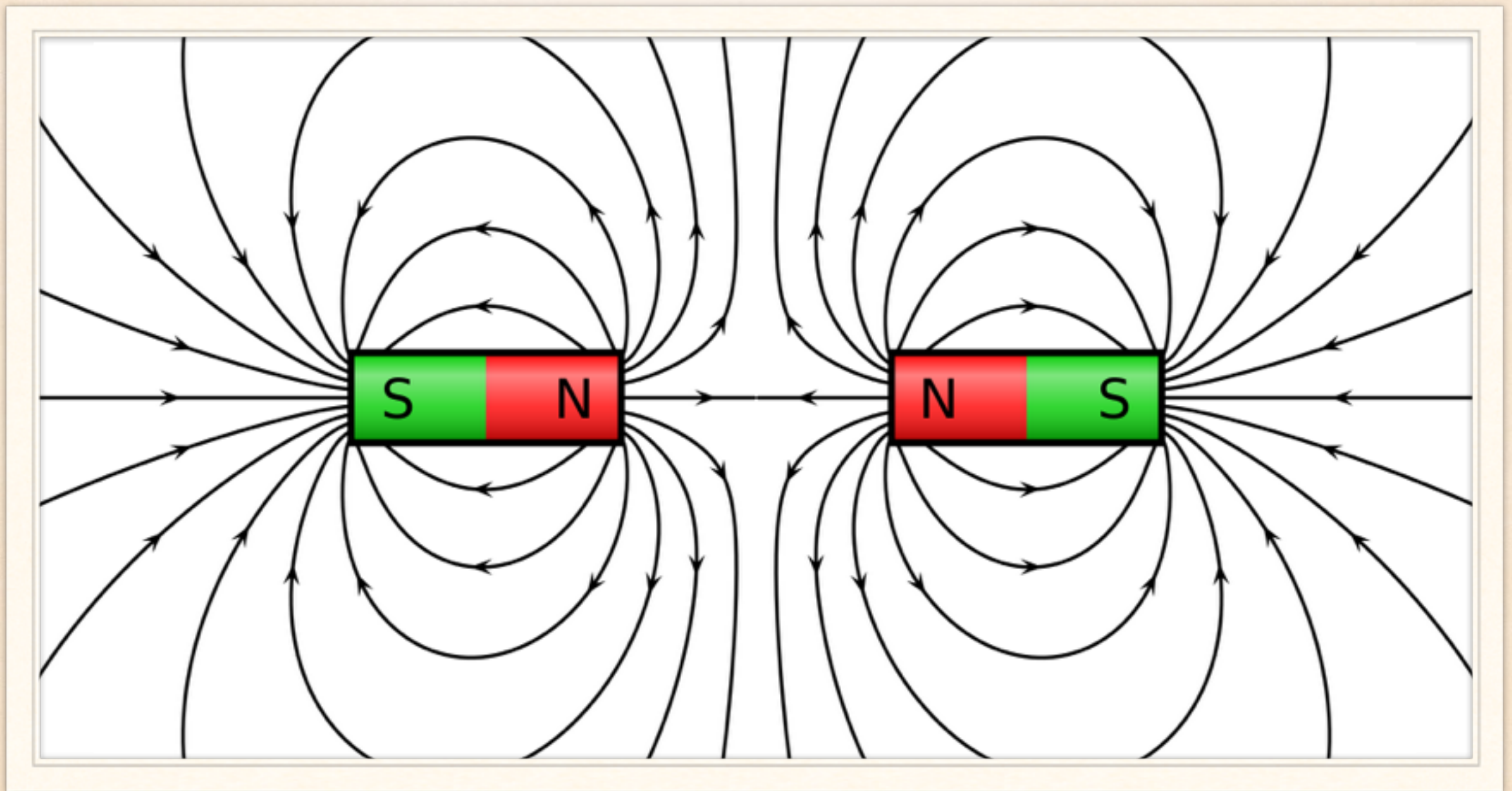


# MAGNETISM



## REVIEW



# QUESTION 1

- ❖ A proton speeding through a synchrotron at  $3.0 \times 10^7$  m/s experiences a magnetic field of 3.0 T that is produced by the steering magnets in the synchrotron. What is the magnetic force pulling on the proton?



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- ❖ *Answer:  $1.4 \times 10^{-11}$  N*

# QUESTION 2

- ❖ A 0.90 m long straight wire on board the Voyager spacecraft carries a current of 0.10 A perpendicular to Jupiter's strong magnetic field of  $5.0 \times 10^{-4}$  T. What is the magnitude of the magnetic force experienced by the wire?

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- ❖ *Answer:  $4.5 \times 10^{-5}$  N*

# QUESTION 3

- ❖ At the equator where the Earth's  $3.0 \times 10^{-5}$  T magnetic field is parallel to the surface of the Earth, Emma is spinning her wedding ring, which has a diameter of 2.0 cm, on top of the table. What is the change in flux through the ring if Emma spins it on its edge?



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- ❖ *Answer:  $9.4 \times 10^{-9} \text{ Wb}$*

# QUESTION 4

- ❖ In Fred's color TV, electrons are shot toward the screen through a  $1.0 \times 10^{-3}$  T magnetic field set up in the picture tube. If the electrons each experiences a magnetic force of  $3.5 \times 10^{-15}$  N, at what speed are they propelled through the picture tube?



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- ❖ *Answer:  $2.2 \times 10^7$  m/s*

# QUESTION 5

- ❖ Niagara Falls sends  $3,000\text{ V}$  to a step-up transformer that sends  $120,000\text{ V}$  to homes in NYC. If there are  $2,000$  loops in the primary end of the transformer, how many loops are in the secondary?

# QUESTION 5

- ❖ Niagara Falls sends 3,000 V to a step-up transformer that sends 120,000 V to homes in NYC. If there are 2,000 loops in the primary end of the transformer, how many loops are in the secondary?
- ❖ *Answer: 80,000 loops*



# QUESTION 6

- ❖ A 6 loop coil of wire is placed in a magnetic field the oscillates between 1.0 T and 6.0 T every 5.0 s. If the coil has a radius of 7.3 cm, what is the induced voltage across it?

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❖ *Answer: 0.10 V*

# QUESTION 7

- ❖ How much current is flowing in a wire 4.20 m long if the maximum force on it is 0.900 N when placed in a uniform 0.800 T field?

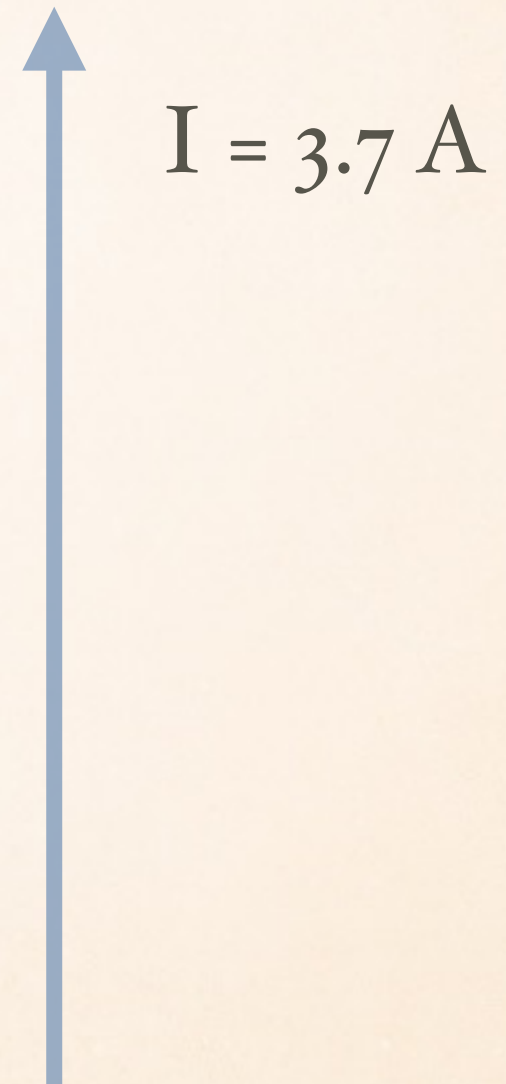


# QUESTION 7

- ❖ How much current is flowing in a wire 4.20 m long if the maximum force on it is 0.900 N when placed in a uniform 0.800 T field?
- ❖ *Answer: 0.268 A*

# QUESTION 8

- ❖ What is the magnitude and direction of the magnetic field 4.9 cm to the right of the wire due to the flow of current as depicted to the right?



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- ❖ *Answer:  $1.5 \times 10^{-5} \text{ T}$  into*





# QUESTION 9

- ❖ A magnetic resonance imager (MRI) machine uses magnetic fields to image the inside of the human body. Sarah is undergoing an MRI procedure and is placed inside a chamber housing the coil of a large electromagnet that has an diameter of  $0.510\text{ m}$ . A flux of  $0.307\text{ Wb}$  passes through the coil opening. What is the magnetic field inside the coil?

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❖ *Answer: 1.5 T*

# QUESTION 10

- ❖ An electron is accelerated through a potential difference of  $V$ . What is the potential difference necessary to give the electron a speed of  $1.9 \times 10^8$  m/s? ( $q = -1.6 \times 10^{-19}$  C;  $m = 9.11 \times 10^{-31}$  kg)



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- ❖ *Answer:  $1.0 \times 10^5$  V*

# QUESTION 11

- ❖ A proton enters a 4.5 T magnetic field at  $2.3 \times 10^8$  m/s perpendicular to the field. What is the radius of the circular path of the electron? ( $m = 1.67 \times 10^{-27}$  kg)

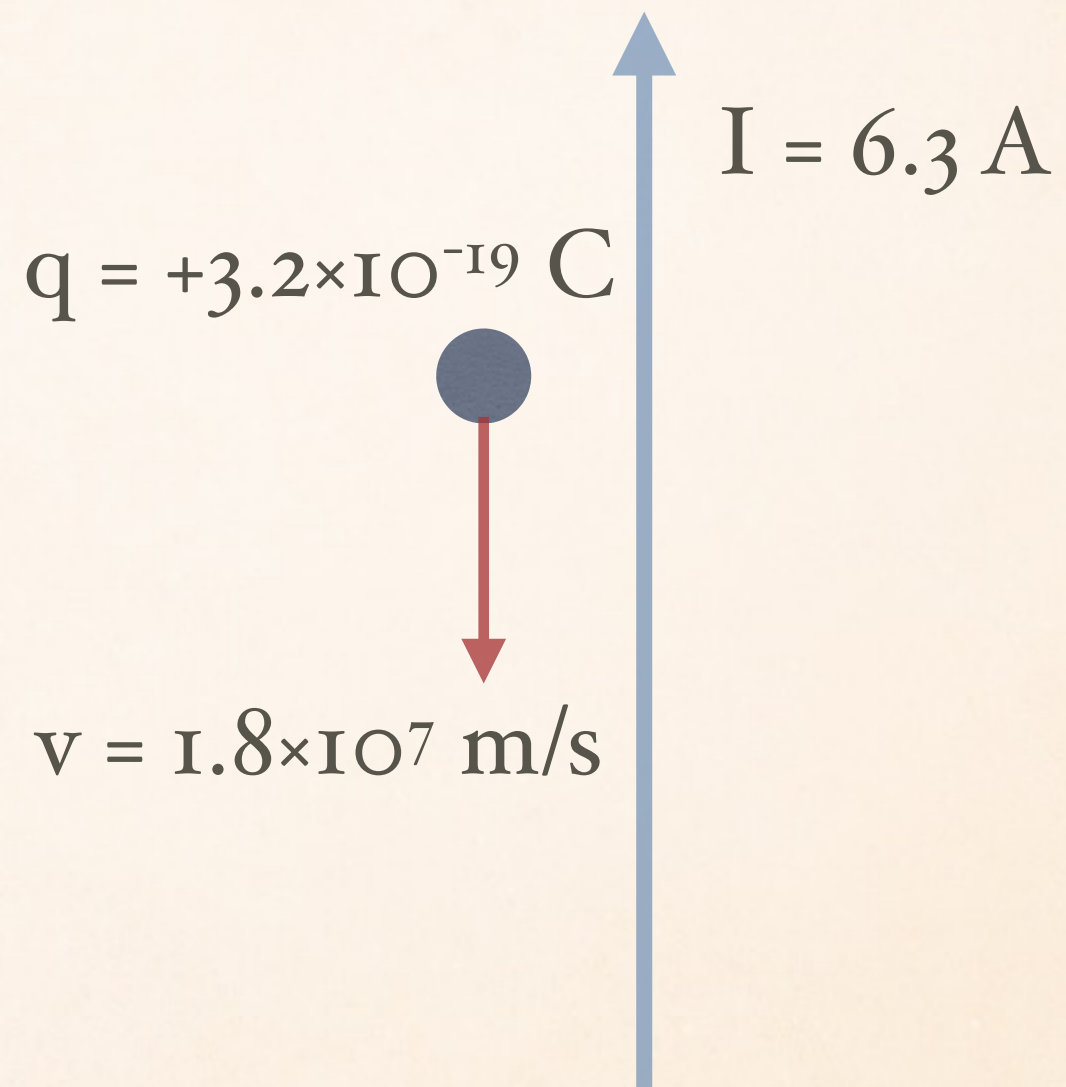
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- ❖ *Answer: 53 cm*



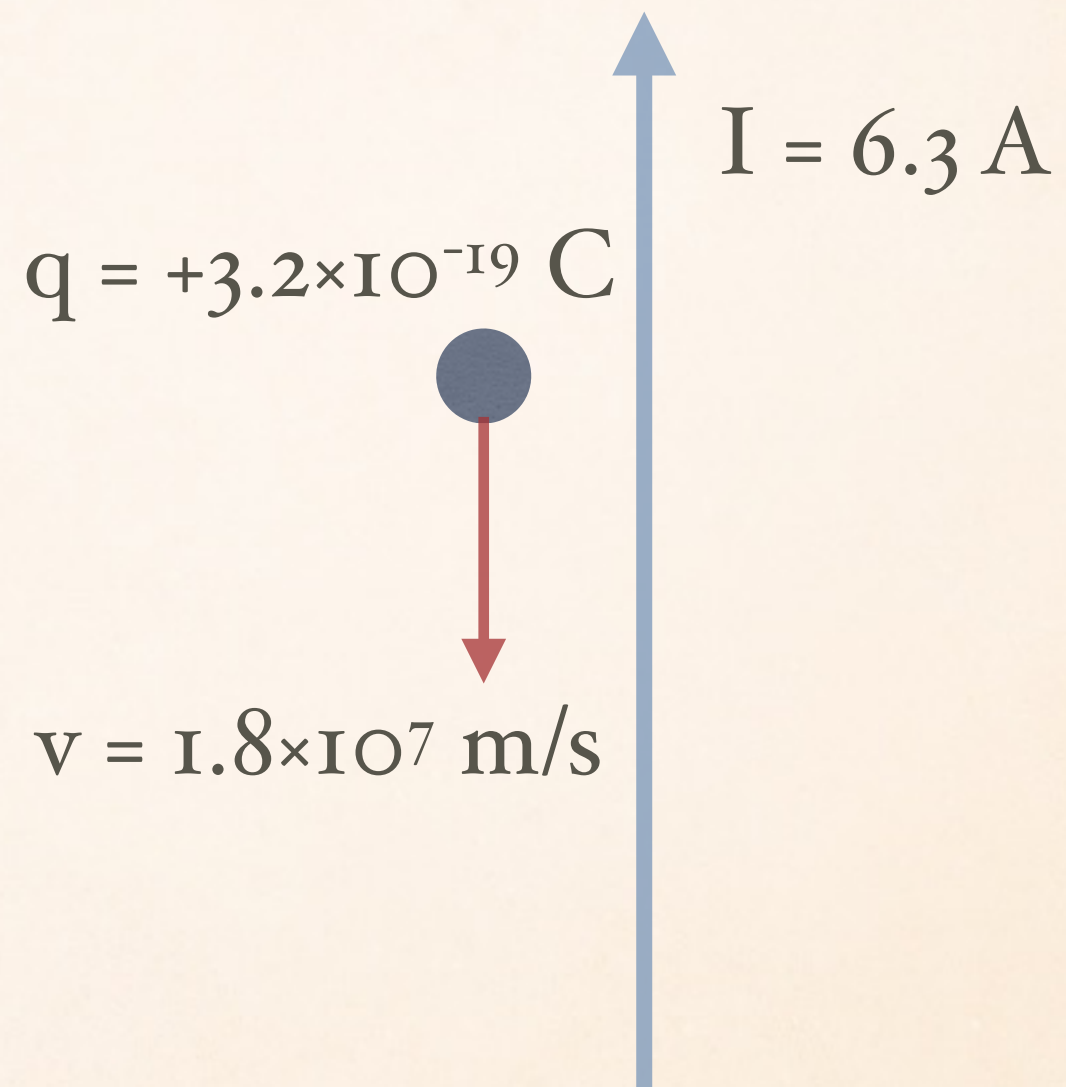
# QUESTION 12

- ❖ In the picture to the right, an alpha particle zips along 23 mm away from the current-carrying wire. What is the magnitude and direction of the force on the alpha particle due to the magnetic field of the wire?



# QUESTION 12

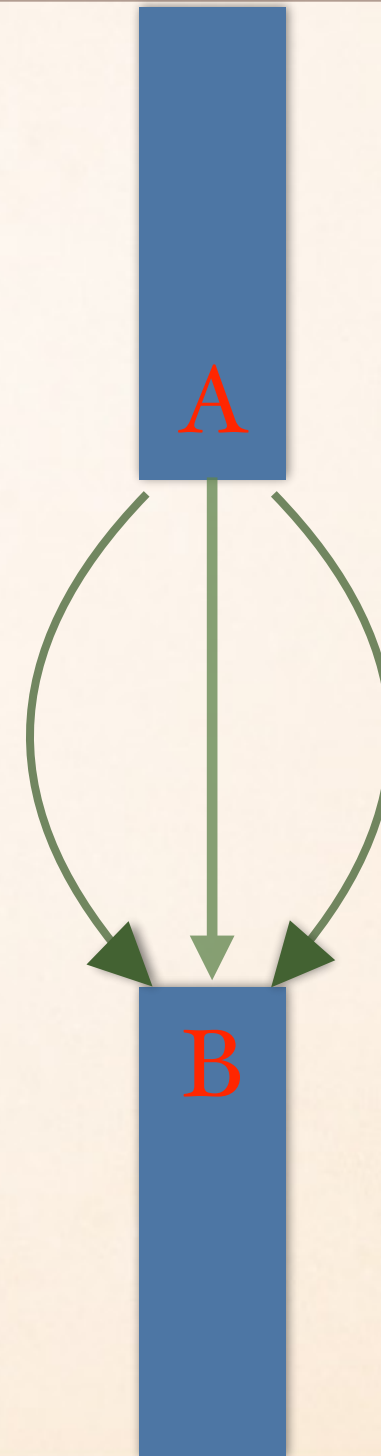
- ❖ In the picture to the right, an alpha particle zips along 23 mm away from the current-carrying wire. What is the magnitude and direction of the force on the alpha particle due to the magnetic field of the wire?



- ❖ *Answer:  $3.2 \times 10^{-16} \text{ N left}$*

# QUESTION 13

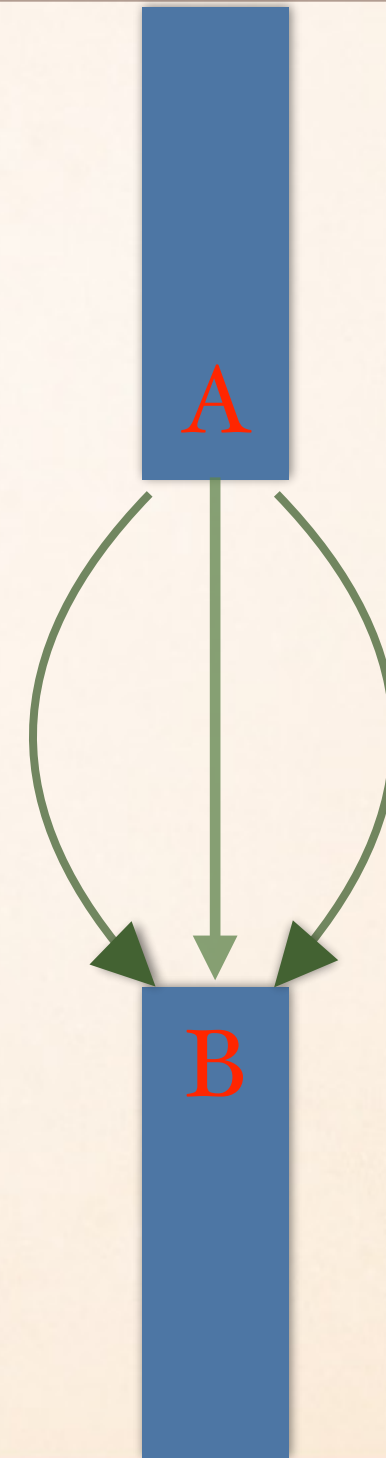
- ❖ The diagram shows the magnetic field lines between two magnetic poles, *A* and *B*. Describe the polarity of magnetic poles *A* and *B*.





# QUESTION 13

- ❖ The diagram shows the magnetic field lines between two magnetic poles, *A* and *B*. Describe the polarity of magnetic poles *A* and *B*.



- ❖ *Answer: A is north, B is south*

# QUESTION 14

- ❖ A 5.0 m stretch of wire carrying 3.7 A of current and laying in a 2.2 T magnetic field experiences 24 N of force. What is the angle between the magnetic field and the wire?

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- ❖ A 5.0 m stretch of wire carrying 3.7 A of current and laying in a 2.2 T magnetic field experiences 24 N of force. What is the angle between the magnetic field and the wire?
- ❖ *Answer:  $36^\circ$  or 0.63 rad*

# QUESTION 15

- ❖ An 8 loop coil of wire experiences a flux that oscillates at  $1.5 \text{ Wb/s}$ . If the wire has a resistance of  $10 \Omega$ , how much current is pushed through the wire?



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- ❖ An 8 loop coil of wire experiences a flux that oscillates at  $1.5 \text{ Wb/s}$ . If the wire has a resistance of  $10 \Omega$ , how much current is pushed through the wire?
- ❖ *Answer: 1.2 A*

# QUESTION 16

- ❖ In a transformer, the power used by the primary and secondary is always the same. A step-up transformer increases 16 V to 120 V. What is the current in the secondary as compared to the primary? (Assume 100% efficiency)

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- ❖ *Answer:  $I_s = 7.5I_p$*