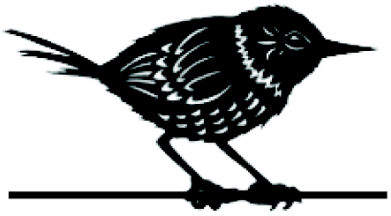
11thG Physics (2017– 18)

3rd Q Exam

(March 22, 2018)

Class	No.	Name



In a calculation problem, describe equations clearly and systematically enough to show how to solve the problem. <u>If not enough, you won't get any point.</u>

5point/question x 21questions=105points
Max 100 points

Exam ／[Total 100 点]

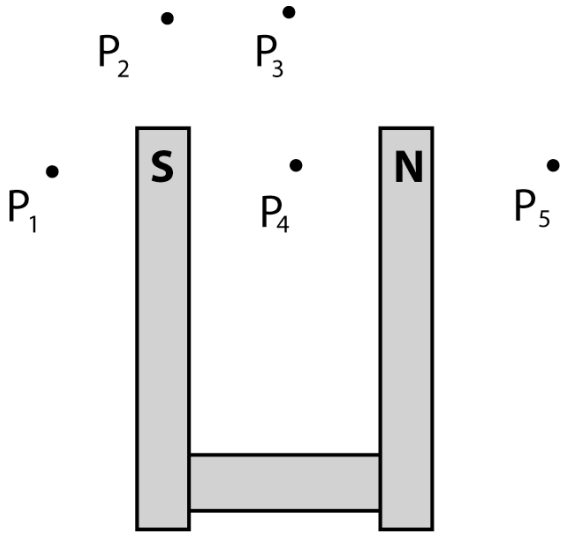
Lab Reports	Number of Full Reports	/2	Score	

Gravitational acceleration rate	$g = 9.80\ m/s^2$
Universal Gravitational Constant	$G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$
Elementary Charge	$e = 1.60 \times 10^{-19}\ C$
Electron Mass	$m_e = 9.11 \times 10^{-31}\ kg$
Proton Mass	$m_p = 1.673 \times 10^{-27}\ kg$
Coulomb's Law Constant	$k = 8.99 \times 10^9\ N \cdot m^2/C^2$
Magnetic Permeability of Free Space	$\mu_0 = 4\pi \times 10^{-7}\ T \cdot m/A$
Avogadro's Number	$N_A = 6.022 \times 10^{23}\ mol^{-1}$
Speed of Light in vacuum	$c = 3.00 \times 10^8\ m/s$

(1) What happens when a positively charged glass rod is brought near a stream of water? Describe a technical term related to the mechanism causing this phenomenon. (You can describe your answer either in English or in Japanese)

(1) Answer

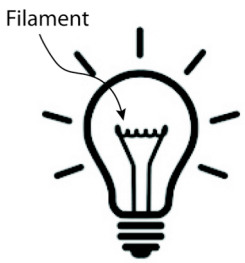
(2) An U-shape or horseshoe magnet creates a magnetic field around it. Show the direction of the magnetic field at each point P_1 ~ P_5 by drawing an arrow.



(2) Answer
Draw arrows in the figure.

(4) Answer

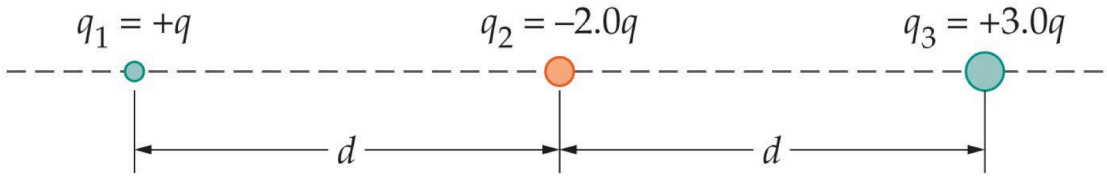
(3) How many electrons flow through the wire filament in a light bulb in 1.00 ms (10^{-3} s) if the current is 50.0 mA.



(Equations)

(3) Answer

(4) In the figure below, q = +12 μ C (+ 12 x 10^{-6} C) and d = 16 cm. Find the direction and magnitude of the net electrostatic force exerted on the point charge q_1.



(Equations)

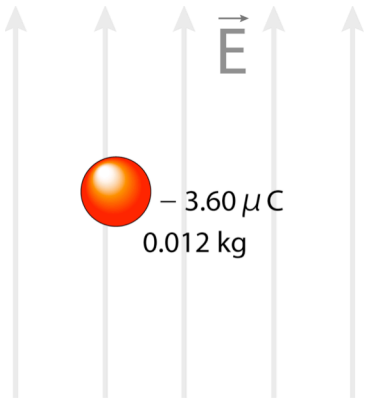
(4) Answer

(5) An object with a charge of – 3.60 μ C and a mass of 0.012 kg experiences an upward electric force, due to a uniform electric field, equal in magnitude to its weight.

(5-a) Find the magnitude of the electric field.

(5-b) If the electric charge on the object is doubled while its mass remains the same, find the direction and magnitude of its acceleration.

(Equations)



(5-a) Answer
(5-b) Answer

(6) A bird lands on a bare copper wire carrying a current of 32 A. The cross-sectional area of the wire is 0.13 cm^2. Find the difference in potential between the bird's feet, assuming they are separated by a distance of 6.0 cm. (The resistivity of copper is $\rho = 1.68 \times 10^{-8}\ \Omega \cdot m$)

(Equations)

(6) Answer

(7) You purchased a light bulb with a specification of 120V and 150W in the USA, as shown in the figure. You went back to Japan with the bulb and use it with 100 V. What is the power consumed by this bulb in Japan?

(Equations)

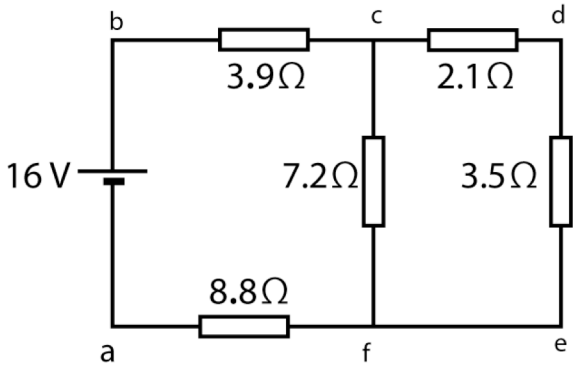
(7) Answer

Find (8) ~ (10) in the circuit shown, where the potential at the point "a" is assumed as 0 V.
(8) The current through the 8.8Ω resistor.

(9) The potential difference between the points, c and f.

(10) When the two points, d and f, are short-circuited, find the power consumed in the 8.8Ω resistor.

(Equations)

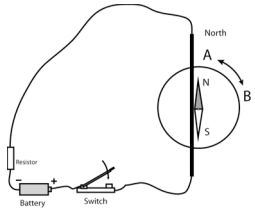


(8) Answer

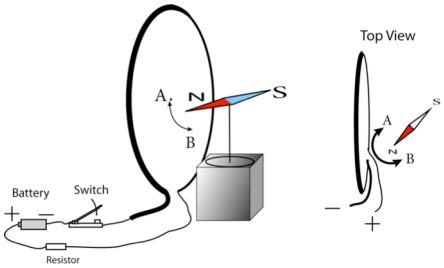
(9) Answer

(10) Answer

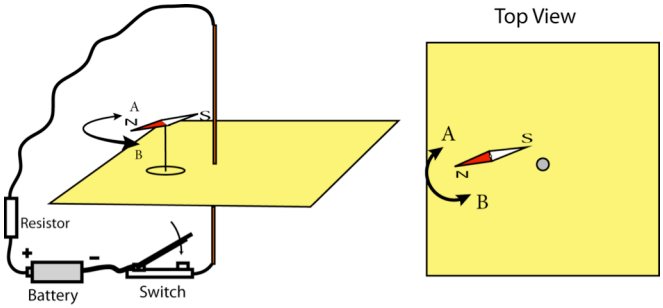
(11-a~c) When the current is applied in wire, the north pole of the compass moves in the direction, A or B. Answer A or B.



11-a

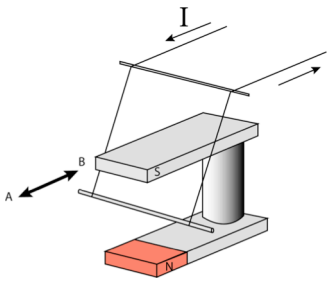


11-b

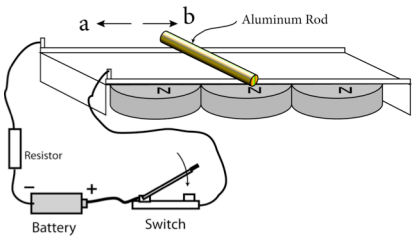


11-c

(11-d~e) When a current is applied in wire, How does the rod move, in the direction A or in the direction B?



(11-d)

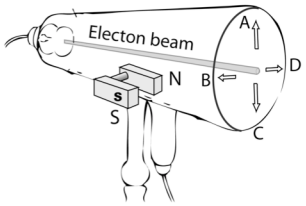


(11-e)

Answer

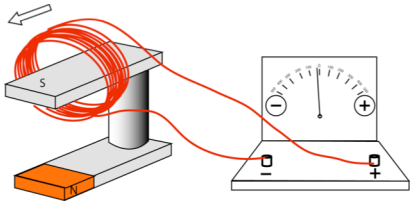
(11-a)
(11-b)
(11-c)
(11-d)
(11-e)

(12-a) Electron beam is shown in a Crooks tube. A magnet is brought near the tube as shown. In which direction does the beam move, A, B, C or D?



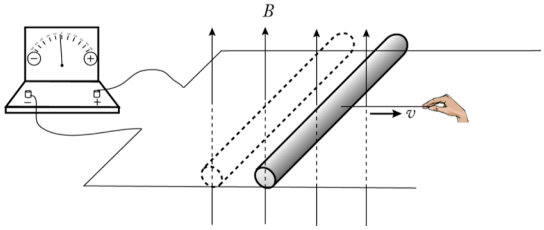
(12-a)

(12-b) When the coil is moving as shown, the galvanometer may show a swing to the positive side negative side or no swing. Answer "positive" (+) , "negative" (–) or no swing (0).



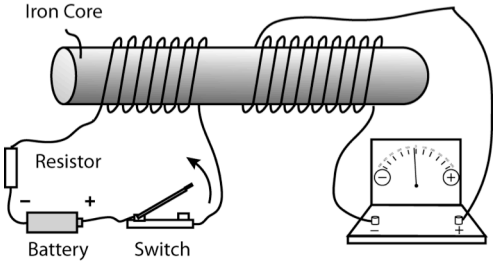
(12-b)

(12-c) When the rod is moving as shown, the galvanometer may show a swing to the positive side negative side or no swing. Answer "positive" (+) , "negative" (–) or no swing (0).



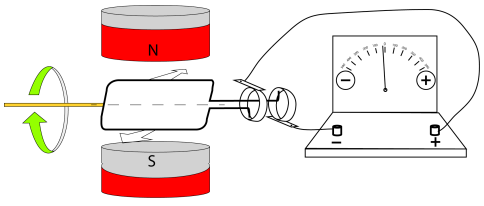
(12-c)

(12-d) The instance the current is switched off in the coil at the left, the galvanometer may show a swing to the positive side negative side or no swing. Answer "positive" (+) , "negative" (–) or no swing (0).



(12-d)

(12- e) The figure shows a generator. The coil rotates around the rotating rod in the direction shown. The galvanometer may show a swing to the positive side negative side or no swing. Answer "positive" (+) , "negative" (–) or no swing

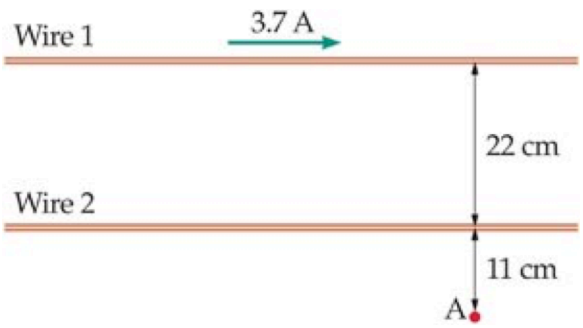


(12-e)

Answer

(12-a)
(12-b)
(12-c)
(12-d)
(12-e)

(13,14) Consider the two current-carrying wires shown in the figure at the right. The current wire 1 is 3.7A; the current in wire 2 is adjusted to make the net magnetic field at point A equal to zero.



(13) Find the magnitude and direction of the magnetic field produced by wire1 at point A.

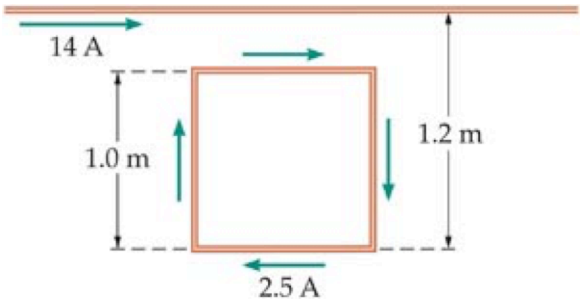
(14) Find the magnitude and direction of the current in wire2.

(Equations)

(13) Answer

(14) Answer

(15) A long straight wire carries a current of 14 A. Next to the wire is a square loop with sides 1.0m in length, as shown in the figure at the right. The loop carries a current of 2.5 A in the direction indicated.



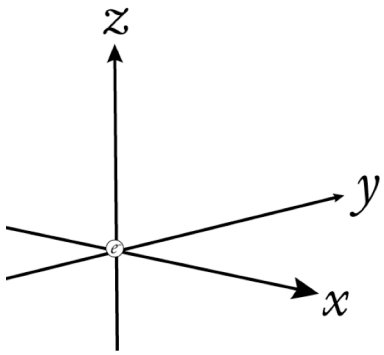
(15-a) What is the direction of the net force exerted on the loop?

(15-b) Find the magnitude of the net force acting on the loop.

(Equations)

(15-a) Answer
(15-b) Answer

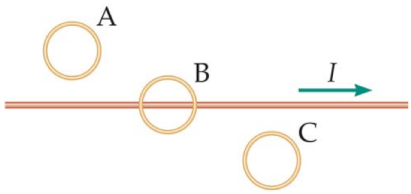
(16) An electron moving with a speed of 4.2×10^5 m/s in the positive x direction experiences zero magnetic force. When it moves in the positive y direction, it experiences a force of 2.0×10^{-13} N that points in the negative z direction. What are the direction and magnitude of the magnetic field?



(Equations)

(16) Answer

(17) A long, straight wire carries a current I, as shown in the figure at the right. Three small metal rings are placed near the current-carrying wire (A and C) or directly on top of it (B). If the current in the wire is increasing with time, is the induced current in the rings clockwise (CW), counterclockwise (CCW) or zero?



(17) Answer

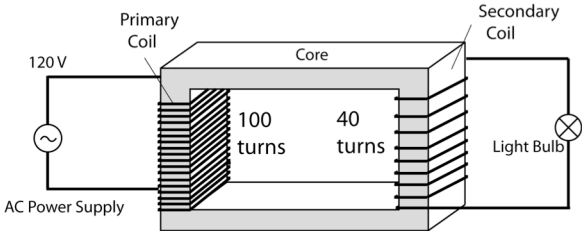
A:

B:

C:

(18) A transformer connected to a 120 V power line has 100 turns in its primary coil and 40 turns in its secondary coil. The primary current is 0.24 A when a light bulb is connected to the secondary coil. What is the resistance of the light bulb?

(Equations)

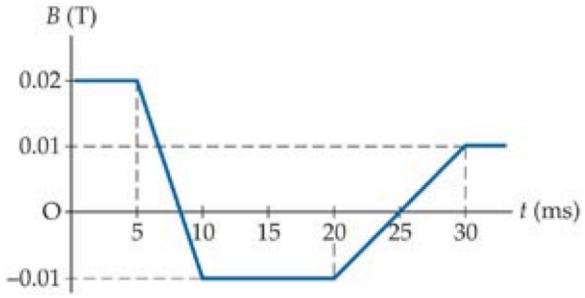


(18) Answer

(19) A magnetic field with the time dependence shown in the figure is at right angles to a 155-turn circular coil with a diameter of 3.75 cm. What is the induced emf (voltage) in the coil at the following times:

(19-a) t = 2.50 ms
(19-b) t = 7.50 ms
(19-c) t = 15.0 ms
(19-d) t = 25.0 ms.

(Equations)



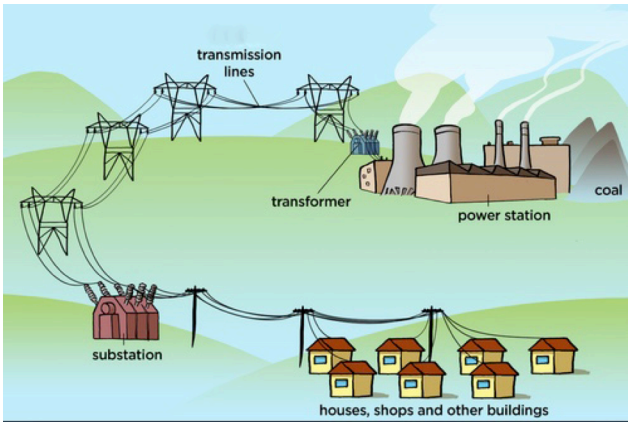
(19-a) Answer
(19-b) Answer
(19-c) Answer
(19-d) Answer

(20,21) A power station produces electric power at 10 kV. The power is transmitted 95 km totally over transmission lines whose resistance is 1.2 Ω/km.

(20) When the plant sends power of 300 kW, what is the loss % of power in the transmission lines?

(21) In order to decrease the power loss by a factor of 100, what turn ratio (secondary/primary) should a transformer be used before the transmission?

(Equations)



(20) Answer

(21) Answer

Your opinions