



TERM2 – WEEK 4		Differentiated Worksheet		Subject:	Physics
Student's Name:		Class:			
Grade:	12	Date:			
Lesson Title:	Magnetic field and forces	Mark:			

Topic 24:

Magnetic Fields

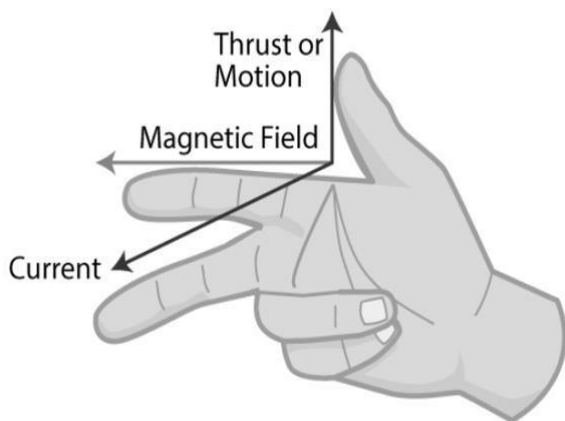
Subtopic 24.2:

Applying Magnetic forces

Explain how a current-carrying conductor placed in an external magnetic field experiences a force due to the superposition of the two magnetic fields.

24.2– Applying Magnetic forces (DOK1)

1. Select the correct statement.
2. The figure below shows the _____

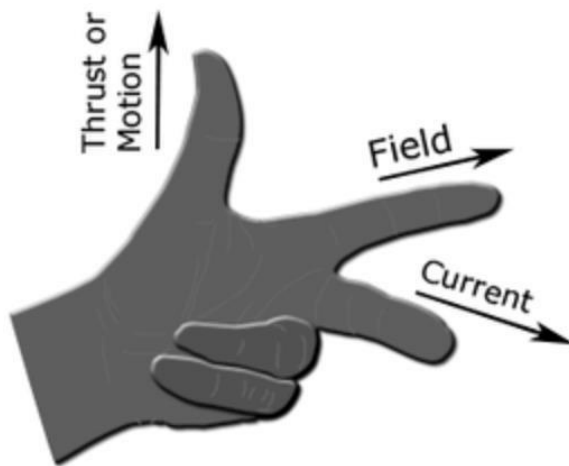


- A. Fleming's right-hand rule or RHR-1
- B. Right hand thumb rule
- C. Hand rule
- D. Fleming's vectors

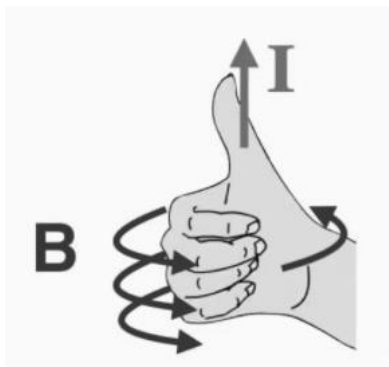
2. Select the correct answer.

Which figure represents the Fleming's left hand rule?

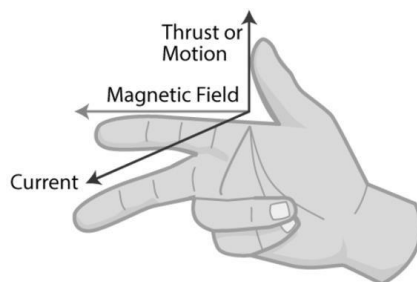
A.



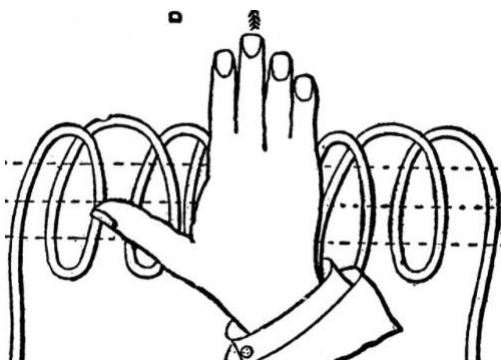
B.



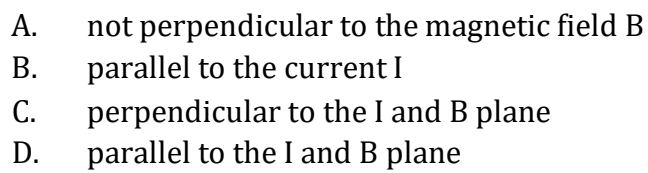
C.



D.



When applying the RHH-1 rule below, the force is _____.



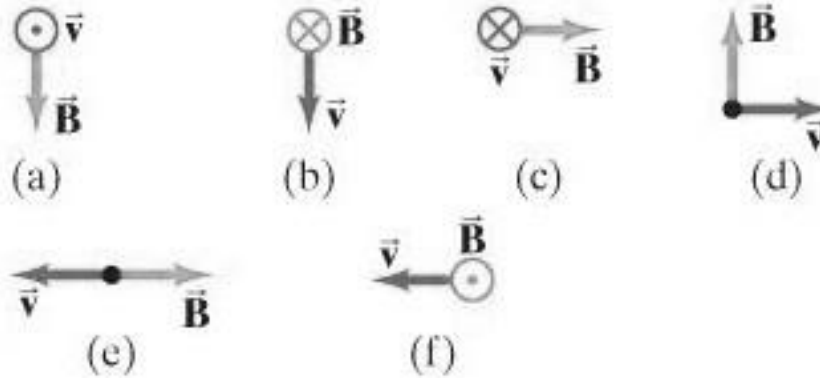
- A magnetic field may exert an attractive or a repulsive force on a metal wire through which a current pass.
- A magnetic field may exert an attractive or a repulsive force on a metal wire in the absence of any current through the wire.

A diagram showing a simple electrical circuit. It consists of a battery (cell), a switch, and a coil of wire. The coil is placed inside a horseshoe magnet, which is oriented so that its magnetic field passes through the coil. The circuit is closed, and the switch is in the 'on' position.

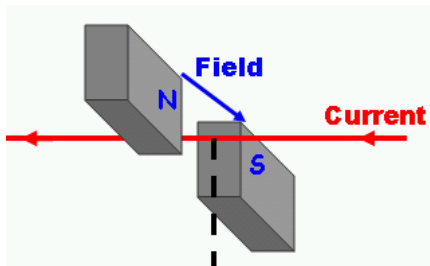
6. A current carrying wire placed in an external magnetic field may experience a magnetic force due to the overlap of the _____ with the external magnetic field.

- A. magnetic field created by the wire
- B. gravitational field created by the wire
- C. magnetic field of the earth
- D. current in the wire

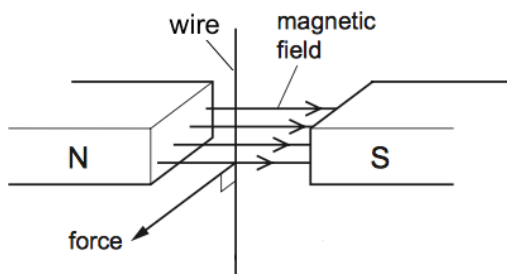
7. In each of the cases below give the direction of the magnetic force on the positive particles moving in a conductor wire, if any. **(DOK2)**



8. Determine the direction of the force.



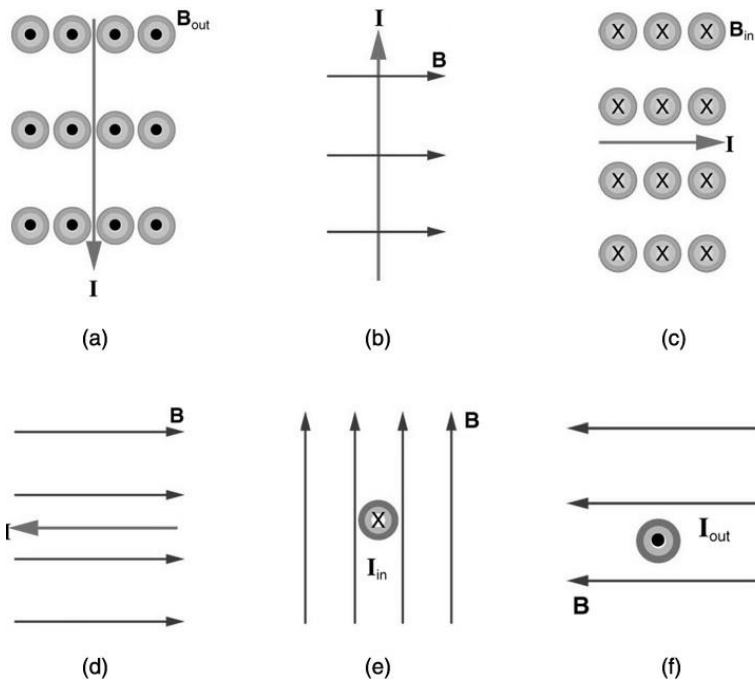
9. The diagram shows the direction of the force experienced by a current carrying vertical wire placed in a magnetic field.



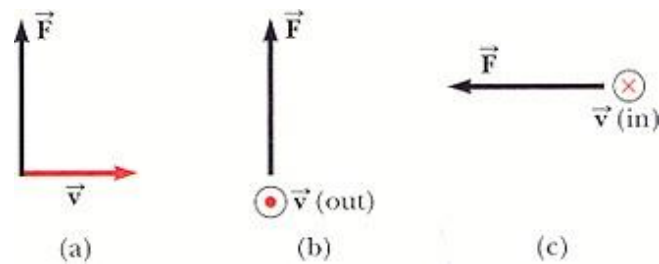
What is the direction of the current in the wire?

- A. Upward
- B. Downward
- C. Into the page
- D. Out of the page

10. Determine the direction of the force in the cases below, where a wire carrying current I is placed in a magnetic field B .



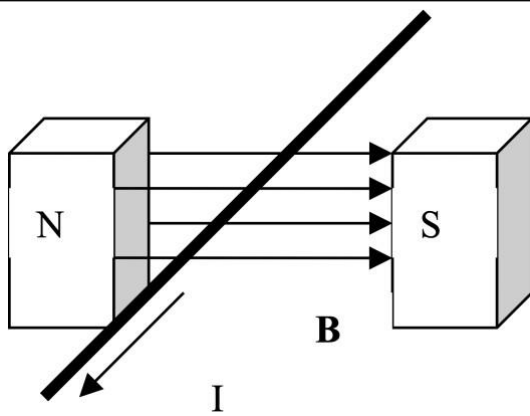
11. In a determine the direction of B on a negative charge, in b and c determine the direction of magnetic field on a positive charge.



12 Choose the correct answer.

What is the direction of the magnetic force acting on the wire shown in the figure?
The current is out of the page and perpendicular to the magnetic field

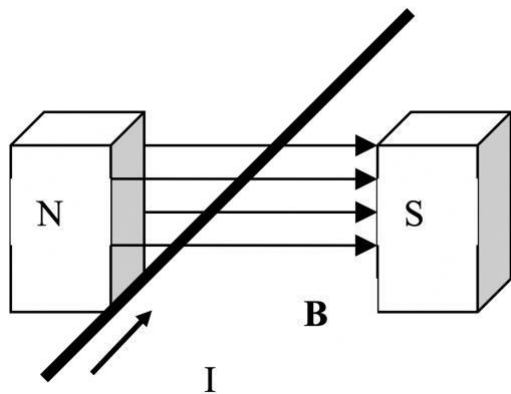
- A. Up
- B. Down
- C. Into the page
- D. Out of the page



13 Choose the correct answer. **(DOK2)**

What is the direction of the magnetic force acting on the wire shown in the figure?
The current is into the page and perpendicular to the magnetic field

- A. Down
- B. Up
- C. Into the page
- D. Out of the page

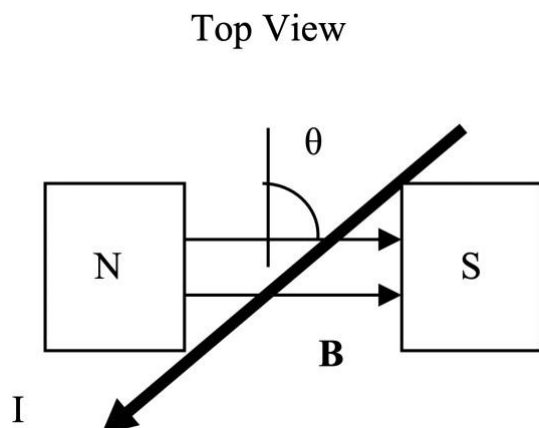


14. Why does a current-carrying wire experience a magnetic force?

15. What two vectors for a current-carrying wire moving through a magnetic field is the magnetic force perpendicular to?

16. Choose the correct answer.

The figure shows the top view for a current carrying wire placed between two poles of a magnet such that a current I passes through the wire in the direction shown. For what angle θ will the magnetic force acting on the wire be maximum?



- A. 0°
- B. 30°
- C. 45°
- D. 90°

17. Complete the below statement.

The magnetic force acting on a current carrying wire will be maximum when_____.

- A. magnetic field is parallel to the wire
- B. magnetic field is perpendicular to the wire
- C. magnetic field makes an angle of 45° with the wire
- D. magnetic field is parallel to the current

18. A wire of length 0.5 m and carrying a current of 10 A , is placed at an angle 30° relative to a 0.68 T magnetic field. Find the force exerted on the wire. **(DOK3)**

19. What is the magnitude of the current needed so that the wire of length 0.98 m is affected by a magnetic force of $1.3 \times 10^{-2}\text{ N}$ when placed at 30° to the magnetic field of strength $B = 4 \times 10^{-2}\text{ T}$?

20. The magnetic force exerted on a 2.15 m length of wire that carries a current of 0.695 A is 0.25 N. Find the magnitude of the magnetic field, given that the wire is perpendicular to the magnetic field.

21. Choose the correct answer.

A wire of length 4.0 m carries a current of 3.9 A and it experiences a magnetic force of 0.15 N. The angle between the wire and the field is 35° . What is magnitude of the magnetic field surrounding the wire?

- A. 1.79 mT
- B. 5.38 mT
- C. 16.8 mT
- D. 62.8 mT

22. A wire with a current of 2.8 A is at an angle 36.0° relative to a magnetic field of 0.88 T. Find the force exerted on a 2.25 m length of the wire.

23. A wire with a current of 5.3 A is at an angle 45° relative to a magnetic field of 0.68 T. What is the force exerted on a 1.5 m length of the wire?

24. Choose the correct answer.

Calculate the magnetic force due to a magnetic field of 780 μT on a wire of length 22.5 m traversed by a current of 55 A. The field makes an angle of 50° with the wire.

- A. 0.62 N
- B. 0.68 N
- C. 0.74 N
- D. 0.97 N

25. Choose the correct answer.

Calculate the magnetic force due to a magnetic field of 560 μT on a wire of length 10 m traversed by a current of 48 A. The field makes an angle of 30° with the wire.

- A. 0.0 N
- B. 0.13 N
- C. 0.23 N
- D. 0.27 N

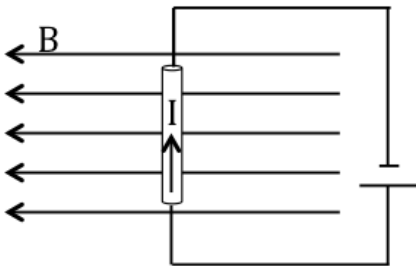
26. The magnetic force exerted on a 1.2 m segment of straight wire is 1.6 N. The wire carries a current of 3.0 A in a region with a constant magnetic field of 0.5 T. What is the angle between the wire and the magnetic field?

27. Choose the correct answer.

A wire of length 3.0 m is placed in a magnetic field of 15 mT. The current through the wire is 2.7 A and it experiences a magnetic force of 0.11 N. What is the angle between the magnetic field and the wire?

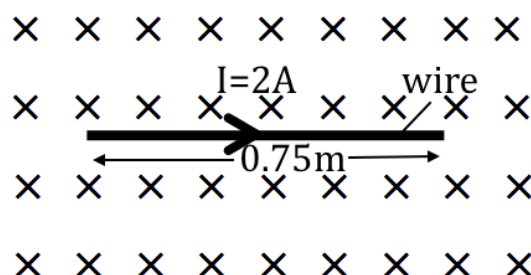
- A. 25°
- B. 42°
- C. 48°
- D. 65°

28. The diagram below shows a current I that passes through a wire, which is free to move and placed in a uniform magnetic field B . Which direction will the wire move?



- A. Upwards
- B. Downwards
- C. Out of the page
- D. To the right

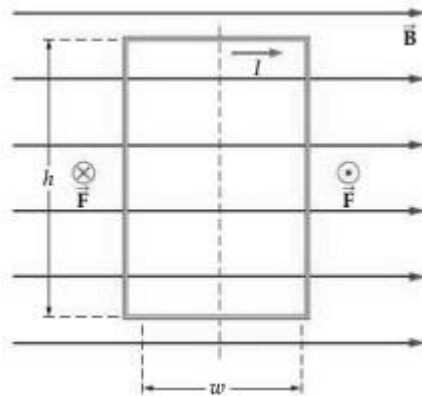
29. A wire 0.75m long is carrying a current of 2.0A and is at right angles to the applied magnetic field as shown below.



a. What is the strength of the field if the force on the wire is 0.9N?

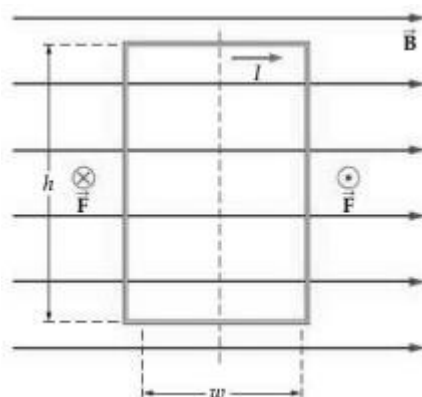
b. The direction of the applied field is changed such that it is now parallel to the current in the wire. Calculate the force on the wire now.

30. A loop is placed in uniform magnetic field as shown below. Which of the following is correct?



- A. The loop rotates around an axis parallel to the magnetic field
- B. The loop rotates around an axis perpendicular to the magnetic field
- C. The loop does not rotate
- D. The loop experiences no force

31. The loop in the figure is placed in a uniform magnetic field B that is parallel to the plane of the loop.



a. Indicate the force experienced by each segment and specify the direction of the force in each segment experiencing a force.

The horizontal segments of the loop:

The vertical segments of the loop:

The direction of the forces:

b. How a current carrying loop like the one shown below cause rotation?

32. Complete the below statement by selecting one of the options from the list **(DOK4)**

In a rotating coil galvanometer, a permanent magnet is used, and it provides_____.

- A. a constant torque
- B. a radial magnetic field
- C. a direct current
- D. electric energy

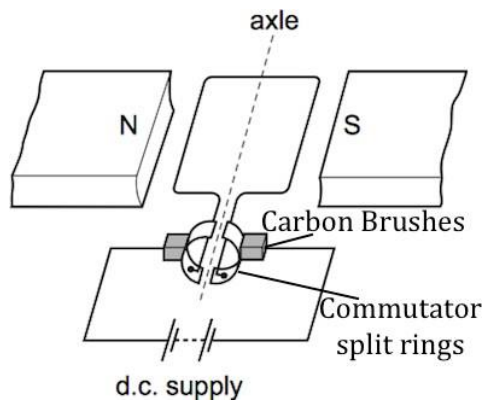
33. Complete the below statement by selecting one of the options from the list

In a rotating coil galvanometer, a moving coil is used, and it is subject to_____.

- A. constant torque
- B. changing torque
- C. uniform magnetic field
- D. zero torque

34. Which of the below describes the action of a split ring commutator?

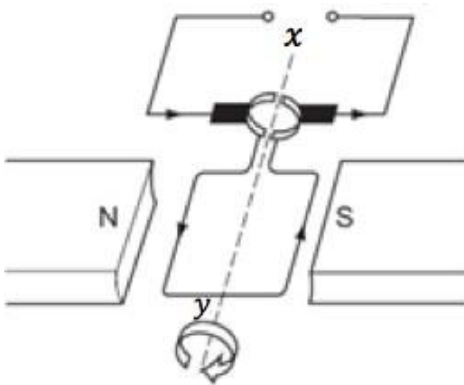
- I. Slides on the carbon brushes.
- II. Reverses the direction of the current in the coil once every turn
- III. Reverses the direction of the current in the coil every half a turn



- A. I only
- B. II only
- C. III only
- D. I and III

35. The diagram shows the coil of an electric motor rotating about the axis.

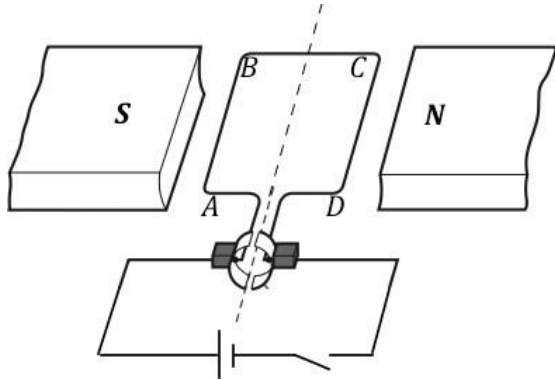
- a. At what position of the coil is the turning effect a maximum?



- b. Explain the function of the commutator in a DC-motor.

36. The diagram below shows an electric motor. The switch is closed and the coil rotates between the poles of a magnet.

- a. Draw two arrows on the diagram to show the direction of force on sides AB and CD on the coil.



- b. In which direction will the coil rotate?
- c. State two ways to make the coil rotate in the opposite direction.
- d. State two ways in which you can make the motor rotate at a faster rate?

37. How is the force exerted on a charged object moving through a magnetic field affected by the angle of the object's velocity relative to the field?

38. What two vectors for a charged object moving through a magnetic field is the magnetic force perpendicular to?

39. What is the connection between moving charges and magnetic fields? What is the connection between magnetic fields and moving charges?

40. What is the value of the magnetic force exerted on an electron moving at a speed of $9.5 \times 10^4 \text{ m/s}$ when it pass at $\theta = 30^\circ$ to a magnetic field of strength 0.35 T ?

41. An electron moves at right angles to a magnetic field of 0.12 T . What is the force exerted on the electron if its speed is $2.8 \times 10^4 \text{ m/s}$?

42. Choose the correct answer.

A point particle carries an electric charge of 13 nC and travels with a speed of $1.2 \times 10^3 \text{ m/s}$. The particle enters a magnetic field of $12 \times 10^{-3} \text{ T}$ at an angle of 60° with the field. What is the magnitude of the magnetic force exerted by the field on the particle?

- A. $1.6 \times 10^{-7} \text{ N}$
- B. $1.3 \times 10^{-7} \text{ N}$
- C. $1.9 \times 10^{-7} \text{ N}$
- D. $9.4 \times 10^{-8} \text{ N}$

43. Choose the correct answer.

A point particle carries an electric charge of 56.0 mC and travels with a speed of $1.20 \times 10^3 \text{ m/s}$. The particle enters a magnetic field of $7.20 \times 10^{-3} \text{ T}$ at an angle of 60° with the field. What is the magnitude of the magnetic force exerted by the field on the particle?

- A. 0.524 N
- B. 0.605 N
- C. 0.728 N
- D. 0.802 N

44. What is the magnetic field strength when a force of magnitude $2.72 \times 10^{-14} \text{ N}$ is exerted on an electron at speed $2.5 \times 10^5 \text{ m/s}$ when it passes at an angle $\theta = 90^\circ$ with respect to the field?

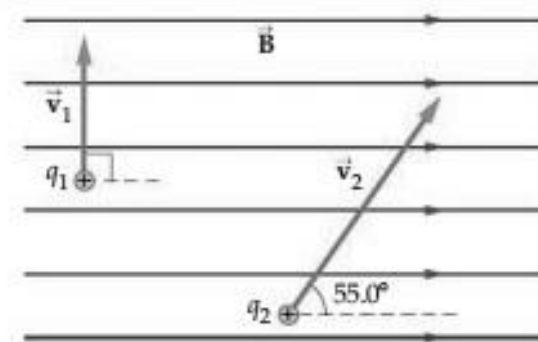
45. A charged particle of charge $300\ \mu\text{C}$ enters a magnetic field at an angle of 27° and experiences a magnetic force $0.16\ \text{N}$. The speed of the particle is $2800\ \text{m/s}$. What is the magnitude of the magnetic field B ?

- A. $0.42\ \text{T}$
- B. $0.27\ \text{T}$
- C. $0.20\ \text{T}$
- D. $0.19\ \text{T}$

46. A charged particle of charge $300\ \text{mC}$ enters a magnetic field at an angle of 37° and experiences a magnetic force $1.6\ \text{N}$. The magnitude of the magnetic field B is $6.6 \times 10^{-3}\ \text{T}$. What is the speed of the particle?

- A. $6.0 \times 10^1\ \text{m/s}$
- B. $1.3 \times 10^3\ \text{m/s}$
- C. $1.8 \times 10^3\ \text{m/s}$
- D. $2.2 \times 10^3\ \text{m/s}$

47. Use the diagram below for the questions **a** and **b** about the force on a charged particle. The charges below experience the same force of magnitude $F = 4.25 \times 10^{-3}\ \text{N}$.



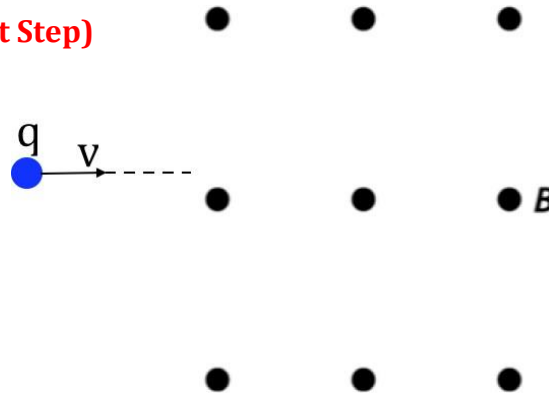
a. Consider an object with charge $q_1 = 3.60 \times 10^{-6}\ \text{C}$ and a speed $v = 862\ \text{m/s}$, travels at right angles to a uniform magnetic field. Find the strength (magnitude) of the magnetic field.

b. Consider an object with charge $q_2 = 5.30 \times 10^{-7}\ \text{C}$ and a speed $v = 1.30 \times 10^3\ \text{m/s}$, moves at an angle of 55° relative to the uniform magnetic field in (a). Find the (magnitude) of the magnetic force.

48. An electron moves at right angles to a magnetic field of 0.12 T. What is its speed if the force exerted on it is $8.9 \times 10^{-15} \text{ N}$?

49. A $0.32 \times 10^{-6} \text{ C}$ object moves with a speed of 16 m/s through a region where a magnetic field has a strength of 0.95 T. At what angle to the field is the object moving if the magnetic force exerted on it is $4.8 \times 10^{-6} \text{ N}$?

50. A charge of $q = -6.4 \times 10^{-19} \text{ C}$ enters a magnetic field of strength $2.6 \times 10^{-2} \text{ T}$, pointing out of the page as shown below. **(Next Step)**



- What is the direction of the force as the charge enters perpendicular to the magnetic field as shown above?
- On the diagram, sketch the path of the charge q as it move through the field.
- If the charge moves with a velocity of $1.9 \times 10^6 \text{ m/s}$, find the magnitude of the force on the charge.