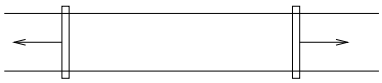
Name: Group:
Number of points:

Problems

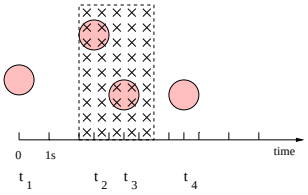
1. Two metal rod slide on a pair of long straight wire in the presence of uniform magnetic field with a velocity of v_1 and v_2 respectively. The magnetic field is perpendicular to the plane of the rails. On which rod acts larger force? 5 points

$v_1 > v_2$

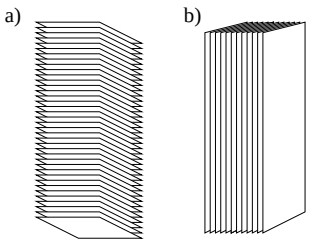


2. On the following figure the shaded area denotes the presence of magnetic field perpendicular to the plane of the paper. Put a cross to the table indicating non zero average of the induced voltage. 10 points

$t_1 \rightarrow t_2$	
$t_2 \rightarrow t_3$	
$t_1 \rightarrow t_3$	
$t_1 \rightarrow t_4$	



3. On the figures two metal core for solenoids are depicted. Which one is more appropriate then the other? Explain your choice! 5 points



4. The mutual induction coefficient of a transformer is M = 0.01 H. How large will the mutual induction coefficient be if the number of turns in the primary coil is doubled? 5 points

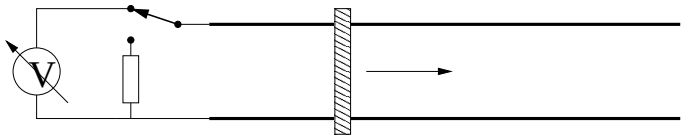
5. We would like to reduce the voltage of the power line ($V_{eff} = 230\ V$) to $V_2 = 12\ V$ with the help of a transformer. Give the number of turns in the secondary coil if the number of turns is $n_1 = 1200$ in the primary coil! 10 points

6. There are two long horizontal straight wire in the presence of vertical magnetic field of 2 T on which a small metal rod can slide without friction. (see the Figure) The distance between the wires is $d = 0.1$ m.

   a. In the first case the metal rod slide on the pair of wires with constant velocity. The voltage which can be measured between the wires is 0.05 V. How large is the velocity of the rod? 7 points

   b. The voltmeter is replaced by a resistor with a resistivity of 0.5 Ω. How much force must be on the rod exerted in order to keep its velocity constant? 8 points?

   c. Give the direction of the current if the magnetic field is downward directed! 5 points



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0 - 15	1
16 - 25	2
26 - 35	3
36 - 45	4
46 - 55	5

Name: Group:
Number of points:

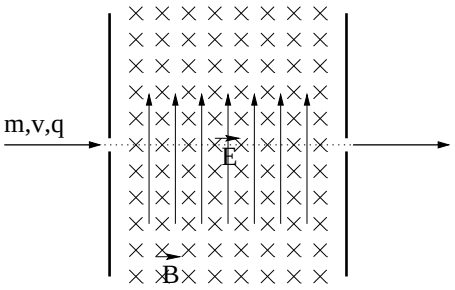
One–sentence–problems

3 points for each questions

1. A current is flowing from left to the right in a wire in a downward directed magnetic field. Give the direction of the force acting on the wire!
2. How large is the sum of the forces acting on a wire loop carrying a current of 1 A in a presence of uniform magnetic fieldi of 1 T?
3. A small positively charged particle is moving with constant velocity on a straight line in the presence of uniform magnetic field. Give the direction of the magnetic field!
4. What does the magnetic flux depend on?
5. Give the magnetic field inside a solenoid?

Problems

1. There are two parallel metal plates with a hole at their centers, as it is shown by the Figure. There are uniform magnetic and electric field between the plates. The magnetic field is directed out of the plane of the paper and the direction of the electric field is given by the arrows on the Figure.



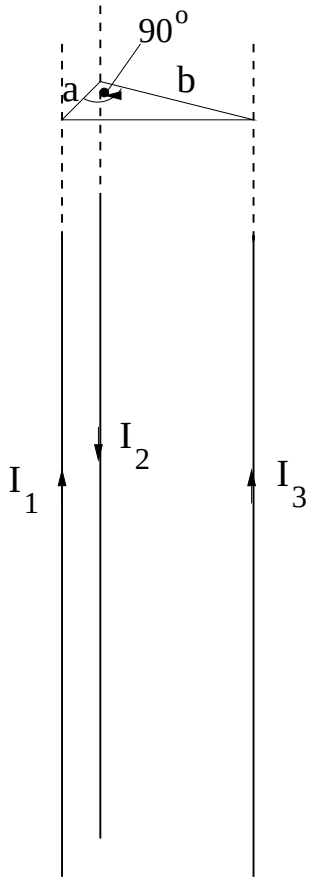
$B = 0.2\ T \quad E = 4{\times}10^{6}\ V/m \quad q_e = -1.6{\times}10^{-16}\ C \quad m_e = 9.1{\times}10^{-31}\ kg$

a; Give the velocity of the electrons which can get through the two holes! 5 points

b; Give the angular velocity of these electrons if the electric field is turned off! 5 points

c; How large will be the radius of the motion in case **b**? 5 points

2.



There are three wire as it is shown by the Figure.

$$I_1 = 10\ A \quad I_2 = 12\ A \quad I_3 = 15\ A$$

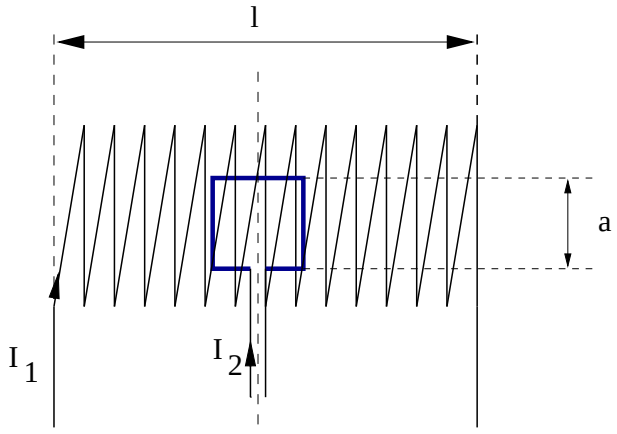
$$a = 0.3\ m \quad b = 0.4\ m$$

a; Give the force on the 1 m long segment of the second wire! 7 points

b; Give the magnetic field at the place of the third wire! 8 points

3. The number of turns of the solenoid given by the figure is $n = 50$.

$$l = 0.2\ m \quad I_1 = 5\ A \quad I_2 = 4\ A \quad a = 0.03\ cm$$



a; How large is the magnetic field inside the solenoid? 5 points

b; Give the torque on the metal frame inside the solenid! 5 points

c; How large is the magnetic flux in the metal frame ? 3 points

d; How large will the torque be on the frame if the flux is the largest in it? 2 points

Name: Group:
Number of points:

Questions:

4 points for each question

1. What does the flux depend on?

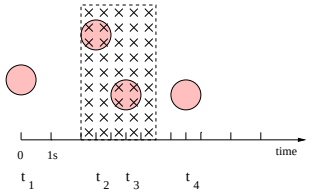
2. A small positively charged particle is moving with constant velocity on a straight line in the presence of uniform magnetic field. Give the direction of the magnetic field!

3. Two metal rod slide with a velocity of v_1 and v_2, respectively, on a pair of long straight wire in the presence of uniform magnetic field perpendicular to the plane of the system. On which rod acts larger force?

4. How does the self induction coefficient of a solenoid change if the number of turns is doubled?

5. On the following figure the shaded area denotes the presence of magnetic field perpendicular to the plane of the paper. Signed in the following table when the average of the induced voltage differs from zero!

$t_1 \longrightarrow t_2$	
$t_2 \longrightarrow t_3$	
$t_1 \longrightarrow t_3$	
$t_1 \longrightarrow t_4$	

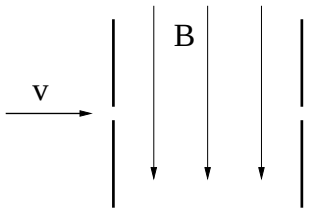


Problems

1. A small positive particle is flying with velocity of $v = 2^3 m/s$ towards two slits given by the figure. Between the two slits the magnetic field is perpendicular to the velocity of the particle.

   a. Give the direction of the electric filed between the slits if the particle can get through them !

   b. Give the magnitude of the electric filed between the slits if the particle can get through them !



2. A long sraight wire carries a current of $I_1 = 15$ A.

   a. Give the magnetic field at a distance $d = 0.3$ m from the wire!

   b. Another wire parallel to the previous one carries a current of $I_2 = 3$ A to the opposite direction. How large is the force between them? Is it attraction or repulsion?

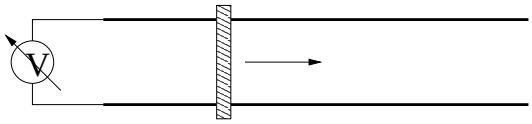
   c. Where should we place a third wire parallel to the others so that the force will be zero on it?

3. There are two long horizontal straight wire in the presence of vertical magnetic field of 2 T on which a small metal rod can slide without friction. (see the Figure) The distance between the wires is $d = 0.1$ m.

   a. In the first case the metal rod slide on the pair of wires with constant velocity. The voltage which can be measured between the wires is 0.05 V. How large is the velocity of the rod? 8 points

   b. A resistor with a resistivity of 0.5 Ω is connected to the end of the two wires. How much force must be on the rod exerted in order to keep its velocity constant? 9 points?

   c. How large is the current in the rod? 8 points

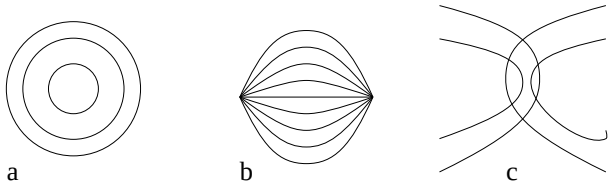


Name: Group:
Number of points:

One–sentence–problems

3 points for each questions

1. Which figure are magnetic lines of force depicted on?

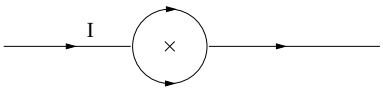


2. A current is flowing from left to the right in a wire in a downward directed magnetic field. Give the direction of the force acting on the wire!

3. A small positively charged particle is moving with constant velocity on a straight line in the presence of uniform magnetic field. Give the direction of the magnetic field!

4. A proton or an electron has larger angular velocity in the presence of uniform magnetic field?

5. Give the magnetic field at the center of the circle shown by the figure below!



Problems

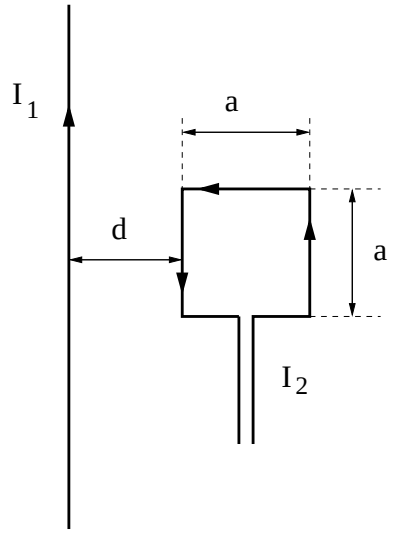
1. A small charged particle with a mass of *1g* and a charge of $10^{-4}C$ is moving on a straight line with constant velocity in the presence of electric and magnetic field.

   a. Give a possible arrangement of the electric and magnetic field! 6 points

   b. Find the velocity of the particle if the electric filed is $E = 100N/C$ and the magnetic field is $B = 0.5T$! 6 points

   c. What kind of motion will the particle have if the electric field is turned off? 3 points

2. There are a long strait wire and a loop carrying a current of I_1 and I_2, respectively, as it is shown by the figure.

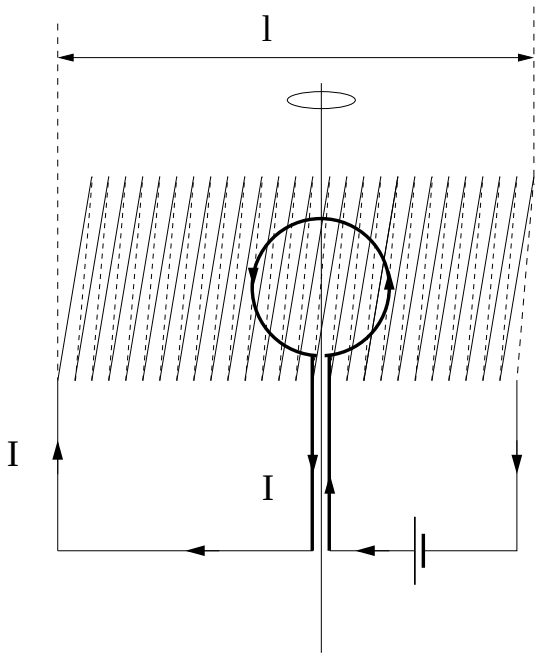


a. Give the force on the current loop! 10 points

b. How much torque acts on the loop? 5 points

$$I_1 = 10A$$
$$I_2 = 20A$$
$$a = 0.1m$$
$$d = 0.05m$$

3. There is a circular current loop inside of a solenoid as it is given by the figure. The radius of the circle is $R = 0.1m$. The length of the solenoid $l = 0.4m$ and it contains 100 turns. A current of $I = 10A$ is flowing in the circuit.



a. Give the torque on the loop! 9 points

b. How large is the net force on the loop? 3 points

c. How will the torque on the loop change if the polarity of the battery is exchanged? 3 points

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0 - 20	21 - 30	31 - 40	41 - 50	51 - 60
1	2	3	4	5