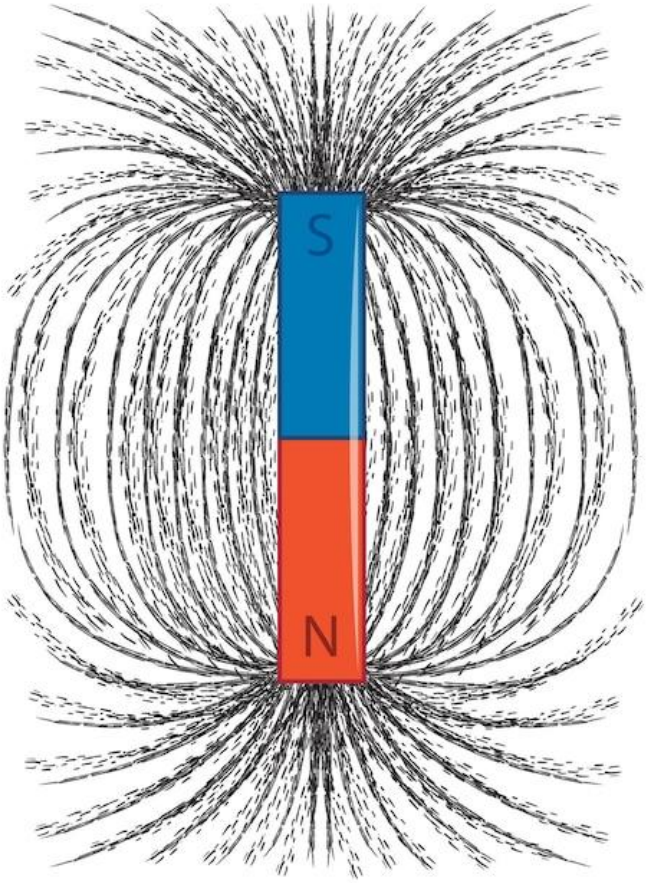



# UNIT 7 – MAGNETISM

# REVIEW PACKAGE

Physics 12 – Provincial Package Review

## OVERVIEW

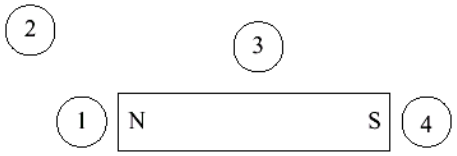
The following review packages are located as follows:

- **Package A:** Pages 1-9 (Key A Page 9)

Mr. Harris
Physics 12

# Provincial Package A for Unit 7

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 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.

3. An electron moves in a circular orbit of radius r in a magnetic field. The electron moves in a path perpendicular to the magnetic field. If the kinetic energy of the electron is doubled, what is the new radius of its path?

A. $\frac{1}{2}$ r

B. $\sqrt{2}$ r

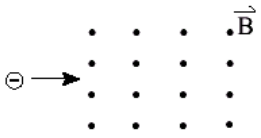
C. 2 r

D. 4 r

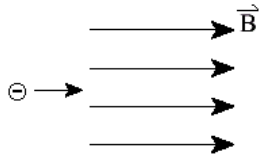
4. In which diagram below would the electron experience **no** magnetic force upon entering the field?

A.

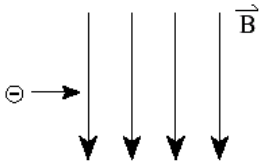

B.




C.



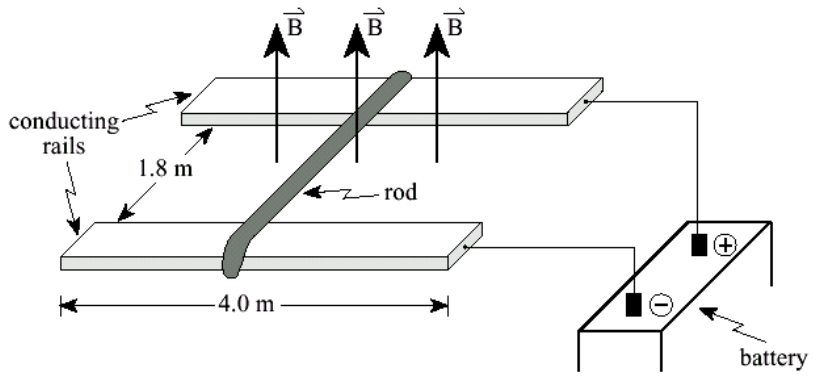

D.




5. A 0.10 m long solenoid, $3.0\times10^{-2}$ m in diameter, has a total of 550 turns of wire. To produce a $1.2\times10^{-2}$ 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. $9.5\times10^{2}$ A
D. $1.4\times10^{3}$ A

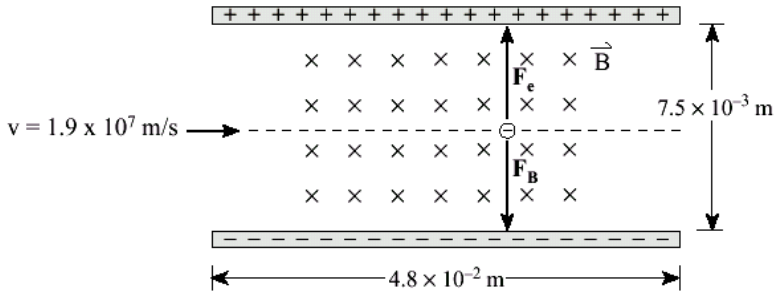
6. A metal rod is resting on top of two 4.0 m long conducting rails that are separated by 1.8 m. The force of friction between the rod and the rails is 1.2 N. A magnetic field of $5.2\times10^{-2}$ T is directed upwards, as shown in the diagram below.




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 |

7. In the situation below, an electron is moving at $1.9\times10^{7}$ 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 $5.2\times10^{-3}$ T, what must be the potential difference between the plates for the electron to continue in a straight line?

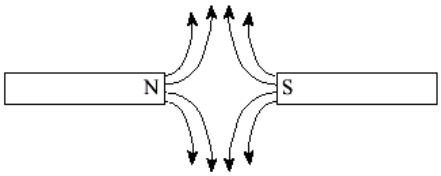
A. $1.9\times10^{-7}$ V
B. $3.9\times10^{-5}$ V
C. $7.4\times10^{2}$ V
D. $4.7\times10^{3}$ V

8. A particle with a charge of $3.2\times10^{-19}$ C is moving at $1.2\times10^{6}$ 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?

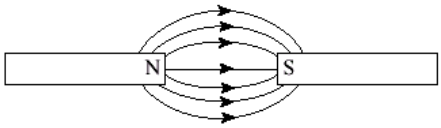
A. $6.7\times10^{-27}$ kg
B. $5.3\times10^{-26}$ kg
C. $6.4\times10^{-20}$ kg
D. $7.7\times10^{-14}$ kg

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

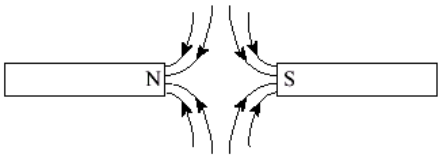
A.



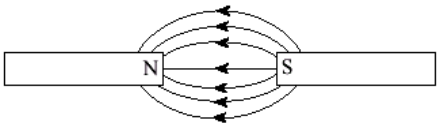

B.



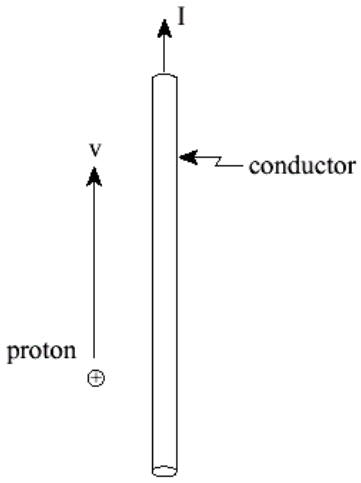

C.




D.




10. 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)

11. What is the radius of curvature of the path of a proton travelling at $4.7\times10^{5}$ m/s in a plane perpendicular to a 0.52 T magnetic field?

A. $2.0\times10^{-8}$ m
B. $5.1\times10^{-6}$ m
C. $9.4\times10^{-3}$ m
D. $1.1\times10^{2}$ m

12. 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. $6.8\times10^{2}$
B. $2.1\times10^{3}$
C. $1.1\times10^{4}$
D. $3.8\times10^{4}$

13. Four compasses are placed around a conductor carrying a current into the page, as shown below. Which compass correctly shows the direction of the magnetic field due to the current?

A.

B.

C.

D.

14. 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?

**Figure I**

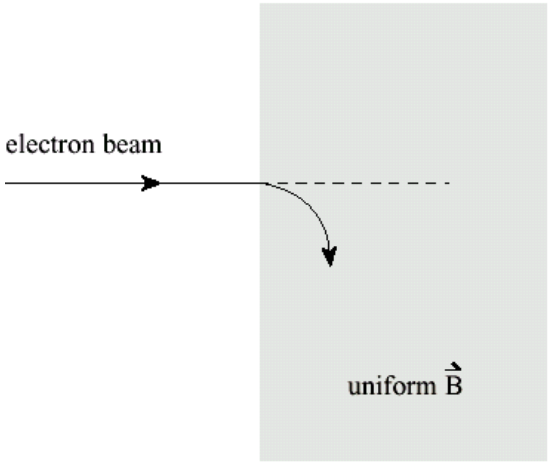
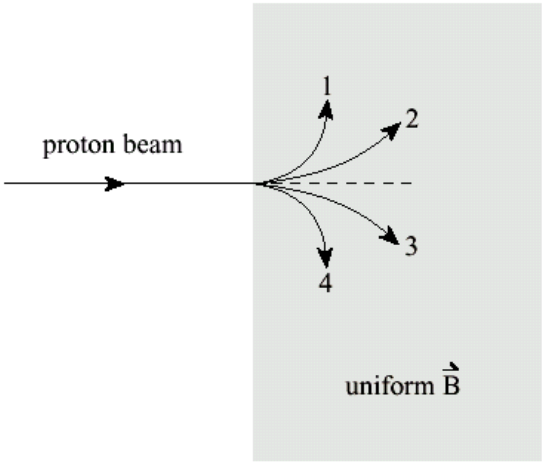



**Figure II**

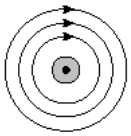


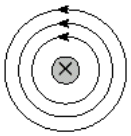

A. 1
B. 2
C. 3
D. 4

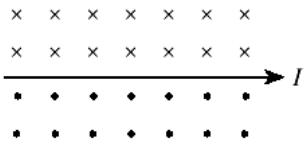
15. A doubly-ionized atom $(Q = 2e)$ with a mass of $6.8 \times 10^{-27}$ kg enters a 3.0 T magnetic field with a speed of $5.0 \times 10^{7}$ m/s. What is the radius of the circular path of the atom?

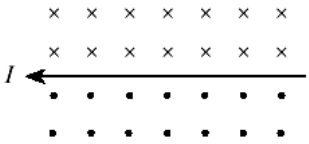
A. 0.35 m
B. 0.71 m
C. 1.4 m
D. 2.8 m

16. Which of the following diagrams shows the magnetic field produced by a long current-carrying wire?

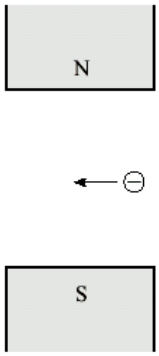
A. 

B. 

C. 


D. 

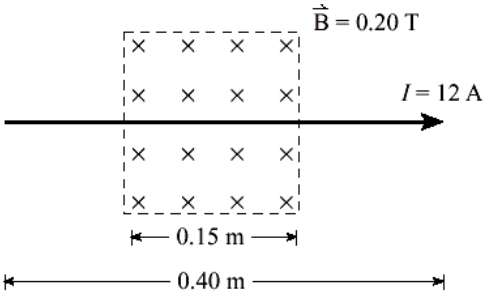

17. The diagram below shows an electron travelling to the left in a magnetic field.




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

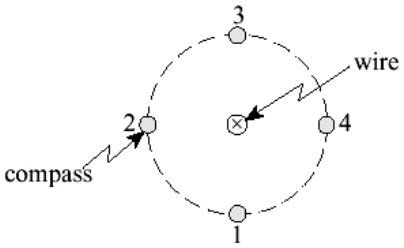
18. A long conductor is placed in a 0.20 T magnetic field as shown in the diagram below.




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 |

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



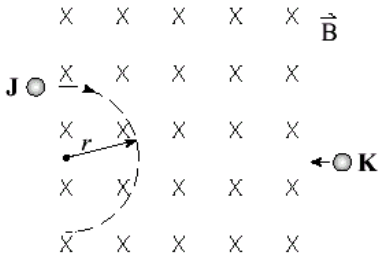

At which of the four positions shown in the diagram will the compass needle point towards the bottom of the page?

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

20. When a 15.0 A current flows through a 0.120 m long solenoid, the magnetic field along its centre is $8.00 \times 10^{-2}$ T. How many turns make up this solenoid?

A. 23
B. 162
C. 509
D. 4 240

21. 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**?

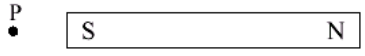
A. $\frac{1}{4}r$

B. $r$

C. $2r$

D. $4r$

22. In the diagram below, what is the direction of the magnetic field at point P due to the bar magnet?




A. up the page
B. down the page
C. towards the left
D. towards the right

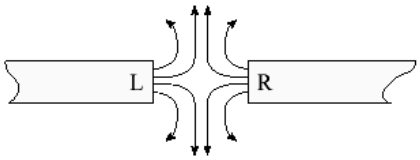
23. An ion with a charge of $1.6\times10^{-19}$ C enters a 0.075 T magnetic field. If the ion follows a circular path of radius 0.083 m, what is the momentum of the ion?

A. $2.7\times10^{-26}$ kg · m/s
B. $1.0\times10^{-21}$ kg · m/s
C. $1.7\times10^{-12}$ kg · m/s
D. $5.2\times10^{-4}$ kg · m/s

24. A 525-turn solenoid has a diameter of 0.050 m and a length of 0.20 m. What current is needed to produce a 0.025 T field inside the solenoid?

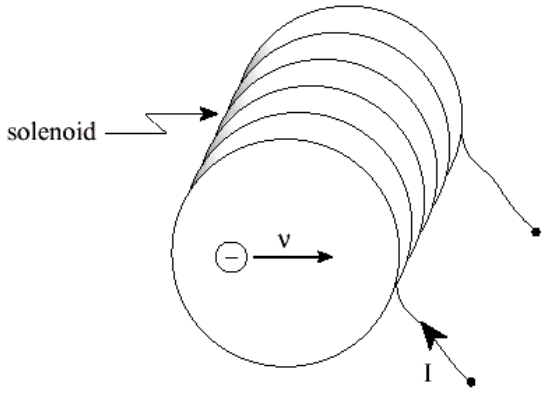
A. 0.38 A
B. 1.9 A
C. 3.8 A
D. 7.6 A

25. Identify the poles of the magnets shown.

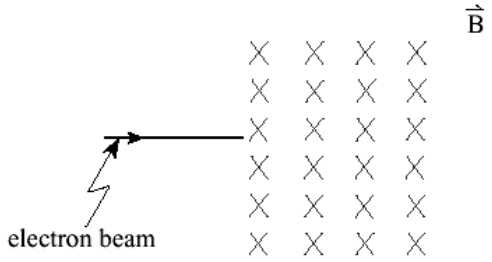



| | POLE L | POLE R |
|---|---|---|
| A. | North | North |
| B. | North | South |
| C. | South | North |
| D. | South | South |

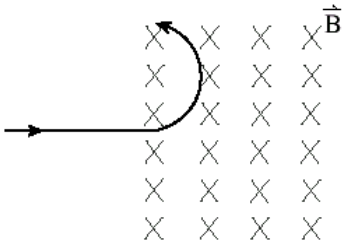
26. A 0.400 m long solenoid has 6 720 turns of wire. A current of 14.5 A flows in the solenoid. An electron inside the solenoid travels perpendicular to the axis of the solenoid with a speed of $6.50\times10^{5}$ m/s . What is the magnitude of the magnetic force acting on the electron? **(7 marks)**

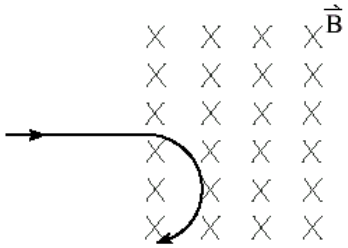


27. A beam of electrons travelling at $1.8\times10^{8}$ m/s is directed towards a 0.014 T magnetic field as shown in the diagram below.




a) Which of the following diagrams illustrates the path of the electron beam once in the magnetic field? (Circle one.) **(1 mark)**



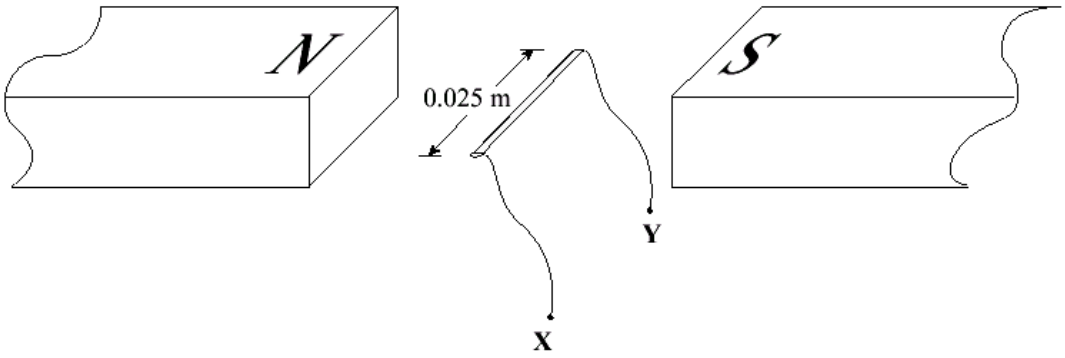

b) What is the radius of the path of the electron beam while in the magnetic field? **(6 marks)**

28. A proton enters a magnetic field of magnitude $2.4\times10^{-2}$ T at a speed of $5.0\times10^{5}$ m/s perpendicular to the field.

a) What magnetic force acts on the proton? **(3 marks)**

b) What is the radius of the proton's circular path? **(4 marks)**

29. A 0.025 m wire segment is positioned in a 0.75 T magnetic field as shown in the diagram below. When a current is passed through this wire segment it experiences a 0.20 N force upwards.

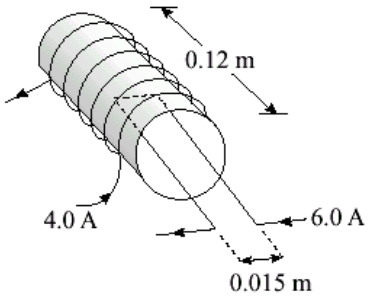



a) What is the direction of the current? (Circle one.) **(2 marks)**

From **X** to **Y** From **Y** to **X**

b) What is the magnitude of the current? **(5 marks)**

30. The diagram below shows a 650-turn solenoid carrying a 4.0 A current.




What is the magnitude of the magnetic force on the 0.015 m segment of wire carrying a 6.0 A current inside the solenoid as shown? **(7 marks)**

31. Electrons accelerated from rest through a potential difference of 300 V enter a $4.1\times10^{-2}$ T magnetic field at right angles. What is the radius of curvature of the path taken by the electrons? **(7 marks)**

KEY

| | | | | |
|---|---|---|---|---|
| 1. C | 6. D | 11. C | 16. D | 21. A |
| 2. A | 7. C | 12. C | 17. A | 22. D |
| 3. B | 8. B | 13. A | 18. A | 23. B |
| 4. C | 9. B | 14. B | 19. D | 24. D |
| 5. B | 10. C | 15. A | 20. C | 25. A |

26. $3.18 \times 10^{-4}$ N
27. a) curve down
    b) 0.073 m
28. a) $1.92 \times 10^{-15}$ N
    b) 0.22 m
29. a) Y to X
    b) 10.7 A
30. $2.45 \times 10^{-3}$ N
31. $1.4 \times 10^{-2}$ m