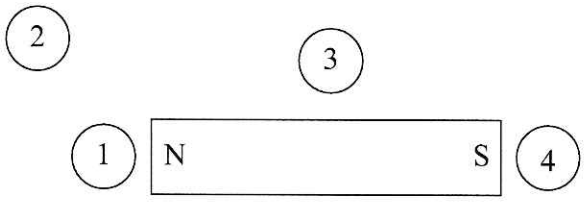
ELECTROMAGNETISM

PROVINCIAL EXAM ASSIGNMENT

Magnetism:	**MC:** 1-6, 8, 10, 12, 13, 16-18, 21, 22, 24-26, 31, 33, 44, 45, 49, 55, 58, 69 **WR:** 1, 2, 3a, 4-8
Induced emf:	**MC:** 6, 7, 11, 14, 15, 19, 20, 23, 27, 28-30, 32, 34-43, 46, 47, 48, 50-53, 56, 57 **WR:** 3b, 6, 9
Note:	**Omit MC:** 9, 54

1. A compass is placed in each of the four locations around a permanent bar magnet as shown below.



In which location would the North pole of the compass needle point to the right side of the page?

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

2. A particle with a charge of 3.2×10^{-19} C is moving at 1.2×10^{6} m/s. This particle enters a 0.25 T magnetic field at right angles and travels in a circular path of 0.80 m radius. What is the mass of this particle?

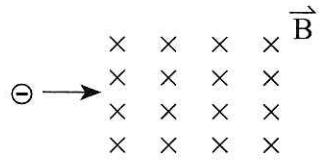
A. 6.7×10^{-27} kg
B. 5.3×10^{-26} kg
C. 6.4×10^{-20} kg
D. 7.7×10^{-14} kg

3. A charge X is placed in an electric field and a second charge Y is placed in a magnetic field. If both charges are initially held at rest, which one of the following **best** describes the motion of the charges after they are released? (Ignore gravitational effects.)

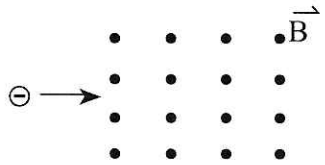
A. Charge X accelerates.
B. Charge Y accelerates.
C. Both charge X and charge Y accelerate.
D. Neither charge X nor charge Y accelerates.

4. In which diagram below would the electron experience no magnetic force upon entering the field?

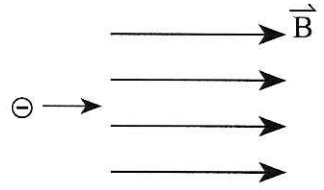
A.



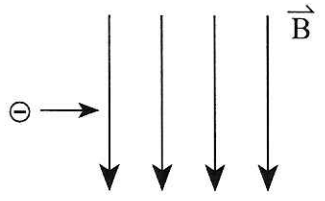
B.



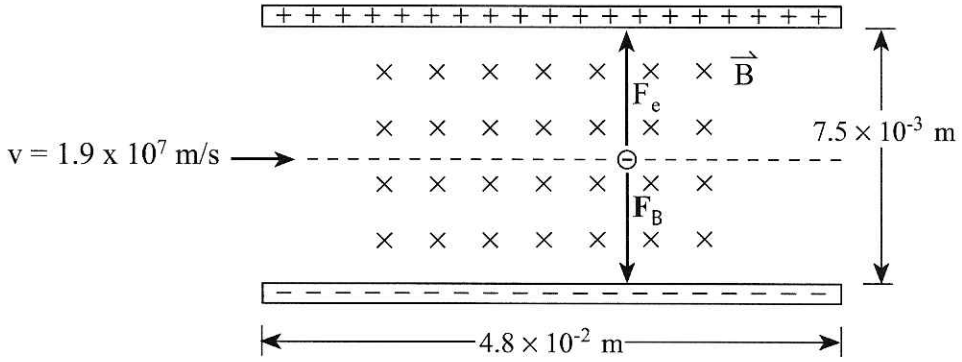
C.



D.



5. In the situation below, an electron is moving at 1.9×10^7 m/s through crossed electric and magnetic fields. When the electric force is equal to the magnetic force, as shown, the electron will travel in a straight line.



If the magnetic field strength is 5.2×10^{-3} T, what must be the potential difference between the plates for the electron to continue in a straight line?

A. 1.9×10^{-7} V
B. 3.9×10^{-5} V
C. 7.4×10^{2} V
D. 4.7×10^{3} V

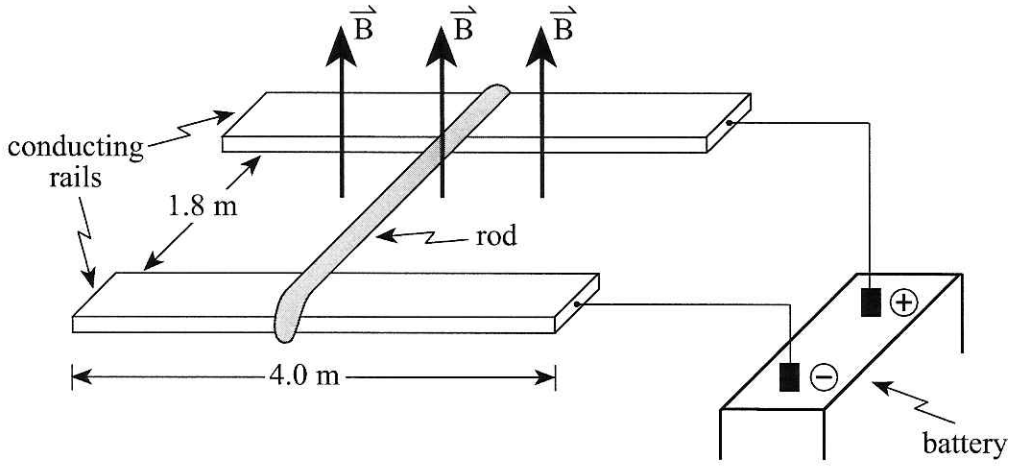
6. A square coil is perpendicular to a uniform magnetic field. Which one of the following would increase the magnetic flux through the coil?

A. Decreasing the area of the coil.
B. Increasing the number of loops in the coil.
C. Removing the coil from the magnetic field.
D. Increasing the strength of the magnetic field.

7. Which one of the following best describes a step-up transformer? [primary circuit: p; secondarycircuit: s]

	VOLTAGE	CURRENT
A.	$V_p > V_s$	$I_p > I_s$
B.	$V_p > V_s$	$I_p < I_s$
C.	$V_p < V_s$	$I_p > I_s$
D.	$V_p < V_s$	$I_p < I_s$

8. A metal rod is resting on top of two 4.0 m long conducting rails that are separated by 1.8 m. The force of friction between the rod and the rails is 1.2 N. A magnetic field of 5.2×10^{-2} T is directed upwards, as shown in the diagram below.



How much current must be sent through the rod before the rod begins to move and in what direction will the rod move?

	CURRENT	DIRECTION ROD WILL MOVE
A.	5.8 A	Towards the battery
B.	5.8 A	Away from the battery
C.	13 A	Towards the battery
D.	13 A	Away from the battery

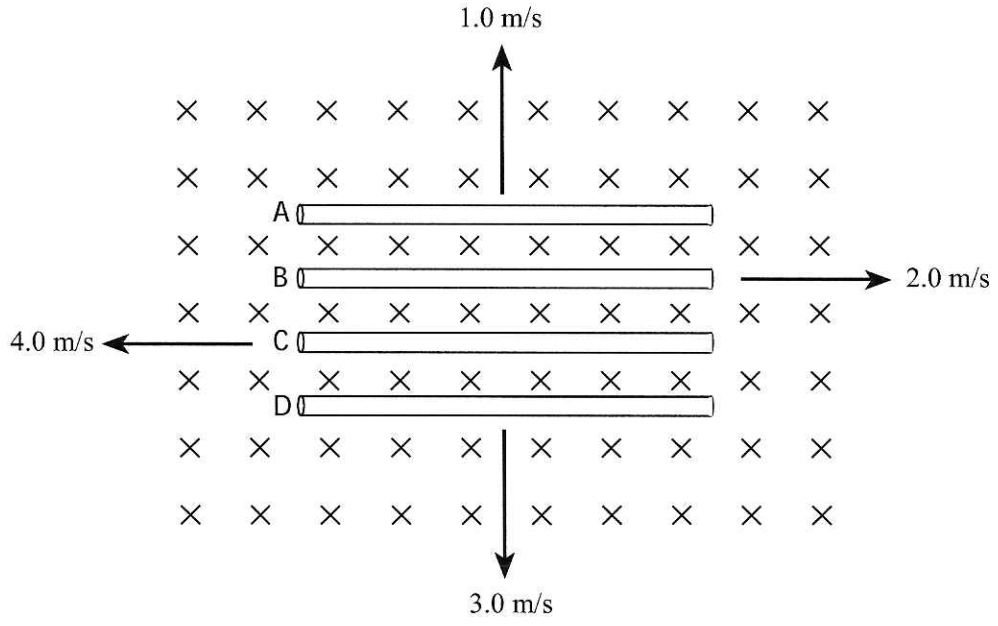
9. Four identical pieces of wire are bent to form four different coils, each containing a different number of loops. Each coil carries 5.0 A of current and is placed in the same magnetic field of 0.2 T. Which of the four coils would experience the greatest maximum torque?

	NUMBER OF LOOPS	AREA OF COIL (m^2)
A.	1	0.18
B.	2	0.045
C.	3	0.020
D.	4	0.011

10. A 0.10 m long solenoid, 3.0×10^{-2} m in diameter, has a total of 550 turns of wire. To produce a 1.2×10^{-2} T magnetic field at the centre of the solenoid, how much current must flow through thewire?

A. 0.26 A
B. 1.7 A
C. 9.5×10^{2} A
D. 1.4×10^{3} A

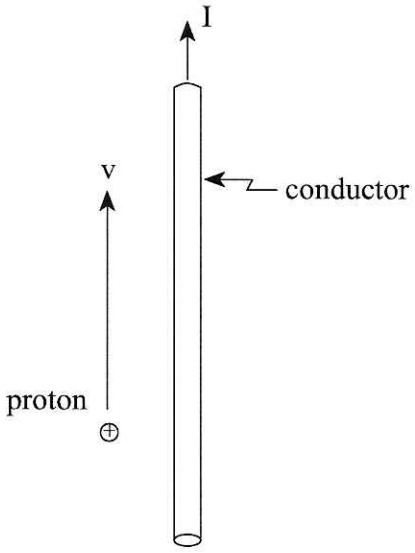
11. Four conductors of equal length are each moved through a uniform magnetic field in different directions and with different speeds, as shown.



While the four conductors are being moved through the field, in which conductor will the largest potential difference be induced?

A. Conductor A
B. Conductor B
C. Conductor C
D. Conductor D

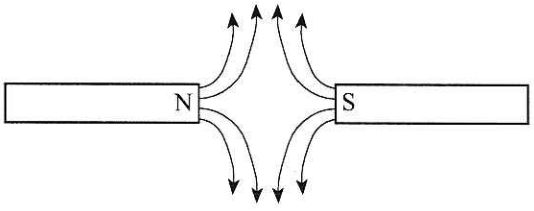
12. A proton moving parallel to a current-carrying wire will experience a force in what direction? (The proton and the wire are both in the plane of the page.)



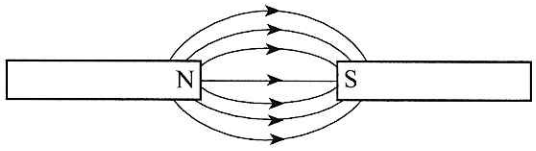
A. into the page
B. out of the page
C. toward the conductor (to the right)
D. away from the conductor (to the left)

13. Which of the following correctly shows the magnetic field between two opposite, magnetic poles?

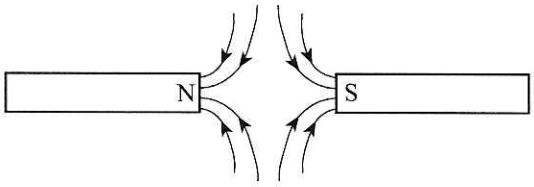
A.



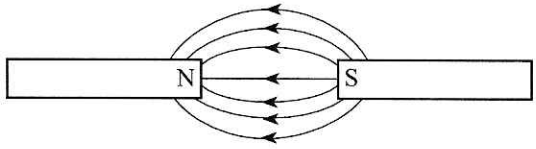
B.



C.



D.



14. Which of the following is a statement of Lenz's law?

A. The number of magnetic lines perpendicular to the surface area enclosed by a circuit is equal to the flux.

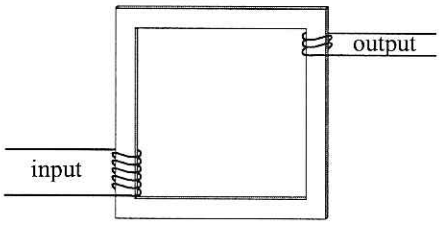
B. An induced current in a closed conducting loop will appear in such a direction that it opposes the change that created it.

C. An emf is produced between the ends of a straight wire when the wire is moving perpendicularly through a uniform magnetic field.

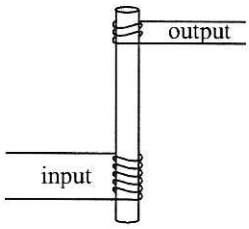
D. The average emf induced in a circuit is proportional to the rate of change of the magnetic flux through that circuit.

15. Which of the following is a step-up transformer?

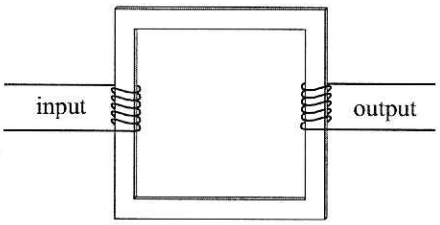
A.



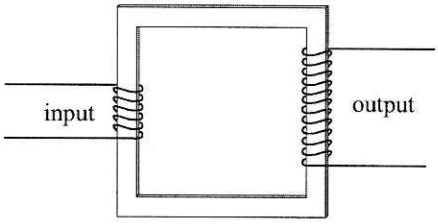
B.



C.



D.

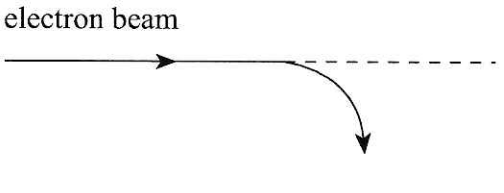


16. A solenoid of diameter 0.018 m is 0.30 m long. A current of 5.3 A is used to create a magnetic field of 0.25 T at the centre of the solenoid. How many turns of wire does this solenoid have?

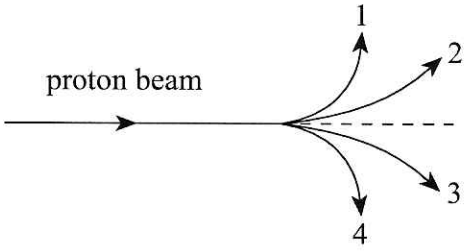
A. 6.8×10^2
B. 2.1×10^3
C. 1.1×10^4
D. 3.8×10^4

17. A beam of electrons is directed into a uniform magnetic field and deflects as shown in Figure I. If a beam of protons with the same speed were to enter this same magnetic field, which of the paths shown in Figure II would the protons take?

Figur e I

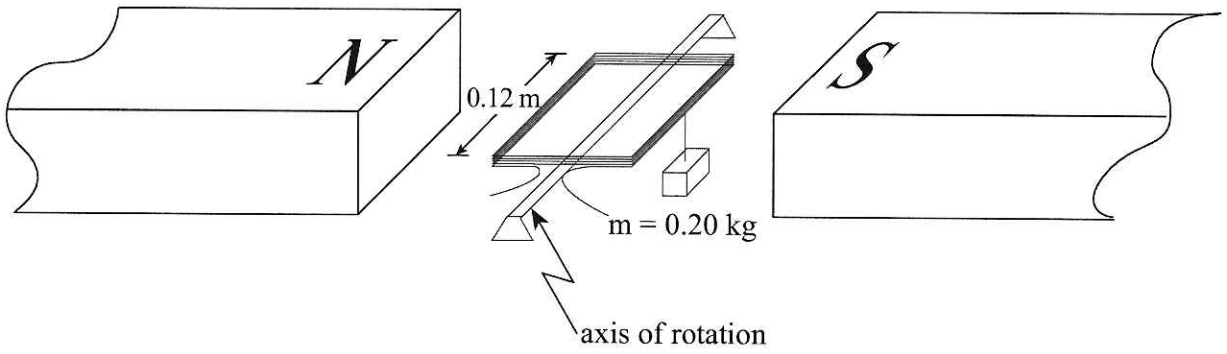


Figur e II



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

18. A 35 loop square coil 0.12 m on a side is positioned in a 0.050 T magnetic field. A 0.20 kg mass is suspended from one side of the coil as shown in the diagram below.



How much current must pass through the coil in order for the coil to remain horizontal?

A. 2.3 A
B. 4.7 A
C. 9.3 A
D. 330 A

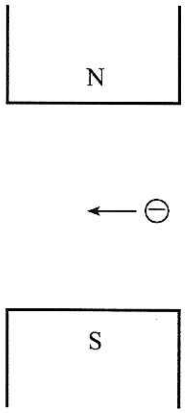
19. For what type of input current will the output current in a transformer be zero?

A. dc
B. ac
C. increasing dc
D. decreasing dc

20. A motor designed to operate on 120 V draws a current of 33 A when it first starts up. At its normal operating speed, the motor draws a current of 2.7 A. What is the back emf at normal operating speed?

A. 9.8 V
B. 110 V
C. 120 V
D. 130 V

21. The diagram below shows an electron travelling to the left in a magnetic field.



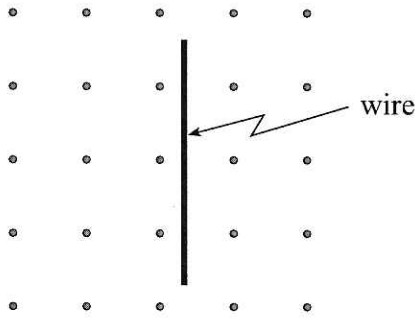
In which direction will the electron be deflected?

A. into the page
B. out of the page
C. towards the north pole
D. towards the south pole

22. A doubly-ionized atom $(Q = 2e)$ with a mass of 6.8×10^{-27} kg enters a 3.0 T magnetic field with a speed of 5.0×10^{7} m/s. What is the radius of the circular path of the atom?

A. 0.35 m
B. 0.71 m
C. 1.4 m
D. 2.8 m

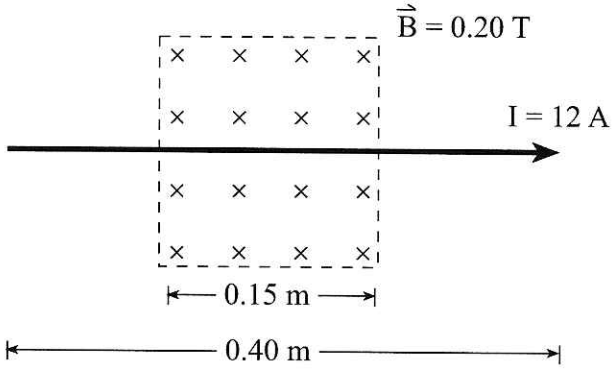
23. A wire is in a magnetic field as shown.



In which direction could the wire be moved to induce an emf across the length of the wire?

A. to the left
B. up the page
C. into the page
D. down the page

24. A long conductor is placed in a 0.20 T magnetic field as shown in the diagram below.



What are the magnitude and direction of the magnetic force on the conductor when it carries a current of 12 A?

	MAGNITUDE OF THE MAGNETIC FORCE	DIRECTION OF THE MAGNETIC FORCE
A.	0.36 N	Up the page
B.	0.36 N	Down the page
C.	0.96 N	Up the page
D.	0.96 N	Down the page

25. A 150 turn coil has an area of $2.4 \times 10^{-4} m^2$. What magnetic field strength will produce a maximum torque of $2.2 \times 10^{-3} N \times m$ on the coil when a 0.20 A current flows through it?

A. $1.6 \times 10^{-5} T$
B. 0.13 T
C. 0.31 T
D. 3.3 T

26. What is the radius of curvature of the path of a proton travelling at 4.7×10^{5} m/s in a plane perpendicular to a 0.52 T magnetic field?

A. $2.0 \times 10^{-8} m$
B. $5.1 \times 10^{-6} m$
C. $9.4 \times 10^{-3} m$
D. $1.1 \times 10^{2} m$