Quiz Submissions - Quiz Week 1

Attempt 2

Question 1 **0 / 1 point**

If an electrically neutral object is charged up to +3 nC, using a charging by contact method, which statement is correct?

- Protons are transferred from the object
- Electrons are transferred from the object
- Protons are transferred to the object
- Electrons are transferred to the object

Question 2 **0 / 1 point**

A positively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the ball is taken away what is the net charge on the conductor?

- Positive
- Negative
- Neutral

Question 3 **0 / 1 point**

An electrically neutral object is charged using a charge by contact method to -(8.27x10^-9) C. Calculate the number of electrons transferred to the object.

Answer:

✘ **(5.14x10^10)**

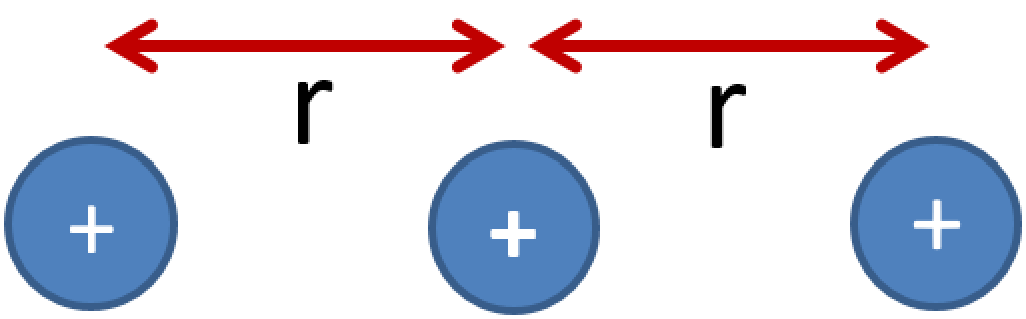
▼ Hide Feedback

The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{|Q|}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **0 / 1 point**



The 3 positive charges are of the same magnitude, and the spacing is constant. What is the direction of the net force on the central charge?

- ○ To the right
- ○ To the left
- ➡ ○ No net force

▼ Hide Feedback

There si no net force on the central charge, as both outer charges repel the central charge. Since the magnitudes of charge and the distances are the same, then these forces are of equal magnitudes and opposite directions.

Question 5 **0 / 1 point**

Calculate the magnitude of the forces in newtons exerted on each other between two point charges q1 = (8.8990x10^-12) C and q2 = (-1.07x10^-12) C, which are (5.4440x10^-1) metres apart.

Answer:

✗ **(2.89x10^-13)**

Hide Feedback

Use Coulomb's Law to calculate the magnitude of the force which each charge exerts on the other. Remember that a magnitude must be a positive number.

$|F| = \frac{k|q_1||q_2|}{r^2}$ or $|F| = \frac{|q_1||q_2|}{4\pi\epsilon_0\, r^2}$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz Week 1

Attempt 1

Question 1 **1 / 1 point**

If an electrically neutral object is charged up to +3 nC, using a charging by contact method, which statement is correct?

- ○ Protons are transferred to the object
- ✔ ○ Electrons are transferred from the object
- ○ Protons are transferred from the object
- ○ Electrons are transferred to the object

Question 2 **1 / 1 point**

A positively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded while the sphere is kept close. If the ground connection is first removed and then the ball is taken away what is the net charge on the conductor?

- ○ Positive
- ✔ ○ Negative
- ○ Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to -(4.19x10^-9) C. Calculate the number of electrons transferred to the object.

Answer:

2.62x10^10 ✓

▼ Hide Feedback

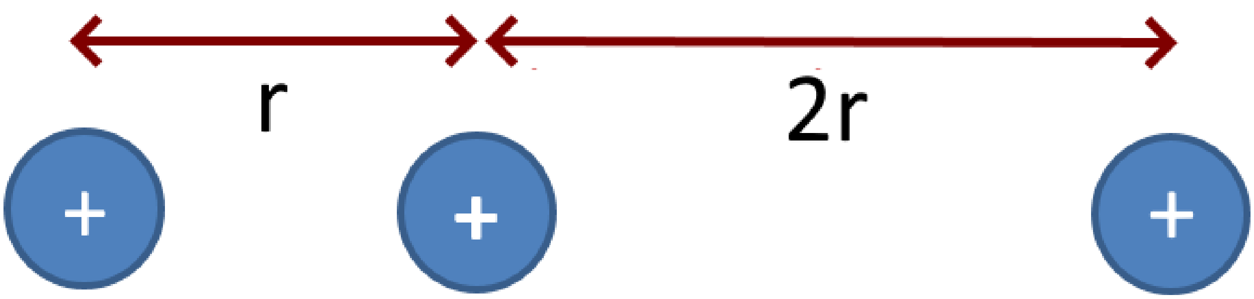
The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{|Q|}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**

The charges are of the same magnitude, and the spacing is r and 2r between them.



What is the direction of the net force on the central charge?

- ○ To the left
- ✓○ To the right
- ○ No net force

▼ Hide Feedback

Both outer charges repel the central charge, as they have like signs. The charge on the left is closer to the central charge, and so will exert a larger force on it than the more distant right hand charge. The net force will be to the right

Question 5 **1 / 1 point**

Calculate the force in newtons exerted on charge q1 = (-1.825x10^-15) C by charge q2 = (5.6520x10^-15) C, which are (5.50x10^-2) m apart and aligned along the x-axis. You do not need to enter a unit vector in your answer, but you do need to use the appropriate sign.

Answer:

3.07x10^-17 ✓

Hide Feedback

We are calculating the force on charge q1 exerted by charge q2. We can use the formula

$$\vec{F} = \frac{kq_1q_2}{r^2}\hat{r}$$

Now if you substitute the signed values of the charge into this equation, you will get the correct sign on the direction.

In this case, the sign on q1 is negative, and the sign on q2 is positive, and there is the negative sign on the unit vector. Overall the expression evaluates as positive, and hence the vector points along the positive axis, as expected.

In this case the radial unit vector $\hat{r} = -\hat{\imath}$ because the radial unit vector extends outwards from q2 towards q1, and is along the negative x-axis.

$$\vec{F} = \frac{kq_1q_2}{r^2}(-\hat{\imath})$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt)**:**5 / 5 - 100 %

Done

Quiz Submissions - Quiz Week 1

Attempt 1

Question 1 **1 / 1 point**

If an electrically neutral object is charged to -5 nC by a charging by contact method, which statement is true?

- Protons are transferred from the object
- Electrons are transferred from the object
- Protons are transferred from the object
- ✔ Electrons are transferred to the object

Question 2 **0 / 1 point**

A negatively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the sphere is taken away what is the net charge on the conductor?

- ➡ Positive
- Negative
- ✘ Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to -(8.86x10^-9) C. Calculate the number of electrons transferred to the object.

Answer:

5.53x10^10 ✓

▼ Hide Feedback

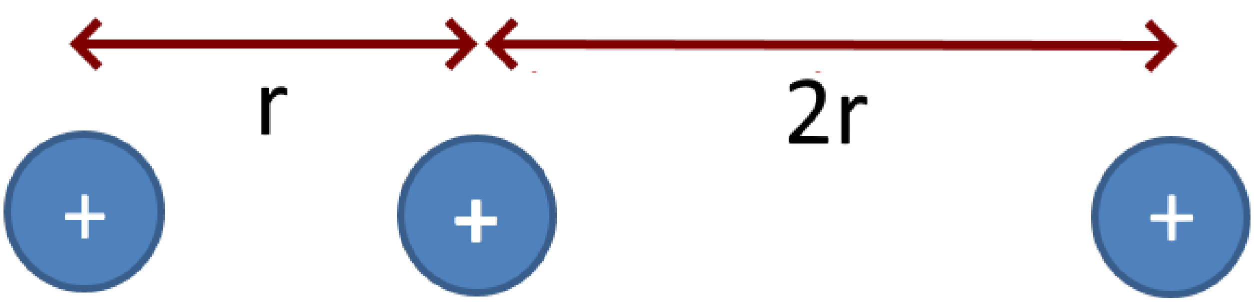
The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{|Q|}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**

The charges are of the same magnitude, and the spacing is r and 2r between them.



What is the direction of the net force on the central charge?

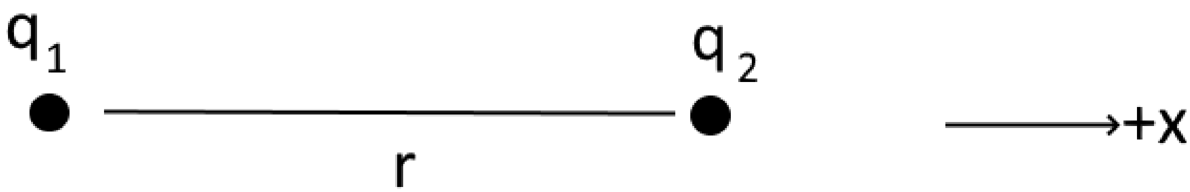
- ◯ To the left
- ✓◯ To the right
- ◯ No net force

▼ Hide Feedback

Both outer charges repel the central charge, as they have like signs. The charge on the left is closer to the central charge, and so will exert a larger force on it than the more distant right hand charge. The net force will be to the right

Question 5 **0 / 1 point**

Calculate the force in newtons exerted on charge q2 = (2.442x10^-15) C by charge q1 = (-6.169x10^-15) C, which are (7.37x10^-2) m apart and aligned along the x-axis. You do not need to enter a unit vector in your answer, but you do need to use the appropriate sign.



Answer:

-1.84x10^-18 ✖ **(-2.49x10^-17)**

Hide Feedback

We are calculating the force on charge q1 exerted by charge q2. We can use the formula

$$\vec{F} = \frac{kq_1q_2}{r^2}\hat{r}$$

In this case the radial unit vector $\hat{r} = \hat{\imath}$ because the radial unit vector extends outwards from q1 towards q2, and is along the positive x-axis.

$$\vec{F} = \frac{kq_1q_2}{r^2}(\hat{\imath})$$

Now if you substitute the signed values of the charge into this equation, you will get the correct sign on the direction.

In this case, the sign on q1 is negative, and the sign on q2 is positive, and there is the positive sign on the unit vector. Overall the expression evaluates as negative, and hence the vector points along the negative axis, as expected.

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz Week 1

Attempt 1

Question 1 **1 / 1 point**

If an electrically neutral object is charged up to +3 nC, using a charging by contact method, which statement is correct?

- ✔ ◯ Electrons are transferred from the object
- ◯ Electrons are transferred to the object
- ◯ Protons are transferred from the object
- ◯ Protons are transferred to the object

Question 2 **1 / 1 point**

A negatively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the sphere is taken away what is the net charge on the conductor?

- ✔ ◯ Positive
- ◯ Negative
- ◯ Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to (5.00x10^-9) C. Calculate the number of electrons transferred from the object.

Answer:

3.12x10^10 ✔

▼ Hide Feedback

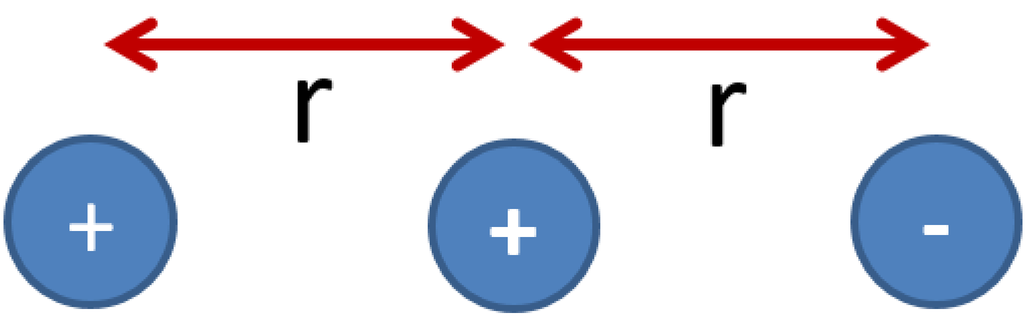
The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{Q}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**

The 3 charges are of the same magnitude, and the spacing is constant. What is the direction of the net force on the central charge?



○ To the left

✔ ○ To the right

○ No net force

▼ Hide Feedback

The left hand charge will repel the central charge, as they are both positive. The right hand charge will attract the central charge as they have opposite signs. Both forces are too the right, so the net force is to the right.

Question 5 **1 / 1 point**

Calculate the force in newtons exerted on charge q2 = (2.9240x10^-15) C by charge q1 = (-4.951x10^-15) C, which are (4.65x10^-2) m apart and aligned along the x-axis. You do not need to enter a unit vector in your answer, but you do need to use the appropriate sign.

Answer:

-6.017x10^-17 ✔ **(-6.02x10^-17)** ✘ wrong number of significant figures **(3)**

Hide Feedback

We are calculating the force on charge q1 exerted by charge q2. We can use the formula

$$\vec{F} = \frac{kq_1q_2}{r^2}\hat{r}$$

In this case the radial unit vector $\hat{r} = \hat{\imath}$ because the radial unit vector extends outwards from q1 towards q2, and is along the positive x-axis.

$$\vec{F} = \frac{kq_1q_2}{r^2}(\hat{\imath})$$

Now if you substitute the signed values of the charge into this equation, you will get the correct sign on the direction.

In this case, the sign on q1 is negative, and the sign on q2 is positive, and there is the positive sign on the unit vector. Overall the expression evaluates as negative, and hence the vector points along the negative axis, as expected.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz Week 1

Attempt 1

Question 1 **0 / 1 point**

If an electrically neutral object is charged up to +3 nC, using a charging by contact method, which statement is correct?

- ✖ ◯ Electrons are transferred to the object
- ◯ Protons are transferred to the object
- ➡ ◯ Electrons are transferred from the object
- ◯ Protons are transferred from the object

Question 2 **0 / 1 point**

A negatively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the sphere is taken away what is the net charge on the conductor?

- ➡ ◯ Positive
- ✖ ◯ Negative
- ◯ Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to -(2.55x10^-9) C. Calculate the number of electrons transferred to the object.

Answer:

1.59x10^10 ✔

▼ Hide Feedback

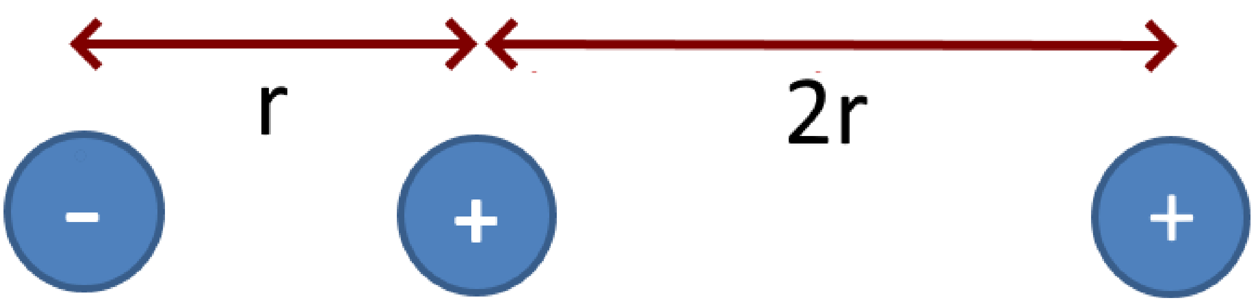
The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{|Q|}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**

All three charges are of the same magnitude, and the spacing is r and 2r respectively. What is the direction of the net force on the central charge?



✔ ◯ To the left

◯ To the right

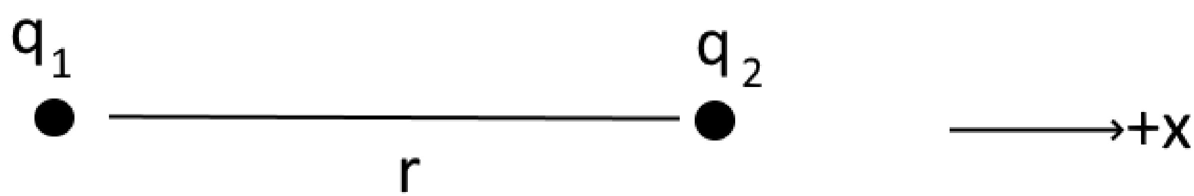
◯ No net force

▼ Hide Feedback

The charge on the left attracts the central charge, and provides a force to the left. The charge on the right repels the central charge and also provides a force to the left. The net force is to the left.

Question 5 **1 / 1 point**

Calculate the force in newtons exerted on charge q1 = (-7.5430x10^-15) C by charge q2 = (3.46x10^-15) C, which are (7.7400x10^-2) m apart and aligned along the x-axis. You do not need to enter a unit vector in your answer, but you do need to use the appropriate sign.



Answer:

3.92x10^-17 ✓

Hide Feedback

We are calculating the force on charge q1 exerted by charge q2. We can use the formula

$$\vec{F} = \frac{kq_1q_2}{r^2}\hat{r}$$

Now if you substitute the signed values of the charge into this equation, you will get the correct sign on the direction.

In this case, the sign on q1 is negative, and the sign on q2 is positive, and there is the negative sign on the unit vector. Overall the expression evaluates as positive, and hence the vector points along the positive axis, as expected.

In this case the radial unit vector $\hat{r} = -\hat{\imath}$ because the radial unit vector extends outwards from q2 towards q1, and is along the negative x-axis.

$$\vec{F} = \frac{kq_1q_2}{r^2}(-\hat{\imath})$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz Week 1

Attempt 1

Question 1 **1 / 1 point**

If an electrically neutral object is charged to -5 nC by a charging by contact method, which statement is true?

- ◯ Electrons are transferred from the object
- ✔ ◯ Electrons are transferred to the object
- ◯ Protons are transferred from the object
- ◯ Protons are transferred from the object

Question 2 **1 / 1 point**

A negatively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the sphere is taken away what is the net charge on the conductor?

- ✔ ◯ Positive
- ◯ Negative
- ◯ Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to (1.72x10^-9) C. Calculate the number of electrons transferred from the object.

Answer:

1.07x10^10 ✓

▼ Hide Feedback

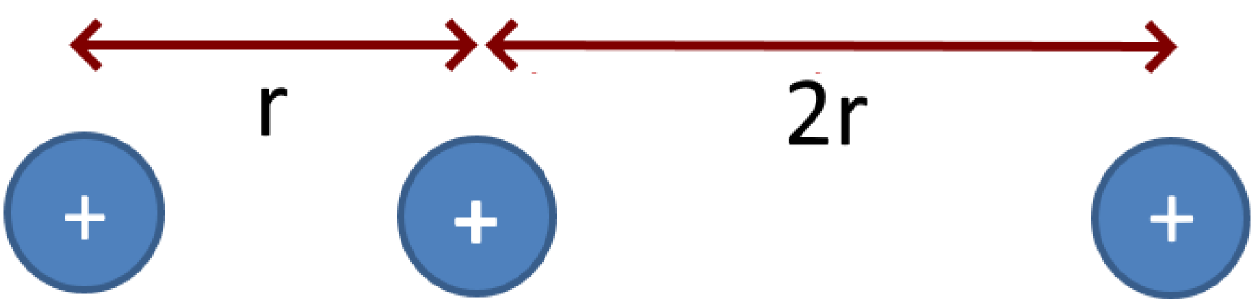
The charge is transferred by electrons so, the number of electrons transferred is

$$N \quad \frac{Q}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**

The charges are of the same magnitude, and the spacing is r and 2r between them.



What is the direction of the net force on the central charge?

- ○ To the left
- ✓ ○ To the right
- ○ No net force

▼ Hide Feedback

Both outer charges repel the central charge, as they have like signs. The charge on the left is closer to the central charge, and so will exert a larger force on it than the more distant right hand charge. The net force will be to the right

Question 5 **1 / 1 point**

What is the distance in metres between point charges q1 = (2.571x10^1) µC and q2 = (-4.38x10^1) µC, if the magnitude of the net force between them is (6.3000x10^0) N?

Answer:

1.27x10^0 ✔

Hide Feedback

Start with the Coulomb force expression. You are asked for the magnitude of the force, so use the magnitude of the charges.

$$F \qquad \frac{k\,q \quad q}{r}$$

Rearrange in terms of r

$$r \qquad \sqrt{\frac{k\,q \quad q}{F}}$$

Don't forget to convert the charges from µC to C, so that your distance is given in metres.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz Week 1

Attempt 2

Question 1 **1 / 1 point**

If an electrically neutral object is charged up to +3 nC, using a charging by contact method, which statement is correct?

- ○ Protons are transferred to the object
- ○ Protons are transferred from the object
- ✔ ○ Electrons are transferred from the object
- ○ Electrons are transferred to the object

Question 2 **1 / 1 point**

A positively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the ball is taken away what is the net charge on the conductor?

- ○ Positive
- ✔ ○ Negative
- ○ Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to (5.16x10^-9) C. Calculate the number of electrons transferred from the object.

Answer:

3.22x10^10 ✓

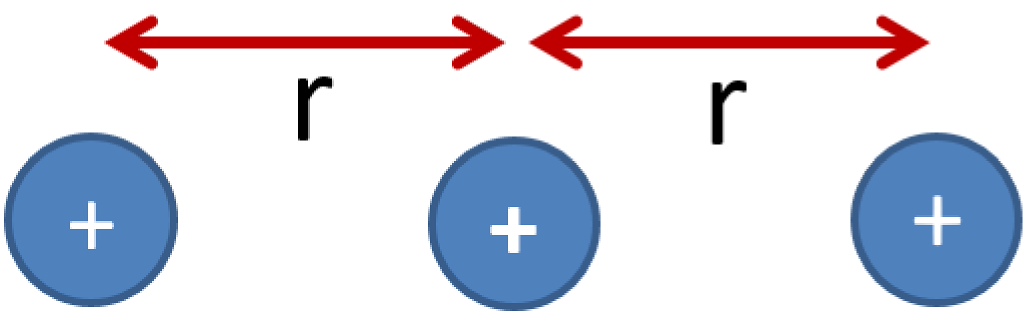
▼ Hide Feedback

The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{Q}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**



The 3 positive charges are of the same magnitude, and the spacing is constant. What is the direction of the net force on the central charge?

- ○ To the right
- ○ To the left
- ✓○ No net force

▼ Hide Feedback

There si no net force on the central charge, as both outer charges repel the central charge. Since the magnitudes of charge and the distances are the same, then these forces are of equal magnitudes and opposite directions.

Question 5 **1 / 1 point**

Calculate the magnitude of the forces in newtons exerted on each other between two point charges q1 = (5.29x10^-12) C and q2 = (-5.432x10^-12) C, which are (9.4040x10^-1) metres apart.

Answer:

2.92x10^-13 ✔

Hide Feedback

Use Coulomb's Law to calculate the magnitude of the force which each charge exerts on the other. Remember that a magnitude must be a positive number.

$|F| = \frac{k|q_1||q_2|}{r^2}$ or $|F| = \frac{|q_1||q_2|}{4\pi\epsilon_0 \, r^2}$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz Week 1

Attempt 2

Question 1 **0 / 1 point**

If an electrically neutral object is charged to -5 nC by a charging by contact method, which statement is true?

- Electrons are transferred from the object
- Protons are transferred from the object
- Electrons are transferred to the object
- Protons are transferred from the object

Question 2 **1 / 1 point**

A positively charged sphere is brought close to an electrically neutral isolated conductor. The conductor is then grounded for a short time while the sphere is kept close. If the ground connection is removed and then the ball is taken away what is the net charge on the conductor?

- Positive
- Negative
- Neutral

Question 3 **1 / 1 point**

An electrically neutral object is charged using a charge by contact method to (5.48x10^-9) C. Calculate the number of electrons transferred from the object.

Answer:

3.42x10^10 ✓

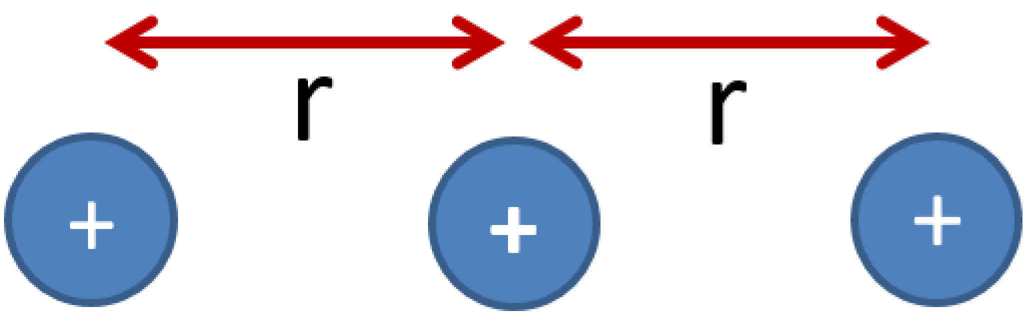
▼ Hide Feedback

The charge is transferred by electrons so, the number of electrons transferred is

$$N = \frac{Q}{e}$$

Where e is the magnitude of the electronic charge. Remember that the number of electrons transferred has to be a positive integer number.

Question 4 **1 / 1 point**



The 3 positive charges are of the same magnitude, and the spacing is constant. What is the direction of the net force on the central charge?

- ○ To the right
- ○ To the left
- ✓○ No net force

▼ Hide Feedback

There si no net force on the central charge, as both outer charges repel the central charge. Since the magnitudes of charge and the distances are the same, then these forces are of equal magnitudes and opposite directions.

Question 5 **0 / 1 point**

What is the distance in metres between point charges q1 = (3.779x10^1) µC and q2 = (-1.95x10^1) µC, if the magnitude of the net force between them is (3.4590x10^0) N?

Answer:

1.38x10^6 ✗ **(1.38x10^0)**

Hide Feedback

Start with the Coulomb force expression. You are asked for the magnitude of the force, so use the magnitude of the charges.

$$|F| = \frac{k|q_1||q_2|}{r^2}$$

Rearrange in terms of r

$$r = \sqrt{\frac{k|q_1||q_2|}{F}}$$

Don't forget to convert the charges from µC to C, so that your distance is given in metres.

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):3 / 5 - 60 %

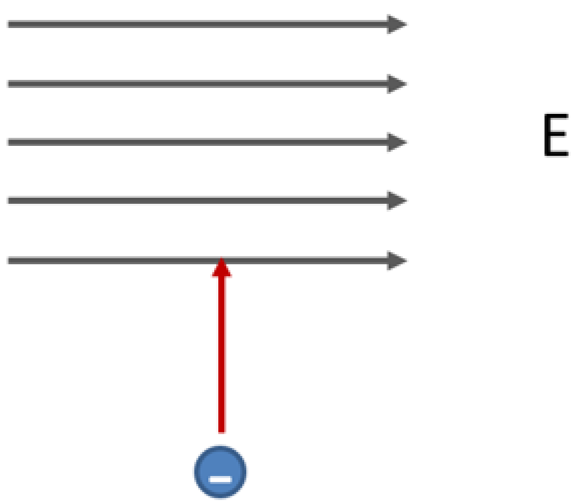
Done

Quiz Submissions - Quiz Week 2

Attempt 2

Question 1 **0 / 1 point**

An electron enters a uniform electric field perpendicularly to the field direction. At the instant it enters the field, in what is direction is the force on the particle?

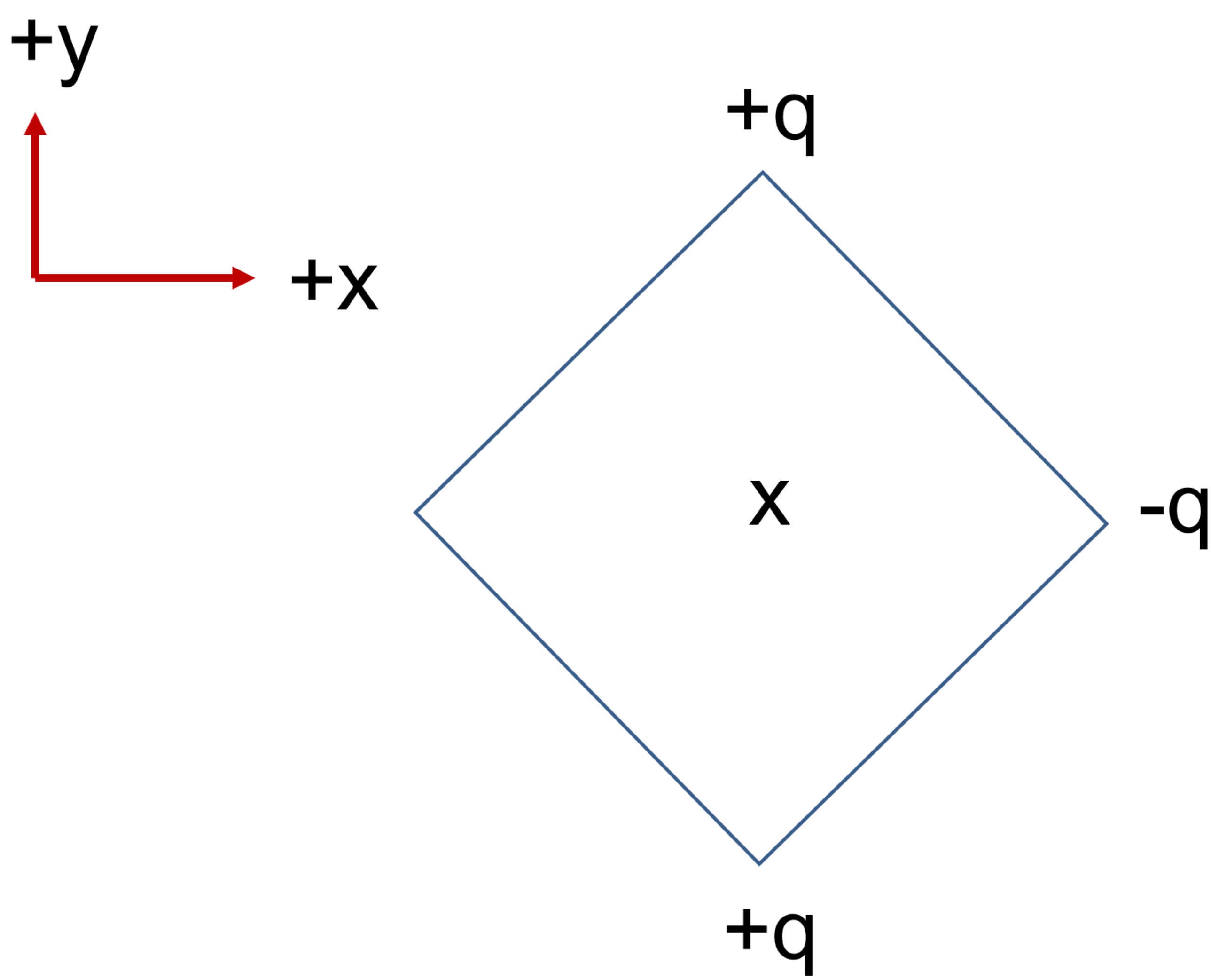


- Up ↑
- Down ↓
- Left ←
- Right →

Hide Feedback

The force on a negatively charged particle is in the opposite direction to the electric field that it is in.

Question 2 **1 / 1 point**



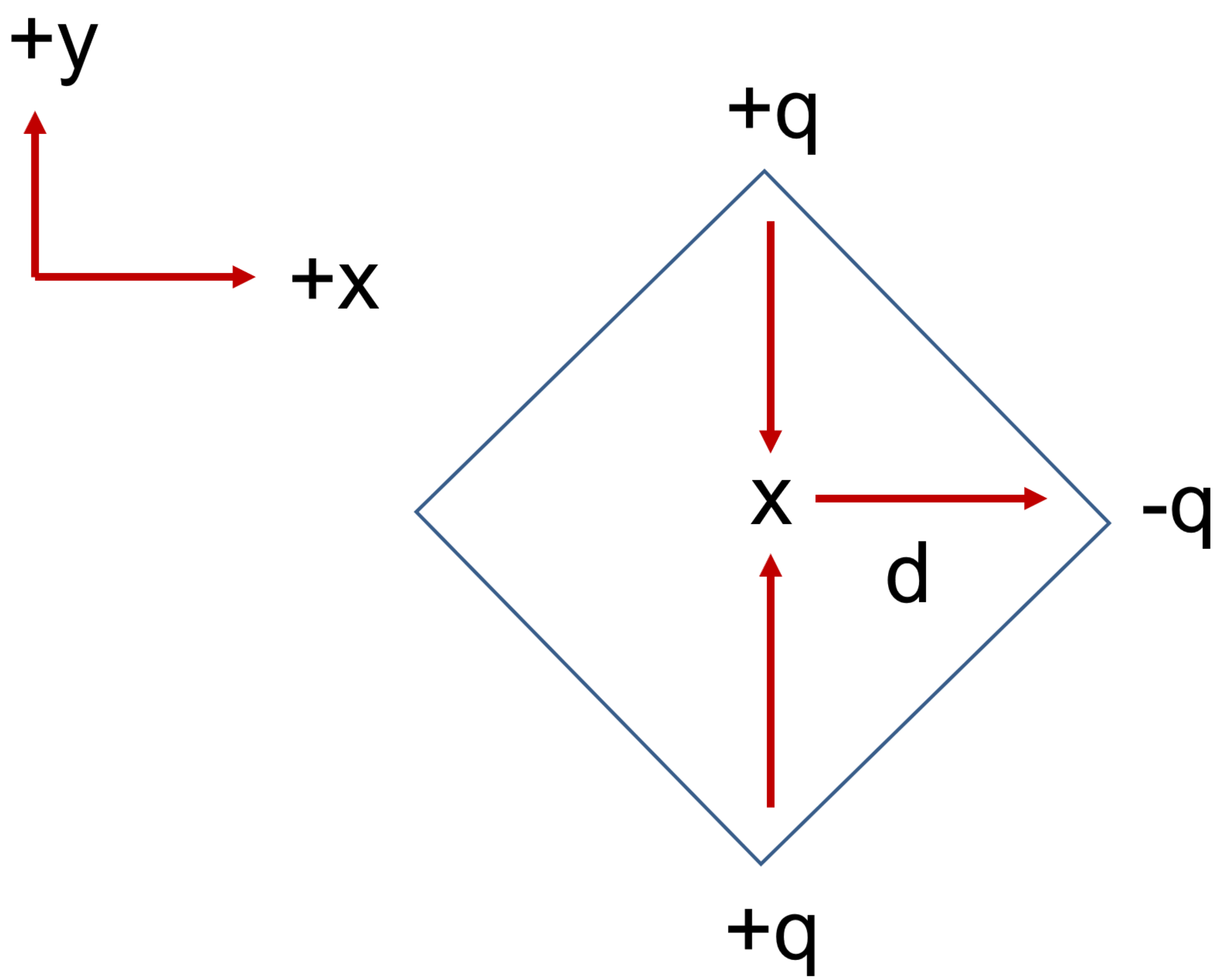
What is the direction of the net electric field in the centre of this square charge system?

- ◯ Along negative x ←
- ✓◯ Along positive x →
- ◯ Along positive y ↑

Along negative y ↓

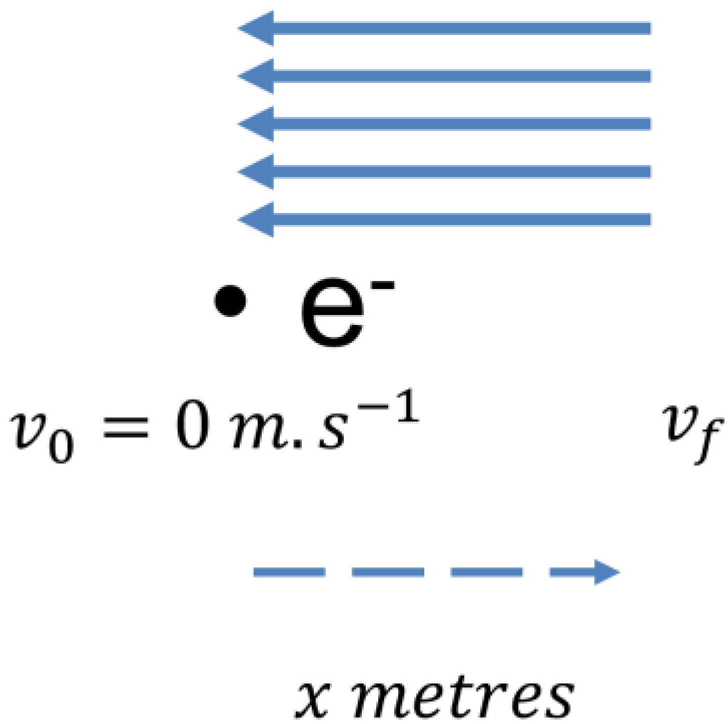
Hide Feedback

The electric fields generated by the upper and lower charges are equal and opposite and will cancel out. The negative charge generates an electric field moving towards it, and this is the only contribution to the net electric field, along positive x.



Question 3 **0 / 1 point**

You are designing an electron accelerator to bring a stationary electron to a speed of (1.32x10^7) m/s in a uniform electric field. If the acceleration time is (7.8470x10^0) µs, what must the magnitude of the electric field be in N/C?



Answer:

9.55x10^28 **(9.52x10^0)**

Hide Feedback

The force on the electron is given by

$$F = qE$$

So the acceleration of the electron, using Newton's Second Law is

$$a = \frac{F}{m} = \frac{qE}{m}$$

Now we can use the kinematic equation

$$v_f = v_0 + at$$

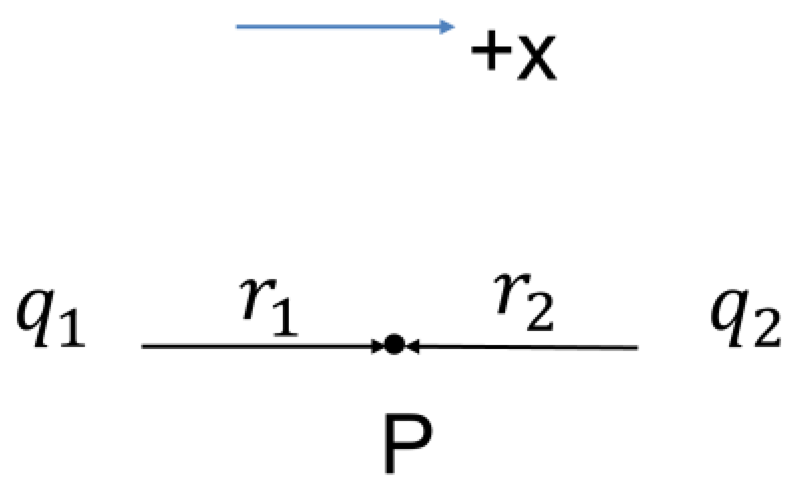
$$v_f = 0 + \frac{qEt}{m}$$

Solving for E

$$E = \frac{mv_f}{qt}$$

Question 4 **0 / 1 point**

Point P lies between two point charges, q_1 = (3.4810x10^0) µC and q_2 = (1.5650x10^0) µC respectively. Point P is at a distance R_1 = (4.756x10^0) cm from charge 1, and R_2 = (3.14x10^0) cm from charge 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

2.10x10^5 ✗ **(-4.35x10^5)**

▼ Hide Feedback

The electric field produced by a point charge, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{q}{4\pi\epsilon_0 r^2}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

In the case of point P, the radial unit vector points away from charge 1, along the positive x axis

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{x}$$

For charge 2, the radial unit vector pointing to point P, is along the negative x axis

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{x})$$

So

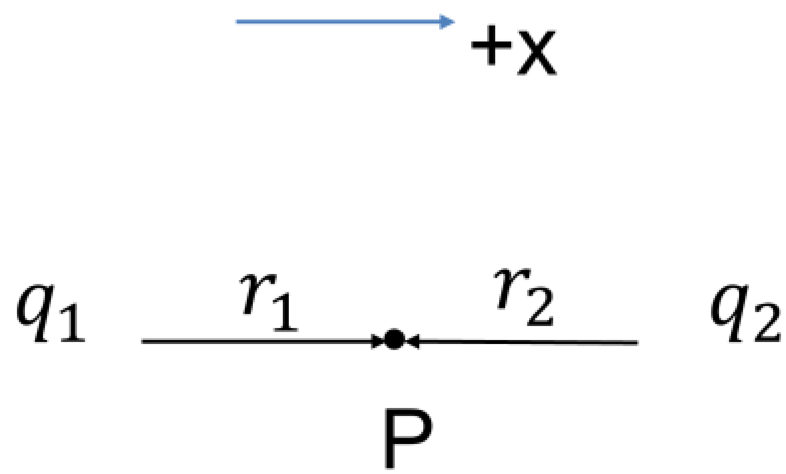
$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{x} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{x}$$

$$\vec{E}_{net} = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{r_1^2} - \frac{q_2}{r_2^2}\right)\hat{x}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Question 5 **0 / 1 point**

Find the net electric field in N/C at point P, where q1 = (4.11x10^0) nC, r1 = (7.6350x10^-1) metres, q2 = (6.770x10^0) nC and r2 = (1.8270x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

-2.85x10^2 **(-1.76x10^3)**

Hide Feedback

Both charges produce electric fields moving away from the charge which produces them

For charge 1, this field is in the positive x-direction

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i}$$

For charge 2, the field is away from the charge, along the negative x-direction.

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} + \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

$$\vec{E}_{net} = (\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2})\hat{i}$$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

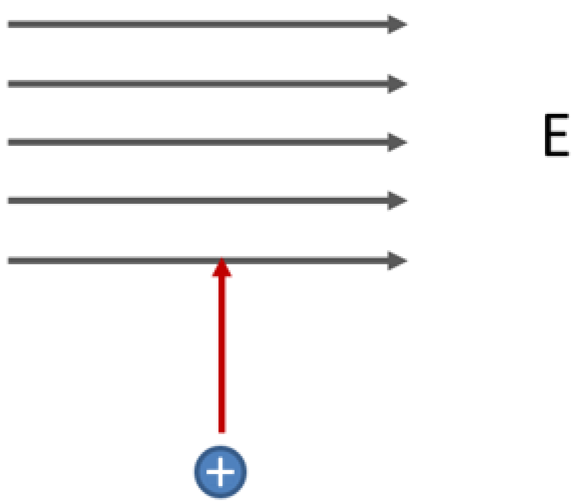
Done

Quiz Submissions - Quiz Week 2

Attempt 1

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. When it enters the field, what direction is the electric force on it?



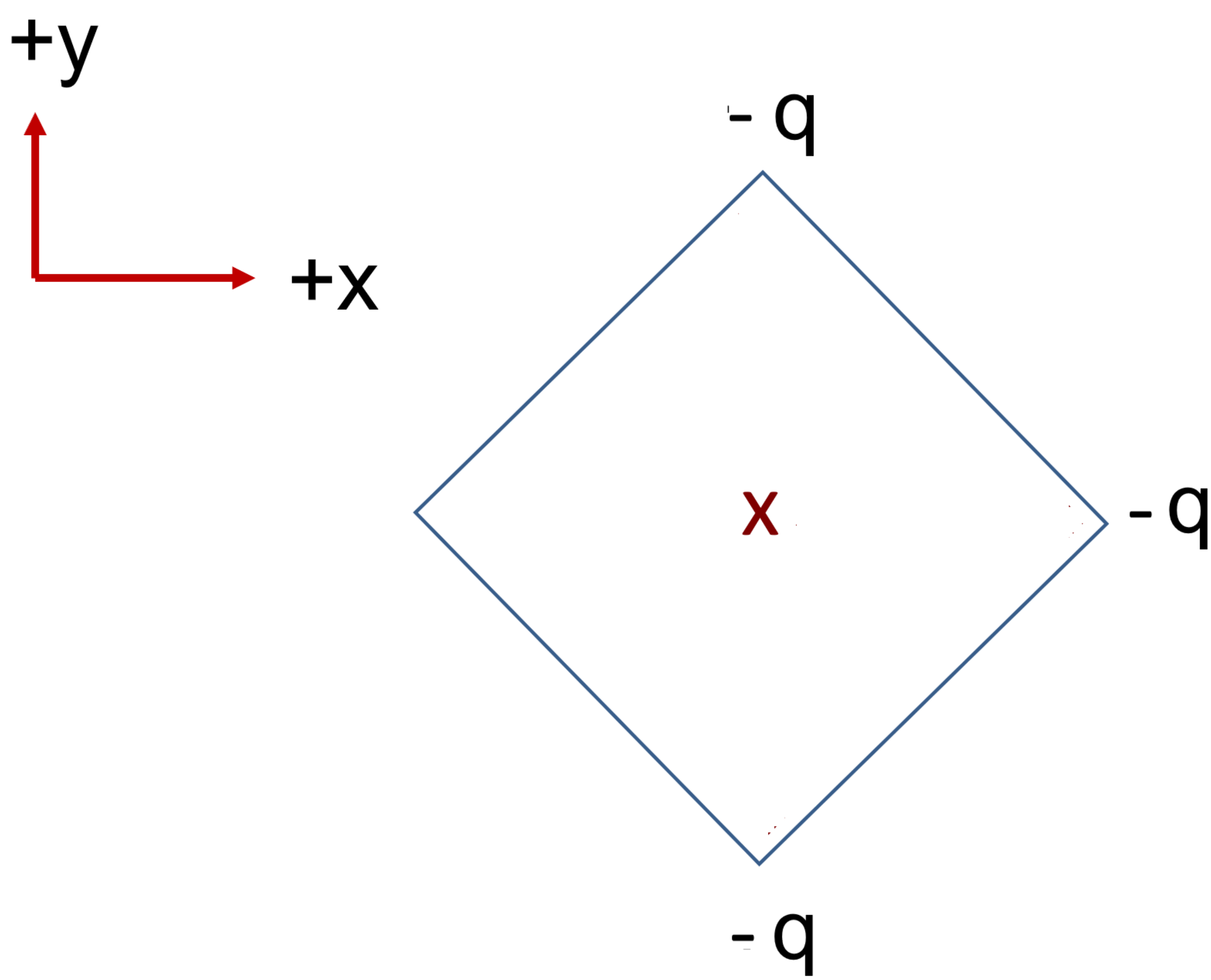
- Up ↑
- Down ↓
- Left ←
- ✓ Right →

Hide Feedback

A positive particle experiences a force in the same direction as the electric field which it is in.

Question 2 **1 / 1 point**

In which direction is the net electric field at the centre of the square of charges?



✔ ◯ Along positive x ⟶

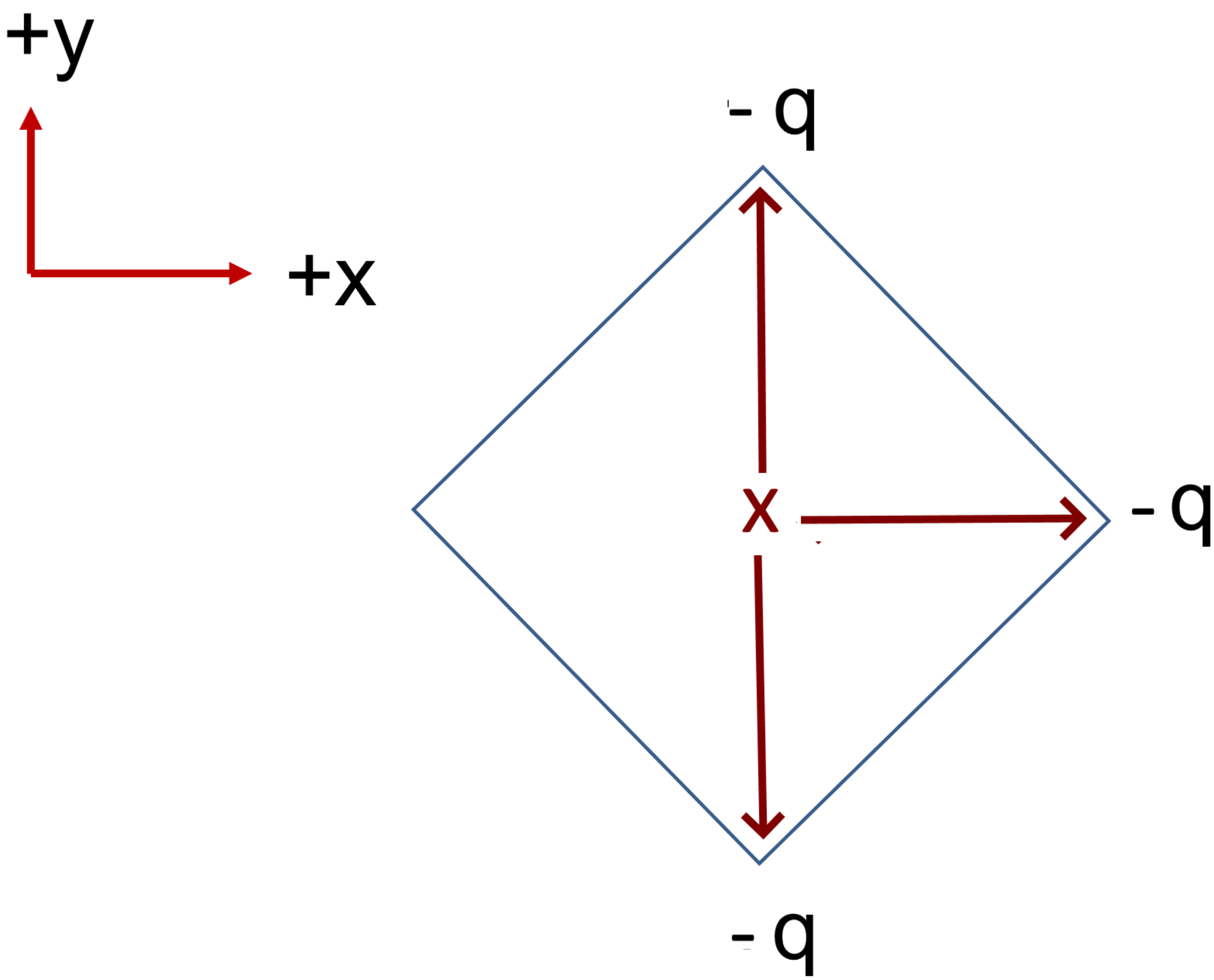
◯ Along negative x ⟵

◯ Along positive y ↑

Along negative y ↓

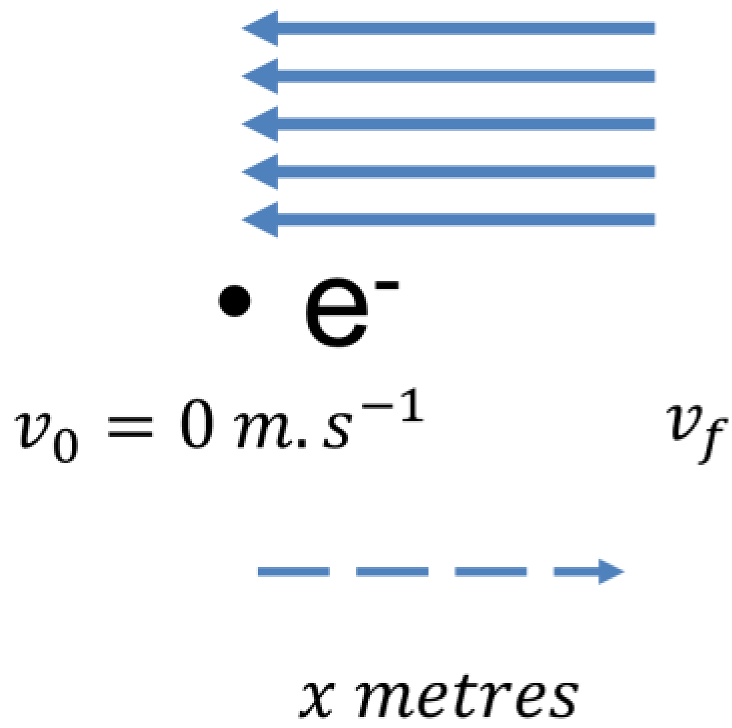
Hide Feedback

All three negative charges produce electric fields at the centre of the square which are pointing towards the generating charge. The top and bottom electric fields cancel out, so the only electric field making a contribution to the net electric field is the one generated by the central charge. This is towards the negative charge, along the positive x-axis



Question 3 **0 / 1 point**

You are designing an electron accelerator to bring a stationary electron to a speed of (6.85x10^6) m/s in a uniform electric field. If the distance travelled is (1.168x10^-2) metres, what must the magnitude of the electric field be in N/C?



Answer:

1.14x10^3 ✗ **(1.14x10^4)**

▼ Hide Feedback

The force on the electron is given by

$$F = qE$$

and the acceleration can be calculated using Newton's Second Law

$$a = \frac{F}{m} = \frac{qE}{m}$$

The final speed is given by the kinematic equation

$$v_f^2 = v_0^2 + 2ax$$

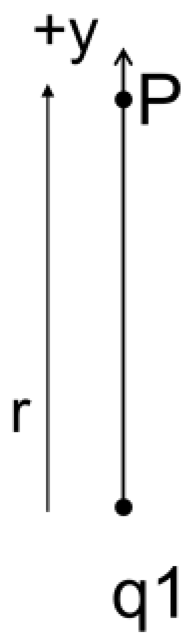
$$v_f^2 = 0 + 2\frac{qEx}{m}$$

Solving for E

$$E = \frac{mv_f^2}{2qx}$$

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (8.31x10^-2) metres from charge q1 = (8.4800x10^0) µC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

1.10x10^7 ✓

Hide Feedback

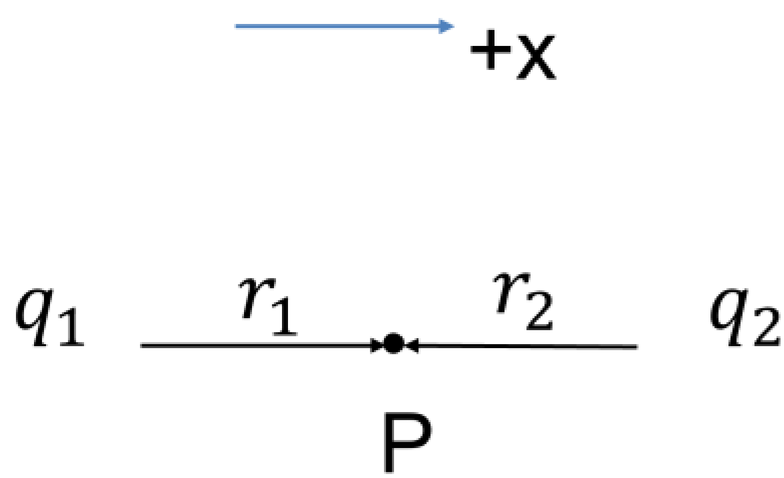
Calculate the charge from the equation

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **j.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{j}$$

Question 5 **0 / 1 point**



Find the net electric field in N/C at point P, where q1 = (-1.20x10^0) nC, r1 = (3.1390x10^-1) metres, q2 = (7.840x10^0) nC and r2 = (5.367x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.

Answer:

-3.52x10^2 ✗ **(-1.35x10^2)**

Hide Feedback

Both charges produce electric fields

For charge 1, this radial vector is in the positive x-axis, but the produced field will be in the negative x-direction (towards the charge).
The field direction will be the radial vector times a negative charge (direction vector will 'flip')

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}(\hat{i})$$

For charge 2, the field is away from the positive charge, in the negative direction (same direction as the radial vector)

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} + \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

$$\vec{E}_{net} = (\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2})\hat{i} = -k(\frac{|q_1|}{r_1^2} + \frac{|q_2|}{r_2^2})\hat{i}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):5 / 5 - 100 %

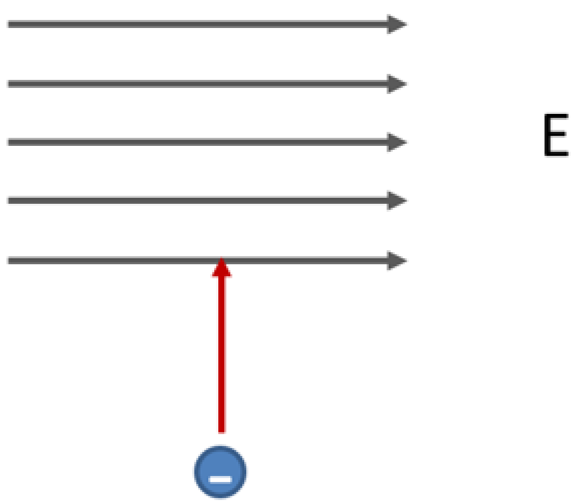
Done

Quiz Submissions - Quiz Week 2

Attempt 1

Question 1 **1 / 1 point**

An electron enters a uniform electric field perpendicularly to the field direction. At the instant it enters the field, in what is direction is the force on the particle?



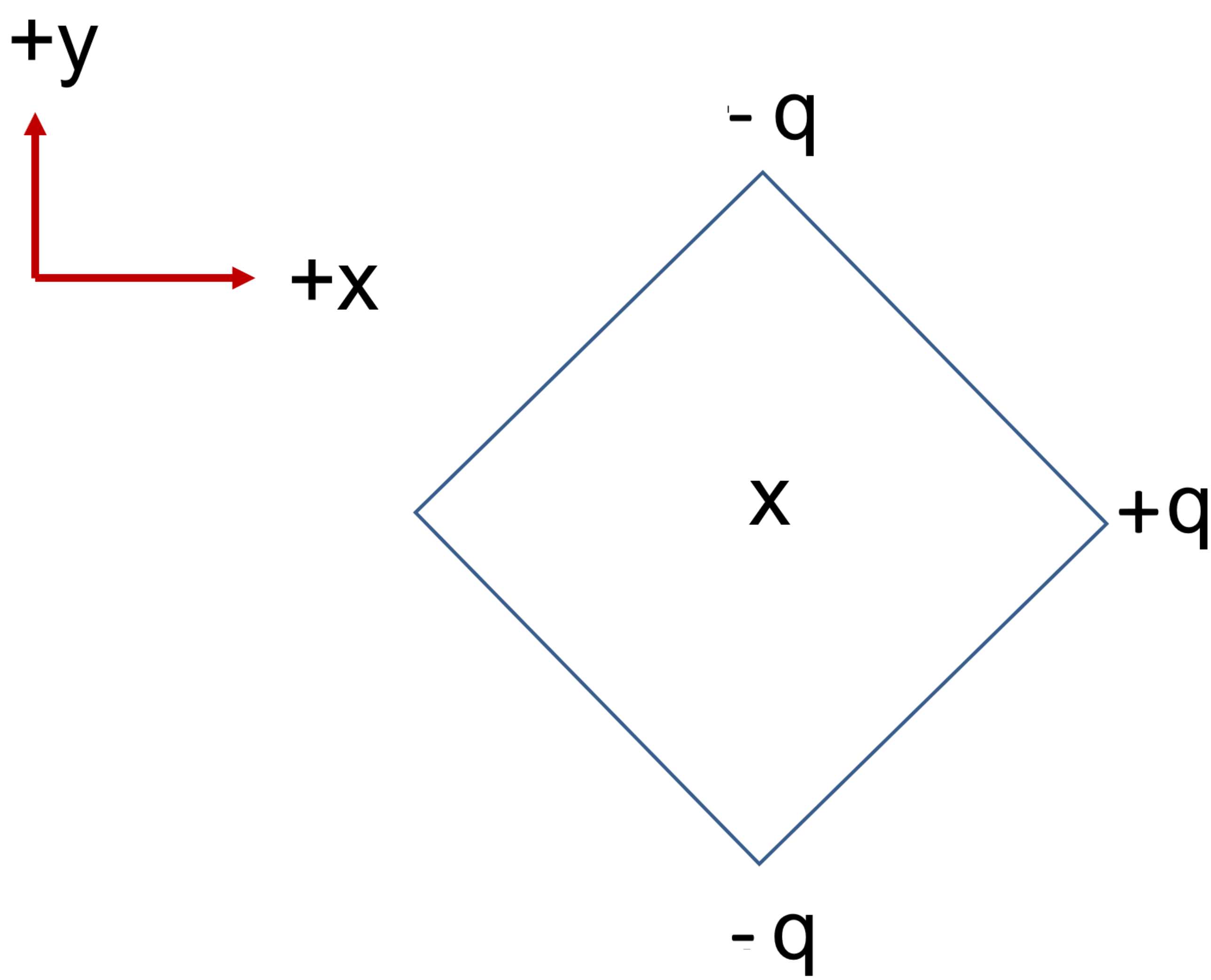
- ◯ Up ↑
- ◯ Down ↓
- ✔ ◯ Left ←
- ◯ Right →

▼ Hide Feedback

The force on a negatively charged particle is in the opposite direction to the electric field that it is in.

Question 2 **1 / 1 point**

In what direction is the net electric field at the centre of the square?



- [ ] Along positive x ⟶
- [x] Along negative x ⟵
- [ ]

Along positive y ↑

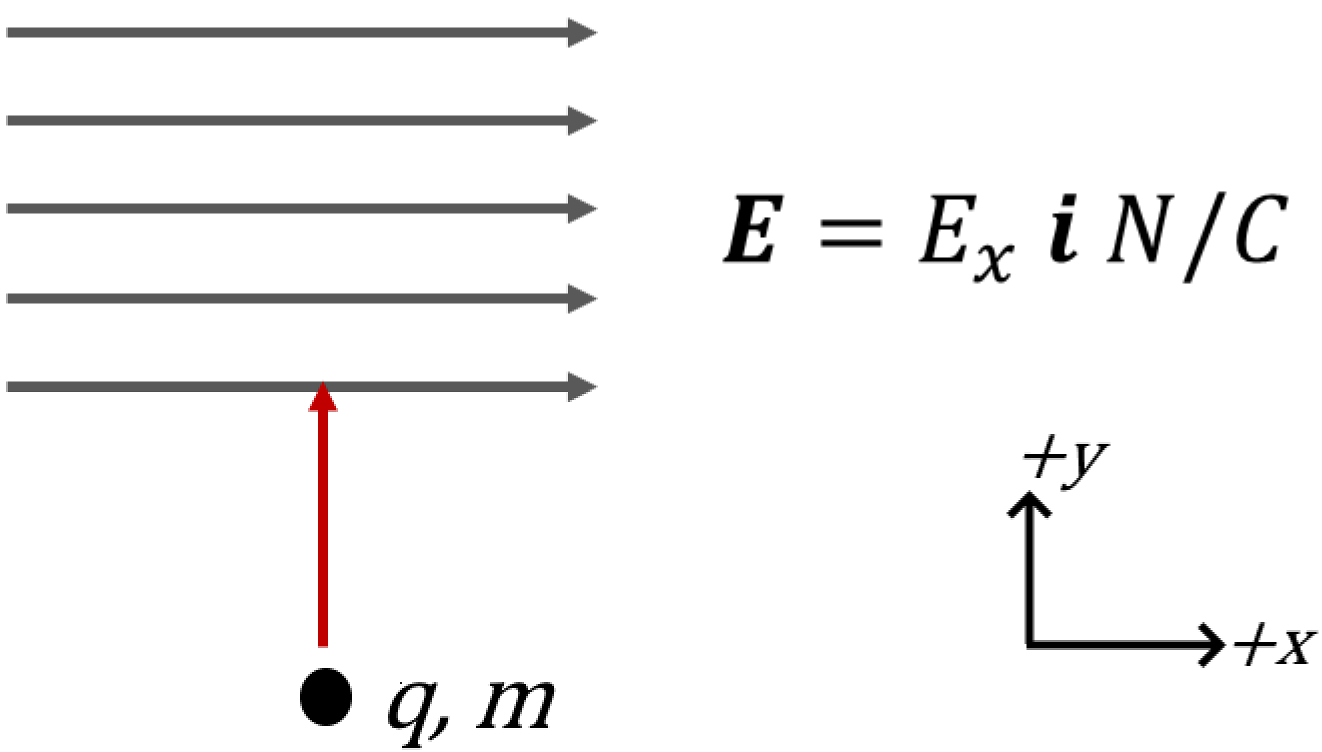
Along negative y ↓

Hide Feedback

The electric fields generated by the upper and lower charges are towards the negative charges. At the centre of the square, they are equal and opposite and cancel. The only field which contributes to the net electric field is that generated by the central charge. This is moving away from the positive charge, along the negative x-axis

Question 3 **1 / 1 point**

A charged particle with charge +(1.0780x10^-17) C and mass (9.90x10^-24) kg moves into a uniform electric field of (4.005x10^3) **i** N/C, with an initial velocity of (7.6020x10^4) **j** m/s. Calculate the acceleration of the particle when it is in the field. in m/s^2. You do not need to enter units or a unit vector in your answer.



Answer:

4.36x10^9 ✓

Hide Feedback

Calculate the force on a charge in an electric field using

$$\vec{F} = q\vec{E}$$

Then use Newton's Second Law to calculate the acceleration.

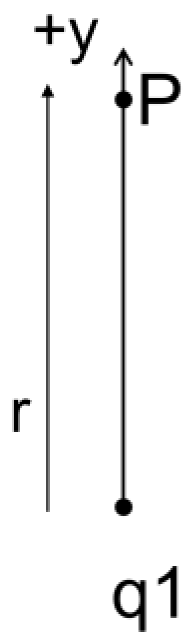
$$\vec{a} = \frac{\vec{F}}{m}$$

$$\vec{a} = \frac{q\vec{E}}{m}$$

Note that the acceleration must be in the direction of the electric field. The initial velocity is not relevant in this calculation (but will affect the trajectory of the particle in the electric field).

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (9.8152x10^-1) metres from charge q1 = (1.37x10^0) μC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

1.28x10^4 ✓

Hide Feedback

Calculate the charge from the equation

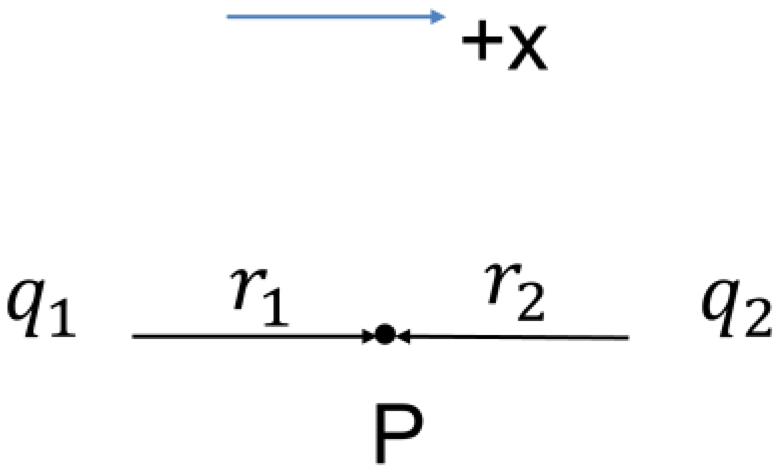
$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **j.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{j}$$

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (5.7050x10^0) nC, r1 = (1.37x10^-1) metres, q2 = (-6.585x10^0) nC and r2 = (7.5050x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

2.83x10^3 **(2.63x10^3)**

Hide Feedback

Both charges produce electric fields directed along the x-axis.

For charge 1, the radial vector is in the positive x-direction (away from the charge), and the produced field will also be in this direction.

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i}$$

For charge 2, the radial vector is from the charge to the point, in the negative x-direction. The produced field is towards the charge, so it will be in the positive x-direction (note that

$$q_2$$

is negative, so the direction will switch).

$$\vec{E}_2 = -\frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

$$\vec{E}_{net} = \left(\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\right)\hat{i} = k\left(\frac{|q_1|}{r_1^2} + \frac{|q_2|}{r_2^2}\right)\hat{i}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

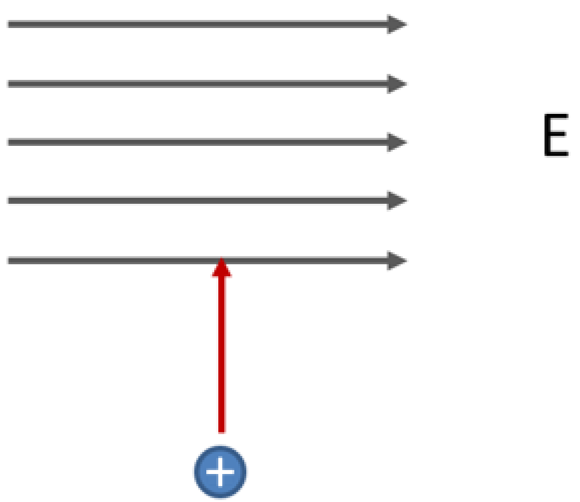
Done

Quiz Submissions - Quiz Week 2

Attempt 1

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. When it enters the field, what direction is the electric force on it?



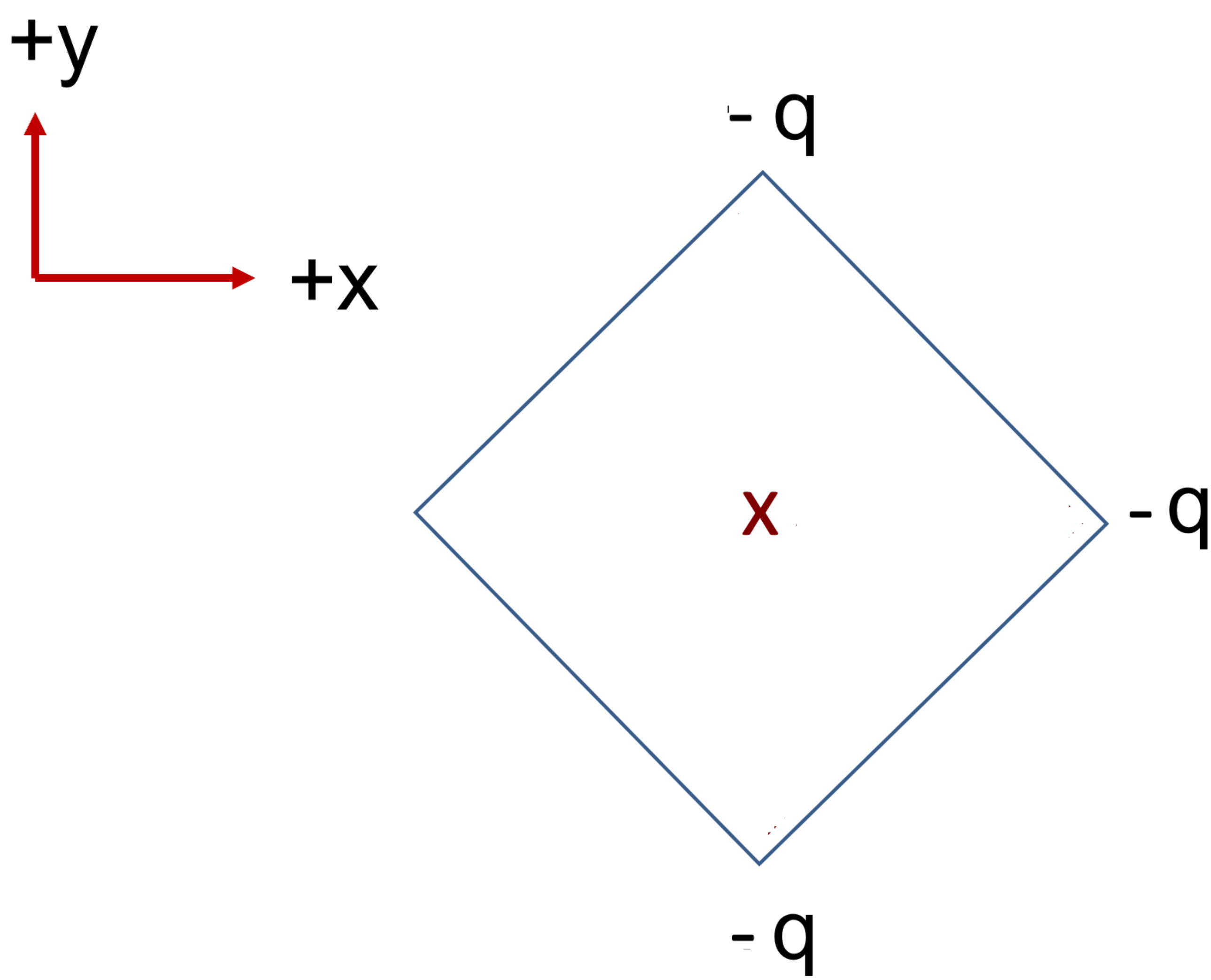
- ◯ Up ↑
- ◯ Down ↓
- ◯ Left ←
- ✓◯ Right →

Hide Feedback

A positive particle experiences a force in the same direction as the electric field which it is in.

Question 2 **1 / 1 point**

In which direction is the net electric field at the centre of the square of charges?



✔ ◯ Along positive x $\rightarrow$

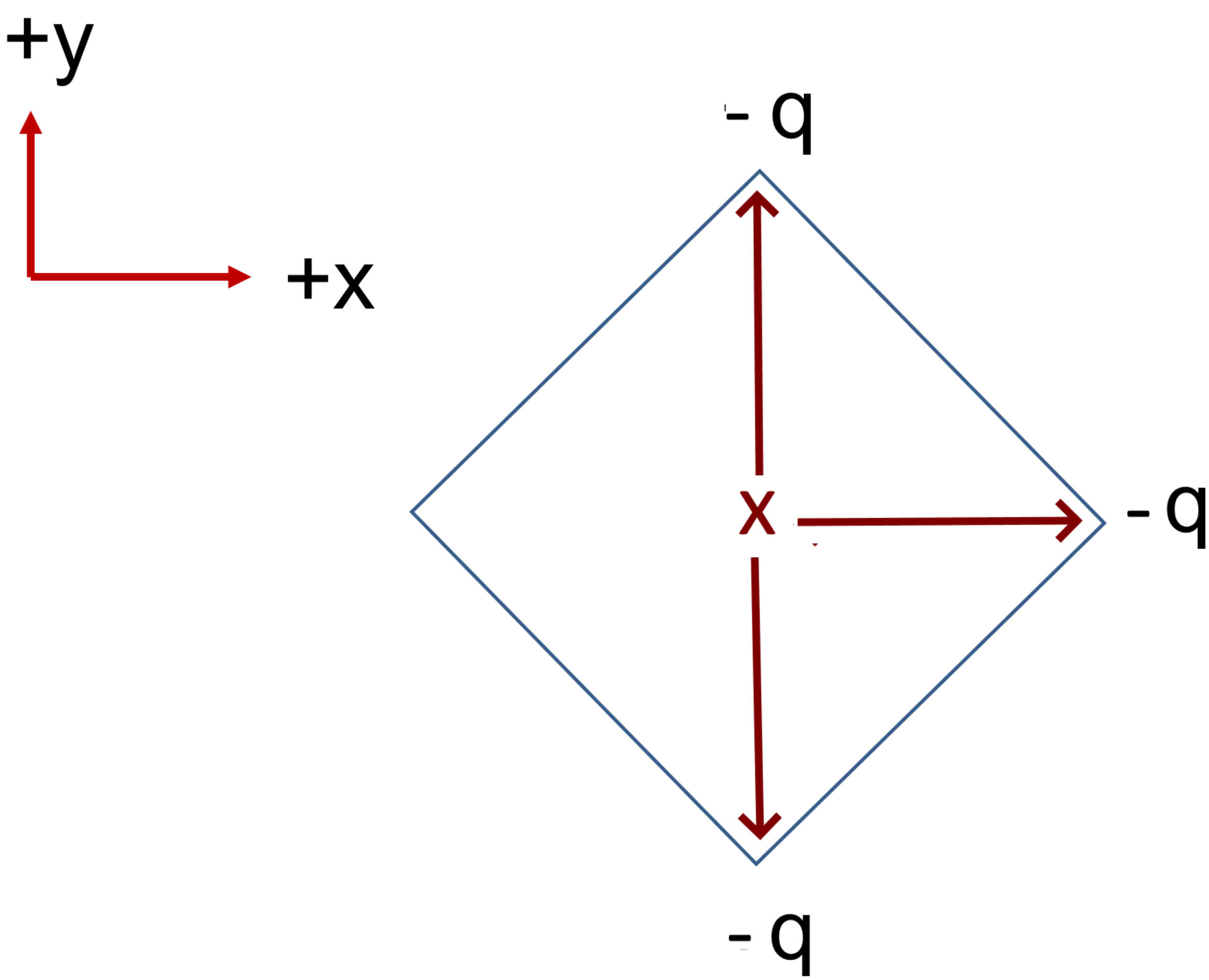
◯ Along negative x $\leftarrow$

◯ Along positive y $\uparrow$

○ Along negative y ↓

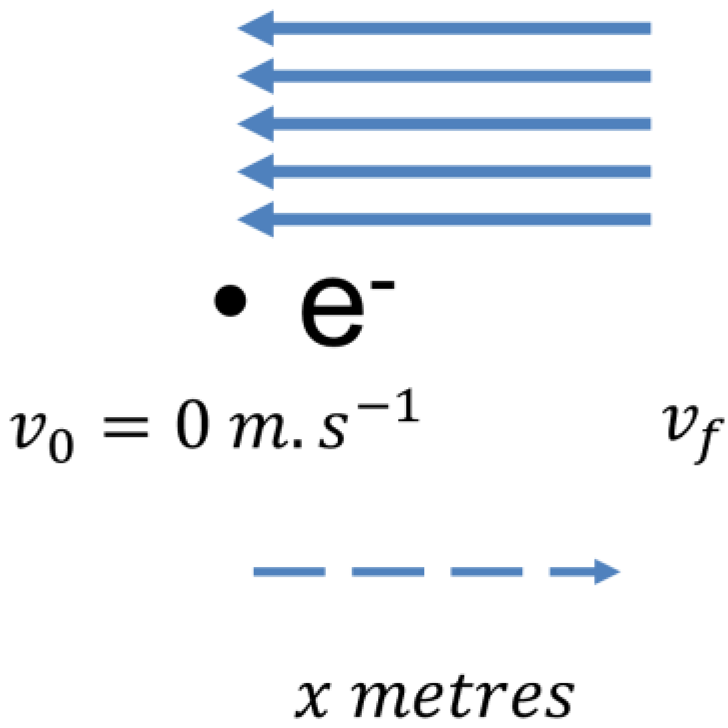
▼ Hide Feedback

All three negative charges produce electric fields at the centre of the square which are pointing towards the generating charge. The top and bottom electric fields cancel out, so the only electric field making a contribution to the net electric field is the one generated by the central charge. This is towards the negative charge, along the positive x-axis



Question 3 **0 / 1 point**

You are designing an electron accelerator to bring a stationary electron to a speed of (3.66x10^6) m/s in a uniform electric field. If the distance travelled is (5.759x10^-2) metres, what must the magnitude of the electric field be in N/C?



Answer:

5.685x10^-12 ✗ **(6.58x10^2)**

Hide Feedback

The force on the electron is given by

$$F = qE$$

and the acceleration can be calculated using Newton's Second Law

$$a = \frac{F}{m} = \frac{qE}{m}$$

The final speed is given by the kinematic equation

$$v_f^2 = v_0^2 + 2ax$$

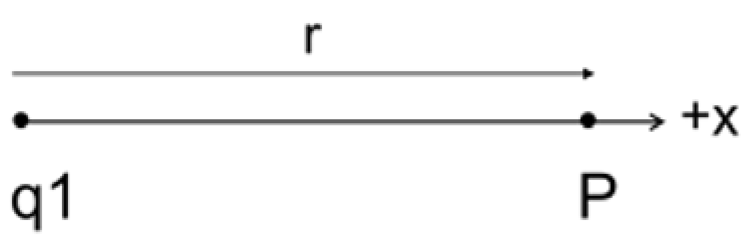
$$v_f^2 = 0 + 2\frac{qEx}{m}$$

Solving for E

$$E = \frac{mv_f^2}{2qx}$$

Question 4 **0 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (7.80x10^-1) metres from charge q1 = (-5.3390x10^0) nC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

-7.8870x10^-3 ✗ **(-7.89x10^1)**

Hide Feedback

Calculate the charge from the equation

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

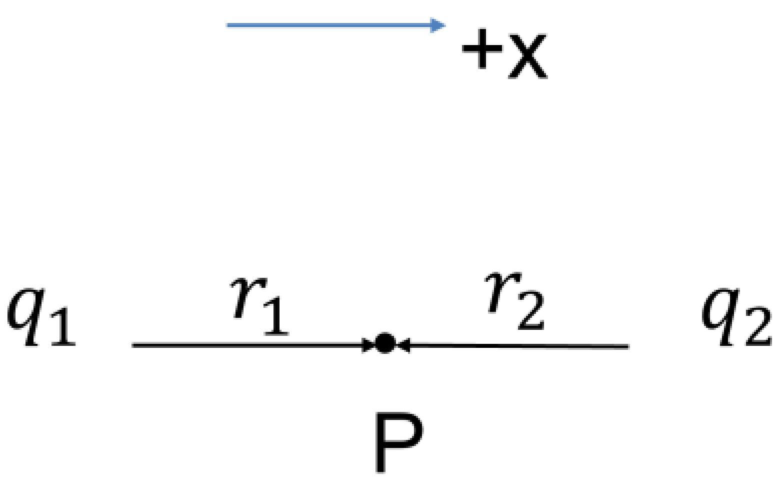
In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **i.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{i}$$

Since the charge has a negative value, you should expect to get a negative answer, signifying that the electric field points towards charge q1 at point P.

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (-2.121x10^0) nC, r1 = (8.915x10^-1) metres, q2 = (-3.30x10^0) nC and r2 = (1.064x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

2.596x10^3 ✔ **(2.60x10^3)** ✘ wrong number of significant figures **(3)**

Hide Feedback

Both charges produce electric fields directed towards the charge which produces them

For charge 1, this field is in the negative x-direction

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}(-\hat{i})$$

For charge 2, the field is towards the charge, along the positive x-direction.

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}(-\hat{i}) + \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

$$\vec{E}_{net} = \left(\frac{q_2}{4\pi\epsilon_0 r_2^2} - \frac{q_1}{4\pi\epsilon_0 r_1^2}\right)\hat{i}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**5 / 5 - 100 %

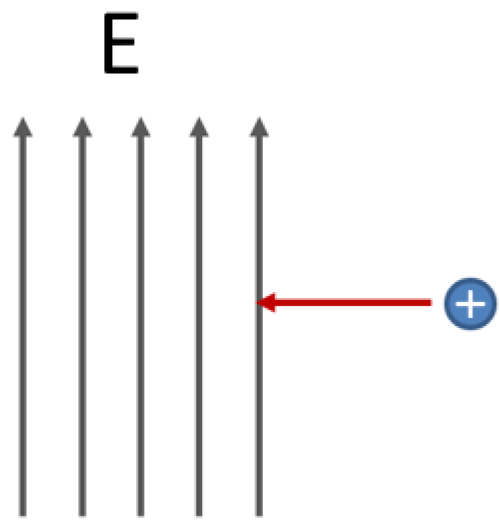
Done

Quiz Submissions - Quiz Week 2

Attempt 1

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. At the instant the particle enters the field, what direction is the electric field exerted in?



✔ ◯ Up ↑

◯ Down ↓

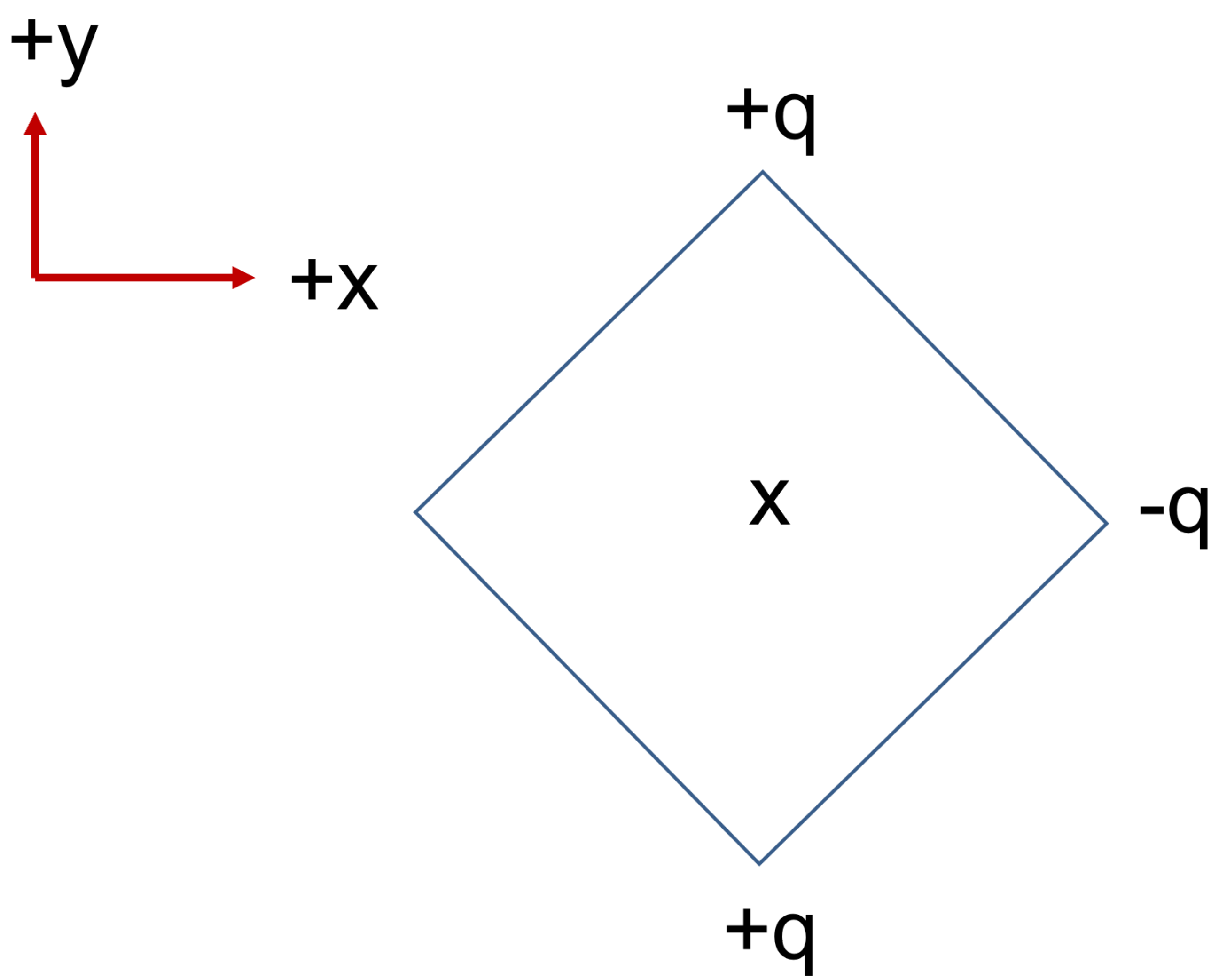
◯ Left ←

◯ Right →

▼ Hide Feedback

A positive charge in an electric field experiences a force in the same direction as the field

Question 2 **1 / 1 point**



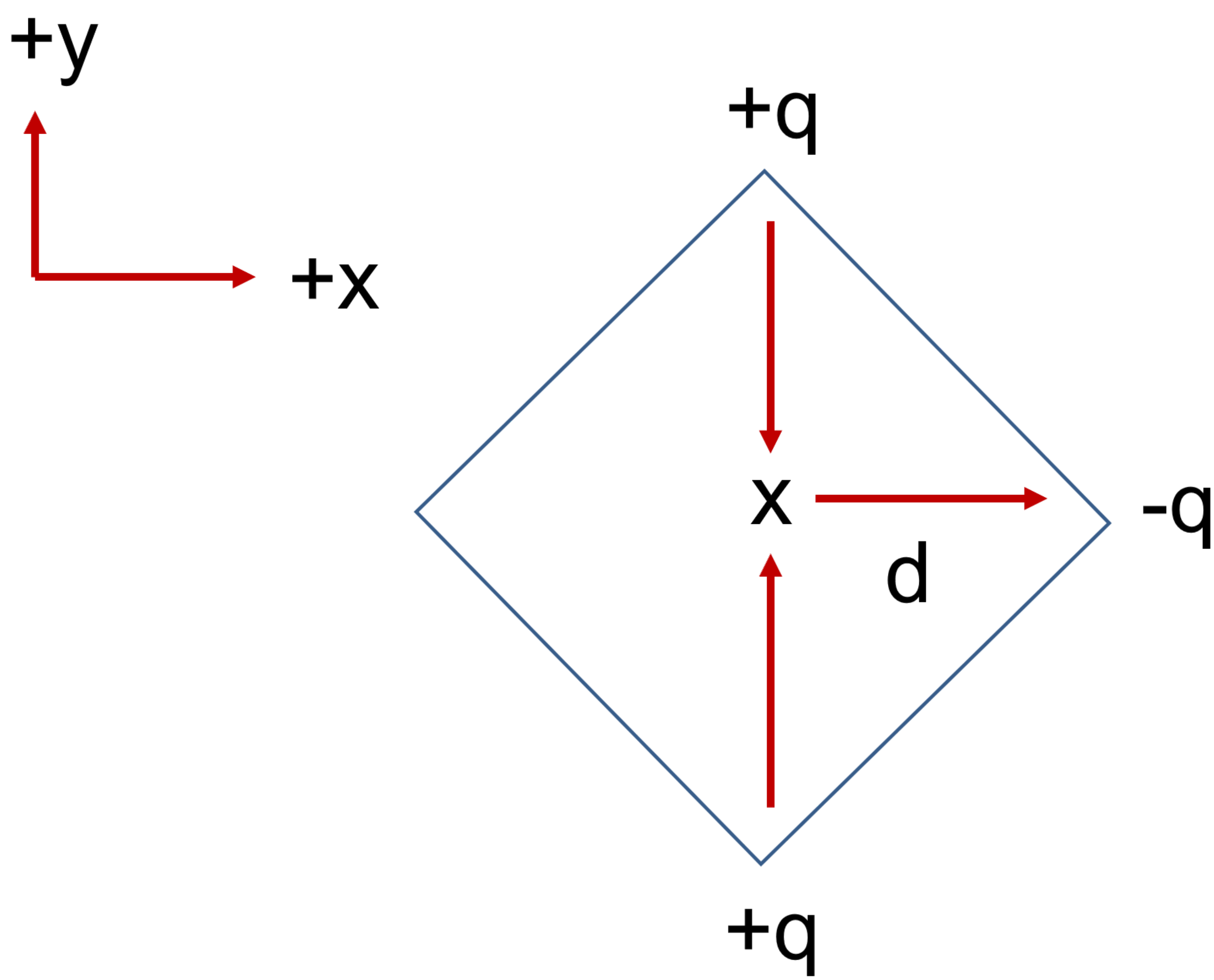
What is the direction of the net electric field in the centre of this square charge system?

- ◯ Along negative x ←
- ✔◯ Along positive x →
- ◯ Along positive y ↑
- ◯

Along negative y ↓

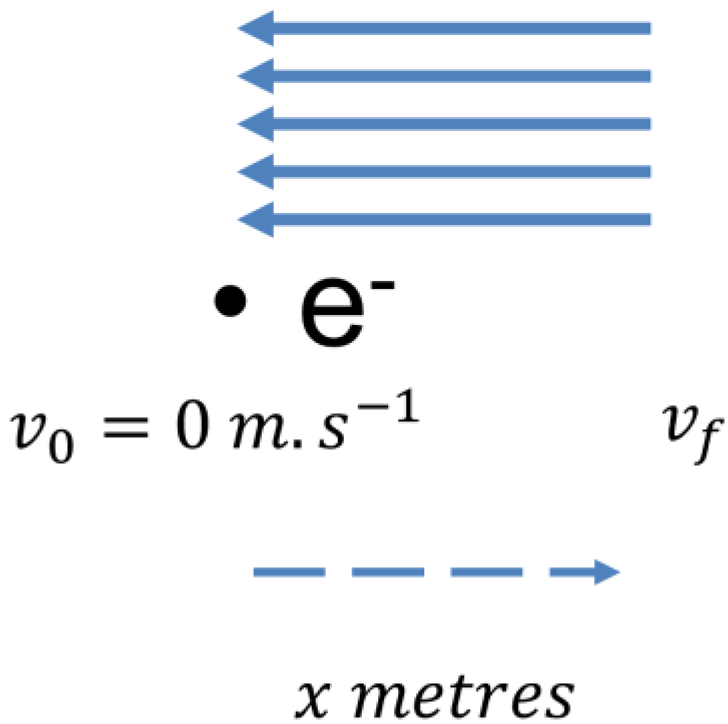
▼ Hide Feedback

The electric fields generated by the upper and lower charges are equal and opposite and will cancel out. The negative charge generates an electric field moving towards it, and this is the only contribution to the net electric field, along positive x.



Question 3 **1 / 1 point**

You are designing an electron accelerator to bring a stationary electron to a speed of (7.84x10^6) m/s in a uniform electric field. If the distance travelled is (1.4540x10^-2) metres, what must the magnitude of the electric field be in N/C?



Answer:

1.20x10^4 ✓

Hide Feedback

The force on the electron is given by

$$F = qE$$

and the acceleration can be calculated using Newton's Second Law

$$a = \frac{F}{m} = \frac{qE}{m}$$

The final speed is given by the kinematic equation

$$v_f^2 = v_0^2 + 2ax$$

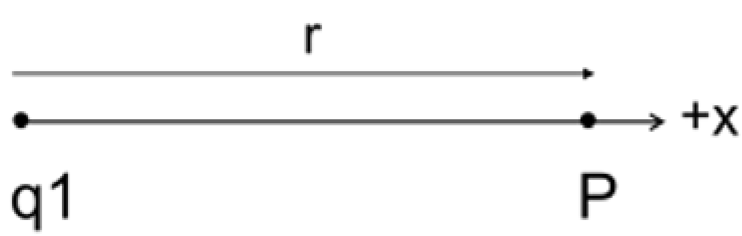
$$v_f^2 = 0 + 2\frac{qEx}{m}$$

Solving for E

$$E = \frac{mv_f^2}{2qx}$$

Question 4 **0 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (9.1401x10^-1) metres from charge q1 = (7.24x10^0) nC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

7.79x10^2 ❌ **(7.79x10^1)**

▼ Hide Feedback

Calculate the charge from the equation

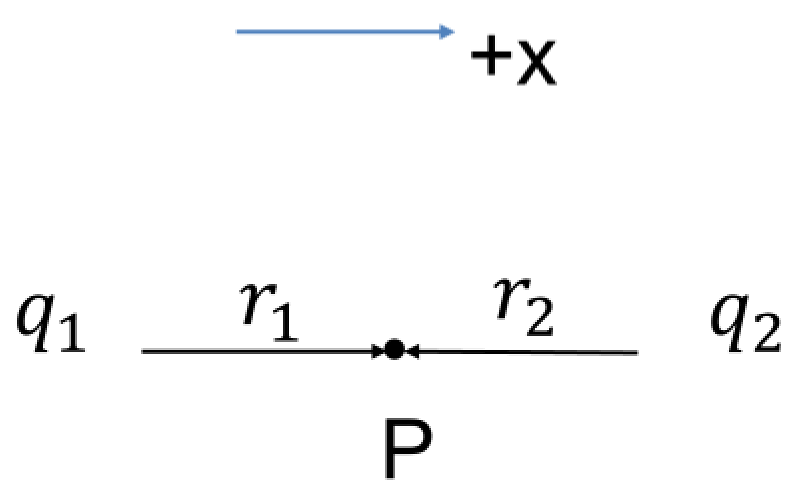
$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **i.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{i}$$

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (1.21x10^0) nC, r1 = (7.8050x10^-1) metres, q2 = (2.233x10^0) nC and r2 = (3.2410x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

-1.73x10^2 ✓

Hide Feedback

Both charges produce electric fields moving away from the charge which produces them

For charge 1, this field is in the positive x-direction

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i}$$

For charge 2, the field is away from the charge, along the negative x-direction.

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} + \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

$$\vec{E}_{net} = (\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2})\hat{i}$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

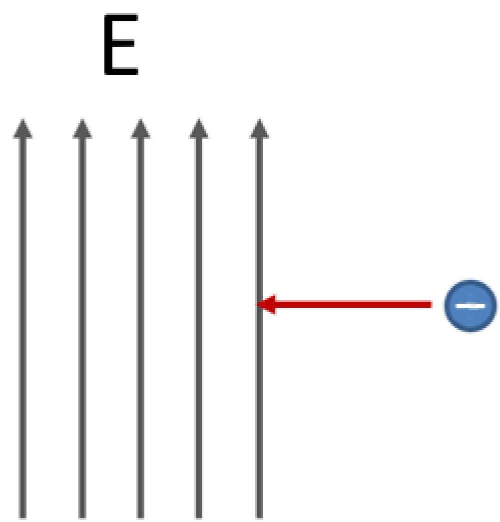
Done

Quiz Submissions - Quiz Week 2

Attempt 1

Question 1 **0 / 1 point**

An electron enters a uniform electric field perpendicularly to the field direction as in the diagram. At the instant it enters the field, what direction is the electric force exerted?



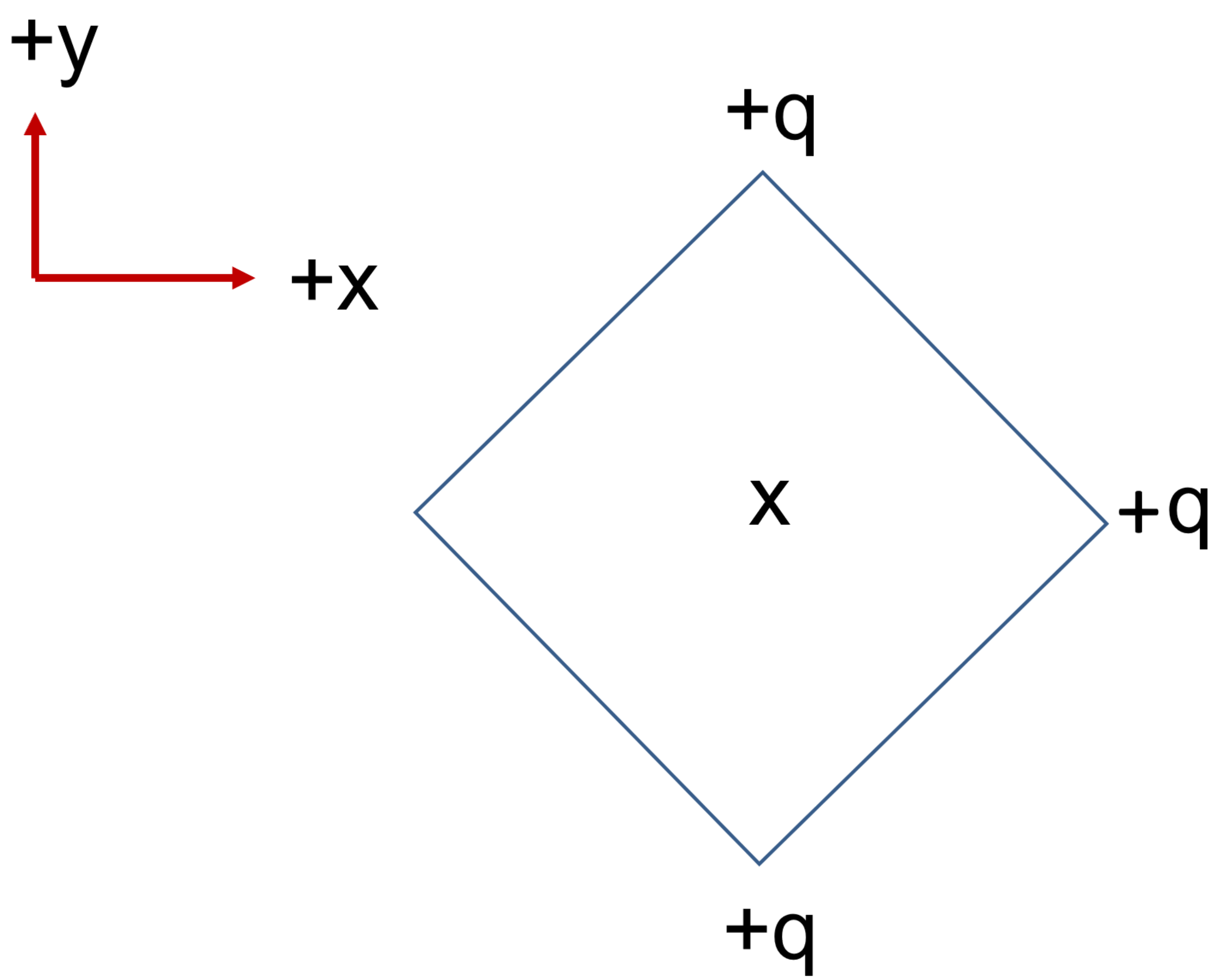
- Up ↑
- Down ↓
- Left ←
- Right →

Hide Feedback

The force on a negatively charged particle is in the opposite direction to the electric field that it is in.

Question 2 **1 / 1 point**

Find the direction of the net electric field in the centre of this square charge system



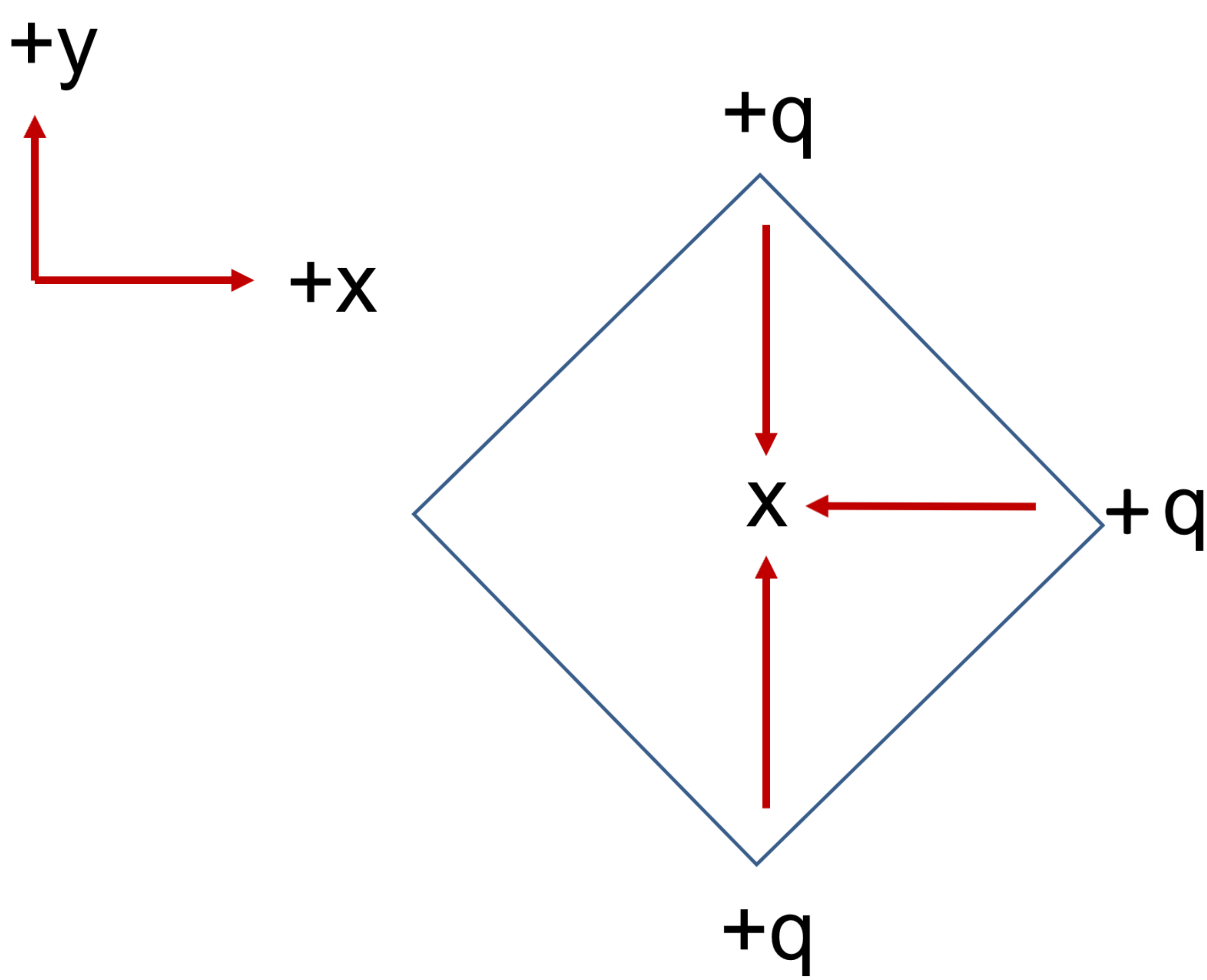
- Along positive x ⟶
- ✔ Along negative x ⟵
-

Along positive y ↑

Along negative x ↓

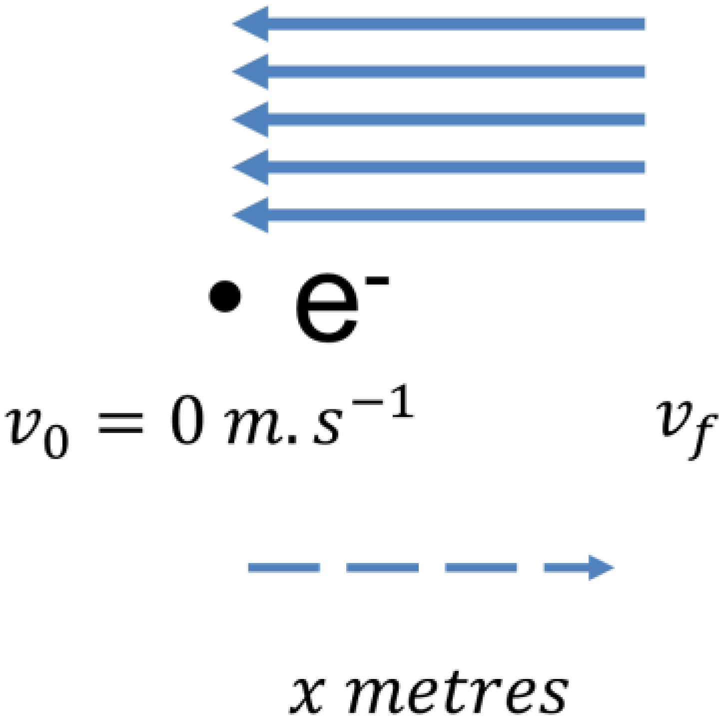
Hide Feedback

All positive charges produce electric fields pointing away from each other at the centre of the square. The upper and lower electric fields are equal and opposite, and cancel. The net electric fields is away from the central positive charge, and is aligned along the negative x - axis



Question 3 **0 / 1 point**

You are designing an electron accelerator to bring a stationary electron to a speed of (8.87x10^6) m/s in a uniform electric field. If the distance travelled is (2.798x10^-2) metres, what must the magnitude of the electric field be in N/C?



Answer:

(7.96x10^3)

Hide Feedback

The force on the electron is given by

$$F = qE$$

and the acceleration can be calculated using Newton's Second Law

$$a = \frac{F}{m} = \frac{qE}{m}$$

The final speed is given by the kinematic equation

$$v_f^2 = v_0^2 + 2ax$$

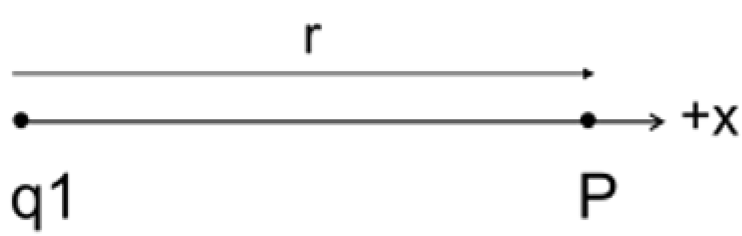
$$v_f^2 = 0 + 2\frac{qEx}{m}$$

Solving for E

$$E = \frac{mv_f^2}{2qx}$$

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (5.42x10^-1) metres from charge q1 = (4.4370x10^0) nC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

1.36x10^2 ✔

▼ Hide Feedback

Calculate the charge from the equation

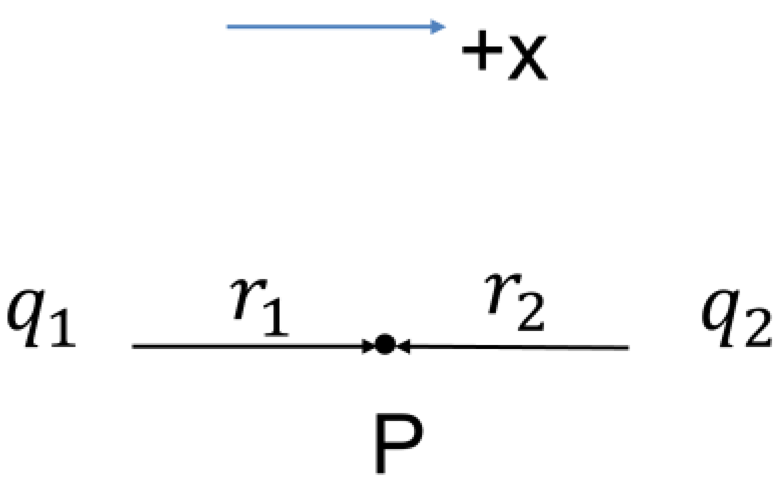
$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **i.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{i}$$

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (-6.468x10^0) nC, r1 = (1.81x10^-1) metres, q2 = (-6.599x10^0) nC and r2 = (4.124x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

-1.43x10^3 ✓

Hide Feedback

Both charges produce electric fields directed towards the charge which produces them

For charge 1, this field is in the negative x-direction

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}(-\hat{i})$$

For charge 2, the field is towards the charge, along the positive x-direction.

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}(-\hat{i}) + \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

$$\vec{E}_{net} = (\frac{q_2}{4\pi\epsilon_0 r_2^2} - \frac{q_1}{4\pi\epsilon_0 r_1^2})\hat{i}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

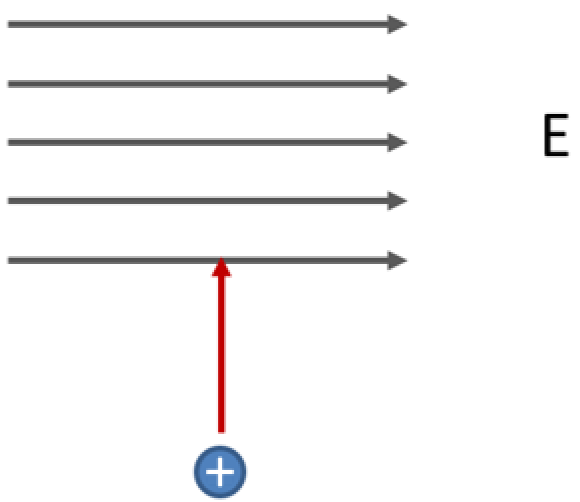
Done

Quiz Submissions - Quiz Week 2

Attempt 1

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. When it enters the field, what direction is the electric force on it?



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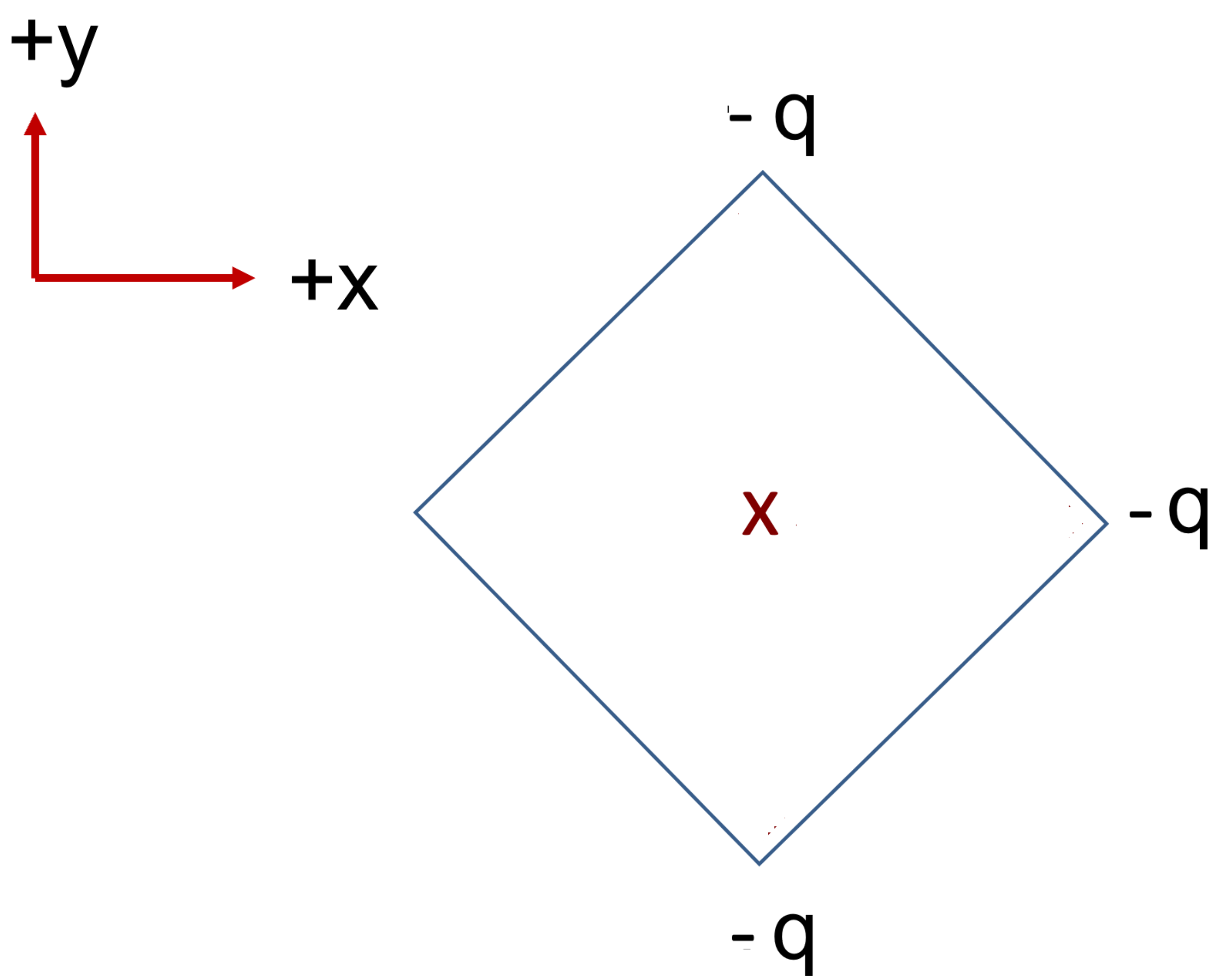
▼ Hide Feedback

A positive particle experiences a force in the same direction as the electric field which it is in.

Question 2 **1 / 1 point**

In which direction is the net electric field at the centre of the square of charges?



✔ ◯ Along positive x ⟶

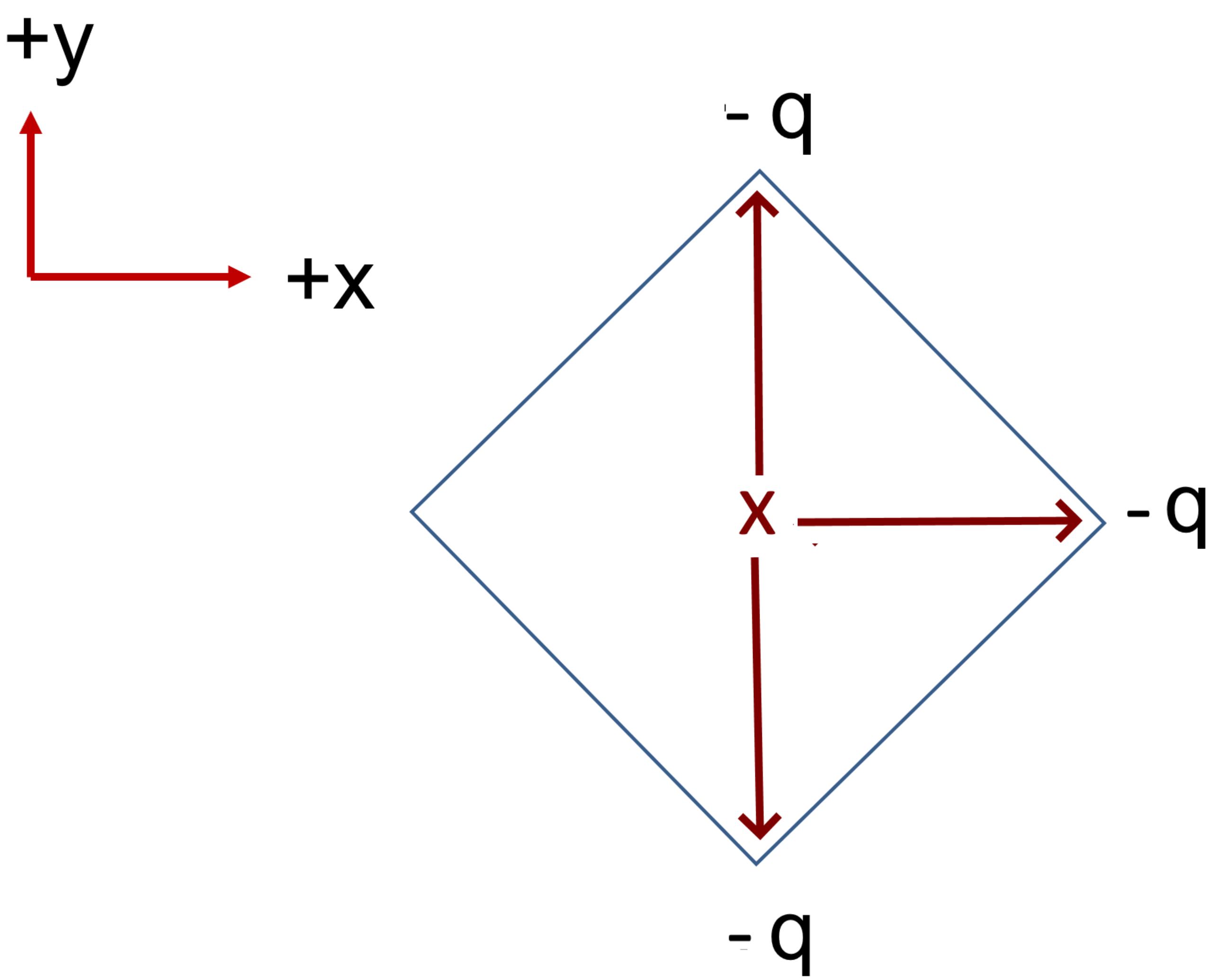
◯ Along negative x ⟵

◯ Along positive y ↑

Along negative y ↓

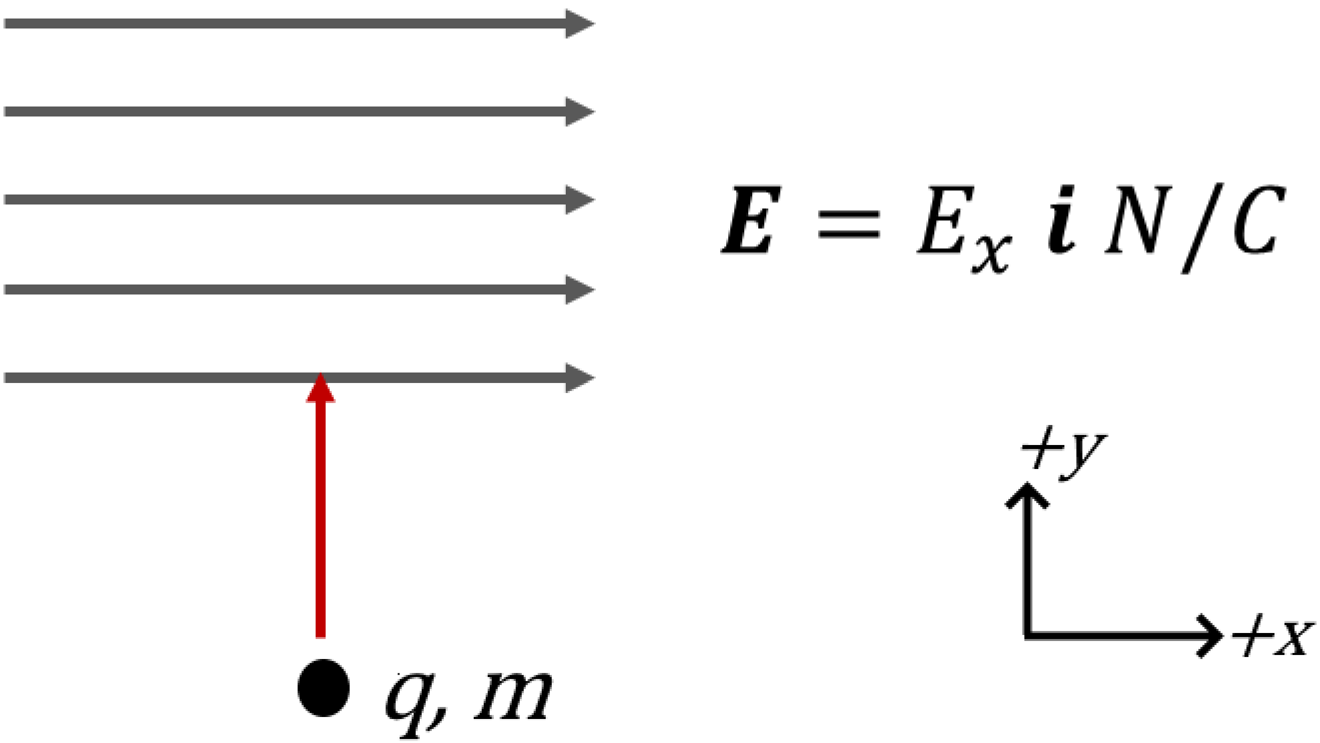
Hide Feedback

All three negative charges produce electric fields at the centre of the square which are pointing towards the generating charge. The top and bottom electric fields cancel out, so the only electric field making a contribution to the net electric field is the one generated by the central charge. This is towards the negative charge, along the positive x-axis



Question 3 **0 / 1 point**

A charged particle with charge +(1.3194x10^-17) C and mass (7.022x10^-24) kg moves into a uniform electric field of (7.210x10^3) **i** N/C, with an initial velocity of (6.12x10^4) **j** m/s. Calculate the acceleration of the particle when it is in the field. in m/s^2. You do not need to enter units or a unit vector in your answer.



Answer:

1.645x10^8 **(1.35x10^10)**

Hide Feedback

Calculate the force on a charge in an electric field using

$$\vec{F} = q\vec{E}$$

Then use Newton's Second Law to calculate the acceleration.

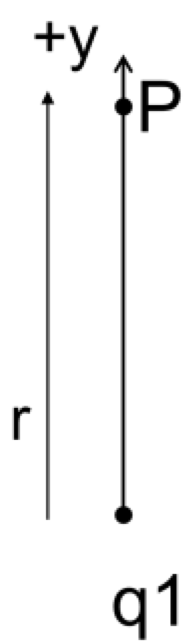
$$\vec{a} = \frac{\vec{F}}{m}$$

$$\vec{a} = \frac{q\vec{E}}{m}$$

Note that the acceleration must be in the direction of the electric field. The initial velocity is not relevant in this calculation (but will affect the trajectory of the particle in the electric field).

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (6.26x10^-1) metres from charge q1 = (-5.2120x10^0) µC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

-1.19x10^5 ✓

Hide Feedback

Calculate the charge from the equation

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

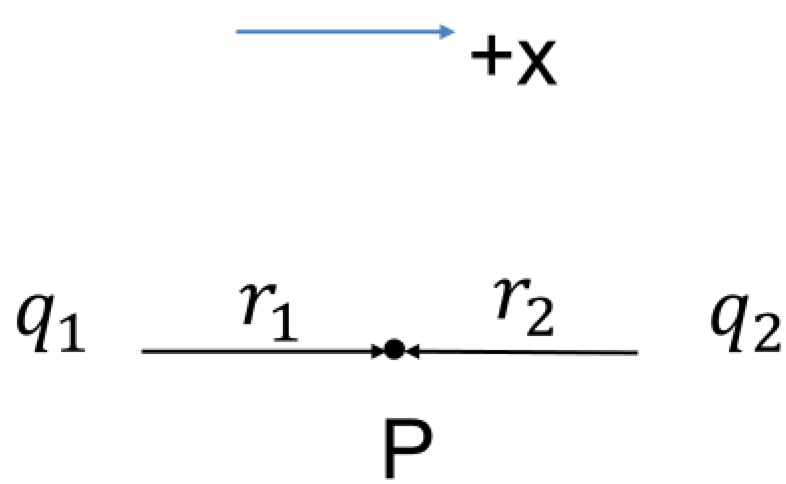
In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **j.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{j}$$

Since the charge is negative, this expression evaluates as negative, indicating that the electric field is directed along the negative y-axis, towards q1

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (-6.602x10^0) nC, r1 = (4.76x10^-1) metres, q2 = (-1.7210x10^0) nC and r2 = (6.938x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

-2.30x10^2 ✓

Hide Feedback

Both charges produce electric fields directed towards the charge which produces them

For charge 1, this field is in the negative x-direction

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}(-\hat{\imath})$$

For charge 2, the field is towards the charge, along the positive x-direction.

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{\imath}$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}(-\hat{\imath}) + \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{\imath}$$

$$\vec{E}_{net} = \left(\frac{q_2}{4\pi\epsilon_0 r_2^2} - \frac{q_1}{4\pi\epsilon_0 r_1^2}\right)\hat{\imath}$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

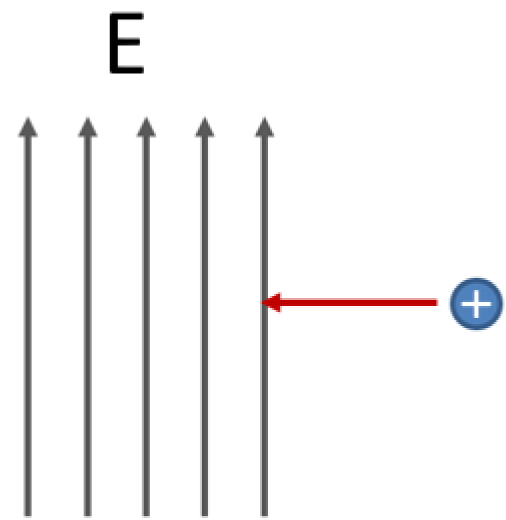
Done

Quiz Submissions - Quiz Week 2

Attempt 2

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. At the instant the particle enters the field, what direction is the electric field exerted in?



✔ ○ Up ↑

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○ Left ←

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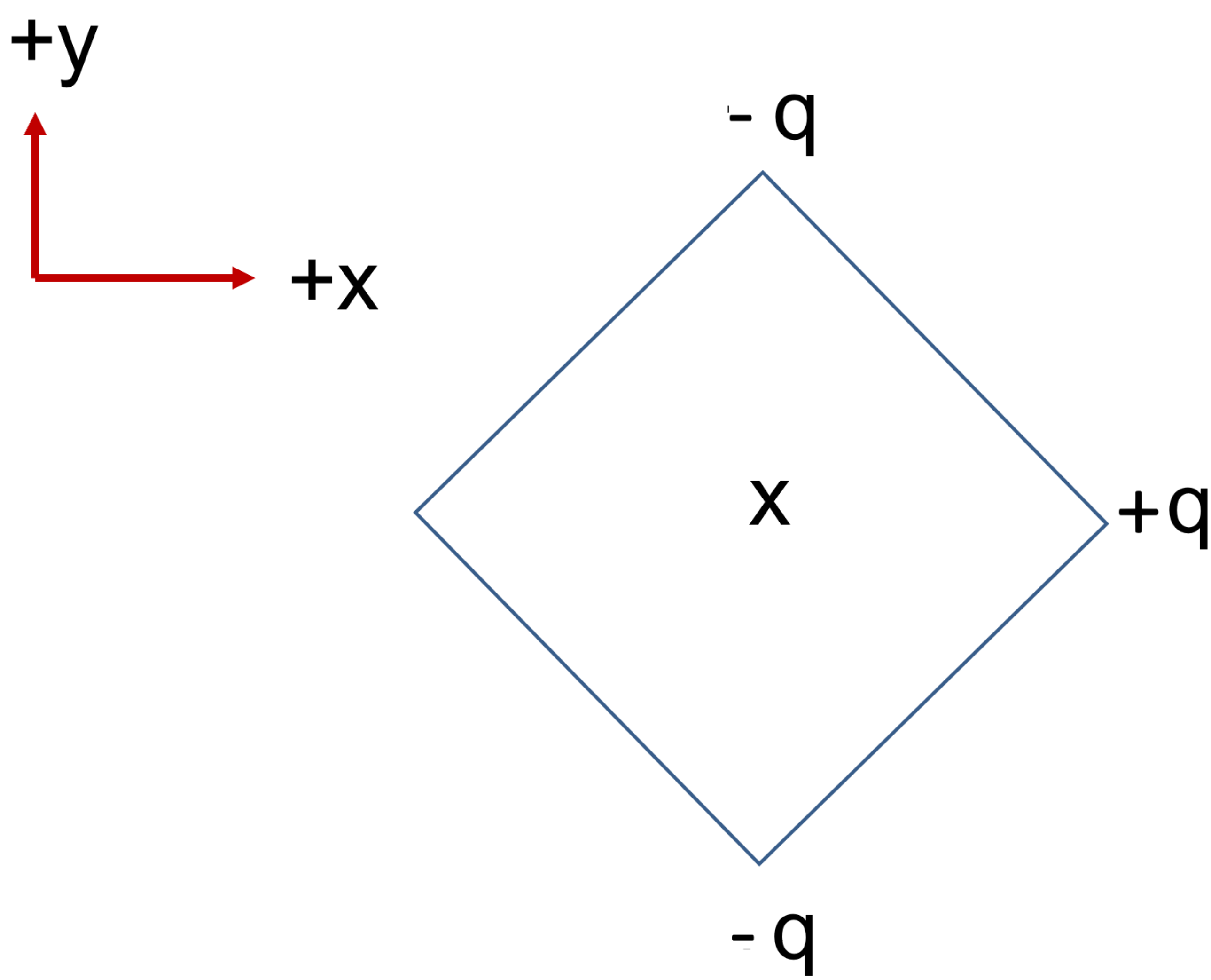
▼ Hide Feedback

A positive charge in an electric field experiences a force in the same direction as the field

Question 2 **1 / 1 point**

In what direction is the net electric field at the centre of the square?



- Along positive x ⟶
- ✔ Along negative x ⟵
- Along positive y ↑

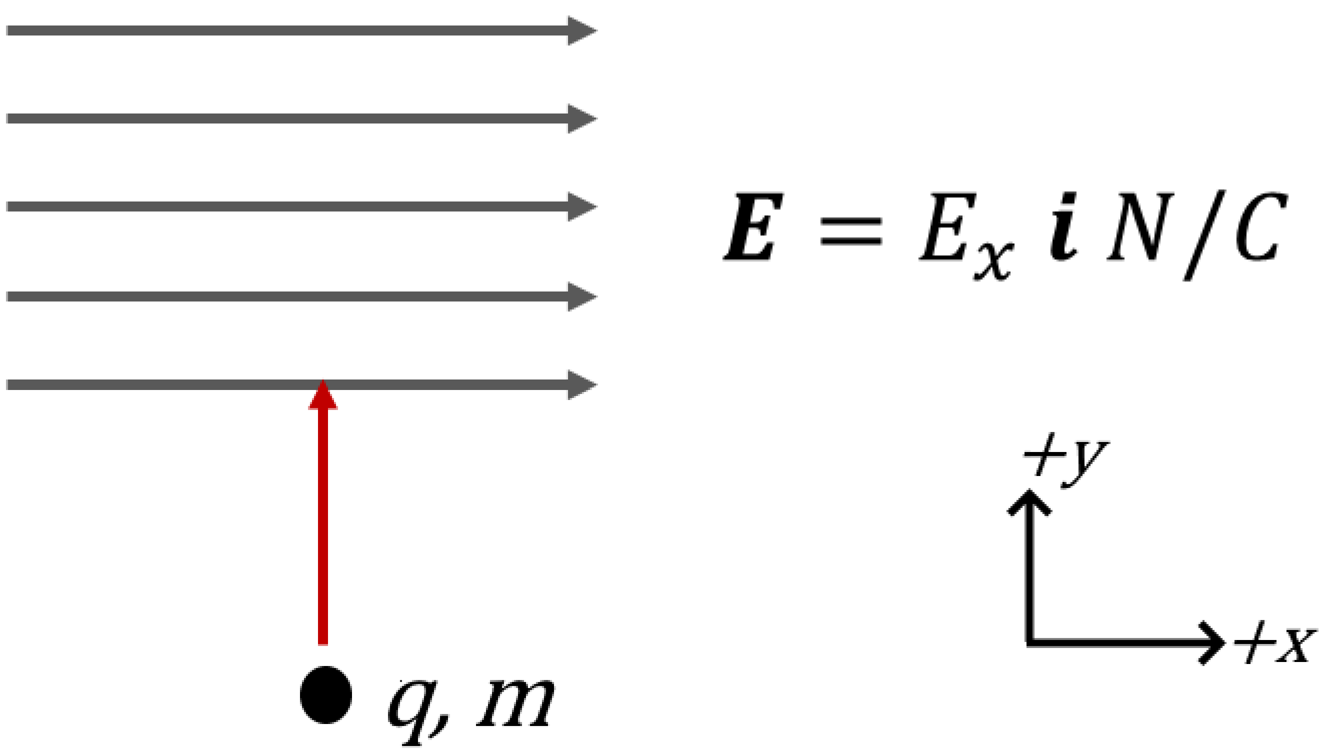
Along negative y ↓

Hide Feedback

The electric fields generated by the upper and lower charges are towards the negative charges. At the centre of the square, they are equal and opposite and cancel. The only field which contributes to the net electric field is that generated by the central charge. This is moving away from the positive charge, along the negative x-axis

Question 3 **1 / 1 point**

A charged particle with charge +(4.8270x10^-18) C and mass (4.032x10^-24) kg moves into a uniform electric field of (4.815x10^3) **i** N/C, with an initial velocity of (5.12x10^4) **j** m/s. Calculate the acceleration of the particle when it is in the field. in m/s^2. You do not need to enter units or a unit vector in your answer.



Answer:

5.76x10^9 ✓

Hide Feedback

Calculate the force on a charge in an electric field using

$$\vec{F} = q\vec{E}$$

Then use Newton's Second Law to calculate the acceleration.

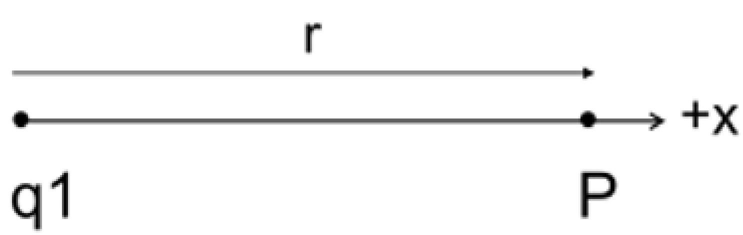
$$\vec{a} = \frac{\vec{F}}{m}$$

$$\vec{a} = \frac{q\vec{E}}{m}$$

Note that the acceleration must be in the direction of the electric field. The initial velocity is not relevant in this calculation (but will affect the trajectory of the particle in the electric field).

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (9.650x10^-2) metres from charge q1 = (1.05x10^0) nC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

1.01x10^3 ✓

Hide Feedback

Calculate the charge from the equation

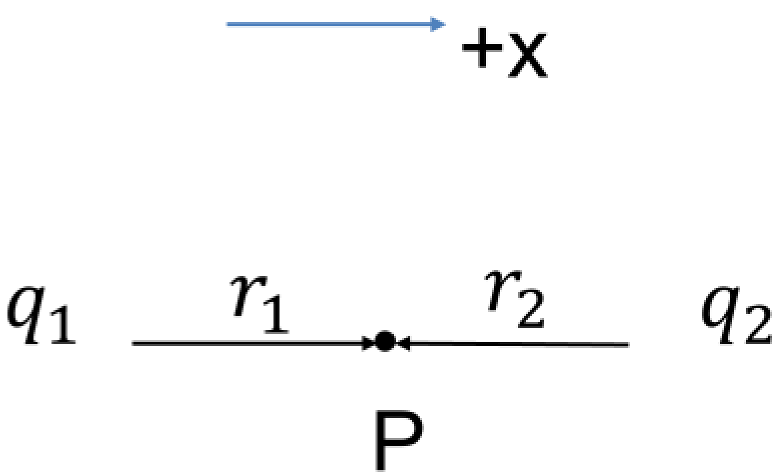
$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **i.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{i}$$

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (4.0280x10^0) nC, r1 = (3.626x10^-1) metres, q2 = (4.07x10^0) nC and r2 = (7.6330x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

2.13x10^2 ✓

Hide Feedback

Both charges produce electric fields moving away from the charge which produces them

For charge 1, this field is in the positive x-direction

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{\imath}$$

For charge 2, the field is away from the charge, along the negative x-direction.

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{\imath})$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{\imath} + \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{\imath})$$

$$\vec{E}_{net} = (\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2})\hat{\imath}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

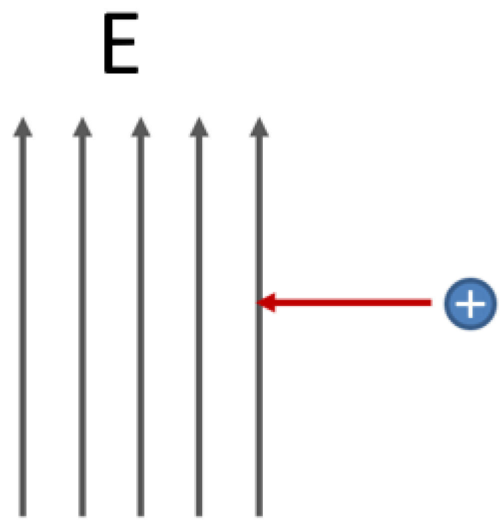
Done

Quiz Submissions - Quiz Week 2

Attempt 2

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. At the instant the particle enters the field, what direction is the electric field exerted in?



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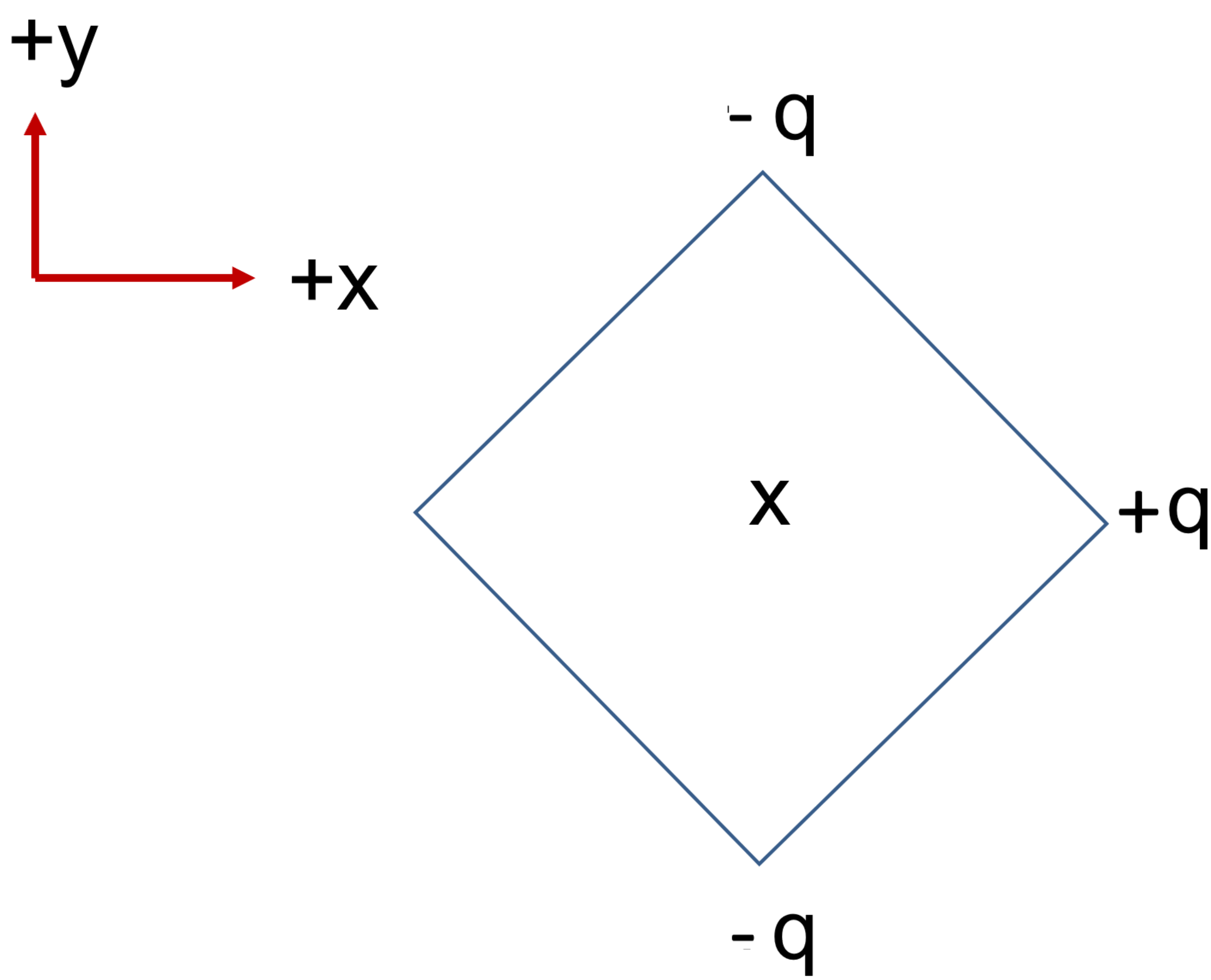
- Down ↓
- Left ←
- Right →

Hide Feedback

A positive charge in an electric field experiences a force in the same direction as the field

Question 2 **1 / 1 point**

In what direction is the net electric field at the centre of the square?



◯ Along positive x ⟶

✔ ◯ Along negative x ⟵

◯ Along positive y ↑

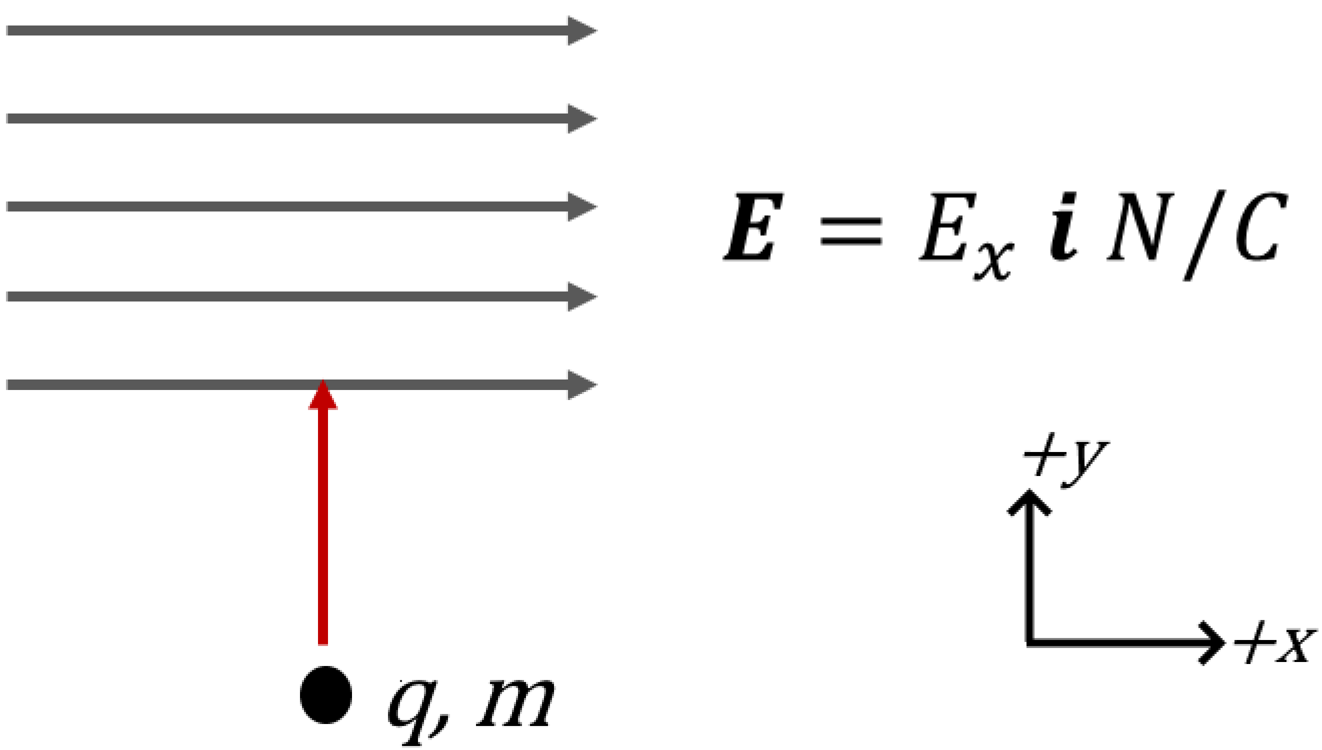
Along negative y ↓

Hide Feedback

The electric fields generated by the upper and lower charges are towards the negative charges. At the centre of the square, they are equal and opposite and cancel. The only field which contributes to the net electric field is that generated by the central charge. This is moving away from the positive charge, along the negative x-axis

Question 3 **1 / 1 point**

A charged particle with charge +(1.480x10^-17) C and mass (6.6554x10^-24) kg moves into a uniform electric field of (5.8660x10^3) **i** N/C, with an initial velocity of (8.59x10^4) **j** m/s. Calculate the acceleration of the particle when it is in the field. in m/s^2. You do not need to enter units or a unit vector in your answer.



Answer:

1.30x10^10 ✓

Hide Feedback

Calculate the force on a charge in an electric field using

$$\vec{F} = q\vec{E}$$

Then use Newton's Second Law to calculate the acceleration.

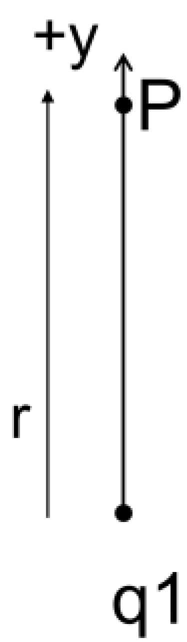
$$\vec{a} = \frac{\vec{F}}{m}$$

$$\vec{a} = \frac{q\vec{E}}{m}$$

Note that the acceleration must be in the direction of the electric field. The initial velocity is not relevant in this calculation (but will affect the trajectory of the particle in the electric field).

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (5.23x10^-1) metres from charge q1 = (-6.147x10^0) µC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

-2.02x10^5 ✓

▼ Hide Feedback

Calculate the charge from the equation

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

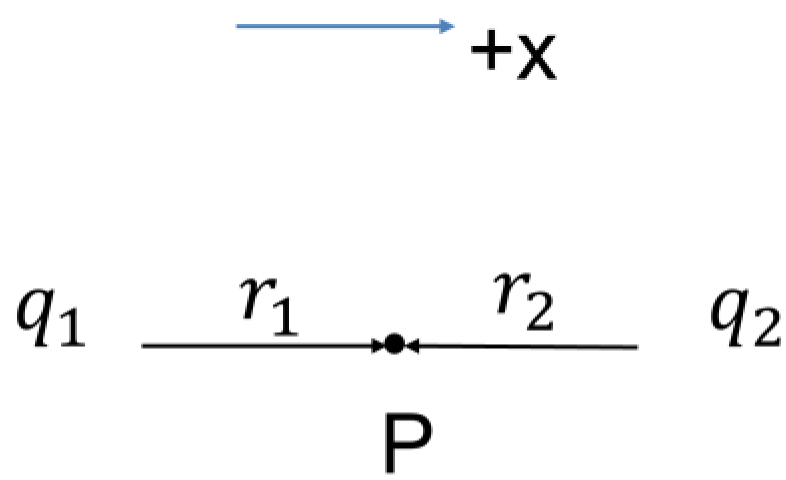
In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **j.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{j}$$

Since the charge is negative, this expression evaluates as negative, indicating that the electric field is directed along the negative y-axis, towards q1

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (2.64x10^0) nC, r1 = (6.318x10^-1) metres, q2 = (-6.2770x10^0) nC and r2 = (3.083x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

6.53x10^2 ✗ **(-5.34x10^2)**

Hide Feedback

Both charges produce electric fields directed along the x-axis.

For charge 1, the radial vector is in the positive x-direction (away from the charge), and the produced field will also be in this direction.

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i}$$

For charge 2, the radial vector is from the charge to the point, in the negative x-direction. The produced field is towards the charge, so it will be in the positive x-direction (note that

$$q_2$$

is negative, so the direction will switch).

$$\vec{E}_2 = -\frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

$$\vec{E}_{net} = \left(\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\right)\hat{i} = k\left(\frac{|q_1|}{r_1^2} + \frac{|q_2|}{r_2^2}\right)\hat{i}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

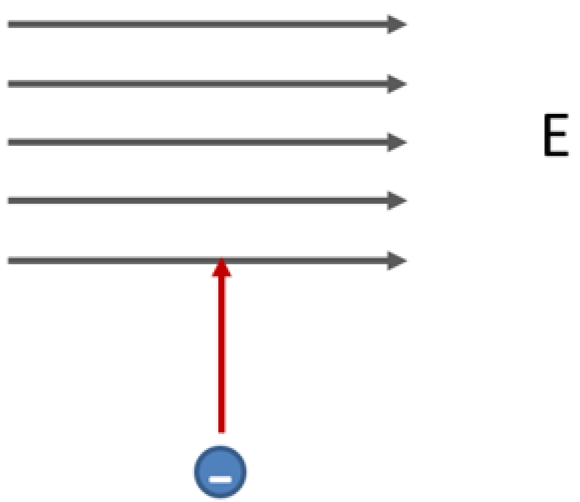
Done

Quiz Submissions - Quiz Week 2

Attempt 2

Question 1 **1 / 1 point**

An electron enters a uniform electric field perpendicularly to the field direction. At the instant it enters the field, in what is direction is the force on the particle?



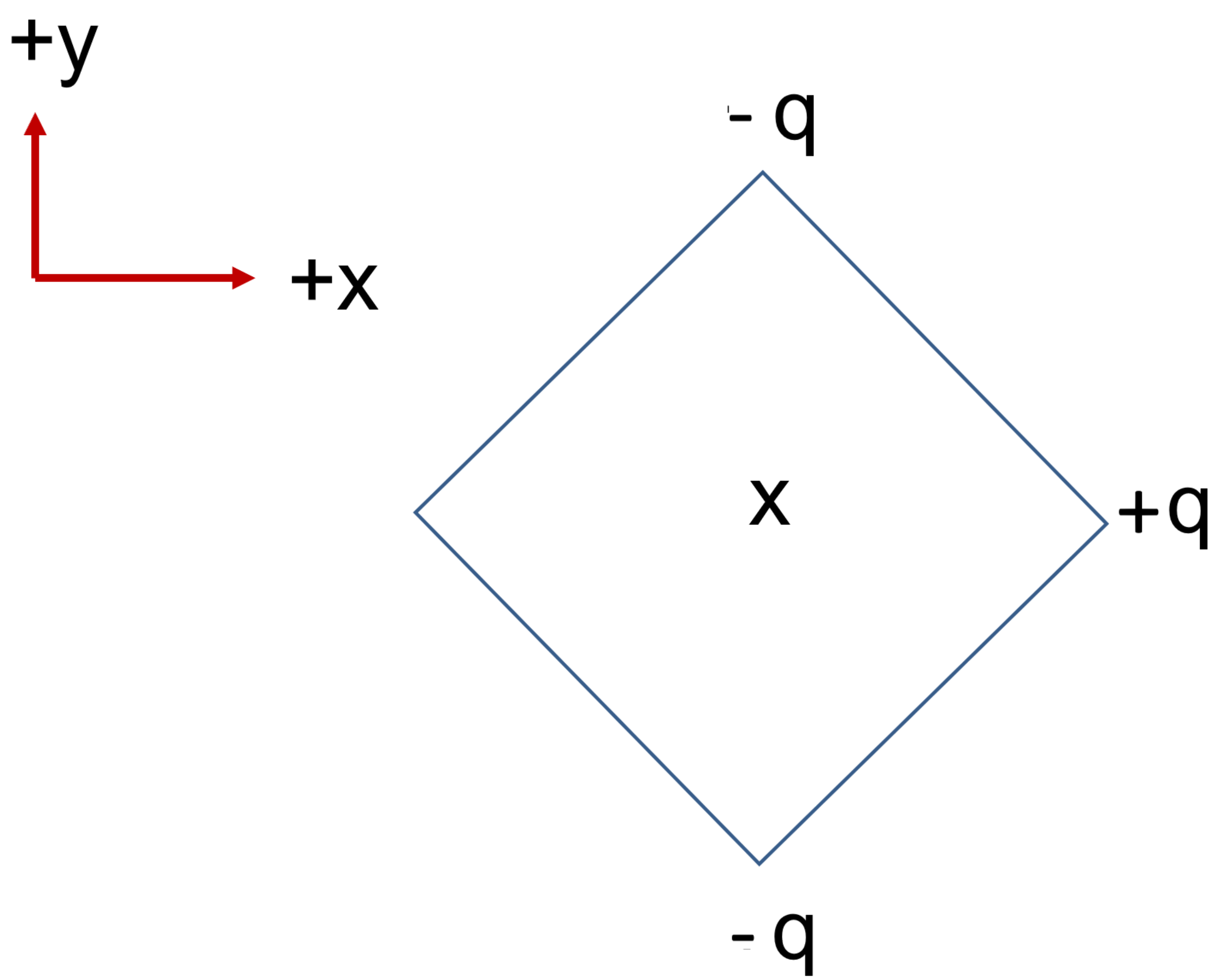
- Up ↑
- Down ↓
- ✔ Left ←
- Right →

▼ Hide Feedback

The force on a negatively charged particle is in the opposite direction to the electric field that it is in.

Question 2 **1 / 1 point**

In what direction is the net electric field at the centre of the square?



- ◯ Along positive x ⟶
- ✔ ◯ Along negative x ⟵
- ◯

Along positive y ↑

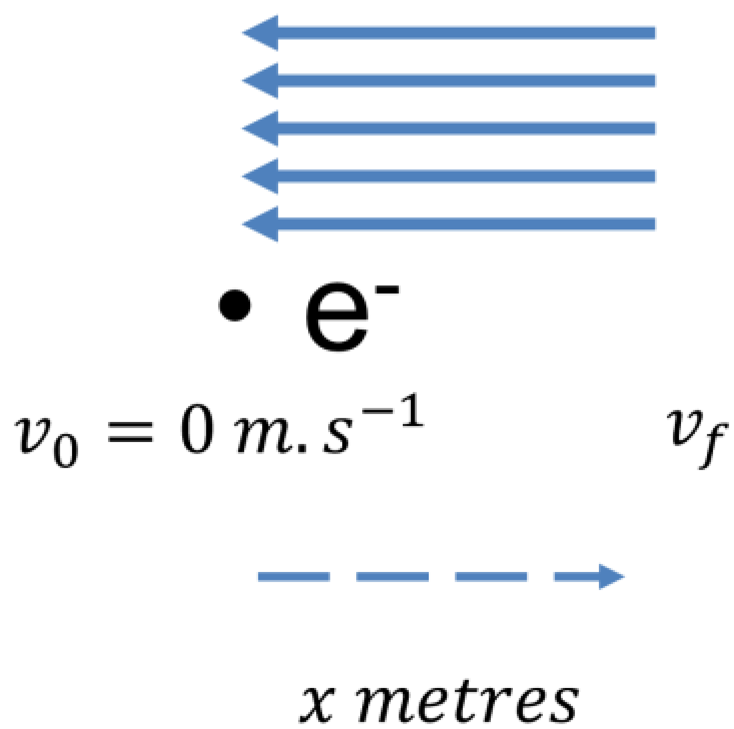
Along negative y ↓

Hide Feedback

The electric fields generated by the upper and lower charges are towards the negative charges. At the centre of the square, they are equal and opposite and cancel. The only field which contributes to the net electric field is that generated by the central charge. This is moving away from the positive charge, along the negative x-axis

Question 3 **1 / 1 point**

You are designing an electron accelerator to bring a stationary electron to a speed of (1.633x10^7) m/s in a uniform electric field. If the acceleration time is (5.54x10^0) µs, what must the magnitude of the electric field be in N/C?



Answer:

1.68x10^1 ✓

Hide Feedback

The force on the electron is given by

$$F = qE$$

So the acceleration of the electron, using Newton's Second Law is

$$a = \frac{F}{m} = \frac{qE}{m}$$

Now we can use the kinematic equation

$$v_f = v_0 + at$$

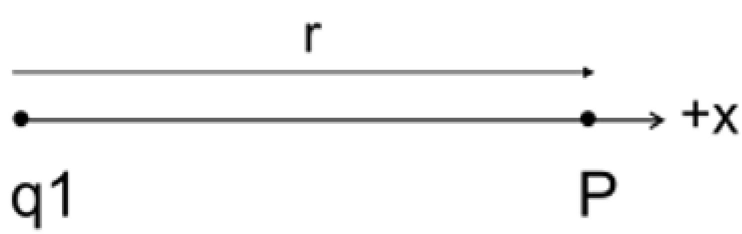
$$v_f = 0 + \frac{qEt}{m}$$

Solving for E

$$E = \frac{mv_f}{qt}$$

Question 4 **1 / 1 point**

Calculate the net electric field in N/C generated at point P, r = (3.5083x10^-1) metres from charge q1 = (-8.65x10^0) nC. You do not need to enter a unit vector in your answer, but if the answer is negative, you must include the negative sign.



Answer:

-6.32x10^2 ✓

Hide Feedback

Calculate the charge from the equation

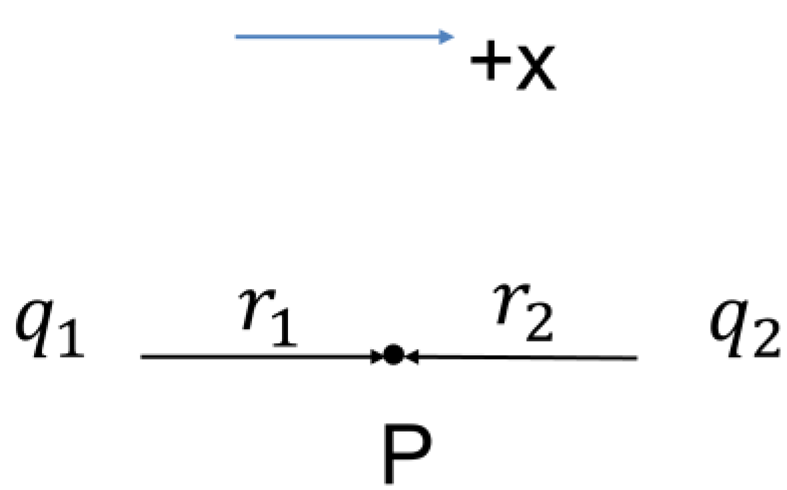
$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{r}$$

In this case the radial vector extends out from the charge along the positive axis, and so can be replaced with the unit vector **i.**

$$\vec{E} = \frac{q_1}{4\pi\epsilon_0 r^2}\hat{i}$$

Since the charge has a negative value, you should expect to get a negative answer, signifying that the electric field points towards charge q1 at point P.

Question 5 **1 / 1 point**



Find the net electric field in N/C at point P, where q1 = (-3.781x10^0) nC, r1 = (1.05x10^-1) metres, q2 = (6.626x10^0) nC and r2 = (1.414x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.

Answer:

-6.06x10^3 **(1.04x10^2)**

Hide Feedback

Both charges produce electric fields

For charge 1, this radial vector is in the positive x-axis, but the produced field will be in the negative x-direction (towards the charge).
The field direction will be the radial vector times a negative charge (direction vector will 'flip')

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}(\hat{i})$$

For charge 2, the field is away from the positive charge, in the negative direction (same direction as the radial vector)

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} + \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{i})$$

$$\vec{E}_{net} = (\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2})\hat{i} = -k(\frac{|q_1|}{r_1^2} + \frac{|q_2|}{r_2^2})\hat{i}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

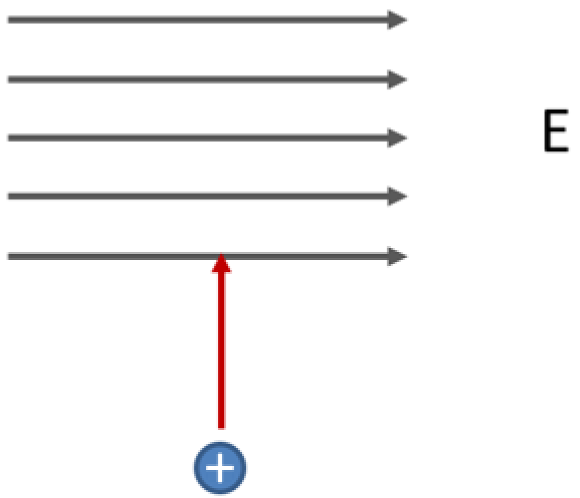
Done

Quiz Submissions - Quiz Week 2

Attempt 2

Question 1 **1 / 1 point**

A proton enters a uniform electric field perpendicularly to the field direction. When it enters the field, what direction is the electric force on it?



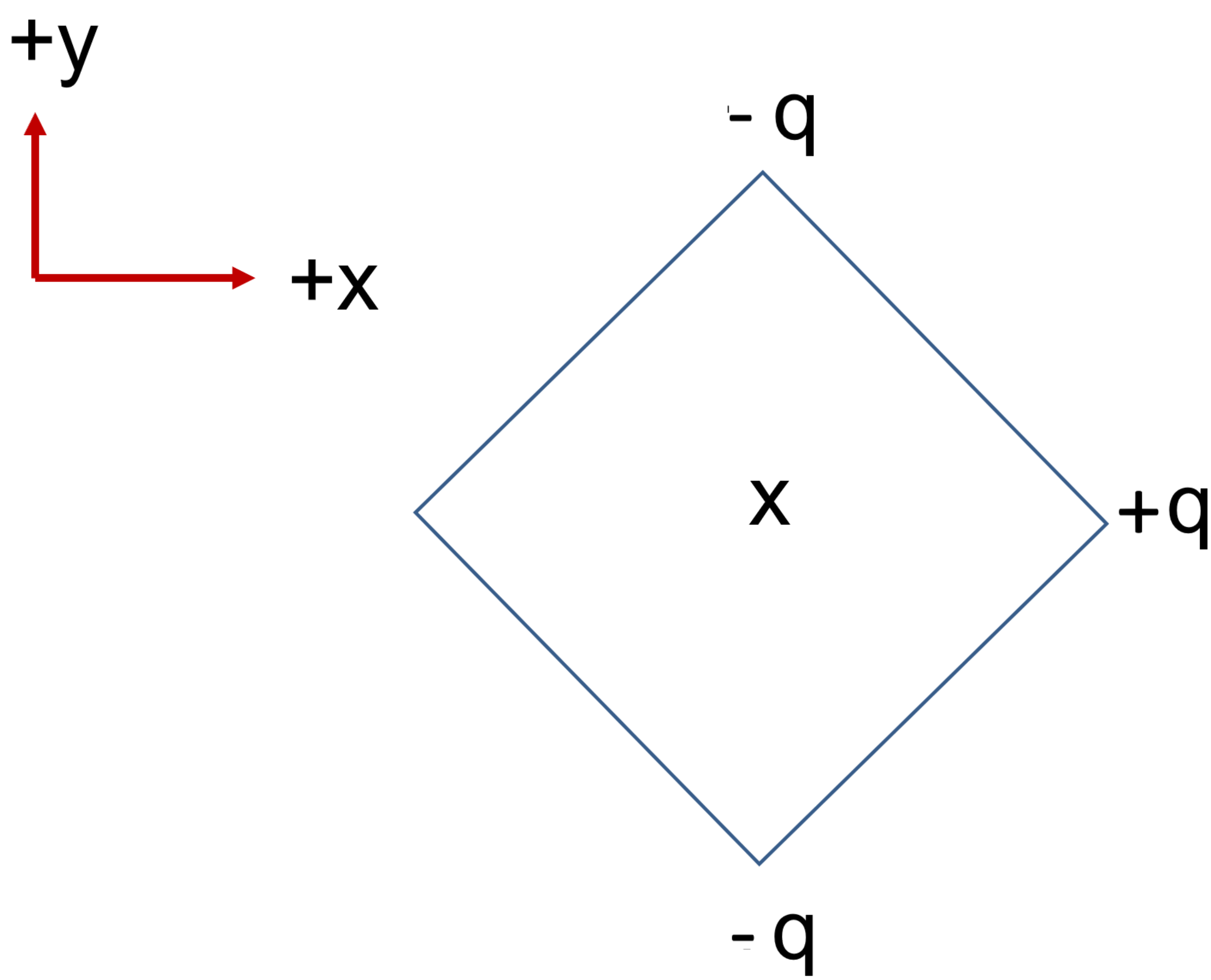
- ◯ Up ↑
- ◯ Down ↓
- ◯ Left ←
- ✔ ◯ Right →

▼ Hide Feedback

A positive particle experiences a force in the same direction as the electric field which it is in.

Question 2 **0 / 1 point**

In what direction is the net electric field at the centre of the square?



- Along positive x ⟶
- Along negative x ⟵
- Along positive y ↑

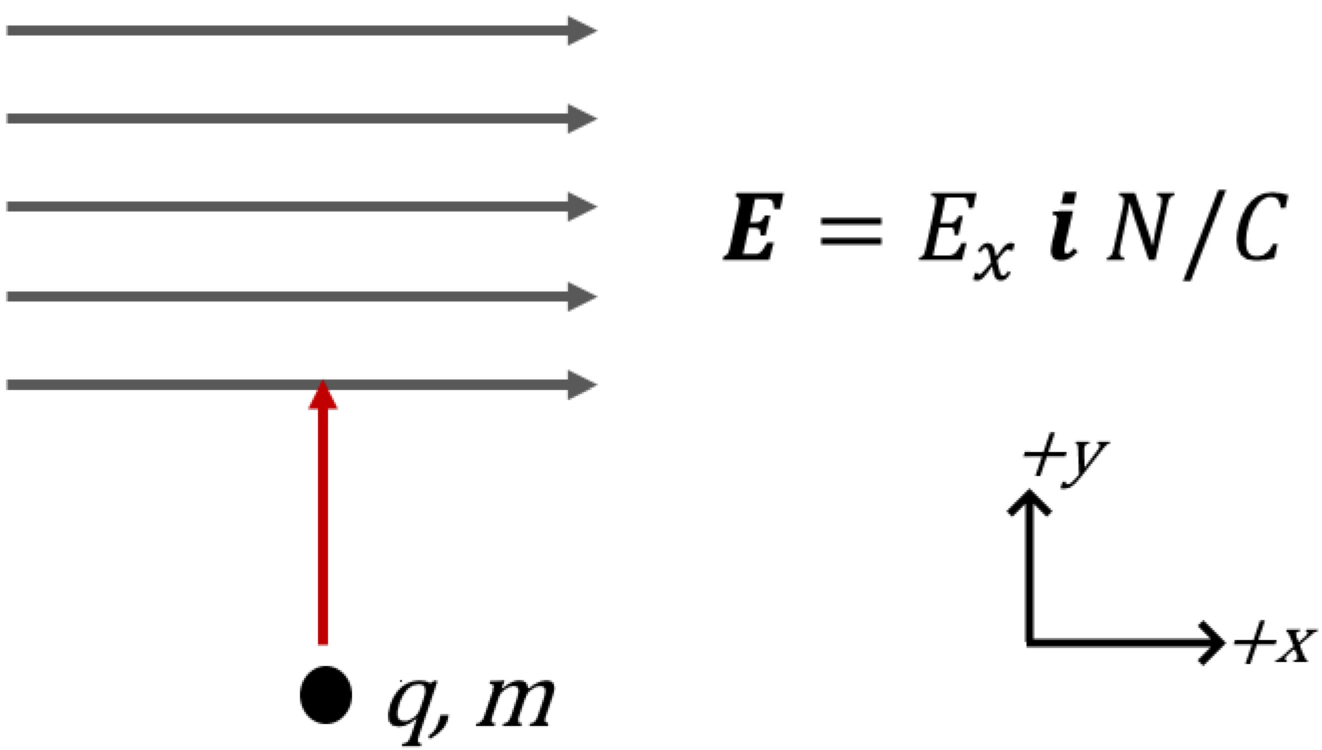
Along negative y ↓

Hide Feedback

The electric fields generated by the upper and lower charges are towards the negative charges. At the centre of the square, they are equal and opposite and cancel. The only field which contributes to the net electric field is that generated by the central charge. This is moving away from the positive charge, along the negative x-axis

Question 3 **0 / 1 point**

A charged particle with charge +(1.61x10^-19) C and mass (3.891x10^-24) kg moves into a uniform electric field of (5.608x10^3) **i** N/C, with an initial velocity of (8.132x10^4) **j** m/s. Calculate the acceleration of the particle when it is in the field. in m/s^2. You do not need to enter units or a unit vector in your answer.



Answer:

1.43x10^27 **(2.32x10^8)**

Hide Feedback

Calculate the force on a charge in an electric field using

$$\vec{F} = q\vec{E}$$

Then use Newton's Second Law to calculate the acceleration.

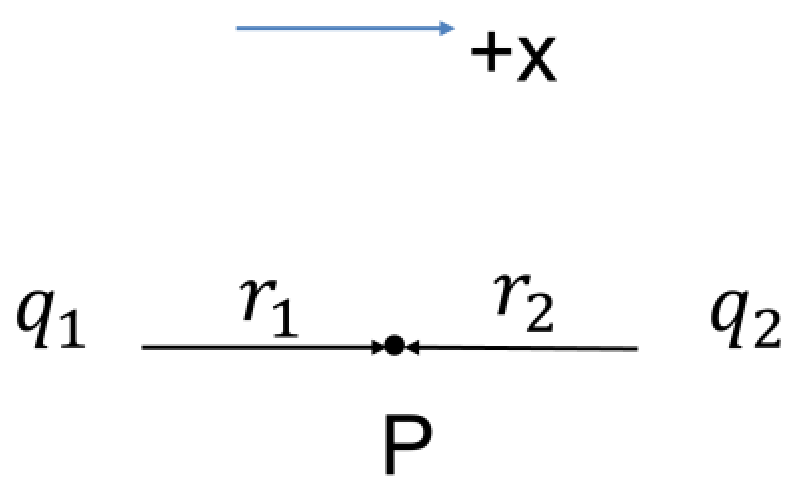
$$\vec{a} = \frac{\vec{F}}{m}$$

$$\vec{a} = \frac{q\vec{E}}{m}$$

Note that the acceleration must be in the direction of the electric field. The initial velocity is not relevant in this calculation (but will affect the trajectory of the particle in the electric field).

Question 4 **1 / 1 point**

Point P lies between two point charges, q_1 = (8.5510x10^0) µC and q_2 = (5.8480x10^0) µC respectively. Point P is at a distance R_1 = (6.22x10^0) cm from charge 1, and R_2 = (8.2040x10^0) cm from charge 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

1.21x10^7 ✓

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The electric field produced by a point charge, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{q}{4\pi\epsilon_0 r^2}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

In the case of point P, the radial unit vector points away from charge 1, along the positive x axis

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{x}$$

For charge 2, the radial unit vector pointing to point P, is along the negative x axis

$$\vec{E}_2 = \frac{q_2}{4\pi\epsilon_0 r_2^2}(-\hat{x})$$

So

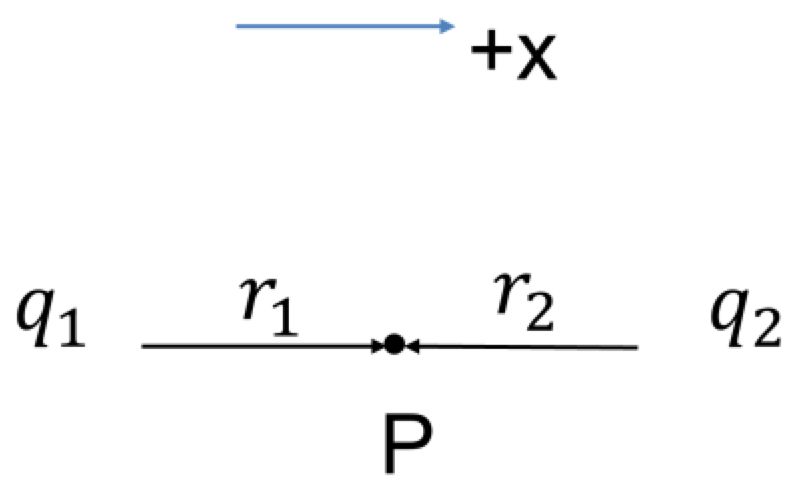
$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{x} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{x}$$

$$\vec{E}_{net} = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{r_1^2} - \frac{q_2}{r_2^2}\right)\hat{x}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Question 5 **1 / 1 point**

Find the net electric field in N/C at point P, where q1 = (3.943x10^0) nC, r1 = (1.792x10^-1) metres, q2 = (-6.07x10^0) nC and r2 = (6.9760x10^-1) metres. You do not need to include a unit vector in your answer, but must include a minus sign if the field direction is in the negative x direction.



Answer:

1.22x10^3 ✗ **(9.92x10^2)**

Hide Feedback

Both charges produce electric fields directed along the x-axis.

For charge 1, the radial vector is in the positive x-direction (away from the charge), and the produced field will also be in this direction.

$$\vec{E}_1 = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i}$$

For charge 2, the radial vector is from the charge to the point, in the negative x-direction. The produced field is towards the charge, so it will be in the positive x-direction (note that

$$q_2$$

is negative, so the direction will switch).

$$\vec{E}_2 = -\frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

Thus the net electric field is

$$\vec{E}_{net} = \frac{q_1}{4\pi\epsilon_0 r_1^2}\hat{i} - \frac{q_2}{4\pi\epsilon_0 r_2^2}\hat{i}$$

$$\vec{E}_{net} = (\frac{q_1}{4\pi\epsilon_0 r_1^2} - \frac{q_2}{4\pi\epsilon_0 r_2^2})\hat{i} = k(\frac{|q_1|}{r_1^2} + \frac{|q_2|}{r_2^2})\hat{i}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):3 / 5 - 60 %

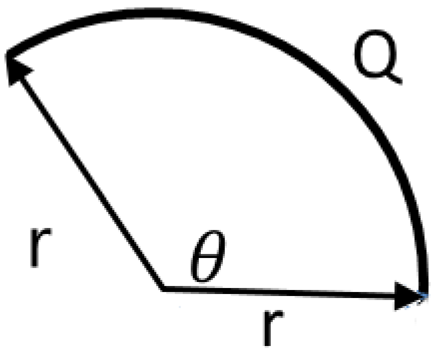
Done

Quiz Submissions - Quiz: Week 3

Attempt 2

Question 1 **0 / 1 point**

Calculate the linear charge density in C/m for an arc of charge with radius (1.27x10^1) cm, angle (2.2997x10^0) radians and total charge (8.3600x10^0) µC.



Answer:

2.10x10^-5 **(2.86x10^-5)**

Hide Feedback

The linear charge density is defined as

$$\lambda = \frac{Q}{L}$$

The arc length L is given by

$$L = R\theta$$

So

$$\lambda = \frac{Q}{R\theta}$$

Question 2 **0 / 1 point**

A rectangular plate of dimensions (5.02x10^1) cm by (4.2450x10^1) cm has a uniform surface charge density of (-1.901x10^0) µC/m^2. Calculate the total charge on the plate in Coulombs.

Answer:

-8.92x10^6 ✗ **(-4.05x10^-7)**

Hide Feedback

From the definition of surface charge density

$$\sigma = \frac{Q}{A}$$

So the total charge is

$$Q = \sigma A$$

As we have a rectangle

$$A = LB$$

$$Q = \sigma LB$$

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of +(8.11x10^0) µC/m, at a distance (5.0891x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

2.87x10^5 ✓

Hide Feedback

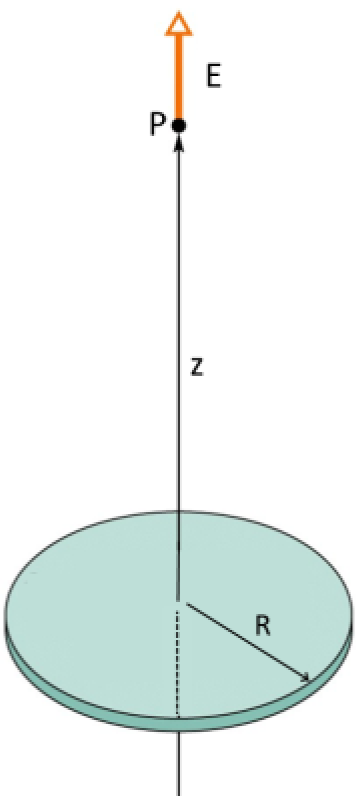
The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (4.99x10^1) cm along the central axis of a disk of charge with radius (1.730x10^0) cm, and charge density +(2.955x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing along the negative z-axis.



Answer:

1.00x10^2 ✓

▼ Hide Feedback

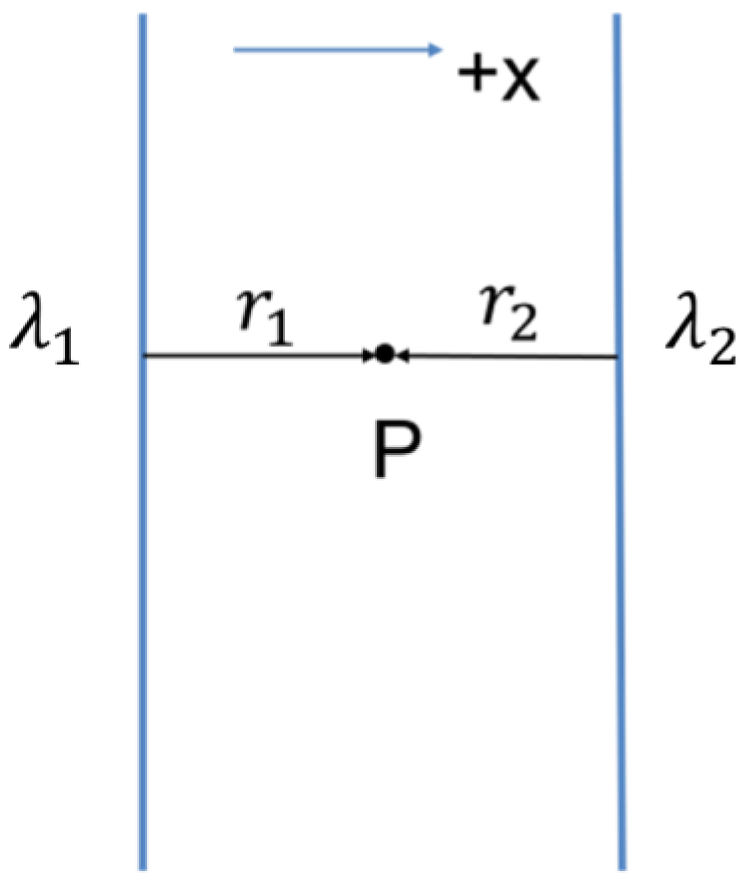
For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **0 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (1.448x10^0) μC/m and λ_2 = (1.23x10^0) μC/m respectively. Point P is at a distance R_1 = (8.6190x10^0) cm from line 1, and R_2 = (2.796x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

4.89x10^5 ✗ **(-4.89x10^5)**

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

In the case of the positively charge line 1, the electric field must point away from the line, along the positive axis

$$\vec{E}_1 = \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath}$$

For line 2, the field must point away from the positive charge, so in the negative x direction

$$\vec{E}_2 = -\frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

So

$$\vec{E}_{net} = \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath} - \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

$$\vec{E}_{net} = \frac{1}{2\pi\epsilon_0}\left(\frac{|\lambda_1|}{r_1} - \frac{|\lambda_2|}{r_2}\right)\hat{\imath}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 3

Attempt 1

Question 1 **1 / 1 point**

Calculate the surface charge density σ in C/m^2 for a circle of radius (1.93x10^1) mm with total charge (4.3080x10^0) nC.

Answer:

3.68x10^-6 ✓

Hide Feedback

The surface charge density is defined as

$$\sigma = \frac{Q}{A}$$

and the area of a circle of radius R is given by

$$A = \pi r^2$$

So

$$\sigma = \frac{Q}{\pi r^2}$$

Don't forget to change the units to SI before calculating.

Question 2 **1 / 1 point**

A rectangular plate of dimensions (5.2105x10^1) cm by (8.136x10^1) cm has a uniform surface charge density of (-4.78x10^0) $\mu C/m^2$. Calculate the total charge on the plate in Coulombs.

Answer:

-2.03x10^-6 ✓

▼ Hide Feedback

From the definition of surface charge density

$$\sigma = \frac{Q}{A}$$

So the total charge is

$$Q = \sigma A$$

As we have a rectangle

$$A = LB$$

$$Q = \sigma LB$$

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of +(7.85x10^0) µC/m, at a distance (3.5717x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

3.95x10^5 ✓

▼ Hide Feedback

The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (6.1561x10^1) cm above an infinite plane of charge with charge density (-5.28x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing towards the plane

Answer:

-2.98x10^5 ✔

▼ Hide Feedback

For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

A charge plane is simply a disk with infinite radius, so the above expression becomes

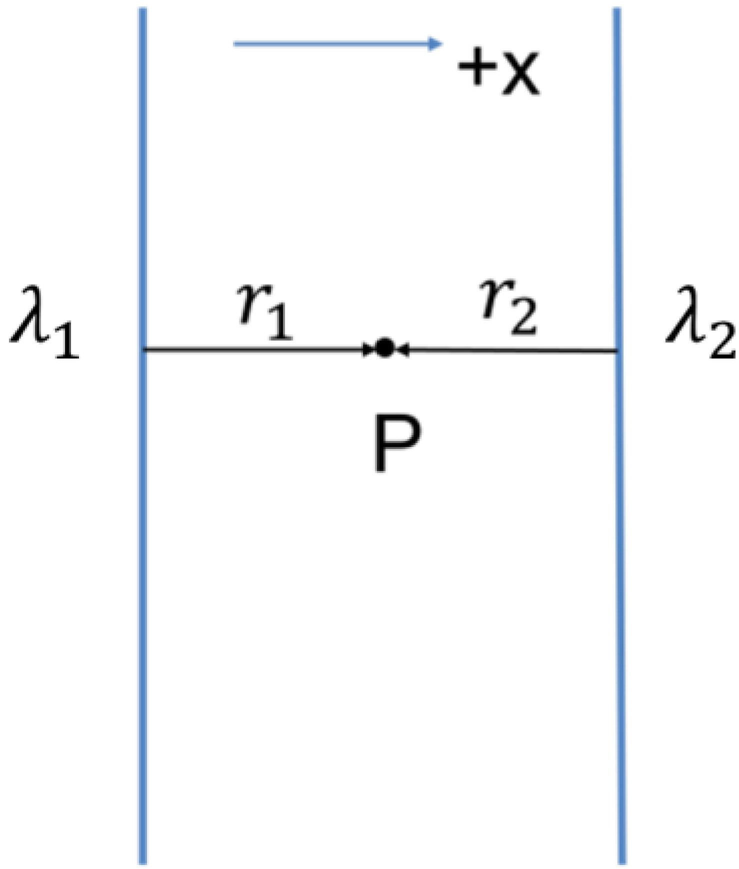
$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}\hat{k}$$

Note that the electric field is constant, and does not depend on the distance from the plane

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **0 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (-7.711x10^0) μC/m and λ_2 = (5.42x10^0) μC/m respectively. Point P is at a distance R_1 = (4.901x10^0) cm from line 1, and R_2 = (6.4460x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

-1.32x10^6 ✗ **(-4.34x10^6)**

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{|\lambda|}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

For line 1, which is negatively charged, the electric field must point towards the line, along the negative x-direction

$$\vec{E}_1 = -\frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

For line 2, which is positively charged, the electric field must point away from the line, so this is also along the negative x axis

$$\vec{E}_2 = -\frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i}$$

So

Double subscripts: use braces to clarify

$$\vec{E}_{net} = -\frac{1}{2\pi\epsilon_0}(\frac{|\lambda_1|}{r_1} + \frac{|\lambda_2|}{r_2})\hat{i}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 3

Attempt 1

Question 1 **0 / 1 point**

Calculate the surface charge density σ in C/m^2 for a circle of radius (2.08x10^1) mm with total charge (2.550x10^0) nC.

Answer:

3.47x10^-12 ✗ **(1.88x10^-6)**

▼ Hide Feedback

The surface charge density is defined as

$$\sigma = \frac{Q}{A}$$

and the area of a circle of radius R is given by

$$A = \pi r^2$$

So

$$\sigma = \frac{Q}{\pi r^2}$$

Don't forget to change the units to SI before calculating.

Question 2 **1 / 1 point**

A rectangular plate of dimensions (8.925x10^1) cm by (3.5542x10^1) cm has a uniform surface charge density of (-3.45x10^0) $\mu C/m^2$. Calculate the total charge on the plate in Coulombs.

Answer:

-1.09x10^-6 ✓

▼ Hide Feedback

From the definition of surface charge density

$$\sigma = \frac{Q}{A}$$

So the total charge is

$$Q = \sigma A$$

As we have a rectangle

$$A = LB$$

$$Q = \sigma LB$$

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of +(5.5470x10^0) µC/m, at a distance (6.54x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

1.53x10^5 ✓

▼ Hide Feedback

The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (3.72x10^1) cm above an infinite plane of charge with charge density (-7.186x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing towards the plane

Answer:

-4.06x10^5 ✓

▼ Hide Feedback

For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

A charge plane is simply a disk with infinite radius, so the above expression becomes

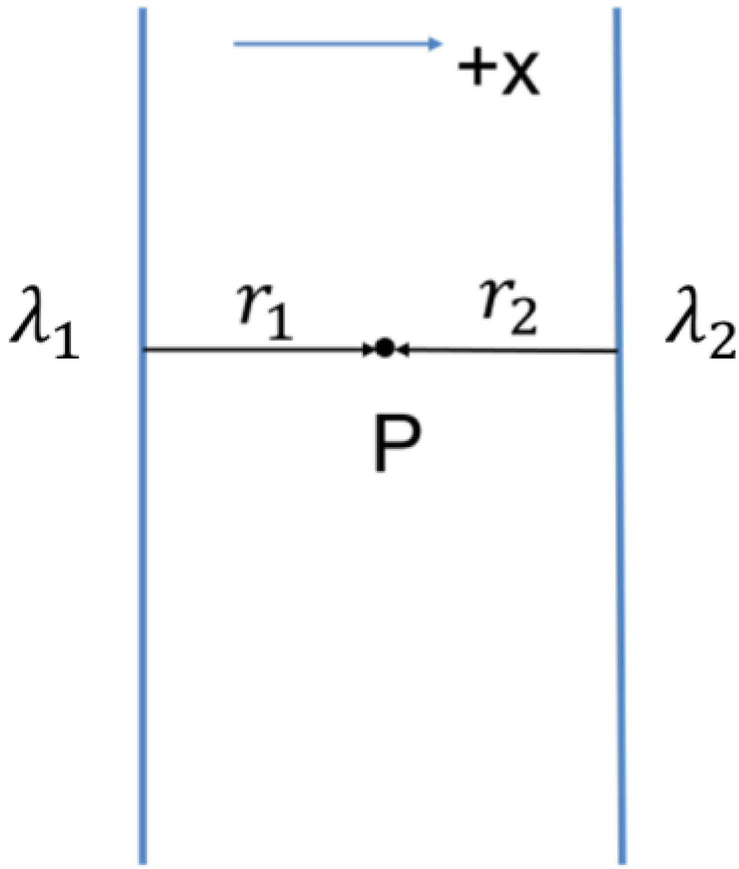
$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}\hat{k}$$

Note that the electric field is constant, and does not depend on the distance from the plane

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **1 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (6.086x10^0) μC/m and λ_2 = (3.1830x10^0) μC/m respectively. Point P is at a distance R_1 = (1.41x10^0) cm from line 1, and R_2 = (4.024x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

6.34x10^6 ✓

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

In the case of the positively charge line 1, the electric field must point away from the line, along the positive axis

$$\vec{E}_1 = \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath}$$

For line 2, the field must point away from the positive charge, so in the negative x direction

$$\vec{E}_2 = -\frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

So

$$\vec{E}_{net} = \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath} - \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

$$\vec{E}_{net} = \frac{1}{2\pi\epsilon_0}(\frac{|\lambda_1|}{r_1} - \frac{|\lambda_2|}{r_2})\hat{\imath}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 3

Attempt 1

Question 1 **0 / 1 point**

Calculate the charge density in C/m for a straight line of charge which has length (5.40x10^2) cm and charge (6.436x10^0) nC.

Answer:

1.19x10^1 ✗ **(1.19x10^-9)**

Hide Feedback

The linear charge density is defined by

$$\lambda = \frac{q}{L}$$

Don't forget to convert the charge to C and the length to metres.

Question 2 **1 / 1 point**

A sphere of radius (4.74x10^1) cm encloses a region of space with a uniform volume charge density ρ = (8.913x10^0) μC/m^3. Calculate the total charge in Coulombs enclosed by the sphere.

Answer:

3.98x10^-6 ✓

Hide Feedback

From the definition of volume charge density

$$\rho = \frac{Q}{V}$$

$$Q = \rho V$$

And as the volume is a sphere of radius R

$$Q = \rho \times \frac{4}{3}\pi R^3$$

Don't forget to convert units to SI before calculating.

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of +(6.925x10^0) µC/m, at a distance (6.82x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

1.83x10^5 ✓

▼ Hide Feedback

The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (1.42x10^1) cm above an infinite plane of charge with charge density (-5.314x10^0) µC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing towards the plane

Answer:

-3.00x10^5 ✓

▼ Hide Feedback

For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

A charge plane is simply a disk with infinite radius, so the above expression becomes

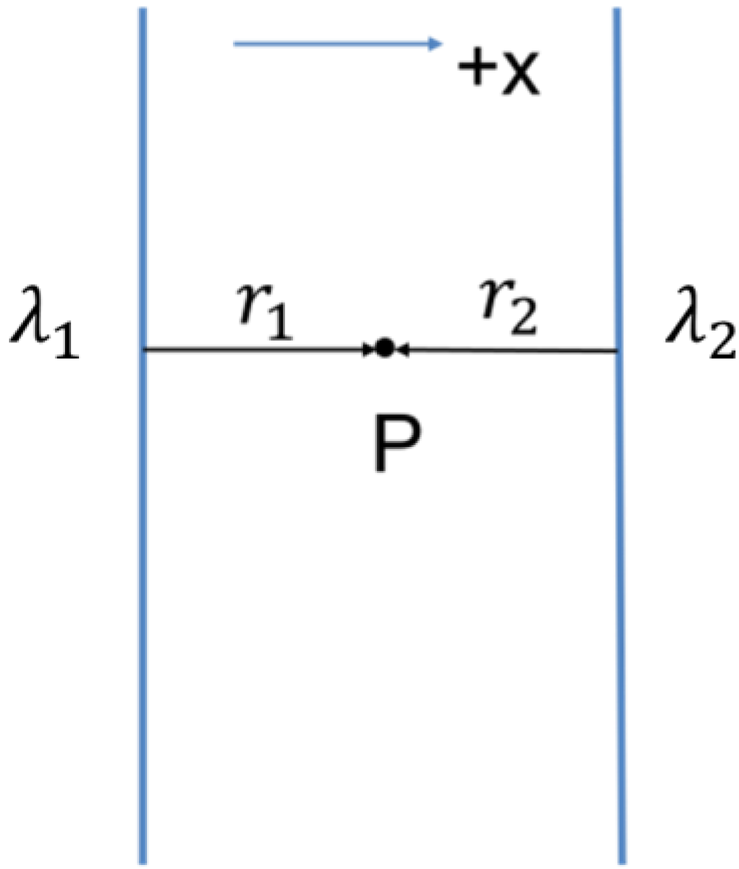
$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}\hat{k}$$

Note that the electric field is constant, and does not depend on the distance from the plane

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **1 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (-5.7140x10^0) μC/m and λ_2 = (3.106x10^0) μC/m respectively. Point P is at a distance R_1 = (7.67x10^0) cm from line 1, and R_2 = (7.892x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

-2.06x10^6 ✔

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{|\lambda|}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

For line 1, which is negatively charged, the electric field must point towards the line, along the negative x-direction

$$\vec{E}_1 = -\frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

For line 2, which is positively charged, the electric field must point away from the line, so this is also along the negative x axis

$$\vec{E}_2 = -\frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i}$$

So

Double subscripts: use braces to clarify

$$\vec{E}_{net} = -\frac{1}{2\pi\epsilon_0}(\frac{|\lambda_1|}{r_1} + \frac{|\lambda_2|}{r_2})\hat{i}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 3

✕

Attempt 1

Question 1 **1 / 1 point**

Calculate the charge density of a rectangular plate with dimensions (4.040x10^1) cm by (2.86x10^1) cm and total charge (-6.302x10^0) mC

Answer:

-5.45x10^-2 ✓

▼ Hide Feedback

The surface charge density is defined as

$$\sigma = \frac{Q}{A}$$

and the area of the rectangular plate is

$$A = LB$$

So

$$\sigma = \frac{Q}{LB}$$

Don't forget to convert to SI units.

Question 2 **1 / 1 point**

A rectangular plate of dimensions (5.531x10^1) cm by (6.11x10^0) cm has a uniform surface charge density of (-1.0230x10^0) μC/m^2. Calculate the total charge on the plate in Coulombs.

Answer:

-3.46x10^-8 ✓

Hide Feedback

From the definition of surface charge density

$$\sigma = \frac{Q}{A}$$

So the total charge is

$$Q = \sigma A$$

As we have a rectangle

$$A = LB$$

$$Q = \sigma LB$$

Question 3 **0 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of (-1.7830x10^0) µC/m, at a distance (7.76x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

-2.07x10^4 ✗ **(-4.13x10^4)**

Hide Feedback

The radial field from an infinite line of charge is given by

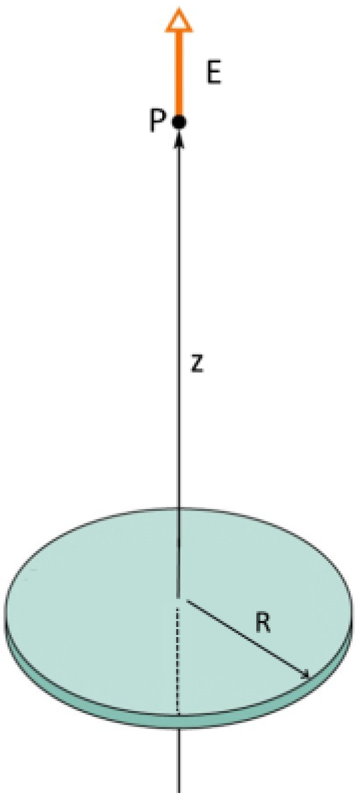
$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

If the line is negatively charged, then the answer will be negative, indicating that the direction of the field is $-\hat{r}$, which is radially inwards towards the wire.

Question 4 **0 / 1 point**

Calculate the electric field in N/C at point P, a distance (8.5242x10^1) cm along the central axis of a disk of charge with radius (4.495x10^0) cm, and charge density +(5.02x10^0) $\mu C/m^2$. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing along the negative z-axis.



Answer:

-3.81x10^5 ✗ **(3.94x10^2)**

▼ Hide Feedback

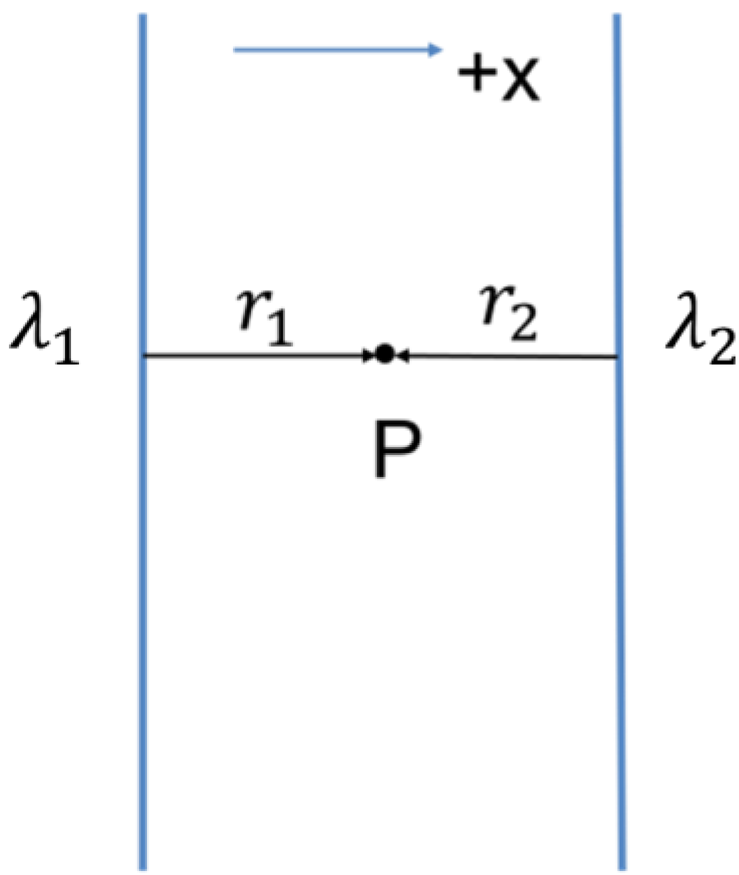
For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **0 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (-3.1830x10^0) µC/m and λ_2 = (-7.202x10^0) µC/m respectively. Point P is at a distance R_1 = (7.81x10^0) cm from line 1, and R_2 = (8.9060x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

-7.17x10^5 ✗ **(7.21x10^5)**

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

Line 1 is negatively charged, so the electric field must point towards the line, in the negative x-direction

$$\vec{E}_1 = -\frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath}$$

For line 2, the electric field must be towards the negative line, which is in the positive direction

$$\vec{E}_2 = \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

So

$$\vec{E}_{net} = \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath} - \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 3

Attempt 1

Question 1 **1 / 1 point**

Calculate the surface charge density σ in C/m^2 for a circle of radius (8.27x10^0) mm with total charge (6.129x10^0) nC.

Answer:

2.85x10^-5 ✓

Hide Feedback

The surface charge density is defined as

$$\sigma = \frac{Q}{A}$$

and the area of a circle of radius R is given by

$$A = \pi r^2$$

So

$$\sigma = \frac{Q}{\pi r^2}$$

Don't forget to change the units to SI before calculating.

Question 2 **1 / 1 point**

A cube of side (4.56x10^1) cm encloses a region of space with a uniform volume charge density ρ = (4.0700x10^0) $\mu C/m^3$. Calculate the total charge in Coulombs enclosed by the cube.

Answer:

3.86x10^-7 ✓

▼ Hide Feedback

From the definition of volume charge density

$$\rho = \frac{Q}{V}$$

$$Q = \rho V$$

And as the volume is a cube of side L

$$Q = \rho \times L^3$$

Don't forget to convert units to SI before calculating.

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of (-2.206x10^0) μC/m, at a distance (8.43x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

-4.71x10^4 ✓

▼ Hide Feedback

The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

If the line is negatively charged, then the answer will be negative, indicating that the direction of the field is $-\hat{r}$, which is radially inwards towards the wire.

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (1.9879x10^1) cm above an infinite plane of charge with charge density (-6.21x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing towards the plane

Answer:

-3.51x10^5 ✓

Hide Feedback

For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

A charge plane is simply a disk with infinite radius, so the above expression becomes

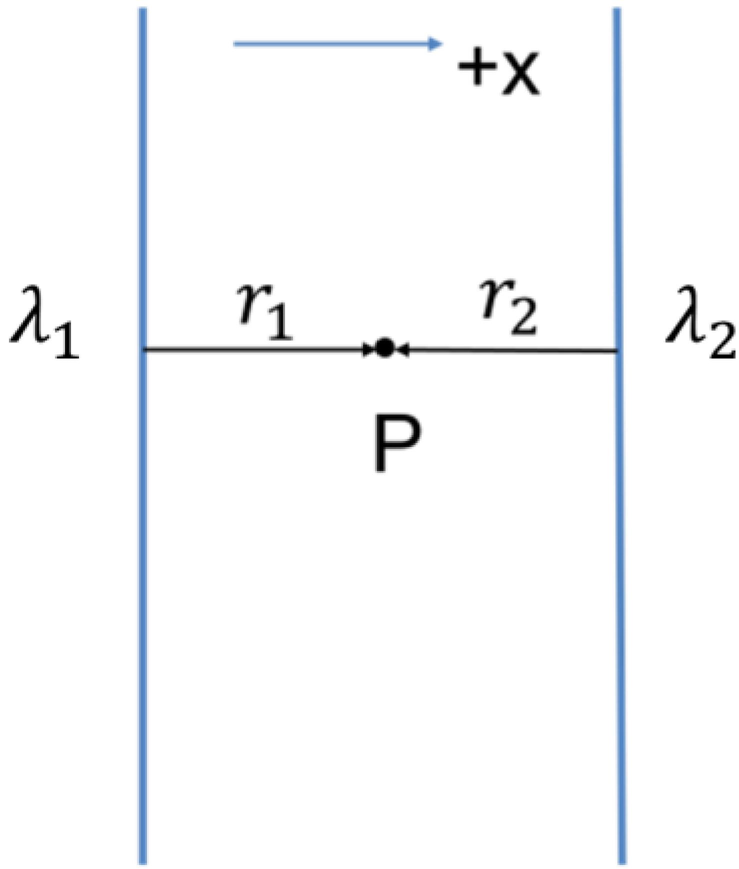
$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}\hat{k}$$

Note that the electric field is constant, and does not depend on the distance from the plane

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **0 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (2.192x10^0) μC/m and λ_2 = (6.4660x10^0) μC/m respectively. Point P is at a distance R_1 = (4.174x10^0) cm from line 1, and R_2 = (8.40x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

✗ **(-4.40x10^5)**

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

In the case of the positively charge line 1, the electric field must point away from the line, along the positive axis

$$\vec{E}_1 = \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath}$$

For line 2, the field must point away from the positive charge, so in the negative x direction

$$\vec{E}_2 = -\frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

So

$$\vec{E}_{net} = \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{\imath} - \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{\imath}$$

$$\vec{E}_{net} = \frac{1}{2\pi\epsilon_0}(\frac{|\lambda_1|}{r_1} - \frac{|\lambda_2|}{r_2})\hat{\imath}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 3

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Attempt 1

Question 1 **0 / 1 point**

Calculate the surface charge density σ in C/m^2 for a circle of radius (2.3093x10^1) mm with total charge (7.43x10^0) nC.

Answer:

3.22x10^-7 ✗ **(4.43x10^-6)**

Hide Feedback

The surface charge density is defined as

$$\sigma = \frac{Q}{A}$$

and the area of a circle of radius R is given by

$$A = \pi r^2$$

So

$$\sigma = \frac{Q}{\pi r^2}$$

Don't forget to change the units to SI before calculating.

Question 2 **0 / 1 point**

A sphere of radius (4.73x10^1) cm encloses a region of space with a uniform volume charge density ρ = (8.8350x10^0) μC/m^3. Calculate the total charge in Coulombs enclosed by the sphere.

Answer:

8.28x10^-6 ✗ **(3.92x10^-6)**

▼ Hide Feedback

From the definition of volume charge density

$$\rho = \frac{Q}{V}$$

$$Q = \rho V$$

And as the volume is a sphere of radius R

$$Q = \rho \times \frac{4}{3}\pi R^3$$

Don't forget to convert units to SI before calculating.

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of (-2.38x10^0) µC/m, at a distance (7.1863x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

-5.96x10^4 ✓

▼ Hide Feedback

The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

If the line is negatively charged, then the answer will be negative, indicating that the direction of the field is $-\hat{r}$, which is radially inwards towards the wire.

Question 4 **0 / 1 point**

Calculate the electric field in N/C at point P, a distance (5.24x10^1) cm above an infinite plane of charge with charge density +(4.4270x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing along the negative z-axis.

Answer:

1.11x10^5 ✗ **(2.50x10^5)**

Hide Feedback

For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

A charge plane is simply a disk with infinite radius, so the above expression becomes

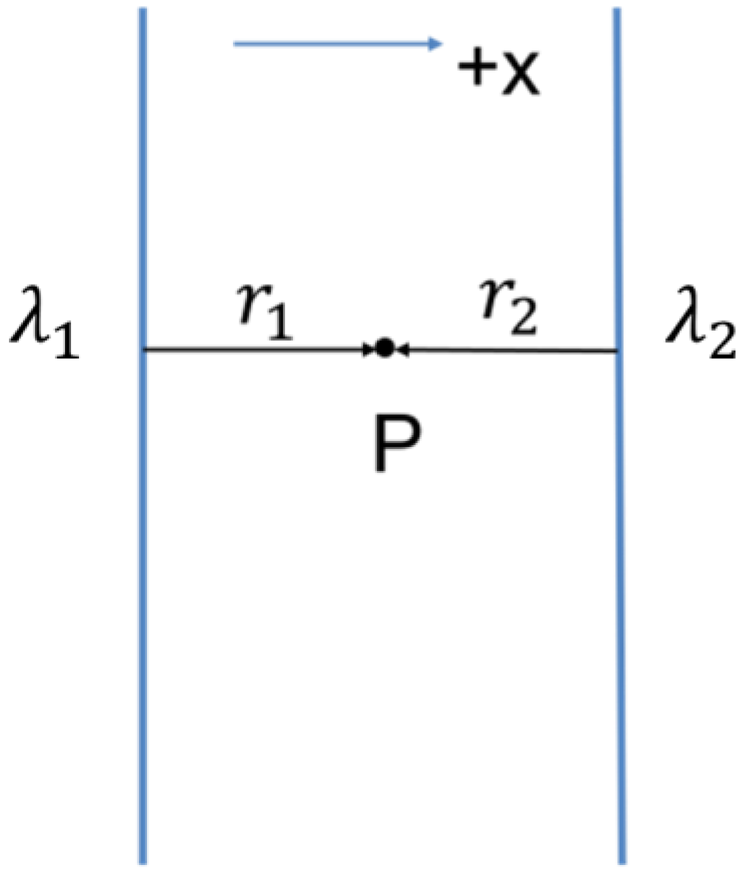
$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}$$

Note that the electric field is constant, and does not depend on the distance from the plane

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **0 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (-6.15x10^0) μC/m and λ_2 = (-6.557x10^0) μC/m respectively. Point P is at a distance R_1 = (7.368x10^0) cm from line 1, and R_2 = (7.3660x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

0.495x10^0 ✗ **(9.98x10^4)**

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

Line 1 is negatively charged, so the electric field must point towards the line, in the negative x-direction

$$\vec{E}_1 = -\frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

For line 2, the electric field must be towards the negative line, which is in the positive direction

$$\vec{E}_2 = \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i}$$

So

$$\vec{E}_{net} = \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i} - \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 3

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Attempt 2

Question 1 **1 / 1 point**

Calculate the charge density in C/m for a straight line of charge which has length (3.03x10^2) cm and charge (3.306x10^0) nC.

Answer:

1.09x10^-9 ✓

▼ Hide Feedback

The linear charge density is defined by

$$\lambda = \frac{q}{L}$$

Don't forget to convert the charge to C and the length to metres.

Question 2 **1 / 1 point**

A cube of side (7.680x10^1) cm encloses a region of space with a uniform volume charge density ρ = (8.87x10^0) μC/m^3. Calculate the total charge in Coulombs enclosed by the cube.

Answer:

4.02x10^-6 ✓

▼ Hide Feedback

From the definition of volume charge density

$$\rho = \frac{Q}{V}$$

$$Q = \rho V$$

And as the volume is a cube of side L

$$Q = \rho \times L^3$$

Don't forget to convert units to SI before calculating.

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of (-2.6640x10^0) µC/m, at a distance (2.95x10^1) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

-1.62x10^5 ✔

▼ Hide Feedback

The radial field from an infinite line of charge is given by

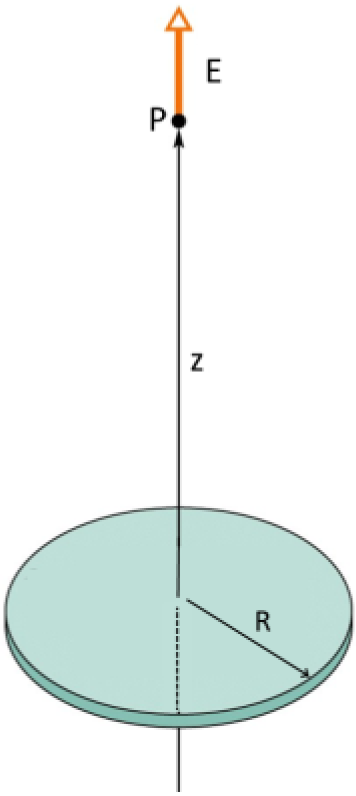
$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

If the line is negatively charged, then the answer will be negative, indicating that the direction of the field is $-\hat{r}$, which is radially inwards towards the wire.

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (6.046x10^1) cm along the central axis of a disk of charge with radius (4.22x10^0) cm, and charge density +(1.5470x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing along the negative z-axis.



Answer:

2.12x10^2 ✓

▼ Hide Feedback

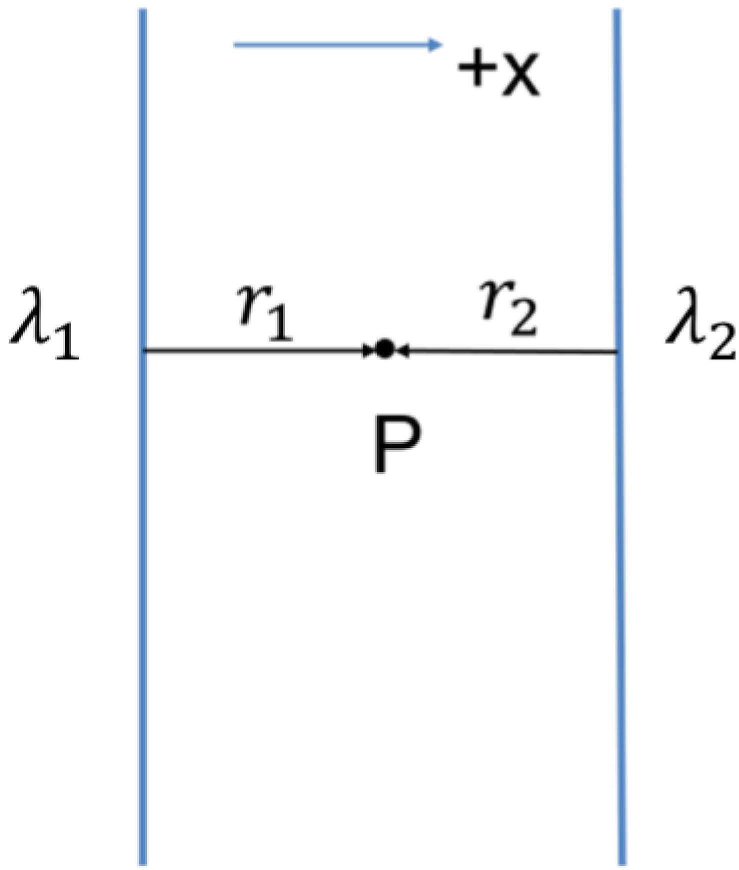
For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **1 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (-8.05x10^0) µC/m and λ_2 = (-3.7350x10^0) µC/m respectively. Point P is at a distance R_1 = (7.649x10^0) cm from line 1, and R_2 = (7.654x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

-1.02x10^6 ✓

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

Line 1 is negatively charged, so the electric field must point towards the line, in the negative x-direction

$$\vec{E}_1 = -\frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

For line 2, the electric field must be towards the negative line, which is in the positive direction

$$\vec{E}_2 = \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i}$$

So

$$\vec{E}_{net} = \frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i} - \frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 3

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Attempt 2

Question 1 **1 / 1 point**

Calculate the surface charge density σ in C/m^2 for a circle of radius (8.53x10^1) mm with total charge (1.429x10^0) nC.

Answer:

6.25x10^-8 ✓

▼ Hide Feedback

The surface charge density is defined as

$$\sigma = \frac{Q}{A}$$

and the area of a circle of radius R is given by

$$A = \pi r^2$$

So

$$\sigma = \frac{Q}{\pi r^2}$$

Don't forget to change the units to SI before calculating.

Question 2 **1 / 1 point**

A cube of side (4.47x10^1) cm encloses a region of space with a uniform volume charge density ρ = (4.549x10^0) μC/m^3. Calculate the total charge in Coulombs enclosed by the cube.

Answer:

4.06x10^-7 ✓

Hide Feedback

From the definition of volume charge density

$$\rho = \frac{Q}{V}$$

$$Q = \rho V$$

And as the volume is a cube of side L

$$Q = \rho \times L^3$$

Don't forget to convert units to SI before calculating.

Question 3 **1 / 1 point**

Calculate the electric field in N/C which extends radially from an infinitely long straight wire with a charge density of +(7.694x10^0) µC/m, at a distance (6.48x10^0) cm from the wire. You do not need to enter the radial unit vector in your answer, but you do need a negative sign, if the field is pointing towards the wire.

Answer:

2.14x10^6 ✓

Hide Feedback

The radial field from an infinite line of charge is given by

$$\vec{E}_z = \frac{\lambda}{2\pi\epsilon_0 z}\hat{r}$$

Don't forget to convert to SI units before calculating

Question 4 **1 / 1 point**

Calculate the electric field in N/C at point P, a distance (5.493x10^1) cm above an infinite plane of charge with charge density (-6.57x10^0) μC/m^2. You do not need to enter a unit vector in your answer, but must put a negative sign in, if the electric field is pointing towards the plane

Answer:

-3.71x10^5 ✔

▼ Hide Feedback

For a charged disk , radius R, and charge density σ, then the field at a point z above the disk is given by

$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})\hat{k}$$

A charge plane is simply a disk with infinite radius, so the above expression becomes

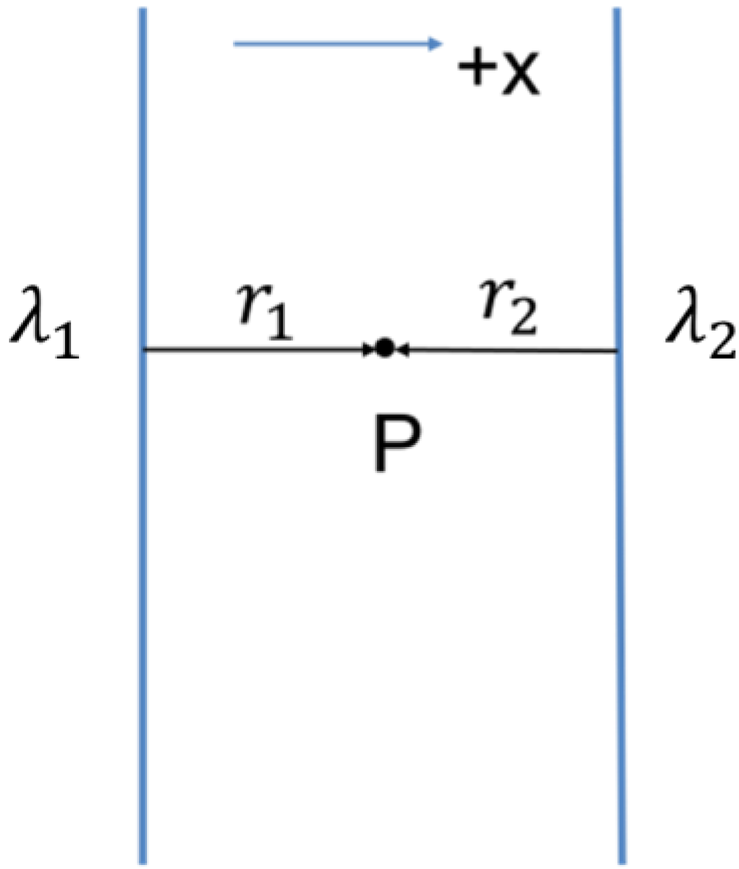
$$\vec{E}_z = \frac{\sigma}{2\epsilon_0}\hat{k}$$

Note that the electric field is constant, and does not depend on the distance from the plane

If the charge density is positive, the vector will be positive, and the field will point along the positive z axis, away from the disk. If the charge density is negative, the field points along the negative z-axis, towards the disk

Question 5 **0 / 1 point**

Point P lies between two parallel infinite lines of charge, which have charge densities λ_1 = (-5.4120x10^0) µC/m and λ_2 = (2.24x10^0) µC/m respectively. Point P is at a distance R_1 = (2.681x10^0) cm from line 1, and R_2 = (8.335x10^0) cm from line 2. Calculate the net electric field at Point P in N/C. You do not need to enter a unit vector in your answer, but a negative sign is needed if the electric field points along the negative x-axis.



Answer:

-3.15x10^6 ✗ **(-4.11x10^6)**

Hide Feedback

The electric field produced by a single infinitely long wire, is always radial to the wire. In this question, there are two electric fields which must be summed to find the electric field.

$$\vec{E} = \frac{|\lambda|}{2\pi\epsilon_0 r}\hat{r}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_2$$

For line 1, which is negatively charged, the electric field must point towards the line, along the negative x-direction

$$\vec{E}_1 = -\frac{|\lambda_1|}{2\pi\epsilon_0 r_1}\hat{i}$$

For line 2, which is positively charged, the electric field must point away from the line, so this is also along the negative x axis

$$\vec{E}_2 = -\frac{|\lambda_2|}{2\pi\epsilon_0 r_2}\hat{i}$$

So

Double subscripts: use braces to clarify

$$\vec{E}_{net} = -\frac{1}{2\pi\epsilon_0}\left(\frac{|\lambda_1|}{r_1} + \frac{|\lambda_2|}{r_2}\right)\hat{i}$$

A positive value will indicate the field is along the positive x-axis, a negative value, that the field is negative.

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 4

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Find the flux in N.m^2.C^{-1} of a constant electric field **E** = (-8.7160x10^3) **i** + (6.153x10^3) **j** + (3.935x10^3) **k** N/C, passing through an area defined by the area vector **A** = (-4.6730x10^0) **i** + (-3.60x10^0) **j** + (-3.030x10^-1) **k** m^2.

Answer:

6.66x10^3 ✗ **(1.74x10^4)**

▼ Hide Feedback

For a constant electric field, the flux is given by

$$\Phi = \vec{E}.\vec{A}$$

$$\Phi = E_x A_x + E_y A_y + E_z A_z$$

Question 2 **0 / 1 point**

What is the surface integral in m^2 a cube of side (7.02x10^1) cm?

Answer:

2.96x10^4 ✗ **(2.96x10^0)**

▼ Hide Feedback

$$\oint dA$$

Question 3 **0 / 1 point**

The net flux **into** a closed surface has a **magnitude** of Φ = (3.47x10^9) N.m^2/C. Calculate the charge enclosed in C.

Answer:

3.47x10^9 ✗ **(-3.07x10^-2)**

▼ Hide Feedback

The net flux is into the closed surface. By convention this means that the flux is negative, and the flux is terminating on negative charges. Hence the charge enclosed must be negative

By Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

Question 4 **1 / 1 point**

The flux through a closed surface is Φ = (-9.00x10^3) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

-7.97x10^-8 ✓

▼ Hide Feedback

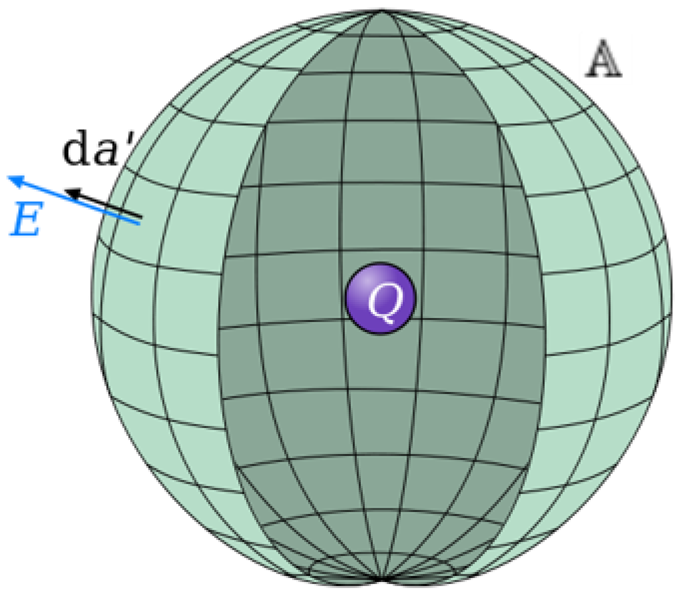
Use Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 5 **1 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (4.863x10^1) cm is (-8.43x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

-2.84x10^3 ✓

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

A negative sign on the flux indicates that the two unit vectors are in opposite directions - the E-filed points inwards if the enclosed charge is negative

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt):2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 4

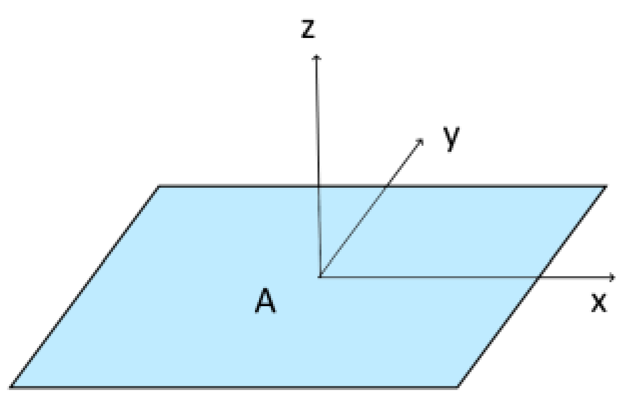
×

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

An electric field of (6.3950x10^3) **i** + (2.7490x10^3) **j** + (4.311x10^3) **k** N/C passes outwards through an area (1.29x10^1) m^2 in the xy plane. Calculate the flux in N.m^2/C.



Answer:

5.56x10^4 ✓

▼ Hide Feedback

The flux is given by

$$\Phi = \vec{E}.\vec{A}$$

The xy plane has the a surface normal which is equivalent to the unit vector **k**

$$\vec{A} = A\hat{k}$$

$$\Phi = \vec{E}.A\hat{k}$$

$$\Phi = A\vec{E}.\hat{k}$$

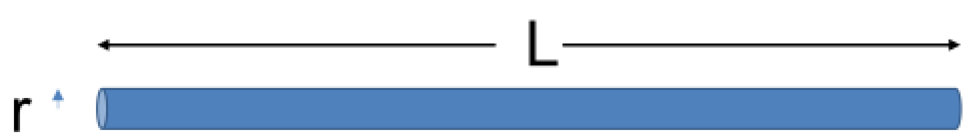
When we evaluate the scalar product, only the z-component of E contributes

$$\Phi = AE_z$$

Question 2 **1 / 1 point**

What is the surface integral in m^2 of a long thin wire with circular cross section, length (1.24x10^0) m and radius (2.497x10^0) mm?

Hint: "long thin" means you can neglect the ends of the wire.



Answer:

1.95x10^-2 ✓

▼ Hide Feedback

The surface integral represents the total surface area of the cylinder.

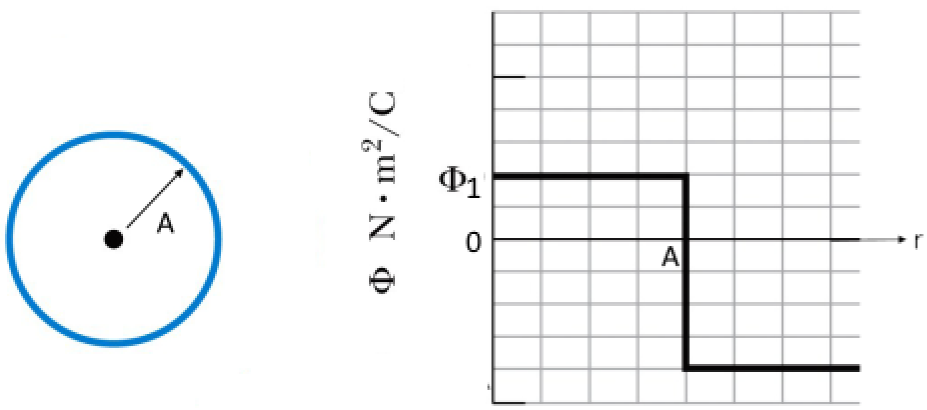
$$\oint dA = A_{side} + 2A_{ends}$$

The "long thin" condition means that the surface area of the two ends is negligible compared to the surface area of the sides. The area of the sides is the product of the circumference of the circle and the length

$$\oint dA \approx A_{side} = 2\pi rL$$

Question 3 **0 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (9.00x10^3) N.m^2/C. What is the value of the **net charge**, in coulombs?



Answer:

7.97x10^-8 **(-1.59x10^-7)**

Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell. It is this value that tells us the net charge.

Thus the value of Φ_1 represents the flux due to the central charge. From the graph, the flux after distance A is

$$\Phi_A = -2 \times \Phi_1$$

So using Gauss' law

$$q_{net} = \epsilon_0 \Phi_A = -2\epsilon_0 \Phi_1$$

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 4 **1 / 1 point**

The flux through a closed surface is Φ = (4.90x10^3) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

4.34x10^-8 ✓

▼ Hide Feedback

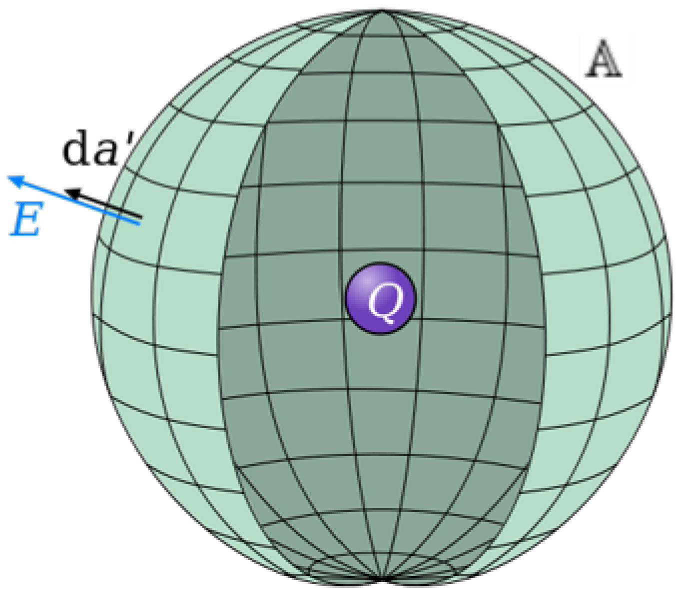
Use Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 5 **1 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (4.36x10^1) cm is (8.3888x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

3.51x10^3 ✔

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 4

Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Find the flux in $N.m^2.C^{-1}$ of a constant electric field **E** = (3.580x10^3) **i** + (-8.011x10^3) **j** + (3.3690x10^3) **k** N/C, passing through an area defined by the area vector **A** = (4.2350x10^0) **i** + (4.547x10^0) **j** + (-4.62x10^0) **k** m^2.

Answer:

✗ **(-3.68x10^4)**

▼ Hide Feedback

For a constant electric field, the flux is given by

$$\Phi = \vec{E}.\vec{A}$$

$$\Phi = E_x A_x + E_y A_y + E_z A_z$$

Question 2 **0 / 1 point**

What is the surface integral in m^2 a cube of side (7.89x10^1) cm?

Answer:

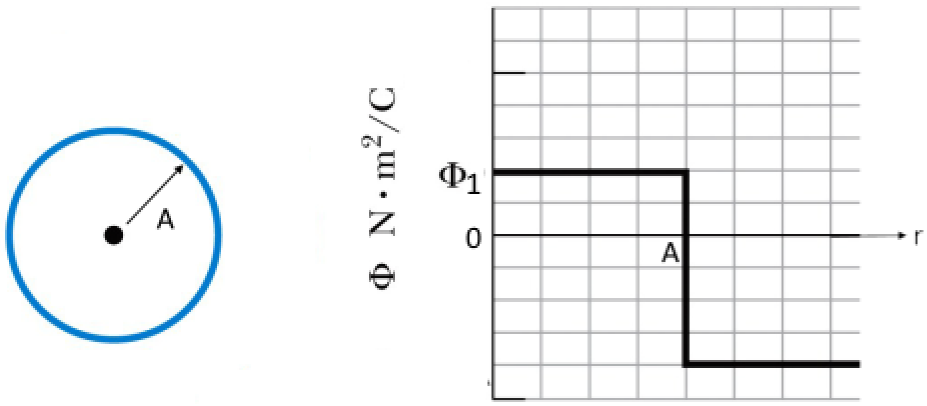
✗ **(3.74x10^0)**

▼ Hide Feedback

$$\oint dA$$

Question 3 **0 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (5.00x10^3) N.m^2/C. What is the value of the **central charge**, in coulombs?



Answer:

✗ (4.43x10^-8)

▼ Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell.

Thus the value of Φ_1 represents the flux due to the central charge.

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 4 **0 / 1 point**

The flux through a closed surface is Φ = (-9.00x10^3) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

✖ (-7.97x10^-8)

▼ Hide Feedback

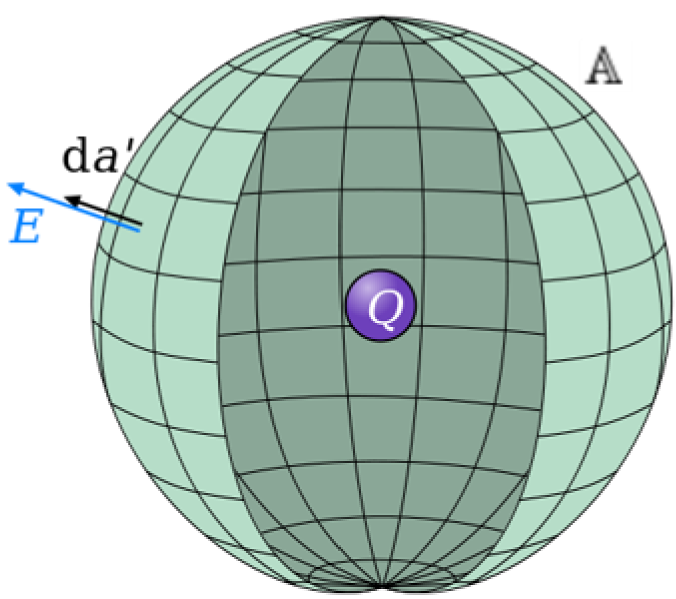
Use Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 5 **0 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (8.77x10^0) cm is (-6.5060x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

✗ **(-6.73x10^4)**

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

A negative sign on the flux indicates that the two unit vectors are in opposite directions - the E-filed points inwards if the enclosed charge is negative

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt)**:**0 / 5 - 0 %

Done

Quiz Submissions - Quiz: Week 4

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Find the flux in $N.m^2.C^{-1}$ of a constant electric field **E** = (-2.9260x10^3) **i** + (1.5800x10^3) **j** + (2.100x10^1) **k** N/C, passing through an area defined by the area vector **A** = (-5.106x10^0) **i** + (2.751x10^0) **j** + (7.26x10^0) **k** m^2.

Answer:

1.94x10^4 ✓

▼ Hide Feedback

For a constant electric field, the flux is given by

$$\Phi = \vec{E}.\vec{A}$$

$$\Phi = E_x A_x + E_y A_y + E_z A_z$$

Question 2 **1 / 1 point**

What is the surface integral in m^2 a cube of side (3.61x10^1) cm?

Answer:

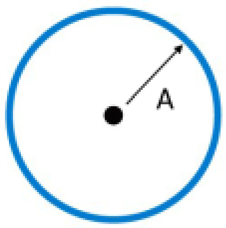
7.82x10^-1 ✓

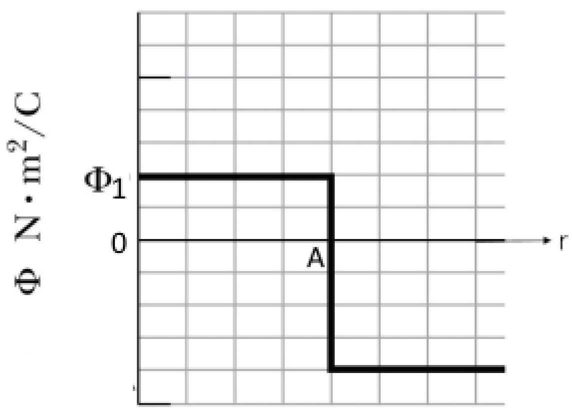
▼ Hide Feedback

$$\oint dA$$

Question 3 **0 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (9.00x10^3) N.m^2/C. What is the value of the **net charge**, in coulombs?





Answer:

7.97x10^-8 **(-1.59x10^-7)**

Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell. It is this value that tells us the net charge.

Thus the value of Φ_1 represents the flux due to the central charge. From the graph, the flux after distance A is

$$\Phi_A = -2 \times \Phi_1$$

So using Gauss' law

$$q_{net} = \epsilon_0 \Phi_A = -2\epsilon_0 \Phi_1$$

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 4 **1 / 1 point**

The flux through a closed surface is Φ = (-9.00x10^3) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

-7.97x10^-8 ✔

▼ Hide Feedback

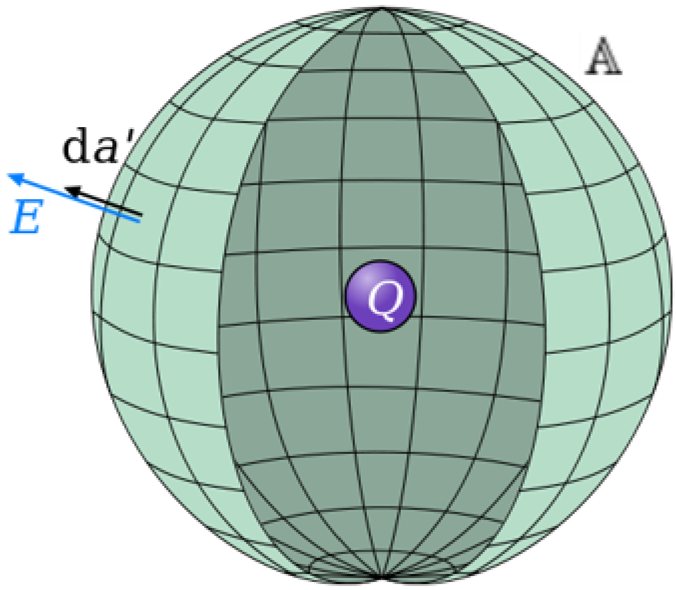
Use Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 5 **1 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (7.38x10^1) cm is (8.231x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

1.20x10^3 ✔

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 4

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Find the flux in $N.m^2.C^{-1}$ of a constant electric field **E** = (-3.880x10^2) **i** + (-6.53x10^3) **j** + (-1.3560x10^3) **k** N/C, passing through an area defined by the area vector **A** = (1.5660x10^0) **i** + (4.505x10^0) **j** + (-6.118x10^0) **k** m^2.

Answer:

-2.17x10^4 ✔

▼ Hide Feedback

For a constant electric field, the flux is given by

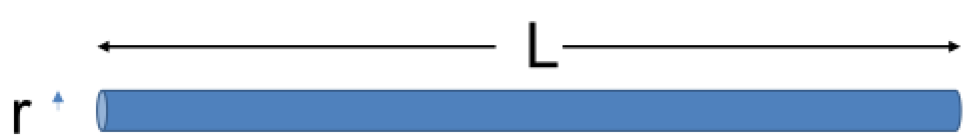
$$\Phi = \vec{E}.\vec{A}$$

$$\Phi = E_x A_x + E_y A_y + E_z A_z$$

Question 2 **1 / 1 point**

What is the surface integral in m^2 of a long thin wire with circular cross section, length (7.79x10^0) m and radius (1.494x10^0) mm?

Hint: "long thin" means you can neglect the ends of the wire.



Answer:

7.31x10^-2 ✓

▼ Hide Feedback

The surface integral represents the total surface area of the cylinder.

$$\oint dA = A_{side} + 2A_{ends}$$

The "long thin" condition means that the surface area of the two ends is negligible compared to the surface area of the sides. The area of the sides is the product of the circumference of the circle and the length

$$\oint dA \approx A_{side} = 2\pi rL$$

Question 3 **1 / 1 point**

The flux through a closed surface is Φ = (-9.00x10^3) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

-7.97x10^-8 ✓

▼ Hide Feedback

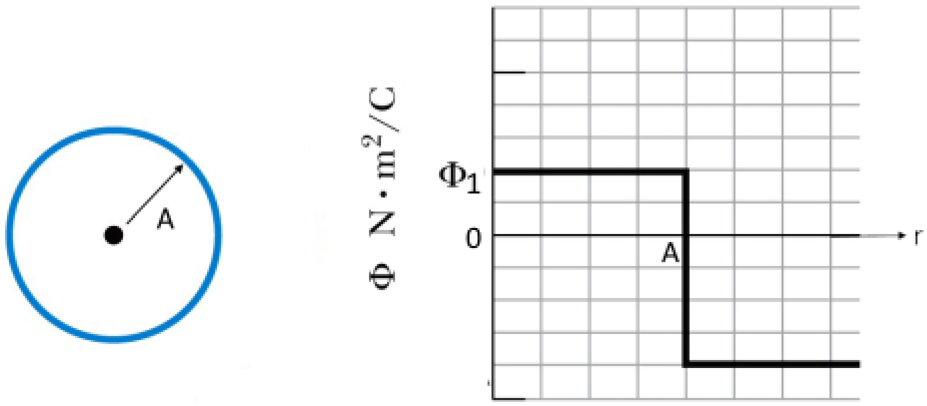
Use Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 4 **1 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (7.00x10^3) N.m^2/C. What is the value of the **central charge**, in coulombs?



Answer:

6.20x10^-8 ✓

Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

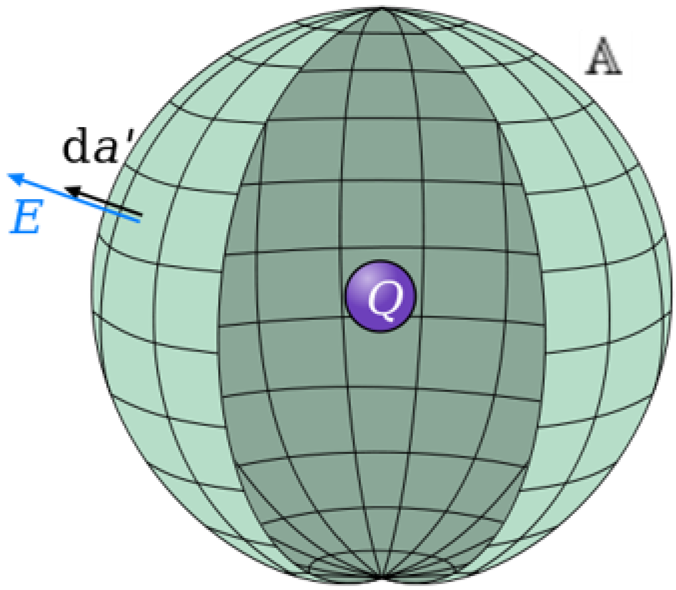
The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell.

Thus the value of Φ_1 represents the flux due to the central charge.

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 5 **1 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (6.9510x10^0) cm is (8.32x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

1.37x10^5 ✔

▷ View Feedback

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 4

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Find the flux in $N.m^2.C^{-1}$ of a constant electric field **E** = (8.0660x10^3) **i** + (1.9800x10^3) **j** + (7.61x10^3) **k** N/C, passing through an area defined by the area vector **A** = (-2.571x10^0) **i** + (-3.907x10^0) **j** + (-6.038x10^0) **k** m^2.

Answer:

-7.44x10^4 ✔

▼ Hide Feedback

For a constant electric field, the flux is given by

$$\Phi = \vec{E}.\vec{A}$$

$$\Phi = E_x A_x + E_y A_y + E_z A_z$$

Question 2 **1 / 1 point**

What is the surface integral in m^2 a sphere of radius (9.52x10^1) cm?

Answer:

1.14x10^1 ✔

▼ Hide Feedback

$\oint dA$ represents the surface area of the sphere

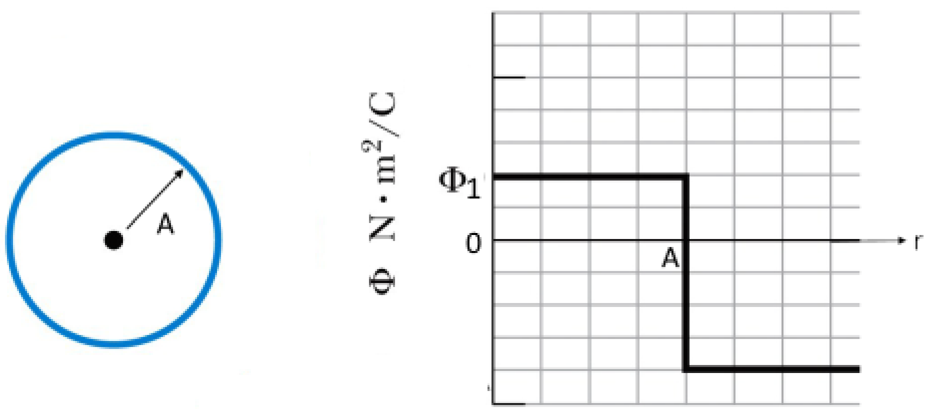
$$\oint dA = 4\pi r^2$$

Be careful converting areas

$$1m^2 = 10^4 cm^2$$

Question 3 **1 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (3.00x10^3) N.m^2/C. What is the value of the **central charge**, in coulombs?



Answer:

2.66x10^-8 ✔

▼ Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell.

Thus the value of Φ_1 represents the flux due to the central charge.

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 4 **1 / 1 point**

The flux through a closed surface is Φ = (1.45x10^3) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

1.28x10^-8 ✔

Hide Feedback

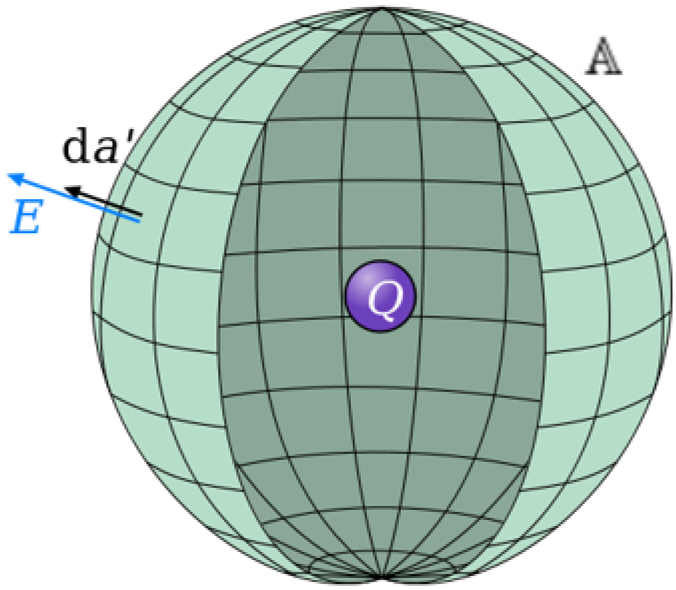
Use Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 5 **0 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (3.635x10^1) cm is (9.08x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

(5.47x10^3)

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 4

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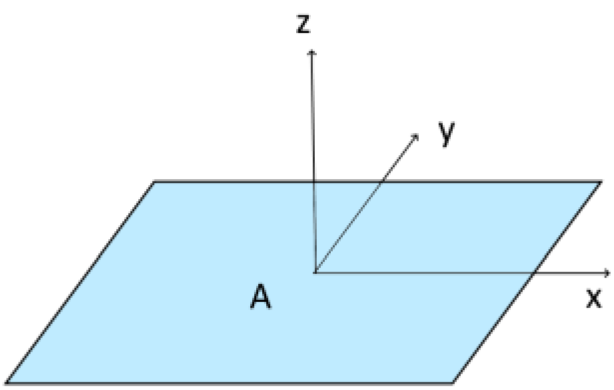
Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

An electric field of (7.0230x10^3) **i** + (5.73x10^3) **j** + (1.005x10^3) **k** N/C passes outwards through an area (1.317x10^-1) m^2 in the xy plane. Calculate the flux in N.m^2/C.



Answer:

✗ **(1.32x10^2)**

▼ Hide Feedback

The flux is given by

$$\Phi = \vec{E}.\vec{A}$$

The xy plane has the a surface normal which is equivalent to the unit vector **k**

$$\vec{A} = A\hat{k}$$

$$\Phi = \vec{E}.A\hat{k}$$

$$\Phi = A\vec{E}.\hat{k}$$

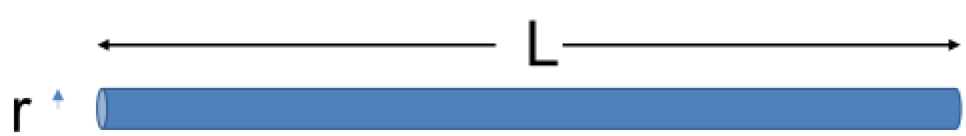
When we evaluate the scalar product, only the z-component of E contributes

$$\Phi = AE_z$$

Question 2 **0 / 1 point**

What is the surface integral in m^2 of a long thin wire with circular cross section, length (7.25x10^0) m and radius (2.060x10^0) mm?

Hint: "long thin" means you can neglect the ends of the wire.



Answer:

❌ (9.38x10^-2)

▼ Hide Feedback

The surface integral represents the total surface area of the cylinder.

$$\oint dA = A_{side} + 2A_{ends}$$

The "long thin" condition means that the surface area of the two ends is negligible compared to the surface area of the sides. The area of the sides is the product of the circumference of the circle and the length

$$\oint dA \approx A_{side} = 2\pi r L$$

Question 3 **0 / 1 point**

The flux through a closed surface is Φ = (2.01x10^2) N.m^2/C. Calculate the charge in Coulombs enclosed by the surface.

Answer:

✗ **(1.78x10^-9)**

Hide Feedback

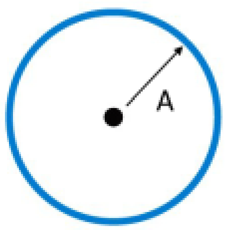
Use Gauss' Law

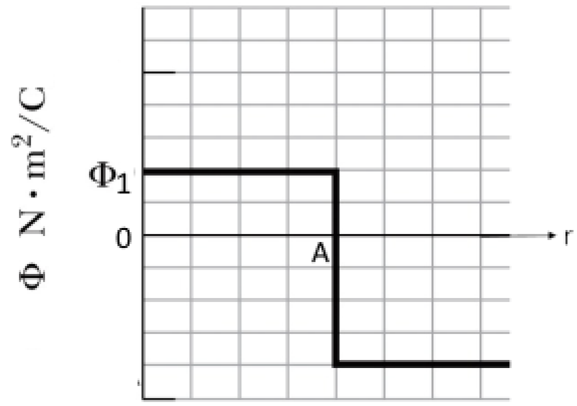
$$q_{enc} = \epsilon_0 \Phi$$

The sign on the flux determines the sign on the charge. Flux out is positive and hence charge is positive (flux lines leave the positive charge and pass outwards from the enclosed surface). If flux is negative, then it is iwards, and terminates on negative charge inside the surface.

Question 4 **0 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (4.00x10^3) N.m^2/C. What is the value of the **net charge**, in coulombs?





Answer:

(-7.08x10^-8)

Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell. It is this value that tells us the net charge.

Thus the value of Φ_1 represents the flux due to the central charge. From the graph, the flux after distance A is

$$\Phi_A = -2 \times \Phi_1$$

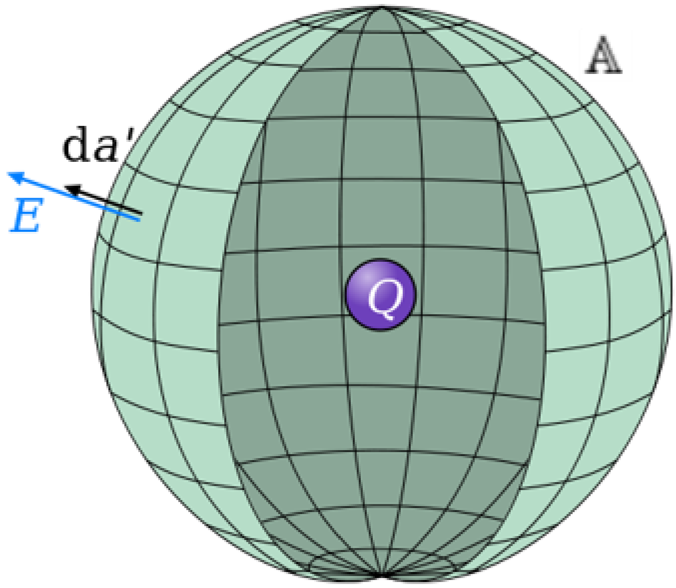
So using Gauss' law

$$q_{net} = \epsilon_0 \Phi_A = -2\epsilon_0 \Phi_1$$

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 5 **0 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (3.511x10^1) cm is (8.91x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

✗ (5.75x10^3)

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 4

Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Find the flux in $N.m^2.C^{-1}$ of a constant electric field **E** = (-4.4000x10^1) **i** + (-8.3600x10^2) **j** + (3.5550x10^3) **k** N/C, passing through an area defined by the area vector **A** = (7.924x10^0) **i** + (-5.670x10^-1) **j** + (-4.41x10^-1) **k** m^2.

Answer:

-1.44x10^3 ✔

▼ Hide Feedback

For a constant electric field, the flux is given by

$$\Phi = \vec{E}.\vec{A}$$

$$\Phi = E_x A_x + E_y A_y + E_z A_z$$

Question 2 **1 / 1 point**

What is the surface integral in m^2 a cube of side (8.20x10^1) cm?

Answer:

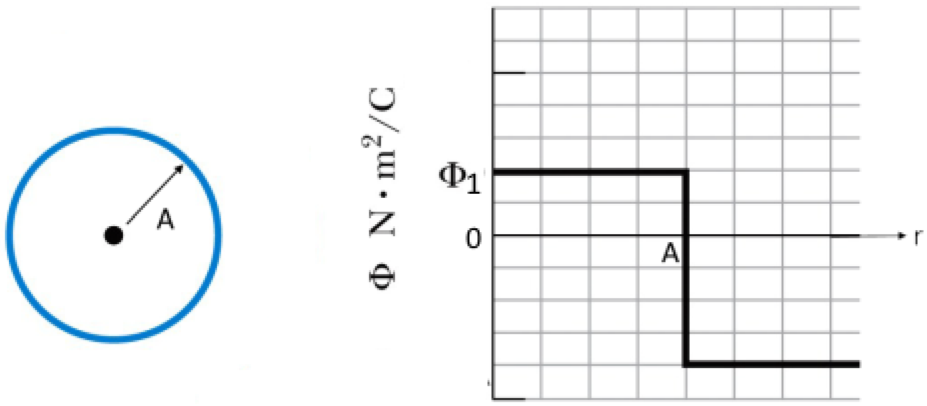
4.03x10^0 ✔

▼ Hide Feedback

$$\oint dA$$

Question 3 **0 / 1 point**

An unknown point charge is surrounded by a concentric thin non-conducting shell, which is also charged, at a distance A from the charge. The flux graph with increasing distance from the centre is shown. The value of Φ_1 = (2.00x10^3) N.m^2/C. What is the value of the **central charge**, in coulombs?



Answer:

-3.54x10^-8 ✗ **(1.77x10^-8)**

Hide Feedback

We can use Gauss' Law to determine the value of the central charge.

$$q_{enc} = \epsilon_0 \Phi$$

The flux remains constant as you increase the radius of your Gaussian sphere, until you get to the distance A, where the Gaussian sphere now encloses all of the charge including that of the spherical shell.

Thus the value of Φ_1 represents the flux due to the central charge.

$$q_{cent} = \epsilon_0 \Phi_1$$

Question 4 **0 / 1 point**

The net flux **into** a closed surface has a **magnitude** of Φ = (6.59x10^9) N.m^2/C. Calculate the charge enclosed in C.

Answer:

5.83x10^-2 ✗ **(-5.83x10^-2)**

Hide Feedback

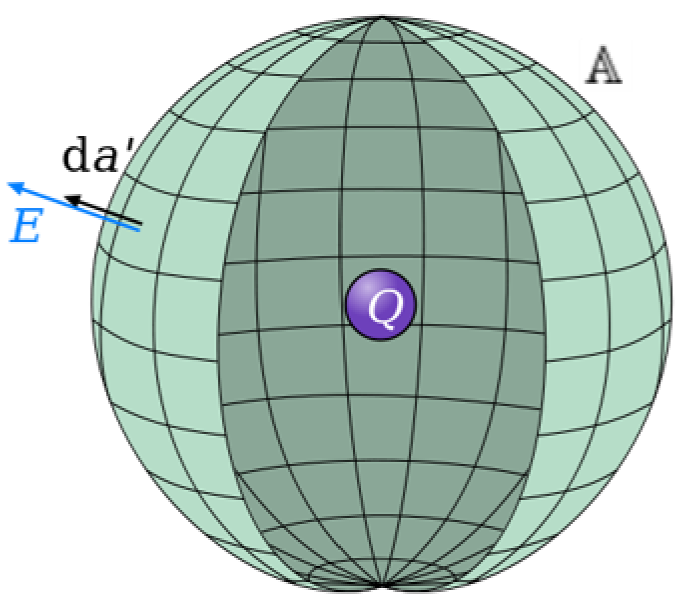
The net flux is into the closed surface. By convention this means that the flux is negative, and the flux is terminating on negative charges. Hence the charge enclosed must be negative

By Gauss' Law

$$q_{enc} = \epsilon_0 \Phi$$

Question 5 **1 / 1 point**

A point charge is surrounded by a Gaussian Sphere, with the charge at the centre. The flux at the surface of a Gaussian sphere of radius (3.30x10^1) cm is (-6.405x10^3) N.m2/C. What is the electric field in N/C at the surface of this sphere? Assume the flux is perpendicular to the surface of the sphere. You do not need to include a unit vector in your answer, but if the field points into the centre of the sphere, then you must include a negative sign.



Answer:

-4.68x10^3 ✓

Hide Feedback

From the definition of flux

$$\Phi = \vec{E}.\vec{A}$$

The area vector can be written as

$$\vec{A} = A\hat{n}$$

and the electric field vector from the charge is

$$\vec{E} = E\hat{r}$$

Due to the spherical symmetry, the surface normal vector and the radial unit vector are equivalent

$$\Phi = E\hat{r}.A\hat{n} = EA$$

A negative sign on the flux indicates that the two unit vectors are in opposite directions - the E-filed points inwards if the enclosed charge is negative

The area of a sphere of radius R is

$$A = 4\pi R^2$$

Hence

$$\Phi = 4\pi R^2 E$$

rearranging

$$E = \frac{\Phi}{4\pi R^2}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 5

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Attempt 2

Question 1 **1 / 1 point**

An object of mass (3.87x10^0) grams is moving with a speed of (2.7460x10^2) m/s. Calculate the KE in Joules, to 2 sf.

Answer:

1.4x10^2 ✔ **(1.46x10^2)** ✘ wrong number of significant figures **(3)**

▼ Hide Feedback

$$K = \frac{1}{2}mv^2$$

Convert mass to kg from grams before calculating

$$1\ g = 10^{-3}\ kg$$

Question 2 **0 / 1 point**

A spring with a spring constant of (9.45x10^2) N/m is compressed from an initial position of (3.164x10^1) cm to a final position of (5.2420x10^0) cm. Calculate the work done in J by the external force to perform this compression.

Answer:

-4.60x10^1 ✘ **(4.60x10^1)**

▼ Hide Feedback

Use the formula

$$\Delta U_{el} = \frac{1}{2}kx_f^2 - \frac{1}{2}kx_i^2$$

The change in potential energy must be equal to the work done by the external force because

$$-W_{int} = W_{ext} \text{ and } \Delta U = -W_{int}$$

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (5.649x10^0) nC and (7.497x10^0) nC, which are a distance (5.89x10^0) m apart.

Answer:

6.47x10^-8 ✓

▼ Hide Feedback

The electrical potential energy of a pair of point charges is

$$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (-8.6820x10^0) nC and (-4.46x10^0) nC are initially (2.865x10^0) metres apart, and then move to (7.170x10^0) metres apart. Calculate the change in potential energy in Joules.

Answer:

-7.30x10^-8 ✓

▼ Hide Feedback

The change in potential energy is given by

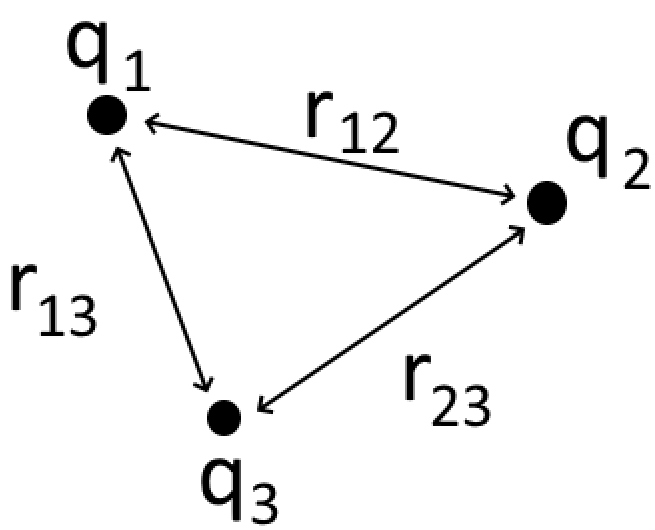
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **0 / 1 point**

Calculate the EPE of a collection of three particles q1 = (1.223x10^1) µC, q2 = (-7.585x10^1) µC and q3 = (-5.6890x10^1) µC, which are distances of r12 = (7.544x10^-1) m, r13 = (8.430x10^-1) m and r23 = (4.39x10^-1) m respectively.



Answer:

6.99x10^-5 ✗ **(6.99x10^1)**

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 5

Attempt 1

Question 1 **0 / 1 point**

A variable force $\vec{F}(x) = 5.00x\hat{i}N$ causes a displacement from $x = 0\ to\ x = (2.95x10^0)\hat{i}\ m$

Calculate the work done by the force in Joules. Use 3 sf in your answer

Answer:

2.81x10^1 ✗ **(2.18x10^1)**

Hide Feedback

The work done by the variable force is given by

$W = \int_0^{xhi} F(x)dx$

Since $F(x) = 5.00x\hat{\imath}\ N$

$W = \int_0^{xhi} 5.00x\hat{\imath} \cdot \vec{dx}$

Since we are moving along the x direction, we can write $\vec{dx} = dx\hat{\imath}$

$W = \int_0^{xhi} 5.00xdx$

Since $\hat{\imath} \cdot \hat{\imath} = 1$

Now we evaluate the integral:

$W = 5.0[\frac{x^2}{2}]_0^{xhi}$

$W = 5.0[\frac{xhi^2}{2} - \frac{0}{2}]$

Question 2 **1 / 1 point**

Your phone, mass (1.4350x10^2) grams falls from your desk to the floor, (1.23x10^2) cm below. What is the change in gravitational potential energy (in Joules) of the phone?

Answer:

-1.73x10^0 ✔

Hide Feedback

The change in potential energy is

$$\Delta U_g = mg\Delta h$$

In this case

$$h_i > h_f$$

, so we expect the answer to be negative - the phone loses potential energy

Make sure that mass is in kg, and displacement in metres, so the answer comes out in Joules.

$$\Delta U_g = mg(h_f - h_i)$$

No phones were harmed during the making of this question.

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (4.515x10^0) nC and (5.61x10^0) nC, which are a distance (4.8888x10^0) m apart.

Answer:

4.70x10^-8 ✓

▼ Hide Feedback

The electrical potential energy of a pair of point charges is

$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (-8.926x10^0) nC and (-6.5090x10^0) nC are initially (9.71x10^0) metres apart, and then move to (2.8029x10^1) metres apart. Calculate the change in potential energy in Joules

Answer:

-3.5x10^-8 ✔ **(-3.52x10^-8)** ✘ wrong number of significant figures **(3)**

▼ Hide Feedback

The change in potential energy is given by

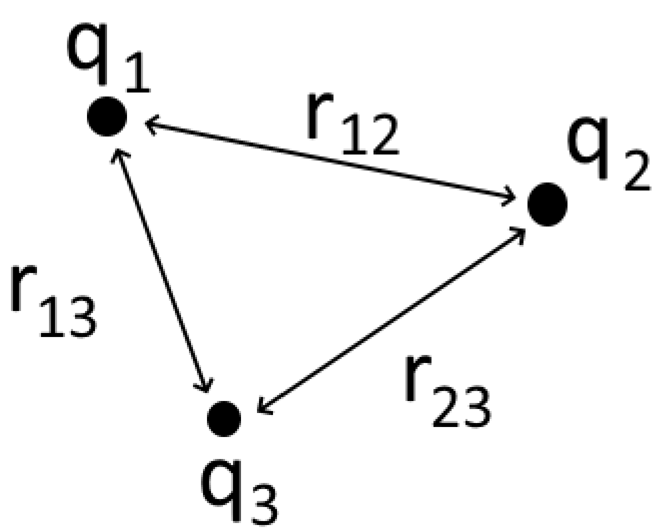
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles (5.97x10^1) nC, (7.919x10^1) nC and (1.0000x10^1) nC, which are distances of r12 = (7.521x10^-1) m, r13 = (2.489x10^-1) m and r23 = (6.996x10^-1) m respectively.



Answer:

8.83x10^-5 ✓

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 5

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Attempt 1

Question 1 **1 / 1 point**

If the kinetic energy of mass (4.1650x10^0) kg is (6.65x10^0) Joules, what is the speed of the object in m/s? Use 2 sf in your answer.

Answer:

1.8x10^0 ✓ **(1.79x10^0)** ✗ wrong number of significant figures **(3)**

Hide Feedback

$$K = \frac{1}{2}mv^2$$

Rearrange in terms of v

$$v = \sqrt{\frac{2K}{m}}$$

$$v = \sqrt{\frac{(2 \times KE\ (J)}{mass\ (kg)}}$$

Question 2 **1 / 1 point**

A spring with spring constant (3.78x10^0) kN/m is stretched by (1.6060x10^0) cm from the unstretched length. How much elastic potential energy is stored?

Answer:

4.87x10^-1 ✓

Hide Feedback

Use the formula

$\Delta U = ½\ k\ x_f^2 - ½\ k\ x_i^2$

In this case x_i =0 (unstretched)

$\Delta U = ½\ k\ x_f^2$

Make sure that the stretch is in metres, to get an answer in Joules.

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (4.937x10^0) nC and (-1.2030x10^0) nC, which are a distance (2.30x10^0) m apart.

Answer:

-2.32x10^-8 ✓

Hide Feedback

The electrical potential energy of a pair of point charges is

$$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (-8.59x10^0) nC and (-5.932x10^0) nC are initially (9.956x10^0) metres apart, and then move to (1.6694x10^1) metres apart. Calculate the change in potential energy in Joules

Answer:

-1.86x10^-8 ✓

Hide Feedback

The change in potential energy is given by

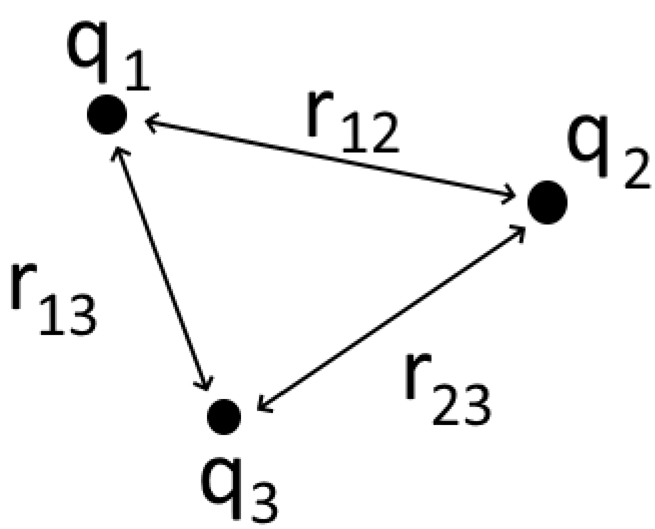
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles (3.3490x10^1) nC, (4.205x10^1) nC and (1.000x10^1) nC, which are distances of r12 = (1.40x10^-1) m, r13 = (4.531x10^-1) m and r23 = (6.110x10^-1) m respectively.



Answer:

1.03x10^-4 ✓

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 5

Attempt 1

Question 1 **1 / 1 point**

A force **F =** (1.60x10^-1) **i** + (-2.1500x10^0) **j +** (1.5630x10^1) **k** causes a displacement **Δr** = (-9.1000x10^0) **i**+(7.1400x10^0) **j** + (1.7790x10^1) **k** metres. Calculate the work done in Joules

Answer:

2.61x10^2 ✔

▼ Hide Feedback

Work done by a constant force

$$W = \vec{F} \cdot \Delta\vec{r}$$

$$W = (fx\hat{\imath} + fy\hat{\jmath} + fz\hat{k}) \cdot (rx\hat{\imath} + ry\hat{\jmath} + rz\hat{k})$$

$$W = (fx \times rx) + (fy \times ry) + (fz \times rz)\ J$$

Question 2 **0 / 1 point**

A spring with a spring constant k = (2.893x10^3) N/m is compressed from its unstretched length to a length of (2.56x10^0) cm. Calculate the change in potential energy in Joules.

Answer:

-9.48x10^-1 ✘ **(9.48x10^-1)**

▼ Hide Feedback

$\Delta U = U_{final} - U_{initial} = ½kx_f^2 - ½kx_i^2$

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (8.079x10^0) nC and (-1.839x10^0) nC, which are a distance (9.82x10^0) m apart.

Answer:

-1.36x10^-8 ✓

Hide Feedback

The electrical potential energy of a pair of point charges is

$$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (7.54x10^0) nC and (-5.4610x10^0) nC are initially (7.471x10^0) metres apart, and then move to (3.6291x10^1) metres apart. Calculate the change in potential energy in Joules

Answer:

3.94x10^-8 ✓

Hide Feedback

The change in potential energy is given by

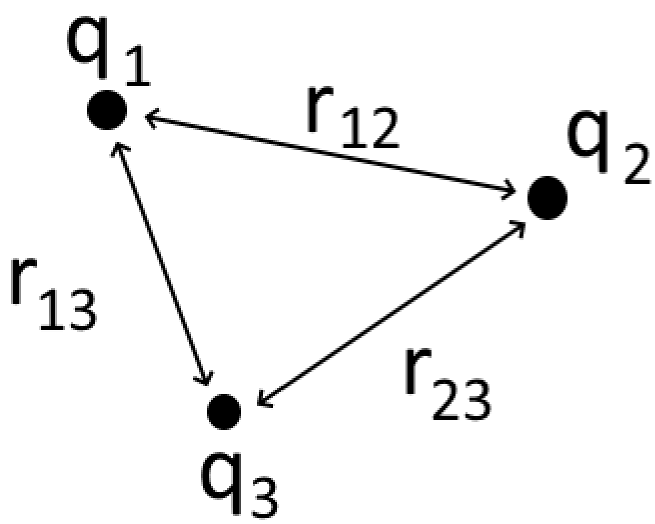
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles (7.5300x10^1) µC, (-6.12x10^1) µC and (-3.4100x10^1) µC, which are distances of r12 = (3.9130x10^-1) m, r13 = (6.125x10^-1) m and r23 = (4.278x10^-1) m respectively.



Answer:

-9.97x10^1 ✔

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 5

Attempt 1

Question 1 **0 / 1 point**

A car, mass 1600 kg is moving at (3.1740x10^0) m/s. The brakes are applied, and do (4.12x10^3) J of work on the car. What is the new speed in m/s?

Answer:

3.90x10^0 ✗ **(2.22x10^0)**

Hide Feedback

The final speed is lower than the initial speed because energy W is removed from the system

hence $K_f = K_i - W$

$$\frac{1}{2}mv_f^2 = \frac{1}{2}mv_0^2 - W$$

$$v_f^2 = v_0^2 - \frac{2W}{m}$$

Question 2 **0 / 1 point**

A horizontal spring with a spring constant k = (2.3920x10^4) N/m is uncompressed from an extension Δx = (2.03x10^0) cm back to its unstretched length. Calculate the change in potential energy in Joules.

Answer:

4.93x10^0 ✗ **(-4.93x10^0)**

Hide Feedback

$\Delta U = U_{final} - U_{initial} = ½kx_f^2 - ½kx_i^2$

In this case the final state has x = 0, so the answer must be negative

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (3.85x10^0) nC and (-2.9530x10^0) nC, which are a distance (1.4324x10^0) m apart.

Answer:

-7.16x10^-8 ✓

▼ Hide Feedback

The electrical potential energy of a pair of point charges is

$$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **0 / 1 point**

Two particles q1 = (7.923x10^0) nC and (-2.34x10^0) nC are initially (3.335x10^0) metres apart, and then move to (6.097x10^0) metres apart. Calculate the change in potential energy in Joules

Answer:

✗ **(2.26x10^-8)**

▼ Hide Feedback

The change in potential energy is given by

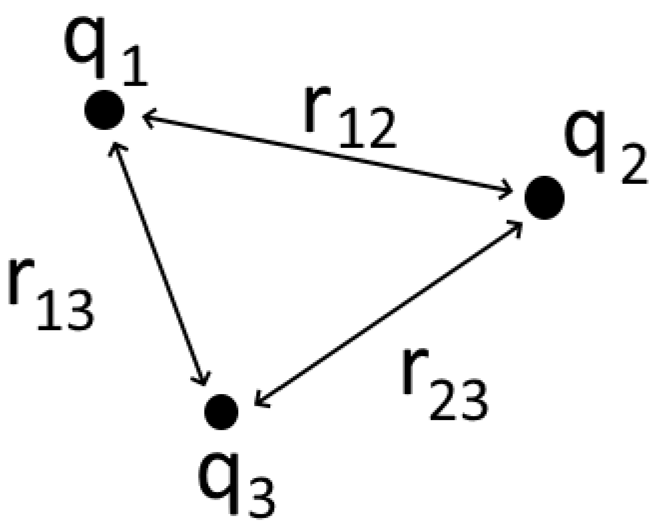
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **0 / 1 point**

Calculate the EPE of a collection of three particles q1 = (-4.137x10^1) nC, q2 = (-7.338x10^1) nC and q3 = (-4.9410x10^1) nC, which are distances of r12 = (2.33x10^-1) m, r13 = (1.853x10^-1) m and r23 = (3.2380x10^-1) m respectively.



Answer:

✗ **(3.17x10^-4)**

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 5

Attempt 1

Question 1 **1 / 1 point**

A puck, mass 0.20 kg, slides on a horizontal ice rink with a speed of (1.09x10^0) m/s. A hockey stick does +(4.7180x10^1) J of work on the puck. What is the new speed? (Neglect friction). Calculate your answer to 2 s.f.

Answer:

2.2x10^1 ✔ **(2.17x10^1)** ✘ wrong number of significant figures **(3)**

Hide Feedback

Use the work energy theorem. The change in kinetic energy is equal to the work done

$W = ½mvf^2 - ½mv_i^2$

Hence

$(2W + mv_i^2)/m = v_f^2$

$v_f = √(2W/m + v_i^2)$

Question 2 **0 / 1 point**

A spring with a spring constant k = (9.782x10^3) N/m is compressed from its unstretched length to a length of (8.64x10^0) cm. Calculate the change in potential energy in Joules.

Answer:

-4.23x10^2 ✘ **(3.65x10^1)**

Hide Feedback

$\Delta U = U_{final} - U_{initial} = ½kx_f^2 - ½kx_i^2$

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (7.391x10^0) nC and (-5.615x10^0) nC, which are a distance (8.23x10^0) m apart.

Answer:

-4.53x10^-8 ✓

Hide Feedback

The electrical potential energy of a pair of point charges is

$$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **0 / 1 point**

Two particles q1 = (6.061x10^0) nC and (7.00x10^0) nC are initially (9.1140x10^0) metres apart, and then move to (2.655x10^1) metres apart. Calculate the change in potential energy in Joules

Answer:

2.73x10^-8 ✗ **(-2.75x10^-8)**

Hide Feedback

The change in potential energy is given by

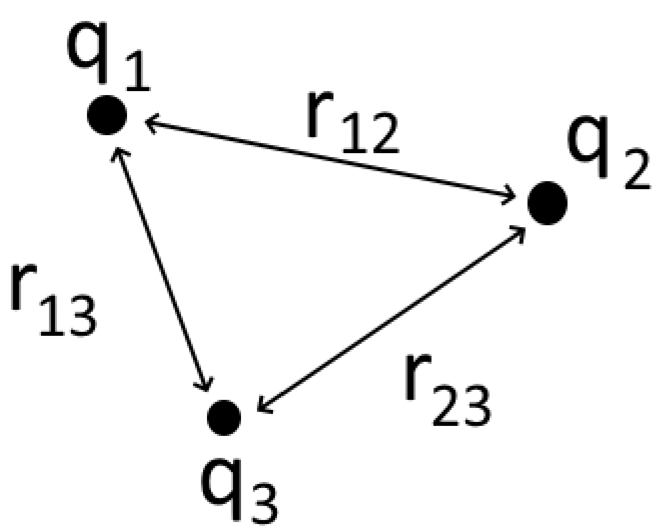
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles q1 = (-1.714x10^1) nC, q2 = (-2.1200x10^1) nC and q3 = (-3.1350x10^1) nC, which are distances of r12 = (5.2860x10^-1) m, r13 = (1.05x10^-1) m and r23 = (9.493x10^-1) m respectively.



Answer:

5.85x10^-5 ✔

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 5

×

Attempt 2

Question 1 **1 / 1 point**

A force **F**=(5.401x10^0) **i**+(1.27x10^0) **j**+2.0 **k** N causes a displacement Δr =(5.0330x10^0) **i**+(9.2220x10^0) **j**+1.0 **k** metres. Calculate the work done in Joules.

Answer:

4.09x10^1 ✓

▼ Hide Feedback

Work done by a constant force

$$W = \vec{F} \cdot \Delta\vec{r}$$

$$W = (fx\hat{i} + fy\hat{j} + 2.0\hat{k}) \cdot (rx\vec{i} + ry\vec{j} + 1.0\hat{k})$$

$$W = (fx \times rx) + (fy \times ry) + (2.0 \times 1.0)\ J$$

Question 2 **1 / 1 point**

A student of mass (7.90x10^1) kg climbs up the stairs in the Physics Department, with a vertical height change (7.0000x10^0) metres.

What is the change in gravitational potential energy? Give your answer in Joules, to 2 significant figures.

Answer:

5.4x10^3 ✓ **(5.42x10^3)** ✗ wrong number of significant figures **(3)**

Hide Feedback

GPE is calculated from ΔU_{gpe}= mgΔh

If you go up then $\Delta h = (h_{final} - h_{initial})$ is positive, so ΔUgpe is positive too.

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (2.699x10^0) nC and (-7.2180x10^0) nC, which are a distance (8.93x10^0) m apart.

Answer:

-1.96x10^-8 ✓

Hide Feedback

The electrical potential energy of a pair of point charges is

$$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (3.66x10^0) nC and (-2.1600x10^0) nC are initially (4.834x10^0) metres apart, and then move to (7.2380x10^0) metres apart. Calculate the change in potential energy in Joules

Answer:

4.88x10^-9 ✓

Hide Feedback

The change in potential energy is given by

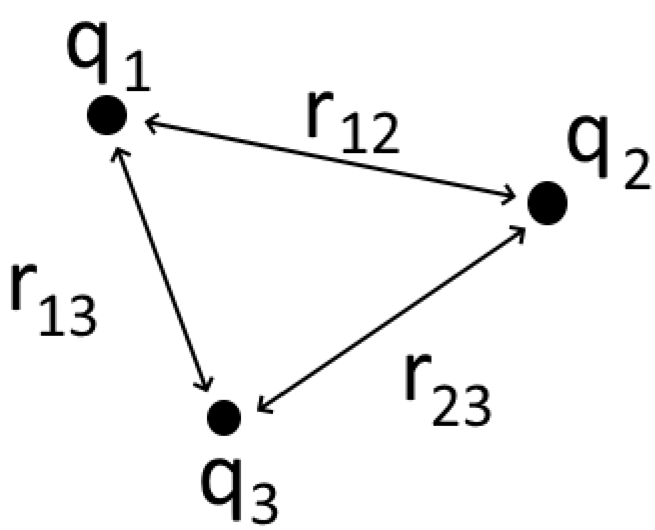
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles (7.7600x10^1) µC, (-5.3670x10^1) µC and (-4.170x10^1) µC, which are distances of r12 = (5.64x10^-1) m, r13 = (4.049x10^-1) m and r23 = (7.559x10^-1) m respectively.



Answer:

-1.12x10^2 ✔

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 5

Attempt 2

Question 1 **1 / 1 point**

An object of mass (7.74x10^0) grams is moving with a speed of (2.919x10^2) m/s. Calculate the KE in Joules, to 2 sf.

Answer:

3.30x10^2 ✓

Hide Feedback

$$K = \frac{1}{2}mv^2$$

Convert mass to kg from grams before calculating

$$1\ g = 10^{-3}\ kg$$

Question 2 **1 / 1 point**

Your phone, mass (1.34x10^2) grams falls from your desk to the floor, (1.2320x10^2) cm below. What is the change in gravitational potential energy (in Joules) of the phone?

Answer:

-1.62x10^0 ✓

Hide Feedback

The change in potential energy is

$$\Delta U_g = mg\Delta h$$

In this case

$$h_i > h_f$$

, so we expect the answer to be negative - the phone loses potential energy

Make sure that mass is in kg, and displacement in metres, so the answer comes out in Joules.

$$\Delta U_g = mg(h_f - h_i)$$

No phones were harmed during the making of this question.

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (8.0560x10^0) nC and (5.618x10^0) nC, which are a distance (7.07x10^-1) m apart.

Answer:

5.76x10^-7 ✔

▼ Hide Feedback

The electrical potential energy of a pair of point charges is

$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (2.9060x10^0) nC and (-8.336x10^0) nC are initially (3.169x10^0) metres apart, and then move to (6.26x10^0) metres apart. Calculate the change in potential energy in Joules

Answer:

3.39x10^-8 ✓

Hide Feedback

The change in potential energy is given by

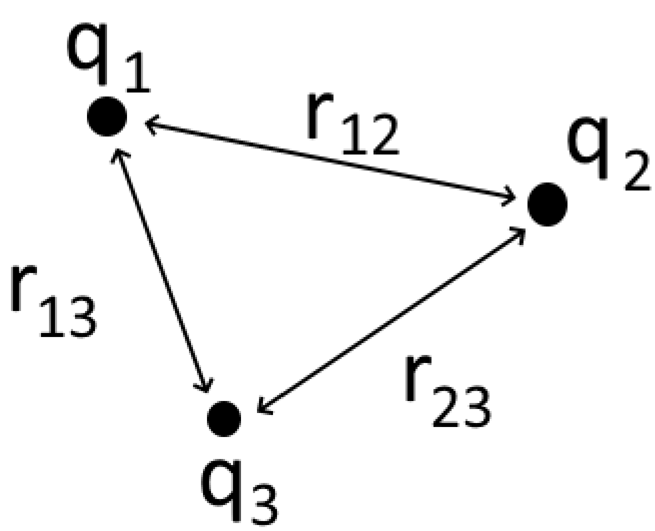
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles q1 = (-1.5610x10^1) nC, q2 = (-1.88x10^1) nC and q3 = (-6.9770x10^1) nC, which are distances of r12 = (7.5020x10^-1) m, r13 = (4.064x10^-1) m and r23 = (1.967x10^-1) m respectively.



Answer:

8.76x10^-5 ✓

▼ Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 5

Attempt 2

Question 1 **0 / 1 point**

A variable force $\vec{F}(x) = 5.00x\hat{i}N$ causes a displacement from x = (9.4680x10^0) **i** m to x = (2.25x10^0) **i** m.

Calculate the work done by the force in Joules.

Answer:

❌ **(-2.11x10^2)**

▼ Hide Feedback

The work done by the variable force is given by

$$W = \int_{x_{lo}}^{x_{hi}} F(x)dx$$

Since $F(x) = 5.00x\hat{i}\ N$

$$W = \int_{x_{lo}}^{x_{hi}} 5.00x\hat{i} \cdot \vec{dx}$$

Since we are moving along the x direction, we can write $\vec{dx} = dx\hat{i}$

$$W = \int_{x_{lo}}^{x_{hi}} 5.00xdx$$

Since $\hat{i} \cdot \hat{i} = 1$

Now we evaluate the integral:

$$W = 5.0[\frac{x^2}{2}]_{x_{lo}}^{x_{hi}}$$

$$W = 5.0[\frac{{x_{hi}}^2}{2} - \frac{{x_{lo}}^2}{2}]$$

Question 2 **0 / 1 point**

Your phone, mass (1.6260x10^2) grams falls from your desk to the floor, (1.37x10^2) cm below. What is the change in gravitational potential energy (in Joules) of the phone?

Answer:

2.18x10^3 ❌ **(-2.19x10^0)**

▼ Hide Feedback

The change in potential energy is

$$\Delta U_g = mg\Delta h$$

In this case

$$h_i > h_f$$

, so we expect the answer to be negative - the phone loses potential energy

Make sure that mass is in kg, and displacement in metres, so the answer comes out in Joules.

$$\Delta U_g = mg(h_f - h_i)$$

No phones were harmed during the making of this question.

Question 3 **1 / 1 point**

Calculate the electrical potential energy in Joules, of two particles (-4.8770x10^0) nC and (-6.256x10^0) nC, which are a distance (4.55x10^0) m apart.

Answer:

6.03x10^-8 ✔

▼ Hide Feedback

The electrical potential energy of a pair of point charges is

$U_{12} = \frac{q_1 q_2}{4\pi\epsilon_0 r_{12}}$

Make sure your units are in SI, to get an answer in Joules.

Question 4 **1 / 1 point**

Two particles q1 = (-7.2830x10^0) nC and (-4.79x10^0) nC are initially (3.4800x10^0) metres apart, and then move to (9.6270x10^0) metres apart. Calculate the change in potential energy in Joules.

Answer:

-5.76x10^-8 ✓

▼ Hide Feedback

The change in potential energy is given by

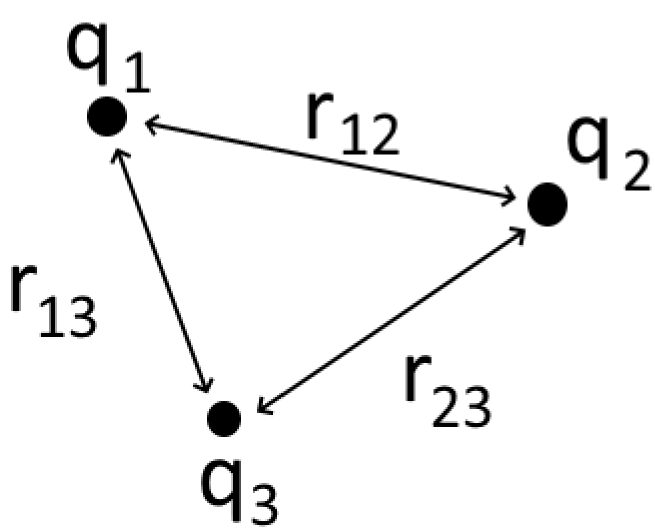
$$\Delta U = U_f - U_i$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0 r_f} - \frac{q_1 q_2}{4\pi\epsilon_0 r_i}$$

$$\Delta U = \frac{q_1 q_2}{4\pi\epsilon_0}\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$$

Question 5 **1 / 1 point**

Calculate the EPE of a collection of three particles q1 = (6.9780x10^1) nC, q2 = (6.683x10^1) nC and q3 = (1.00x10^1) nC, which are distances of r12 = (2.351x10^-1) m, r13 = (9.007x10^-1) m and r23 = (7.584x10^-1) m respectively.



Answer:

1.93x10^-4 ✔

Hide Feedback

The total EPE of a multiple charge system is the sum of the pair-wise potential energies

$$U = U_{12} + U_{23} + U_{13}$$

$$U = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r_{12}} + \frac{q_2 q_3}{r_{23}} + \frac{q_1 q_3}{r_{13}}\right)$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 6

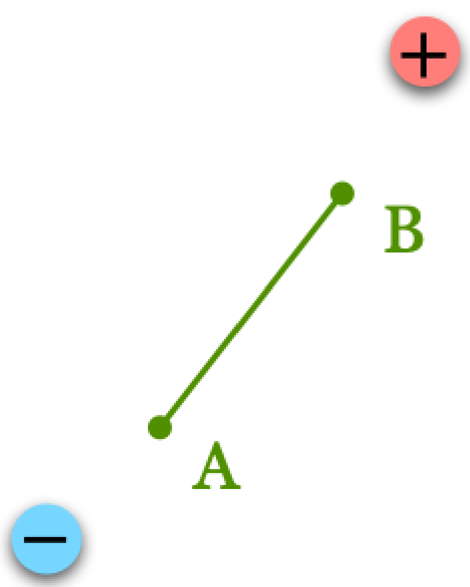
Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider a proton moving from point A to point B towards a positive charge and away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- [ ] Positive work is done by the field
- [ ] Negative work is done by the field
- [ ] External (positive) work needs to be applied

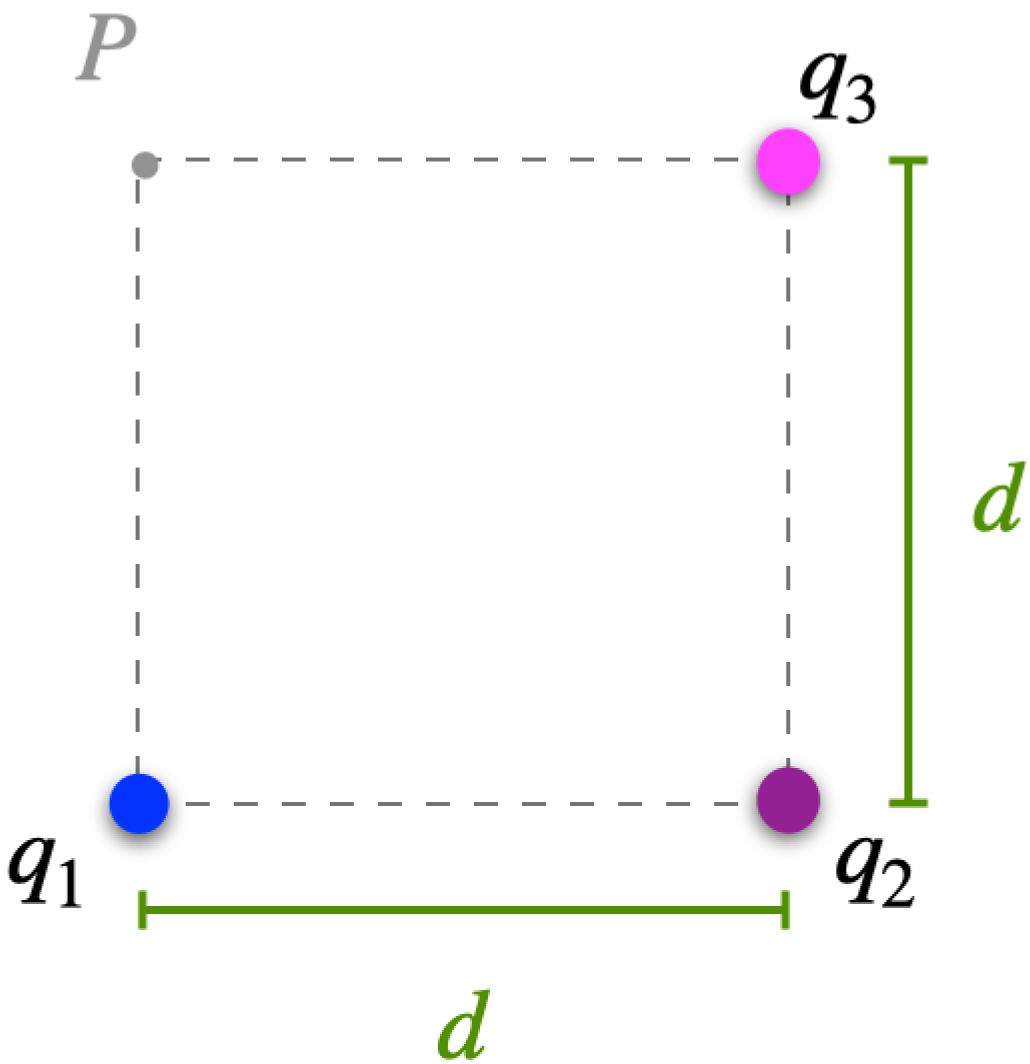
Hide Feedback

A proton is a positive charge. We need to apply positive external work to move a positive charge against the electric field. The work done by the field is **negative** (we 'fight the field').

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (1.600x10^-9) C, q_2 = (5.0x10^-9) C and q_3 = (3.500x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.20x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

6.5x10^3 ✓ V ✓

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

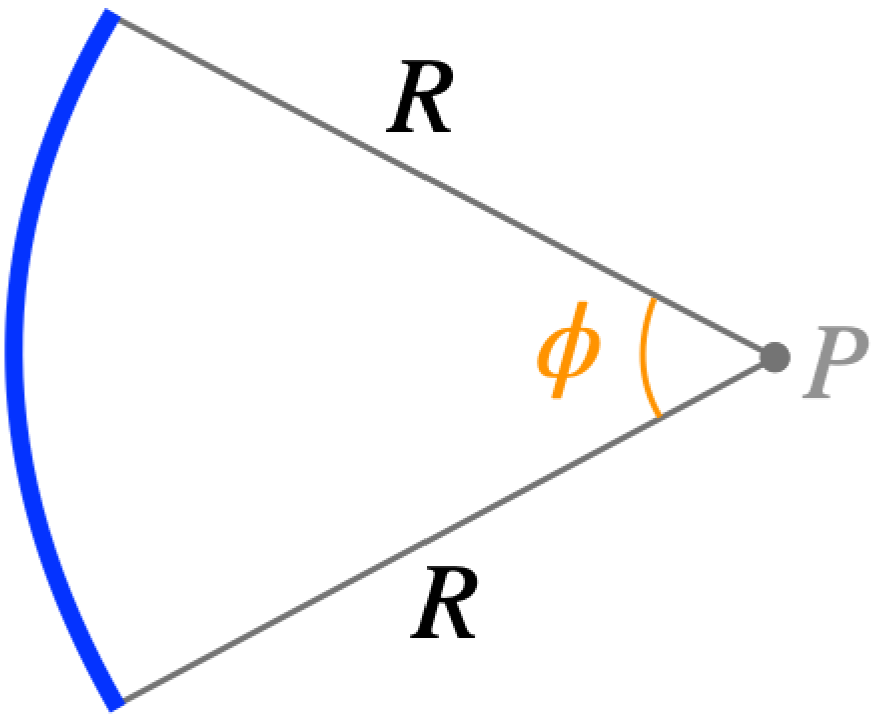
We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **0 / 1 point**

Consider a charged arc segment with radius R = (4.9x10^-2) m and charge density λ = (4.900x10^-6) C/m and a central angle ϕ = (2.40x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

1.1x10^2 ✗ **(1.1x10^4)** V ✓

Hide Feedback

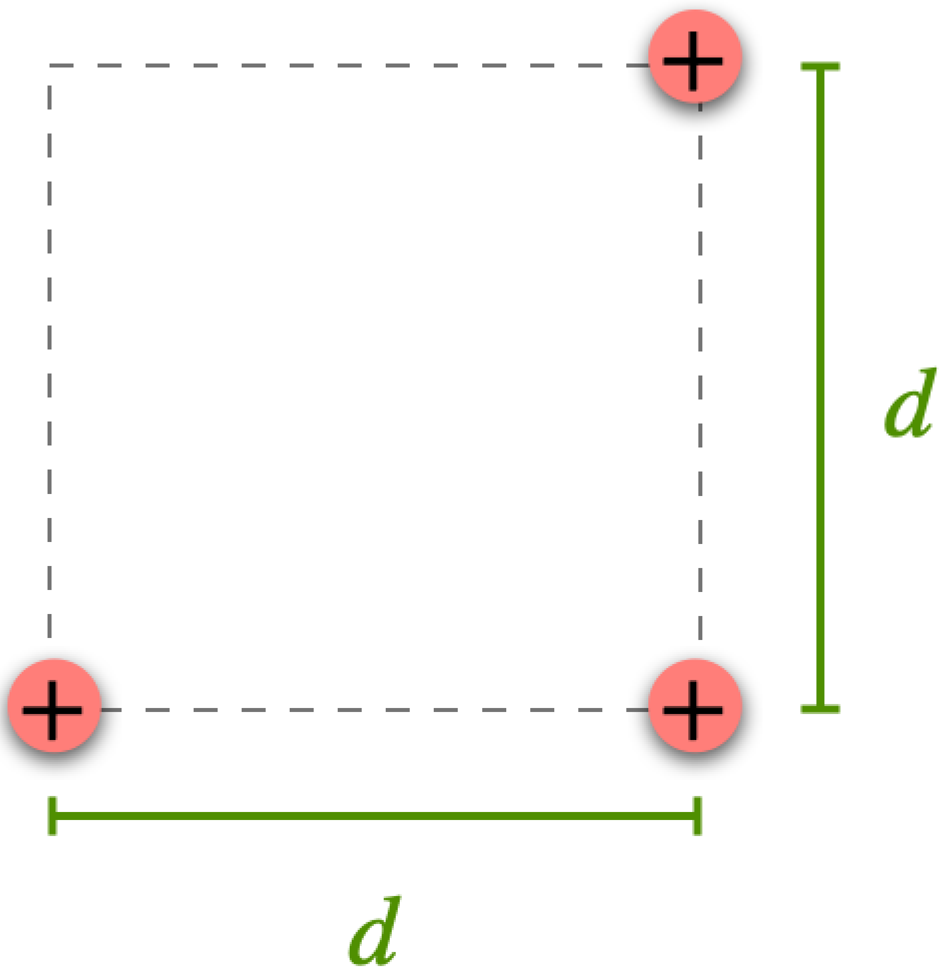
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed positive charges q = (2.90x10^2) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (4.7x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

-1.1x10^-2 ✗ **(4.4x10^-2)** J ✓

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\,d$$

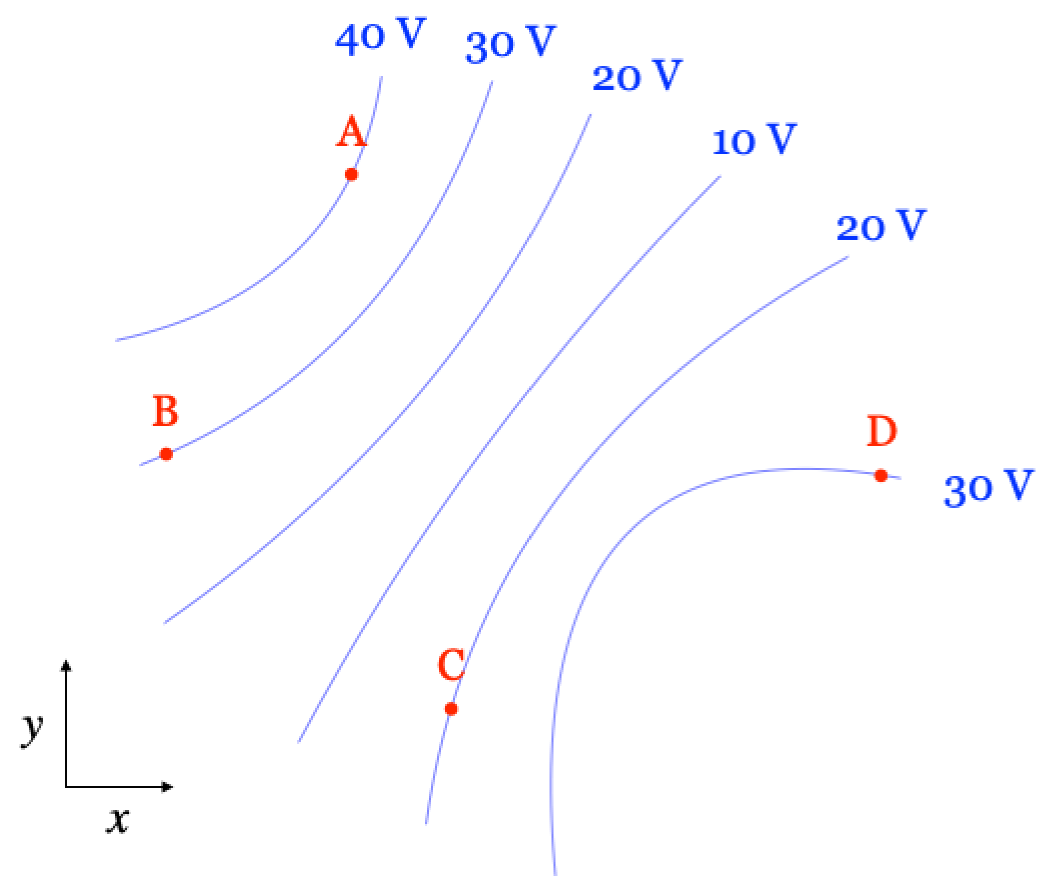
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = (10.5\hat{\imath} - 3.8\hat{\jmath})\ \mathrm{V/m}$$



- Point A
- Point B
- Point C
- Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point A does this give a direction that is "to the right and slightly down".

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 6

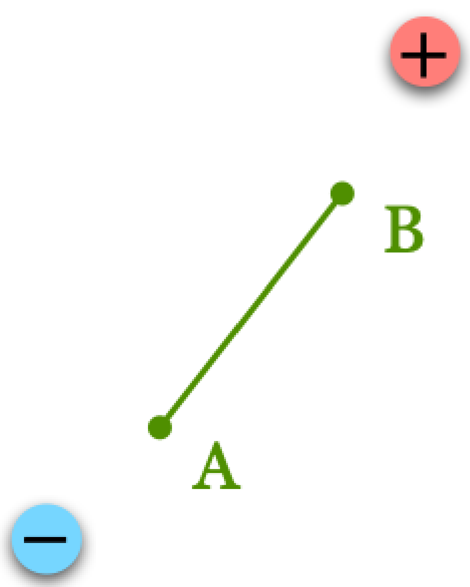
Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider a proton moving from point A to point B towards a positive charge and away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- [ ] Positive work is done by the field
- [ ] Negative work is done by the field
- [ ] External (positive) work needs to be applied

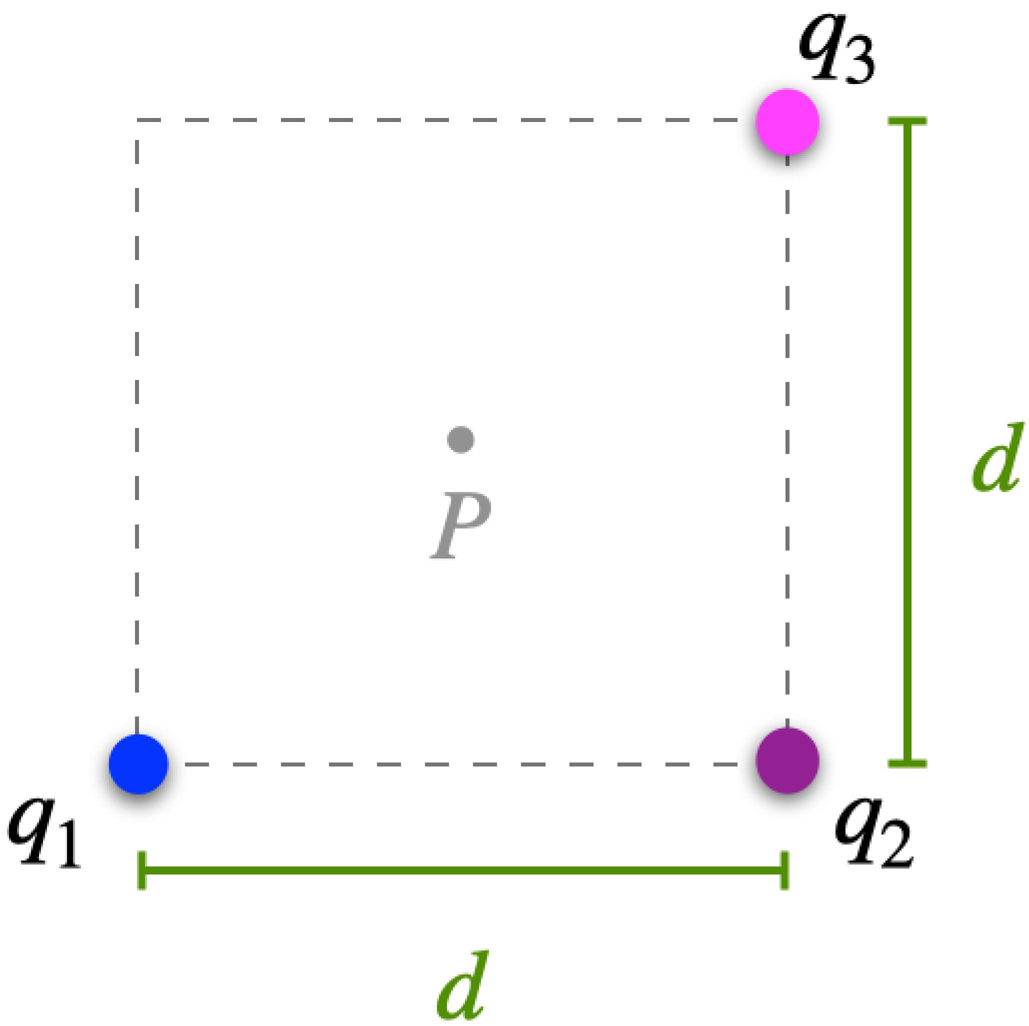
Hide Feedback

A proton is a positive charge. We need to apply positive external work to move a positive charge against the electric field. The work done by the field is **negative** (we 'fight the field').

Question 2 **1 / 1 point**

What is the electric potential in point P at $(x,y) = (d/2,d/2)$ given three point charges q_1 = (-3.40x10^-9) C, q_2 = (-6.30x10^-9) C and q_3 = (-3.7x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.20x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-1.4x10^4 ✓ V ✓

▼ Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

All charges are at a distance

$$r = \sqrt{2}d/2 = d/\sqrt{2}$$

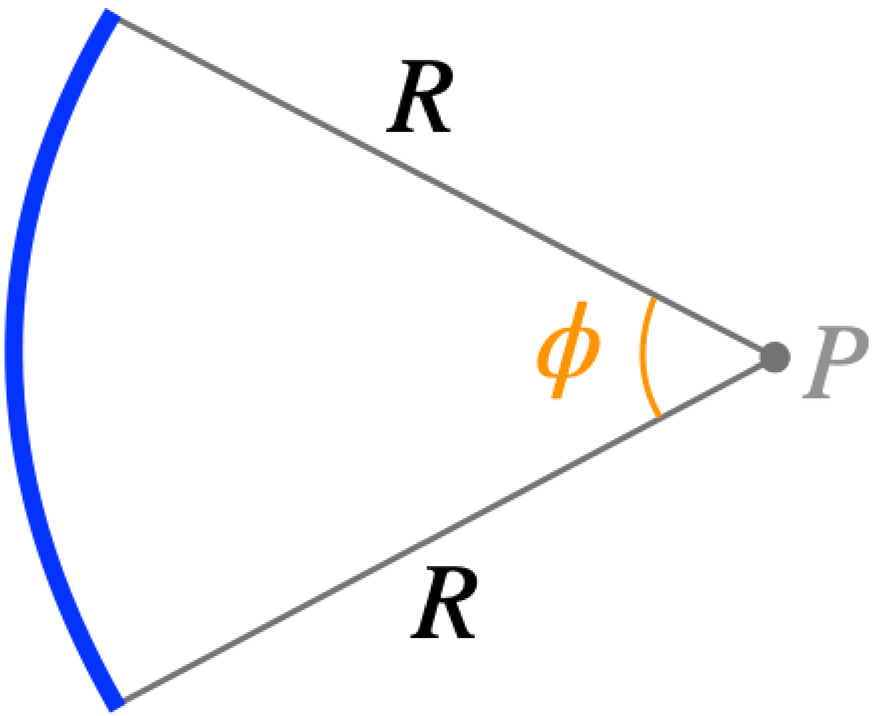
We hence get:

$$V = \frac{k\,q_1}{r} + \frac{k\,q_2}{r} + \frac{k\,q_3}{r} = \frac{k\,\sqrt{2}}{d}(q_1 + q_2 + q_3)$$

Question 3 **1 / 1 point**

Consider a charged arc segment with radius R = (1.10x10^-2) m and charge density λ = (-1.400x10^-6) C/m and a central angle ϕ = (3.0x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

-3.78x10^3 ✓ **(-3.8x10^3)** V ✓ ✗ wrong number of significant figures **(2)**

Hide Feedback

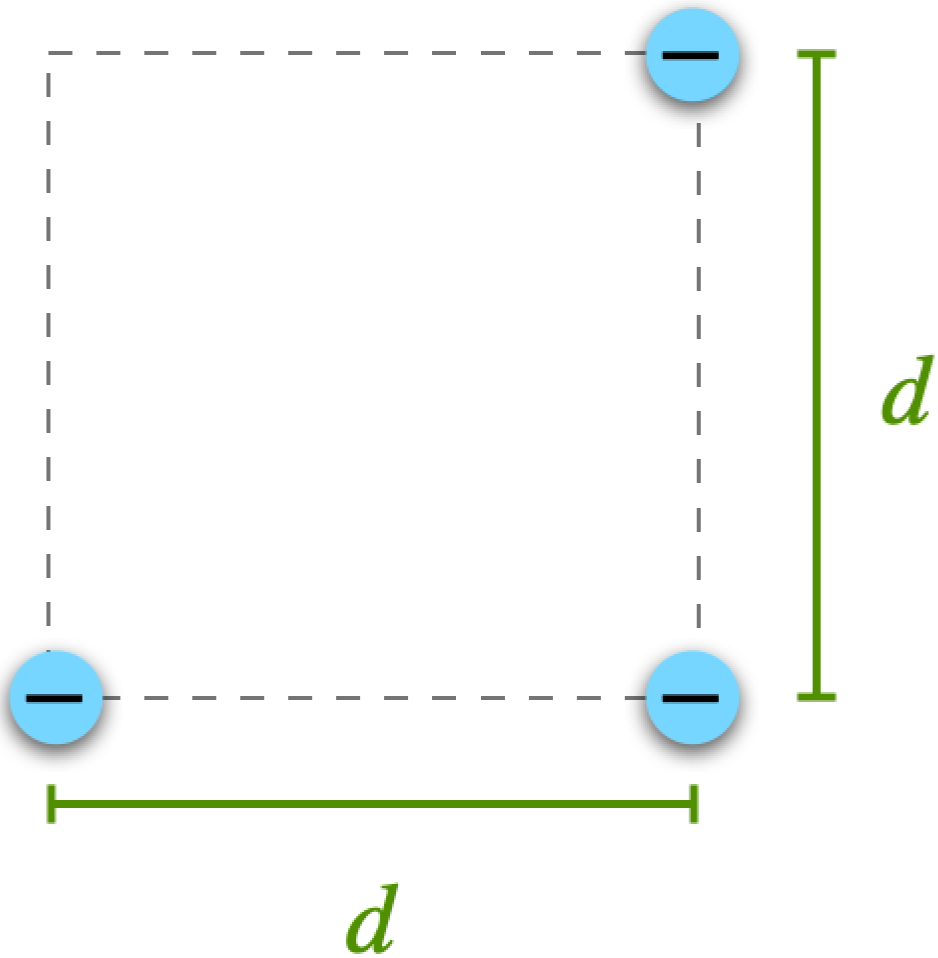
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **1 / 1 point**

Consider the system of 3 fixed negative charges q = (1.8x10^3) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (5.70x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

1.4x10^0 ✓ J ✓

▼ Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\, q_1 q_2}{r_{12}} + \frac{k\, q_2 q_3}{r_{23}} + \frac{k\, q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\, d$$

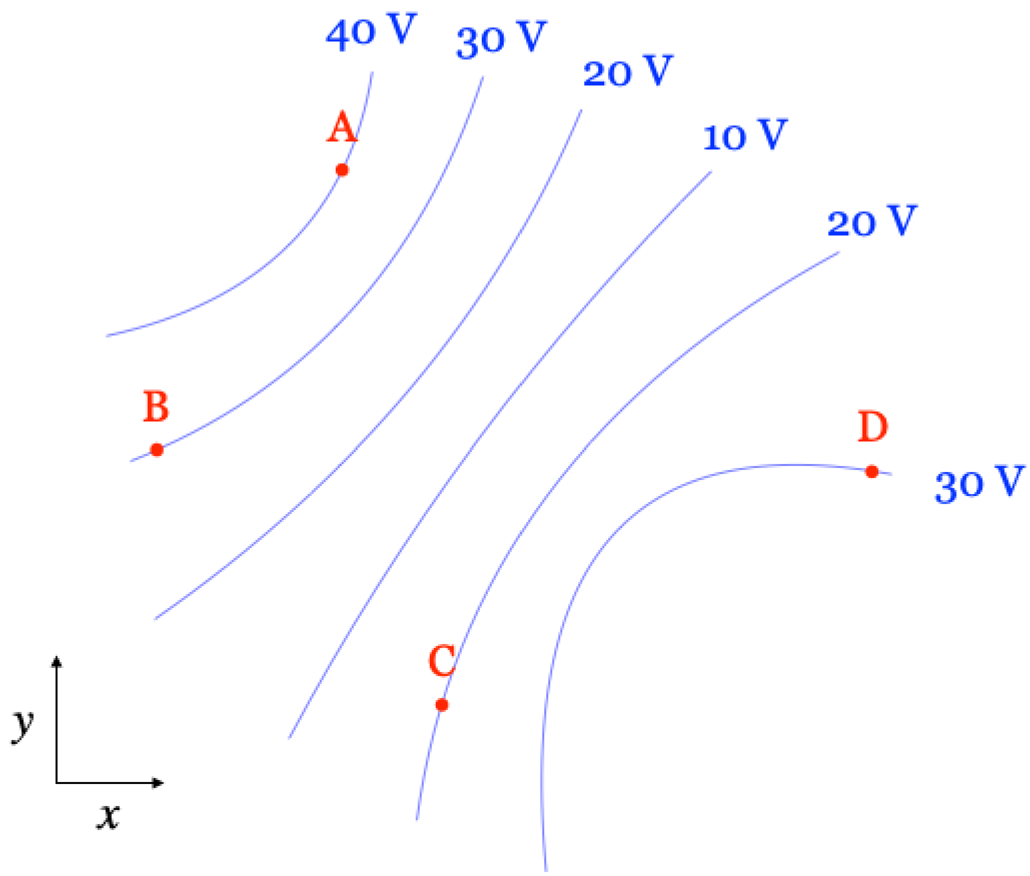
.

Question 5 **1 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(-9.4\hat{\imath} + 3.4\hat{\jmath}\right)\ \mathrm{V/m}$$



- Point A
- Point B
- ✓ Point C
- Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point C does this give a direction that is "mostly left and slightly up".

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 6

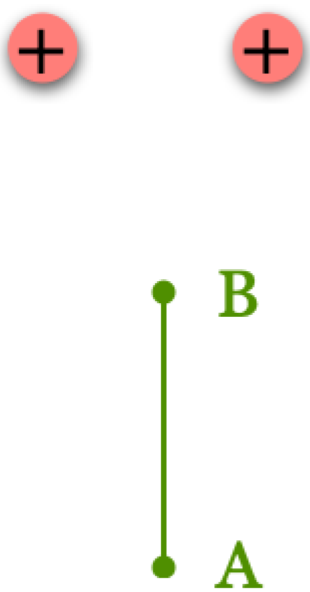
Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider an electron moving from point A to point B towards two positive charges as illustrated below.

Select all correct statements regarding the work involved for this action.



- [ ] Positive work is done by the electric field
- [ ] Negative work is done by the electric field
- [ ] External (positive) work needs to be applied

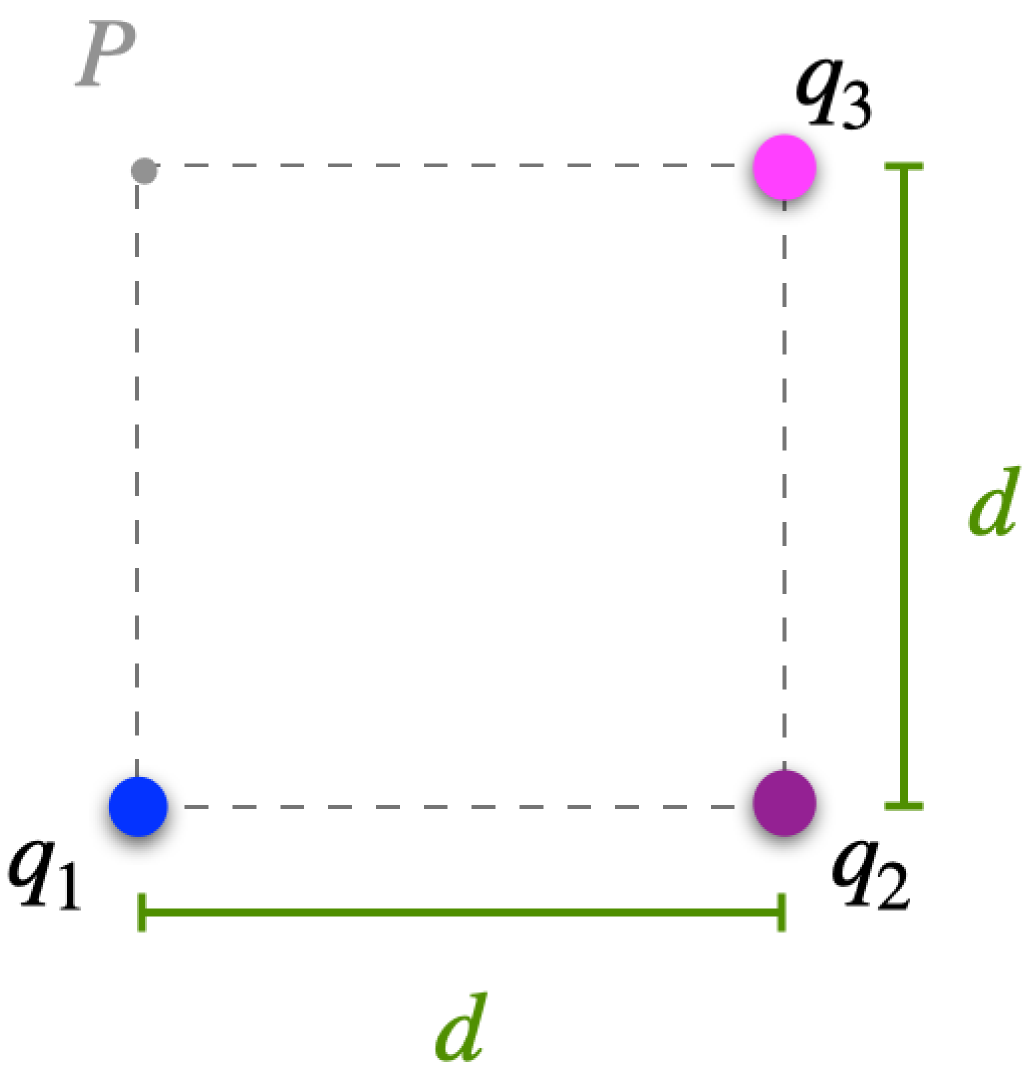
Hide Feedback

An electron is a negative charge. We do not need to apply positive external work to move a negative charge against the electric field towards two positive charges (that attract our charge). The work done by the field is **positive**. That is, the field with do the work without the need to apply an external force.

Question 2 **0 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (3.500x10^-9) C, q_2 = (-4.7x10^-8) C and q_3 = (1.80x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.60x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

❌ **(-1.6x10^4)** ❌ **(V)**

▼ Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **1 / 1 point**

Consider a thin charged ring with radius (3.7x10^1) cm and charge density (-7.60x10^1) μC/m located in the *x*-*y* plane centred at the origin (*x*,*y*) = (0,0).

What is the electric potential (9.000x10^1) cm right above the charged ring? That is at (*x*,*y*,*z*) = (0,0,(9.000x10^1)) cm?

Provide your answer in volts (V) using proper scientific notation.

Answer:

-1.59x10^6 ✔ **(-1.6x10^6)** V ✔ ❌ wrong number of significant figures **(2)**

▼ Hide Feedback

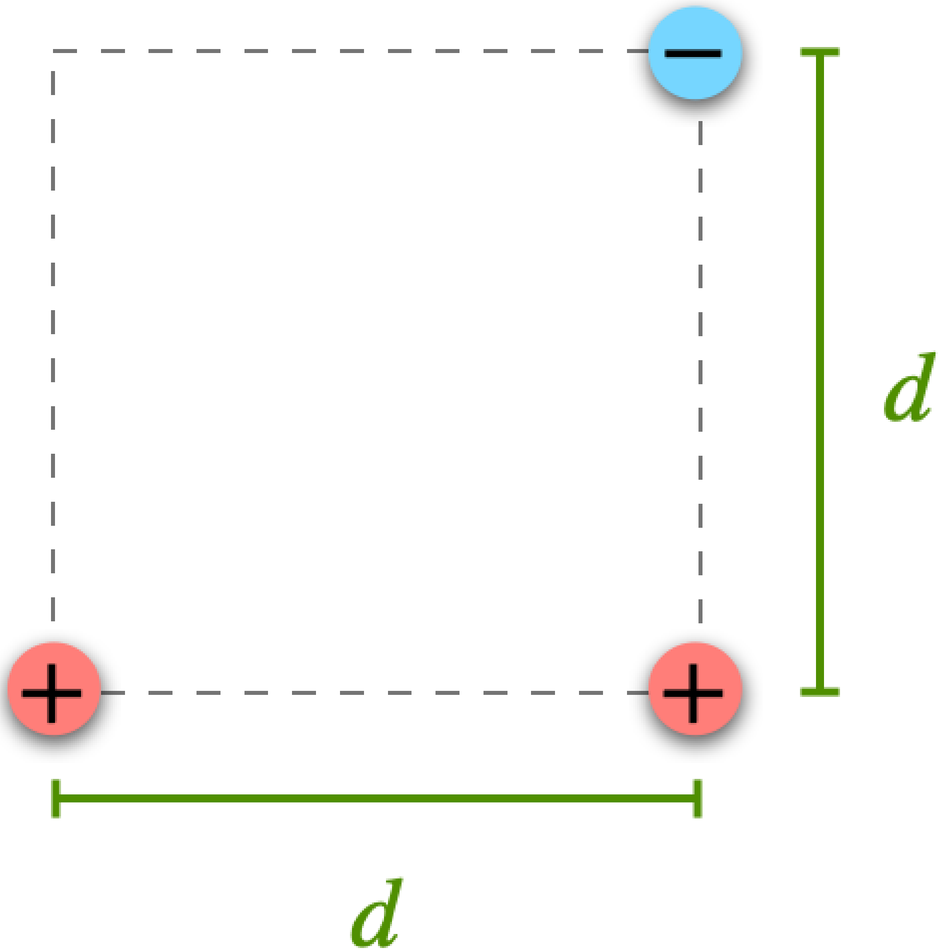
The electric potential for a continuous charge distribution is given by an integral. This does not become too complicated here since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{r} = [dq = \lambda\,ds = \lambda\,R\,d\theta] = \frac{k\,\lambda\,R}{\sqrt{z^2 + R^2}} \int_0^{2\pi} d\theta = \frac{2\pi\,k\,\lambda\,R}{\sqrt{z^2 + R^2}}$$

Question 4 **1 / 1 point**

Consider the system of 3 fixed charges of absolute magnitude $|q|$ = (3.20x10^2) nC, placed as specified in the figure. The (x,y) coordinates of the two postivie charges are (0,0), $(0,d)$ and the negative charge is at (d,d), with the distance d = (9.3x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

-7.0x10^-3 ✓ J ✓

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case, two of the terms cancel, and we are left only by

$$U_{123} = -\frac{k|q|^2}{\sqrt{2}\,d}$$

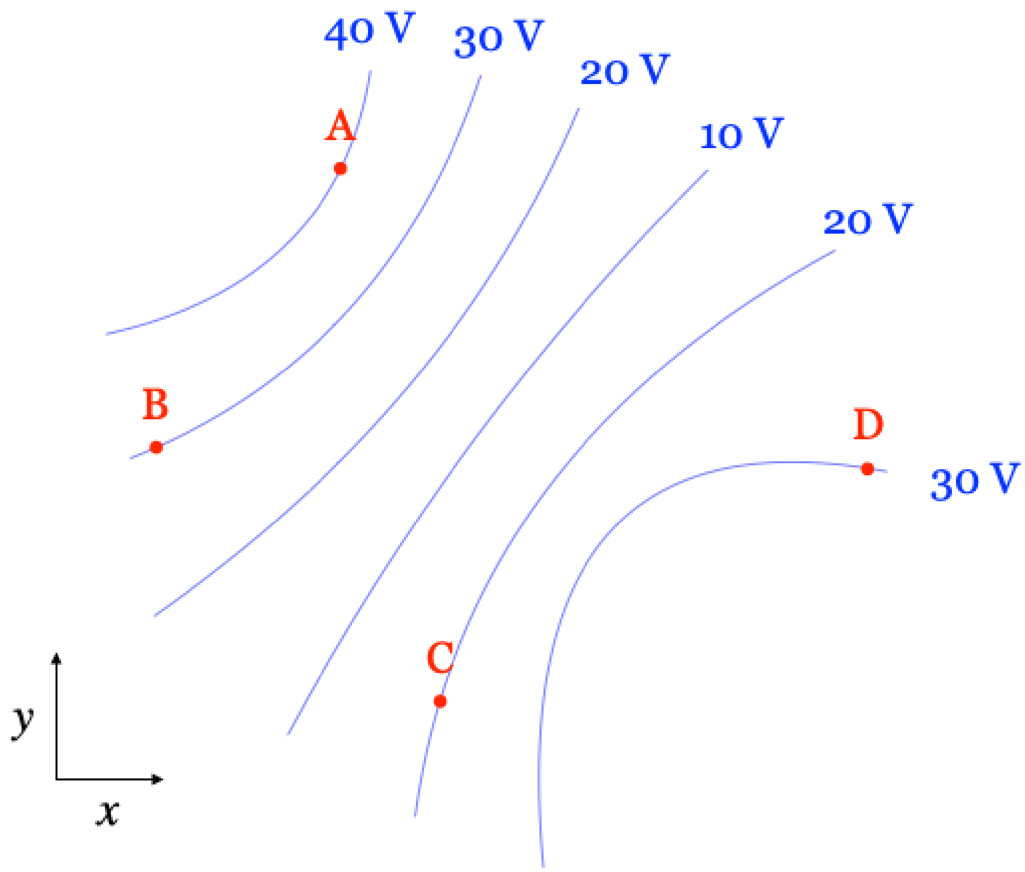
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(3.5\hat{\imath} - 9.4\hat{\jmath}\right)\ \mathrm{V/m}$$



- Point A
- Point B
- Point C
- Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point B does this give a direction that is "mostly down and slightly to the right".

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 6

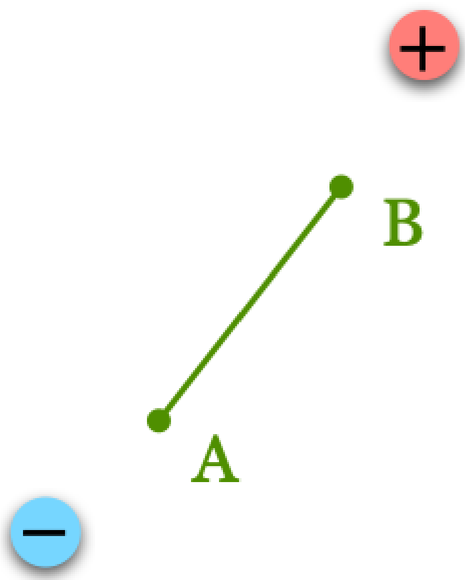
Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider an electron moving from point A to point B towards a positive charge away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- [ ] Positive work is done by the electric field
- [ ] Negative work is done by the electric field
- [ ] External (positive) work needs to be applied

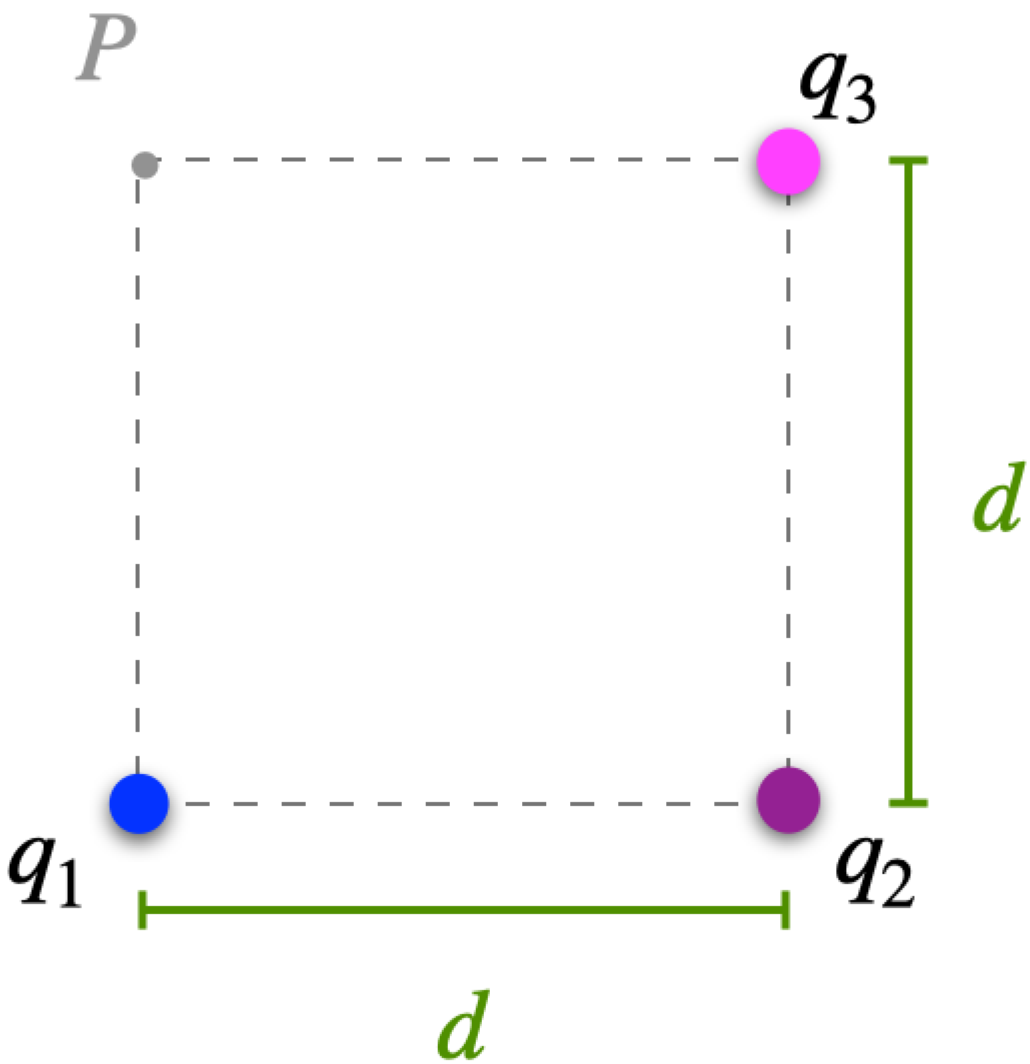
▼ Hide Feedback

An electron has a negative charge. We do not need to apply positive external work to move a negative charge against the electric field lines. The work done by the field is **positive**.

Question 2 **0 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (2.10x10^-9) C, q_2 = (-8.800x10^-8) C and q_3 = (2.6x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.40x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-4.42x10^4 ✗ **(-3.7x10^4)** V ✓

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

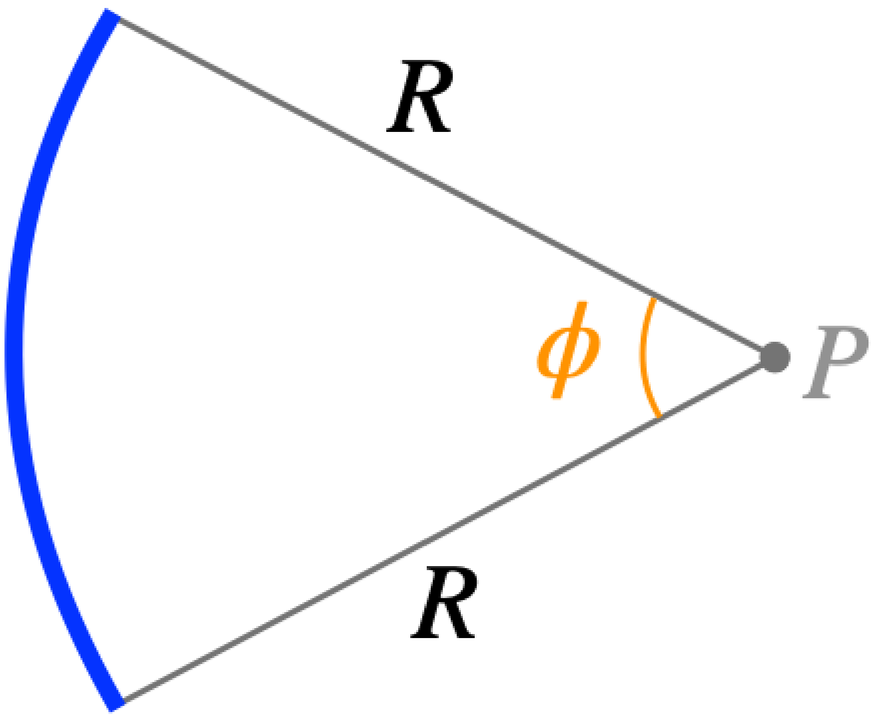
We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **1 / 1 point**

Consider a charged arc segment with radius R = (5.2x10^-2) m and charge density λ = (-4.500x10^-6) C/m and a central angle ϕ = (7.90x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

-3.20x10^4 ✔ **(-3.2x10^4)** V ✔ ✘ wrong number of significant figures **(2)**

▼ Hide Feedback

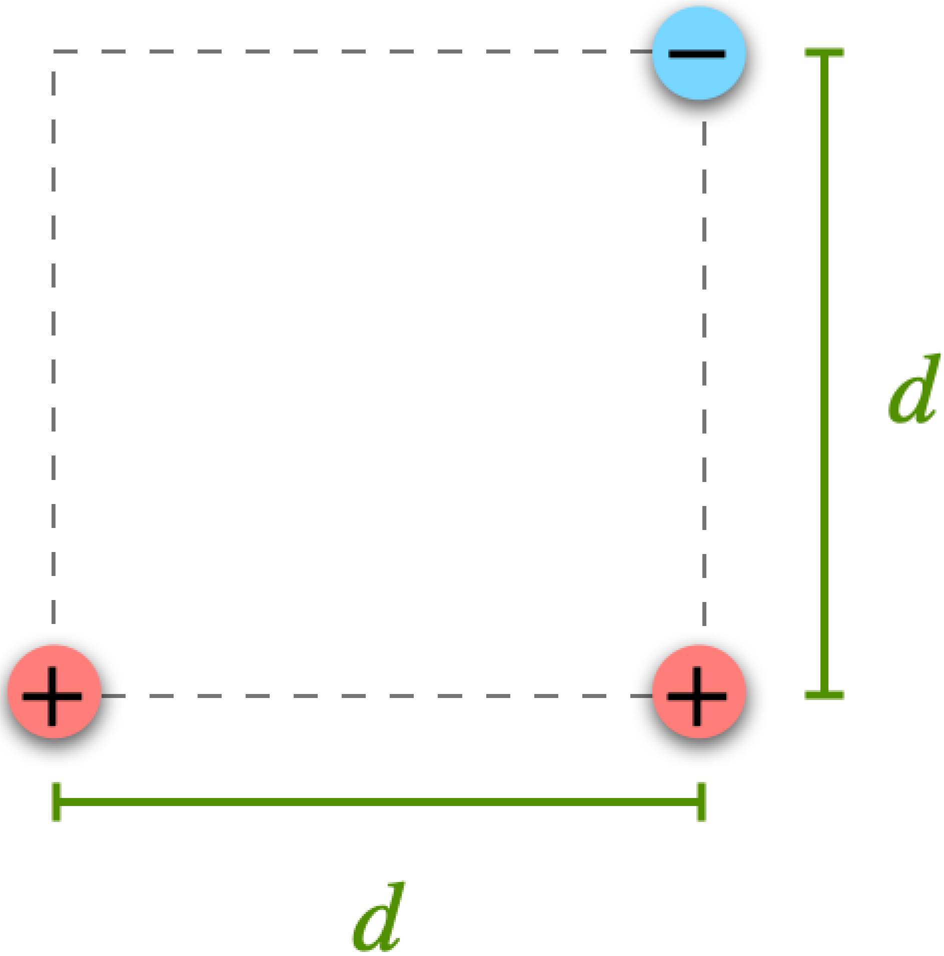
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed charges of absolute magnitude |*q*| = (1.050x10^3) nC, placed as specified in the figure. The (*x*,*y*) coordinates of the two postivie charges are (0,0), (0,*d*) and the negative charge is at (*d*,*d*), with the distance *d* = (1.5x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

7.48x10^-1 **(-4.7x10^-1)** J

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case, two of the terms cancel, and we are left only by

$$U_{123} = -\frac{k|q|^2}{\sqrt{2}\,d}$$

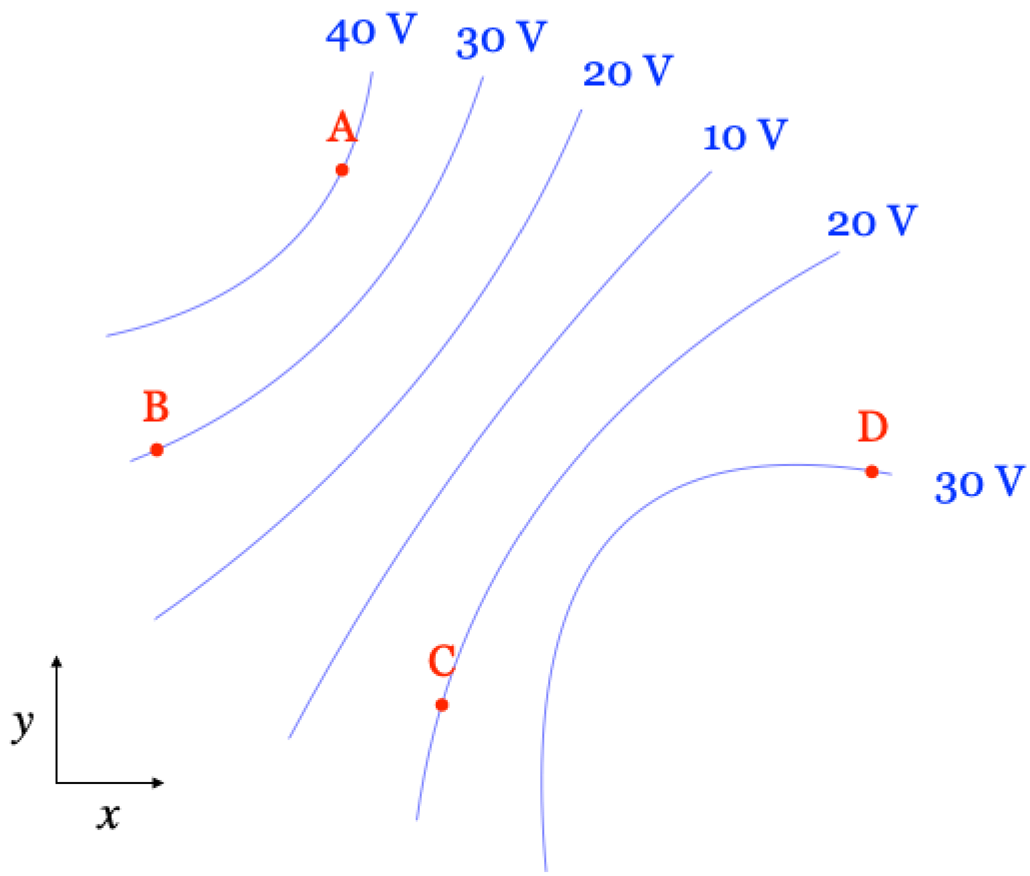
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(3.5\hat{\imath} - 9.4\hat{\jmath}\right)\ \mathrm{V/m}$$



- Point A
- Point B
- Point C
- Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point B does this give a direction that is "mostly down and slightly to the right".

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 6

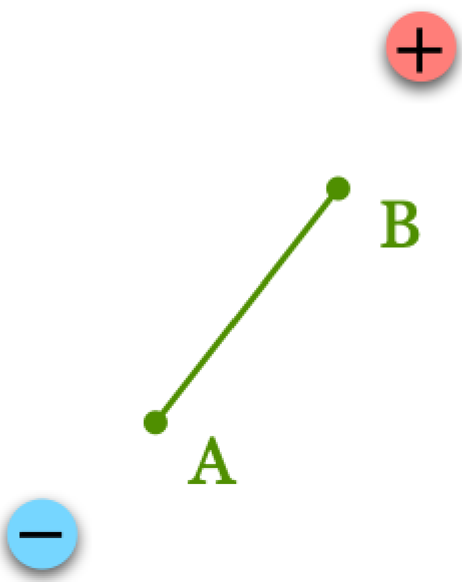
Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider a proton moving from point A to point B towards a positive charge and away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- [ ] Positive work is done by the field
- [ ] Negative work is done by the field
- [ ] External (positive) work needs to be applied

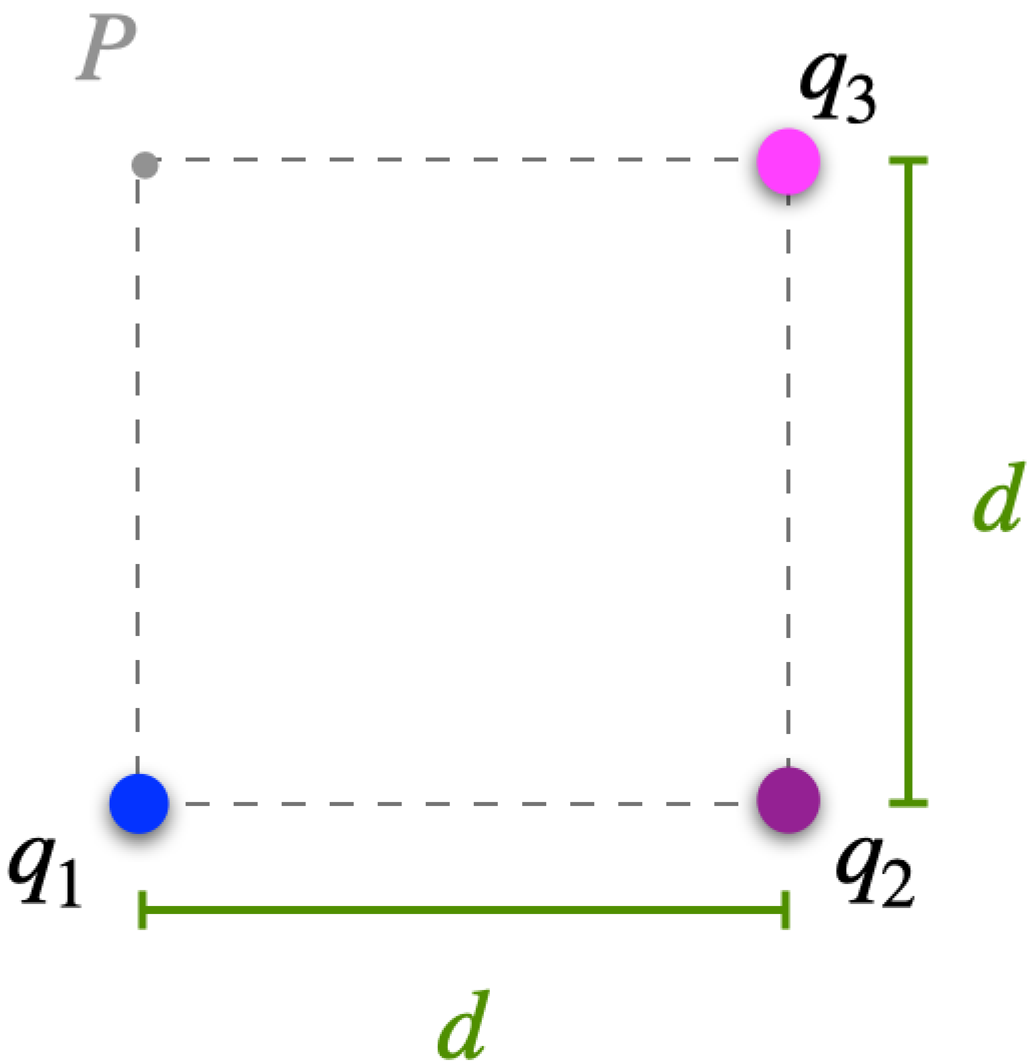
Hide Feedback

A proton is a positive charge. We need to apply positive external work to move a positive charge against the electric field. The work done by the field is **negative** (we 'fight the field').

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (3.600x10^-9) C, q_2 = (-5.30x10^-8) C and q_3 = (-3.50x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (2.3x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-1.46x10^4 ✔ **(-1.5x10^4)** V ✔ ✘ wrong number of significant figures **(2)**

▼ Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **0 / 1 point**

Consider a thin charged ring with radius (5.20x10^1) cm and charge density (-8.7x10^1) µC/m located in the *x*-*y* plane centred at the origin (*x*,*y*) = (0,0).

What is the electric potential (5.900x10^1) cm right above the charged ring? That is at (*x*,*y*,*z*) = (0,0,(5.900x10^1)) cm?

Provide your answer in volts (V) using proper scientific notation.

Answer:

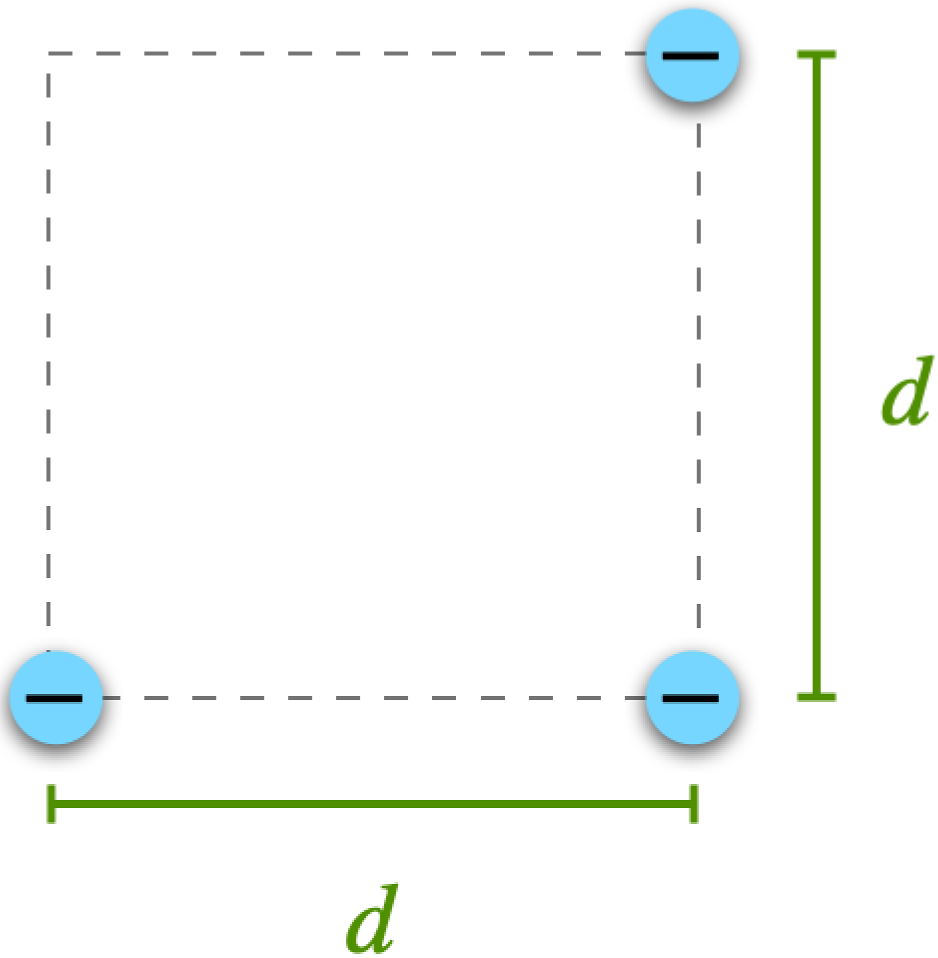
-9.66x10^5 ✘ **(-3.2x10^6)** V ✔

▷ View Feedback

Question 4 **1 / 1 point**

Consider the system of 3 fixed negative charges q = (1.480x10^3) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (8.3x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

6.42x10^-1 ✔ **(6.4x10^-1)** J ✔ ✘ wrong number of significant figures **(2)**

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\,d$$

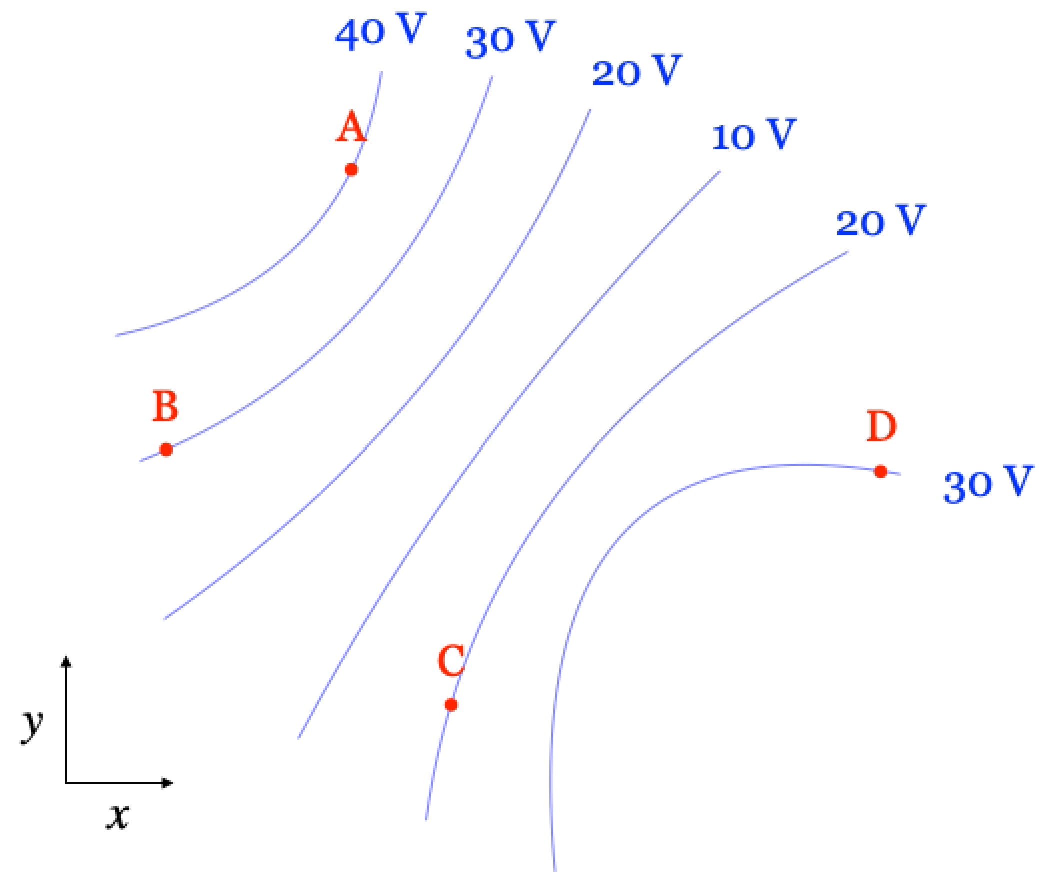
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(2.4\hat{\imath} + 19\hat{\jmath}\right)\ \mathrm{V/m}$$



- ◯ Point A
- ✗ ◯ Point B
- ◯ Point C
- ➡ ◯ Point D

Hide Feedback

The electric field has a direction from high to low potential, and is **perpendicular** to the equipotential surface lines. Only for point D does this give a direction that is "mostly up and very slightly to the right".

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 6

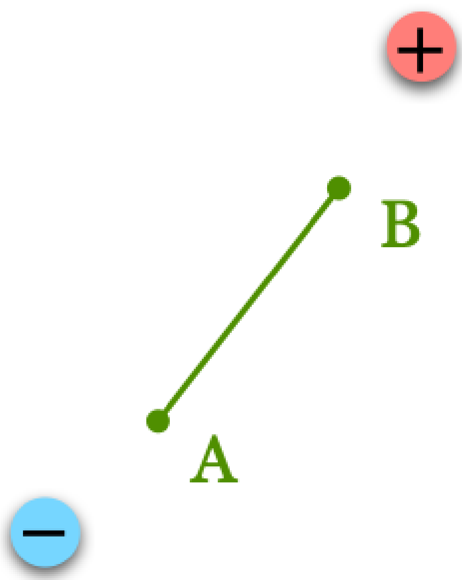
Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider an electron moving from point A to point B towards a positive charge away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- ✔ ☐ Positive work is done by the electric field
- ✔ ☐ Negative work is done by the electric field
- ✘ ☐ External (positive) work needs to be applied

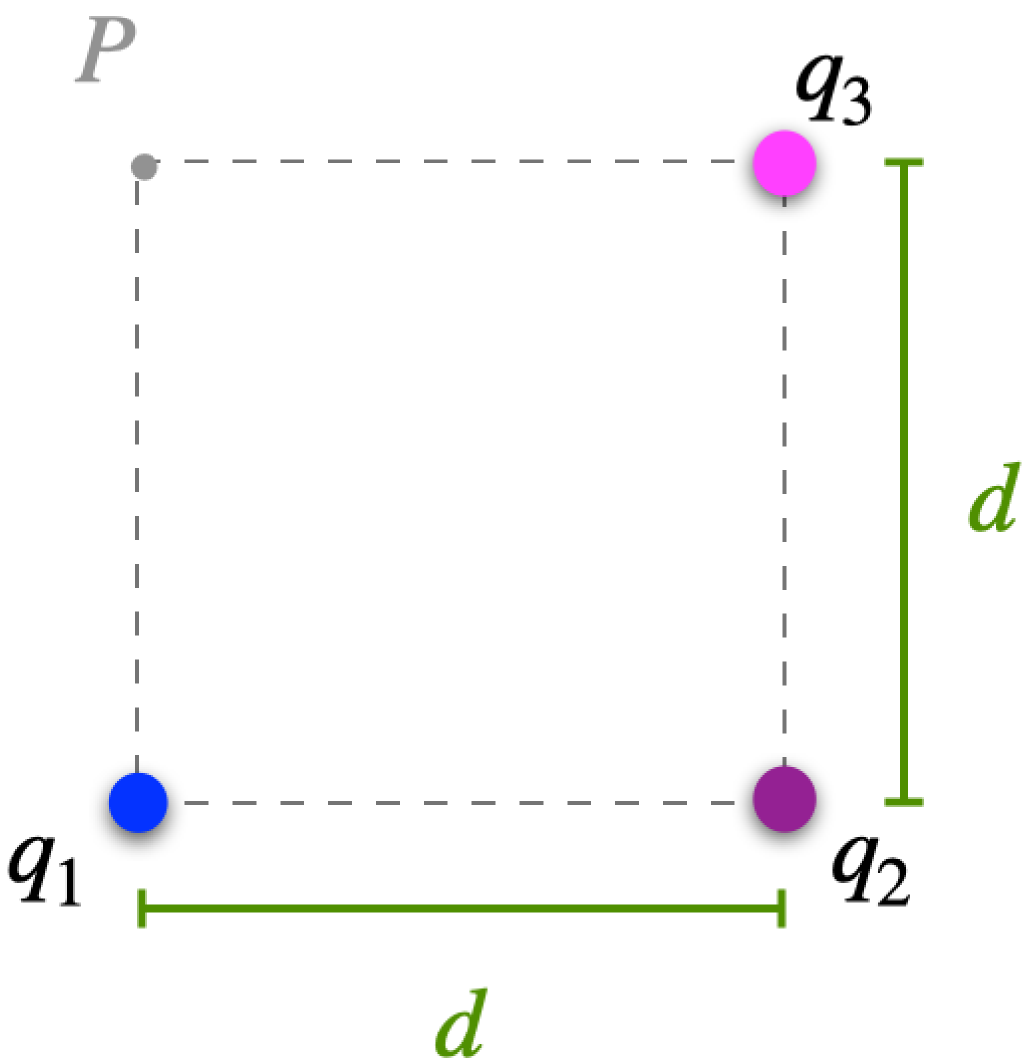
▼ Hide Feedback

An electron has a negative charge. We do not need to apply positive external work to move a negative charge against the electric field lines. The work done by the field is **positive**.

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (2.400x10^-9) C, q_2 = (-7.1x10^-8) C and q_3 = (4.300x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.500x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-2.61x10^4 ✔ **(-2.6x10^4)** V ✔ ✖ wrong number of significant figures **(2)**

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **0 / 1 point**

Consider a thin charged ring with radius (3.0x10^1) cm and charge density (6.300x10^1) µC/m located in the *x-y* plane centred at the origin (*x*,*y*) = (0,0).

What is the electric potential (8.700x10^1) cm right above the charged ring? That is at (*x*,*y*,*z*) = (0,0,(8.700x10^1)) cm?

Provide your answer in volts (V) using proper scientific notation.

Answer:

✖ **(1.2x10^6)** ✖ **(V)**

Hide Feedback

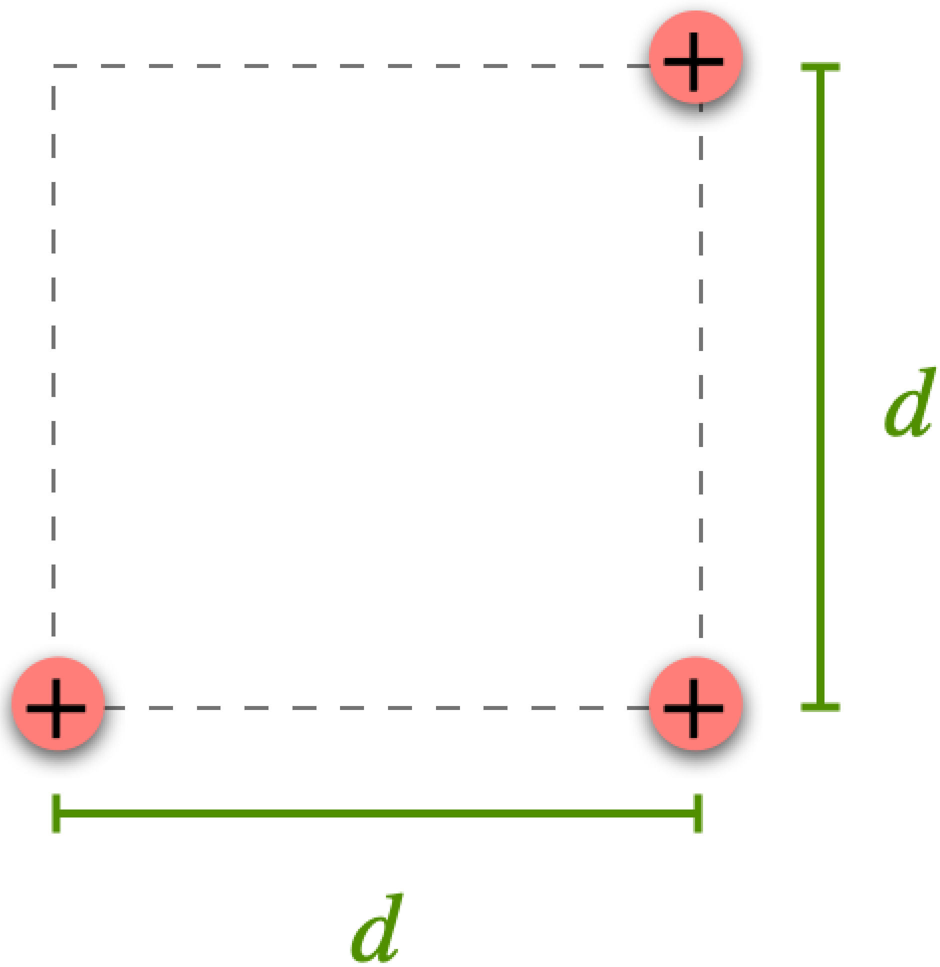
The electric potential for a continuous charge distribution is given by an integral. This does not become too complicated here since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{r} = [dq = \lambda\,ds = \lambda\,R\,d\theta] = \frac{k\,\lambda\,R}{\sqrt{z^2+R^2}} \int_0^{2\pi} d\theta = \frac{2\pi\,k\,\lambda\,R}{\sqrt{z^2+R^2}}$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed positive charges q = (9.000x10^2) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (9.0x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

✗ **(2.2x10^-1)** J ✓

▼ Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\,d$$

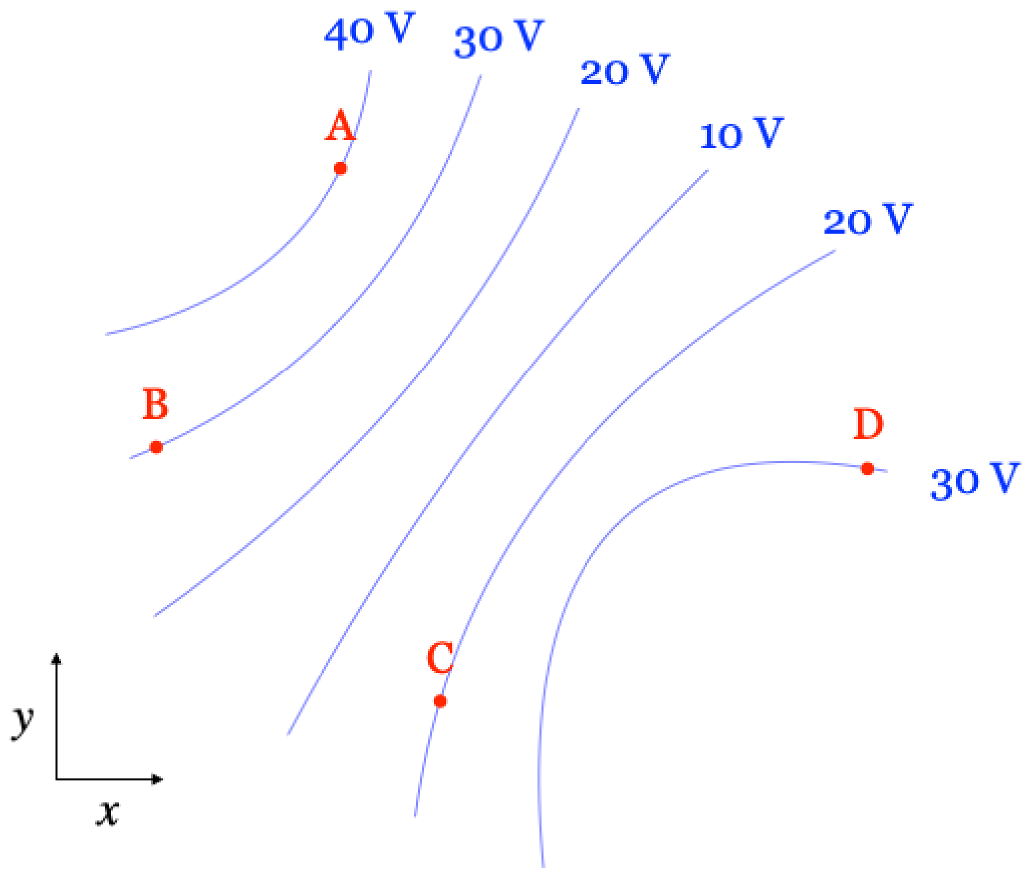
.

Question 5 **1 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(-9.4\hat{\imath} + 3.4\hat{\jmath}\right)\ \mathrm{V/m}$$



- ◯ Point A
- ◯ Point B
- ✔◯ Point C
- ◯ Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point C does this give a direction that is "mostly left and slightly up".

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 6

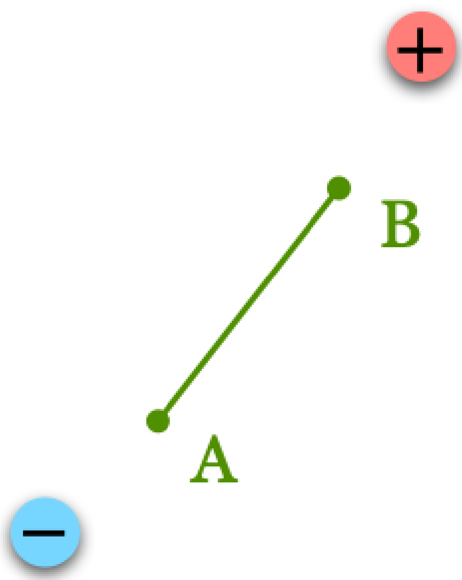
Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider an electron moving from point A to point B towards a positive charge away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- ✔ ☐ Positive work is done by the electric field
- ✔ ☐ Negative work is done by the electric field
- ✔ ☐ External (positive) work needs to be applied

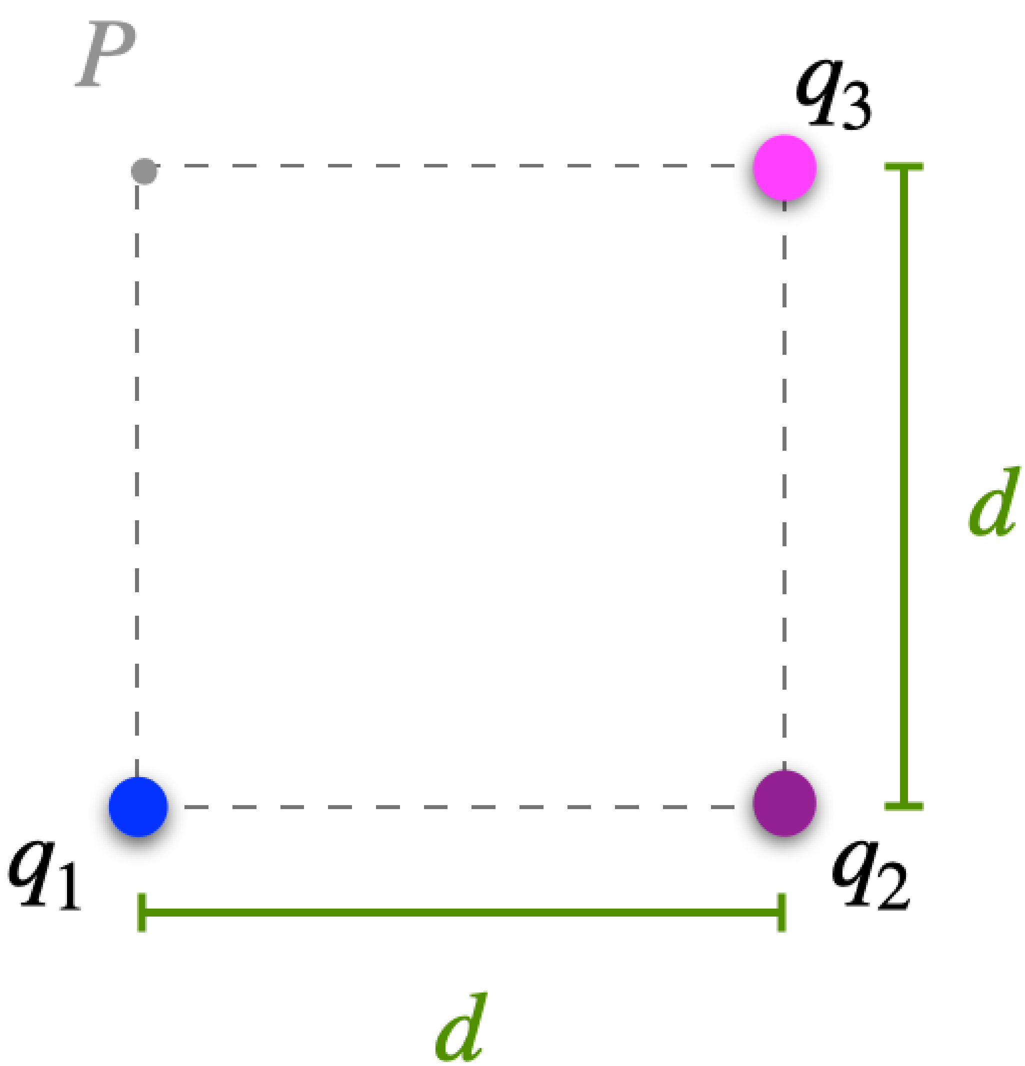
▼ Hide Feedback

An electron has a negative charge. We do not need to apply positive external work to move a negative charge against the electric field lines. The work done by the field is **positive**.

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (3.70x10^-9) C, q_2 = (-6.50x10^-8) C and q_3 = (1.2x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (2.00x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-1.8x10^4 ✔ V ✔

▼ Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **1 / 1 point**

Consider a thin charged ring with radius (3.8x10^1) cm and charge density (-5.40x10^1) µC/m located in the *x-y* plane centred at the origin (*x*,*y*) = (0,0).

What is the electric potential (6.000x10^1) cm right above the charged ring? That is at (*x*,*y*,*z*) = (0,0,(6.000x10^1)) cm?

Provide your answer in volts (V) using proper scientific notation.

Answer:

-1.6x10^6 ✔ V ✔

▼ Hide Feedback

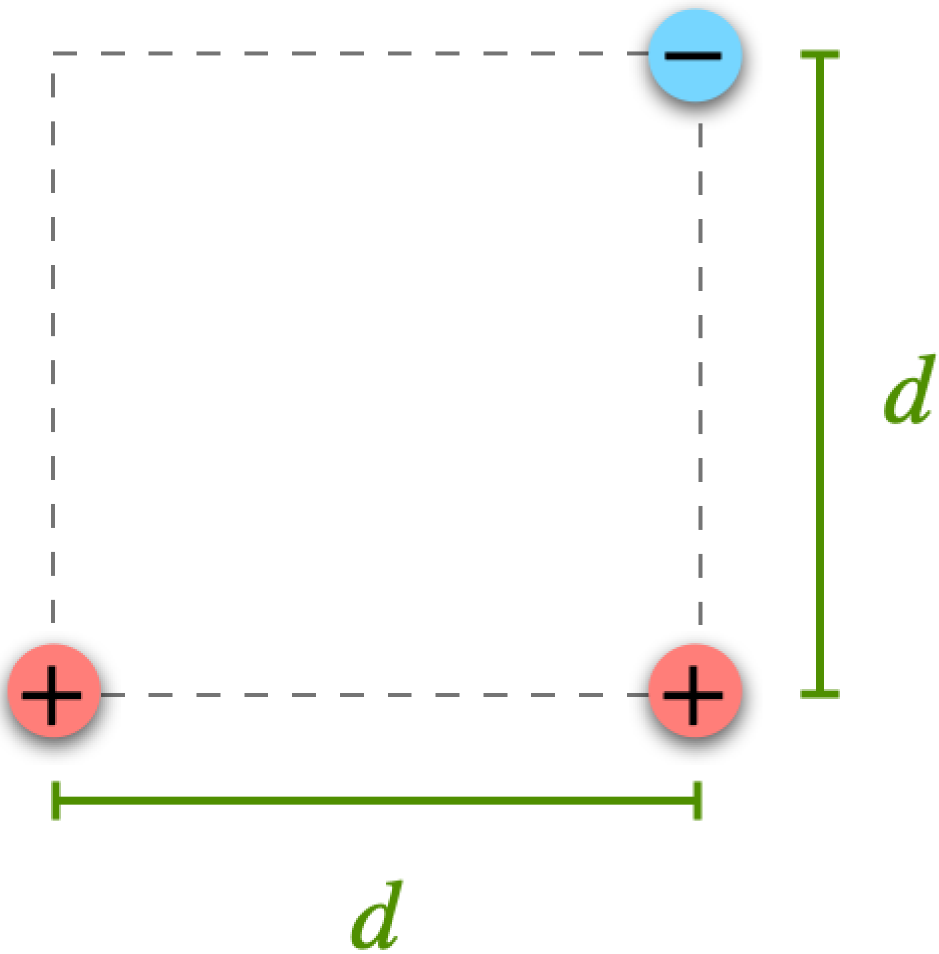
The electric potential for a continuous charge distribution is given by an integral. This does not become too complicated here since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{r} = [dq = \lambda\,ds = \lambda\,R\,d\theta] = \frac{k\,\lambda\,R}{\sqrt{z^2+R^2}} \int_0^{2\pi} d\theta = \frac{2\pi\,k\,\lambda\,R}{\sqrt{z^2+R^2}}$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed charges of absolute magnitude $|q|$ = (1.220x10^3) nC, placed as specified in the figure. The (x,y) coordinates of the two postivie charges are (0,0), (0,d) and the negative charge is at (d,d), with the distance d = (7.2x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

4.4x10^5 **(-1.3x10^-1)** J

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case, two of the terms cancel, and we are left only by

$$U_{123} = -\frac{k|q|^2}{\sqrt{2}\,d}$$

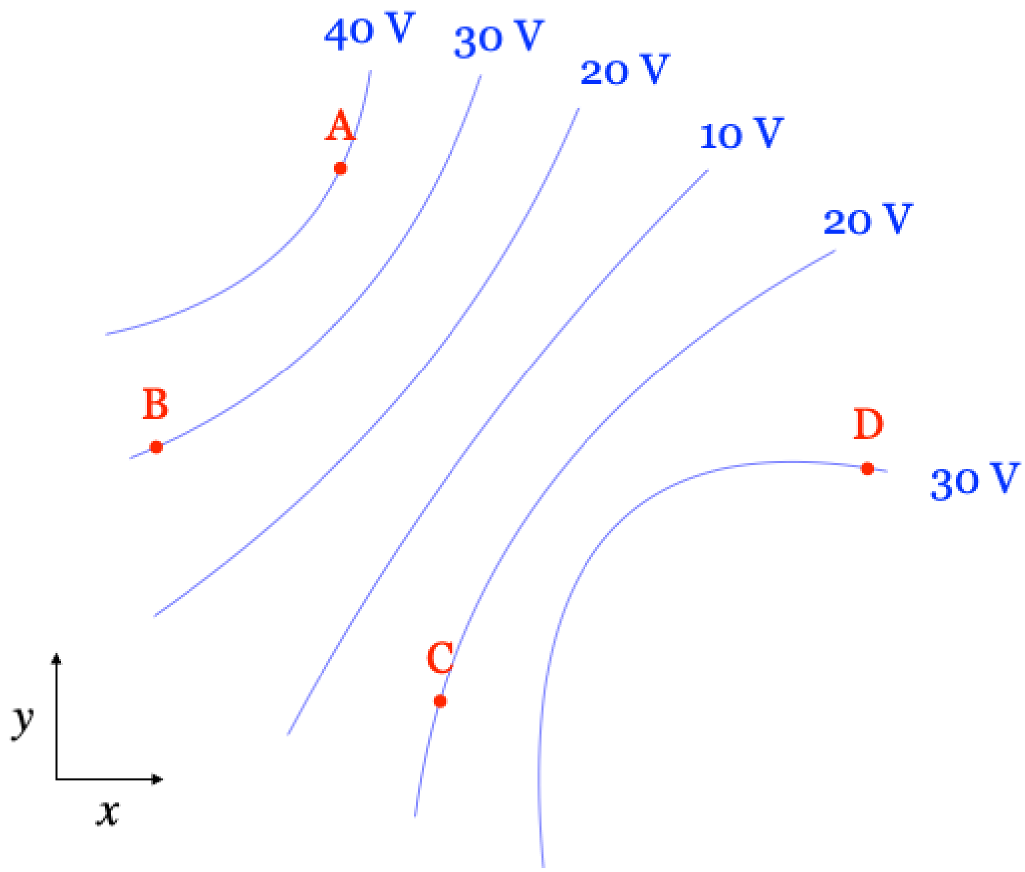
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(2.4\hat{\imath} + 19\hat{\jmath}\right)\ \text{V/m}$$



- Point A
- Point B
- ✗ Point C
- ➡ Point D

Hide Feedback

The electric field has a direction from high to low potential, and is **perpendicular** to the equipotential surface lines. Only for point D does this give a direction that is "mostly up and very slightly to the right".

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 6

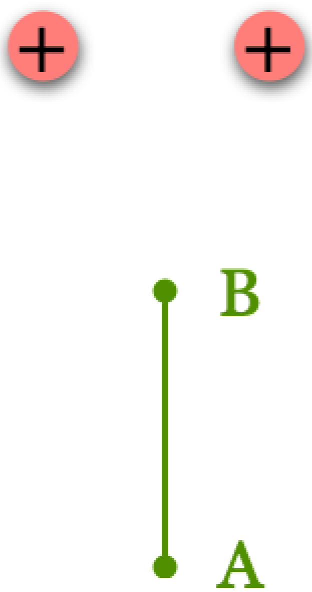
Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider an electron moving from point A to point B towards two positive charges as illustrated below.

Select all correct statements regarding the work involved for this action.



- [ ] Positive work is done by the electric field
- [ ] Negative work is done by the electric field
- [ ] External (positive) work needs to be applied

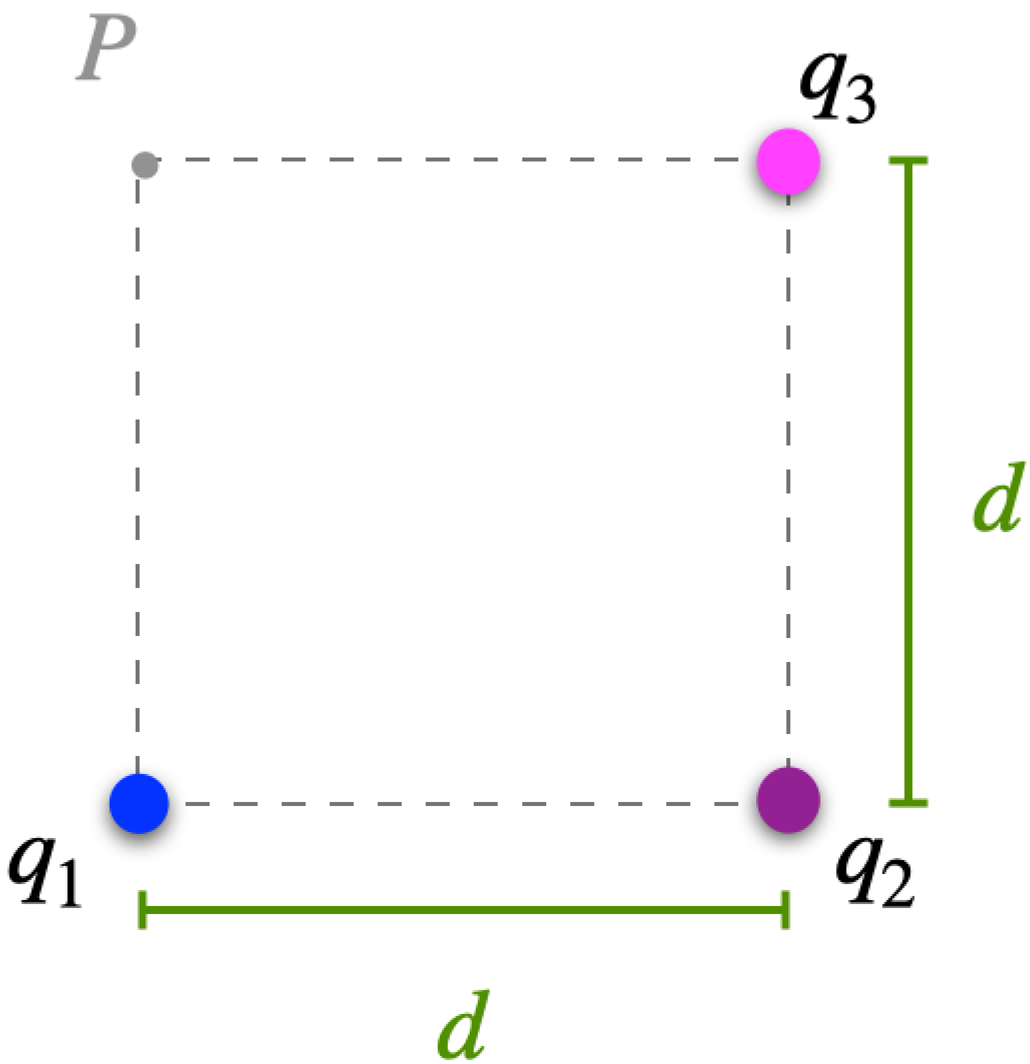
Hide Feedback

An electron is a negative charge. We do not need to apply positive external work to move a negative charge against the electric field towards two positive charges (that attract our charge). The work done by the field is **positive**. That is, the field with do the work without the need to apply an external force.

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (4.00x10^-9) C, q_2 = (-3.600x10^-8) C and q_3 = (-1.7x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.100x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-1.9x10^4 ✔ V ✔

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

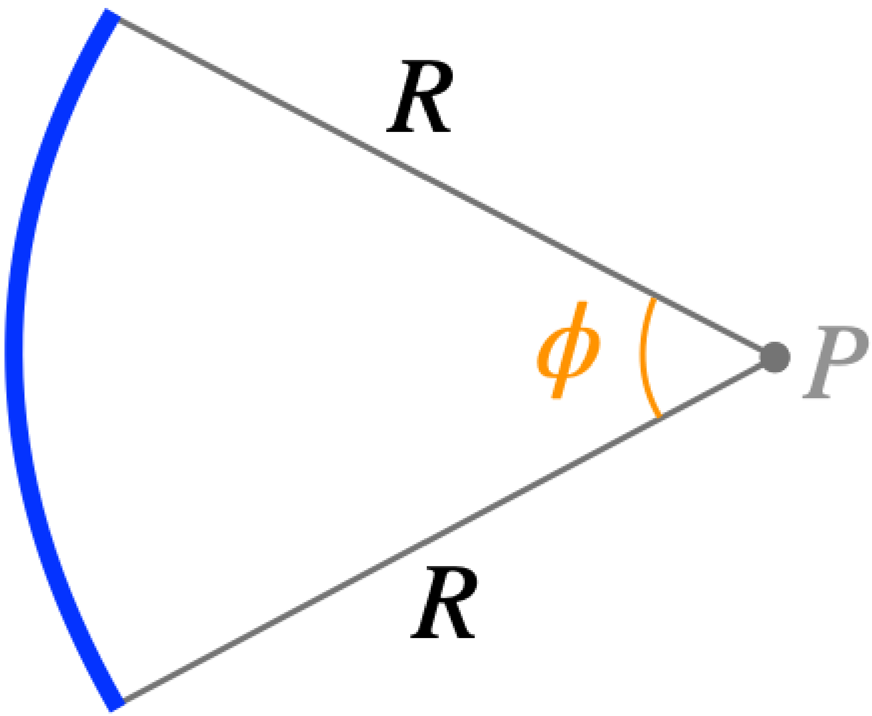
We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **1 / 1 point**

Consider a charged arc segment with radius R = (3.3x10^-2) m and charge density λ = (1.20x10^-6) C/m and a central angle ϕ = (2.500x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

2.7x10^3 ✓ V ✓

Hide Feedback

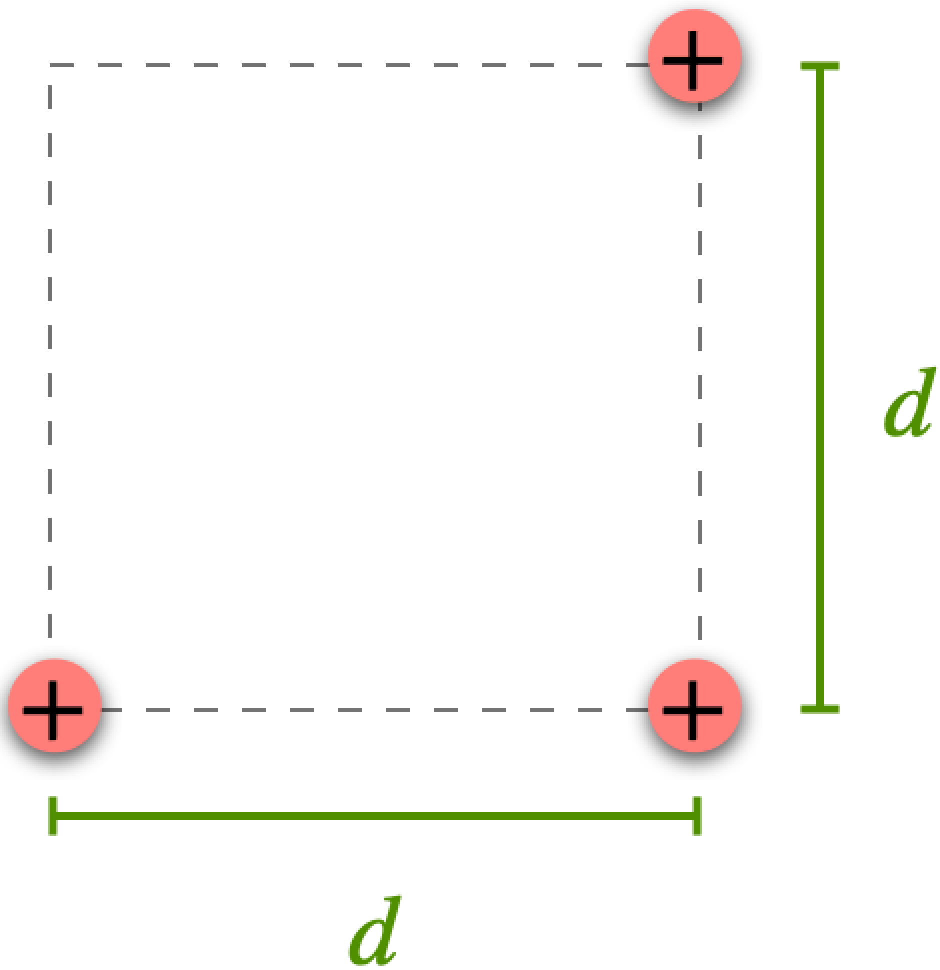
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **1 / 1 point**

Consider the system of 3 fixed positive charges q = (1.5x10^3) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), $(0,d)$ and (d,d), with the distance d = (7.30x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

7.5x10^-1 ✓ J ✓

▼ Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\,d$$

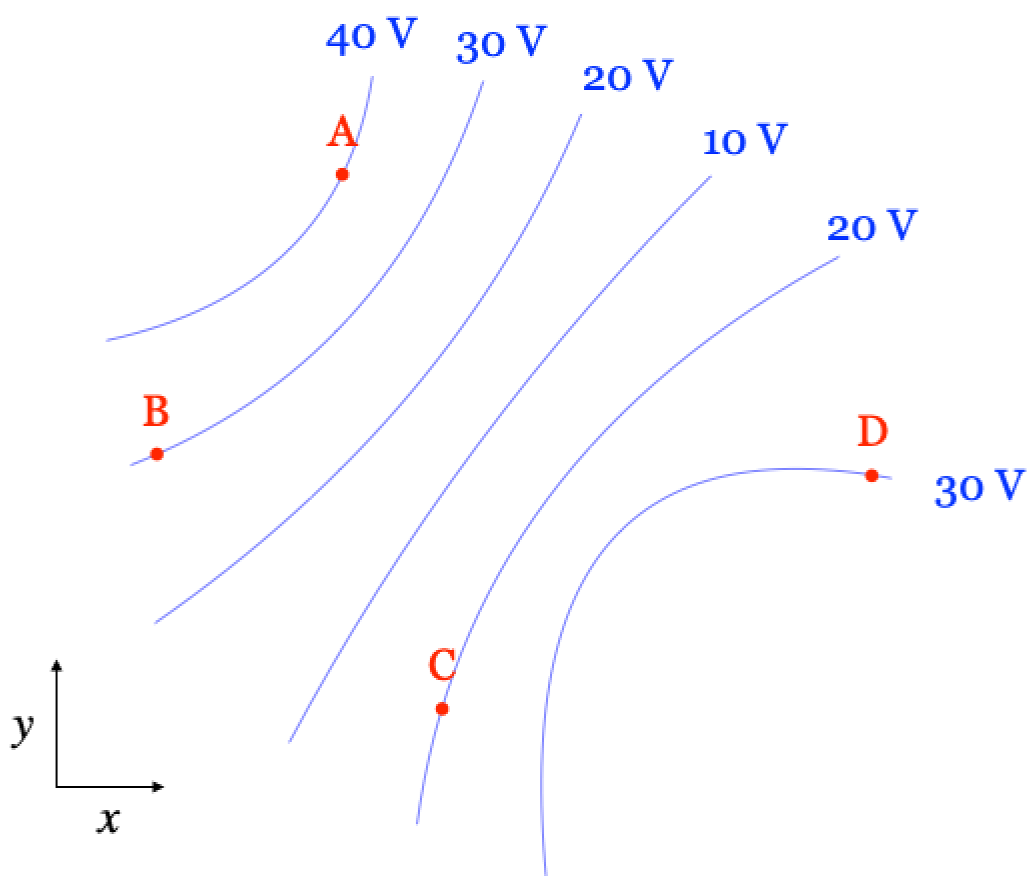
.

Question 5 **1 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = (10.5\hat{\imath} - 3.8\hat{\jmath})\ \mathrm{V/m}$$



- [x] Point A
- [ ] Point B
- [ ] Point C
- [ ] Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point A does this give a direction that is "to the right and slightly down".

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 6

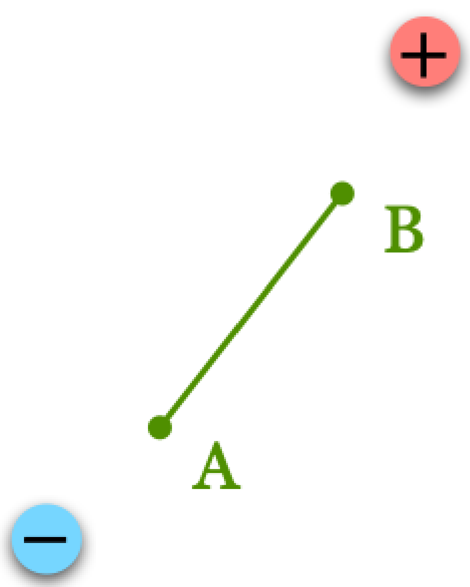
Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider a proton moving from point A to point B towards a positive charge and away from a negative one as illustrated below.

Select all correct statements regarding the associated work.



- ✔ ☐ Positive work is done by the field
- ✔ ☐ Negative work is done by the field
- ✔ ☐ External (positive) work needs to be applied

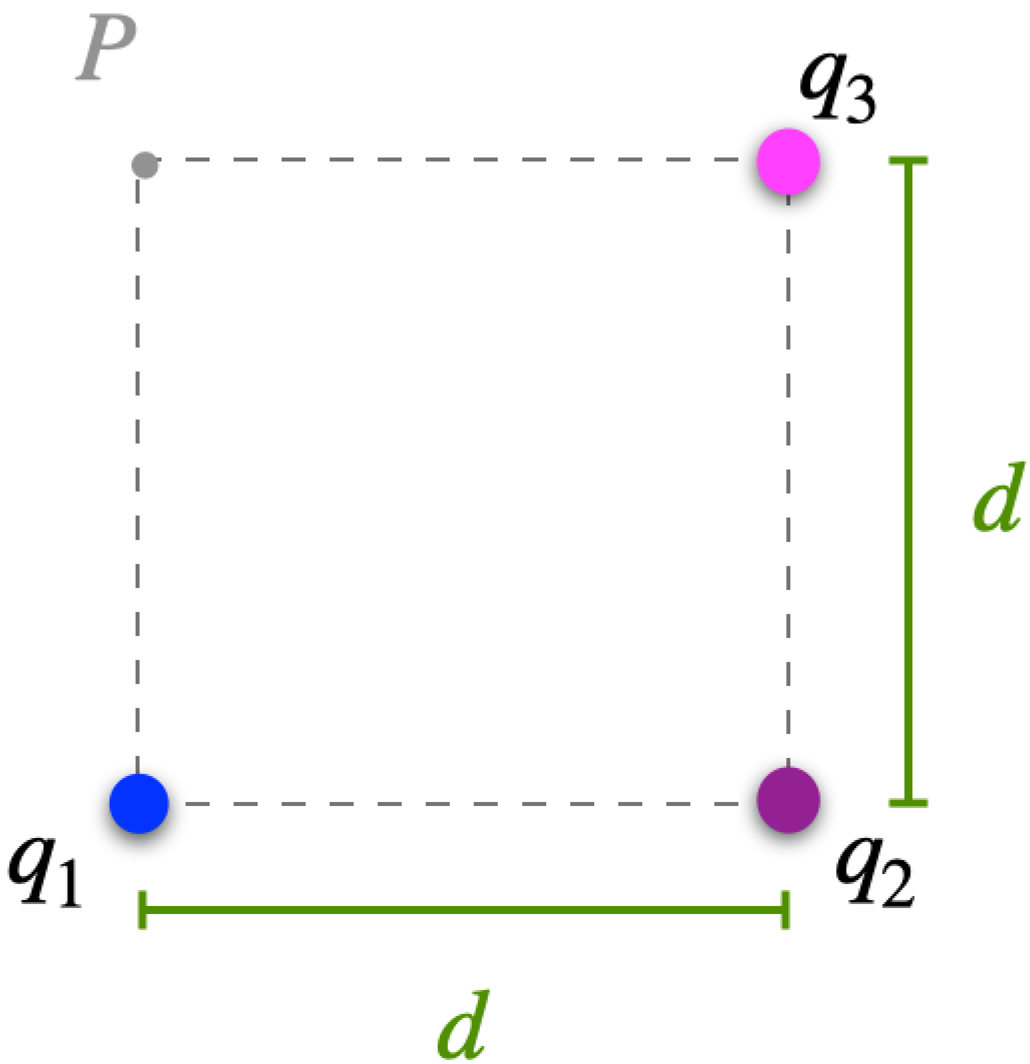
▼ Hide Feedback

A proton is a positive charge. We need to apply positive external work to move a positive charge against the electric field. The work done by the field is **negative** (we 'fight the field').

Question 2 **0 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (1.900x10^-9) C, q_2 = (-4.10x10^-8) C and q_3 = (-2.300x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.5x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

(-1.8x10^4) (V)

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

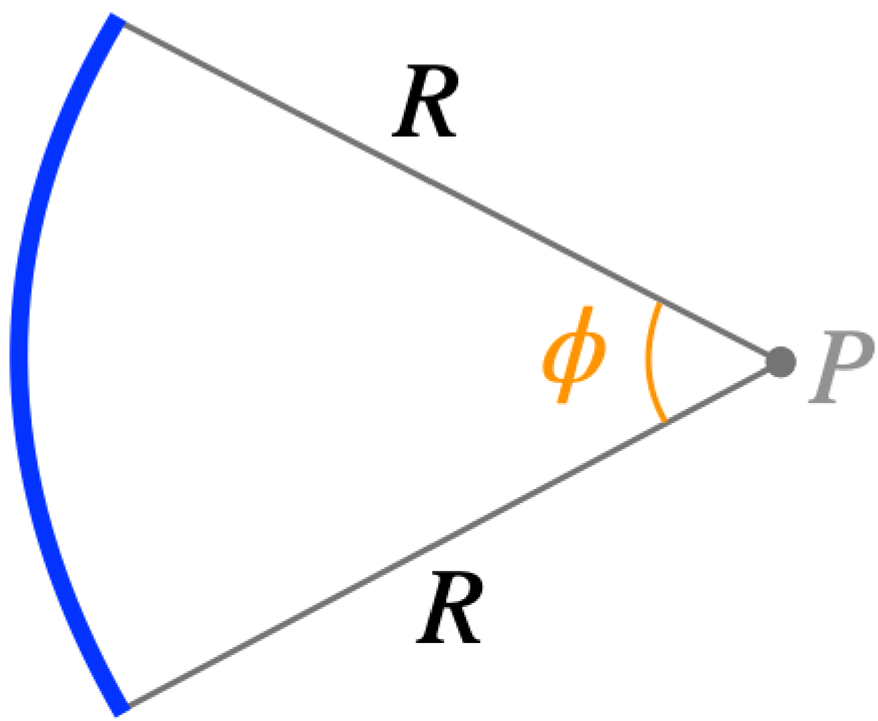
We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **0 / 1 point**

Consider a charged arc segment with radius R = (4.8x10^-2) m and charge density λ = (2.700x10^-6) C/m and a central angle ϕ = (8.10x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

✗ (2.0x10^4) ✗ (V)

▼ Hide Feedback

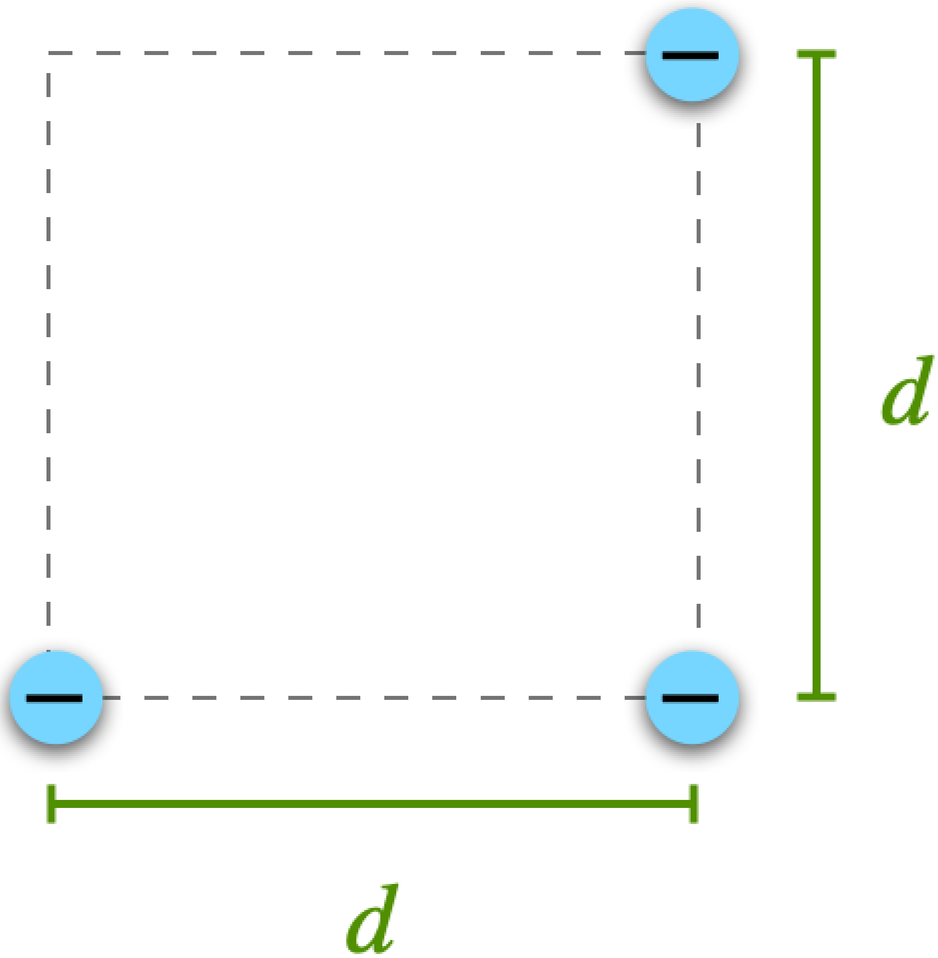
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed negative charges q = (2.2x10^2) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (5.50x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

✗ (2.1x10^-2) ✗ (J)

▼ Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\,d$$

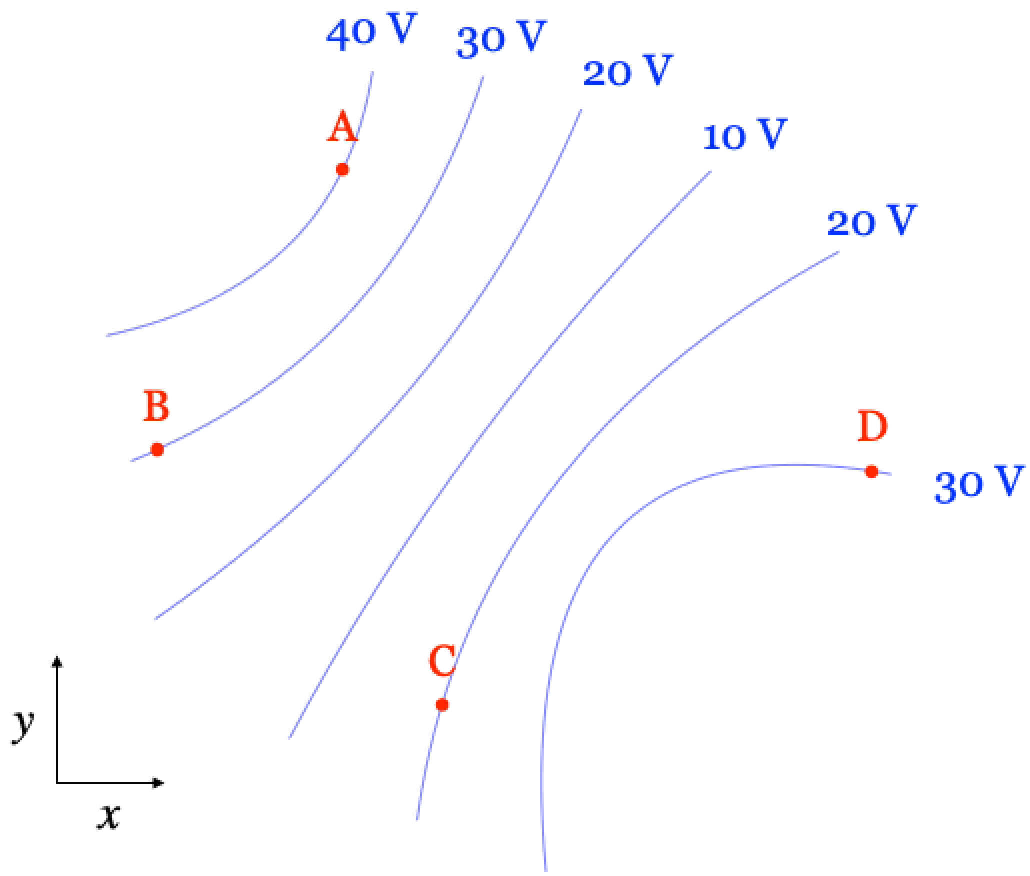
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$\vec{E} = \left(-9.4\hat{\imath} + 3.4\hat{\jmath}\right)\ \mathrm{V/m}$



- Point A
- Point B
- Point C
- Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point C does this give a direction that is "mostly left and slightly up".

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 6

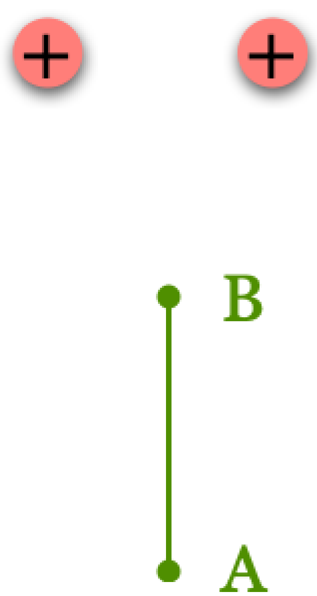
Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider an electron moving from point A to point B towards two positive charges as illustrated below.

Select all correct statements regarding the work involved for this action.



- [ ] Positive work is done by the electric field
- [ ] Negative work is done by the electric field
- [ ] External (positive) work needs to be applied

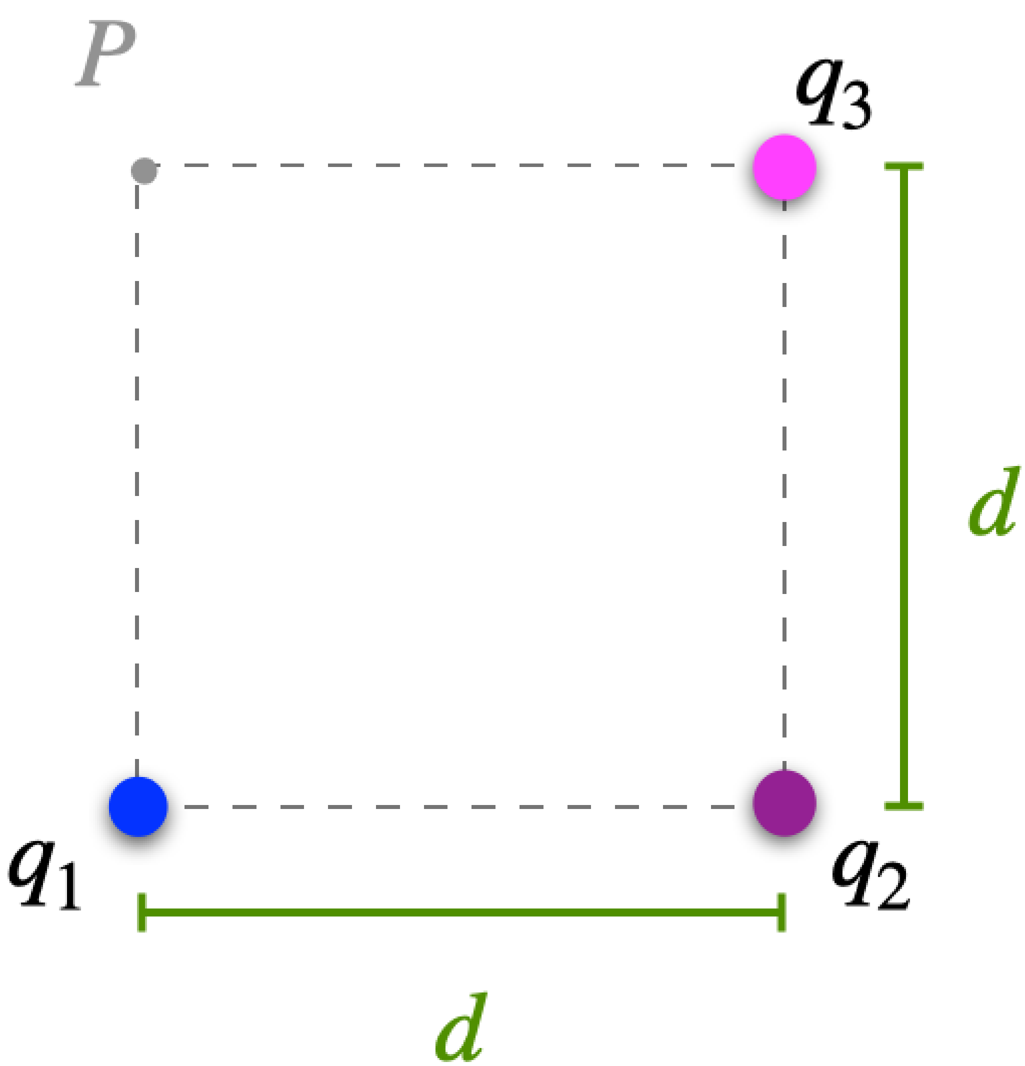
Hide Feedback

An electron is a negative charge. We do not need to apply positive external work to move a negative charge against the electric field towards two positive charges (that attract our charge). The work done by the field is **positive**. That is, the field with do the work without the need to apply an external force.

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (2.400x10^-9) C, q_2 = (-8.6x10^-8) C and q_3 = (-2.80x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (1.200x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-4.6x10^4 ✔ V ✔

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **0 / 1 point**

Consider a thin charged ring with radius (2.500x10^1) cm and charge density (4.1x10^1) µC/m located in the *x*-*y* plane centred at the origin (*x*,*y*) = (0,0).

What is the electric potential (5.10x10^1) cm right above the charged ring? That is at (*x*,*y*,*z*) = (0,0,(5.10x10^1)) cm?

Provide your answer in volts (V) using proper scientific notation.

Answer:

1.02x10^5 ✘ **(1.0x10^6)** V ✔

Hide Feedback

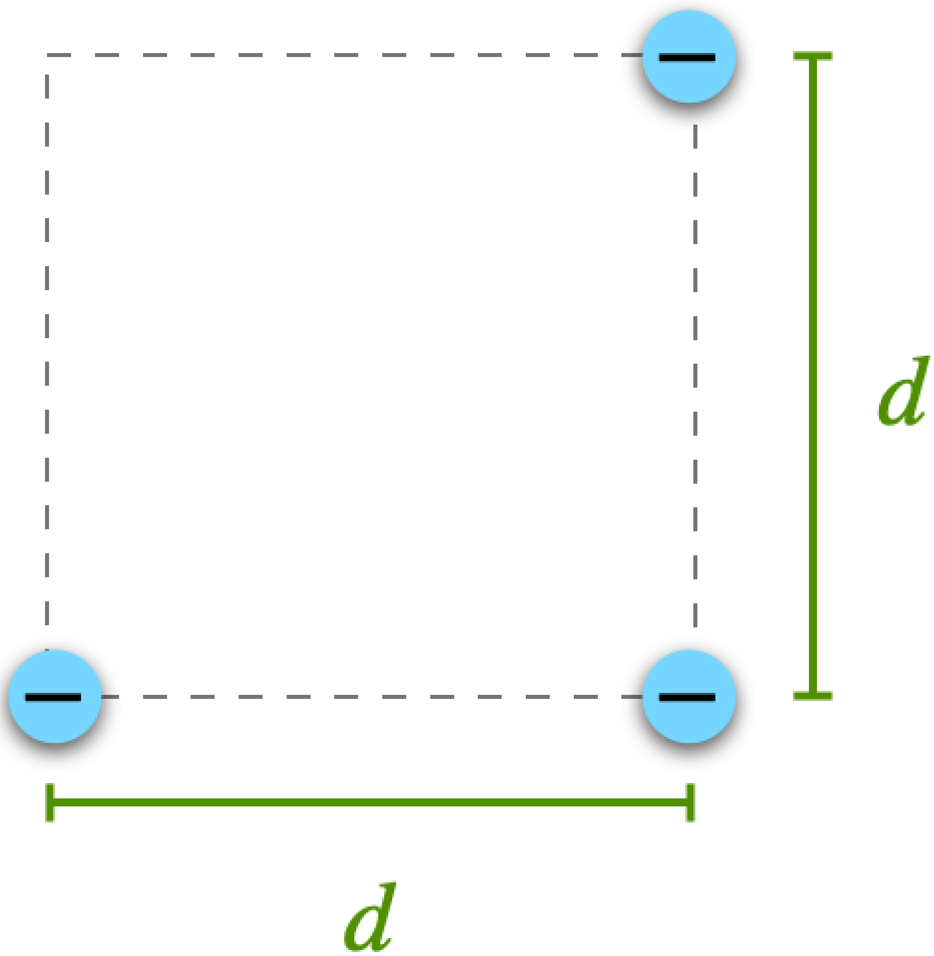
The electric potential for a continuous charge distribution is given by an integral. This does not become too complicated here since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{r} = [dq = \lambda\,ds = \lambda\,R\,d\theta] = \frac{k\,\lambda\,R}{\sqrt{z^2+R^2}}\int_0^{2\pi} d\theta = \frac{2\pi\,k\,\lambda\,R}{\sqrt{z^2+R^2}}$$

Question 4 **1 / 1 point**

Consider the system of 3 fixed negative charges q = (2.5x10^2) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (2.50x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

6.1x10^-2 ✔ J ✔

▼ Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\,d$$

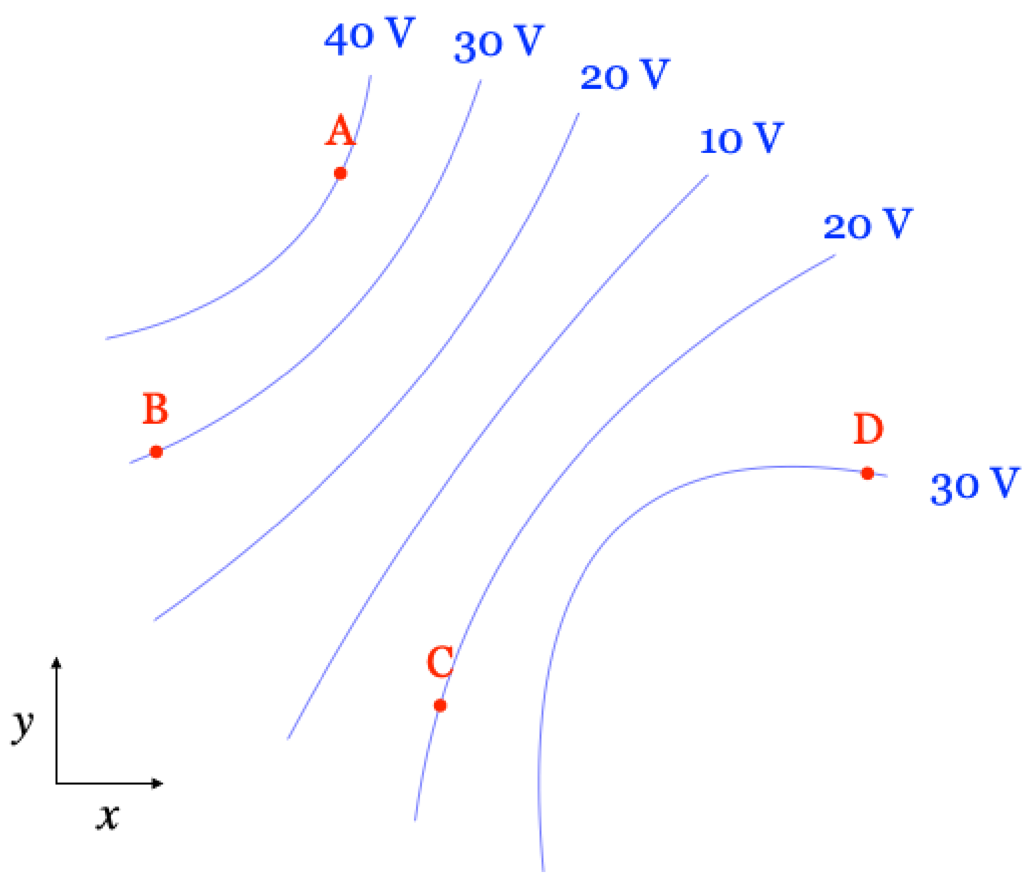
.

Question 5 **1 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(2.4\hat{\imath} + 19\hat{\jmath}\right)\ \mathrm{V/m}$$



- Point A
- Point B
- Point C
- ✓ Point D

Hide Feedback

The electric field has a direction from high to low potential, and is **perpendicular** to the equipotential surface lines. Only for point D does this give a direction that is "mostly up and very slightly to the right".

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 6

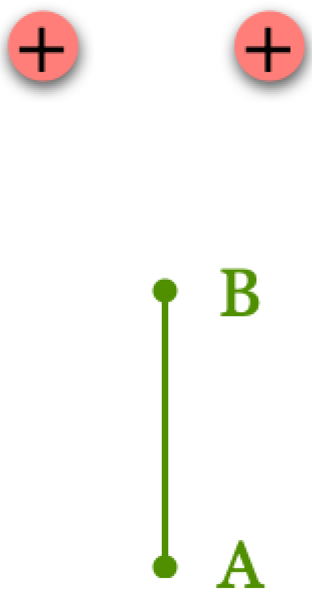
Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider an electron moving from point A to point B towards two positive charges as illustrated below.

Select all correct statements regarding the work involved for this action.



✓ ☐ Positive work is done by the electric field

✓ ☐ Negative work is done by the electric field

✓ ☐ External (positive) work needs to be applied

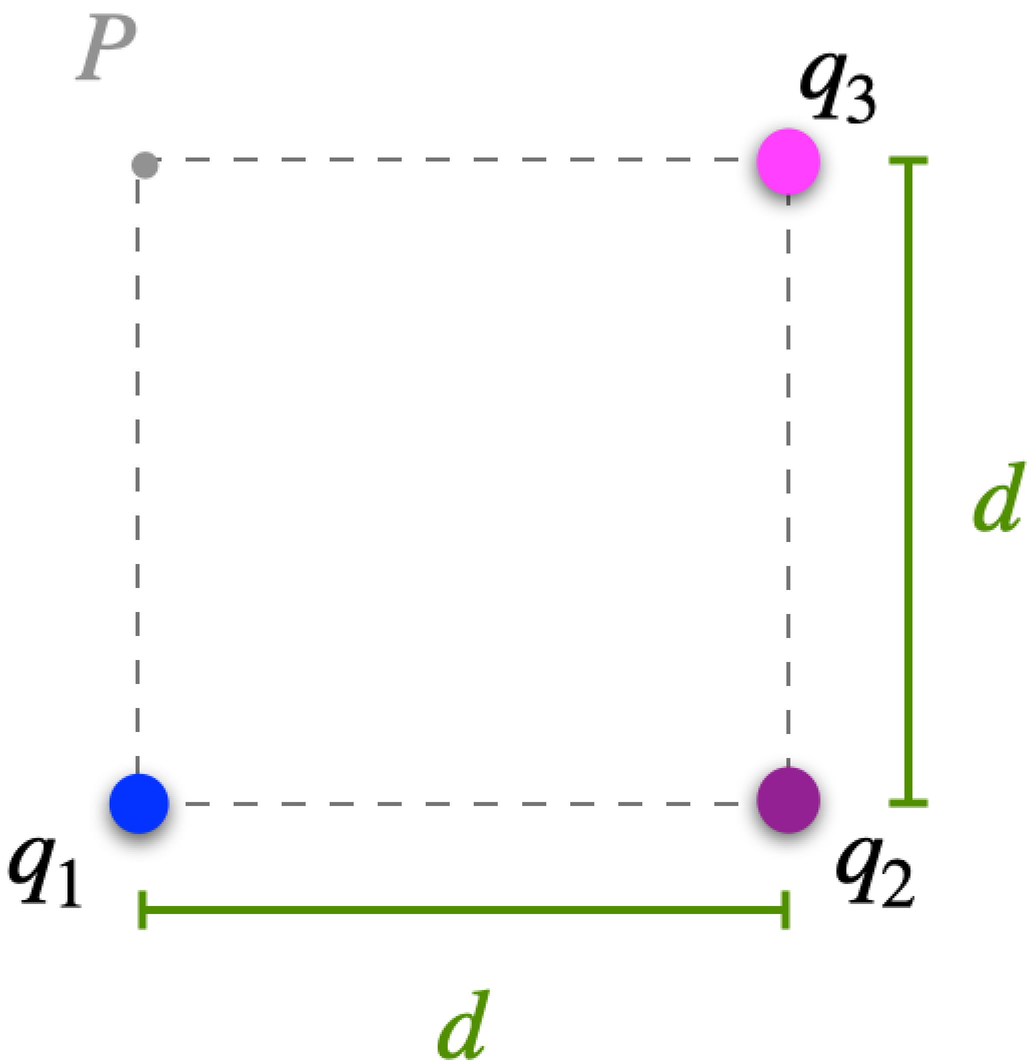
▼ Hide Feedback

An electron is a negative charge. We do not need to apply positive external work to move a negative charge against the electric field towards two positive charges (that attract our charge). The work done by the field is **positive**. That is, the field with do the work without the need to apply an external force.

Question 2 **0 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (1.00x10^-9) C, q_2 = (2.0x10^-9) C and q_3 = (1.500x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (2.70x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

13.0x10^3 ❌ **(1.3x10^3)** V ✔

▼ Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

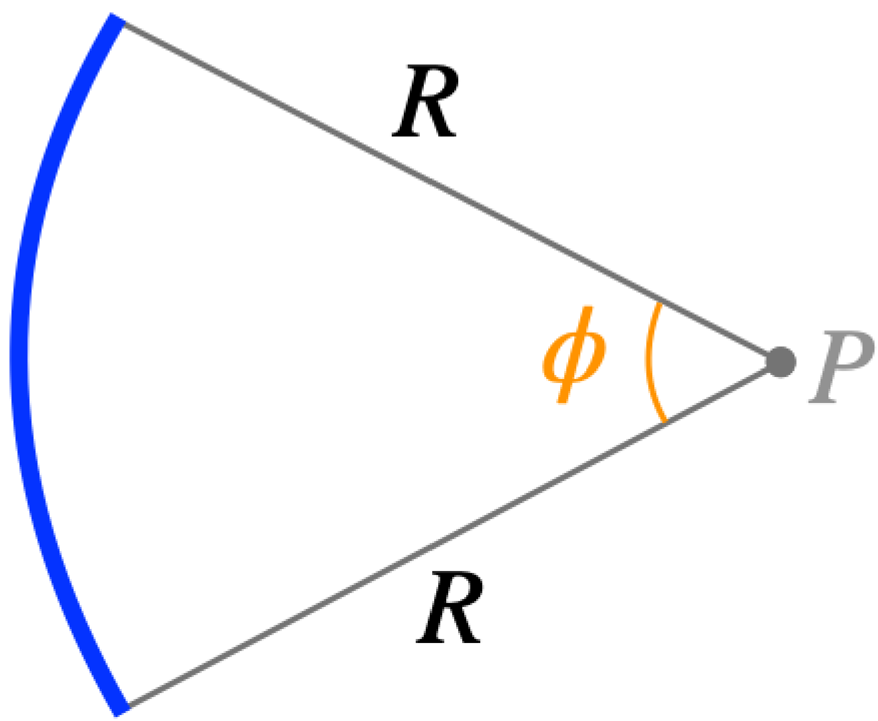
We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **1 / 1 point**

Consider a charged arc segment with radius R = (1.500x10^-2) m and charge density λ = (4.7x10^-6) C/m and a central angle ϕ = (3.50x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

1.48x10^4 ✓ **(1.5x10^4)** V ✓ ✗ wrong number of significant figures **(2)**

Hide Feedback

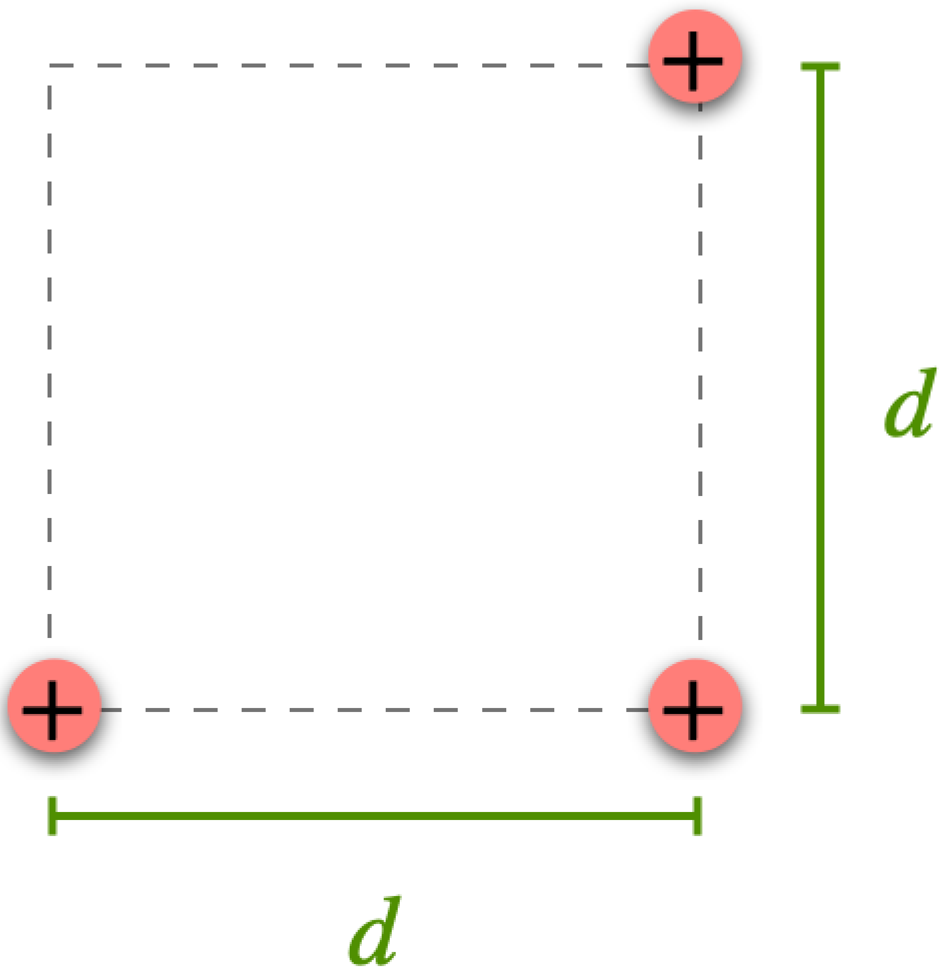
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed positive charges q = (2.80x10^2) nC, given in the figure. The (x,y) coordinates of the charges are (0,0), (0,d) and (d,d), with the distance d = (9.3x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

1.83x10^-2 ✗ **(2.1x10^-2)** J ✓

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\, q_1 q_2}{r_{12}} + \frac{k\, q_2 q_3}{r_{23}} + \frac{k\, q_1 q_3}{r_{13}}$$

In this case all charges are equally large and two distances are *d*, while the other is

$$\sqrt{2}\, d$$

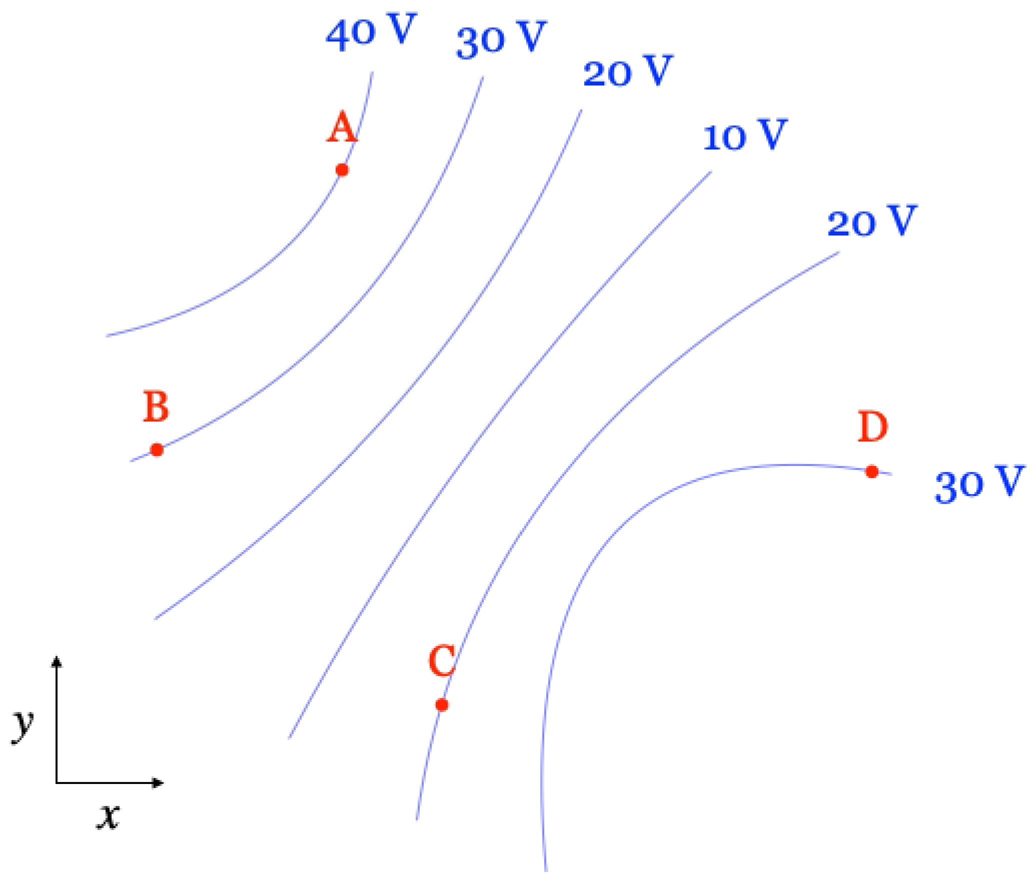
.

Question 5 **1 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = \left(-9.4\hat{\imath} + 3.4\hat{\jmath}\right)\ \mathrm{V/m}$$



- ○ Point A
- ○ Point B
- ✔ ○ Point C
- ○ Point D

▼ Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point C does this give a direction that is "mostly left and slightly up".

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 6

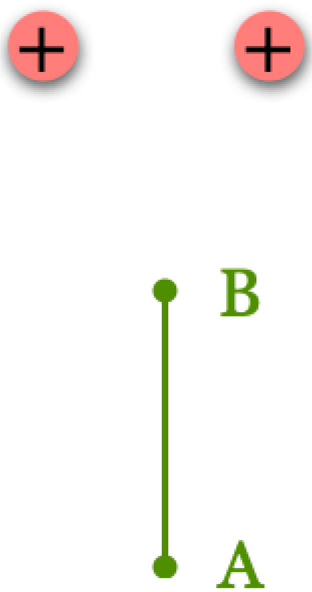
Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider an electron moving from point A to point B towards two positive charges as illustrated below.

Select all correct statements regarding the work involved for this action.



- [ ] Positive work is done by the electric field
- [ ] Negative work is done by the electric field
- [ ] External (positive) work needs to be applied

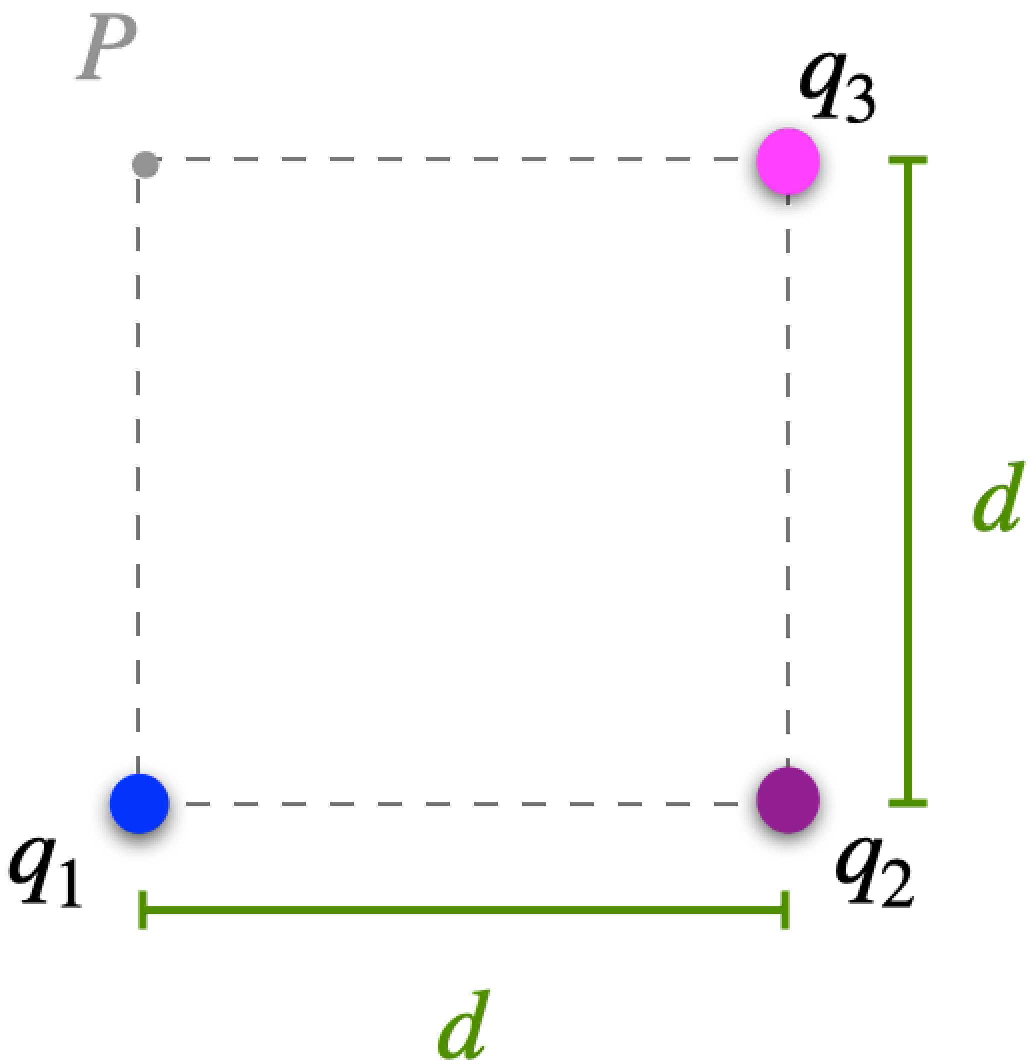
Hide Feedback

An electron is a negative charge. We do not need to apply positive external work to move a negative charge against the electric field towards two positive charges (that attract our charge). The work done by the field is **positive**. That is, the field with do the work without the need to apply an external force.

Question 2 **1 / 1 point**

What is the electric potential in point P at (x,y) = (0,d) given three point charges q_1 = (1.4x10^-9) C, q_2 = (-5.000x10^-8) C and q_3 = (-3.400x10^-9) C, located at (0,0), (0,d) and (d,d), respectively, with d = (2.300x10^-2) m ?

Answer in units of volts (V) with scientific notation.



Answer:

-1.5x10^4 ✔ V ✔

Hide Feedback

Each point charge contributes with

$$V = \frac{k\,q}{r}$$

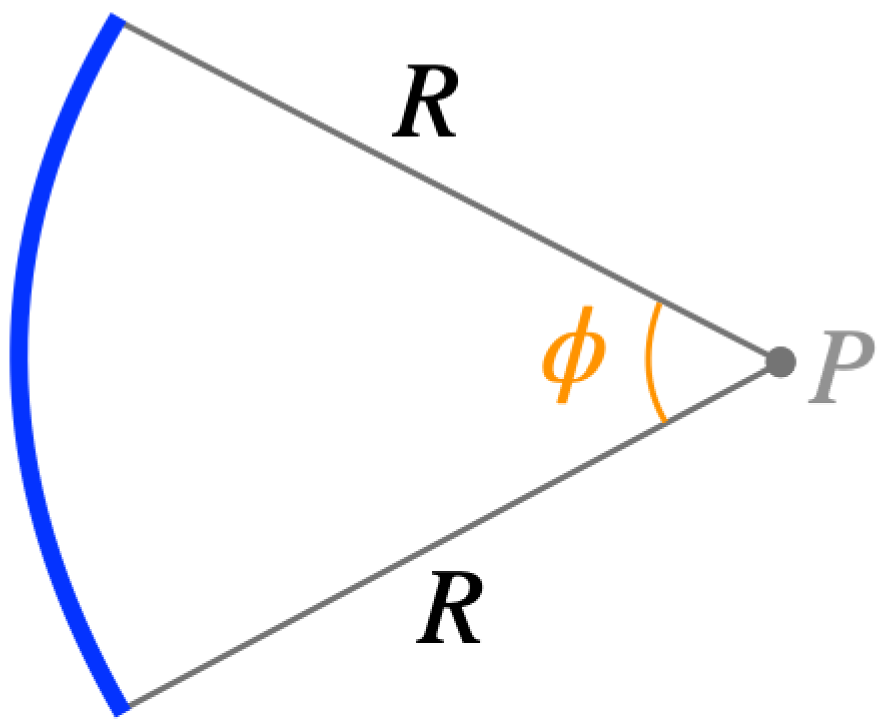
We hence get:

$$V = \frac{k\,q_1}{d} + \frac{k\,q_2}{\sqrt{2}\,d} + \frac{k\,q_3}{d}$$

Question 3 **1 / 1 point**

Consider a charged arc segment with radius R = (5.800x10^-2) m and charge density λ = (4.1x10^-6) C/m and a central angle ϕ = (8.300x10^-1) rad. What is the electric potential at the geometrical centrum of the arc segment (point P in the figure, in the same plane as the arc segment) ?

Answer with unit volts (V) using proper scientific notation.



Answer:

3.1x10^4 ✓ V ✓

▼ Hide Feedback

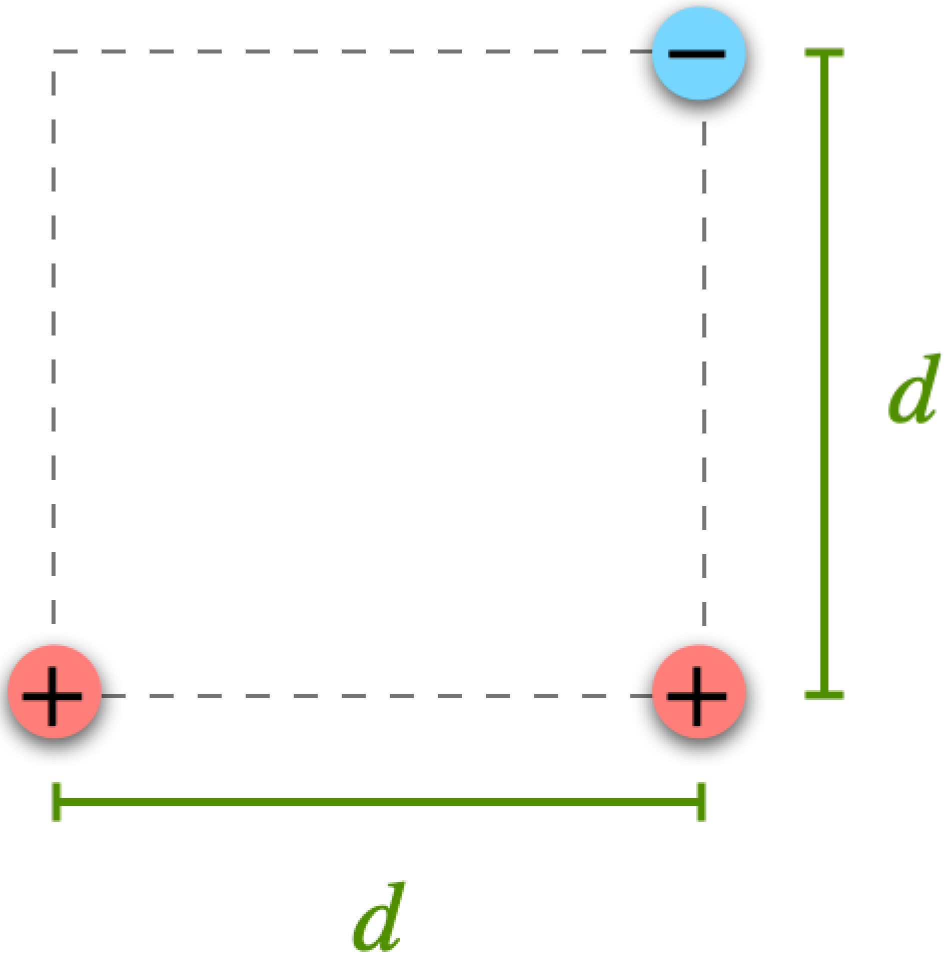
The electric potential for a continuous charge distribution is given by an integral. In this example, it is not too complicated since the distance between the point and the charge distribution is the same. We simply get $V = k\,Q\,/\,r$. Full details:

$$V = \int \frac{k\,dq}{R} = [dq = \lambda\,ds = \lambda\,R\,d\phi] = k\lambda \int d\phi = k\lambda\phi$$

Question 4 **0 / 1 point**

Consider the system of 3 fixed charges of absolute magnitude $|q|$ = (1.6x10^3) nC, placed as specified in the figure. The (x,y) coordinates of the two postivie charges are (0,0), (0,d) and the negative charge is at (d,d), with the distance d = (3.90x10^-2) m. What is the electric potential energy of this system?

Answer in joules (J) with proper scientific notation.



Answer:

1.6x10^0 **(-4.2x10^-1)** J

Hide Feedback

The potential energy of the system of charges is the amount of work to 'build the system'. See for example Sample Problem 24.06 in the textbook.

We get

$$U_{123} = U_{12} + U_{23} + U_{13} = \frac{k\,q_1 q_2}{r_{12}} + \frac{k\,q_2 q_3}{r_{23}} + \frac{k\,q_1 q_3}{r_{13}}$$

In this case, two of the terms cancel, and we are left only by

$$U_{123} = -\frac{k|q|^2}{\sqrt{2}\,d}$$

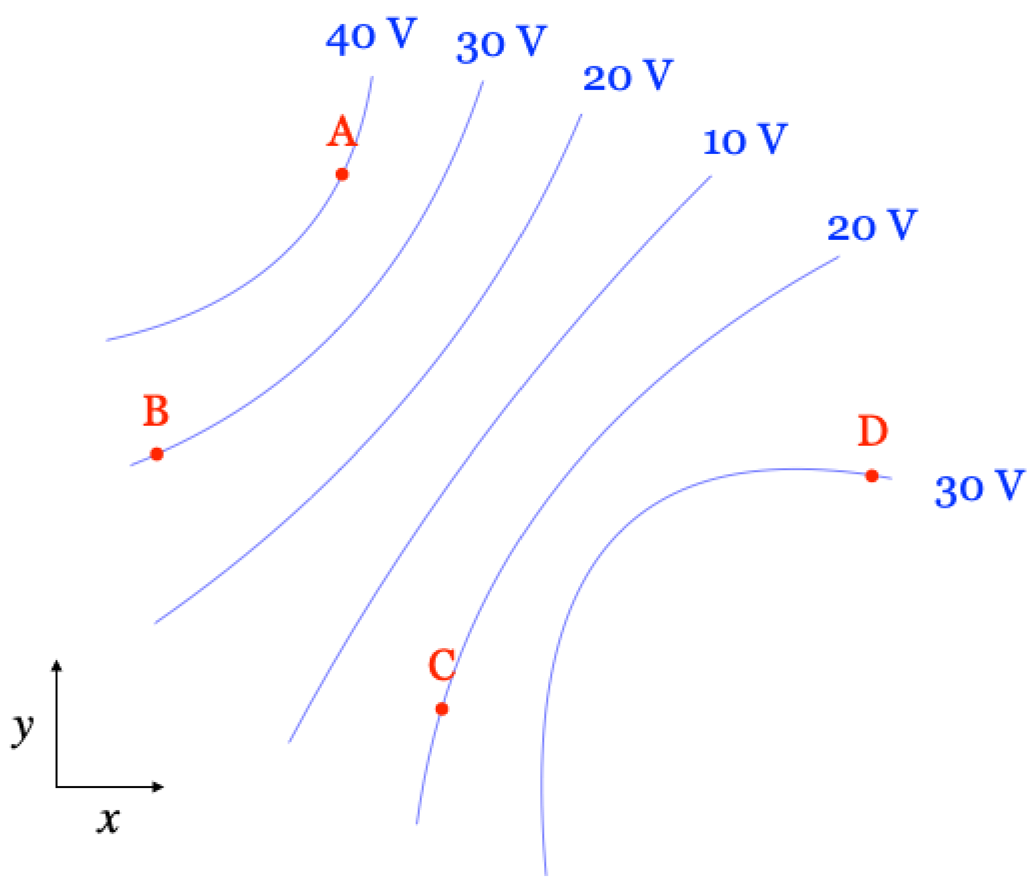
.

Question 5 **0 / 1 point**

The figure below shows equipotential surfaces (cross-section view in the *x*-*y* plane).

In which of the points is might the electric field given by:

$$\vec{E} = (10.5\hat{\imath} - 3.8\hat{\jmath})\ \mathrm{V/m}$$



- Point A
- Point B
- Point C
- Point D

Hide Feedback

The electric field has a direction from high to low potential, and is perpendicular to the equipotential surface lines. Only for point A does this give a direction that is "to the right and slightly down".

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 7

×

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A capacitor is hocked up with a (4.70x10^3) volt DC energy supply for a long time. You measure the charge on one of the plate and find it is (5.0x10^2) µC. What is the capacitance of the capacitor? Give your answer in farads (F) using scientific notation.

Answer:

1.1x10^-7 ✔ F ✔

▼ Hide Feedback

The capacitance is given by

$$C \equiv \frac{q}{\Delta V}$$

Question 2 **1 / 1 point**

A coaxial cable has length (2.90x10^0) m has an inner core of a conductor with radius (2.0x10^0) mm and outer shell (also conductor) of radius (7.90x10^0) mm. What is the capacitance of the cable? Answer in farads (F) using scientific notation.

Answer:

1.2x10^-10 ✔ F ✔

▼ Hide Feedback

A coax cable is a cylindrical capacitor, which has capacitance:

$$C = 2\pi\varepsilon_0 \frac{L}{\ln(b/a)}$$

Question 3 **1 / 1 point**

A cylindrical (2.70x10^0) µF capacitor, is connected in parallel to a (5.2x10^0) µF parallel-plate capacitor. A potential difference of (5.100x10^1) volts is applied to this configuration. After a long time, what is the charge on the cylindrical capacitor's plates? Answer in coulombs (C) using scientific notation. Answer with a positive number.

Answer:

1.4x10^-4 ✔ C ✔

▼ Hide Feedback

The potential difference across both capacitors are the same. Hence the charge is simply given from the definition of capacitance:

$$C \equiv \frac{q}{V}$$

Question 4 **1 / 1 point**

A cylindrical (1.000x10^0) µF capacitor is connected to a power supply and is charged from zero to a final charge of ±(6.6x10^-5) on its plates. How much work is done to charge the capacitor? Give your answer in joules (J) using scientific notation.

Answer:

2.2x10^-3 ✔ J ✔

▼ Hide Feedback

The work to charge a capacitor is equal to its potential energy. This is given by:

$$U = \frac{q^2}{2C}$$

Question 5 **1 / 1 point**

A parallel-plate capacitor is fully charged (not connected to any power supply). The electric field between the plates is measured to be (6.00x10^5) V/m and the electric potential across the plates is (1.30x10^2) volt. A plastic material with a dielectric constant of (5.2x10^0) is carefully inserted between the plates. What is the resulting electric field strength between the plates? Give your answer in V/m using scientific notation.

Answer:

1.2x10^5 ✔ V/m ✔

Hide Feedback

As the capacitor is not connected to a power supply, its charge will remain constant. As the dielectric is inserted, the capacitance will increase by a factor of kappa, and the voltage across the plates and the strength of the electric field will both be reduced by a factor of kappa. That is

$$E_{\text{new}} = E_{\text{old}}/\kappa$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 7

×

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

What is the amount on charge on one of the plates of a (1.8x10^1) µF capacitor that has been connected to a (1.48x10^2) V DC power supply for a long time? Give your answer in C using scientific notation.

Answer:

2.7x10^-3 ✓ C ✓

▼ Hide Feedback

Using the definition of capacitance:

$$C \equiv \frac{q}{\Delta V}$$

,

we here need to solve for the charge q.

Question 2 **1 / 1 point**

You cut out two rectangular pieces of aluminum foil. Both have the same dimensions: (4.100x10^1) mm x (3.3x10^1) mm. With help of some plastic structure, you place them (1.000x10^0) mm apart. What is the capacitance of your home-made electric device? Give you answer in farads (F) using scientific notation.

Answer:

1.2x10^-11 ✓ F ✓

Hide Feedback

This is a parallel plate capacitor, which has capacitance

$$C = \frac{\varepsilon_0 \, A}{d}$$

Question 3 **1 / 1 point**

Three capacitors are connected in series to a 120 V DC power supply. The capacitances of the capacitors are 2 μF, 3 μF and 5 μF, respectively. Which of the capacitors hold the most charge?

- The 2 μF capacitor
- The 3 μF capacitor
- The 5 μF capacitor
- ✓ All the same

Hide Feedback

Capacitors in series have the same amount of charge (each of the plates will hold +Q or -Q charge for all capacitors).

Question 4 **1 / 1 point**

A cylindrical (6.000x10^0) μF capacitor is connected to a power supply and is charged from zero to a final charge of ±(7.3x10^-5) on its plates. How much work is done to charge the capacitor? Give your answer in joules (J) using scientific notation.

Answer:

4.4x10^-4 ✓ J ✓

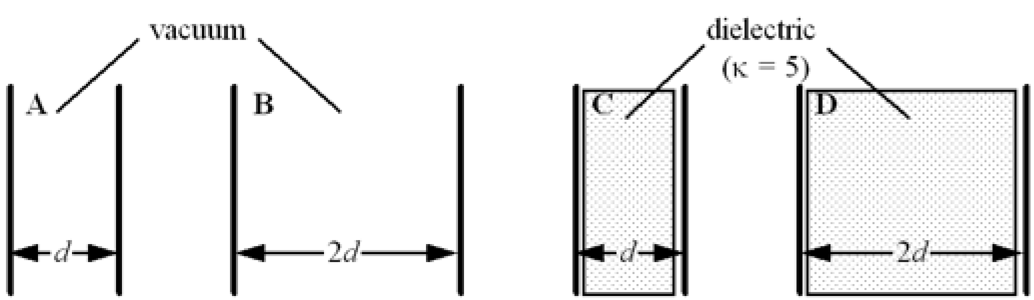
Hide Feedback

The work to charge a capacitor is equal to its potential energy. This is given by:

$$U = \frac{q^2}{2C}$$

Question 5 **1 / 1 point**

Four parallel-plate capacitors all carry the same amount of charge on their plate. As can be seen in the figure, capacitors A and C have their plates separated by distance *d*, while B and D have twice the separation (2*d*). Capacitors C and D contain dielectrics with a dielectric constant of 5. Which option ranks the capacitors of increasing capacitance?



- A, C, B, D
- A, B, C, D
- ✓ B, A, D, C
- D, C, B, A
- D, B, C, A

Hide Feedback

Larger distance means smaller capacitance. So B < A and D < C, by a factor of 2.
Dielectrics gives larger capacitance by a factor of 5.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 7

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

What is the amount on charge on one of the plates of a (1.8x10^1) µF capacitor that has been connected to a (1.420x10^2) V DC power supply for a long time? Give your answer in C using scientific notation.

Answer:

2.56x10^-3 ✔ **(2.6x10^-3)** C ✔ ✘ wrong number of significant figures **(2)**

Hide Feedback

Using the definition of capacitance:

$$C \equiv \frac{q}{\Delta V}$$

,

we here need to solve for the charge *q*.

Question 2 **1 / 1 point**

A coaxial cable has length (2.600x10^0) m has an inner core of a conductor with radius (1.6x10^0) mm and outer shell (also conductor) of radius (4.10x10^0) mm. What is the capacitance of the cable? Answer in farads (F) using scientific notation.

Answer:

1.54x10^-10 ✔ **(1.5x10^-10)** F ✔ ✘ wrong number of significant figures **(2)**

Hide Feedback

A coax cable is a cylindrical capacitor, which has capacitance:

$$C = 2\pi\varepsilon_0 \frac{L}{\ln(b/a)}$$

Question 3 **1 / 1 point**

Three capacitors with capacitance (3.3x10^0) µF, (1.500x10^0) µF and (7.000x10^-3) mF, respectively, are connected in parallel. Calculate the equivalent capacitance. Answer in farads (F) using scientific notation.

Answer:

1.18x10^-5 ✔ **(1.2x10^-5)** F ✔ ✖ wrong number of significant figures **(2)**

Hide Feedback

The equivalent capacitance for capacitors in parallel is simply the sum of capacitances. Be careful with the units and prefixes.

Question 4 **1 / 1 point**

A parallel-plate capacitor has plates with an area of (3.5x10^2) square mm, and a distance (1.00x10^0) mm between its plates. It is connected to a 60 V DC power supply. When fully charged, what is the energy density in the electric field between the plates? Give your answer in Joules per cubic meters (J/m^3) using scientific notation.

Answer:

1.59x10^-2 ✔ **(1.6x10^-2)** J/m^3 ✔ ✖ wrong number of significant figures **(2)**

Hide Feedback

A parallel-plate capacitor has capacitance

$$C = \frac{\varepsilon_0 \, A}{d}$$

The energy density u_E in a parallel-plate capacitor is the electric potential energy divided by the volume:

$$u_E = \frac{U}{V} = \frac{U}{Ad}$$

The electric potential energy is given by

$$U = CV^2/2$$

.

This energy is stored in the electric field inside the capacitor is hence

$$u_E = \frac{\varepsilon_0 \, V^2}{2 \, d^2} = \frac{\varepsilon_0 \, E^2}{2}$$

Question 5 **1 / 1 point**

A parallel-plate capacitor is fully charged (not connected to any power supply). The electric field between the plates is measured to be (1.8x10^6) V/m and the electric potential across the plates is (2.350x10^2) volt. A plastic material with a dielectric constant of (3.500x10^0) is carefully inserted between the plates. What is the resulting electric field strength between the plates? Give your answer in V/m using scientific notation.

Answer:

5.14x10^5 ✔ **(5.1x10^5)** V/m ✔ ✖ wrong number of significant figures **(2)**

Hide Feedback

As the capacitor is not connected to a power supply, its charge will remain constant. As the dielectric is inserted, the capacitance will increase by a factor of kappa, and the voltage across the plates and the strength of the electric field will both be reduced by a factor of kappa. That is

$$E_{\text{new}} = E_{\text{old}}/\kappa$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt)**:**5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 7

Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (2.500x10^1) µF capacitor initially has a charge of (3.500x10^-3) C and (hence) a potential difference of (1.4x10^2) V across the plates. The electric potential is then increased to (2.600x10^2) volts. What is the capacitance of the capacitor after this change? Give your answer in farads (F) using scientific notation.

Answer:

✖ **(2.5x10^-5)** ✖ **(F)**

Hide Feedback

When the voltage is increased, the charge also increases. The capacitance stays the same.

Question 2 **0 / 1 point**

You cut out two rectangular pieces of aluminum foil. Both have the same dimensions: (2.400x10^1) mm x (3.0x10^1) mm. With help of some plastic structure, you place them (2.100x10^0) mm apart. What is the capacitance of your home-made electric device? Give you answer in farads (F) using scientific notation.

Answer:

✖ **(3.0x10^-12)** ✖ **(F)**

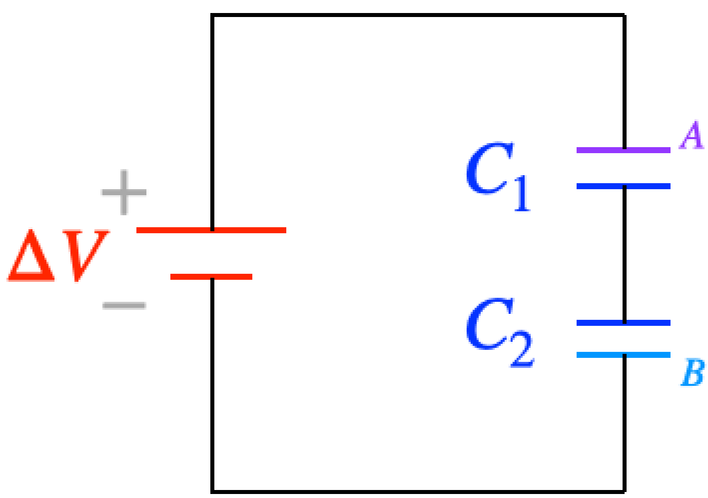
Hide Feedback

This is a parallel plate capacitor, which has capacitance

$$C = \frac{\varepsilon_0 A}{d}$$

Question 3 **0 / 1 point**

Consider the setup of two capacitors and a DC power supply is shown in the figure. The potential difference is (6.40x10^1) volts, and the capacitors have capacitances C_1 = (3.6x10^0) µF and C_2 = (3.40x10^0) µF. What is the charge on the capacitor plate labelled B in the figure (connected to the cathode of the voltage supply). Give your answer in unit of coulombs (C) using scientific notation.



Answer:

✗ (-1.1x10^-4) ✗ (C)

Hide Feedback

The capacitors are connected in series and have effective capacitance according to:

$$\frac{1}{C_{\mathrm{eq}}} = \sum_i \frac{1}{C_i}$$

which gives for two capacitors

$$C_{\mathrm{eq}} = \frac{C_1\, C_2}{C_1 + C_2}$$

The charge is given from the definition of capacitance (charge over voltage) to be

$$q = C_{\mathrm{eq}} V$$

And the charge will be positive on the side with higher voltage (plate A) and negative for lower voltage (plate B).

Question 4 **0 / 1 point**

Two (1.4x10^0) µF capacitors are connected in parallel with a (3.50x10^1) V DC power supply. After the capacitors are fully charged, what is the combined electric potential energy stored in the capacitors? Give your answer in joules (J) using scientific notation.

Answer:

✗ **(1.7x10^-3)** ✗ **(J)**

Hide Feedback

Each capacitor has a potential energy of

$$U = \frac{C(\Delta V)^2}{2}$$

Question 5 **0 / 1 point**

Six identical parallel-plate capacitors are connected in series with a resulting equivalent capacitance of (4.3x10^0) µF. A dielectric with κ = (6.00x10^0) is inserted for three of the capacitors. What is the new equivalent capacitance? Give your answer in farads (F) using scientific notation.

Answer:

✗ **(7.4x10^-6)** ✗ **(F)**

Hide Feedback

For capacitance in series, we have

$$\frac{1}{C_{\text{eq}}} = \sum_i \frac{1}{C_i}$$

Initially, with six identical capacitors, we get:

$$C_0 = 6\,C_{\text{eq}}$$

The three capacitors with dielectrics all get a new capacitance equal to

$$C = C_0\,\kappa$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 7

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A capacitor is hocked up with a (2.70x10^3) volt DC energy supply for a long time. You measure the charge on one of the plate and find it is (1.4x10^3) µC. What is the capacitance of the capacitor? Give your answer in farads (F) using scientific notation.

Answer:

5.2x10^-7 ✔ F ✔

▼ Hide Feedback

The capacitance is given by

$$C \equiv \frac{q}{\Delta V}$$

Question 2 **0 / 1 point**

A spherical capacitor consists of two concentric conducting spheres. What is the capacitance of such a capacitor where the inner sphere has radius (3.10x10^0) cm and the outer shell has radius (4.9x10^0) cm? Answer in farads (F) using scientific notation.

Answer:

1.2x10^-10 ✘ **(9.4x10^-12)** F ✔

▼ Hide Feedback

The capacitance of a spherical capacitor is given by

$$C = 4\pi\varepsilon_0 \frac{ab}{b-a}$$

Question 3 **1 / 1 point**

Three capacitors with capacitance (1.80x10^0) µF, (2.4x10^0) µF and (3.000x10^-3) mF, respectively, are connected in parallel. Calculate the equivalent capacitance. Answer in farads (F) using scientific notation.

Answer:

7.2x10^-6 ✓ F ✓

▼ Hide Feedback

The equivalent capacitance for capacitors in parallel is simply the sum of capacitances. Be careful with the units and prefixes.

Question 4 **0 / 1 point**

Two (2.8x10^0) µF capacitors are connected in parallel with a (1.050x10^2) V DC power supply. After the capacitors are fully charged, what is the combined electric potential energy stored in the capacitors? Give your answer in joules (J) using scientific notation.

Answer:

2.5x10^-17 ✗ **(3.1x10^-2)** J ✓

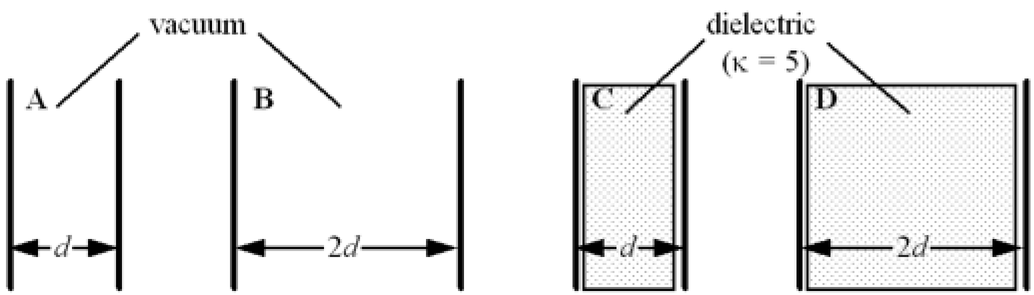
▼ Hide Feedback

Each capacitor has a potential energy of

$$U = \frac{C(\Delta V)^2}{2}$$

Question 5 **1 / 1 point**

Four parallel-plate capacitors all carry the same amount of charge on their plate. As can be seen in the figure, capacitors A and C have their plates separated by distance *d*, while B and D have twice the separation (2*d*). Capacitors C and D contain dielectrics with a dielectric constant of 5. Which option ranks the capacitors of increasing capacitance?



- A, C, B, D
- A, B, C, D
- ✓ B, A, D, C
- D, C, B, A
- D, B, C, A

Hide Feedback

Larger distance means smaller capacitance. So B < A and D < C, by a factor of 2.
Dielectrics gives larger capacitance by a factor of 5.

Attempt Score: 3 / 5 - 60 %

Overall Grade (highest attempt): 3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 7

Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A (2.00x10^2) µF capacitor is fully-charged when it has (8.9x10^-3) C on its plates. What is the potential difference across the plates of the capacitor? Give your answer in V using scientific notation.

Answer:

4.5x10^1 ✓ V ✓

Hide Feedback

Using the definition of capacitance:

$$C \equiv \frac{q}{\Delta V}$$

,

we here need to solve for the potential difference

$$\Delta V$$

.

Question 2 **1 / 1 point**

A coaxial cable has length (1.5x10^0) m has an inner core of a conductor with radius (1.300x10^0) mm and outer shell (also conductor) of radius (3.90x10^0) mm. What is the capacitance of the cable? Answer in farads (F) using scientific notation.

Answer:

7.6x10^-11 ✓ F ✓

▼ Hide Feedback

A coax cable is a cylindrical capacitor, which has capacitance:

$$C = 2\pi\varepsilon_0 \frac{L}{\ln(b/a)}$$

Question 3 **1 / 1 point**

A cylindrical (2.600x10^0) µF capacitor, is connected in parallel to a (3.3x10^0) µF parallel-plate capacitor. A potential difference of (4.90x10^1) volts is applied to this configuration. After a long time, what is the charge on the cylindrical capacitor's plates? Answer in coulombs (C) using scientific notation. Answer with a positive number.

Answer:

1.3x10^-4 ✓ C ✓

▼ Hide Feedback

The potential difference across both capacitors are the same. Hence the charge is simply given from the definition of capacitance:

$$C \equiv \frac{q}{V}$$

Question 4 **1 / 1 point**

A cylindrical (4.0x10^0) µF capacitor is connected to a power supply and is charged from zero to a final charge of ±(8.40x10^-5) on its plates. How much work is done to charge the capacitor? Give your answer in joules (J) using scientific notation.

Answer:

8.8x10^-4 ✔ J ✔

▼ Hide Feedback

The work to charge a capacitor is equal to its potential energy. This is given by:

$$U = \frac{q^2}{2C}$$

Question 5 **0 / 1 point**

A parallel-plate capacitor is fully charged (not connected to any power supply). The electric field between the plates is measured to be (1.60x10^6) V/m and the electric potential across the plates is (2.30x10^2) volt. A plastic material with a dielectric constant of (3.9x10^0) is carefully inserted between the plates. What is the resulting electric field strength between the plates? Give your answer in V/m using scientific notation.

Answer:

✘ **(4.1x10^5)** V/m ✔

▼ Hide Feedback

As the capacitor is not connected to a power supply, its charge will remain constant. As the dielectric is inserted, the capacitance will increase by a factor of kappa, and the voltage across the plates and the strength of the electric field will both be reduced by a factor of kappa. That is

$$E_{\text{new}} = E_{\text{old}}/\kappa$$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 7

Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (4.00x10^2) μF capacitor is fully-charged when it has (9.7x10^-3) C on its plates. What is the potential difference across the plates of the capacitor? Give your answer in V using scientific notation.

Answer:

4.1x10^-2 ✗ **(2.4x10^1)** V ✓

Hide Feedback

Using the definition of capacitance:

$$C \equiv \frac{q}{\Delta V}$$

,

we here need to solve for the potential difference

$$\Delta V$$

.

Question 2 **1 / 1 point**

A coaxial cable has length (1.4x10^0) m has an inner core of a conductor with radius (1.300x10^0) mm and outer shell (also conductor) of radius (5.00x10^0) mm. What is the capacitance of the cable? Answer in farads (F) using scientific notation.

Answer:

5.8x10^-11 ✔ F ✔

▼ Hide Feedback

A coax cable is a cylindrical capacitor, which has capacitance:

$$C = 2\pi\varepsilon_0 \frac{L}{\ln(b/a)}$$

Question 3 **0 / 1 point**

A cylindrical (3.00x10^0) µF capacitor, is connected in parallel to a (3.9x10^0) µF parallel-plate capacitor. A potential difference of (5.000x10^1) volts is applied to this configuration. After a long time, what is the charge on the cylindrical capacitor's plates? Answer in coulombs (C) using scientific notation. Answer with a positive number.

Answer:

1.4x10^-7 ✘ **(1.5x10^-4)** C ✔

▼ Hide Feedback

The potential difference across both capacitors are the same. Hence the charge is simply given from the definition of capacitance:

$$C \equiv \frac{q}{V}$$

Question 4 **0 / 1 point**

A cylindrical (8.000x10^0) µF capacitor is connected to a power supply and is charged from zero to a final charge of ±(9.2x10^-5) on its plates. How much work is done to charge the capacitor? Give your answer in joules (J) using scientific notation.

Answer:

-5.3x10^-4 ✗ **(5.3x10^-4)** J ✓

Hide Feedback

The work to charge a capacitor is equal to its potential energy. This is given by:

$$U = \frac{q^2}{2C}$$

Question 5 **1 / 1 point**

Six identical parallel-plate capacitors are connected in series with a resulting equivalent capacitance of (2.20x10^0) µF. A dielectric with κ = (6.5x10^0) is inserted for three of the capacitors. What is the new equivalent capacitance? Give your answer in farads (F) using scientific notation.

Answer:

3.8x10^-6 ✓ F ✓

Hide Feedback

For capacitance in series, we have

$$\frac{1}{C_{\text{eq}}} = \sum_i \frac{1}{C_i}$$

Initially, with six identical capacitors, we get:

$$C_0 = 6\,C_{\text{eq}}$$

The three capacitors with dielectrics all get a new capacitance equal to

$$C = C_0\,\kappa$$

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 8

Attempt 3

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A proton is travelling to the right (pos x-direction) in a magnetic field directed down (neg y-direction). In which direction does the magnetic force on the proton act?

- ○ Down (neg y-direction)
- ○ Up (pos y-direction)
- ✔ ○ Inwards (neg z-direction)
- ○ There is no force
- ○ Outwards (pos z-direction)

Hide Feedback

Use right hand rule. Velocity = index finger, B = ring finger/palm, thumb = force. Orienting the hand according to this gives your thumb inwards, in the negative z direction.

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Question 2 **1 / 1 point**

A proton travels with a speed of (7.3x10^4) m/s along the x-axis. A uniform magnetic field of strength (1.38x10^-3) T directed along the y-axis is turned on, and the proton starts travelling in a circle due to the magnetic force. What is the radius of this circle?

Give your answer in meters (m) using scientific notation.

Answer:

5.5x10^-1 ✔ m ✔

▼ Hide Feedback

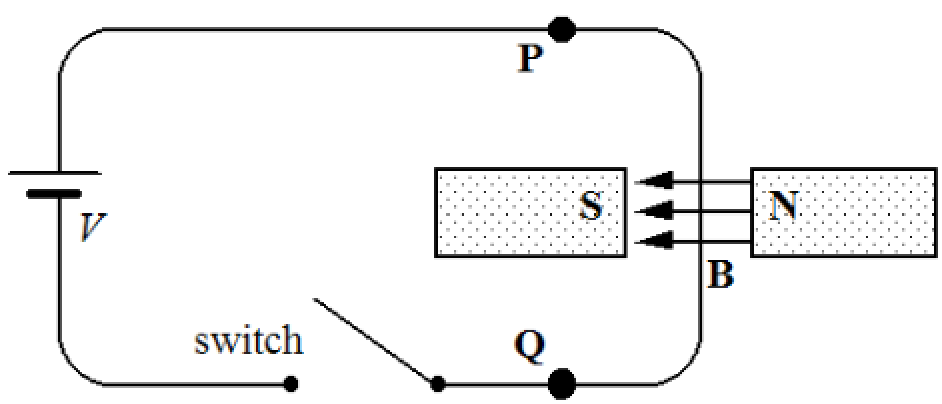
The radius of curvature of a charged particle travelling in a uniform magnetic field is given by

$$r = \frac{m\,v}{|q|\,B}$$

Here we need to use the mass and charge of a proton.

Question 3 **1 / 1 point**

A portion of a loop of wire passes between the poles of a magnet as shown. We are viewing the circuit from above. When the switch is closed and a current passes through the circuit, what is the movement, if any, of the wire between the poles of the magnet?



◯ It doesn't move

- The wire moves upwards (towards us)
- The wire moves towards the south pole of the magnet
- The wire moves towards the north pole of the magnet
- ✔ The wire moves inwards (away from us)

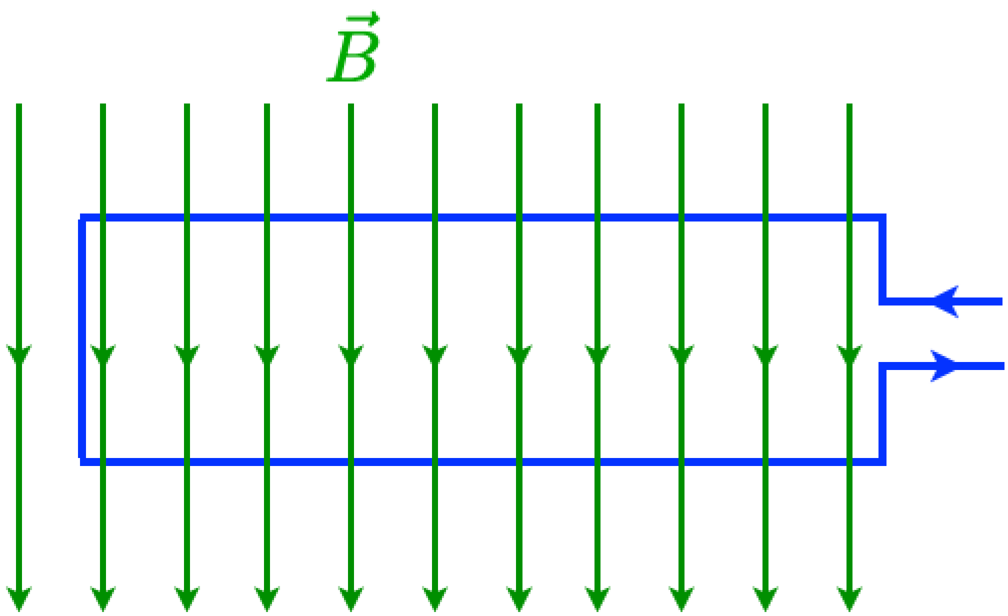
Hide Feedback

The current is moving down (positive charges has downward velocity), magnetic field points left. The right hand rule gives a force directed inwards.

Question 4 **0 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- In this situation, there will be no forces or torque on the coil
- There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- The net force will be to the left, causing the loop to move left (in towards the B-field)
- There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)

Hide Feedback

The magnetic dipole moment of the coil will be outwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves towards us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the left.

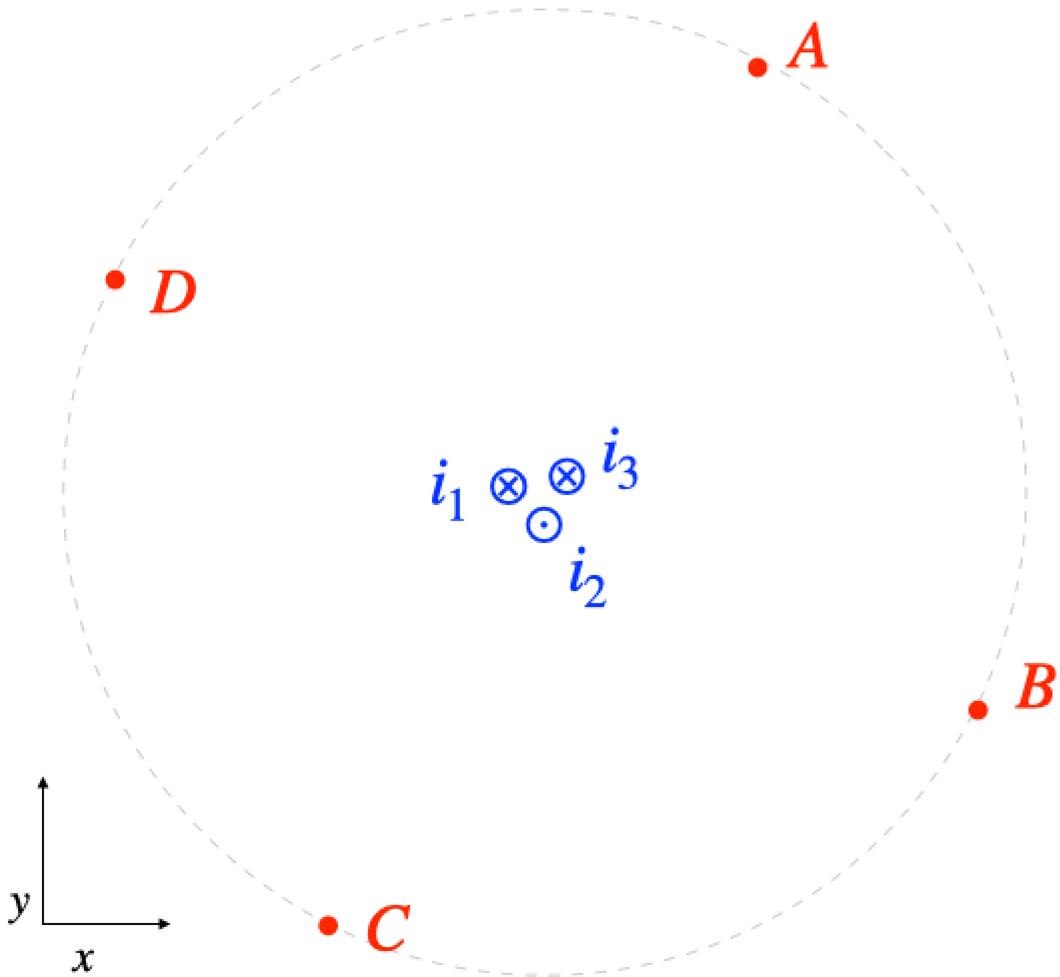
left x down = out

Question 5 **0 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 11 mA, i_2 = 8.1 mA and i_3 = 1.2 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- A
- B
- C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed inwards, and we can now use the right hand rule and put our thumb inwards. The B-field will hence curl in the same direction as your finger, i.e. clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point D.

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 8

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A proton is travelling to the right (pos x-direction) in a magnetic field directed down (neg y-direction). In which direction does the magnetic force on the proton act?

✔ ○ Inwards (neg z-direction)

○ There is no force

○ Up (pos y-direction)

○ Outwards (pos z-direction)

○ Down (neg y-direction)

▼ Hide Feedback

Use right hand rule. Velocity = index finger, B = ring finger/palm, thumb = force. Orienting the hand according to this gives your thumb inwards, in the negative z direction.

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Question 2 **1 / 1 point**

A proton is entering a region of a uniform magnetic field of strength (3.4x10^-3) T. The electron travels at a speed of (1.140x10^3) m/s at an angle (1.300x10^0) radians to the magnetic field lines. Calculate the magnitude of the magnetic force that acts on the electron. Present your answers in newtons (N) using scientific notation.

Answer:

6.0x10^-19 ✓ N ✓

▼ Hide Feedback

The magnetic force is given by:

$$\vec{F}_\mathrm{B} = q\vec{v} \times \vec{B}$$

Its magnitude is:

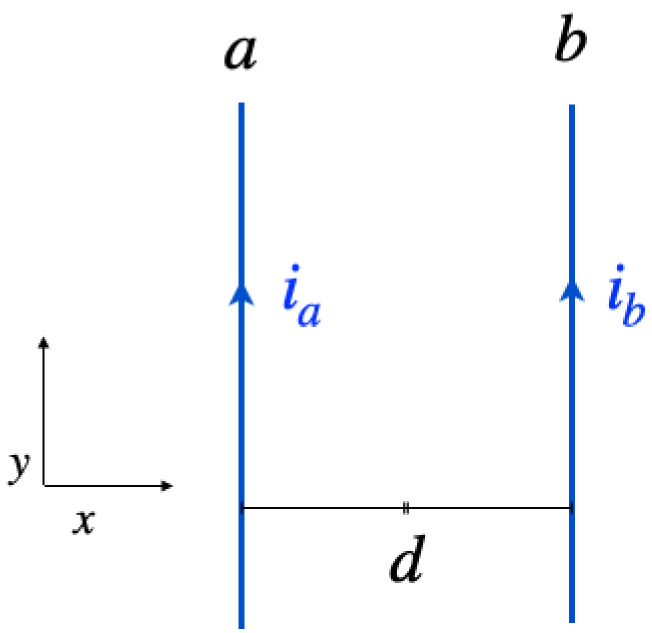
$$F_\mathrm{B} = |\vec{F}_\mathrm{B}| = qvB\sin\phi$$

where ϕ is the angle between the magnetic field and the velocity. The charge q of a proton is the elementary charge

Question 3 **1 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (1.8x10^0) mA directed upwards. They are separated by a distance of (1.20x10^0) cm. What is the force on a 1 cm piece of the left cable, indicated by *a* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

5.4x10^-13 ✔ N ✔

Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0 \, L \, i_a \, i_b}{2\pi \, d}$$

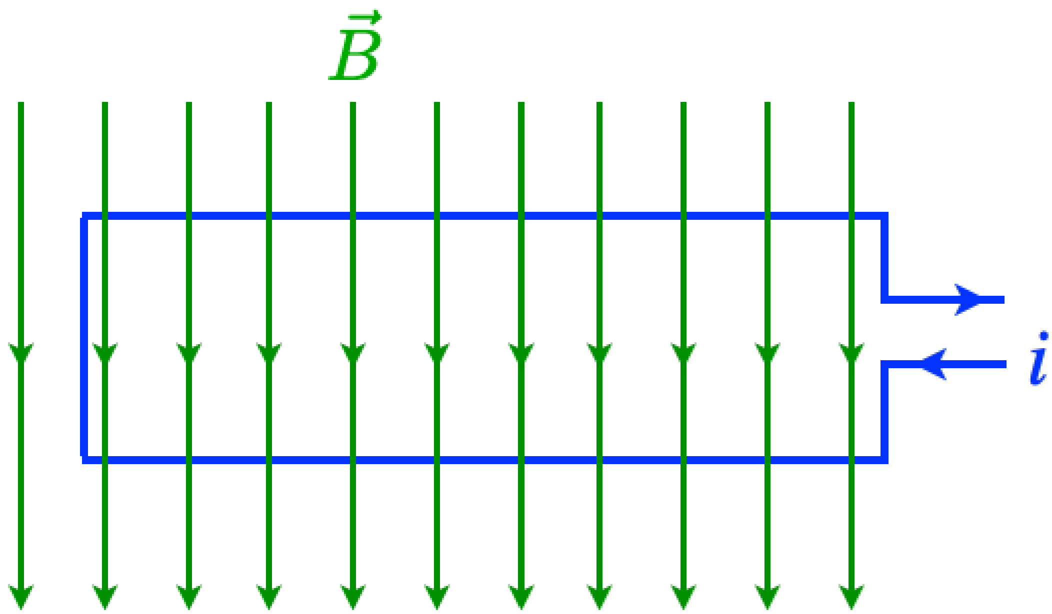
This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is towards the other wire if the currents are parallel as in this case. The force on the left wire is hence in the positive x-direction.

Question 4 **1 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- ✓ ○ There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)
- ○ In this situation, there will be no forces or torque on the coil
- ○ There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- ○ The net force will be to the left, causing the loop to move left (in towards the B-field)

▼ Hide Feedback

The magnetic dipole moment of the coil will be inwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves away from us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the right.

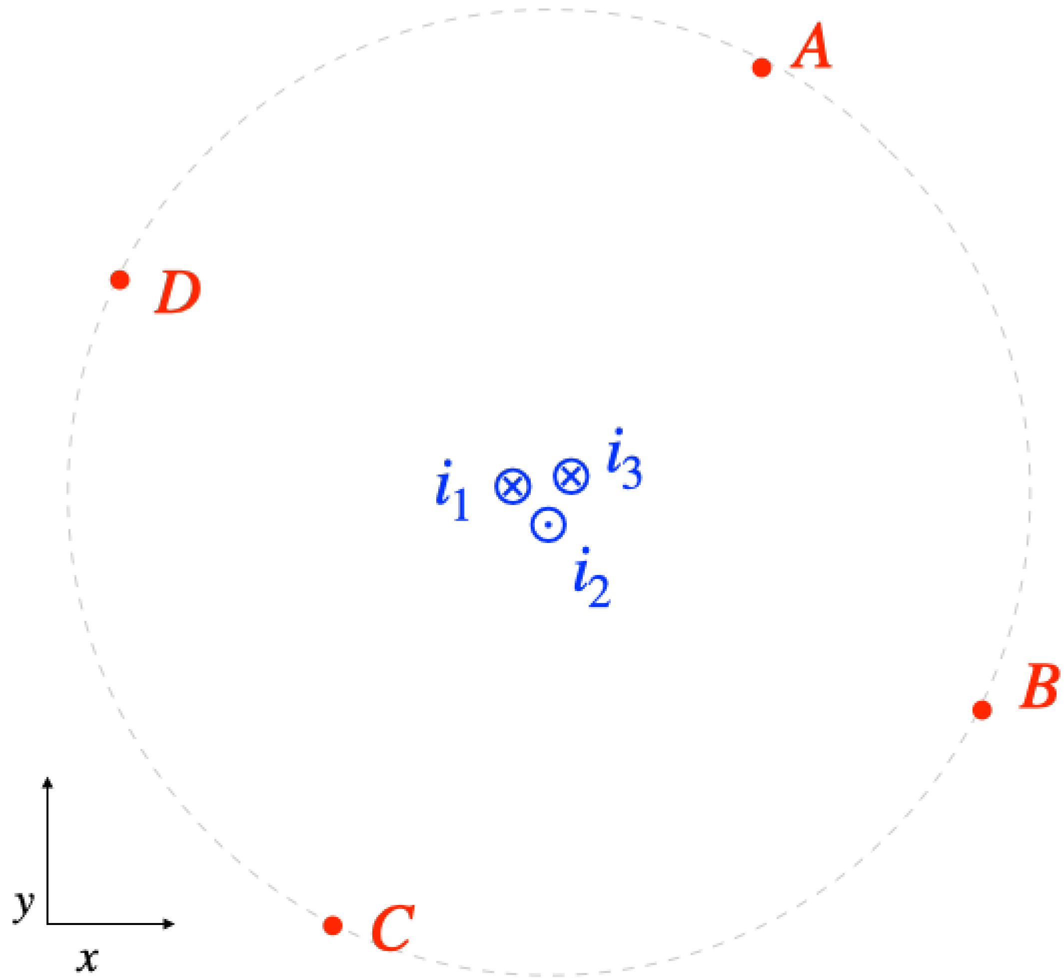
right x down = inwards

Question 5 **1 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 11 mA, i_2 = 8.1 mA and i_3 = 1.2 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- A
- B
- C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed inwards, and we can now use the right hand rule and put our thumb inwards. The B-field will hence curl in the same direction as your finger, i.e. clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point D.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 8

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

An electron is travelling to the right (pos x-direction) in a magnetic field directed down (neg y-direction). In which direction does the magnetic force on the electron act?

- ◯ Inwards (neg z-direction)
- ✔◯ Outwards (pos z-direction)
- ◯ Down (neg y-direction)
- ◯ Up (pos y-direction)
- ◯ There is no force

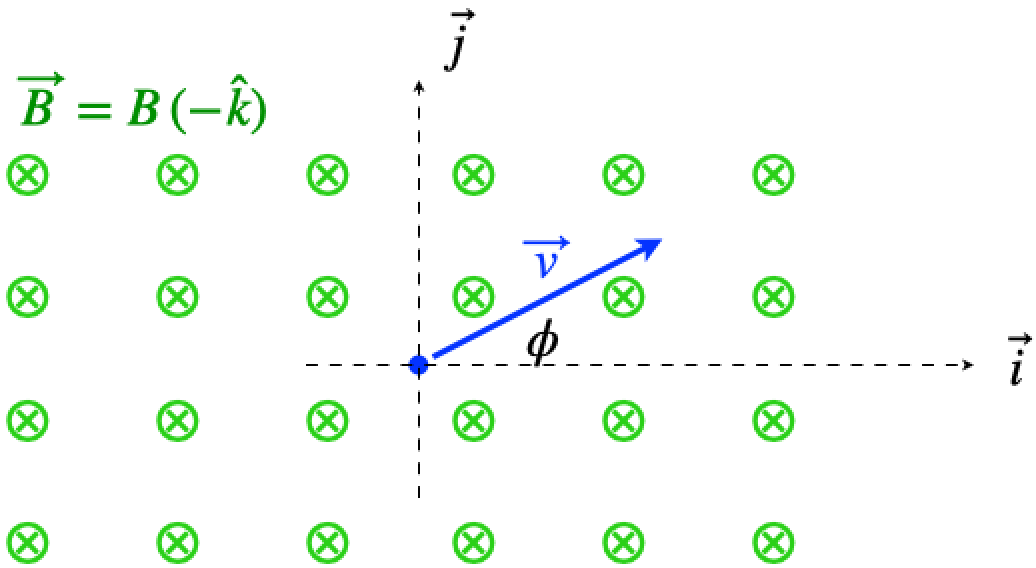
▼ Hide Feedback

Use right hand rule. Velocity = index finger, B = ring finger/palm, thumb = force. Orienting the hand according to this gives your thumb inwards, in the negative z direction. But then you need to multiply with the charge which flips the direction to outwards (pos z-direction).

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Question 2 **0 / 1 point**

A proton is travelling with a velocity (7.2x10^2) m/s in a uniform magnetic field of strength (5.800x10^-6) T directed along the negative z-axis as shown in the figure. The proton travels in the x-y plane at an angle (7.000x10^-2) radians to the x-axis as indicated in the figure. Calculate the magnitude of the magnetic force acting on the proton. Present your answer in newtons (N) using scientific notation (2 sig figs).



Answer:

(6.7x10^-22) (N)

Hide Feedback

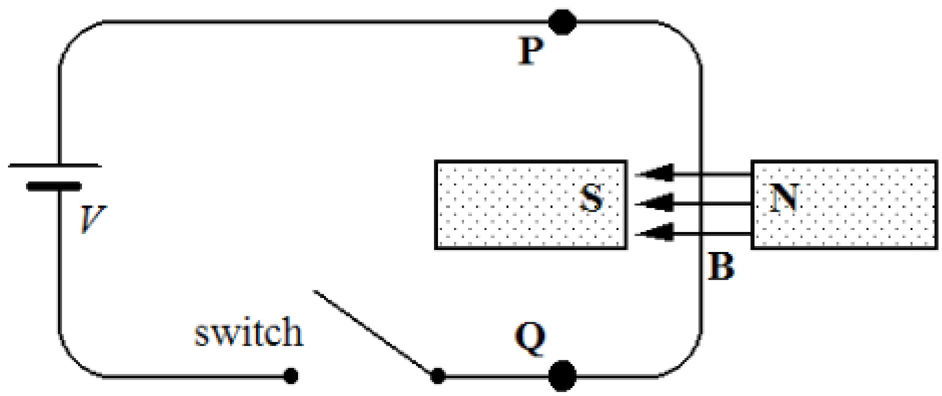
In this example, the proton travels perpendicular to the magnetic field. The magnitude of the force is hence simply given by

$$\vec{F}_{\mathrm{B}} = qvB$$

Where the charge is the elementary charge.

Question 3 **1 / 1 point**

A portion of a loop of wire passes between the poles of a magnet as shown. We are viewing the circuit from above. When the switch is closed and a current passes through the circuit, what is the movement, if any, of the wire between the poles of the magnet?



- ◯ The wire moves upwards (towards us)
- ✔◯ The wire moves inwards (away from us)
- ◯ The wire moves towards the south pole of the magnet
- ◯ The wire moves towards the north pole of the magnet
- ◯ It doesn't move

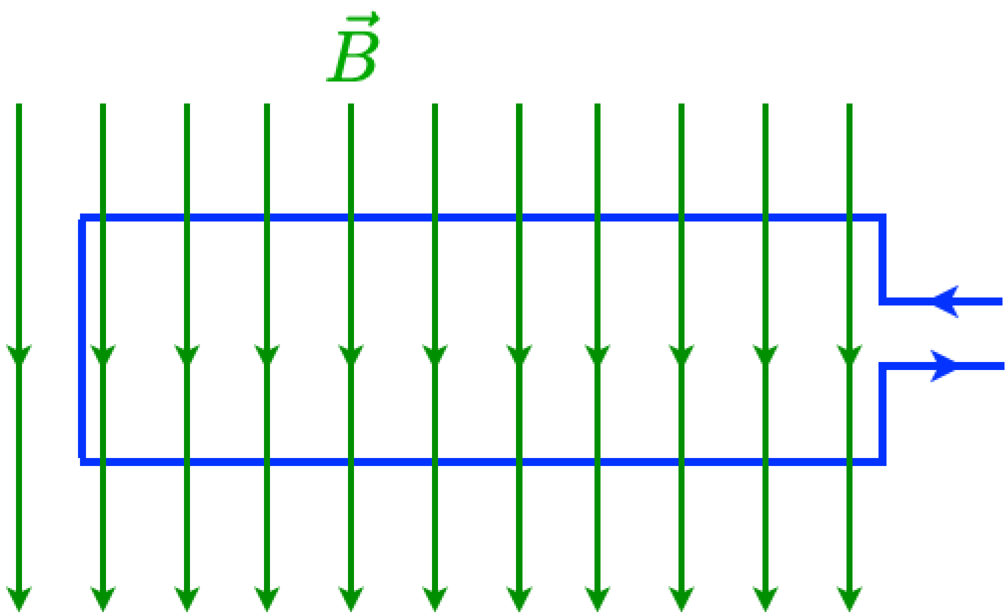
▼ Hide Feedback

The current is moving down (positive charges has downward velocity), magnetic field points left. The right hand rule gives a force directed inwards.

Question 4 **0 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- In this situation, there will be no forces or torque on the coil
- There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- The net force will be to the left, causing the loop to move left (in towards the B-field)
- There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)

Hide Feedback

The magnetic dipole moment of the coil will be outwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves towards us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the left.

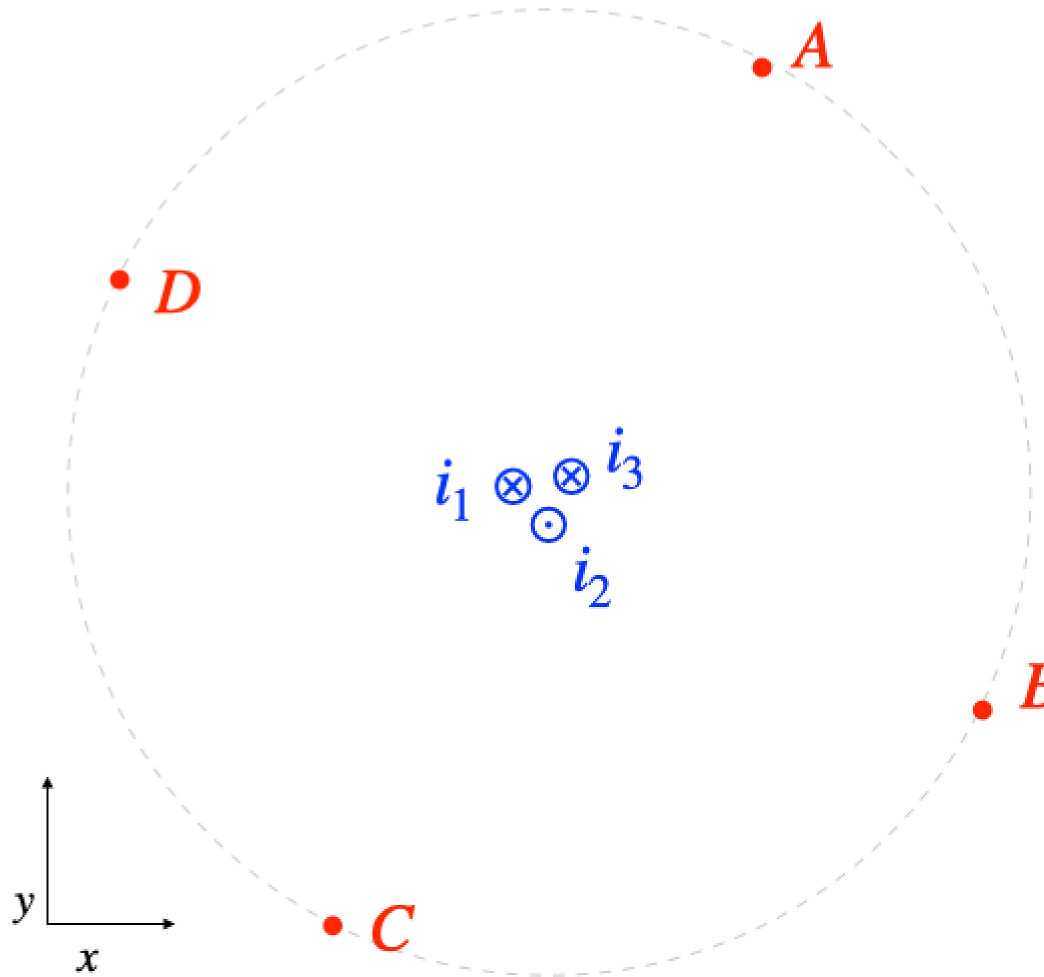
left x down = out

Question 5 **1 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 1.2 mA, i_2 = 4.1 mA and i_3 = 1.9 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- A
- ✔ B
- C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed outwards, and we can now use the right hand rule and put our thumb outwards. The B-field will hence curl in the direction of your fingers, i.e. counter clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point B.

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 8

×

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A proton is travelling to the right (pos x-direction) in a magnetic field directed down (neg y-direction). In which direction does the magnetic force on the proton act?

- ◯ Down (neg y-direction)
- ◯ There is no force
- ◯ Up (pos y-direction)
- ◯ Outwards (pos z-direction)
- ✔◯ Inwards (neg z-direction)

▼ Hide Feedback

Use right hand rule. Velocity = index finger, B = ring finger/palm, thumb = force. Orienting the hand according to this gives your thumb inwards, in the negative z direction.

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Question 2 **1 / 1 point**

An electron travels with a speed of (1.3x10^4) m/s along the x-axis. A uniform magnetic field of strength (6.100x10^-4) T directed along the y-axis is turned on, and the proton starts travelling in a circle due to the magnetic force. What is the radius of this circle?

Give your answer in meters (m) using scientific notation.

Answer:

2.23x10^-1 ✗ **(1.2x10^-4)** m ✓

Hide Feedback

The radius of curvature of a charged particle travelling in a uniform magnetic field is given by

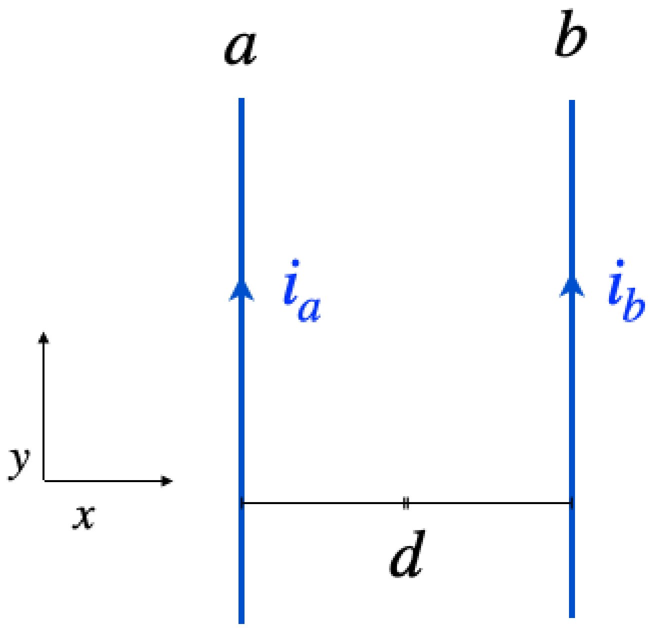
$$r = \frac{m\,v}{|q|\,B}$$

Here we need to use the mass and charge of a proton.

Question 3 **1 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (1.9x10^0) mA directed upwards. They are separated by a distance of (1.800x10^0) cm. What is the force on a 1 cm piece of the left cable, indicated by *a* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

4.01x10^-13 ✓ **(4.0x10^-13)** N ✓ ✗ wrong number of significant figures **(2)**

Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0 \, L \, i_a \, i_b}{2\pi \, d}$$

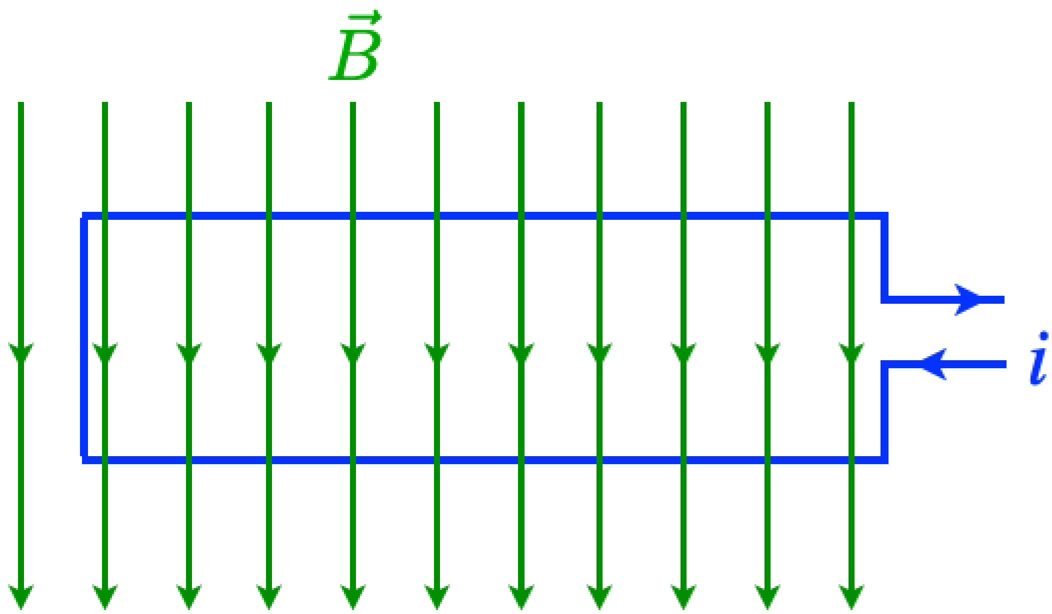
This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is towards the other wire if the currents are parallel as in this case. The force on the left wire is hence in the positive x-direction.

Question 4 **1 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- ○ There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- ○ The net force will be to the left, causing the loop to move left (in towards the B-field)
- ✔ ○ There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)
- ○ In this situation, there will be no forces or torque on the coil

▼ Hide Feedback

The magnetic dipole moment of the coil will be inwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves away from us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the right.

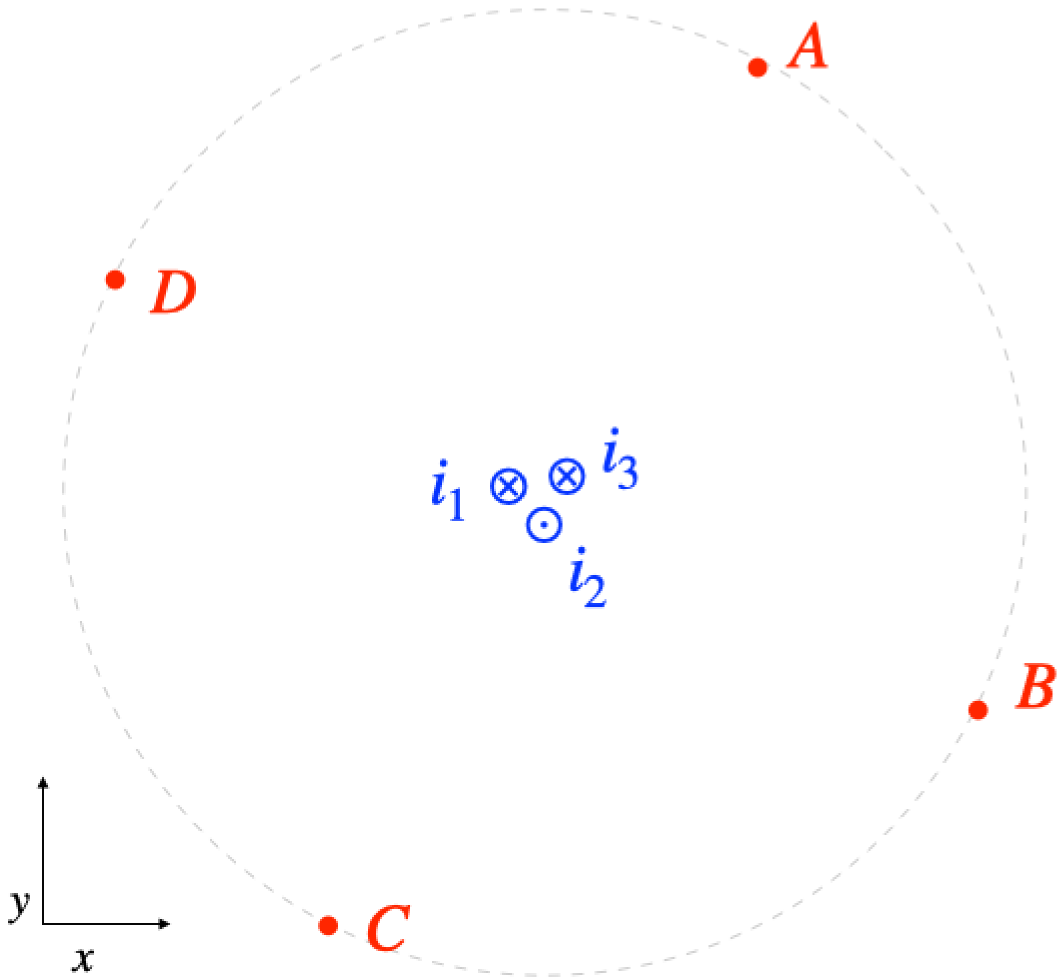
right x down = outwards

Question 5 **1 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 11 mA, i_2 = 8.1 mA and i_3 = 1.2 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- A
- B
- C

✓ ◯ D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed inwards, and we can now use the right hand rule and put our thumb inwards. The B-field will hence curl in the same direction as your finger, i.e. clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point D.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

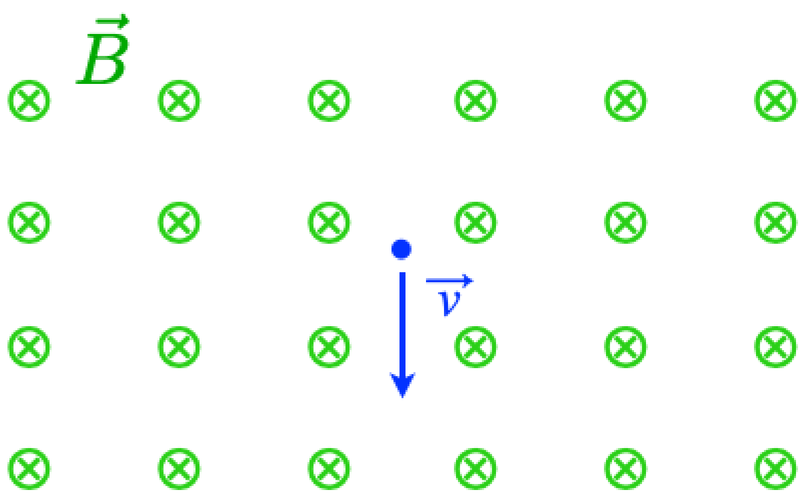
Quiz Submissions - Quiz: Week 8

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider an electron moving down in a uniform magnetic field as depicted below. How will its trajectory get altered?



- ○ Bend to the right
- ✓ ○ Bend to the left
- ○ Continue unchanged
- ○ Bend inwards
- ○ Bend outwards

▼ Hide Feedback

The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

The cross product v x B will point to the right. The force will point to the left (as the charge q is negative for an electron and hence flips the direction). The electron will hence get pushed to the left and its trajectory will start bending to the left.

Question 2 **1 / 1 point**

A proton is entering a region of a uniform magnetic field of strength (1.0x10^-3) T. The electron travels at a speed of (1.72x10^3) m/s at an angle (3.000x10^-1) radians to the magnetic field lines. Calculate the magnitude of the magnetic force that acts on the electron. Present your answers in newtons (N) using scientific notation.

Answer:

8.13x10^-20 ✔ **(8.1x10^-20)** N ✔ ✘ wrong number of significant figures **(2)**

▼ Hide Feedback

The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Its magnitude is:

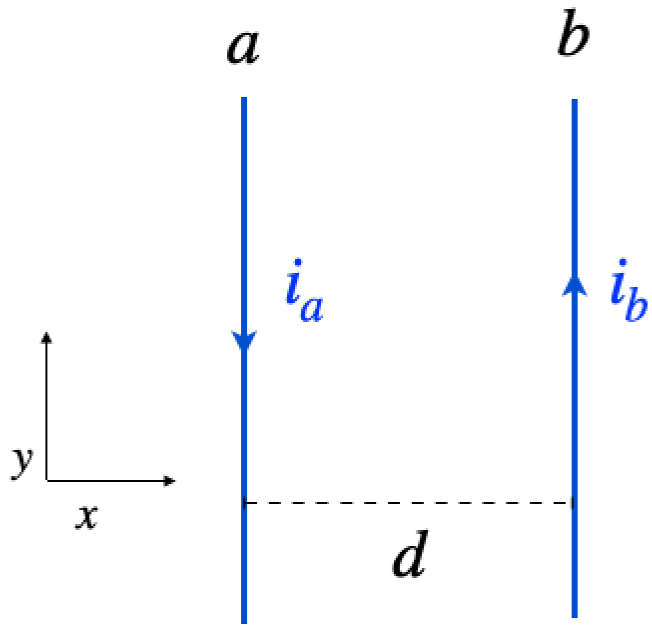
$$F_{\mathrm{B}} = |\vec{F}_{\mathrm{B}}| = qvB\sin\phi$$

where ϕ is the angle between the magnetic field and the velocity. The charge q of a proton is the elementary charge

Question 3 **1 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (3.7x10^0) mA directed as indicated in the figure. They are separated by a distance of (3.400x10^0) cm. What is the force on a 1 cm piece of the left cable, indicated by *a* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

-8.05x10^-13 ✔ **(-8.1x10^-13)** N ✔ ✖ wrong number of significant figures **(2)**

▼ Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0\, L\, i_a\, i_b}{2\pi\, d}$$

, where L = 1 cm in this case.

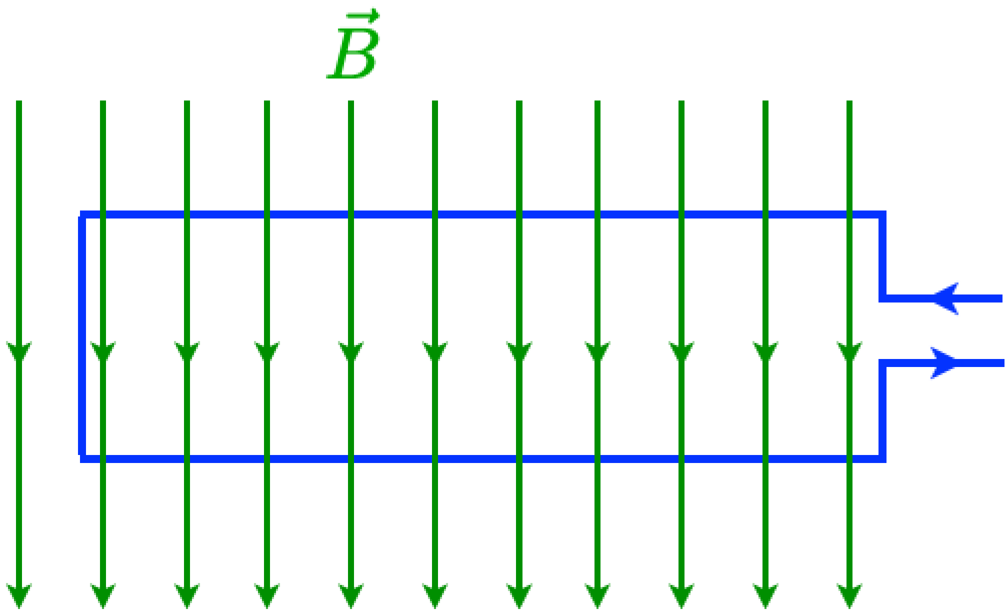
This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is away from the other wire if the currents are antiparallel as in this case. The force on the left wire is hence in the negative x-direction.

Question 4 **1 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- In this situation, there will be no forces or torque on the coil
- ✓ There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- The net force will be to the left, causing the loop to move left (in towards the B-field)
- There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)

▼ Hide Feedback

The magnetic dipole moment of the coil will be outwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves towards us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the left.

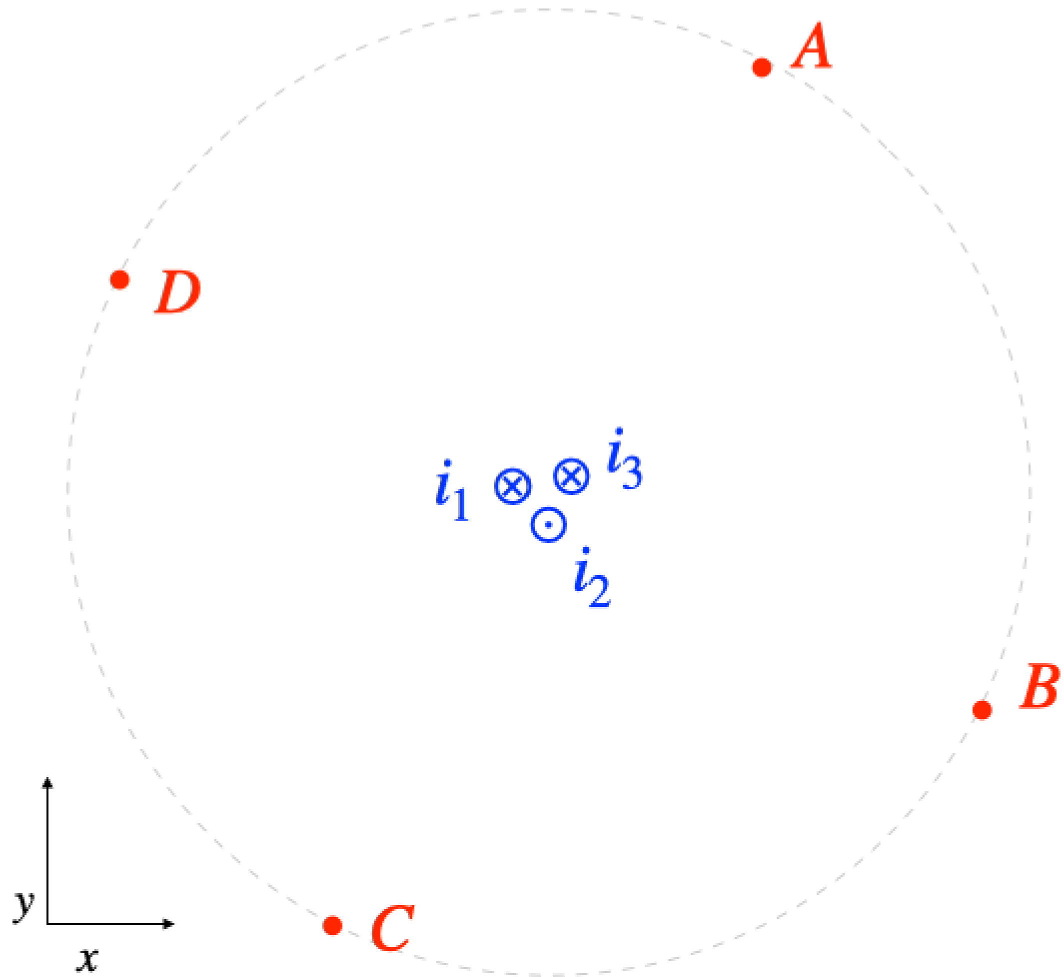
left x down = out

Question 5 **1 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 1.2 mA, i_2 = 4.1 mA and i_3 = 1.9 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- A
- ✔ B
- C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed outwards, and we can now use the right hand rule and put our thumb outwards. The B-field will hence curl in the direction of your fingers, i.e. counter clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point B.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

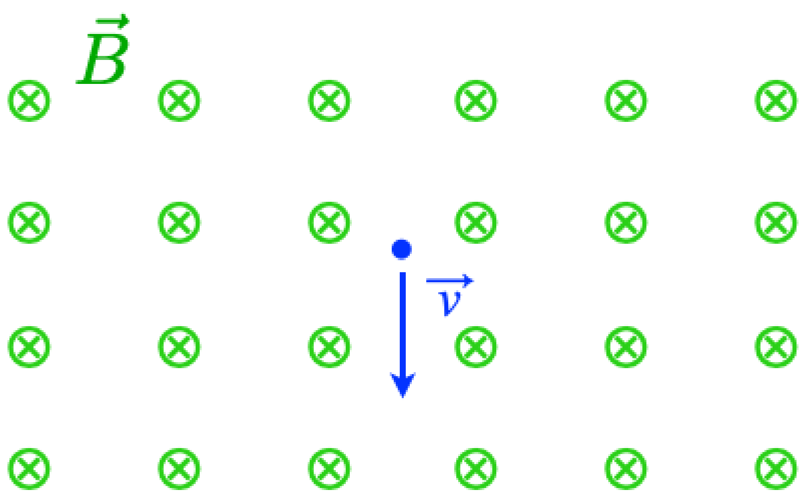
Quiz Submissions - Quiz: Week 8

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider an electron moving down in a uniform magnetic field as depicted below. How will its trajectory get altered?



- ○ Bend to the right
- ✓ ○ Bend to the left
- ○ Continue unchanged
- ○ Bend inwards
- ○ Bend outwards

▼ Hide Feedback

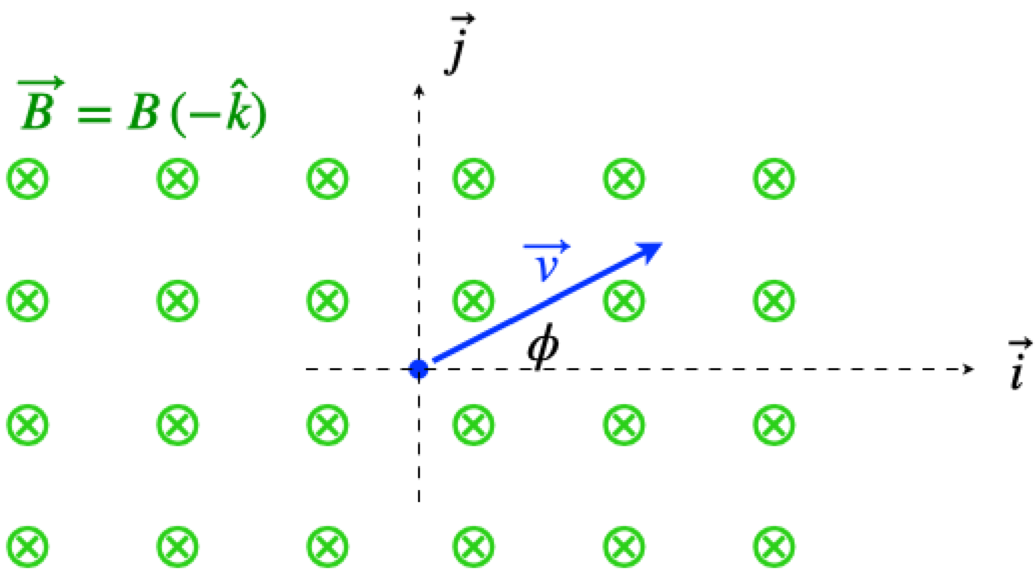
The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

The cross product v x B will point to the right. The force will point to the left (as the charge q is negative for an electron and hence flips the direction). The electron will hence get pushed to the left and its trajectory will start bending to the left.

Question 2 **0 / 1 point**

A proton is travelling with a velocity (8.5x10^2) m/s in a uniform magnetic field of strength (7.400x10^-6) T directed along the negative z-axis as shown in the figure. The proton travels in the x-y plane at an angle (4.000x10^-2) radians to the x-axis as indicated in the figure. Calculate the magnitude of the magnetic force acting on the proton. Present your answer in newtons (N) using scientific notation (2 sig figs).



Answer:

✘ **(1.0x10^-21)** N ✔

Hide Feedback

In this example, the proton travels perpendicular to the magnetic field. The magnitude of the force is hence simply given by

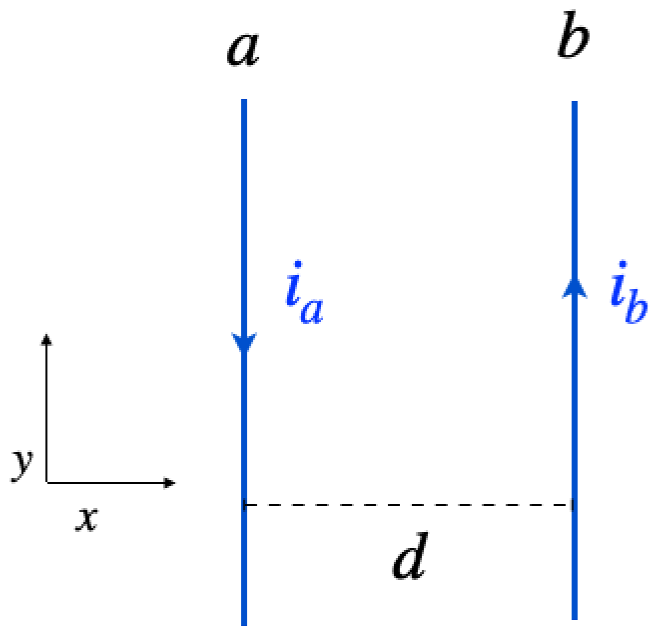
$$\vec{F}_{\mathrm{B}} = qvB$$

Where the charge is the elementary charge.

Question 3 **0 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (1.600x10^0) mA directed as indicated in the figure. They are separated by a distance of (1.5x10^0) cm. What is the force on a 1 cm piece of the right cable, indicated by *b* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

❌ (3.4x10^-13) ❌ (N)

▼ Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0 \, L \, i_a \, i_b}{2\pi \, d}$$

, where L = 1 cm in this case.

This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is away from the other wire if the currents are antiparallel as in this case. The force on the right wire is hence in the positive x-direction.

Question 4 **0 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?

- ○ The magnetic forces give rise to torque that wants to make the coil spin around
- ○

There are forces on the coil segments in the magnetic field that act outwards, away from the centre

- The net force will be to the right, causing the loop to move away from the B-field

- In this situation, there will be no forces on any of the coil segments

Hide Feedback

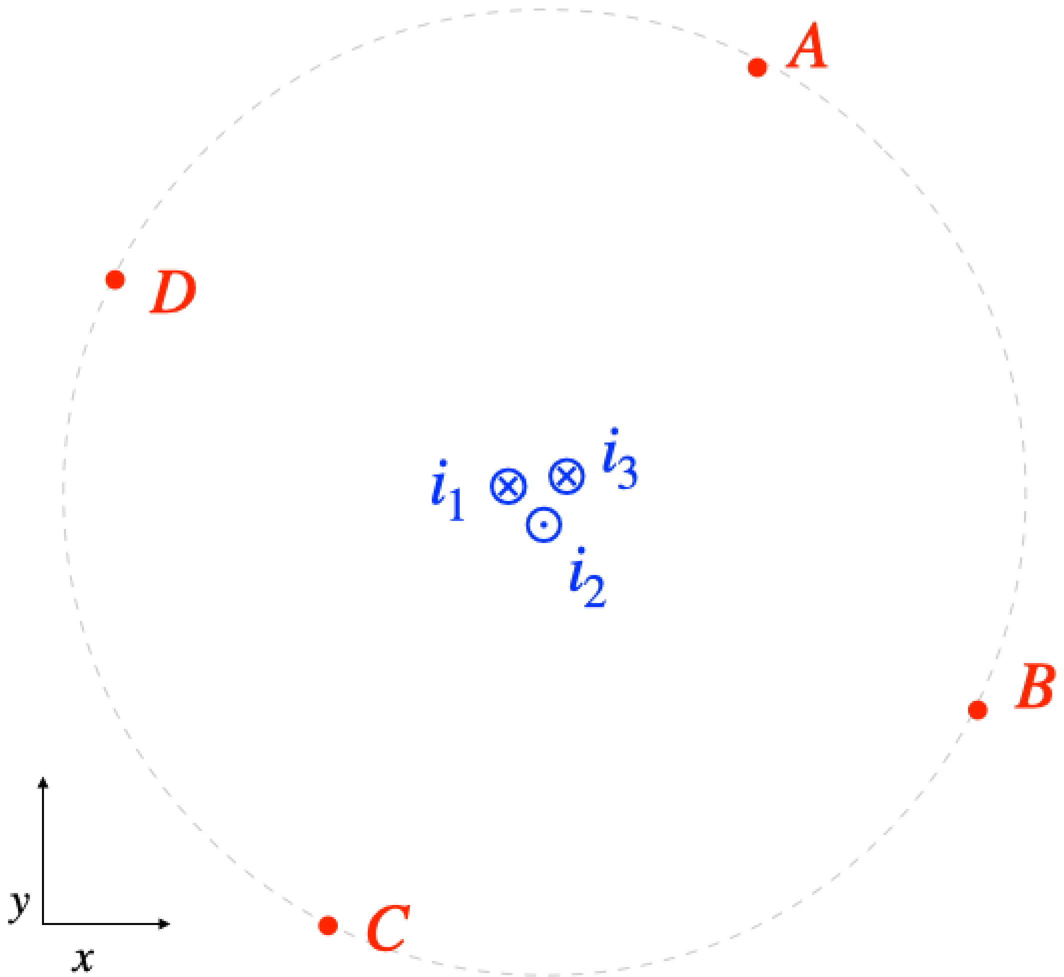
The magnetic dipole moment of the coil will be inwards, in the same direction as the B-field. Hence there is no torque on the coil. All wires inside the magnetic field will have a force that point away from the centre of the coil, which you can see by using the right hand rule.

Question 5 **0 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 1.2 mA, i_2 = 4.1 mA and i_3 = 1.9 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- A
- B
- C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed outwards, and we can now use the right hand rule and put our thumb outwards. The B-field will hence curl in the direction of your fingers, i.e. counter clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point B.

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt):3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 8

Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

An electron is travelling to the right (pos x-direction) in a magnetic field directed down (neg y-direction). In which direction does the magnetic force on the electron act?

- Outwards (pos z-direction)
- Down (neg y-direction)
- Inwards (neg z-direction)
- There is no force
- Up (pos y-direction)

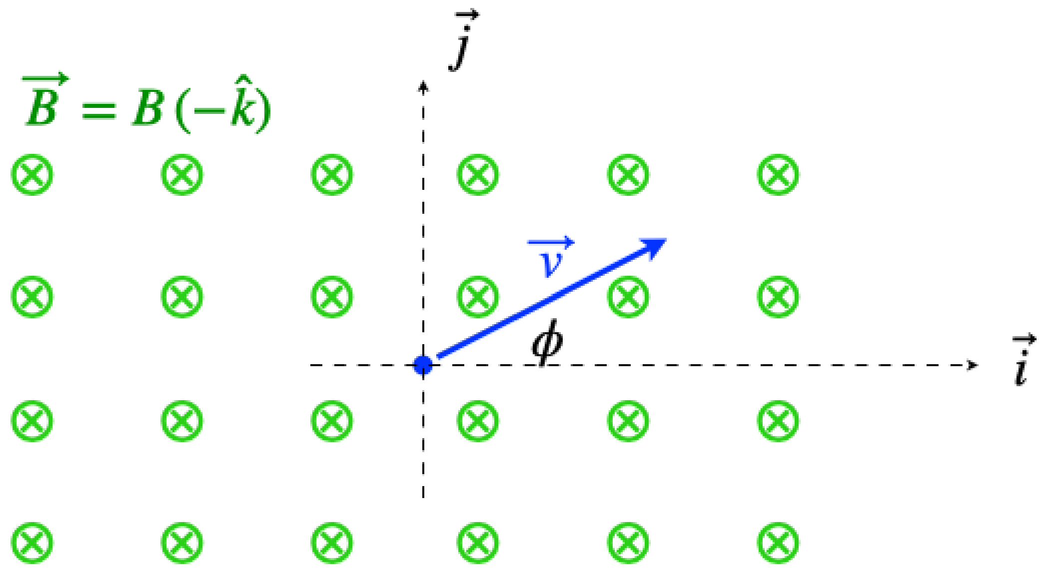
Hide Feedback

Use right hand rule. Velocity = index finger, B = ring finger/palm, thumb = force. Orienting the hand according to this gives your thumb inwards, in the negative z direction. But then you need to multiply with the charge which flips the direction to outwards (pos z-direction).

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Question 2 **0 / 1 point**

A proton is travelling with a velocity (7.80x10^2) m/s in a uniform magnetic field of strength (2.6x10^-6) T directed along the negative z-axis as shown in the figure. The proton travels in the x-y plane at an angle (7.000x10^-2) radians to the x-axis as indicated in the figure. Calculate the magnitude of the magnetic force acting on the proton. Present your answer in newtons (N) using scientific notation (2 sig figs).



Answer:

(3.2x10^-22) (N)

Hide Feedback

In this example, the proton travels perpendicular to the magnetic field. The magnitude of the force is hence simply given by

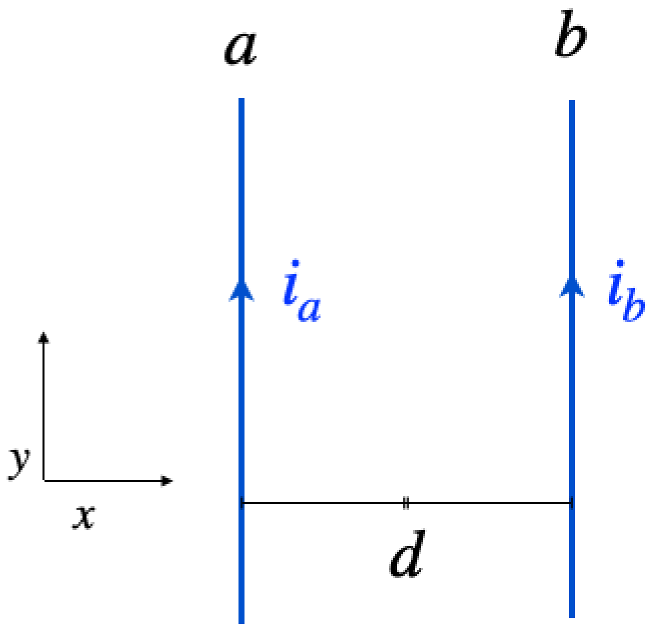
$$\vec{F}_{\mathrm{B}} = qvB$$

Where the charge is the elementary charge.

Question 3 **0 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (2.5x10^0) mA directed upwards. They are separated by a distance of (1.00x10^0) cm. What is the force on a 1 cm piece of the left cable, indicated by *a* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

(1.3x10^-12) (N)

Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0 \, L \, i_a \, i_b}{2\pi \, d}$$

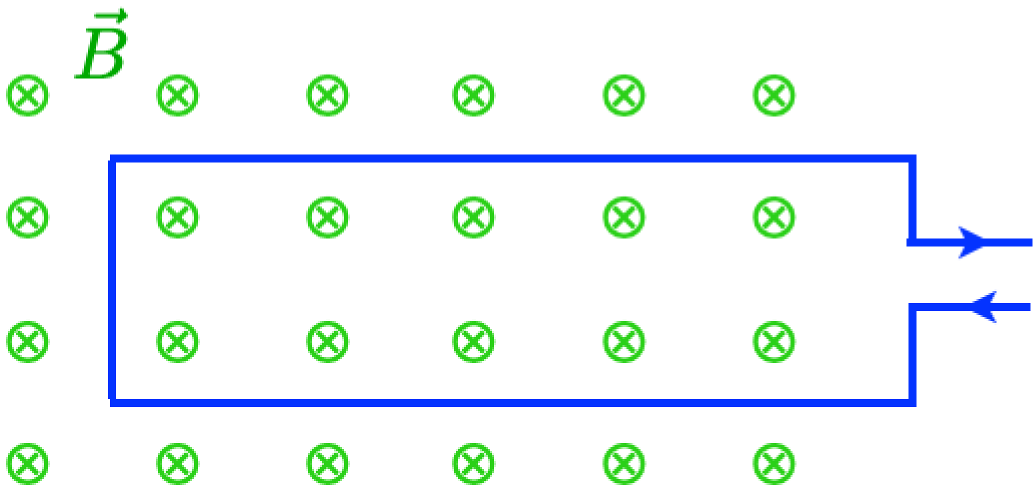
This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is towards the other wire if the currents are parallel as in this case. The force on the left wire is hence in the positive x-direction.

Question 4 **0 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- ◯ The magnetic forces give rise to torque that wants to make the coil spin around
- ➡ ◯ There are forces on the coil segments in the magnetic field that act outwards, away from the centre
- ◯ The net force will be to the right, causing the loop to move away from the B-field
- ◯ In this situation, there will be no forces on any of the coil segments

▼ Hide Feedback

The magnetic dipole moment of the coil will be inwards, in the same direction as the B-field. Hence there is no torque on the coil. All wires inside the magnetic field will have a force that point away from the centre of the coil, which you can see by using the right hand rule.

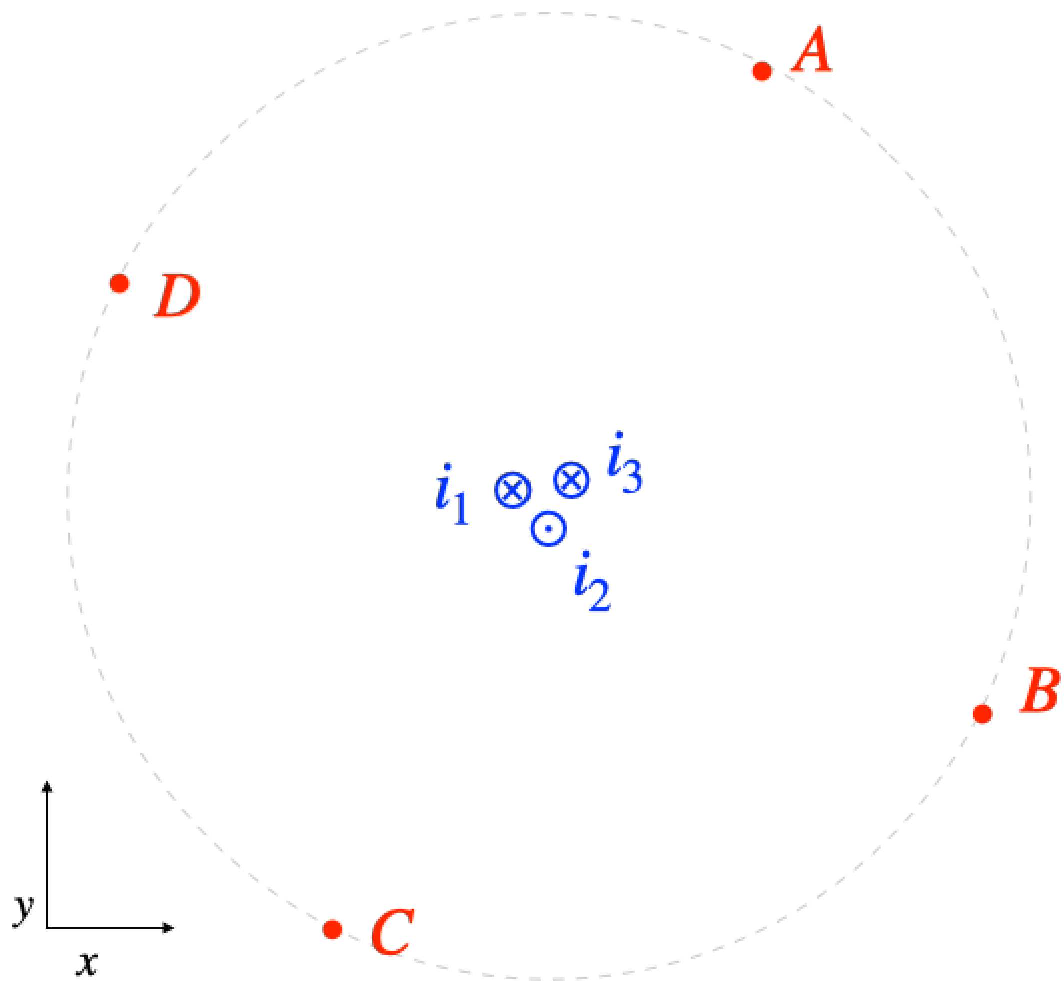
Question 5 **1 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 1.2 mA, i_2 = 4.1 mA and i_3 = 1.9 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (-9.2\hat{\imath} + 4.6\hat{\jmath})$$

(units μT).

In which of the points indicated in the figure was this magnetic field measured?



✓ ○ A

○ B

C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed outwards, and we can now use the right hand rule and put our thumb outwards. The B-field will curl in the same direction as your fingers, i.e. counter clockwise through the points. The only point that gets a B-field "mostly left and slightly up" is point A.

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt):3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 8

Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A proton is travelling to the right (pos x-direction) in a magnetic field directed down (neg y-direction). In which direction does the magnetic force on the proton act?

- Down (neg y-direction)
- ✔ Inwards (neg z-direction)
- There is no force
- Outwards (pos z-direction)
- Up (pos y-direction)

Hide Feedback

Use right hand rule. Velocity = index finger, B = ring finger/palm, thumb = force. Orienting the hand according to this gives your thumb inwards, in the negative z direction.

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Question 2 **1 / 1 point**

An electron travels with a speed of (3.700x10^4) m/s along the x-axis. A uniform magnetic field of strength (6.4x10^-4) T directed along the y-axis is turned on, and the electron starts travelling in a circle due to the magnetic force. What is the radius of this circle?

Give your answer in meters (m) using scientific notation.

Answer:

3.3x10^-4 ✔ m ✔

▼ Hide Feedback

The radius of curvature of a charged particle travelling in a uniform magnetic field is given by

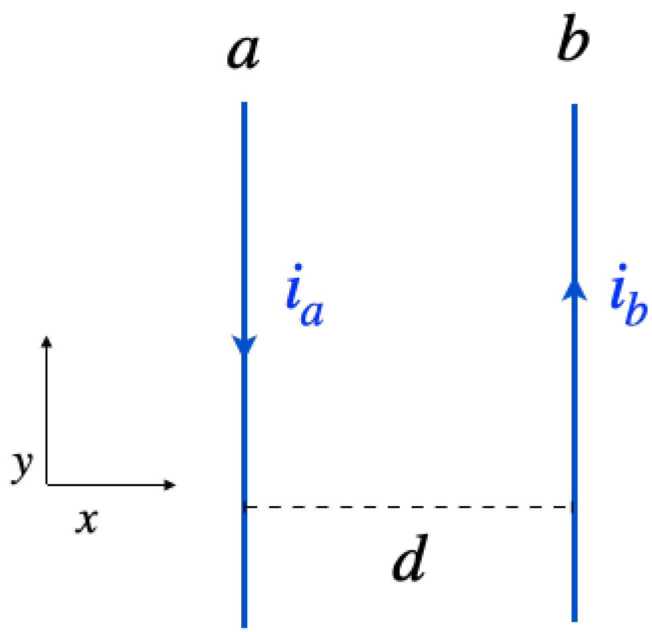
$$r = \frac{m\,v}{|q|\,B}$$

Here we need to use the mass and charge of a proton.

Question 3 **1 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (2.8x10^0) mA directed as indicated in the figure. They are separated by a distance of (1.00x10^0) cm. What is the force on a 1 cm piece of the left cable, indicated by *a* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

-1.6x10^-12 ✓ N ✓

Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0 \, L \, i_a \, i_b}{2\pi \, d}$$

, where L = 1 cm in this case.

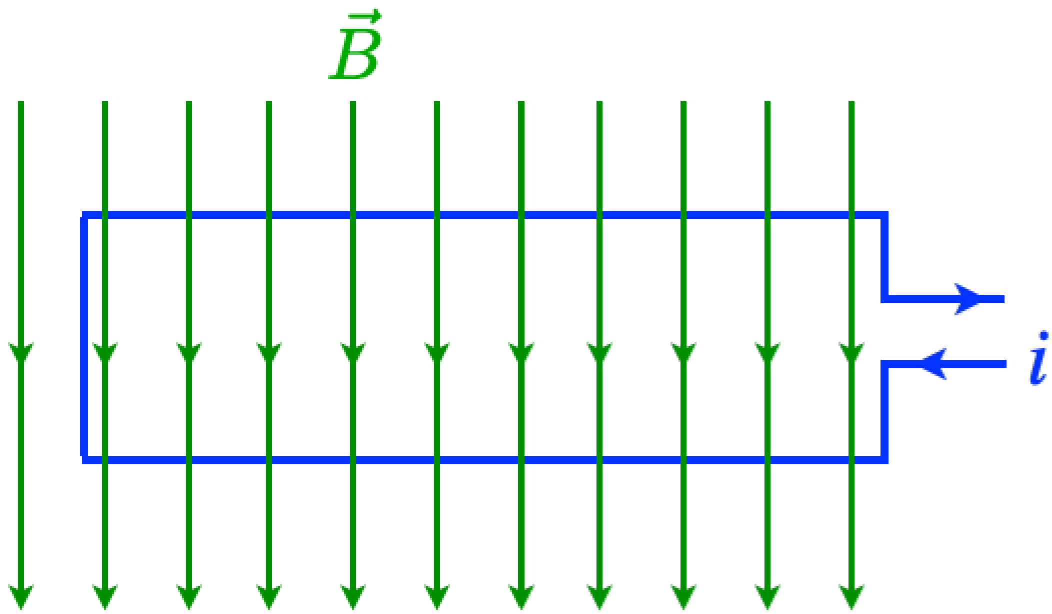
This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is away from the other wire if the currents are antiparallel as in this case. The force on the left wire is hence in the negative x-direction.

Question 4 **0 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- ➡ ◯ There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)
- ◯ In this situation, there will be no forces or torque on the coil
- ✖ ◯ There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- ◯ The net force will be to the left, causing the loop to move left (in towards the B-field)

▼ Hide Feedback

The magnetic dipole moment of the coil will be inwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves away from us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the right.

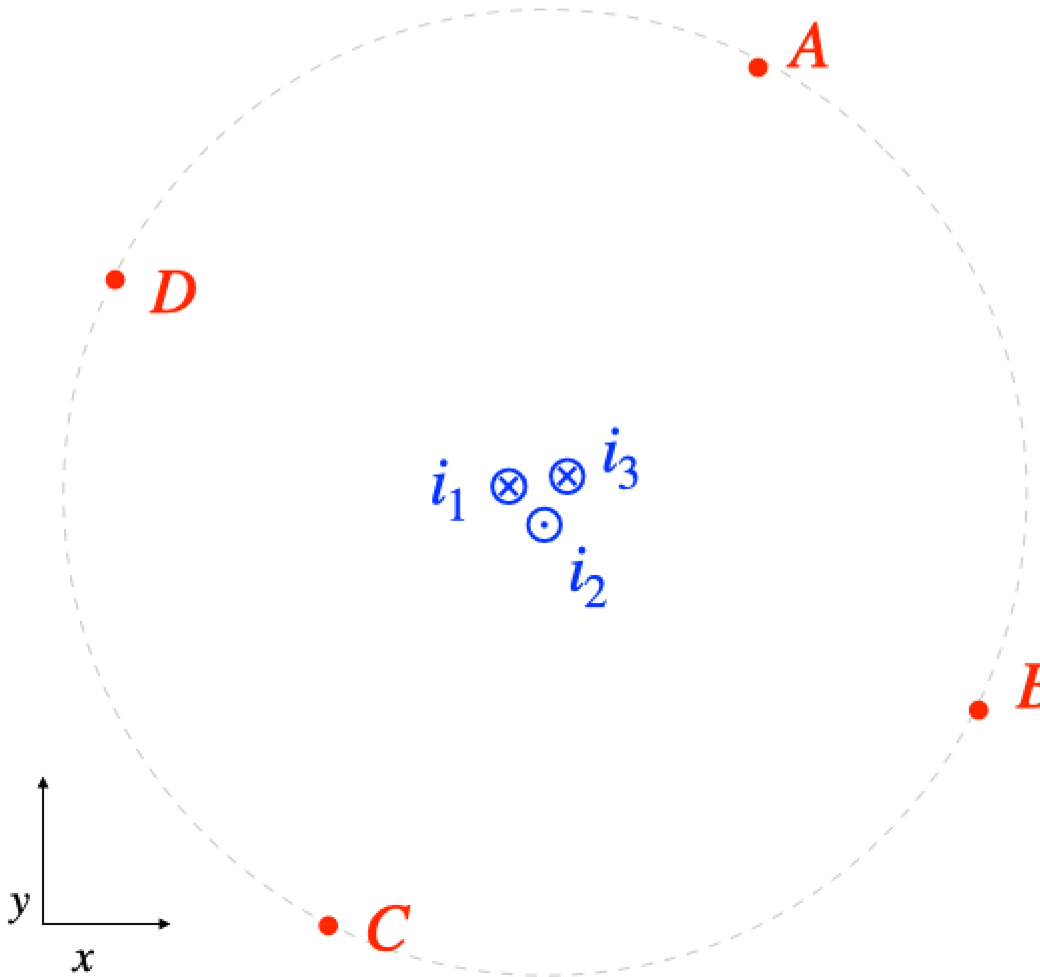
right x down = inwards

Question 5 **0 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 11 mA, i_2 = 8.1 mA and i_3 = 1.2 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (460\hat{\imath} + 920\hat{\jmath})\,\mathrm{nT}$$

In which of the points indicated in the figure was this magnetic field measured?



- ○ A
- ✗ ○ B
- ○ C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed inwards, and we can now use the right hand rule and put our thumb inwards. The B-field will hence curl in the same direction as your finger, i.e. clockwise through the points. The only point that gets a B-field "mostly up and slightly right" is point D.

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

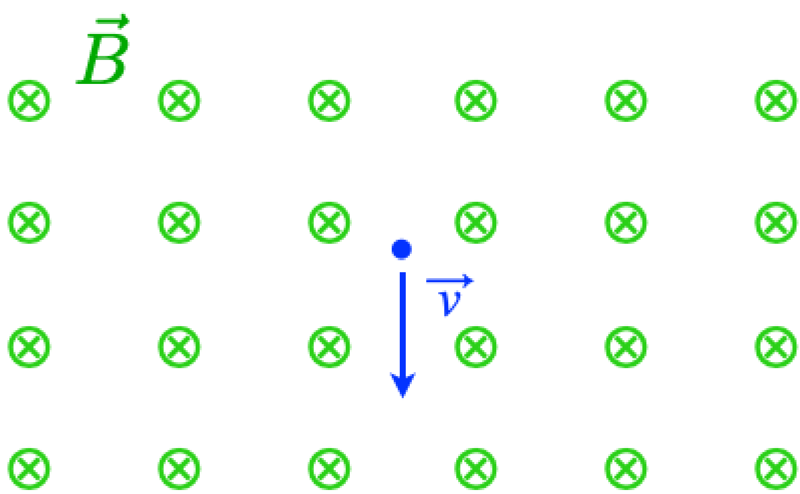
Quiz Submissions - Quiz: Week 8

Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Consider a proton moving down in a uniform magnetic field as depicted below. How will its trajectory get altered?



- ✔ ◯ Bend to the right
- ◯ Bend to the left
- ◯ Bend inwards
- ◯ Bend outwards
- ◯ It will not get altered

▼ Hide Feedback

The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

The cross product v x B will point to the right. The force will also be directed to the right (the charge q is positive for a proton). The proton will hence get pushed to the right and its trajectory will start bending to the right.

Question 2 **0 / 1 point**

A proton is entering a region of a uniform magnetic field of strength (1.600x10^-3) T. The proton travels at a speed of (1.690x10^3) m/s at an angle (4.0x10^-1) radians to the magnetic field lines. Calculate the magnitude of the magnetic force that acts on the proton. Present your answers in newtons (N) using scientific notation.

Answer:

1.8x10^-27 ✗ **(1.7x10^-19)** N ✓

▼ Hide Feedback

The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

Its magnitude is:

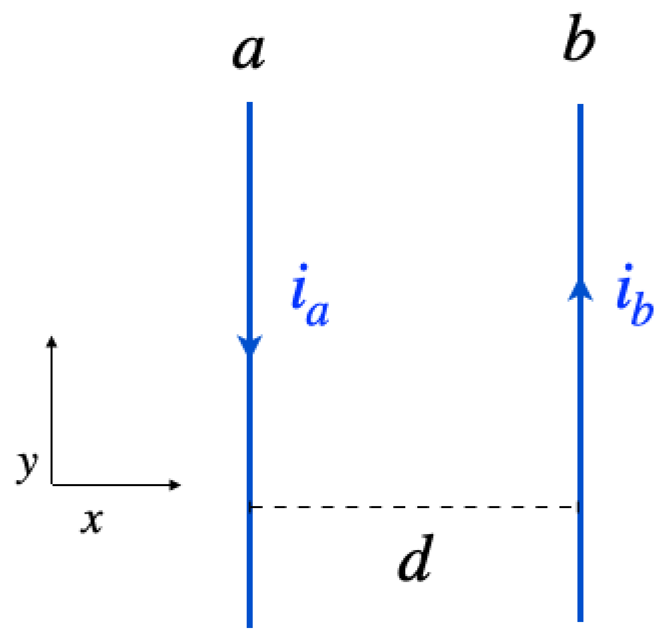
$$F_{\mathrm{B}} = |\vec{F}_{\mathrm{B}}| = qvB\sin\phi$$

where ϕ is the angle between the magnetic field and the velocity. The charge q of a proton is the elementary charge

Question 3 **1 / 1 point**

Consider the two parallel wires as illustrated below that both carry a current of (2.10x10^0) mA directed as indicated in the figure. They are separated by a distance of (3.3x10^0) cm. What is the force on a 1 cm piece of the right cable, indicated by *b* in the figure?

Give your answer in newtons (N) using scientific notation with a sign that indicates the direction along the x-axis.



Answer:

2.7x10^-13 ✔ N ✔

Hide Feedback

The force on parallel wires are given by

$$F = \frac{\mu_0 \, L \, i_a \, i_b}{2\pi \, d}$$

, where L = 1 cm in this case.

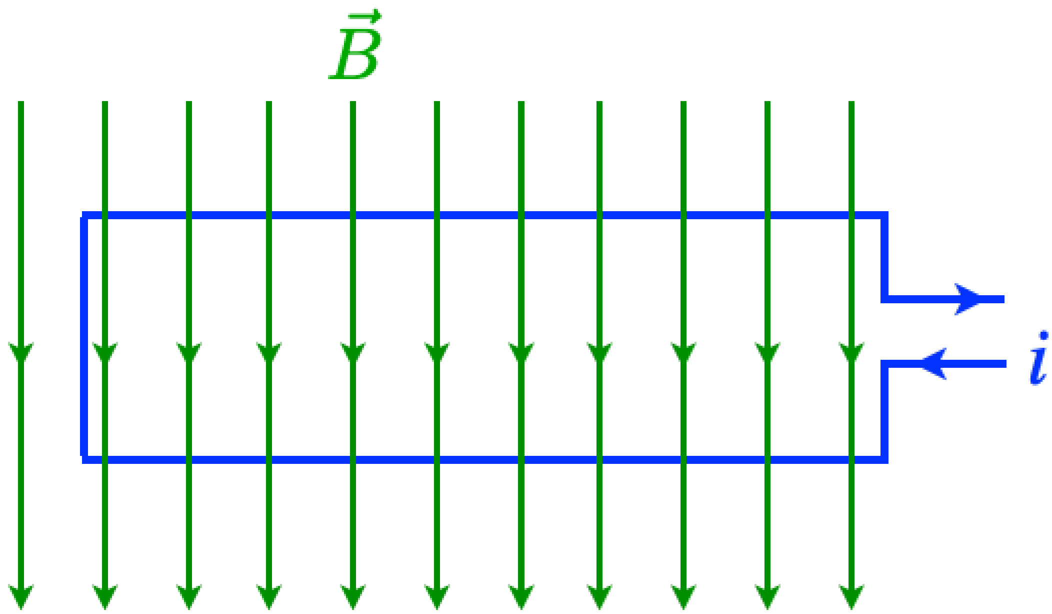
This follows from the combining the formulas for magnetic field produced around a wire with the force on a current conducting wire in a magnetic field.

The direction of the force is away from the other wire if the currents are antiparallel as in this case. The force on the right wire is hence in the positive x-direction.

Question 4 **0 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- ◯ The net force will be to the left, causing the loop to move left (in towards the B-field)
- ◯ There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- ✗ ◯ In this situation, there will be no forces or torque on the coil
- ⇨ ◯ There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)

▼ Hide Feedback

The magnetic dipole moment of the coil will be inwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves away from us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the right.

right x down = inwards

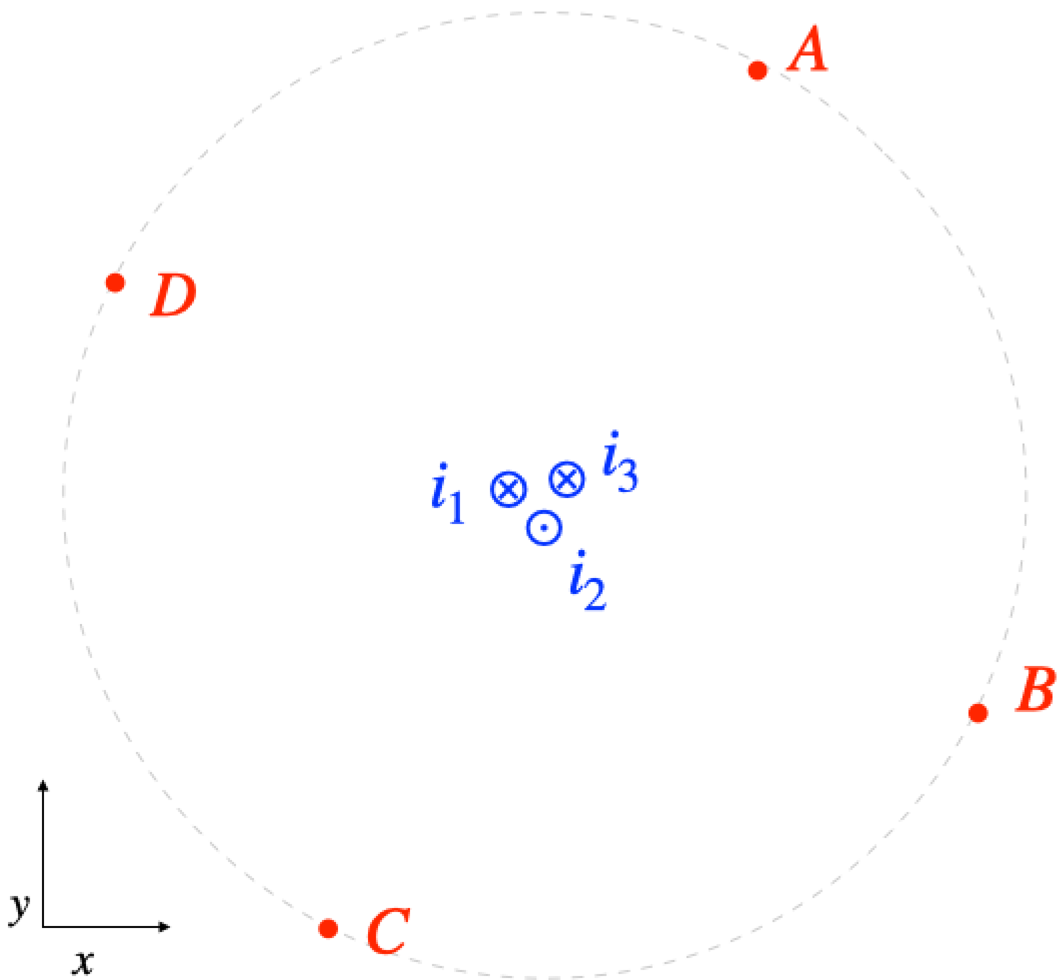
Question 5 **0 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 1.2 mA, i_2 = 2.6 mA and i_3 = 1.9 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (-9.2\hat{\imath} + 4.6\hat{\jmath})$$

(units μT).

In which of the points indicated in the figure was this magnetic field measured?



- [ ] A
- [ ] B
- [ ]

C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed inwards, and we can now use the right hand rule and put our thumb outwards. The B-field will curl according to our fingers, i.e. clockwise through the points. The only point that gets a B-field "mostly left and slightly up" is point C.

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

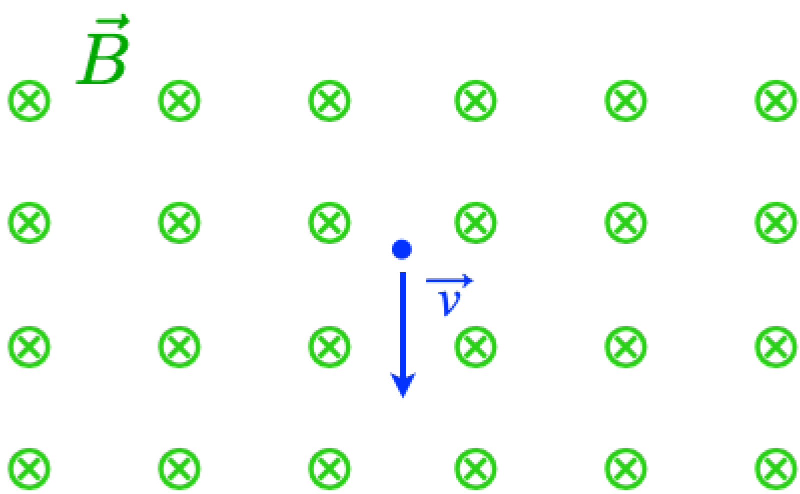
Quiz Submissions - Quiz: Week 8

Attempt 3

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Consider a proton moving down in a uniform magnetic field as depicted below. How will its trajectory get altered?



- Bend to the right
- Bend to the left
- Bend inwards
- Bend outwards
- It will not get altered

Hide Feedback

The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

The cross product v x B will point to the right. The force will also be directed to the right (the charge q is positive for a proton). The proton will hence get pushed to the right and its trajectory will start bending to the right.

Question 2 **0 / 1 point**

A proton is entering a region of a uniform magnetic field of strength (3.80x10^-3) T. The proton travels at a speed of (8.8x10^2) m/s at an angle (1.200x10^0) radians to the magnetic field lines. Calculate the magnitude of the magnetic force that acts on the proton. Present your answers in newtons (N) using scientific notation.

Answer:

5.4x10^-19 ✗ **(5.0x10^-19)** N ✓

▼ Hide Feedback

The magnetic force is given by:

$$\vec{F}_{\mathrm{B}} = q\vec{v} \times \vec{B}$$

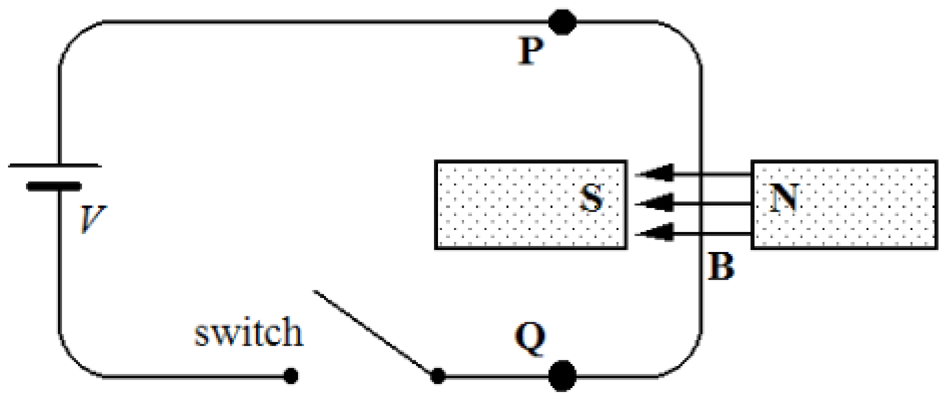
Its magnitude is:

$$F_{\mathrm{B}} = |\vec{F}_{\mathrm{B}}| = qvB\sin\phi$$

where ϕ is the angle between the magnetic field and the velocity. The charge q of a proton is the elementary charge

Question 3 **0 / 1 point**

A portion of a loop of wire passes between the poles of a magnet as shown. We are viewing the circuit from above. When the switch is closed and a current passes through the circuit, what is the movement, if any, of the wire between the poles of the magnet?



- ◯ The wire moves towards the north pole of the magnet
- ✖ ◯ The wire moves towards the south pole of the magnet
- ➡ ◯ The wire moves inwards (away from us)
- ◯ The wire moves upwards (towards us)
- ◯ It doesn't move

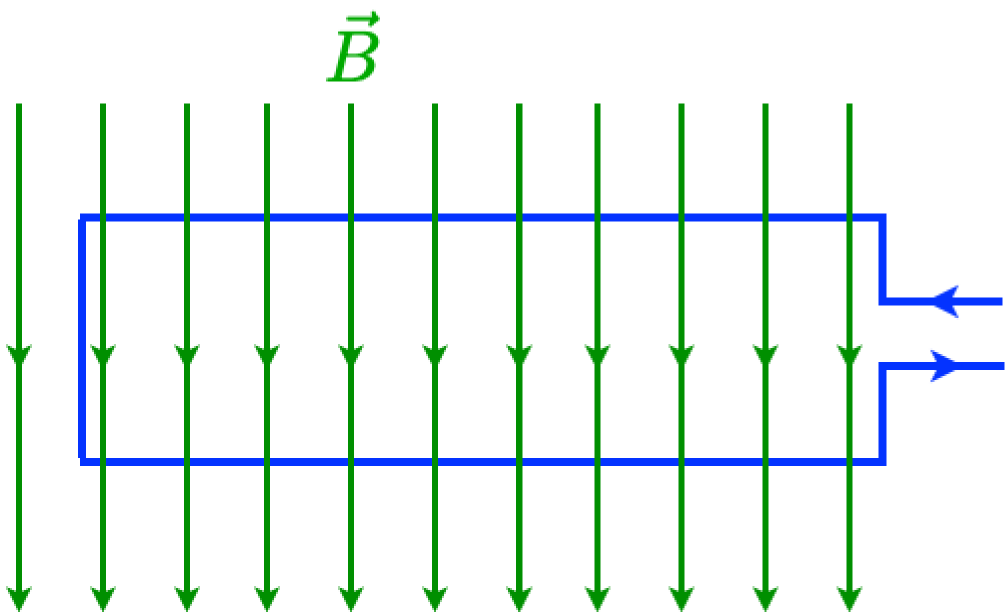
▼ Hide Feedback

The current is moving down (positive charges has downward velocity), magnetic field points left. The right hand rule gives a force directed inwards.

Question 4 **1 / 1 point**

Consider the situation below in which a current carrying coil (loop) is situated in a magnetic field. The plane of the coil is perpendicular to the magnetic field, and an electric current is run in the direction indicated.

What is true regarding to the forces on the coil?



- ◯ In this situation, there will be no forces or torque on the coil
- ✓◯ There will be a torque on the coil that will push the lower coil segment inward (into the page) and the upper segment outwards (out of the page)
- ◯ The net force will be to the left, causing the loop to move left (in towards the B-field)
- ◯ There will be a torque on the coil that will push the upper coil segment inward (into the page) and the lower segment outwards (out of the page)

Hide Feedback

The magnetic dipole moment of the coil will be outwards, while the magnetic field points down. The coil dipole moment will want to align with the magnetic field direction, and hence point down. This means the coil will want to spin 90 degrees such that the upper segment moves towards us.

We can also get to the same conclusion using the the right hand rule for currents carrying segments.

For example, for the upper segment, the current moves to the left.

left x down = out

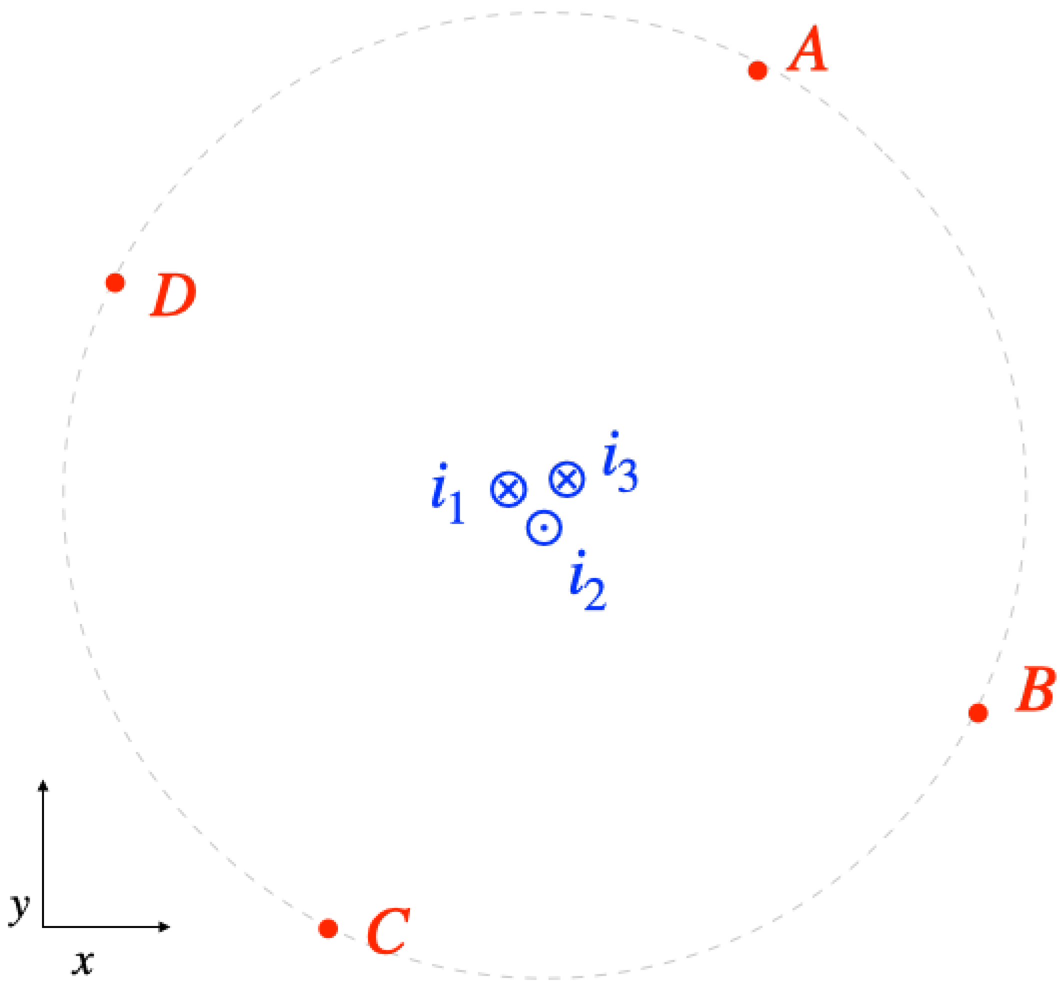
Question 5 **1 / 1 point**

Consider the situation depicted below, where three closely spaced wires are carrying currents of magnitudes i_1 = 1.2 mA, i_2 = 4.1 mA and i_3 = 1.9 mA, with directions either into the page or out of the page, as indicated in the figure. In one of the points the magnetic field is measured to be

$$\vec{B} = (-9.2\hat{\imath} + 4.6\hat{\jmath})$$

(units μT).

In which of the points indicated in the figure was this magnetic field measured?



- [x] A
- [ ] B
- [ ]

C

D

Hide Feedback

We can use Ampere's law to draw an imaginary loop through the points. The net enclosed current is directed outwards, and we can now use the right hand rule and put our thumb outwards. The B-field will curl in the same direction as your fingers, i.e. counter clockwise through the points. The only point that gets a B-field "mostly left and slightly up" is point A.

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

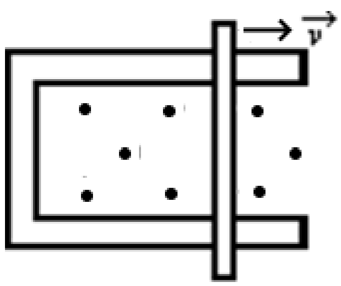
Done

Quiz Submissions - Quiz: Week 9

Attempt 1

Question 1 **1 / 1 point**

A rod lies across frictionless rails in a uniform magnetic field B that point toward the viewer

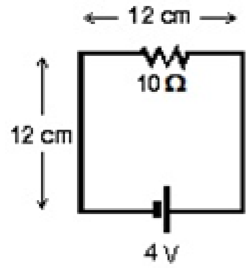


The rod moves to the right with constant speed *v*. In order for the emf around the circuit to be zero, the magnitude of the magnetic field should:

- increase quadratically with time
- increase linearly with time
- decrease quadratically with time
- ✓ decrease linearly with time
- not change

Question 2 **1 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **into the page**. The current in the circuit is (1.7x10^-1) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

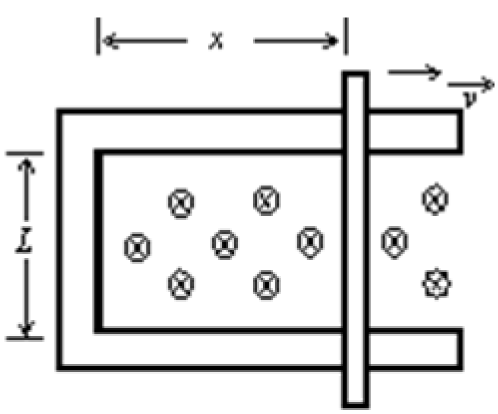
-1.6x10^2 ✔

▼ Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(-)(I * R - \Delta V)$$

Question 3 **1 / 1 point**

A rod with resistance *R* lies across frictionless conducting rails in a constant uniform magnetic field *B*, **pointing into the paper as shown below**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed *v*** is:



○

BLv(x/R)

✓ ◯ B^2L^2v/R

◯ $B^2L^2v(x/R)$

◯ No force (zero Newton)

◯ *BLv*

Question 4 **1 / 1 point**

A **10-turn ideal solenoid** has an inductance of (4.49x10^0) mH. When the solenoid carries a current of (3.0x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

1.3x10^-3 ✓

▼ Hide Feedback

$$\Phi_B = \frac{1}{N}Li$$

Question 5 **1 / 1 point**

A 10-turn ideal solenoid has an inductance of (4.410x10^-3) H. To generate an EMF of (1.9x10^0) V what should be the rate of change of the current? Express your result as the magnitude in A/s.

Answer:

4.3x10^2 ✓

Hide Feedback

$$\text{EMF} = L\frac{di}{dt}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

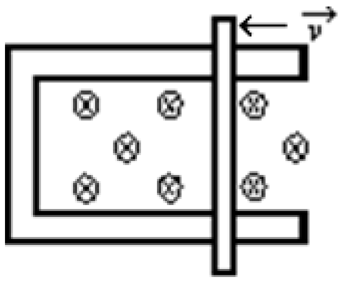
Quiz Submissions - Quiz: Week 9

×

Attempt 1

Question 1 **0 / 1 point**

A rod lies across frictionless rails in a uniform magnetic field B such that the encapsulated area becomes smaller, i.e. the rod moves at constant speed to the left in the picture below.

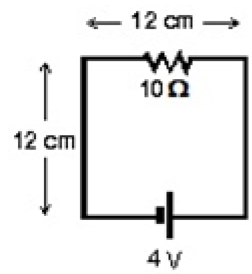


In order for the emf around the circuit to be zero, the magnitude of the magnetic field should:

- ○ increase quadratically with time
- ○ decrease linearly with time
- ○ decrease quadratically with time
- ➡ ○ increase linearly with time
- ✗ ○ not change

Question 2 **0 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **out from the page**. The current in the circuit is (1.7x10^-1) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

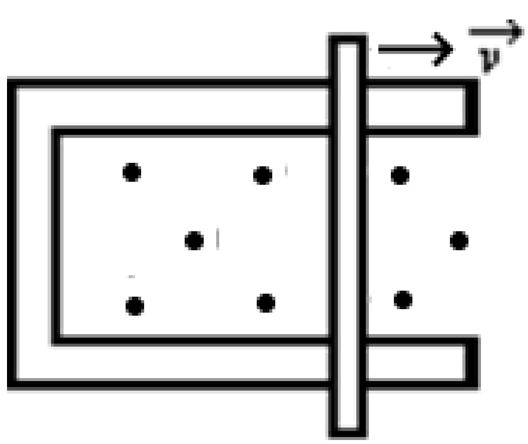
✗ **(1.6x10^2)**

Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(I * R - \Delta V)$$

Question 3 **1 / 1 point**

A rod with resistance *R* lies across frictionless conducting rails in a constant uniform magnetic field *B*, **pointing out of the paper**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed *v*** is:



○

No force (zero Newton)

- BLv
- $B^2L^2v(x/R)$
- ✔ B^2L^2v/R
- $BLv(x/R)$

Question 4 **0 / 1 point**

A **12-turn ideal solenoid** has an inductance of (2.72x10^0) mH. When the solenoid carries a current of (7.7x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

✘ **(1.7x10^-3)**

Hide Feedback

$$\Phi_B = \frac{1}{N}Li$$

Question 5 **0 / 1 point**

A 10-turn ideal solenoid has an inductance of (2.88x10^-3) H. To generate an EMF of (1.8x10^0) V what should be the rate of change of the current? Express your result as the magnitude in A/s.

Answer:

✘ **(6.3x10^2)**

Hide Feedback

$$\mathrm{EMF} = L\,\frac{di}{dt}$$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 9

Attempt 1

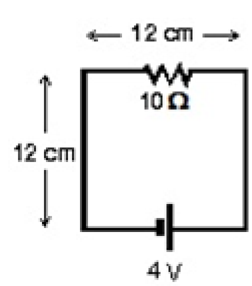
Question 1 **0 / 1 point**

A rectangular loop of wire has area A. It is placed perpendicular to a uniform magnetic field *B* and then spun around one of its sides at frequency *f*. The maximum induced emf is:

- BAf
- $4\pi\epsilon_0 BAf$
- $2\pi BAf$
- $BAf/2\pi$

Question 2 **0 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **into the page**. The current in the circuit is (8.1x10^-2) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

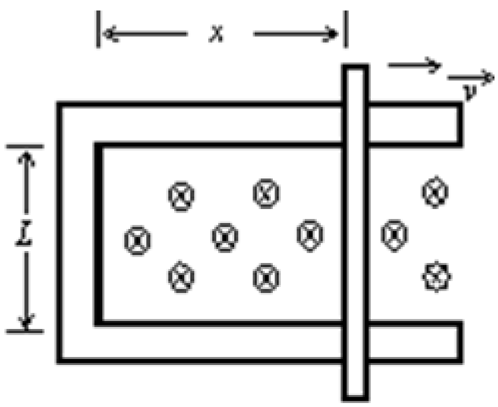
(-2.2x10^2)

Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(-)(I * R - \Delta V)$$

Question 3 **1 / 1 point**

A rod with resistance R lies across frictionless conducting rails in a constant uniform magnetic field B, **pointing out of the paper, i.e. opposite to what is shown below**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed v** is:



- ○ BLv
- ✔ ○ B^2L^2v/R
- ○ No force (zero Newton)
- ○ $BLv(x/R)$
- ○ $B^2L^2v(x/R)$

Question 4 **1 / 1 point**

A **12-turn ideal solenoid** has an inductance of (2.8x10^0) mH. When the solenoid carries a current of (7.68x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

1.79x10^-3 ✔ **(1.8x10^-3)** ✘ wrong number of significant figures **(2)**

▼ Hide Feedback

$$\Phi_B = \frac{1}{N} Li$$

Question 5 **0 / 1 point**

A 10-turn ideal solenoid has an inductance of (3.0x10^-3) H. To generate an EMF of (1.880x10^0) V what should be the rate of change of the current? Express your result as the magnitude in A/s.

Answer:

6.07x10^2 ✘ **(6.3x10^2)**

▼ Hide Feedback

$$\mathrm{EMF} = L\frac{di}{dt}$$

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt):3 / 5 - 60 %

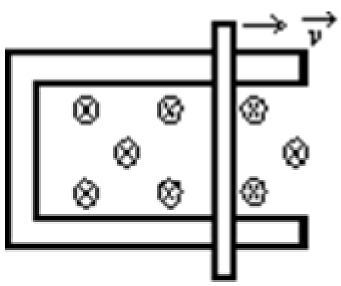
Done

Quiz Submissions - Quiz: Week 9

Attempt 1

Question 1 **1 / 1 point**

A rod lies across frictionless rails in a uniform magnetic field B that point toward the viewer (ignore the illustration and consider the magnetic field points out of the screen)

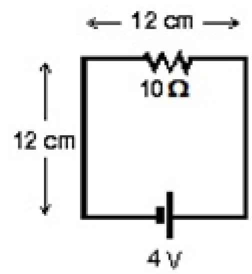


The rod moves to the right with constant speed *v*. In order for the emf around the circuit to be zero, the magnitude of the magnetic field should:

- increase quadratically with time
- ✔ decrease linearly with time
- not change
- decrease quadratically with time
- increase linearly with time

Question 2 **1 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **into the page**. The current in the circuit is (8.2x10^-2) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

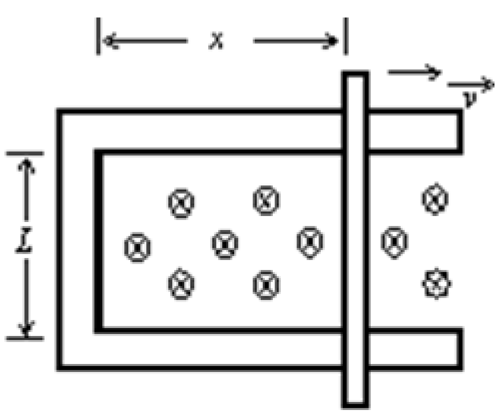
-2.2x10^2 ✓

Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(-)(I * R - \Delta V)$$

Question 3 **1 / 1 point**

A rod with resistance *R* lies across frictionless conducting rails in a constant uniform magnetic field *B*, **pointing out of the paper, i.e. opposite to what is shown below**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed *v*** is:



BLv(x/ R)

○ *BLv*

✔○ $B^2 L^2 v/R$

○ No force (zero Newton)

○ $B^2 L^2 v(x/R)$

Question 4 **1 / 1 point**

A **10-turn ideal solenoid** has an inductance of (1.9x10^0) mH. When the solenoid carries a current of (3.90x10^-1) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

7.4x10^-5 ✔

▼ Hide Feedback

$$\Phi_B = \frac{1}{N} Li$$

Question 5 **1 / 1 point**

A 25-turn ideal solenoid has an inductance of (3.540x10^-3) H. To generate an EMF of (6.3x10^-1) V what should be the rate of change of the current? Express your result as the magnitude in A/s.

Answer:

1.8x10^2 ✔

Hide Feedback

$$\text{EMF} = L\frac{di}{dt}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

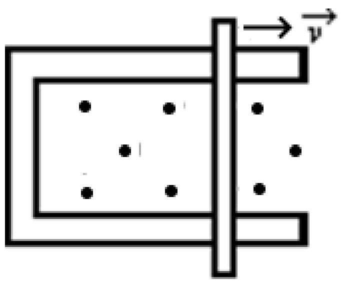
Done

Quiz Submissions - Quiz: Week 9

Attempt 1

Question 1 **0 / 1 point**

A rod lies across frictionless rails in a uniform magnetic field B that point toward the viewer

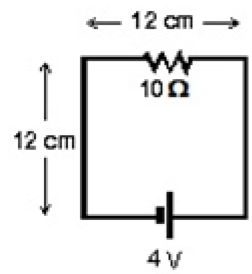


The rod moves to the right with constant speed *v*. In order for the emf around the circuit to be zero, the magnitude of the magnetic field should:

- increase linearly with time
- increase quadratically with time
- decrease linearly with time
- decrease quadratically with time
- not change

Question 2 **0 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **into the page**. The current in the circuit is (1.8x10^-1) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

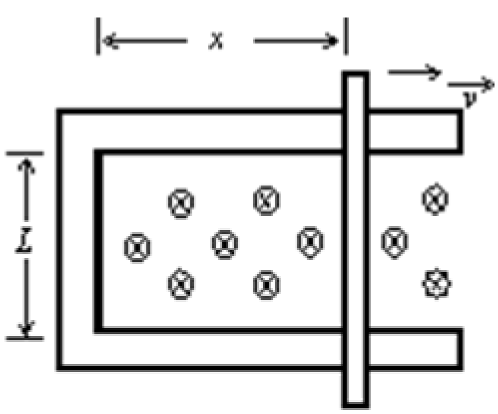
✗ **(-1.5x10^2)**

▼ Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(-)(I * R - \Delta V)$$

Question 3 **0 / 1 point**

A rod with resistance *R* lies across frictionless conducting rails in a constant uniform magnetic field *B*, **pointing into the paper as shown below**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed** ***v*** is:



○

$B^2L^2v(x/R)$

No force (zero Newton)

B^2L^2v/R

$BLv(x/R)$

BLv

Question 4 **0 / 1 point**

A **10-turn ideal solenoid** has an inductance of (5.2x10^0) mH. When the solenoid carries a current of (1.420x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

7.1x10^-4 **(7.4x10^-4)**

Hide Feedback

$$\Phi_B = \frac{1}{N}Li$$

Question 5 **0 / 1 point**

A 10-turn ideal solenoid has an inductance of (4.5x10^-3) H. To generate an EMF of (1.160x10^0) V what should be the rate of change of the current? Express your result as the magnitude in A/s.

Answer:

-4.5x10^-4 **(2.6x10^2)**

Hide Feedback

$$\mathrm{EMF} = L\frac{di}{dt}$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt):3 / 5 - 60 %

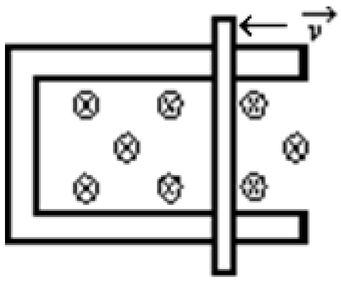
Done

Quiz Submissions - Quiz: Week 9

Attempt 1

Question 1 **1 / 1 point**

A rod lies across frictionless rails in a uniform magnetic field B such that the encapsulated area becomes smaller, i.e. the rod moves at constant speed to the left in the picture below.

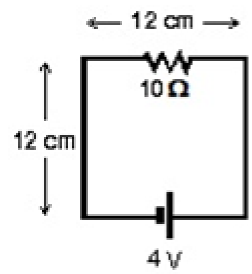


In order for the emf around the circuit to be zero, the magnitude of the magnetic field should:

- decrease quadratically with time
- increase quadratically with time
- ✓ increase linearly with time
- decrease linearly with time
- not change

Question 2 **1 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **out from the page**. The current in the circuit is (1.8x10^-1) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

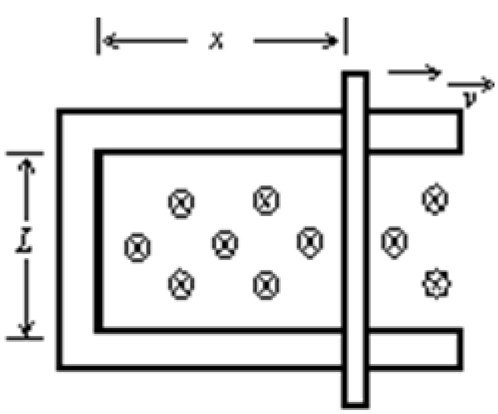
1.5x10^2 ✔

▼ Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(I * R - \Delta V)$$

Question 3 **1 / 1 point**

A rod with resistance *R* lies across frictionless conducting rails in a constant uniform magnetic field *B*, **pointing into the paper as shown below**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed *v*** is:



○

No force (zero Newton)

- $B^2L^2v(x/R)$
- BLv
- $BLv(x/R)$
- ✓ B^2L^2v/R

Question 4 **1 / 1 point**

A **14-turn ideal solenoid** has an inductance of (4.1x10^0) mH. When the solenoid carries a current of (2.96x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

8.7x10^-4 ✓

Hide Feedback

$$\Phi_B = \frac{1}{N}Li$$

Question 5 **1 / 1 point**

A (3.2510x10^0) mH inductor and a (2.50x10^-3) H inductor are connected in series. The equivalent inductance is:

Note: *Express the result in mH with three significant figures.*

Answer:

5.75x10^0 ✓

Hide Feedback

Add the two inductances expressed in mH.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt)**:**5 / 5 - 100 %

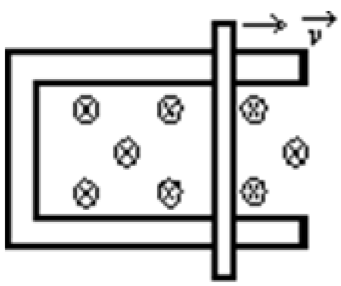
Done

Quiz Submissions - Quiz: Week 9

Attempt 2

Question 1 **0 / 1 point**

A rod lies across frictionless rails in a uniform magnetic field B, as shown.

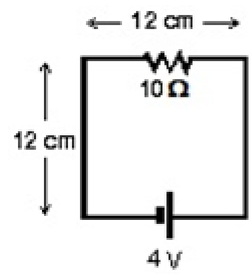


The rod moves to the right with constant speed *v*. In order for the emf around the circuit to be zero, the magnitude of the magnetic field should:

- ○ increase quadratically with time
- ✗ ○ decrease quadratically with time
- ➡ ○ decrease linearly with time
- ○ not change
- ○ increase linearly with time

Question 2 **0 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **out from the page**. The current in the circuit is (1.1x10^-1) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

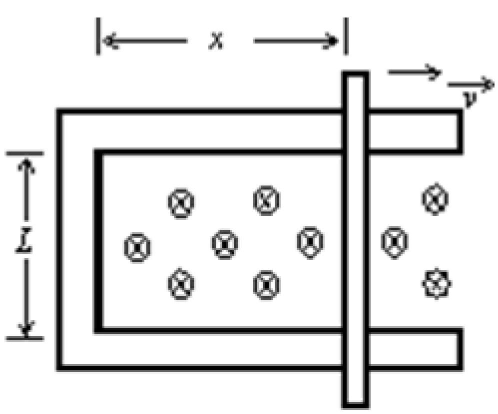
3.05x10^2 ✗ **(2.0x10^2)**

Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(I * R - \Delta V)$$

Question 3 **1 / 1 point**

A rod with resistance *R* lies across frictionless conducting rails in a constant uniform magnetic field *B*, **pointing into the paper as shown below**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed *v*** is:



○

BLv

○ $B^2L^2v(x/R)$

○ No force (zero Newton)

○ $BLv(x/R)$

✓○ B^2L^2v/R

Question 4 **1 / 1 point**

A **25-turn ideal solenoid** has an inductance of (1.6x10^0) mH. When the solenoid carries a current of (6.31x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

4.0x10^-4 ✓

▼ Hide Feedback

$$\Phi_B = \frac{1}{N}Li$$

Question 5 **1 / 1 point**

A (6.12x10^0) mH inductor and a (8.5640x10^-3) H inductor are connected in series. The equivalent inductance is:

Note: *Express the result in mH with three significant figures.*

Answer:

1.47x10^1 ✓

Hide Feedback

Add the two inductances expressed in mH.

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 9

×

Attempt 2

Question 1 **0 / 1 point**

A 10-turn conducting loop with a radius of (1.01x10^0) cm spins at (5.6x10^1) revolutions per second in a magnetic field of (7.52x10^-1) T. The maximum EMF generated is:

Answer:

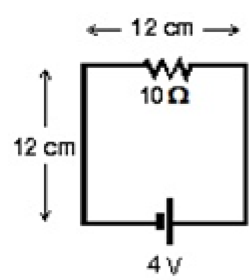
✖ (8.5x10^-1)

▼ Hide Feedback

Use the formula $\mathrm{EMF} = 20\pi^2 r^2 f B$

Question 2 **1 / 1 point**

The circuit shown below is in a **uniform magnetic field** that is **out from the page**. The current in the circuit is (9.3x10^-2) A. At what rate is the magnitude of the magnetic field changing? Use T/s for your answer. ***Note:*** *Use a positive sign if the rate is increasing or a negative sign if the rate is decreasing.*



Answer:

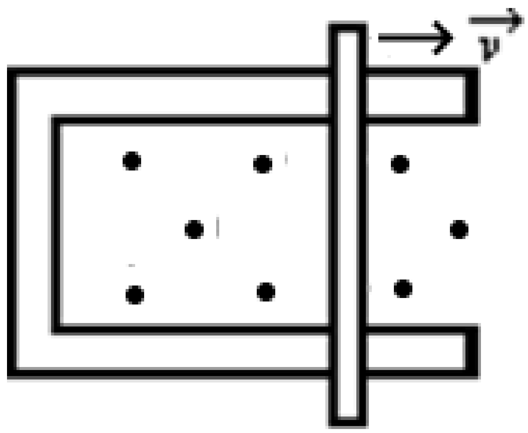
2.1x10^2 ✔

Hide Feedback

$$\frac{dB}{dt} = \frac{1}{\text{Area}}\frac{d\Phi}{dt} = -\frac{1}{\text{Area}}(-\text{EMF}) = -\frac{1}{\text{Area}}(I * R - \Delta V)$$

Question 3 **0 / 1 point**

A rod with resistance R lies across frictionless conducting rails in a constant uniform magnetic field B, **pointing out of the paper**. Assume the rails have negligible resistance. The magnitude of the force that must be applied by a person to pull the rod to the right at **constant speed** v is:



- B^2L^2v/R
- $BLv(x/R)$
- No force (zero Newton)
- $B^2L^2v(x/R)$
- BLv

Question 4 **1 / 1 point**

A **25-turn ideal solenoid** has an inductance of (4.410x10^0) mH. When the solenoid carries a current of (6.8x10^0) A. **What is the magnetic flux through each turn?**

Note: *Answer in scientific notation using Wb.*

Answer:

1.2x10^-3 ✓

Hide Feedback

$$\Phi_B = \frac{1}{N} L i$$

Question 5 **1 / 1 point**

A 25-turn ideal solenoid has an inductance of (3.3x10^-3) H. To generate an EMF of (1.180x10^0) V what should be the rate of change of the current? Express your result as the magnitude in A/s.

Answer:

3.6x10^2 ✓

Hide Feedback

$$\text{EMF} = L \frac{di}{dt}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 10

Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (4.0x10^1)-μF capacitor is connected to an **AC source** of EMF with a frequency of (4.200x10^2) Hz and a maximum EMF of (4.080x10^1) V. What is the maximum current expressed in μA and with two significant figures.

Answer:

4.3x10^4 ✗ **(4.3x10^6)**

Hide Feedback

The reactance of a capacitor is given by $\chi = \frac{1}{\omega C}$ and, therefore, the maximum current is given by $I_{\text{max}} = \frac{V_{\text{max}}}{\chi}$

Question 2 **0 / 1 point**

A capacitor in an ***LC*** oscillator has a maximum potential difference of (1.37x10^1) V and a maximum energy of (5.4x10^2) mJ. At a certain instant the energy in the capacitor is (4.13x10^1) mJ. What is the potential difference across the capacitor at that exact instance?

Answer:

✗ **(3.8x10^0)**

Hide Feedback

$$U = \frac{1}{2}CV^2$$

which means that the ratio between the initial voltage and the final one scales with the square root of the energy

$$v = V \times \sqrt{\frac{u}{U}}$$

where lower case symbols designate the final voltage and energy respectively, and the upper case designate the initial voltage and energy.

Question 3 **1 / 1 point**

An ***LC*** circuit has an inductance of L mH and a capacitance of (5.8649x10^-3) mF. At one instant the charge on the capacitor is (7.586x10^-3) mC. What is the voltage in this circuit, at that time? Express your result in V. Provide your answer with four significant figures.

Answer:

1.293x10^0 ✔

▼ Hide Feedback

The voltage is shared by both the inductor and capacitor and is given by $V = \frac{Q}{C}$.

Question 4 **1 / 1 point**

A generator supplies **(1.918x10^2) V** to the primary coil of a transformer. The ***primary has 500 turns*** and the ***secondary has 50 turns***. What is the secondary voltage? Use kV for your answer and four significant figures.

Answer:

1.918x10^-2 ✔

▼ Hide Feedback

$$V_S = \frac{N_S}{N_P} V_P$$

Question 5 **0 / 1 point**

An ***RLC*** circuit has a resistance of (3.4300x10^2) Ω, an inductance of (1.93x10^1) mH, and a capacitance of (3.4110x10^1) nF. At time *t* = 0 the charge on the capacitor is (2.3630x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **five** complete cycles? Express your result in nJ with three significant figures.

Answer:

3.34x10^1 ✗ **(3.34x10^0)**

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C}} - 1$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 5 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 5T\right)}$

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 10

×

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A generator supplies **(1.294x10^2) V** to the primary coil of a transformer. The ***primary has 50 turns*** and the ***secondary has 500 turns***. What is the secondary voltage? Use kV for your answer and four significant figures.

Answer:

1.294x10^0 ✓

▼ Hide Feedback

$$V_S = \frac{N_S}{N_P} V_P$$

Question 2 **1 / 1 point**

A (3.5250x10^1)-mH inductor is connected to an **AC source** of EMF with a frequency of (3.4700x10^2) Hz and a maximum EMF of (2.05x10^1) V. What is the maximum current expressed in A and with three significant figures.

Answer:

2.67x10^-1 ✓

▼ Hide Feedback

The reactance of a inductor is given by $\chi = \omega L$ and, therefore, the maximum current is given by $I_{\max} = \frac{V_{\max}}{\chi}$

Question 3 **1 / 1 point**

An ***RLC*** circuit has a resistance of (2.34x10^2) Ω, an inductance of (1.560x10^1) mH, and a capacitance of (3.43x10^1) nF. At time *t* = 0 the charge on the capacitor is (2.1x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **two** complete cycles? Express your result in nJ with two significant figures.

Answer:

7.7x10^4 ✔

▼ Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 2 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 2T\right)}$

Question 4 **1 / 1 point**

An ***LC*** circuit has an inductance of L mH and a capacitance of (2.251x10^-3) mF. At one instant the charge on the capacitor is (8.2694x10^-3) mC. What is the voltage in this circuit, at that time? Express your result in V. Provide your answer with four significant figures.

Answer:

3.674x10^0 ✔

▼ Hide Feedback

The voltage is shared by both the inductor and capacitor and is given by $V = \frac{Q}{C}$.

Question 5 **0 / 1 point**

A capacitor in an ***LC*** oscillator has a maximum potential difference of (1.2x10^1) V and a maximum energy of (5.08x10^2) mJ. At a certain instant the energy in the capacitor is (4.140x10^1) mJ. What is the potential difference across the capacitor at that exact instance?

Answer:

4.2x10^1 ✗ **(3.4x10^0)**

Hide Feedback

$$U = \frac{1}{2}CV^2$$

which means that the ratio between the initial voltage and the final one scales with the square root of the energy

$$v = V \times \sqrt{\frac{u}{U}}$$

where lower case symbols designate the final voltage and energy respectively, and the upper case designate the initial voltage and energy.

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 10

X

Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Which of the following has the greatest effect in **increasing** the **oscillation frequency** of an ***LC*** circuit?

- Decreasing C by a factor of two while keeping L constant
- ✗ Increasing C by a factor of two while keeping L constant
- ⇨ Decreasing both L and C by a factor of two
- Decreasing L by a factor of two while keeping C constant
- Increasing both L and C by a factor of two
- Increasing L by a factor of two while keeping C constant
- Make no sense as the oscillation frequency has nothing to do with either L or C

Question 2 **0 / 1 point**

In an oscillating ***LC*** circuit, the total stored energy is (5.709x10^-1) J and the maximum charge on the **capacitor** is (6.00x10^-5) C. When the charge on the capacitor has decay to (3.4440x10^-6) C, what is the energy stored in the **inductor**? Express your result in **mJ** with three significant figures.

Answer:

✗ (5.69x10^2)

▼ Hide Feedback

$$U = \frac{1}{2}\frac{Q^2}{C}$$

which means that the ratio between the initial energy and the final one scales with the square of the charge ratio

$$u = U \times \frac{q^2}{Q^2}$$

where lower case symbols designate the final charge and energy respectively, and the upper case designate the initial charge and energy. Finally, the energy gained by the inductor equals that lost by the capacitor

$$U_L = U - u$$

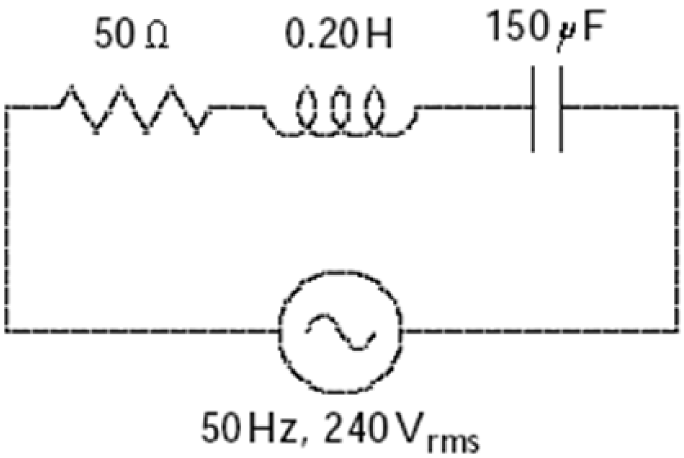
Question 3 **1 / 1 point**

Iron, rather than copper, is used in the core of transformers because iron:

- ○ can withstand a higher temperature.
- ○ insulates the primary from the secondary.
- ✓○ has a very high permeability.
- ○ makes a good permanent magnet.
- ○ has a greater resistivity.

Question 4 **0 / 1 point**

What is the impedance of the circuit below with three sig. fig.?



Answer:

5x10^1 ✗ **(6.50x10^1)**

Hide Feedback

$$Z = \sqrt{\left(L\omega - \frac{1}{C\omega}\right)^2 + R^2}$$

Question 5 **0 / 1 point**

An ***RLC*** circuit has a resistance of (2.500x10^2) Ω, an inductance of (1.8x10^1) mH, and a capacitance of (3.50x10^1) nF. At time t = 0 the charge on the capacitor is (2.45x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **three** complete cycles? Express your result in nJ with two significant figures.

Answer:

✗ **(1.1x10^4)**

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \frac{R}{2L}\sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 3 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 3T\right)}$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 10

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

An ***RLC*** circuit has a resistance of (2.2x10^2) Ω, an inductance of (1.85x10^1) mH, and a capacitance of (3.280x10^1) nF. At time *t* = 0 the charge on the capacitor is (3.950x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **two** complete cycles? Express your result in nJ with two significant figures.

Answer:

6.139x10^-6 ✗ **(5.8x10^5)**

▼ Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 2 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 2T\right)}$

Question 2 **0 / 1 point**

An ***LC*** circuit has an inductance of (1.330x10^1) mH and a capacitance of (5.53x10^0) μF. At time *t* = 0 the charge on the capacitor is (2.618x10^0) μC and the current is (8.707x10^0) mA. What is the total energy in this circuit at that time? Express your result in J with three significant figures.

Answer:

6.197x10^-7 ✗ **(1.12x10^-6)**

▼ Hide Feedback

The energy in the capacitor is given by $U_C = \frac{1}{2}\frac{Q^2}{C}$ and the energy in the inductor is given by $U_L = \frac{1}{2}L \times i^2$ and, therefore, the total energy in the circuit is $E = U_C + U_L = \frac{1}{2}\frac{Q^2}{C} + \frac{1}{2}L \times i^2$

Question 3 **1 / 1 point**

A (2.97x10^1)-μF capacitor is connected to an **AC source** of EMF with a frequency of (3.670x10^2) Hz and a maximum EMF of (4.3x10^1) V. What is the maximum current expressed in μA and with two significant figures.

Answer:

2.95x10^6 ✓ **(2.9x10^6)** ✗ wrong number of significant figures **(2)**

▼ Hide Feedback

The reactance of a capacitor is given by $\chi = \frac{1}{\omega C}$ and, therefore, the maximum current is given by $I_{\max} = \frac{V_{\max}}{\chi}$

Question 4 **1 / 1 point**

A generator supplies **(2.21x10^1) A** to the primary coil of a transformer. The ***primary has 50 turns*** and the ***secondary has 350 turns***. What is the current in the secondary? Use A and three significant figures.

Answer:

3.16x10^0 ✓

Hide Feedback

$I_S = \frac{N_P}{N_S} I_P$

Question 5 **1 / 1 point**

Which of the following has the greatest effect in **decreasing** the **oscillation frequency** of an ***LC*** circuit?

- Make no sense as the oscillation frequency has nothing to do with either L or C
- Decreasing C by a factor of two while keeping L constant
- Increasing L by a factor of two while keeping C constant
- Decreasing L by a factor of two while keeping C constant
- Decreasing both L and C by a factor of two
- ✔ Increasing both L and C by a factor of two
- Increasing C by a factor of two while keeping L constant

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**3 / 5 - 60 %

Done

Quiz Submissions - Quiz: Week 10

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A generator supplies **(1.072x10^2) V** to the primary coil of a transformer. The ***primary has 50 turns*** and the ***secondary has 500 turns***. What is the secondary voltage? Use kV for your answer and four significant figures.

Answer:

1.072x10^0 ✓

▼ Hide Feedback

$$V_S = \frac{N_S}{N_P} V_P$$

Question 2 **1 / 1 point**

Which of the following has the greatest effect in **increasing** the **oscillation frequency** of an ***LC*** circuit?

✓ ◯ Decreasing both L and C by a factor of two

◯ Decreasing C by a factor of two while keeping L constant

◯ Increasing both L and C by a factor of two

◯ Decreasing L by a factor of two while keeping C constant

○ Make no sense as the oscillation frequency has nothing to do with either L or C

○ Increasing L by a factor of two while keeping C constant

○ Increasing C by a factor of two while keeping L constant

Question 3 **1 / 1 point**

A (3.21x10^1)-μF capacitor is connected to an **AC source** of EMF with a frequency of (4.8010x10^2) Hz and a maximum EMF of (1.1160x10^1) V. What is the maximum current expressed in mA and with three significant figures.

Answer:

1.08x10^3 ✓

▼ Hide Feedback

The reactance of a capacitor is given by $\chi = \frac{1}{\omega C}$ and, therefore, the maximum current is given by $I_{\text{max}} = \frac{V_{\text{max}}}{\chi}$

Question 4 **1 / 1 point**

A capacitor in an ***LC*** oscillator has a maximum potential difference of (1.20x10^1) V and a maximum energy of (5.20x10^2) mJ. At a certain instant the energy in the capacitor is (4.0x10^1) mJ. What is the potential difference across the capacitor at that exact instance?

Answer:

3.3x10^0 ✓

▼ Hide Feedback

$$U = \frac{1}{2}CV^2$$

which means that the ratio between the initial voltage and the final one scales with the square root of the energy

$$v = V \times \sqrt{\frac{u}{U}}$$

where lower case symbols designate the final voltage and energy respectively, and the upper case designate the initial voltage and energy.

Question 5 **0 / 1 point**

An ***RLC*** circuit has a resistance of (1.73x10^2) Ω, an inductance of (2.020x10^1) mH, and a capacitance of (3.2x10^1) nF. At time *t* = 0 the charge on the capacitor is (2.220x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **three** complete cycles? Express your result in nJ with two significant figures.

Answer:

7.7x10^6 ✖ **(1.2x10^5)**

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 3 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 3T\right)}$

Attempt Score: **Attempt Score:**4 / 5 - 80 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 10

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (7.7410x10^1)-mH inductor is connected to an **AC source** of EMF with a frequency of (3.5130x10^2) Hz and a maximum EMF of (1.67x10^1) V. What is the maximum current expressed in mA and with three significant figures.

Answer:

2.72x10^1 ✗ **(9.77x10^1)**

▼ Hide Feedback

The reactance of a inductor is given by $\chi = \omega L$ and, therefore, the maximum current is given by $I_{\max} = \frac{V_{\max}}{\chi}$

Question 2 **1 / 1 point**

A generator supplies **(7.97x10^0) A** to the primary coil of a transformer. The ***primary has 350 turns*** and the ***secondary has 50 turns***. What is the current in the secondary? Use A and three significant figures.

Answer:

5.58x10^1 ✓

▼ Hide Feedback

$$I_S = \frac{N_P}{N_S} I_P$$

Question 3 **0 / 1 point**

An ***RLC*** circuit has a resistance of (1.92x10^2) Ω, an inductance of (1.10x10^1) mH, and a capacitance of (3.2x10^1) nF. At time *t* = 0 the charge on the capacitor is (3.37x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **three** complete cycles? Express your result in nJ with two significant figures.

Answer:

✖ (3.4x10^4)

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 3 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 3T\right)}$

Question 4 **0 / 1 point**

A capacitor in an ***LC*** oscillator has a maximum potential difference of (1.460x10^1) V and a maximum energy of (4.2x10^2) mJ. At a certain instant the energy in the capacitor is (4.08x10^1) mJ. What is the potential difference across the capacitor at that exact instance?

Answer:

✖ (4.6x10^0)

Hide Feedback

$$U = \frac{1}{2} C V^2$$

which means that the ratio between the initial voltage and the final one scales with the square root of the energy

$$v = V \times \sqrt{\frac{u}{U}}$$

where lower case symbols designate the final voltage and energy respectively, and the upper case designate the initial voltage and energy.

Question 5 **1 / 1 point**

Which of the following has the greatest effect in **decreasing** the **oscillation frequency** of an ***LC*** circuit?

- ◯ Decreasing both L and C by a factor of two
- ◯ Increasing L by a factor of two while keeping C constant
- ◯ Decreasing C by a factor of two while keeping L constant
- ◯ Make no sense as the oscillation frequency has nothing to do with either L or C
- ◯ Increasing C by a factor of two while keeping L constant
- ✔◯ Increasing both L and C by a factor of two
- ◯ Decreasing L by a factor of two while keeping C constant

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 10

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A generator supplies **(9.12x10^1) V** to the primary coil of a transformer. The ***primary has 50 turns*** and the ***secondary has 350 turns***. What is the secondary voltage? Use V for yours answer and three sig. fig.

Answer:

1.30x10^1 ✗ **(6.38x10^2)**

▼ Hide Feedback

$$V_S = \frac{N_S}{N_P} V_P$$

Question 2 **1 / 1 point**

In an oscillating ***LC*** circuit, the total stored energy is (4.37x10^-1) J and the maximum charge on the **capacitor** is (3.7790x10^-5) C. When the charge on the capacitor has decay to (2.682x10^-6) C, what is the energy stored in the **inductor**? Express your result in **mJ** with three significant figures.

Answer:

4.38x10^2 ✓

▼ Hide Feedback

$$U = \frac{1}{2}\frac{Q^2}{C}$$

which means that the ratio between the initial energy and the final one scales with the square of the charge ratio

$$u = U \times \frac{q^2}{Q^2}$$

where lower case symbols designate the final charge and energy respectively, and the upper case designate the initial charge and energy. Finally, the energy gained by the inductor equals that lost by the capacitor

$$U_L = U - u$$

Question 3 **1 / 1 point**

A (4.30x10^1)-mH inductor is connected to an **AC source** of EMF with a frequency of (3.413x10^2) Hz and a maximum EMF of (1.6490x10^1) V. What is the maximum current expressed in A and with three significant figures.

Answer:

1.79x10^-1 ✔

▼ Hide Feedback

The reactance of a inductor is given by $\chi = \omega L$ and, therefore, the maximum current is given by $I_{\max} = \frac{V_{\max}}{\chi}$

Question 4 **1 / 1 point**

Which of the following has the greatest effect in **decreasing** the **oscillation frequency** of an ***LC*** circuit?

○ Increasing C by a factor of two while keeping L constant

- Decreasing L by a factor of two while keeping C constant
- Make no sense as the oscillation frequency has nothing to do with either L or C
- Increasing L by a factor of two while keeping C constant
- ✔ Increasing both L and C by a factor of two
- Decreasing both L and C by a factor of two
- Decreasing C by a factor of two while keeping L constant

Question 5 **1 / 1 point**

An ***RLC*** circuit has a resistance of (1.540x10^2) Ω, an inductance of (1.7x10^1) mH, and a capacitance of (3.380x10^1) nF. At time *t* = 0 the charge on the capacitor is (3.250x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **three** complete cycles? Express your result in nJ with two significant figures.

Answer:

2.5x10^5 ✔

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 3 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2 \times \frac{R}{2L} \times 3T\right)}$

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 10

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A (4.38x10^1)-μF capacitor is connected to an **AC source** of EMF with a frequency of (3.1620x10^2) Hz and a maximum EMF of (2.2240x10^1) V. What is the maximum current expressed in A and with three significant figures.

Answer:

1.94x10^0 ✔

▼ Hide Feedback

The reactance of a capacitor is given by $\chi = \frac{1}{\omega C}$ and, therefore, the maximum current is given by $I_{\text{max}} = \frac{V_{\text{max}}}{\chi}$

Question 2 **1 / 1 point**

In an oscillating ***LC*** circuit, the total stored energy is (3.8940x10^-1) J and the maximum charge on the **capacitor** is (8.1430x10^-5) C. When the charge on the capacitor has decay to (2.30x10^-6) C, what is the energy stored in the **inductor**? Express your result in **mJ** with three significant figures.

Answer:

3.89x10^2 ✔

▼ Hide Feedback

$$U = \frac{1}{2}\frac{Q^2}{C}$$

which means that the ratio between the initial energy and the final one scales with the square of the charge ratio

$$u = U \times \frac{q^2}{Q^2}$$

where lower case symbols designate the final charge and energy respectively, and the upper case designate the initial charge and energy. Finally, the energy gained by the inductor equals that lost by the capacitor

$$U_L = U - u$$

Question 3 **1 / 1 point**

A generator supplies **(1.49x10^1) A** to the primary coil of a transformer. The ***primary has 50 turns*** and the ***secondary has 350 turns***. What is the current in the secondary? Use A and three significant figures.

Answer:

2.13x10^0 ✔

▼ Hide Feedback

$$I_S = \frac{N_P}{N_S} I_P$$

Question 4 **1 / 1 point**

An ***RLC*** circuit has a resistance of (3.18x10^2) Ω, an inductance of (1.41x10^1) mH, and a capacitance of (3.240x10^1) nF. At time *t* = 0 the charge on the capacitor is (1.7x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **three** complete cycles? Express your result in nJ with two significant figures.

Answer:

3.8x10^2 ✓

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 3 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 3T\right)}$

Question 5 **1 / 1 point**

Which of the following has the greatest effect in **decreasing** the **oscillation frequency** of an ***LC*** circuit?

- ✓ Increasing both L and C by a factor of two
- Increasing L by a factor of two while keeping C constant
- Decreasing both L and C by a factor of two
- Make no sense as the oscillation frequency has nothing to do with either L or C
- Increasing C by a factor of two while keeping L constant
- Decreasing L by a factor of two while keeping C constant
- Decreasing C by a factor of two while keeping L constant

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt)**:**5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 10

✕

Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (4.2950x10^1)-mH inductor is connected to an **AC source** of EMF with a frequency of (4.169x10^2) Hz and a maximum EMF of (2.05x10^1) V. What is the maximum current expressed in A and with three significant figures.

Answer:

✗ (1.82x10^-1)

▼ Hide Feedback

The reactance of a inductor is given by $\chi = \omega L$ and, therefore, the maximum current is given by $I_{\text{max}} = \frac{V_{\text{max}}}{\chi}$

Question 2 **0 / 1 point**

An ***RLC*** circuit has a resistance of (2.4x10^2) Ω, an inductance of (1.29x10^1) mH, and a capacitance of (3.560x10^1) nF. At time *t* = 0 the charge on the capacitor is (3.080x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **two** complete cycles? Express your result in nJ with two significant figures.

Answer:

✗ (8.0x10^4)

▼ Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 2 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 2T\right)}$

Question 3 **0 / 1 point**

An ***LC*** circuit has an inductance of L mH and a capacitance of (2.924x10^-3) mF. At one instant the charge on the capacitor is (7.6805x10^-3) mC. What is the voltage in this circuit, at that time? Express your result in V. Provide your answer with four significant figures.

Answer:

✘ **(2.627x10^0)**

Hide Feedback

The voltage is shared by both the inductor and capacitor and is given by $V = \frac{Q}{C}$.

Question 4 **0 / 1 point**

A generator supplies **(1.136x10^2) V** to the primary coil of a transformer. The ***primary has 50 turns*** and the ***secondary has 500 turns***. What is the secondary voltage? Use kV for your answer and four significant figures.

Answer:

✘ **(1.136x10^0)**

Hide Feedback

$$V_S = \frac{N_S}{N_P} V_P$$

Question 5 **0 / 1 point**

An ***LC*** circuit has an inductance of (2.744x10^1) mH and a capacitance of (2.8800x10^0) μF. At time t = 0 the charge on the capacitor is (2.6950x10^0) μC and the current is (7.46x10^0) mA. What is the total energy in this circuit at that time? Express your result in J with three significant figures.

Answer:

✘ **(2.02x10^-6)**

Hide Feedback

The energy in the capacitor is given by $U_C = \frac{1}{2}\frac{Q^2}{C}$ and the energy in the inductor is given by $U_L = \frac{1}{2}L \times i^2$ and, therefore, the total energy in the circuit is

$$E = U_C + U_L = \frac{1}{2}\frac{Q^2}{C} + \frac{1}{2}L \times i^2$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt)**:**1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 10

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A (3.836x10^1)-mH inductor is connected to an **AC source** of EMF with a frequency of (4.97x10^2) Hz and a maximum EMF of (2.2890x10^1) V. What is the maximum current expressed in A and with three significant figures.

Answer:

1.91x10^-1 ✔

▼ Hide Feedback

The reactance of a inductor is given by $\chi = \omega L$ and, therefore, the maximum current is given by $I_{\text{max}} = \frac{V_{\text{max}}}{\chi}$

Question 2 **1 / 1 point**

An ***RLC*** circuit has a resistance of (3.1x10^2) Ω, an inductance of (1.460x10^1) mH, and a capacitance of (3.180x10^1) nF. At time *t* = 0 the charge on the capacitor is (3.77x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **two** complete cycles? Express your result in nJ with two significant figures.

Answer:

6.1x10^4 ✔

▼ Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 2 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 2T\right)}$

Question 3 **1 / 1 point**

In an oscillating ***LC*** circuit, the total stored energy is (5.45x10^-1) J and the maximum charge on the **capacitor** is (9.254x10^-5) C. When the charge on the capacitor has decay to (4.939x10^-6) C, what is the energy stored in the **inductor**? Express your result in **mJ** with three significant figures.

Answer:

5.43x10^2 ✔

▼ Hide Feedback

$$U = \frac{1}{2}\frac{Q^2}{C}$$

which means that the ratio between the initial energy and the final one scales with the square of the charge ratio

$$u = U \times \frac{q^2}{Q^2}$$

where lower case symbols designate the final charge and energy respectively, and the upper case designate the initial charge and energy. Finally, the energy gained by the inductor equals that lost by the capacitor

$$U_L = U - u$$

Question 4 **1 / 1 point**

An ***LC*** circuit has an inductance of (3.092x10^0) mH and a capacitance of (5.244x10^-3) mF. At one instant the charge on the capacitor is (7.62x10^-3) mC. What is the rate of change (provide the magnitude only) of the current in this circuit, at that instant? Express your result in A/s. Provide your answer with three significant figures.

Answer:

4.70x10^2 ✓

Hide Feedback

The voltage is shared by both the inductor and capacitor and is given by $V = \frac{Q}{C}$.

Therefore, the rate of change of the current is set by the inductor $\frac{di}{dt} = \frac{V}{L}$

Question 5 **1 / 1 point**

Iron, rather than copper, is used in the core of transformers because iron:

- ○ has a greater resistivity.
- ✓ ○ has a very high permeability.
- ○ makes a good permanent magnet.
- ○ insulates the primary from the secondary.
- ○ can withstand a higher temperature.

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 10

Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Iron, rather than copper, is used in the core of transformers because iron:

- insulates the primary from the secondary.
- ✗ makes a good permanent magnet.
- has a greater resistivity.
- can withstand a higher temperature.
- ➡ has a very high permeability.

Question 2 **0 / 1 point**

An ***RLC*** circuit has a resistance of (1.978x10^2) Ω, an inductance of (1.534x10^1) mH, and a capacitance of (3.2010x10^1) nF. At time t = 0 the charge on the capacitor is (2.03x10^1) μC and there is no current flowing. What is the energy stored in the capacitor after **five** complete cycles? Express your result in nJ with three significant figures.

Answer:

✗ (7.41x10^2)

Hide Feedback

The initial energy store in the capacitor is given by $U = \frac{1}{2}\frac{Q^2}{C}$.

The angular frequency of oscillation in an LRC circuit is given by $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} = \frac{R}{2L}\sqrt{\frac{4L}{R^2C} - 1}$ and the period of oscillation relates to the angular frequency by the relation $T = \frac{2\pi}{\omega}$. The total time is 5 times longer.

The energy decays is given by the formula $u = U \times e^{\left(-2\times\frac{R}{2L}\times 5T\right)}$

Question 3 **0 / 1 point**

An ***LC*** circuit has an inductance of (2.82x10^1) mH and a capacitance of (4.553x10^0) μF. At time *t* = 0 the charge on the capacitor is (3.3800x10^0) μC and the current is (6.337x10^0) mA. What is the total energy in this circuit at that time? Express your result in J with three significant figures.

Answer:

✗ (1.82x10^-6)

Hide Feedback

The energy in the capacitor is given by $U_C = \frac{1}{2}\frac{Q^2}{C}$ and the energy in the inductor is given by $U_L = \frac{1}{2}L \times i^2$ and, therefore, the total energy in the circuit is $E = U_C + U_L = \frac{1}{2}\frac{Q^2}{C} + \frac{1}{2}L \times i^2$

Question 4 **1 / 1 point**

Which of the following has the greatest effect in **increasing** the **oscillation frequency** of an ***LC*** circuit?

○ Increasing both L and C by a factor of two

✓ ○ Decreasing both L and C by a factor of two

○ Decreasing L by a factor of two while keeping C constant

○ Decreasing C by a factor of two while keeping L constant

○ Increasing L by a factor of two while keeping C constant

○ Increasing C by a factor of two while keeping L constant

○ Make no sense as the oscillation frequency has nothing to do with either L or C

Question 5 **0 / 1 point**

A (2.9x10^1)-μF capacitor is connected to an **AC source** of EMF with a frequency of (3.690x10^2) Hz and a maximum EMF of (4.19x10^1) V. What is the maximum current expressed in μA and with two significant figures.

Answer:

✗ (2.8x10^6)

Hide Feedback

The reactance of a capacitor is given by $\chi = \frac{1}{\omega C}$ and, therefore, the maximum current is given by $I_{\text{max}} = \frac{V_{\text{max}}}{\chi}$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 11

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the magnetic field between the plates of a charging parallel plate capacitor with square plates?

- ✓ ○ $\oint \vec{B}.\, d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$
- ○ None of these expressions
- ○ $\oint \vec{B}.\, d\vec{A} = 0$
- ○ $\oint \vec{E}.\, d\vec{s} = -\frac{d\Phi_B}{dt}$
- ○ $\oint \vec{E}.\, d\vec{A} = \frac{Q}{\epsilon_0}$

Question 2 **1 / 1 point**

A (2.860x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.19x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

3.40x10^-1 ✓

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 3 **1 / 1 point**

A (5.55x10^-1)-m radius cylindrical region contains a **uniform electric field** that is parallel to the axis and is increasing at the rate (3.5140x10^12) V/m×s. What is the magnitude of the **magnetic field** at a point (3.9990x10^-1) m from the axis? Express your result with three significant figures.

Answer:

7.81x10^-6 ✓

Hide Feedback

$\frac{d\Phi_E}{dt} = \frac{1}{\mu_0\epsilon_0}\oint \vec{B}.d\vec{s} = c^2\oint \vec{B}.d\vec{s}$ which leads to

$\pi r^2\frac{dE}{dt} = 2\pi r c^2 B$ or

$B = \frac{r}{2c^2}\frac{dE}{dt}$ where c is the speed of light

Question 4 **1 / 1 point**

A (5.11x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

6.42x10^-7 ✓

Hide Feedback

$$\oint \vec{B}.\, d\vec{s} = \mu_0 i$$

Question 5 **1 / 1 point**

A (1.2394x10^0)-m radius cylindrical region contains a **uniform electric field** along the cylinder axis. It is **increasing uniformly with time**. What is the **rate of change** (magnitude) of the **electric field** required to obtain a total **displacement current** of (2.58x10^0) nA through a cross section of the region? Provide your answer in V/(m.s) with three significant figures.

Answer:

6.04x10^1 ✔

Hide Feedback

$i_D = \epsilon_0 \frac{d\Phi_E}{dt}$ which leads to

$$\frac{dE}{dt} = \frac{4k}{r^2} i_D$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 11

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A (5.6440x10^-1)-m radius cylindrical region contains a **uniform electric field** that is parallel to the axis and is increasing at the rate (7.925x10^12) V/m×s. What is the magnitude of the **magnetic field** at a point (2.87x10^-1) m from the axis? Express your result with three significant figures.

Answer:

1.26x10^-5 ✓

Hide Feedback

$\frac{d\Phi_E}{dt} = \frac{1}{\mu_0\epsilon_0} \oint \vec{B}.d\vec{s} = c^2 \oint \vec{B}.d\vec{s}$ which leads to

$\pi r^2 \frac{dE}{dt} = 2\pi r c^2 B$ or

$B = \frac{r}{2c^2}\frac{dE}{dt}$ where c is the speed of light

Question 2 **1 / 1 point**

A (1.0500x10^0)-m radius cylindrical region contains a **uniform electric field** along the cylinder axis. It is **increasing uniformly with time**. What is the **rate of change** (magnitude) of the **electric field** required to obtain a total **displacement current** of (2.11x10^0) nA through a cross section of the region? Provide your answer in V/(m.s) with three significant figures.

Answer:

6.88x10^1 ✓

Hide Feedback

$i_D = \epsilon_0 \frac{d\Phi_E}{dt}$ which leads to

$\frac{dE}{dt} = \frac{4k}{r^2} i_D$

Question 3 **1 / 1 point**

A (7.78x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

9.78x10^-7 ✓

Hide Feedback

$$\oint \vec{B}.d\vec{s} = \mu_0 i$$

Question 4 **1 / 1 point**

A circular parallel-plate capacitor whose plates have a radius of (5.7x10^1) cm is being charged with a current of (2.400x10^1) A. What is the magnetic field (1.55x10^1) cm from the center of the plates? Express your result in μT with two significant figures.

Answer:

2.3x10^0 ✓

Hide Feedback

$i_D = \frac{r^2}{R^2} i$ and

$\oint \vec{B}.\, d\vec{s} = \mu_0 i_D$ or

$2\pi r B = \mu_0 i_D$ which leads to

$B = \frac{\mu_0 i_D}{2\pi r}$

Question 5 **1 / 1 point**

Which of the following equations can be used, along with a symmetry argument, to calculate the magnetic field of a long straight wire carrying current?

- $\oint \vec{E}.\, d\vec{s} = -\frac{d\Phi_B}{dt}$
- $\oint \vec{E}.\, d\vec{A} = \frac{Q}{\epsilon_0}$
- All of these expressions
- $\oint \vec{B}.\, d\vec{A} = 0$
- ✓ $\oint \vec{B}.\, d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 11

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the magnetic field between the plates of a charging parallel plate capacitor with circular plates?

- $\oint \vec{E}.\,d\vec{s} = -\frac{d\Phi_B}{dt}$
- ✔ $\oint \vec{B}.\,d\vec{s} = \mu_0 i + \mu_0\epsilon_0\frac{d\Phi_E}{dt}$
- $\oint \vec{E}.\,d\vec{A} = \frac{Q}{\epsilon_0}$
- $\oint \vec{B}.\,d\vec{A} = 0$
- Any of these expressions

Question 2 **0 / 1 point**

A current of (1.208x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (4.04x10^1) cm. What is the displacement current through a (2.4250x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

✖ **(1.79x10^1)**

Hide Feedback

$$i_D = \frac{A}{d^2} i$$

Question 3

0 / 1 point

A (7.6460x10^-1)-m radius cylindrical region contains a **uniform electric field** that is parallel to the axis and is increasing at the rate (3.521x10^12) V/m×s. What is the magnitude of the **magnetic field** at a point (3.50x10^-1) m from the axis? Express your result with three significant figures.

Answer:

✗ **(6.85x10^-6)**

Hide Feedback

$\frac{d\Phi_E}{dt} = \frac{1}{\mu_0 \epsilon_0} \oint \vec{B}.d\vec{s} = c^2 \oint \vec{B}.d\vec{s}$ which leads to

$\pi r^2 \frac{dE}{dt} = 2\pi r c^2 B$ or

$B = \frac{r}{2c^2}\frac{dE}{dt}$ where c is the speed of light

Question 4

0 / 1 point

A (2.41x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.9860x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

✗ **(4.79x10^-1)**

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 5 **0 / 1 point**

A (2.94x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.\,d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

✗ **(3.69x10^-7)**

Hide Feedback

$$\oint \vec{B}.\,d\vec{s} = \mu_0 i$$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 11

✕

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the electric field produced by a uniform time-varying magnetic field?

- ✓ $\oint \vec{E}.d\vec{s} = -\frac{d\Phi_B}{dt}$
- $\oint \vec{B}.d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$
- $\oint \vec{E}.d\vec{A} = \frac{Q}{\epsilon_0}$
- None of these expressions
- $\oint \vec{B}.d\vec{A} = 0$

Question 2 **0 / 1 point**

A (3.51x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.733x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

✗ **(6.08x10^-1)**

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 3 **0 / 1 point**

A current of (1.2410x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (5.64x10^1) cm. What is the displacement current through a (4.262x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

✗ **(1.66x10^1)**

Hide Feedback

$$i_D = \frac{A}{d^2}i$$

Question 4 **0 / 1 point**

A (3.21x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.\, d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

✗ **(4.03x10^-7)**

Hide Feedback

$\oint \vec{B}.d\vec{s} = \mu_0 i$

Question 5 **0 / 1 point**

A (7.951x10^-1)-m radius cylindrical region contains a **uniform electric field** that is parallel to the axis and is increasing at the rate (6.12x10^12) V/m×s. What is the magnitude of the **magnetic field** at a point (2.907x10^-1) m from the axis? Express your result with three significant figures.

Answer:

✗ **(9.88x10^-6)**

Hide Feedback

$\frac{d\Phi_E}{dt} = \frac{1}{\mu_0\epsilon_0}\oint \vec{B}.d\vec{s} = c^2\oint \vec{B}.d\vec{s}$ which leads to

$\pi r^2 \frac{dE}{dt} = 2\pi r c^2 B$ or

$B = \frac{r}{2c^2}\frac{dE}{dt}$ where c is the speed of light

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 11

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Which of the following equations can be used, along with a symmetry argument, to calculate the magnetic field of a long straight wire carrying current?

- $\oint \vec{B}.\, d\vec{A} = 0$
- $\oint \vec{E}.\, d\vec{A} = \frac{Q}{\epsilon_0}$
- All of these expressions
- ✓ $\oint \vec{B}.\, d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$
- $\oint \vec{E}.\, d\vec{s} = -\frac{d\Phi_B}{dt}$

Question 2 **1 / 1 point**

A (5.89x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.\, d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

7.40x10^-7 ✓

Hide Feedback

$$\oint \vec{B}.d\vec{s} = \mu_0 i$$

Question 3 **1 / 1 point**

A (1.70x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.1560x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

1.97x10^-1 ✓

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 4 **1 / 1 point**

A circular parallel-plate capacitor whose plates have a radius of (4.170x10^1) cm is being charged with a current of (3.2x10^1) A. What is the magnetic field (1.723x10^1) cm from the center of the plates? Express your result in μT with two significant figures.

Answer:

6.3x10^0 ✓

Hide Feedback

$i_D = \frac{r^2}{R^2} i$ and

$\oint \vec{B} . d\vec{s} = \mu_0 i_D$ or

$2\pi r B = \mu_0 i_D$ which leads to

$B = \frac{\mu_0 i_D}{2\pi r}$

Question 5 **1 / 1 point**

A current of (1.030x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (3.45x10^1) cm. What is the displacement current through a (1.4970x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

1.30x10^1 ✔

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$i_D = \frac{A}{d^2} i$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 11

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (6.377x10^-1)-m radius cylindrical region contains a **uniform electric field** that is parallel to the axis and is increasing at the rate (3.9440x10^12) V/m×s. What is the magnitude of the **magnetic field** at a point (1.27x10^-1) m from the axis? Express your result with three significant figures.

Answer:

✗ **(2.78x10^-6)**

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$\frac{d\Phi_E}{dt} = \frac{1}{\mu_0\epsilon_0}\oint \vec{B}.d\vec{s} = c^2 \oint \vec{B}.d\vec{s}$ which leads to

$\pi r^2 \frac{dE}{dt} = 2\pi r c^2 B$ or

$B = \frac{r}{2c^2}\frac{dE}{dt}$ where c is the speed of light

Question 2 **0 / 1 point**

A (6.97x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

✗ **(8.76x10^-7)**

Hide Feedback

$$\oint \vec{B}.\, d\vec{s} = \mu_0 i$$

Question 3 **0 / 1 point**

A (1.9800x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.62x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

✗ (3.21x10^-1)

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 4 **0 / 1 point**

A current of (1.11x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (3.2140x10^1) cm. What is the displacement current through a (3.974x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

✗ (4.27x10^1)

Hide Feedback

$$i_D = \frac{A}{d^2} i$$

Question 5 **1 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the electric field produced by a uniform time-varying magnetic field?

- ○ $\oint \vec{B}.\, d\vec{s} = \mu_0 i + \mu_0\epsilon_0 \frac{d\Phi_E}{dt}$
- ○ $\oint \vec{B}.\, d\vec{A} = 0$
- ○ None of these expressions
- ○ $\oint \vec{E}.\, d\vec{A} = \frac{Q}{\epsilon_0}$
- ✔ ○ $\oint \vec{E}.\, d\vec{s} = -\frac{d\Phi_B}{dt}$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 11

Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the magnetic field between the plates of a charging parallel plate capacitor with circular plates?

- $\oint \vec{B}.\, d\vec{A} = 0$
- $\oint \vec{E}.\, d\vec{s} = -\frac{d\Phi_B}{dt}$
- $\oint \vec{B}.\, d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$
- $\oint \vec{E}.\, d\vec{A} = \frac{Q}{\epsilon_0}$
- Any of these expressions

Question 2 **1 / 1 point**

A (1.94x10^2)-mA current is used to charge up a parallel plate capacitor. A large square piece of paper is placed between the plates and parallel to them so it sticks out on all sides. What is the value of the integral $\oint \vec{B}.\, d\vec{s}$ around the perimeter of the paper? Express your result in T.m with three significant figures.

Answer:

2.44x10^-7 ✓

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$$\oint \vec{B}.\,d\vec{s} = \mu_0 i$$

Question 3 **1 / 1 point**

A (8.80x10^-1)-m radius cylindrical region contains a **uniform electric field** along the cylinder axis. It is **increasing uniformly with time**. What is the **rate of change** (magnitude) of the **electric field** required to obtain a total **displacement current** of (6.621x10^0) nA through a cross section of the region? Provide your answer in V/(m.s) with three significant figures.

Answer:

3.07x10^2 ✔

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$i_D = \epsilon_0 \frac{d\Phi_E}{dt}$ which leads to

$$\frac{dE}{dt} = \frac{4k}{r^2} i_D$$

Question 4 **0 / 1 point**

A circular parallel-plate capacitor whose plates have a radius of (5.690x10^1) cm is being charged with a current of (1.91x10^1) A. What is the magnetic field (8.3x10^0) cm from the center of the plates? Express your result in μT with two significant figures.

Answer:

1.3x10^0 ✘ **(9.8x10^-1)**

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$i_D = \frac{r^2}{R^2} i$ and

$\oint \vec{B} . d\vec{s} = \mu_0 i_D$ or

$2\pi r B = \mu_0 i_D$ which leads to

$B = \frac{\mu_0 i_D}{2\pi r}$

Question 5 **1 / 1 point**

A current of (1.230x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (4.61x10^1) cm. What is the displacement current through a (1.4340x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

8.30x10^0 ✓

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$i_D = \frac{A}{d^2} i$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 11

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A (1.262x10^0)-m radius cylindrical region contains a **uniform electric field** along the cylinder axis. It is **increasing uniformly with time**. What is the **rate of change** (magnitude) of the **electric field** required to obtain a total **displacement current** of (3.73x10^0) nA through a cross section of the region? Provide your answer in V/(m.s) with three significant figures.

Answer:

✗ **(8.34x10^1)**

▼ Hide Feedback

$i_D = \epsilon_0 \frac{d\Phi_E}{dt}$ which leads to

$\frac{dE}{dt} = \frac{4k}{r^2} i_D$

Question 2 **0 / 1 point**

A circular parallel-plate capacitor whose plates have a radius of (5.9x10^1) cm is being charged with a current of (2.650x10^1) A. What is the magnetic field (1.60x10^1) cm from the center of the plates? Express your result in μT with two significant figures.

Answer:

✗ **(2.4x10^0)**

▼ Hide Feedback

$i_D = \frac{r^2}{R^2} i$ and

$\oint \vec{B}.d\vec{s} = \mu_0 i_D$ or

$2\pi r B = \mu_0 i_D$ which leads to

$B = \frac{\mu_0 i_D}{2\pi r}$

Question 3 **0 / 1 point**

A current of (1.439x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (4.515x10^1) cm. What is the displacement current through a (2.01x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

✖ **(1.42x10^1)**

Hide Feedback

$i_D = \frac{A}{d^2} i$

Question 4 **0 / 1 point**

A (3.07x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.399x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

✖ **(4.29x10^-1)**

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 5 **0 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the electric field produced by a uniform time-varying magnetic field?

- $\oint \vec{E}.d\vec{s} = -\frac{d\Phi_B}{dt}$
- $\oint \vec{B}.d\vec{A} = 0$
- $\oint \vec{B}.d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$
- None of these expressions
- $\oint \vec{E}.d\vec{A} = \frac{Q}{\epsilon_0}$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt)**:**1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 11

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Which of the following equations, along with a symmetry argument, can be used to calculate the magnetic field between the plates of a charging parallel plate capacitor with circular plates?

✓ ○ $\oint \vec{B}.d\vec{s} = \mu_0 i + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$

○ $\oint \vec{B}.d\vec{A} = 0$

○ Any of these expressions

○ $\oint \vec{E}.d\vec{s} = -\frac{d\Phi_B}{dt}$

○ $\oint \vec{E}.d\vec{A} = \frac{Q}{\epsilon_0}$

Question 2 **1 / 1 point**

A circular parallel-plate capacitor whose plates have a radius of (5.2x10^1) cm is being charged with a current of (3.29x10^1) A. What is the magnetic field (1.865x10^1) cm from the center of the plates? Express your result in μT with two significant figures.

Answer:

4.5x10^0 ✓

▼ Hide Feedback

$i_D = \frac{r^2}{R^2} i$ and

$\oint \vec{B}.\, d\vec{s} = \mu_0 i_D$ or

$2\pi r B = \mu_0 i_D$ which leads to

$B = \frac{\mu_0 i_D}{2\pi r}$

Question 3 **1 / 1 point**

A (1.22x10^0)-m radius cylindrical region contains a **uniform electric field** along the cylinder axis. It is **increasing uniformly with time**. What is the **rate of change** (magnitude) of the **electric field** required to obtain a total **displacement current** of (7.640x10^0) nA through a cross section of the region? Provide your answer in V/(m.s) with three significant figures.

Answer:

1.85x10^2 ✓

▼ Hide Feedback

$i_D = \epsilon_0 \frac{d\Phi_E}{dt}$ which leads to

$\frac{dE}{dt} = \frac{4k}{r^2} i_D$

Question 4 **1 / 1 point**

A current of (1.46x10^0) A is used to charge a parallel plate capacitor with square plates. The side of each plate is (6.387x10^1) cm. What is the displacement current through a (1.201x10^-3) m^2 area wholly between the capacitor plates and parallel to them? Answer with three significant figures in mA.

Answer:

4.30x10^0 ✓

Hide Feedback

$$i_D = \frac{A}{d^2} i$$

Question 5 **1 / 1 point**

A (2.51x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.9460x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

4.87x10^-1 ✓

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 11

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A circular parallel-plate capacitor whose plates have a radius of (3.70x10^1) cm is being charged with a current of (3.69x10^1) A. What is the magnetic field (1.6x10^1) cm from the center of the plates? Express your result in μT with two significant figures.

Answer:

✗ **(8.6x10^0)**

▼ Hide Feedback

$i_D = \frac{r^2}{R^2} i$ and

$\oint \vec{B}.d\vec{s} = \mu_0 i_D$ or

$2\pi r B = \mu_0 i_D$ which leads to

$B = \frac{\mu_0 i_D}{2\pi r}$

Question 2 **0 / 1 point**

A (1.162x10^0)-m radius cylindrical region contains a **uniform electric field** along the cylinder axis. It is **increasing uniformly with time**. What is the **rate of change** (magnitude) of the **electric field** required to obtain a total **displacement current** of (5.62x10^0) nA through a cross section of the region? Provide your answer in V/(m.s) with three significant figures.

Answer:

✗ **(1.48x10^2)**

Hide Feedback

$i_D = \epsilon_0 \frac{d\Phi_E}{dt}$ which leads to

$\frac{dE}{dt} = \frac{4k}{r^2} i_D$

Question 3 **1 / 1 point**

A (3.45x10^0)-μF capacitor is connected to an EMF that is increasing uniformly with time at a rate of (1.9290x10^2) V/s. What is the displacement current between the plates? Express the result in mA with three significant figures.

Answer:

6.66x10^-1 ✓

Hide Feedback

$$i_D = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Question 4 **0 / 1 point**

A (7.6620x10^-1)-m radius cylindrical region contains a **uniform electric field** that is parallel to the axis and is increasing at the rate (4.3680x10^12) V/m×s. What is the magnitude of the **magnetic field** at a point (3.95x10^-1) m from the axis? Express your result with three significant figures.

Answer:

✗ (9.59x10^-6)

Hide Feedback

$$\frac{d\Phi_E}{dt} = \frac{1}{\mu_0\epsilon_0} \oint \vec{B}.d\vec{s} = c^2 \oint \vec{B}.d\vec{s}$$ which leads to

$$\pi r^2 \frac{dE}{dt} = 2\pi r c^2 B$$ or

$$B = \frac{r}{2c^2}\frac{dE}{dt}$$ where c is the speed of light

Question 5 **0 / 1 point**

Which of the following equations can be used, along with a symmetry argument, to calculate the electric field of a point charge?

- ✗ ○ $\oint \vec{B}.d\vec{s} = \mu_0 i + \mu_0\epsilon_0 \frac{d\Phi_E}{dt}$
- ➡ ○ $\oint \vec{E}.d\vec{A} = \frac{Q}{\epsilon_0}$
- ○ $\oint \vec{E}.d\vec{s} = -\frac{d\Phi_B}{dt}$
- ○ None of these expressions
- ○ $\oint \vec{B}.d\vec{A} = 0$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt):1 / 5 - 20 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 3

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A company claims to have developed material that absorbs light energy without a transfer of momentum. Such material is

- ◯ impossible!
- ◯ possible, but very expensive!
- ◯ inexpensive and already in common use!
- ◯ a breakthrough in high technology!

Question 2 **0 / 1 point**

A clear sheet of polarizing material is placed on top of a second, similar sheet so that their polarizing axes make an angle $\phi =$ (2.62x10^1)° with each other. What is the ratio of the **intensity** of **emerging light** to **incident unpolarized light**? Express your answer with three significant figures.

Answer:

✗ (4.03x10^-1)

Hide Feedback

The first polarizing sheet will polarize the light and reduce the intensity by a factor of two. The effect of the second polarizing sheet depends on the relative angle. The combined effect is given by

$$\frac{I}{I_0} = \frac{\cos^2\phi}{2}$$

Question 3 **0 / 1 point**

Three polarizing sheets are placed in a stack with the polarizing directions of the first and third perpendicular to each other. What angle should the polarizing direction of the middle sheet make with the polarizing direction of the first sheet to obtain maximum transmitted intensity when unpolarized light is incident on the stack?

- 0°
- 15°
- 30°
- ➡ 45°
- 60°
- 75°
- 90°

Question 4 **0 / 1 point**

A point source emits electromagnetic energy at a rate of (1.078x10^2) Joules per second. What is the intensity of the electromagnetic radiation (9.01x10^0) m from the source? Express your result with three significant figures in mW/m^2.

Answer:

(1.06x10^2)

Hide Feedback

$$I = \frac{P}{A} = \frac{P}{4\pi d^2}$$

Question 5 **0 / 1 point**

An electromagnetic wave has an electric field whose RMS value is (1.82x10^2) V/m. What is the instantaneous rate S of energy flow for this wave? Express your result in W/m^2 with three significant figures.

Answer:

(8.89x10^1)

Hide Feedback

$$S = \frac{cE^2}{4\pi k}$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A clear sheet of polarizing material is placed on top of a second, similar sheet so that their polarizing axes make an angle $\phi =$ (5.78x10^1)° with each other. What is the ratio of the **intensity** of **emerging light** to **incident unpolarized light**? Express your answer with three significant figures.

Answer:

❌ **(1.42x10^-1)**

▼ Hide Feedback

The first polarizing sheet will polarize the light and reduce the intensity by a factor of two. The effect of the second polarizing sheet depends on the relative angle. The combined effect is given by

$$\frac{I}{I_0} = \frac{\cos^2\phi}{2}$$

Question 2 **0 / 1 point**

The light intensity (1.66259x10^2) cm from a point source is (1.4448x10^0) kW/m^2. What is the intensity (4.541x10^2) m away from the same source? Express your result with four significant figures in W/m^2.

Answer:

❌ **(1.937x10^-2)**

Hide Feedback

$$I = i\frac{d^2}{D^2}$$

Question 3 **1 / 1 point**

A transmitter consists of an LC circuit with an inductance of (2.56x10^1) µH and a capacitance of (2.8120x10^1) pF. What is the wavelength of the electromagnetic waves it emits? Express your result with three significant figures in meters.

Answer:

5.05x10^1 ✓

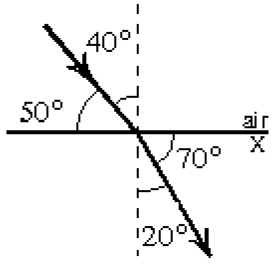
Hide Feedback

$2\pi f = \omega = \sqrt{\frac{1}{LC}}$ and

$\lambda = \frac{c}{f}$ where c is the speed of light

Question 4 **0 / 1 point**

The diagram below shows the passage of a ray of light from air into a substance X. What is the index of refraction of X?



- 0.53

1.88

3.01

0.82

1.21

Question 5 **0 / 1 point**

An electromagnetic wave has an electric field whose RMS value is (1.84x10^2) V/m. What is the instantaneous rate S of energy flow for this wave? Express your result in W/m^2 with three significant figures.

Answer:

(9.08x10^1)

Hide Feedback

$$S = \frac{cE^2}{4\pi k}$$

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 12

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

Light with an intensity of (4.3x10^0) kW/m^2 falls normally on a surface and is completely reflected. What is the radiation pressure in μPa. Use two significant figures for your answer.

Answer:

2.869x10^-5 ✗ **(2.9x10^1)**

▼ Hide Feedback

$p = \frac{2I}{c}$ where c is the speed of light

Question 2 **1 / 1 point**

A point source emits electromagnetic energy at a rate of (1.012x10^2) Joules per second. What is the intensity of the electromagnetic radiation (9.10x10^0) m from the source? Express your result with three significant figures in mW/m^2.

Answer:

9.73x10^1 ✓

▼ Hide Feedback

$$I = \frac{P}{A} = \frac{P}{4\pi d^2}$$

Question 3 **0 / 1 point**

The magnetic field in a light wave has an amplitude of (1.40x10^-1) μT. What is the intensity of this wave? Express your result in W/m^2 with three significant figures.

Answer:

2.60x10^-14 ✘ **(2.34x10^0)**

Hide Feedback

$$I = \frac{cB^2}{2\mu_0}$$

Question 4 **1 / 1 point**

Three polarizing sheets are placed in a stack with the polarizing directions of the first and third perpendicular to each other. What angle should the polarizing direction of the middle sheet make with the polarizing direction of the first sheet to obtain maximum transmitted intensity when unpolarized light is incident on the stack?

- ○ 0°
- ○ 15°
- ○ 30°
- ✔ ○ 45°
- ○ 60°
- ○ 75°
- ○ 90°

Question 5 **1 / 1 point**

A company claims to have developed material that absorbs light energy without a transfer of momentum. Such material is

- ✔ impossible!
- possible, but very expensive!
- inexpensive and already in common use!
- a breakthrough in high technology!

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

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Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

The light intensity (2.66730x10^1) cm from a point source is (1.14780x10^0) kW/m^2. What is the intensity (3.968x10^2) m away from the same source? Express your result with four significant figures in W/m^2.

Answer:

5.186x10^-4 ✔

▼ Hide Feedback

$$I = i\frac{d^2}{D^2}$$

Question 2 **1 / 1 point**

A clear sheet of polarizing material is placed on top of a second, similar sheet so that their polarizing axes make an angle $\phi =$ (4.09x10^1)° with each other. What is the ratio of the **intensity** of **emerging light** to **incident unpolarized light**? Express your answer with three significant figures.

Answer:

2.86x10^-1 ✔

▼ Hide Feedback

The first polarizing sheet will polarize the light and reduce the intensity by a factor of two. The effect of the second polarizing sheet depends on the relative angle. The combined effect is given by

$$\frac{I}{I_0} = \frac{\cos^2\phi}{2}$$

Question 3 **1 / 1 point**

Light with an intensity of (1.3x10^0) kW/m^2 falls normally on a surface and is completely reflected. What is the radiation pressure in μPa. Use two significant figures for your answer.

Answer:

8.7x10^0 ✔

▼ Hide Feedback

$p = \frac{2I}{c}$ where c is the speed of light

Question 4 **1 / 1 point**

A transmitter consists of an LC circuit with an inductance of (1.9970x10^1) µH and a capacitance of (3.85x10^1) pF. What is the wavelength of the electromagnetic waves it emits? Express your result with three significant figures in meters.

Answer:

5.23x10^1 ✔

▼ Hide Feedback

$2\pi f = \omega = \sqrt{\frac{1}{LC}}$ and

$\lambda = \frac{c}{f}$ where c is the speed of light

Question 5 **1 / 1 point**

An electromagnetic wave has an electric field whose RMS value is (2.52x10^2) V/m. What is the instantaneous rate S of energy flow for this wave? Express your result in W/m^2 with three significant figures.

Answer:

1.68x10^2 ✔

▼ Hide Feedback

$S = \frac{cE^2}{4\pi k}$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

Light with an intensity of (3.3x10^0) kW/m^2 falls normally on a surface and is completely reflected. What is the radiation pressure in μPa. Use two significant figures for your answer.

Answer:

2.2x10^1 ✔

▼ Hide Feedback

$p = \frac{2I}{c}$ where c is the speed of light

Question 2 **1 / 1 point**

A company claims to have developed material that absorbs light energy without a transfer of momentum. Such material is

- ✔ ○ impossible!
- ○ possible, but very expensive!
- ○ inexpensive and already in common use!
- ○ a breakthrough in high technology!

Question 3 — 0 / 1 point

A clear sheet of polarizing material is placed on top of a second, similar sheet so that their polarizing axes make an angle $\phi =$ (3.45x10^1)° with each other. What is the ratio of the **intensity** of **emerging light** to **incident unpolarized light**? Express your answer with three significant figures.

Answer:

4.98x10^1 ✗ **(3.40x10^-1)**

▼ Hide Feedback

The first polarizing sheet will polarize the light and reduce the intensity by a factor of two. The effect of the second polarizing sheet depends on the relative angle. The combined effect is given by

$$\frac{I}{I_0} = \frac{\cos^2\phi}{2}$$

Question 4 — 0 / 1 point

An electromagnetic wave has an electric field whose RMS value is (3.07x10^2) V/m. What is the instantaneous rate S of energy flow for this wave? Express your result in W/m^2 with three significant figures.

Answer:

8.15x10^-1 ✗ **(2.53x10^2)**

▼ Hide Feedback

$$S = \frac{cE^2}{4\pi k}$$

Question 5 — 1 / 1 point

The index of refraction of a certain glass is (1.48x10^0). What is the critical angle for total internal reflection at the glass-air interface? Express your result in degrees with three significant figures.

Answer:

4.25x10^1 ✓

Hide Feedback

$$\theta_c = \sin^{-1}\left(\frac{1}{n}\right)$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 1

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A point source emits electromagnetic energy at a rate of (1.054x10^2) Joules per second. What is the intensity of the electromagnetic radiation (9.81x10^0) m from the source? Express your result with three significant figures in mW/m^2.

Answer:

8.72x10^1 ✓

▼ Hide Feedback

$$I = \frac{P}{A} = \frac{P}{4\pi d^2}$$

Question 2 **1 / 1 point**

Three polarizing sheets are placed in a stack with the polarizing directions of the first and third perpendicular to each other. What angle should the polarizing direction of the middle sheet make with the polarizing direction of the first sheet to obtain maximum transmitted intensity when unpolarized light is incident on the stack?

- 0°
- 15°
- 30°

✓ ○ 45°

○ 60°

○ 75°

○ 90°

Question 3 **0 / 1 point**

An electromagnetic wave with an electric field amplitude of (1.847x10^2) V/m is incident normally on a surface with an area of (3.770x10^0) cm^2 and is completely absorbed. How much energy is delivered during (1.57x10^1) s? Express your result in J with three significant figures.

Answer:

1.01x10^0 ✗ **(2.71x10^-1)**

▼ Hide Feedback

$I = \frac{cE^2}{8\pi k}$ and the energy absorbed is given by

$$Q = S * A * \Delta t$$

Question 4 **1 / 1 point**

The index of refraction of a certain glass is (1.53x10^0). What is the critical angle for total internal reflection at the glass-air interface? Express your result in degrees with three significant figures.

Answer:

4.08x10^1 ✓

▼ Hide Feedback

$$\theta_c = \sin^{-1}\left(\frac{1}{n}\right)$$

Question 5 **0 / 1 point**

The light intensity (1.5721x10^2) cm from a point source is (1.07800x10^0) kW/m^2. What is the intensity (2.233x10^2) m away from the same source? Express your result with four significant figures in W/m^2.

Answer:

5.343x10^-5 ✗ **(5.343x10^-2)**

Hide Feedback

$$I = i\frac{d^2}{D^2}$$

Attempt Score:3 / 5 - 60 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A company claims to have developed material that absorbs light energy without a transfer of momentum. Such material is

- ✔ impossible!
- possible, but very expensive!
- inexpensive and already in common use!
- a breakthrough in high technology!

Question 2 **0 / 1 point**

A point source emits electromagnetic energy at a rate of (9.48x10^1) Joules per second. What is the intensity of the electromagnetic radiation (9.802x10^0) m from the source? Express your result with three significant figures in mW/m^2.

Answer:

✘ **(7.85x10^1)**

Hide Feedback

$$I = \frac{P}{A} = \frac{P}{4\pi d^2}$$

Question 3 **0 / 1 point**

An electromagnetic wave with an electric field amplitude of (2.9480x10^2) V/m is incident normally on a surface with an area of (2.222x10^0) cm^2 and is completely absorbed. How much energy is delivered during (2.33x10^1) s? Express your result in J with three significant figures.

Answer:

❌ **(6.03x10^-1)**

Hide Feedback

$I = \frac{cE^2}{8\pi k}$ and the energy absorbed is given by

$$Q = S * A * \Delta t$$

Question 4 **0 / 1 point**

The magnetic field in a light wave has an amplitude of (1.44x10^-1) μT. What is the intensity of this wave? Express your result in W/m^2 with three significant figures.

Answer:

❌ **(2.48x10^0)**

Hide Feedback

$$I = \frac{cB^2}{2\mu_0}$$

Question 5 **1 / 1 point**

Three polarizing sheets are placed in a stack with the polarizing directions of the first and third perpendicular to each other. What angle should the polarizing direction of the middle sheet make with the polarizing direction of the first sheet to obtain maximum transmitted intensity when unpolarized light is incident on the stack?

- 0°
- 15°
- 30°
- ✔ 45°
- 60°
- 75°
- 90°

Attempt Score:2 / 5 - 40 %

Overall Grade (highest attempt)**:**2 / 5 - 40 %

Done

Quiz Submissions - Quiz: Week 12

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

The light intensity (2.71470x10^1) cm from a point source is (1.572x10^0) kW/m^2. What is the intensity (4.68619x10^2) m away from the same source? Express your result with four significant figures in W/m^2.

Answer:

✗ **(5.275x10^-4)**

▼ Hide Feedback

$$I = i\frac{d^2}{D^2}$$

Question 2 **0 / 1 point**

An electromagnetic wave with an electric field amplitude of (2.69x10^2) V/m is incident normally on a surface with an area of (1.800x10^0) cm^2 and is completely absorbed. How much energy is delivered during (2.3360x10^1) s? Express your result in J with three significant figures.

Answer:

✗ **(4.08x10^-1)**

▼ Hide Feedback

$I = \frac{cE^2}{8\pi k}$ and the energy absorbed is given by

$$Q = S * A * \Delta t$$

Question 3 **0 / 1 point**

A clear sheet of polarizing material is placed on top of a second, similar sheet so that their polarizing axes make an angle $\phi =$ (2.80x10^1)° with each other. What is the ratio of the **intensity** of **emerging light** to **incident unpolarized light**? Express your answer with three significant figures.

Answer:

✖ (3.90x10^-1)

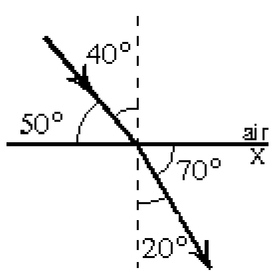
Hide Feedback

The first polarizing sheet will polarize the light and reduce the intensity by a factor of two. The effect of the second polarizing sheet depends on the relative angle. The combined effect is given by

$$\frac{I}{I_0} = \frac{\cos^2\phi}{2}$$

Question 4 **0 / 1 point**

The diagram below shows the passage of a ray of light from air into a substance X. What is the index of refraction of X?



- 1.21
- 0.53
- 1.88
- 0.82
- 3.01

Question 5 **0 / 1 point**

The index of refraction of a certain glass is (1.63x10^0). What is the critical angle for total internal reflection at the glass-air interface? Express your result in degrees with three significant figures.

Answer:

(3.78x10^1)

Hide Feedback

$$\theta_c = \sin^{-1}\left(\frac{1}{n}\right)$$

Attempt Score:0 / 5 - 0 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 2

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

An electromagnetic wave with an electric field amplitude of (1.81x10^2) V/m is incident normally on a surface with an area of (1.6480x10^0) cm^2 and is completely absorbed. How much energy is delivered during (2.105x10^1) s? Express your result in J with three significant figures.

Answer:

(1.52x10^-1)

Hide Feedback

$I = \frac{cE^2}{8\pi k}$ and the energy absorbed is given by

$$Q = S * A * \Delta t$$

Question 2 **0 / 1 point**

The light intensity (2.618x10^1) cm from a point source is (1.2922x10^0) kW/m^2. What is the intensity (9.98320x10^1) m away from the same source? Express your result with four significant figures in W/m^2.

Answer:

(8.886x10^-3)

Hide Feedback

$$I = i\frac{d^2}{D^2}$$

Question 3 **1 / 1 point**

Three polarizing sheets are placed in a stack with the polarizing directions of the first and third perpendicular to each other. What angle should the polarizing direction of the middle sheet make with the polarizing direction of the first sheet to obtain maximum transmitted intensity when unpolarized light is incident on the stack?

- ○ 0°
- ○ 15°
- ○ 30°
- ✔○ 45°
- ○ 60°
- ○ 75°
- ○ 90°

Question 4 **0 / 1 point**

The magnetic field in a light wave has an amplitude of (1.29x10^-1) μT. What is the intensity of this wave? Express your result in W/m^2 with three significant figures.

Answer:

✘ **(1.99x10^0)**

▼ Hide Feedback

$$I = \frac{cB^2}{2\mu_0}$$

Question 5 **0 / 1 point**

A transmitter consists of an LC circuit with an inductance of (2.33x10^1) µH and a capacitance of (3.4340x10^1) pF. What is the wavelength of the electromagnetic waves it emits? Express your result with three significant figures in meters.

Answer:

✖ **(5.33x10^1)**

Hide Feedback

$2\pi f = \omega = \sqrt{\frac{1}{LC}}$ and

$\lambda = \frac{c}{f}$ where c is the speed of light

Attempt Score:1 / 5 - 20 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done

Quiz Submissions - Quiz: Week 12

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Attempt 2

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A transmitter consists of an LC circuit with an inductance of (2.30x10^1) µH and a capacitance of (4.0400x10^1) pF. What is the wavelength of the electromagnetic waves it emits? Express your result with three significant figures in meters.

Answer:

5.75x10^1 ✓

▼ Hide Feedback

$2\pi f = \omega = \sqrt{\frac{1}{LC}}$ and

$\lambda = \frac{c}{f}$ where c is the speed of light

Question 2 **1 / 1 point**

The magnetic field in a light wave has an amplitude of (1.44x10^-1) μT. What is the intensity of this wave? Express your result in W/m^2 with three significant figures.

Answer:

2.48x10^0 ✓

▼ Hide Feedback

$$I = \frac{cB^2}{2\mu_0}$$

Question 3 **1 / 1 point**

Light with an intensity of (2.2x10^0) kW/m^2 falls normally on a surface and is completely reflected. What is the radiation pressure in μPa. Use two significant figures for your answer.

Answer:

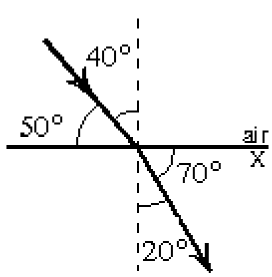
1.47x10^1 ✔ **(1.5x10^1)** ✘ wrong number of significant figures **(2)**

▼ Hide Feedback

$p = \frac{2I}{c}$ where c is the speed of light

Question 4 **1 / 1 point**

The diagram below shows the passage of a ray of light from air into a substance X. What is the index of refraction of X?



- ○ 0.82
- ✔ ○ 1.88
- ○ 0.53

1.21

3.01

Question 5 **1 / 1 point**

An electromagnetic wave has an electric field whose RMS value is (2.67x10^2) V/m. What is the instantaneous rate S of energy flow for this wave? Express your result in W/m^2 with three significant figures.

Answer:

1.89x10^2 ✔

Hide Feedback

$$S = \frac{cE^2}{4\pi k}$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 3

Your quiz has been submitted successfully.

Question 1 **1 / 1 point**

A transmitter consists of an LC circuit with an inductance of (1.8020x10^1) µH and a capacitance of (3.02x10^1) pF. What is the wavelength of the electromagnetic waves it emits? Express your result with three significant figures in meters.

Answer:

4.39x10^1 ✓

Hide Feedback

$2\pi f = \omega = \sqrt{\frac{1}{LC}}$ and

$\lambda = \frac{c}{f}$ where c is the speed of light

Question 2 **1 / 1 point**

An electromagnetic wave has an electric field whose RMS value is (3.40x10^2) V/m. What is the instantaneous rate S of energy flow for this wave? Express your result in W/m^2 with three significant figures.

Answer:

3.07x10^2 ✓

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$$S = \frac{cE^2}{4\pi k}$$

Question 3 **1 / 1 point**

The magnetic field in a light wave has an amplitude of (2.04x10^-1) μT. What is the intensity of this wave? Express your result in W/m^2 with three significant figures.

Answer:

4.96x10^0 ✔

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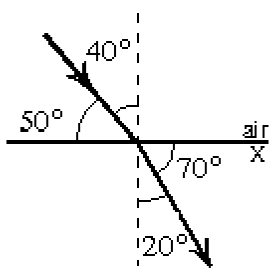
$$I = \frac{cB^2}{2\mu_0}$$

Question 4 **1 / 1 point**

The diagram below shows the passage of a ray of light from air into a substance X. What is the index of refraction of X?



○ 0.53

✔ ○ 1.88

○ 1.21

3.01

0.82

Question 5 **1 / 1 point**

The index of refraction of a certain glass is (1.69x10^0). What is the critical angle for total internal reflection at the glass-air interface? Express your result in degrees with three significant figures.

Answer:

3.63x10^1 ✔

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$$\theta_c = \sin^{-1}\left(\frac{1}{n}\right)$$

Attempt Score:5 / 5 - 100 %

Overall Grade (highest attempt):5 / 5 - 100 %

Done

Quiz Submissions - Quiz: Week 12

Attempt 3

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

A point source emits electromagnetic energy at a rate of (9.6490x10^1) Joules per second. What is the intensity of the electromagnetic radiation (9.38x10^0) m from the source? Express your result with three significant figures in mW/m^2.

Answer:

✗ **(8.73x10^1)**

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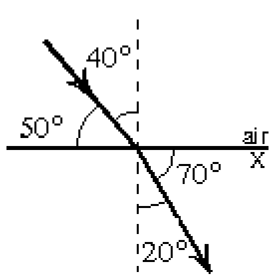
$$I = \frac{P}{A} = \frac{P}{4\pi d^2}$$

Question 2 **1 / 1 point**

The diagram below shows the passage of a ray of light from air into a substance X. What is the index of refraction of X?



○ 3.01

- 1.21
- ✓ 1.88
- 0.53
- 0.82

Question 3 **1 / 1 point**

The magnetic field in a light wave has an amplitude of (1.25x10^-1) μT. What is the intensity of this wave? Express your result in W/m^2 with three significant figures.

Answer:

1.87x10^0 ✓

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$$I = \frac{cB^2}{2\mu_0}$$

Question 4 **1 / 1 point**

A company claims to have developed material that absorbs light energy without a transfer of momentum. Such material is

- ✓ impossible!
- possible, but very expensive!
- inexpensive and already in common use!
-

a breakthrough in high technology!

Question 5 **1 / 1 point**

A transmitter consists of an LC circuit with an inductance of (2.3300x10^1) µH and a capacitance of (2.49x10^1) pF. What is the wavelength of the electromagnetic waves it emits? Express your result with three significant figures in meters.

Answer:

4.54x10^1 ✔

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$2\pi f = \omega = \sqrt{\frac{1}{LC}}$ and

$\lambda = \frac{c}{f}$ where c is the speed of light

Attempt Score:4 / 5 - 80 %

Overall Grade (highest attempt)**:**4 / 5 - 80 %

Done