 10^{14}$ Hz (C) $3.0 \cdot 10^{14}$ Hz (D) $6.0 \cdot 10^{14}$ Hz (E) $2.0 \cdot 10^{14}$ Hz

81. A light beam traveling in air with a wavelength of 650 nm falls on a glass block. What is the speed of the light beam in glass? ($c = 3 \cdot 10^8$ m/s, n = 1.5)
(A) $3.0 \cdot 10^8$ m/s (B) $2.0 \cdot 10^8$ m/s (C) $1.5 \cdot 10^8$ m/s (D) $1.0 \cdot 10^8$ m/s (E) $0.5 \cdot 10^8$ m/s

82. A light beam traveling in air with a wavelength of 600 nm falls on a glass block. What is the frequency of the light beam in glass? ($c = 3 \cdot 10^8$ m/s, n = 1.5)
    (A) $5.0 \cdot 10^{14}$ Hz (B) $2.5 \cdot 10^{14}$ Hz (C) $3.0 \cdot 10^{14}$ Hz (D) $6.0 \cdot 10^{14}$ Hz (E) $2.0 \cdot 10^{14}$ Hz

83. A blue beam of light falls on two narrow slits producing an interference pattern on a screen. If instead blue light a red beam of light was used in the same experiment, which new changes to the interference pattern we can observe?
    (A) Interference fringes move close to the central maximum
    (B) Interference fringes move away from the central maximum
    (C) No change in interference
    (D) Bright fringes are replaced with dark fringes
    (E) The number of fringes increases

84. Which of the following theories can explain the bending of waves behind obstacles into "shadow region"?
    (A) Particle theory of light (B) Wave theory of light (C) Kinetic theory
    (D) Special theory of relativity (E) Classical mechanics

85. The wave theory of light is associated with:
    (A) I. Newton (B) A. Einstein (C) Max Plank (D) Christian Huygens (E) Robert Milliken

86. Which of the following photons has the greatest energy?
    (A) Infrared (B) Blue (C) X-Ray (D) γ- photon (E) UV – photon

87. In the Rutherford's Experiment "Scattering α – particles by a gold foil" the biggest part of α – particles could pass through the foil undeflected. Which of the following properties of the atom can be explained from this observation?
    (A) The positive charge is concentrated in the nucleus
    (B) The nucleus has electrons and protons
    (C) The atomic mass is concentrated in the nucleus
    (D) The α – particles couldn't be deflected by electrons
    (E) The size of the nucleus is much less than the size of the atom

88. Which of the following statement(s) can be associated with Bohr's theory of the atom?
    I. An electron orbiting the nucleus can change its energy continuously
    II. An electron orbiting the nucleus emits energy and falls on the nucleus
    III. An electron orbits the nucleus without radiating energy and can change its energy only by a certain portion when it jumps between the orbits
    IV. The angular momentum of an electron around the nucleus is equal an integer times $h/2\pi$

    (A) I and II (B) II and IV (C) II and III (D) III and IV (E) I, II, III and IV

89. The atomic number is equivalent to which of the following?
    A. The number of neutrons in the atom
    B. The number of protons in the atom
    C. The number of nucleons in the atom
    D. The number of $\alpha$–particles in the atom
    E. None of the above

90. The atomic mass number is equivalent to which of the following?
    A. The number of neutrons in the atom
    B. The number of protons in the atom
    C. The number of nucleons in the atom
    D. The number of $\alpha$–particles in the atom
    E. None of the above

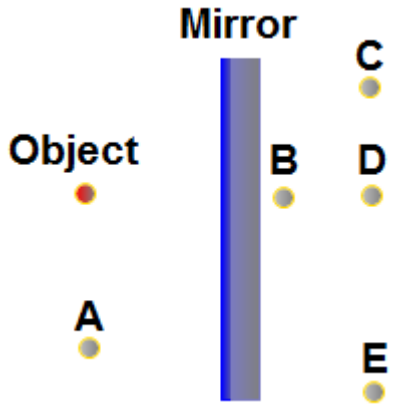
91. Which of the following is the α–particle?
    A. ${}^{0}_{+1}e$ B. ${}^{0}_{-1}e$ C. ${}^{1}_{0}n$ D. ${}^{1}_{1}H$ E. ${}^{4}_{2}He$

92. Which of the following is the $\beta^{-}$–particle?
    A. ${}^{0}_{+1}e$ B. ${}^{0}_{-1}e$ C. ${}^{1}_{0}n$ D. ${}^{1}_{1}H$ E. ${}^{4}_{2}He$

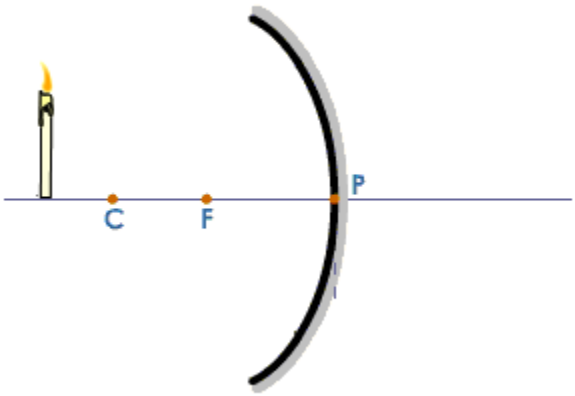
93. Which of the following is the $\beta^{+}$–particle?
    A. ${}^{0}_{+1}e$ B. ${}^{0}_{-1}e$ C. ${}^{1}_{0}n$ D. ${}^{1}_{1}H$ E. ${}^{4}_{2}He$

94. What is the missing element from the following equation ${}^{14}_{6}C \rightarrow ? + {}^{0}_{-1}e$?
    A. ${}^{13}_{7}N$ B. ${}^{12}_{6}C$ C. ${}^{17}_{8}O$ D. ${}^{16}_{8}O$ E. ${}^{14}_{7}N$

95. A 100 g of a radioactive element has a half-life of 5 days. How many grams of radioactive material will remain after 15 days?
    A. 100 g B. 50 g C. 25 g D. 12.5 g E. 0

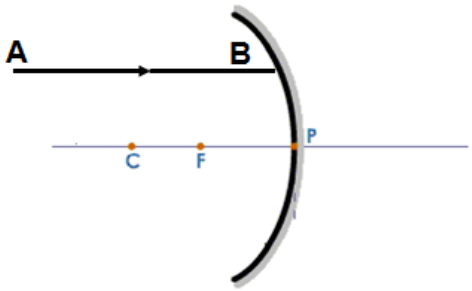



96. A point object is placed in front of a plane mirror. Which is the correct location of the image produced by the mirror?
    (A)A (B) B (C) C (D) D (E) E

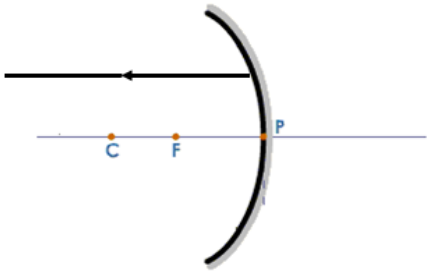



97. A candle is placed in front of a concave mirror. The image produced by the mirror is:
    (A) Real, inverted and magnified
    (B) Real, inverted and demagnified
    (C) Virtual, upright and magnified
    (D) Virtual, upright and demagnified
    (E) Real, upright and magnified

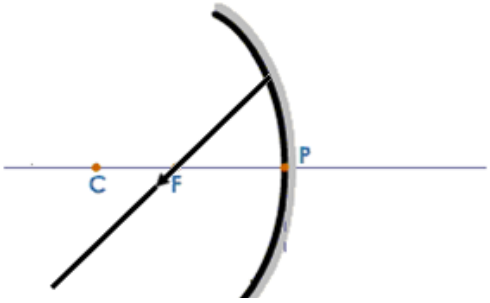
98. A very narrow light ray AB strikes the surface of a concave mirror as shown on the diagram. Which of the following diagrams represents the reflected ray?



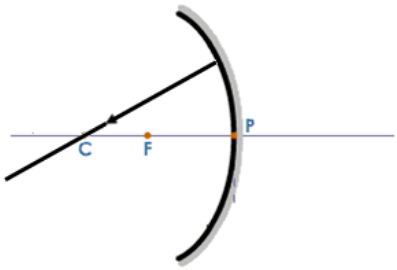

(A)



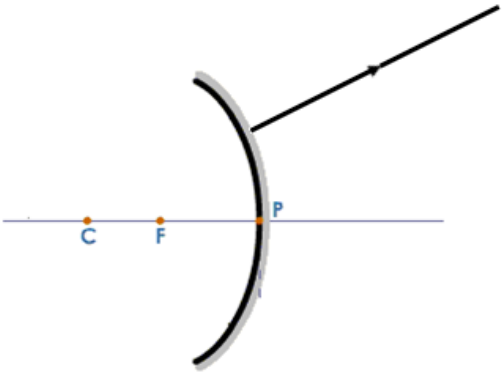

(B)



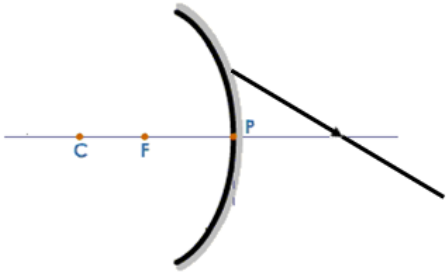

(C)

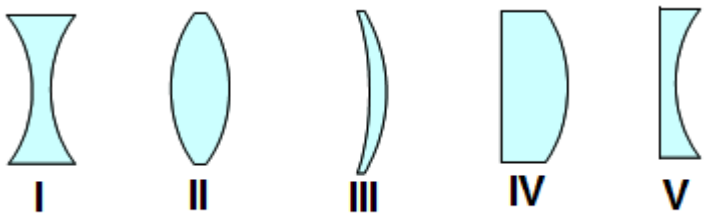



(D)

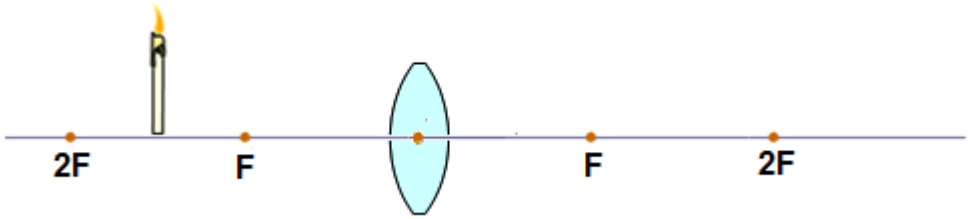



(E)






99. Which of the lens or lenses is the diverging lens?
(A) I and V (B) II, III and IV (C) II and III (D) III and IV (E) IV and V




100. An object is placed in front of a converging lens at a distance between F and 2F. The image produced by the lens is:
(A)Real, inverted and demagnified
(B)Real, inverted and magnified
(C) Virtual, upright and magnified
(D) Virtual, upright and demagnified
(E) Virtual, inverted and magnified