Name: Group:
Number of points:

Questions:

2 points for each question

1. Give the unit of the electric field!
2. Choose the vectors among the following physical quantities: electric field, force, electric potential, position, potential energy, kinetic energy.
3. How can we calculate the force between a set of point charges?
4. How large can a potential difference be on the surface of an ideal metal?
5. How does the resistivity of a metal wire depend on the area of the cross-section ?
6. Give the unit of the resistivity!
7. Give the unit of the specific resistivity!
8. What does the force between two point charges depend on?
9. What does the capacity of a capacitor depend on?
10. State the Ohm's law!

One–sentence–problems

4 points for each questions

Give a *short* explanation of your answers!

1. There are two charges on two vertices of a triangle. In which case can the electric field be zero at the third vertex of the triangle?

2. There is a neutral soap–bulb. How will the diameter of the bulb change if we put some charge on it?

3. There is a uniform electric field between two oppositely charged parallel plates. How will the electric field change if the distance between the plates is doubled?

4. There are two balls hanging on a piece of rope. One of them is conductor the other one is insulator. What happens if we touch them with a charged glass rod?

5. Do we have to do work in order to increase the distance between two oppositely charged plates?

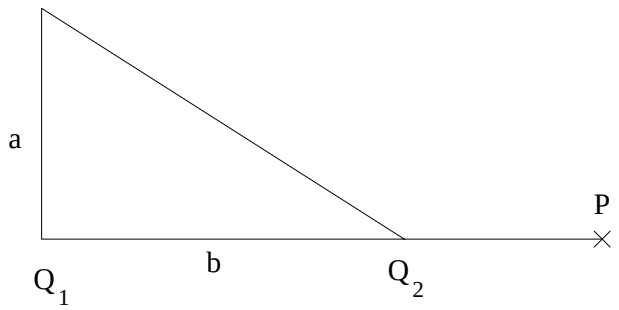
Problems

1. There are two charges at two vertices of a rectangular triangle according to the figure. The charges Q_1 and Q_2 are $10^{-4}C$ and $-2 \times 10^{-4}C$ respectively. The distances are: $a = 7m$, $b = 11m$.

   a.) Give the electric potential at the third vertex of the triangle! 10 points

   b.) How large force will act on a $-10^{-4}C$ charge if we put it at the third edge of the triangle? 10 points

   c.) Find the position of the point P if the potential is zero at P. 10 points



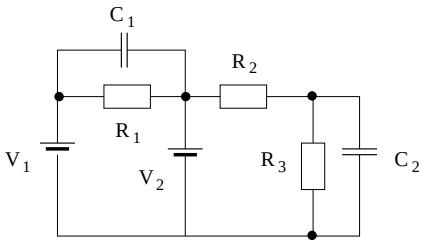
2. The system of capacitors and resistors is given by the following figure.

a.) Find the currents in each resistors! 8 points

b.) Give the charge in each capacitors! 8 points

c.) How large are the voltage drops on the resistors? 8 points

d.) How will the currents be changed if the capacitors are removed? 6 points



$$
\begin{aligned}
R_1 &= 200\Omega \\
R_2 &= 300\Omega \\
R_3 &= 200\Omega \\
C_1 &= 100\mu F \\
C_2 &= 100\mu F \\
V_1 &= 9V \\
V_2 &= 6V
\end{aligned}
$$

Electricity Exam

Name: Group:
Number of points:

Problems

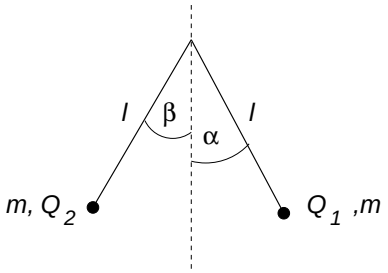
1. Two charged particles with equal masses are suspended from the same point on ropes with the length of $l = 2.5$ m as it is shown by the Figure. The charges of the particles are $Q_1 = 2 \times 10^6$ C and $Q_2 = 3 \times 10^6$ C, respectively. The angle between the rope of Q_1 and the vertical line is $\alpha = 30^o$.

   a) How large is the angle β between the rope of Q_2 and the vertical line?
   2 points

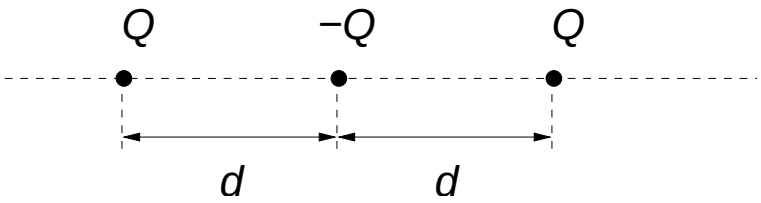
   b) How large is the mass of the particles? 5 points

   c) How large is the electric force between them? 3 points

   d) Give the electric field at the place of the particles! 5 points



2. There are three charges on a line with the separation of $d = 0.6$ m. The absolute value of the charges are the same and the sign of them is given by the figure.



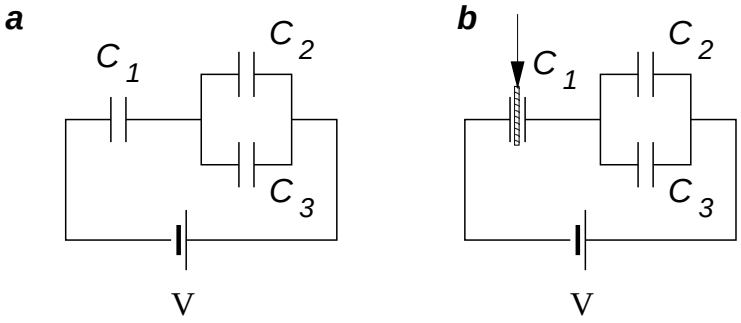
   a) Give a point where the electric potential is zero! 7 points

   b) Give the number of points where the electric potential is zero! 3 points

   c) How much work has to be done in order to move the charge in the middle with a distance of $l = 0.8$ m perpendicular to the line? 5 points

3. A network of planar capacitors is shown by the figure **a**.

$$\begin{aligned} C_1 &= 1nF \\ C_2 &= 3nF \\ C_3 &= 6nF \\ V &= 9V \end{aligned}$$

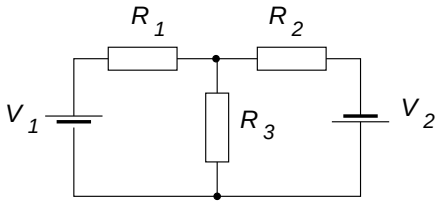


a) Give the voltages on the capacitors and the charges stored in the capacitors! 5 points

b) How does the amount of charge stored in the system change if an insulator with a dielectric constant of $\varepsilon = 2$ is placed between the plates of the C_1 capacitor. (see Fig. **b**) 5 points

c) Give the energy stored in the systems in both cases! 5 points

4. A network of resistors is shown by the figure.



$$\begin{aligned} R_1 &= 100\Omega \\ R_2 &= 200\Omega \\ R_3 &= 300\Omega \\ V_1 &= 8V \\ V_2 &= 3V \end{aligned}$$

a) Give the currents through the resistors! 5 points

b) Give the voltages on the resistors! 5 points

c) How much power is dissipated on the system? 5 points

---

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

Electricity Exam

Name: Group:
Number of points:

Problems

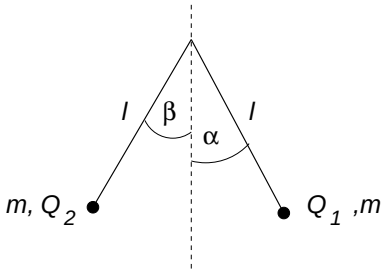
1. Two charged particles with a mass of $m_1 = m_2 = 4$ g are suspended from the same point on ropes with equal length as it is shown by the Figure. The charges of the particles are $Q_1 = 1 \times 10^6$ C and $Q_2 = 2 \times 10^6$ C, respectively. The angle between the rope of Q_1 and the vertical line is $\alpha = 30^o$.

   a) How large is the angle β between the rope of Q_2 and the vertical line? 2 points

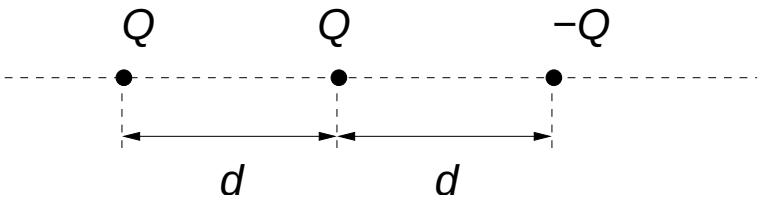
   b) How large is the length of the ropes? 5 points

   c) How large is the electric force between them? 3 points

   d) Give the electric field at the place of the particles! 5 points



2. There are three charges on a line with the separation of $d = 0.6$ m. The absolute value of the charges are the same and the sign of them is given by the figure.



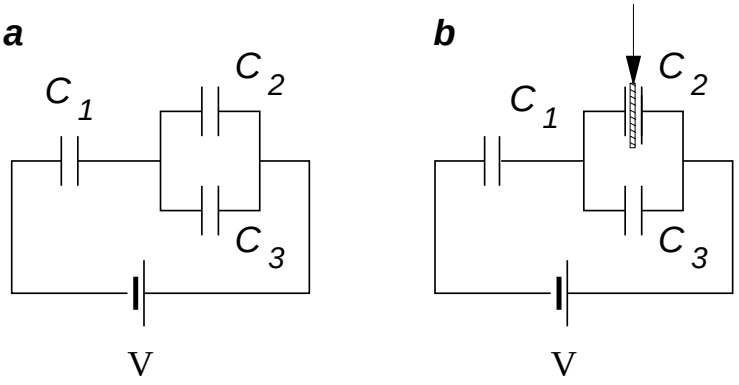
   a) Give a point where the electric potential is zero! 7 points

   b) Give the number of points where the electric potential is zero! 3 points

   c) How much work has to be done in order to move the charge in the middle with a distance of $l = 0.8$ m perpendicular to the line? 5 points

3. A network of planar capacitors is shown by the figure **a**.

$C_1 = 1nF$
$C_2 = 3nF$
$C_3 = 6nF$
$V = 9V$

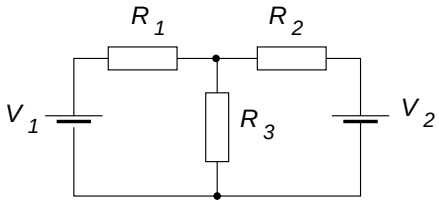


a) Give the voltages on the capacitors and the charges stored in the capacitors! 5 points

b) How does the amount of charge stored in the system change if an insulator with a dielectric constant of $\varepsilon = 2$ is placed between the plates of the C_2 capacitor. (see Fig. **b**) 5 points

c) Give the energy stored in the systems in both cases! 5 points

4. A network of resistors is shown by the figure.



$R_1 = 100\Omega$
$R_2 = 200\Omega$
$R_3 = 300\Omega$
$V_1 = 6V$
$V_2 = 3V$

a) Give the currents through the resistors! 5 points

b) Give the voltages on the resistors! 5 points

c) How much power is dissipated on the system? 5 points

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

Electricity Exam

Name: Group:
Number of points:

Problems

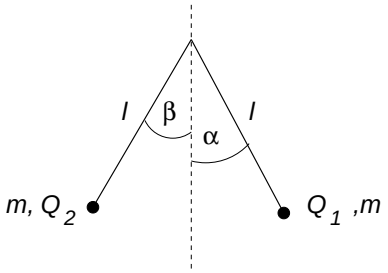
1. Two charged particles with equal masses are suspended from the same point on ropes with the length of $l = 2.68$ m as it is shown by the Figure. The charges of the particles are $Q_1 = 2 \times 10^6$ C and $Q_2 = 3 \times 10^6$ C, respectively. The angle between the rope of Q_1 and the vertical line is $\alpha = 45^o$.

   a) How large is the angle β between the rope of Q_2 and the vertical line? 2 points

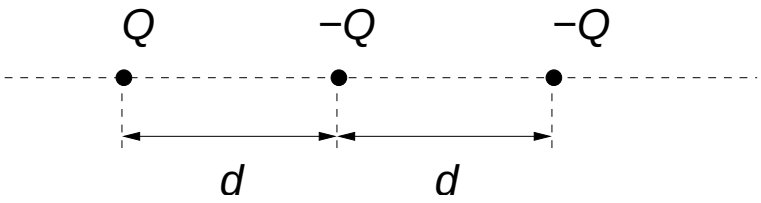
   b) How large is the mass of the particles? 5 points

   c) How large is the electric force between them? 3 points

   d) Give the electric field at the place of the particles! 5 points



2. There are three charges on a line with the separation of $d = 0.6$ m. The absolute value of the charges are the same and the sign of them is given by the figure.



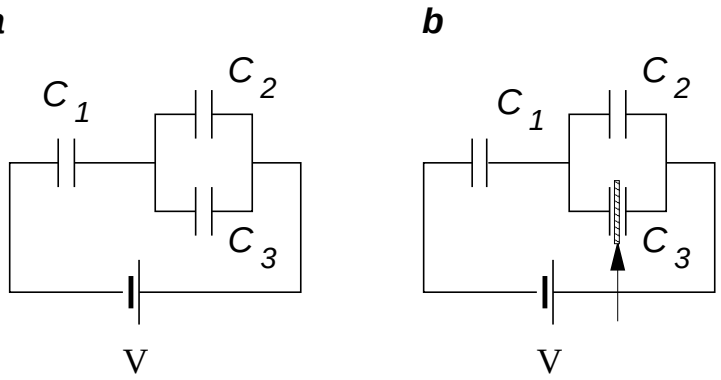
   a) Give a point where the electric potential is zero! 7 points

   b) Give the number of points where the electric potential is zero! 3 points

   c) How much work has to be done in order to move the charge in the middle with a distance of $l = 0.8$ m perpendicular to the line? 5 points

3. A network of planar capacitors is shown by the figure **a**.

$$C_1 = 1nF$$
$$C_2 = 3nF$$
$$C_3 = 6nF$$
$$V = 9V$$

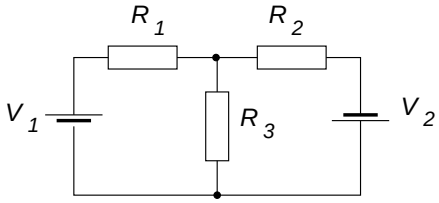


a) Give the voltages on the capacitors and the charges stored in the capacitors! 5 points

b) How does the amount of charge stored in the system change if an insulator with a dielectric constant of $\varepsilon = 2$ is placed between the plates of the C_3 capacitor. (see Fig. **b**) 5 points

c) Give the energy stored in the systems in both cases! 5 points

4. A network of resistors is shown by the figure.



$$R_1 = 100\Omega$$
$$R_2 = 200\Omega$$
$$R_3 = 300\Omega$$
$$V_1 = 16V$$
$$V_2 = 6V$$

a) Give the currents through the resistors! 5 points

b) Give the voltages on the resistors! 5 points

c) How much power is dissipated on the system? 5 points

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

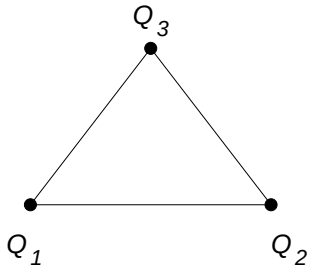
Electricity Exam

Name: Group:
Number of points:

Problems

1. There are three charges as it is given by the figure. The position of the charges are given below.

$Q_1 = ?$ $\quad \vec{r}_1 = (-0.6m, 0)$
$Q_2 = -10^{-6}C$ $\quad \vec{r}_2 = (0.6m, 0)$
$Q_3 = 2 \times 10^{-6}C$ $\quad \vec{r}_3 = (0, 0.8m)$

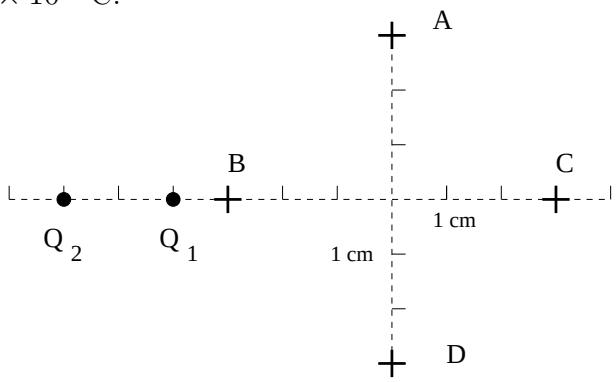


a.) The components of the electric filed at $\vec{r}_3$ are $\vec{E}_3 = (10800N/C, 0)$. Give the charge Q_1 at $\vec{r}_1$! 5 points

b.) Give the electric field at the place of Q_1 ($\vec{r}_1$)! 5 points

c.) Give the forces on the three charges! 5 points

2. There are two charges in the space according to the figure: $Q_1 = 10^{-5}$C, $Q_2 = -2 \times 10^{-5}$C.



Give the work we have to do in order to move a third charge of $q = 10^{-5}$C from

a) point **A** to point **B** 5 points

b) point **B** to point **C** 5 points

c) point **A** to point **D** 5 points

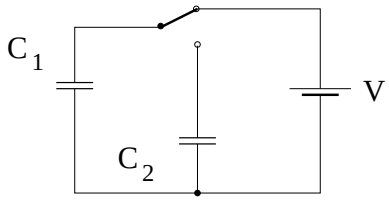
3. On the figure a network of capacitors is shown. At the first case C_1 is connected to the battery.

   a.) Give the amount of charge stored in the capacitor! 5 points

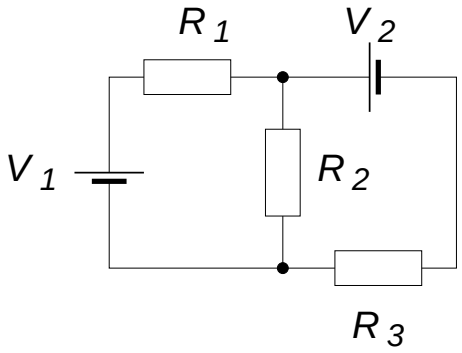
   b.) In the second case the position of the switch is changed and the two capacitors C_1 and C_2 are connected. Give the voltage on the capacitors! 5 points

   c.) Give the energy stored in the system in the two cases. 5 points!

$$C_1 = 10\ \mu F$$
$$C_2 = 20\ \mu F$$
$$V = 12\ V$$



4. The network of resistors is given by the figure below.



$$R_1 = 30\Omega$$
$$R_2 = 60\Omega$$
$$R_3 = 40\Omega$$
$$V_1 = 9V$$
$$V_2 = 3V$$

   a.) Give the currents through the resistors and the voltages on the resistors! 9 points

   b.) How much power is dissipated on the system? 6 points

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

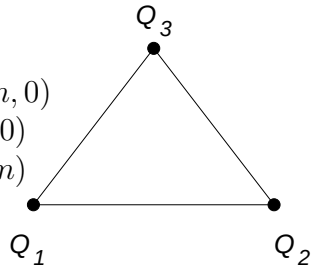
Electricity Exam

Name: Group:
Number of points:

Problems

1. There are three charges as it is given by the figure. The position of the charges are given below.

$Q_1 = ?$ $\quad \vec{r}_1 = (-0.5m, 0)$
$Q_2 = -2.19 \times 10^{-6} C$ $\quad \vec{r}_2 = (0.5m, 0)$
$Q_3 = 10^{-6} C$ $\quad \vec{r}_3 = (0, 1.2m)$

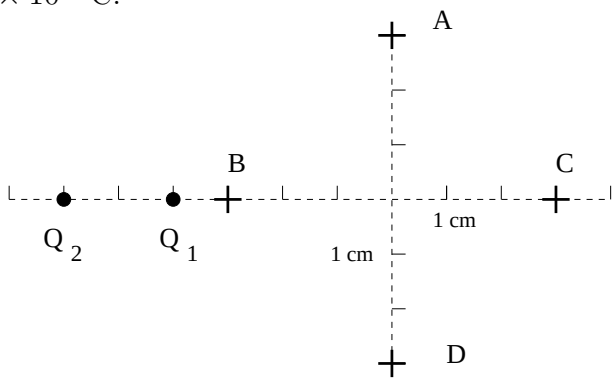


a.) The components of the electric filed at $\vec{r}_3$ are $\vec{E}_3 = (9000N/C, 0)$. Give the charge Q_1 at $\vec{r}_1$! 5 points

b.) Give the electric field at the place of Q_1 ($\vec{r}_1$)! 5 points

c.) Give the forces on the three charges! 5 points

2. There are two charges in the space according to the figure: $Q_1 = 10^{-5}$C, $Q_2 = -2 \times 10^{-5}$C.



Give the work we have to do in order to move a third charge of $q = 10^{-5}$C from

a) point **A** to point **C** 5 points

b) point **C** to point **B** 5 points

c) point **A** to point **D** 5 points

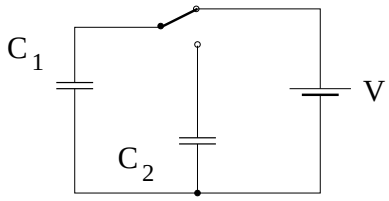
3. On the figure a network of capacitors is shown. At the first case C_1 is connected to the battery.

   a.) Give the amount of charge stored in the capacitor! 5 points

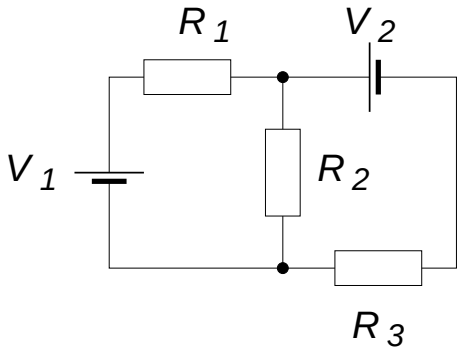
   b.) In the second case the position of the switch is changed and the two capacitors C_1 and C_2 are connected. Give the voltage on the capacitors! 5 points

   c.) Give the energy stored in the system in the two cases. 5 points!

$$C_1 = 60\ \mu F$$
$$C_2 = 90\ \mu F$$
$$V = 12\ V$$



4. The network of resistors is given by the figure below.



$$R_1 = 45\Omega$$
$$R_2 = 90\Omega$$
$$R_3 = 30\Omega$$
$$V_1 = 9V$$
$$V_2 = 3V$$

   a.) Give the currents through the resistors and the voltages on the resistors! 9 points

   b.) How much power is dissipated on the system? 6 points

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

Electricity Exam

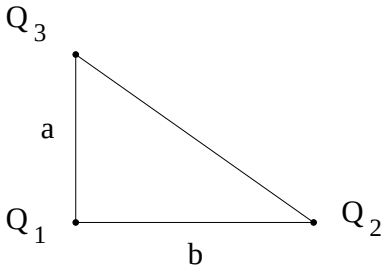
Name: Group:
Number of points:

Problems

10 points for each problems

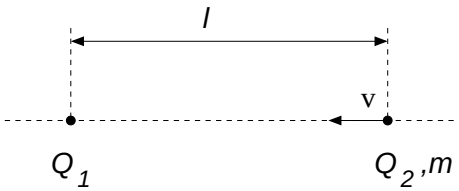
1. The electric field at the origin due to a point charge of $Q = 6.76 \times 10^{-7}$ C is $\vec{E} = (0, 12N/C, 5N/C)$. Give the position of the point charge!

2. There are three charges at the vertices of a rectangular triangle as it is given in the figure. Give the force on Q_2!



$$Q_1 = 8 \times 10^{-5}C \quad a = 3m$$
$$Q_2 = 10^{-4}C$$
$$Q_3 = 2.5 \times 10^{-4}C \quad b = 4m$$

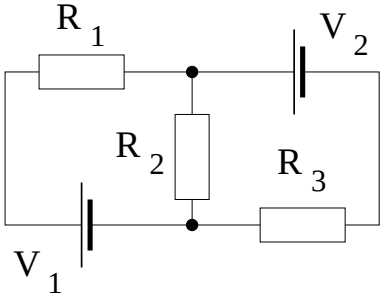
3. There are two positive charges separated by the distance of l. One of them is fixed and the other one has the initial velocity of v as it is given in the figure. How large will the smallest distance be between the two charges?



$$Q_1 = 10^{-4}C \quad l = 1m$$
$$Q_2 = 10^{-5}C \quad v = 10m/s$$
$$m = 0.1kg$$

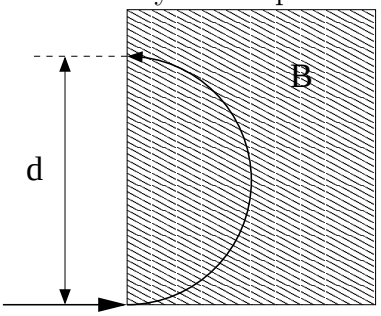
4. The charge and the energy stored in a capacitor are $Q = 10^{-2}C$ and $E = 2J$, respectively. How large is the capacity of the system? How much energy will in the system be stored if the space between the plates of the capacitor is filled by an insulator which has a dielectric constant of $\varepsilon = 3$?

5. Give the power dissipated on R_3 !



$$R_1 = 15\Omega \quad V_1 = 9V$$
$$R_2 = 30\Omega \quad V_2 = 4V$$
$$R_2 = 10\Omega$$

6. In the figure the path of a proton is shown. In the shaded area uniform magnetic field of $B = 1T$ is present. Give the direction of the magnetic field! The distance $d = 2m$. How large is the velocity of the proton?



$m_p = 1.6 \times 10^{-27}$ kg, $Q_p = 1.6 \times 10^{-19}$ C.

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

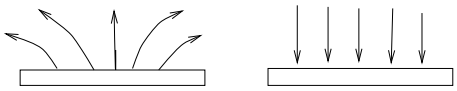
1	
2	
3	
4	
5	
6	
sum	

Electricity Exam: 27.01.2000
Name: Group:
Number of points:

Questions:

2 points for each question

1. There are two positive point charge in the space. Can the electric potential be zero in the vicinity of the charges?
2. What does the uniform electric field mean?
3. Give the definition of the equipotential surface!
4. How can we calculate the force between a set of point charges?
5. On the figure electric lines of force on the surface of a piece of metal and on a surface of a piece of glass are depicted on. Identify the metal surface!

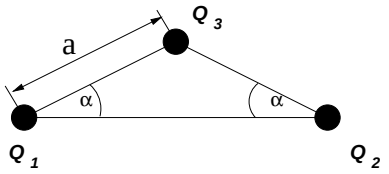


a, **b,**

6. What does the capacity of a capacitor depend on?
7. The energy stored in a system which consist of two charged parallel metal plates is 10 J. How much work has to be done in order to double the distance between the plates?
8. How large can a potential difference be on the surface of an ideal metal?
9. State the Ohm's low!
10. How does the resistivity of a metal wire depend on the area of the cross-section ?

Problems

1. There are three charges at the vertices of a triangle (see the figure).

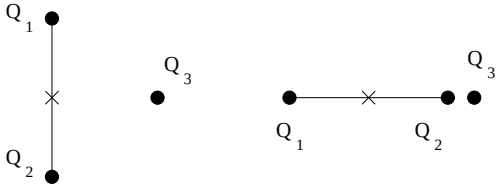


$$\begin{aligned} Q_1 &= 10^{-4}C \\ Q_2 &= -2 \times 10^{-4}C \\ Q_3 &= 3 \times 10^{-4}C \\ \alpha &= 30^\circ \end{aligned}$$

a. Give the force on the third charge! 5 points

b. How large is the electric field at the middle of the triangle?

2. There are three charges in the arrangement given by the figure **a**. Two of them are connected by a rod. The length of the rod is 0.6 m and the distance between the rod and the third charge is 0.4 m.



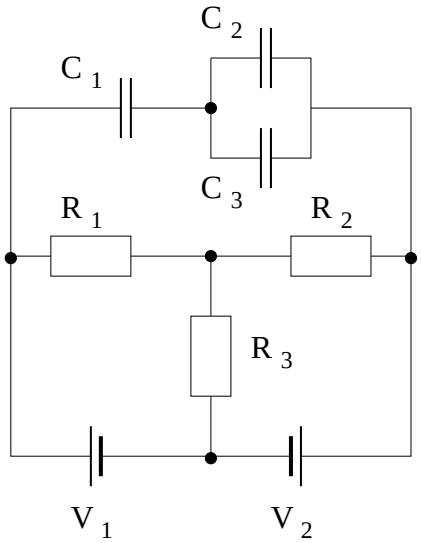
$$\begin{aligned} Q_1 &= 10^{-4}C \\ Q_2 &= -2 \times 10^{-4}C \\ Q_2 &= 2 \times 10^{-4}C \end{aligned}$$

a. Give the potential energy of the system!

b. Find a point on the line connecting the centre of the rod and Q_3 at which the electric potential is zero!

c. How much work has to be done if we want to rotate the rod around of its centre according to figure **b**?

3. The system of capacitors and resistors is given by the figure.



$$
\begin{aligned}
R_1 &= 100\Omega \\
R_2 &= 100\Omega \\
R_3 &= 200\Omega \\
V_1 &= 6V \\
V_2 &= 9V \\
C_1 &= 60\mu F \\
C_2 &= 10\mu F \\
C_3 &= 20\mu F
\end{aligned}
$$

a. Give the currents through the resistors! 4 points

b. Give the voltage drops on the resistors! 4 points

c. Give the potential on each capacitor! 4 points

d. How much energy is stored in the hole system? 4 points

e. Give the charges stored in the capacitors! 4 points

Electricity Exam

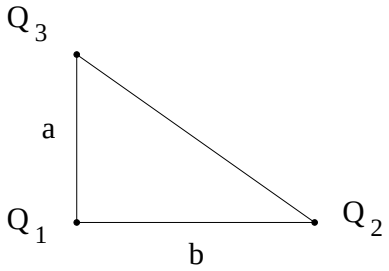
Name: Group:
Number of points:

Problems

10 points for each problems

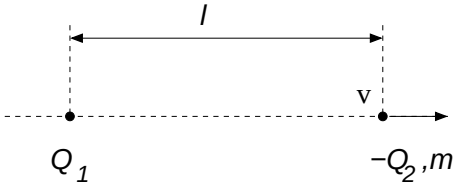
1. The electric field at the origin due to a point charge of $Q = 2.5 \times 10^{-6}$ C is $\vec{E} = (4N/C, 0, 3N/C)$. Give the position of the point charge!

2. There are three charges at the vertices of a rectangular triangle as it is given in the figure. Give the force on Q_3!



$$Q_1 = 10^{-4}C \quad a = 3m$$
$$Q_2 = -10^{-4}C$$
$$Q_3 = 2.5 \times 10^{-4}C \quad b = 4m$$

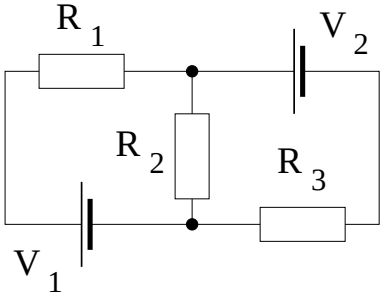
3. There are two charges separated by the distance of l. One of them is fixed and the other one has the initial velocity of v as it is given in the figure. How large will the largest distance be between the two charges?



$$Q_1 = 10^{-4}C \quad l = 1m$$
$$Q_2 = -10^{-5}C \quad v = 10m/s$$
$$m = 0.1kg$$

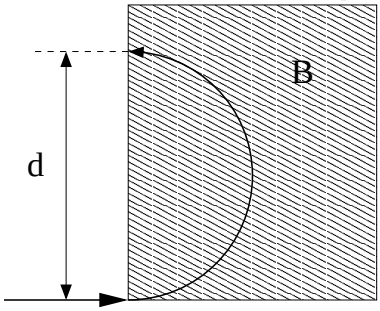
4. The charge and the energy stored in a capacitor are $Q = 10^{-2}C$ and $E = 2J$, respectively. How large is the capacity of the system? How much energy will in the system be stored if the space between the plates of the capacitor is filled by an insulator which has a dielectric constant of $\varepsilon = 2$?

5. Give the power dissipated on R_1 !



$$R_1 = 15\Omega \quad V_1 = 9V$$
$$R_2 = 30\Omega \quad V_2 = 4V$$
$$R_2 = 10\Omega$$

6. In the figure the path of a proton is shown. In the shaded area uniform magnetic field of $B = 2T$ is present. Give the direction of the magnetic field! The distance $d = 1m$. How large is the kinetic energy of the proton? $m_p = 1.6 \times 10^{-27}$ kg, $Q_p = 1.6 \times 10^{-19}$ C.



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

1	
2	
3	
4	
5	
6	
sum	

Electricity Exam

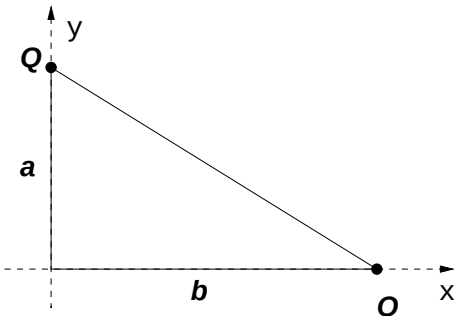
Name: Group:
Number of points: Mark:

Problems

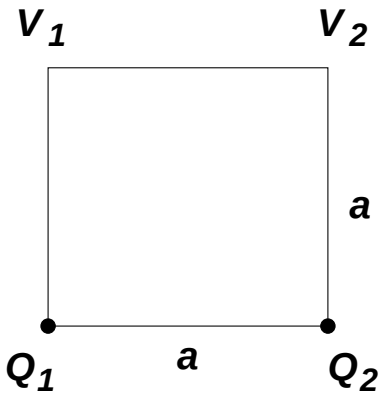
1. There are the same amount of charge of $Q = 2 \times 10^{-4}\ C$ on two vertices of a rectangular triangle as it is given by the figure. The electric field at the third vertex of the triangle is $\vec{E} = (-8000\ N/C, -18000\ N/C)$.

   a.) Give the length of the sides of the triangle! 5 points

   b.) How large is the force between the charges? 5 points



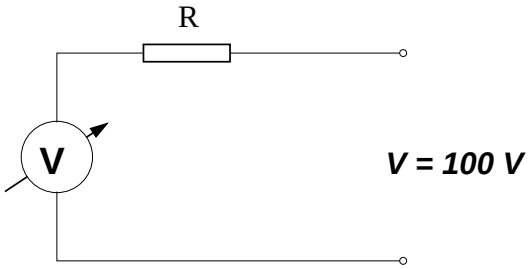
2. There are two point charges at two neighboring vertices of a square. The electric potential at the opposite vertices are V_1 and V_2, respectively. Give the charges at the vertices! 10 points



$$V_1 = 21727\ V$$
$$V_2 = 24369\ V$$
$$a = 1\ m$$

3. There are three capacitors with the capacities of 1 μF, 2 μF and 3 μF, respectively. The maximum voltage can be applied on the capacitors is $V_{max} = 60\ V$. Design a network from the given capacitors which can be connected to a $V = 100\ V$ battery and can store the maximum amount of charge! 10 points

4. A voltage meter can measure a maximum of $V_{max} = 1\ V$. The resistivity of the voltage meter is $R_0 = 10\ k\Omega$. How large resistivity must be applied according to the figure, if we want to measure $V = 100\ V$ on a system? 10 points

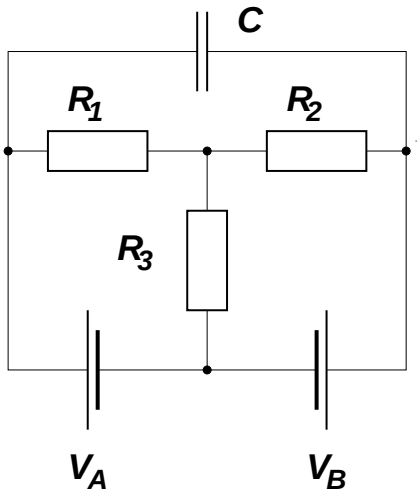


5. There is a network built from resistors, a capacitor and batteries as it is shown by the figure.

   a.) Give the current and the voltage drops on each resistors! 4 points

   b.) How much charge is stored in the capacitor? 3 points

   c.) How much power is dissipated on R_3? 3 points



$R_1 = 300\ \Omega$
$R_2 = 300\ \Omega$
$R_3 = 150\ \Omega$
$V_A = 9\ V$
$V_B = 6\ V$
$C = 10\ \mu F$

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0 - 10	1
11 - 20	2
21 - 30	3
31 - 40	4
41 - 50	5

Repeated Electricity Exam

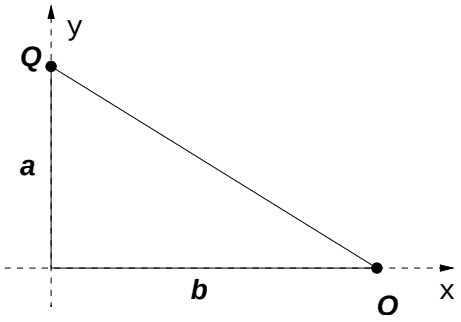
Name: Group:
Number of points:

Problems

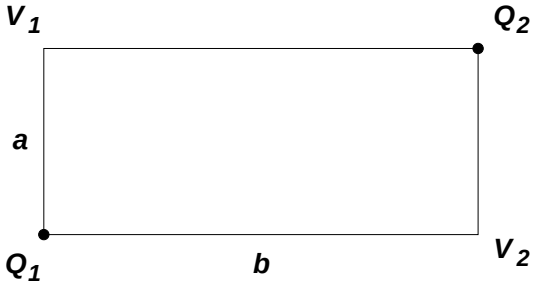
1. There are the same amount of charge of $Q = 2 \times 10^{-4}\ C$ on two vertices of a rectangular triangle as it is given by the figure. The electric field at the third vertex of the triangle is $\vec{E} = (-800\ N/C, -1800\ N/C)$.

   a.) Give the length of the sides of the triangle!

   b.) How large is the force between the charges?

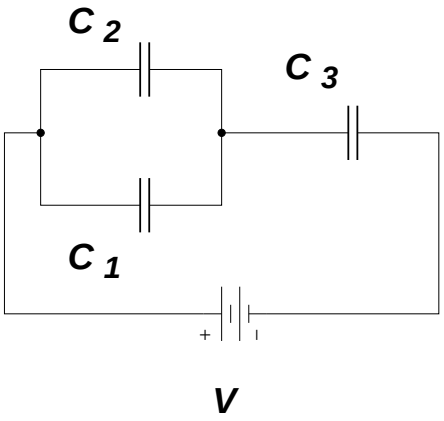


2. There are two point charges at two opposite vertices of a rectangle. The electric potential at the other vertices are V_1 and V_2, respectively. Give the charges at the vertices!



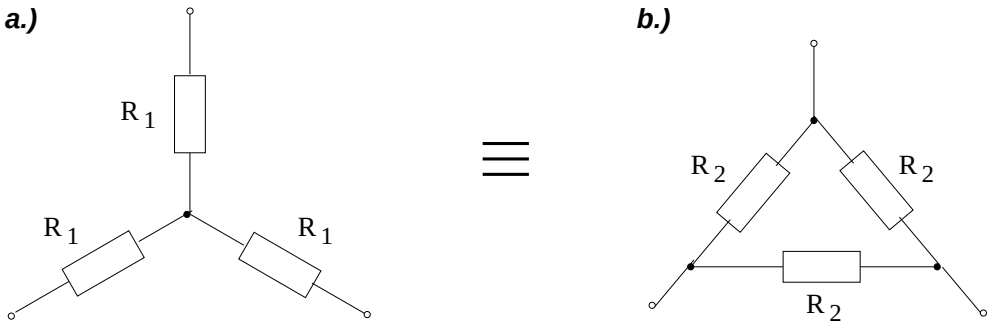
$$V_1 = 6 \times 10^6\ V$$
$$V_2 = 7.5 \times 10^6 V$$
$$a = 0.3\ m$$
$$b = 0.6\ m$$

3. The highest voltage can be applied on the capacitors shown by the figure is $V_{max} = 60\ V$. How large is the largest voltage of the battery which can be applied without the damage of the capacitors?



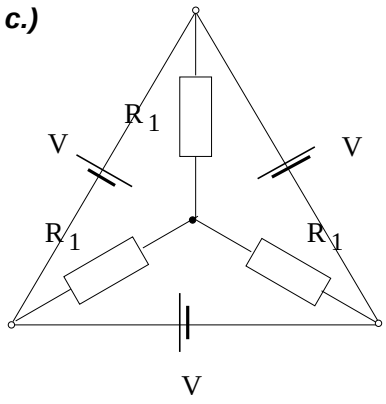
$$C_1 = 15\ \mu F$$
$$C_2 = 45\ \mu F$$
$$C_3 = 30\ \mu F$$

4. The resistivity between any of the three points on figure **a)** and figure **b)** are $R = 200\ \Omega$.



a.) Give R_1 and R_2!

b.) Give the currents through the resistors in the systems shown by figure **c)**. $V = 10\ V$



Electricity Exam

Name: Group:
Number of points:

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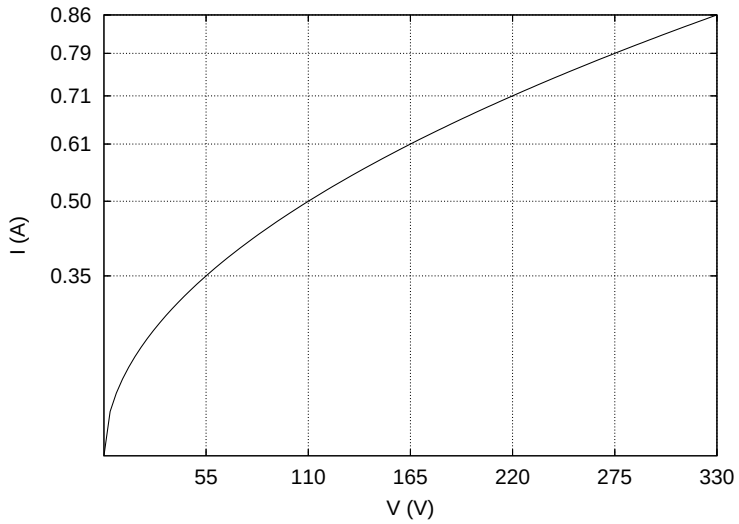
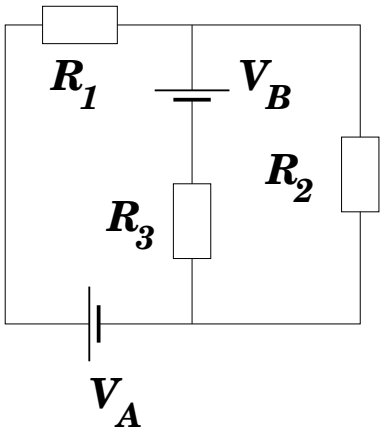
1. On the following figure the current flowing through a lamp is depicted as a function of the applied voltage. Give the power dissipated on the lamp if the applied voltage is $V_1 = 110\ V$ and $V_2 = 220\ V$! **10 points**

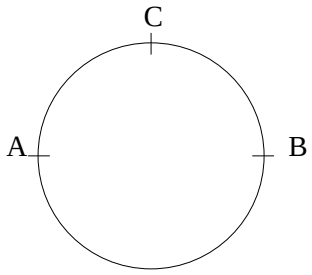


2. Give the voltage drops and the currents on the resistors for the following system! **20 points**

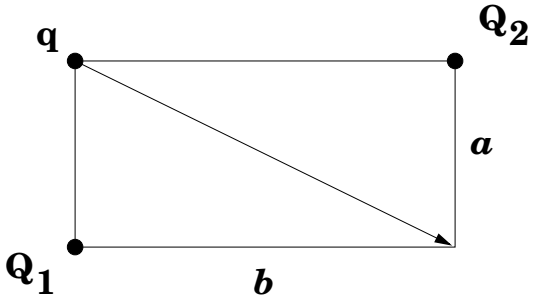


$R_1 = 15\ \Omega$
$R_2 = 30\ \Omega$
$R_2 = 10\ \Omega$
$V_A = 9\ V$
$V_B = 4\ V$

3. A circle is formed from a wire. The resistance between the points **A** and **B** of the circle is $R_{AB} = 100\ \Omega$. Give the resistance between the points **A** and **C**! **20 points**

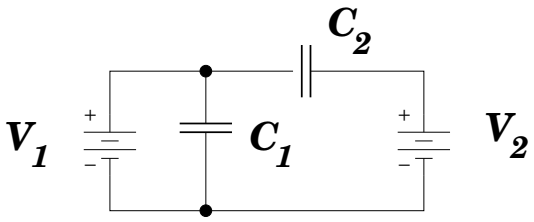


4. How much work has to be done in order to move the charge of $q = 10^{-5}\ C$ from one vertex of the rectangle to the other. **15 points**



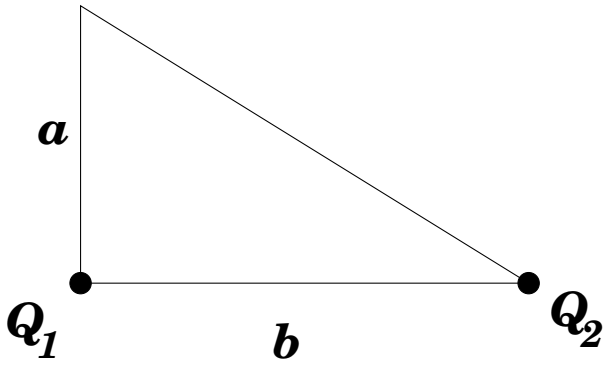
$$\begin{aligned} Q_1 &= -2 \times 10^{-4}\ C \\ Q_2 &= 10^{-4}\ C \\ q &= 10^{-5}\ C \\ a &= 0.2\ m \\ b &= 0.3\ m \end{aligned}$$

5. A network of capacitors is shown by the figure. Give the energy stored in the system. **15 points**



$$\begin{aligned} C_1 &= 10\ \mu F \\ C_2 &= 30\ \mu F \\ V_1 &= 9\ V \\ V_2 &= 6\ V \end{aligned}$$

6. There are two charges on two vertexes of a triangle as it is shown by the figure.



$$\begin{aligned} Q_1 &= 2 \times 10^{-5}\ C \\ Q_2 &= -4 \times 10^{-5}\ C \\ a &= 0.6\ m \\ b &= 0.8\ m \end{aligned}$$

Give the electric filed vector at the third vertex of the triangle! **20 points**

Electricity Exam

Name: Group:
Number of points:

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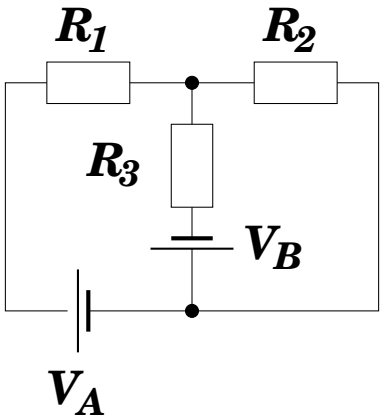
1. The electric potential of a point charge at a given point is $V = 10^5\ V$. The components of the electric field vector at the same point are $E_x = 5 \times 10^4\ N/C$ $E_y = 12 \times 10^4\ N/C$.

   How far is the charge from the point? **5 points**

   Give the charge producing the electric field! **5 points**

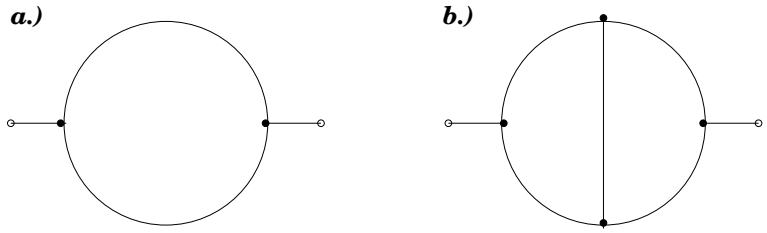
   Give the position of the point where the potential is given if the charge is at the origin! **5 points**

2. Give the voltage drops and the currents on the resistors for the following system! **20 points**

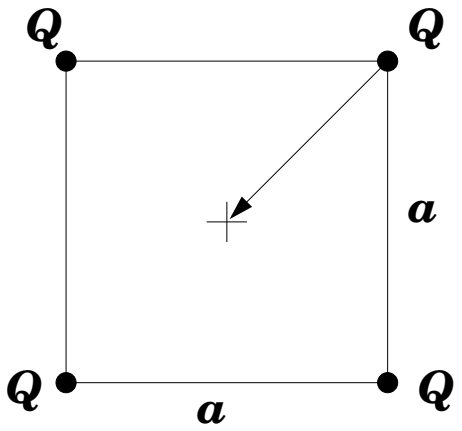


$R_1 = 25\ \Omega$
$R_2 = 100\ \Omega$
$R_2 = 300\ \Omega$
$V_A = 10\ V$
$V_B = 8\ V$

3. A circle with a radius of $R = 0.2\ m$ is made from a wire which has a diameter of $d = 4 \times 10^{-4}\ m$. The specific resistivity of the wire is $\rho = 4 \times 10^{-6}\ \Omega m$. The resistance of the piece of wires connected to the circle is negligible. Give the resistance of the two systems! **15 points**

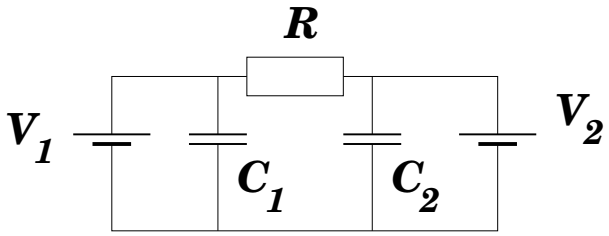


4. The same amount of charges are placed at the four vertices of a square. How much work has to be done in order to move one of the charges to the center of the square? **15 points**



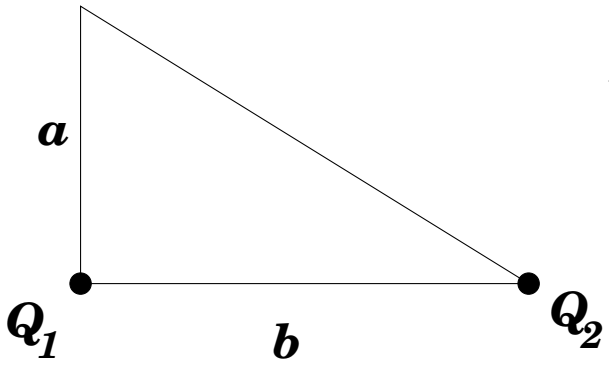
$$Q = 2 \times 10^{-4}\ C$$
$$a = 0.2\ m$$

5. Give the energy stored in the capacitors for the system shown by the figure! **15 points**



$$C_1 = 10\ \mu F$$
$$C_2 = 30\ \mu F$$
$$V_1 = 9\ V$$
$$V_2 = 6\ V$$

6. There are two charges on two vertices of a triangle as it is shown by the figure.



4

$$Q_1 = -2 \times 10^{-5}\ C$$
$$Q_2 = 2 \times 10^{-5}\ C$$
$$a = 0.3\ m$$
$$b = 0.4\ m$$

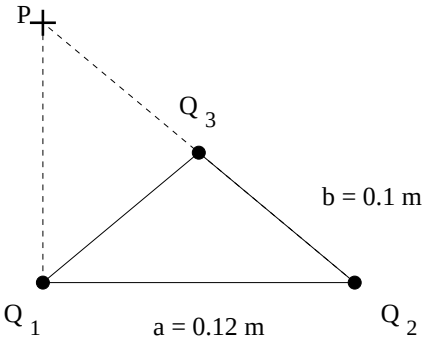
Give the electric filed vector at the third vertex of the triangle! **20 points**

Electricity Exam

Name: Group:
Number of points:

Problems

1. There are three charges on the vertices of an isoclinic triangle as it is shown by the figure.



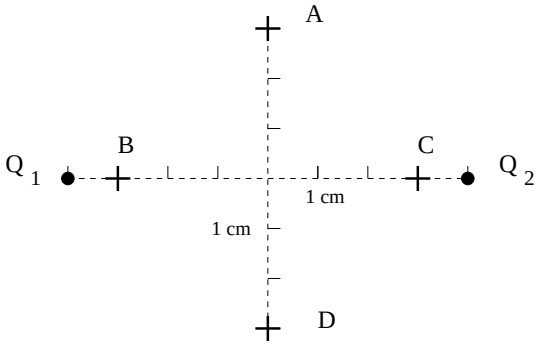
$$Q_1 = 10^{-4}C$$
$$Q_2 = -10^{-4}C$$
$$Q_3 = 2 \times 10^{-4}C$$

a) Give the force on Q_2 !

b) Give the electric field vector at the point P!

c) What will the direction of the force be on a negative charge if we put it at the point P?

2. There are two charges in the space according to the figure: $Q_1 = 10^{-5}$C, $Q_2 = -2 \times 10^{-5}$C.



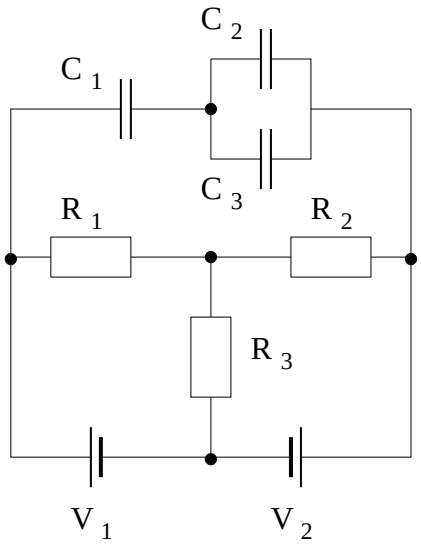
Give the work we have to do in order to move a third charge of $q = 10^{-5}$C from

a) point **A** to point **B**

b) point **B** to point **C**

c) point **A** to point **D**

3. The system of capacitors and resistors is given by the figure.



$$
\begin{aligned}
R_1 &= 100\Omega \\
R_2 &= 100\Omega \\
R_3 &= 200\Omega \\
V_1 &= 6V \\
V_2 &= 9V \\
C_1 &= 60\mu F \\
C_2 &= 10\mu F \\
C_3 &= 20\mu F
\end{aligned}
$$

a. Give the currents through the resistors! 4 points

b. Give the voltage drops on the resistors! 4 points

c. Give the potential on each capacitor! 4 points

d. How much energy is stored in the hole system? 4 points

e. Give the charges stored in the capacitors! 4 points

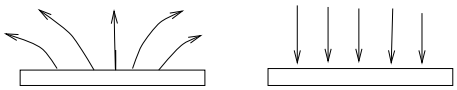
Electricity Exam

Name: Group:
Number of points:

Questions:

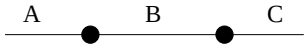
2 points for each question

1. There are two positive point charge in the space. Can the electric potential be zero in the vicinity of the charges?
2. What does the uniform electric field mean?
3. Give the definition of the equipotential surface!
4. On the figure electric lines of force on the surface of a piece of metal and on a surface of a piece of glass are depicted on. Identify the metal surface!

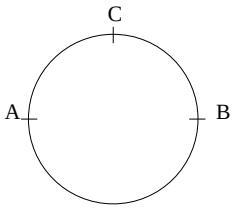


a, ***b,***

5. State the Ohm's low!
6. There are two positive charges as it is shown by the figure. Choose one from regions A, B, C where the electric filed can be zero.



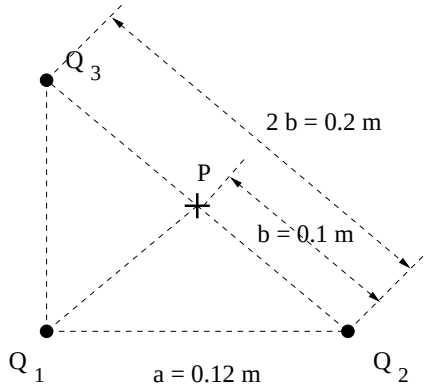
7. There is a uniform electric field between two oppositely charged parallel plates. How will the electric field change if the distance between the plates is decreased?
8. There is a metal ring shown by the figure. The resistance between contacts A and B is R_{AB} and the resistance between the contacts A and C is R_{AC}. Which is larger: R_{AB} or R_{AC}?



9. There is a charged metallic cube. Where is the electric potential larger: at the centre of one of its sides or at one of its vertices?
10. There are two oppositely charged large plate. Where is the electric field larger: at the middle or close to one of the plates?

Problems

1. There are three charges on the vertices of an isoclinic triangle as it is shown by the figure.



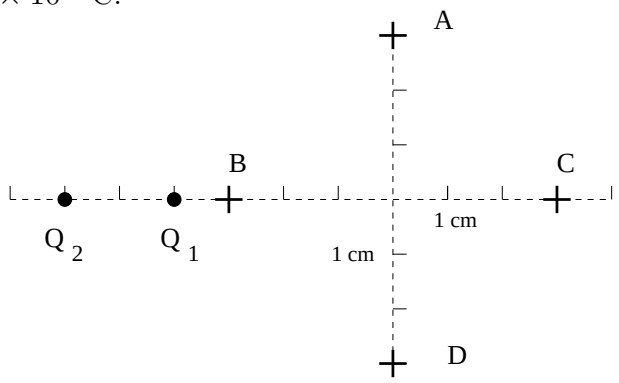
$$Q_1 = 10^{-4}C$$
$$Q_2 = -10^{-4}C$$
$$Q_3 = 2 \times 10^{-4}C$$

a) Give the force on Q_2 ! 10 points

b) Give the electric field vector at the point P! 8 points

c) What will the direction of the force be on a negative charge if we put it at the point P? 2 points

2. There are two charges in the space according to the figure: $Q_1 = 10^{-5}$C, $Q_2 = -2 \times 10^{-5}$C.



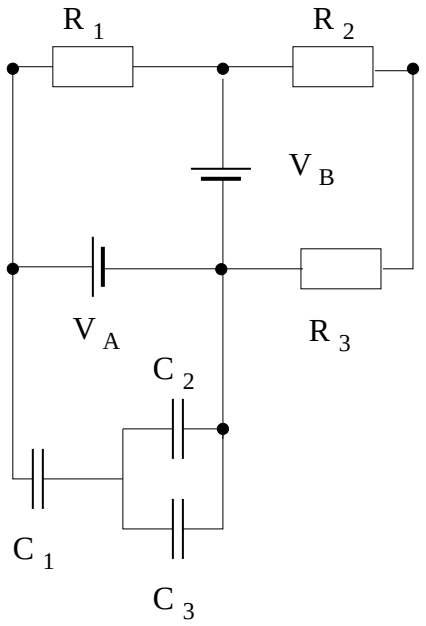
Give the work we have to do in order to move a third charge of $q = 10^{-5}$C from

a) point **A** to point **B** 8 points

b) point **B** to point **C** 7 points

c) point **A** to point **D** 5 points

3. The system of capacitors and resistors is given by the figure.



$$
\begin{aligned}
R_1 &= 100\Omega \\
R_2 &= 100\Omega \\
R_3 &= 200\Omega \\
V_A &= 6V \\
V_B &= 9V \\
C_1 &= 60\mu F \\
C_2 &= 10\mu F \\
C_3 &= 20\mu F
\end{aligned}
$$

a. Give the currents through the resistors! 4 points

b. Give the voltage drops on the resistors! 4 points

c. Give the potential on each capacitor! 4 points

d. How much energy is stored in the hole system? 4 points

e. Give the charges stored in the capacitors! 4 points

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0 – 20	1
21 – 35	2
36 – 50	3
51 – 65	4
66 – 80	5