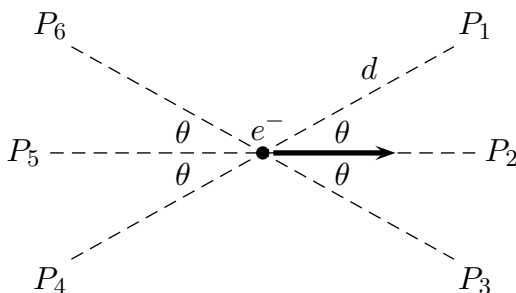


This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points



An electron is moving horizontally to the right with speed 2×10^6 m/s. Each location is $d = 6$ cm from the electron, and the angle $\theta = 34^\circ$. Give the magnetic field at P_3 using the convention that out of the page is positive.

1. 0.497×10^{-17} T
2. 0.994×10^{-17} T
3. 0.331×10^{-17} T
4. -0.994×10^{-17} T
5. -0.331×10^{-17} T
6. -0.746×10^{-17} T
7. 0.746×10^{-17} T
8. -0.497×10^{-17} T

002 (part 1 of 3) 3.0 points

Given two vectors $\vec{A} = \langle 4, 2, 0 \rangle$ and $\vec{B} = \langle 1, 1, 0 \rangle$, determine their cross-product $\vec{C} = \vec{A} \times \vec{B}$ using the 3x3 matrix method.

What is $|\vec{C}|$?

003 (part 2 of 3) 3.0 points

What is $\hat{C}$, the direction of $\vec{C}$?

1. $\hat{j}$
2. $\hat{k}$
3. $\hat{i}$

004 (part 3 of 3) 4.0 points

Geometrically, the cross product has the following representation:

$$\vec{C} = \vec{A} \times \vec{B} = \|\vec{A}\| \|\vec{B}\| \sin \alpha \hat{C},$$

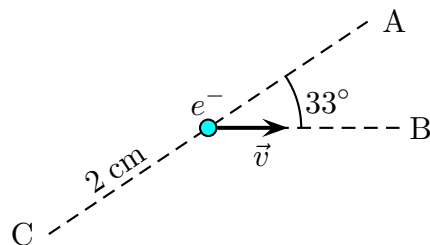
where α is the angle between $\vec{A}$ and $\vec{B}$.

What is the angle between $\vec{A}$ and $\vec{B}$ given in part 1?

Answer in units of $^\circ$

005 (part 1 of 4) 2.5 points

An electron is moving horizontally to the right with speed 5×10^6 m/s (see the following figure). Each of the indicated locations is 2 cm from the electron. Let $+x$ be toward the right, $+y$ be upward, and $+z$ be out of the page.



At the instant shown, what will be the direction of the magnetic field at location A due to the moving electron?

1. None of these.
2. $+\hat{j}$
3. $-\hat{k}$
4. $-\hat{j}$
5. $+\hat{i}$
6. $+\hat{k}$

7. $-\hat{i}$

006 (part 2 of 4) 2.5 points

What is the magnitude of the magnetic field due to this moving electron at the point A?

Use

$$\frac{\mu_0}{4\pi} = 1 \times 10^{-7} \text{ T} \cdot \text{m/A},$$

and

$$e = 1.6 \times 10^{-19} \text{ C}.$$

007 (part 3 of 4) 2.5 points

What is the magnitude of the magnetic field due to this moving electron at the point B?

1. Zero
2. smaller in magnitude than at location A
3. larger in magnitude than at location A
4. The same magnitude as location A

008 (part 4 of 4) 2.5 points

What will be the direction of the magnetic field at location C due to the moving electron?

1. $-\hat{i}$
2. $+\hat{i}$
3. None of these.
4. $+\hat{j}$
5. $-\hat{j}$
6. $+\hat{k}$
7. $-\hat{k}$

009 (part 1 of 2) 5.0 points

A current-carrying wire oriented north-south and laid over a compass deflects the compass 25° East. The horizontal component of the Earth's magnetic field is about $2 \times 10^{-5} \text{ T}$. What is the magnitude of the magnetic field made by the current?

Answer in units of T

010 (part 2 of 2) 5.0 points

What is the direction of the magnetic field made by the current?

1. East
2. South
3. North
4. West

011 (part 1 of 2) 5.0 points

A current carrying wire is laid on a table, oriented North-South. Electrons in the wire are flowing South. What is the direction of the of the magnetic field at a location directly underneath the wire, due only to these moving electrons?

1. West
2. East
3. North
4. South

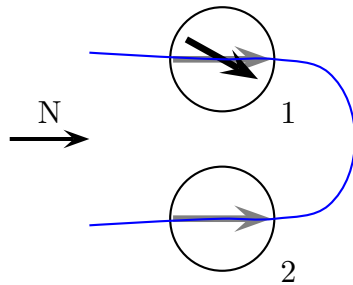
012 (part 2 of 2) 5.0 points

If a compass is placed under the wire, in which direction will the needle point?

1. East
2. Northeast
3. Southeast
4. Northwest
5. West
6. North
7. Southwest
8. South

013 10.0 points

Consider the following diagram.



The wire rests on top of two compasses. When no current is running, both compasses point North (the direction shown by the gray arrows). When the current runs in the circuit, the needle of compass 1 deflects as shown. In what direction will the needle of compass 2 point?

1. West
2. Southeast
3. Northwest
4. South
5. Southwest
6. Northeast
7. East
8. North

and point P are all in the xy plane.

The E-field at point P

- Ia) Is **not** the zero vector
- Ib) Is the zero vector

The B-field at point P

- IIa) Is in the $+\hat{k}$ direction
- IIb) Is in the $-\hat{k}$ direction
- IIc) Is in the $+\hat{j}$ direction
- IId) Is in the $-\hat{j}$ direction
- IIE) Is the zero vector

1. Ib, IIa

2. Ia, IIc

3. Ia, IIE

4. Ib, IID

5. Ia, IID

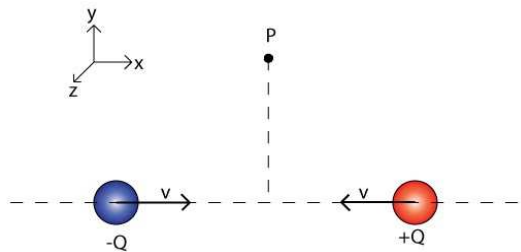
6. Ia, IIa

7. Ib, IIE

8. Ib, IIc

9. Ia, IIb

10. Ib, IIb

014 10.0 points

Two equal and opposite charges are equidistant from point P and are moving towards each other with the same speed v . The charges