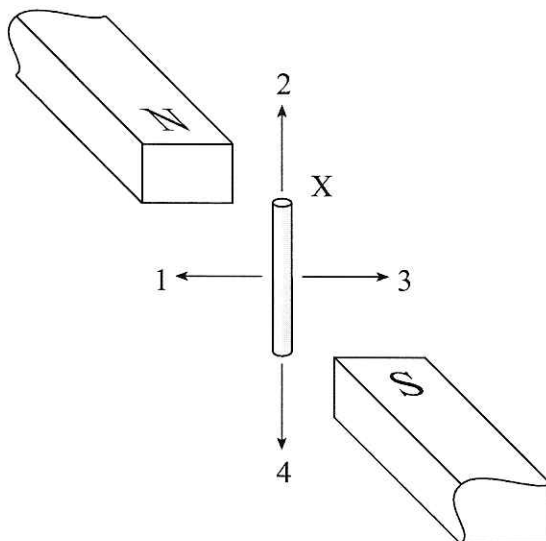


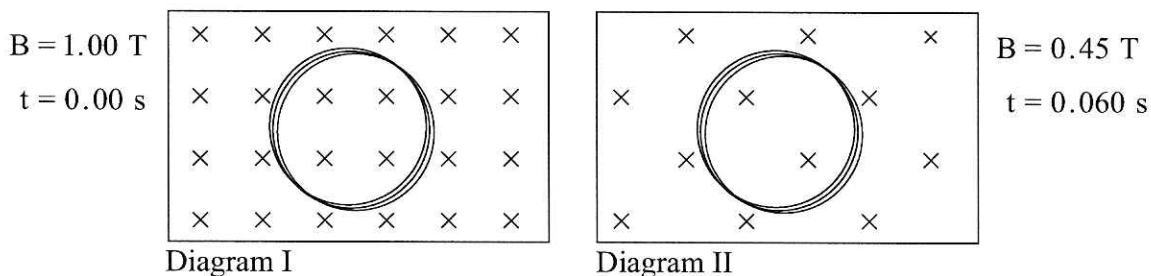
27. A conductor is initially at rest in a magnetic field.



In which direction should the conductor be moved so that the end nearest X becomes positive?

- A. 1
- B. 2
- C. 3
- D. 4

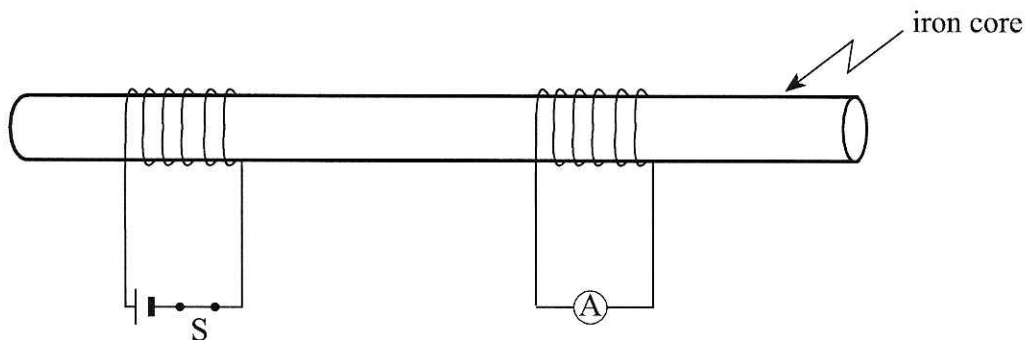
28. A coil of 150 turns and an area of $2.0 \times 10^{-4} \text{ m}^2$ is placed in a 1.00 T magnetic field as shown in Diagram I.



If this field changes to 0.45 T in 0.060 s, what is the average emf induced in the coil and in what direction does the induced current flow?

	INDUCED EMF (V)	CURRENT DIRECTION
A.	0.28	Clockwise
B.	0.28	Counterclockwise
C.	0.36	Clockwise
D.	0.36	Counterclockwise

29. In the following diagram, ammeter A shows a current



- A. while switch S remains closed.
 - B. while switch S remains opened.
 - C. only while switch S is being closed.
 - D. while switch S is being opened or being closed.
30. A transformer connected to a 120 V ac source has an output of 24 V ac. If the primary coil has 330 turns, how many turns of wire are there in the secondary coil?
- A. 24 turns
 - B. 66 turns
 - C. 330 turns
 - D. 1650 turns
31. A 1700 turn coil of radius 0.25 m, is located in a 0.085 T magnetic field. If the maximum torque on the coil is 250 N·m, what current is in this coil?
- A. 0.11 A
 - B. 6.9 A
 - C. 8.8 A
 - D. 28 A
32. A dc motor is connected to a constant voltage supply. The load on the motor decreases, allowing the motor to rotate faster. How do the back emf and current through the motor change?

	BACK EMF	CURRENT
A.	decreases	decreases
B.	decreases	increases
C.	increases	decreases
D.	increases	increases

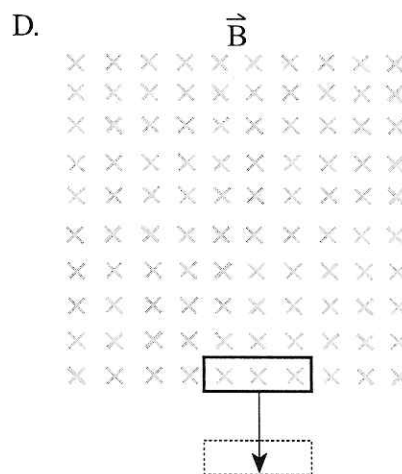
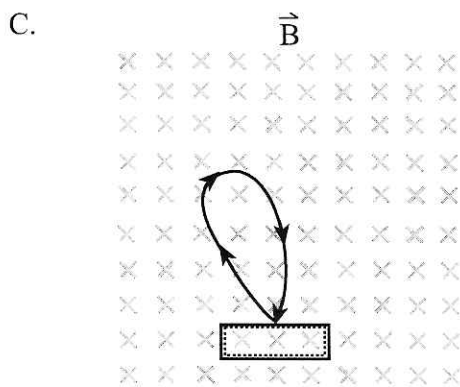
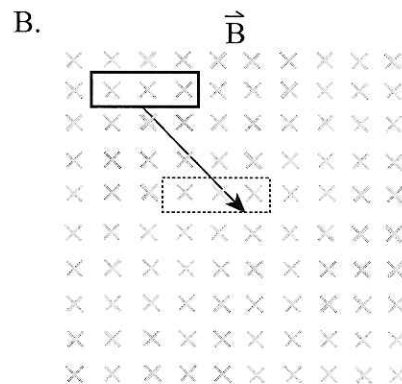
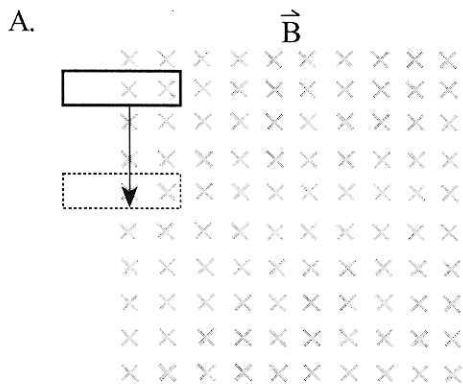
33. A 2.5 m wire moves 77 m/s perpendicular to a uniform 3.8×10^{-6} T magnetic field. What potential difference is induced across the ends of this wire?

- A. 0 V
- B. 1.6×10^{-19} V
- C. 2.0×10^{-8} V
- D. 7.3×10^{-4} V

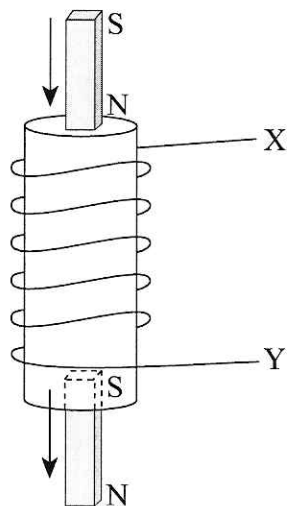
34. A transformer has four times as many turns on the secondary as on the primary. If the primary voltage is 120 V ac, which of the following describes the transformer?

	SECONDARY VOLTAGE	TYPE
A.	30 V ac	step down
B.	30 V ac	step up
C.	480 V ac	step down
D.	480 V ac	step up

35. In which of the following situations would an induced emf be produced in a rectangular loop of wire? The loop of wire is moved as indicated.



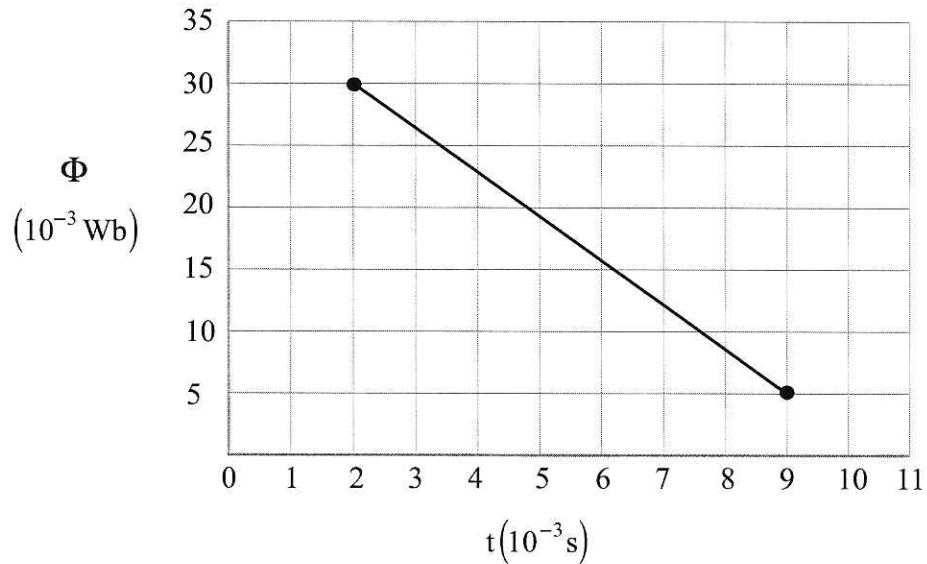
36. A 75-turn square coil of wire, 0.12 m on a side, is in a 4.5×10^{-2} T magnetic field. The field is perpendicular to the coil. If the coil of wire is removed from the field in 0.10 s, what average emf is induced in the coil?
- A. 6.5×10^{-3} V
 B. 1.2×10^{-1} V
 C. 2.4×10^{-1} V
 D. 4.9×10^{-1} V
37. A bar magnet is dropped through a solenoid, as shown.



What is the direction of the induced current in the solenoid as the magnet enters the top (i) and as the magnet leaves the bottom (ii)?

	(i) ENTERS TOP	(ii) LEAVES BOTTOM
A.	From X to Y	From X to Y
B.	From X to Y	From Y to X
C.	From Y to X	From Y to X
D.	From Y to X	From X to Y

38. The graph below shows how the magnetic flux through a single loop changes with respect to time.



What is the average emf induced between $t = 2.0 \times 10^{-3}$ s and $t = 9.0 \times 10^{-3}$ s?

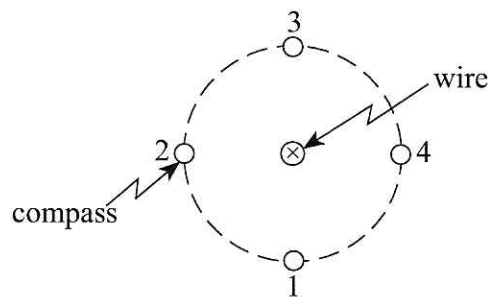
- A. 1.2×10^{-4} V
 - B. 1.8 V
 - C. 3.6 V
 - D. 25 V
39. A dc motor has an armature resistance of 3.0Ω . When connected to a 24 V source the motor draws 1.4 A at maximum speed. What is the back emf produced by the motor at maximum speed?
- A. 4.2 V
 - B. 20 V
 - C. 24 V
 - D. 28 V
40. A soldering iron transformer has 200 primary turns and 5 secondary turns. The primary draws 0.80 A at 120 V. Which of the following gives the secondary current and secondary voltage?

	SECONDARY CURRENT	SECONDARY VOLTAGE
A.	0.020 A	4 800 V
B.	0.80 A	120 V
C.	4.0 A	24 V
D.	32 A	3.0 V

41. An emf is induced in a coil if the magnetic flux through the coil is
- zero.
 - changing.
 - constant and large.
 - constant and small.
42. A coil of wire contains 55 loops. The coil is rotated such that the flux changes from 2.0×10^{-4} Wb to 8.0×10^{-4} Wb in 1.5×10^{-2} s. What is the average induced emf?
- 1.1 V
 - 1.8 V
 - 2.2 V
 - 3.7 V
43. A door bell transformer has 900 primary windings and 60 secondary windings. The secondary current is 0.30 A. What is the primary current and what is the type of transformer?

	PRIMARY CURRENT (A)	TRANSFORMER TYPE
A.	0.020	Step-Up
B.	0.020	Step-Down
C.	4.5	Step-Up
D.	4.5	Step-Down

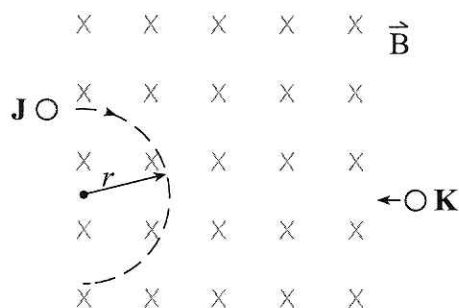
44. The magnetic field around a current-carrying wire is investigated with a compass.



At which of the four positions shown in the diagram will the compass needle point towards the bottom of the page?

- 1
- 2
- 3
- 4

45. Charged particles J and K enter a magnetic field as show in the diagram below.



Particle J travels in a circular path of radius r . Particle K has twice the charge and half the momentum of particle J. How does the radius of particle K's path compare to that of particle J?

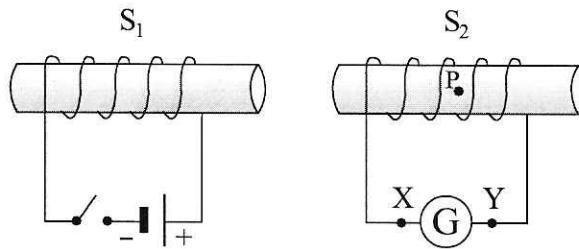
- A. $\frac{1}{4}r$
- B. r
- C. $2r$
- D. $4r$
46. A transformer is used to reduce the house supply (120 V ac) to operate a small toy that requires 9.0 V ac at 0.240 A. Which of the following gives the primary current and possible values for primary and secondary windings?

	PRIMARY CURRENT	PRIMARY WINDINGS	SECONDARY WINDINGS
A.	0.018 A	720	54
B.	0.018 A	54	720
C.	3.2 A	720	54
D.	3.2 A	54	720

47. The flux through a 240 turn coil changes by 4.0×10^{-2} Wb in 0.20 s. What is the magnitude of the average emf induced in the coil during this time?

- A. 1.9 V
- B. 9.6 V
- C. 24 V
- D. 48 V

48. Two solenoids S_1 and S_2 are placed close together as shown in the diagram below.



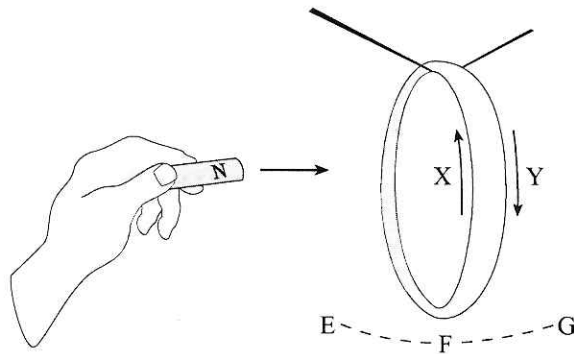
Immediately after the switch is closed, what is the direction of current flow through galvanometer G and what is the direction of the magnetic field produced by this current at position P inside solenoid S_2 ?

	DIRECTION OF CURRENT THROUGH THE GALVANOMETER	DIRECTION OF MAGNETIC FIELD AT P
A.	From X to Y	Left
B.	From X to Y	Right
C.	From Y to X	Left
D.	From Y to X	Right

49. A compass placed on a table points north. In which direction should a conductor, placed directly above the compass, carry current in order to reverse the direction of the compass needle?

- A. east to west
- B. west to east
- C. north to south
- D. south to north

50. A magnet is moved towards an aluminum ring suspended on string as shown.



Determine the direction in which current will flow in the ring and the direction in which the ring will move.

	DIRECTION OF CURRENT IN RING	DIRECTION RING WILL MOVE
A.	X	from F towards G
B.	X	from F towards E
C.	Y	from F towards G
D.	Y	from F towards E

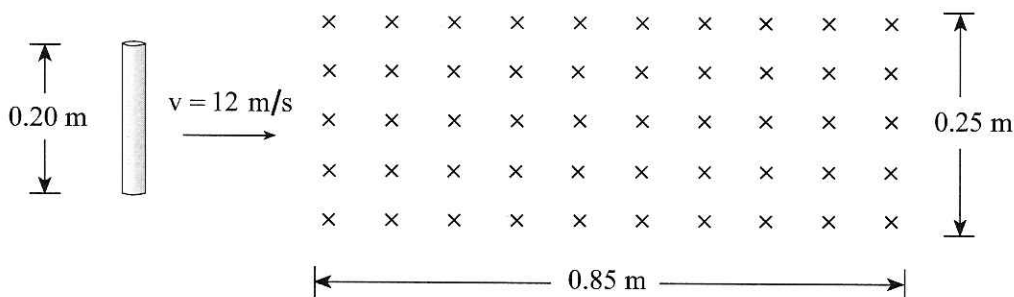
51. In a step-up transformer, how do the primary and secondary voltages, and the primary and secondary currents, compare to one another?

- A. $V_s > V_p$ and $I_s > I_p$
- B. $V_s > V_p$ and $I_s < I_p$
- C. $V_s < V_p$ and $I_s > I_p$
- D. $V_s < V_p$ and $I_s < I_p$

52. As an aircraft flies horizontally over the North Pole, a 0.80 V potential difference is induced across the wings. If the aircraft now slows to one half of the original speed, what will the new potential difference be?

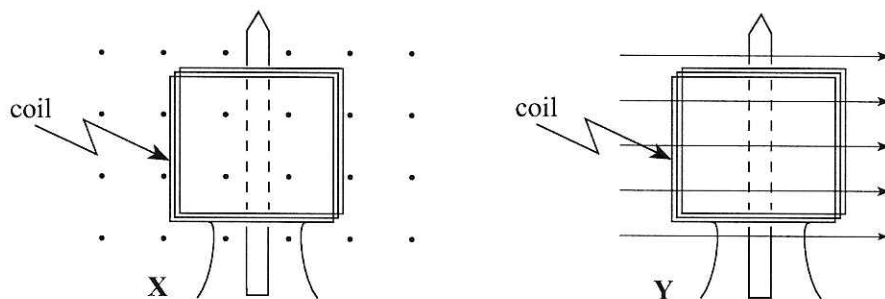
- A. 0.40 V
- B. 0.57 V
- C. 0.80 V
- D. 1.6 V

53. A 0.20 m conductor moves at 12 m/s through the 0.60 T field shown below. Calculate the emf induced in the conductor while passing through the field.



- A. 0 V
 B. 0.13 V
 C. 1.4 V
 D. 1.8 V

54. A coil has 680 turns of wire, a current of 5.6 A, and an area of $2.1 \times 10^{-2} \text{ m}^2$. This coil is placed in a 0.22 T magnetic field in either field-coil orientation X or Y.



Which field-coil orientation would produce a maximum torque, and what is the magnitude of this torque?

	ORIENTATION	TORQUE
A.	X	69 N · m
B.	X	18 N · m
C.	Y	69 N · m
D.	Y	18 N · m