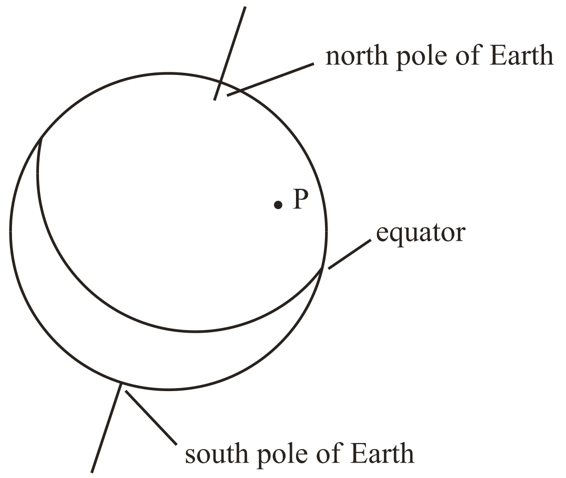
Name: ______________________________

Date: ______________________________

Magnetism I

1. The diagram below shows a point P on the Earth's surface at which a compass needle is suspended freely.



Which one of the following gives the correct direction in which the needle of the compass will point?

	Plane of compass needle	Direction of north pole of compass
A.	Horizontal	Towards north pole of Earth
B.	Horizontal	Towards south pole of Earth
C.	At an angle to the horizontal	Towards north pole of Earth
D.	At an angle to the horizontal	Towards south pole of Earth

2. A magnetic force acts on an electric charge in a magnetic field when

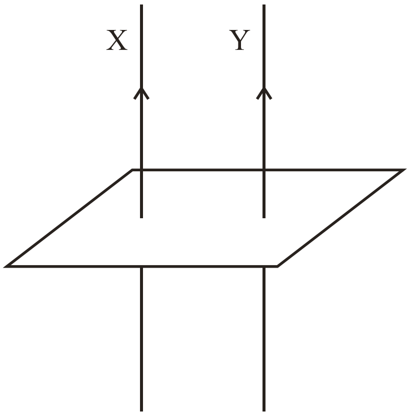
A. the charge is not moving.

B. the charge moves in the direction of the magnetic field.

C. the charge moves in the opposite direction to the magnetic field.

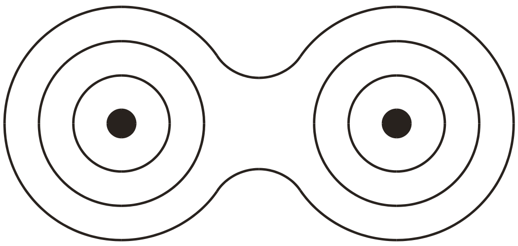
D. the charge moves at right angles to the lines of the magnetic field.

3. Two long, vertical wires X and Y carry currents in the same direction and pass through a horizontal sheet of card.

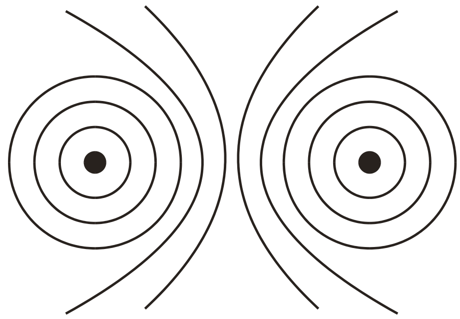


Iron filings are scattered on the card. Which **one** of the following diagrams best shows the pattern formed by the iron filings? *(The dots show where the wires X and Y enter the card.)*

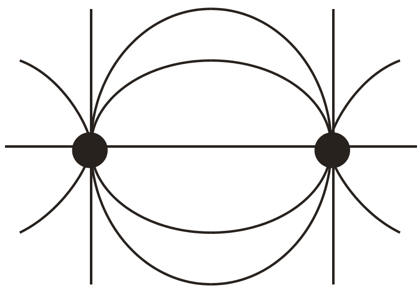
A.



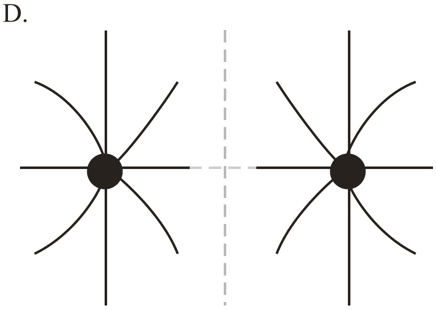
B.



C.



D.



4. A charged particle of mass m and charge q is travelling in a uniform magnetic field with speed v such that the magnetic force on the particle is F. The magnetic force on a particle of mass $2m$, charge q and speed $2v$ travelling in the same direction in the magnetic field is

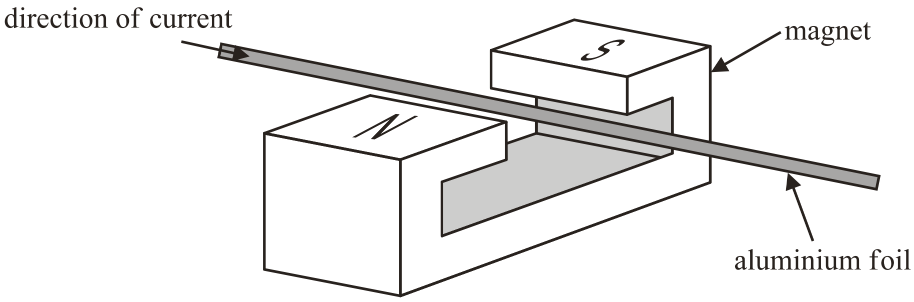
A. $4F$.

B. $2F$.

C. F.

D. $\frac{1}{2}F$.

5. A strip of aluminium foil is held between the poles of a strong magnet, as shown below.



When a current is passed through the aluminium foil in the direction shown, the foil is deflected. In which direction is this deflection?

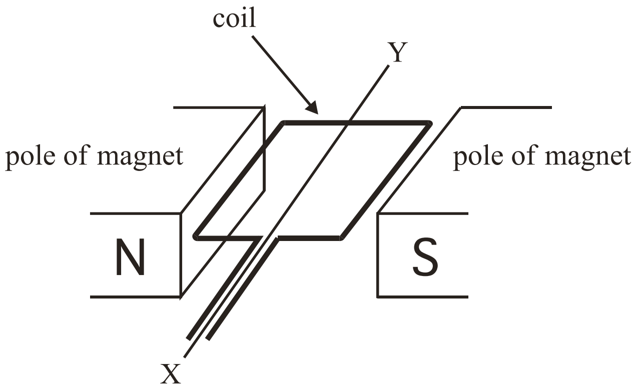
A. Vertically downwards

B. Vertically upwards

C. Towards the North pole of the magnet

D. Towards the South pole of the magnet

6. The diagram shows a coil of wire that can rotate between the poles of a magnet about the axis XY.



A current is passed through the coil by means of a commutator connected to the ends of the coil. What is the position of the coil in the magnetic field so that its turning effect is a maximum and what is the position of the coil when the current is reversed so that the coil rotates continuously?

	plane of coil for maximum turning effect	plane of coil for reversal of current
A.	parallel to direction of field	parallel to direction of field
B.	normal to direction of field	parallel to direction of field
C.	parallel to direction of field	normal to direction of field
D.	normal to direction of field	normal to direction of field

7. This question is about the force between current-carrying wires.

Diagram 1 below shows two long, parallel vertical wires each carrying equal currents in the same direction. The wires pass through a horizontal sheet of card. Diagram 2 shows a plan view of the wires looking down onto the card.

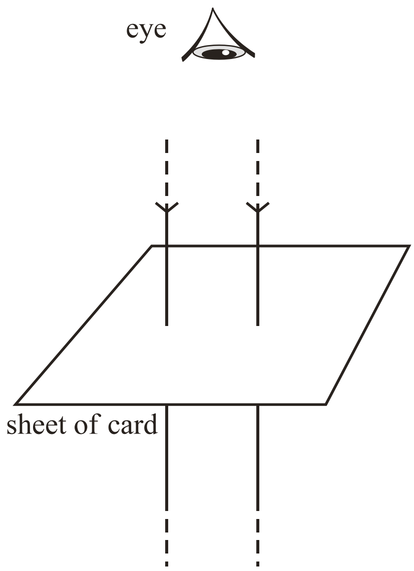


diagram 1

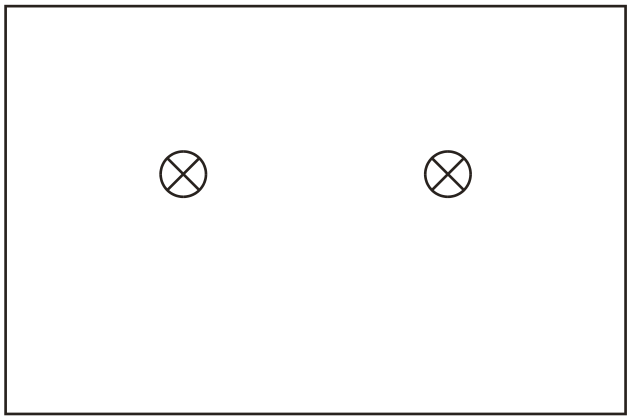


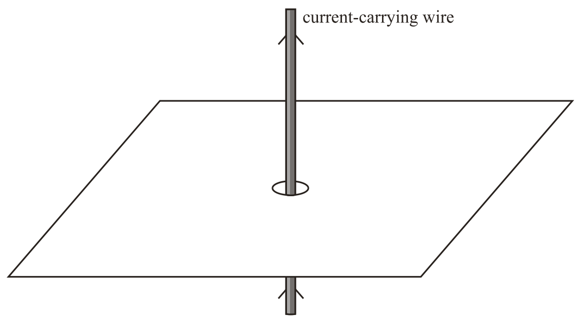
diagram 2

(a) (i) Draw on diagram 1 the direction of the force acting on each wire.

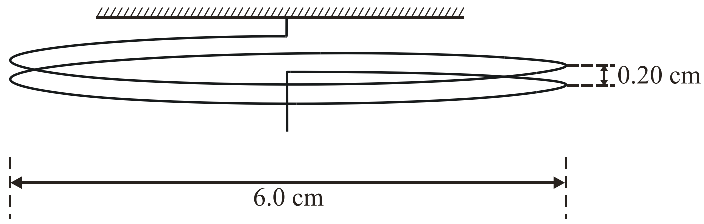
(ii) Draw on diagram 2 the magnetic field pattern due to the currents in the wire.

(b) The card is removed and one of the two wires is free to move. Describe and explain the changes in the velocity and in acceleration of the moveable wire.

8. (a) On the diagram below, draw the magnetic field pattern around a long straight current-carrying conductor.



The diagram below shows a coil consisting of two loops of wire. The coil is suspended vertically.



Each loop has a diameter of 6.0 cm and the separation of the loops is 0.20 cm. The coil forms part of an electrical circuit so that a current may be passed through the coil.

(b) (i) State and explain why, when the current is switched on in the coil, the distance between the two loops changes.

When there is a current I in the coil, a mass of 0.10 g hung from the free end of the coil returns the separation of the loops to the original value of 0.20 cm. The circumference C of a circle of radius r is given by the expression

$$C = 2\pi r.$$

(ii) Calculate the current I in the coil. You may assume that each loop behaves as a long straight current-carrying wire.