Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

Figure 4 shows the shape of the magnetic field near a bar magnet.

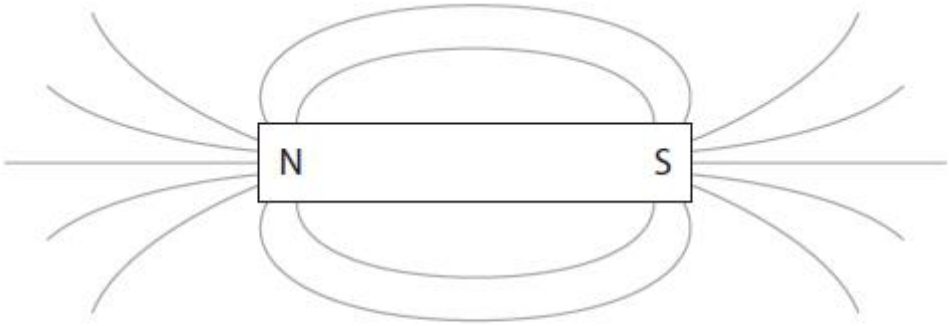


Figure 4

(i) Draw arrows on the field lines in Figure 4 to show the direction of the magnetic field.

(1)

(ii) Place a letter X on Figure 4 at a place where the magnetic field is strongest.

(1)

(iii) Describe **two** differences between the magnetic field shown in Figure 4 and a uniform magnetic field.

(2)

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(Total for question = 4 marks)

Q2.

A student sets up the apparatus shown in Figure 9.

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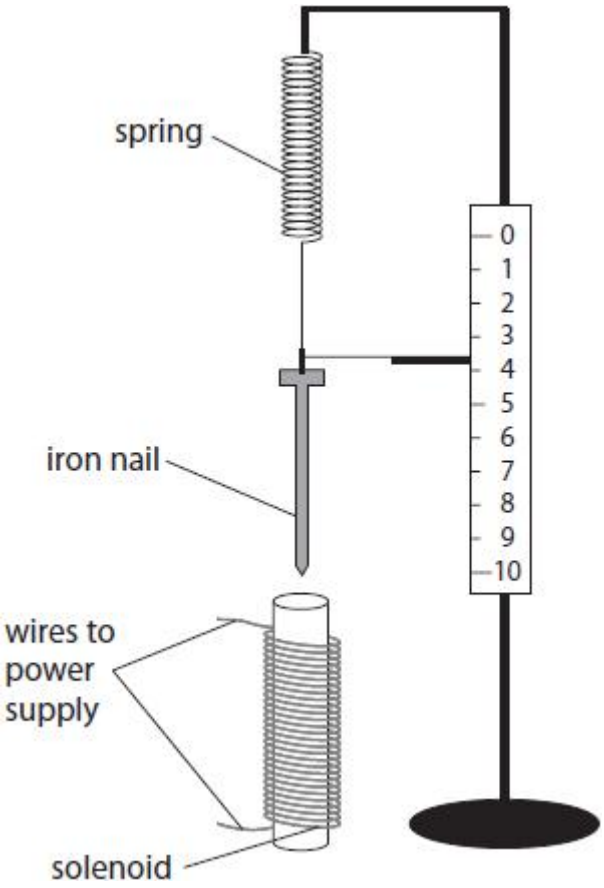


Figure 9

(i) When the current in the solenoid is switched on, the solenoid attracts the iron nail.

Describe how the student could use this apparatus to investigate how the size of the current in the solenoid affects the force of attraction between the solenoid and the iron nail.

(4)

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(ii) The spring constant of a different spring is 24 N/m.

The spring is extended from its unstretched length by 12 cm.
Calculate the energy transferred in extending the spring by 12 cm.
Use an equation selected from the list of equations at the end of this paper.

(2)

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energy transferred = ... J

(Total for question = 6 marks)

Q3.

Two long, thin magnets are held with their N-poles facing each other.
The force, *F*, between the magnets can be calculated using the equation

$$F = \frac{K}{d^2}$$

where

K is a constant value
d is the distance between the magnets.

(i) The magnets are 4.0 cm apart.

The force between the magnets is 1.2 N.
Calculate the value of *K*.
State the unit.

(3)

K = ...unit.....

(ii) The magnets are held the same distance apart but with the N-pole of one magnet now facing the S-pole of the other magnet.

The value of *K* does not change.
State how the force would compare with the force in part (i).

(1)

.....

.....

(Total for question = 4 marks)

Q4.

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Figure 8 shows two metal rods carrying a current.

A metal roller touches both rods and completes the circuit.
The roller is in the magnetic field produced by a magnet.

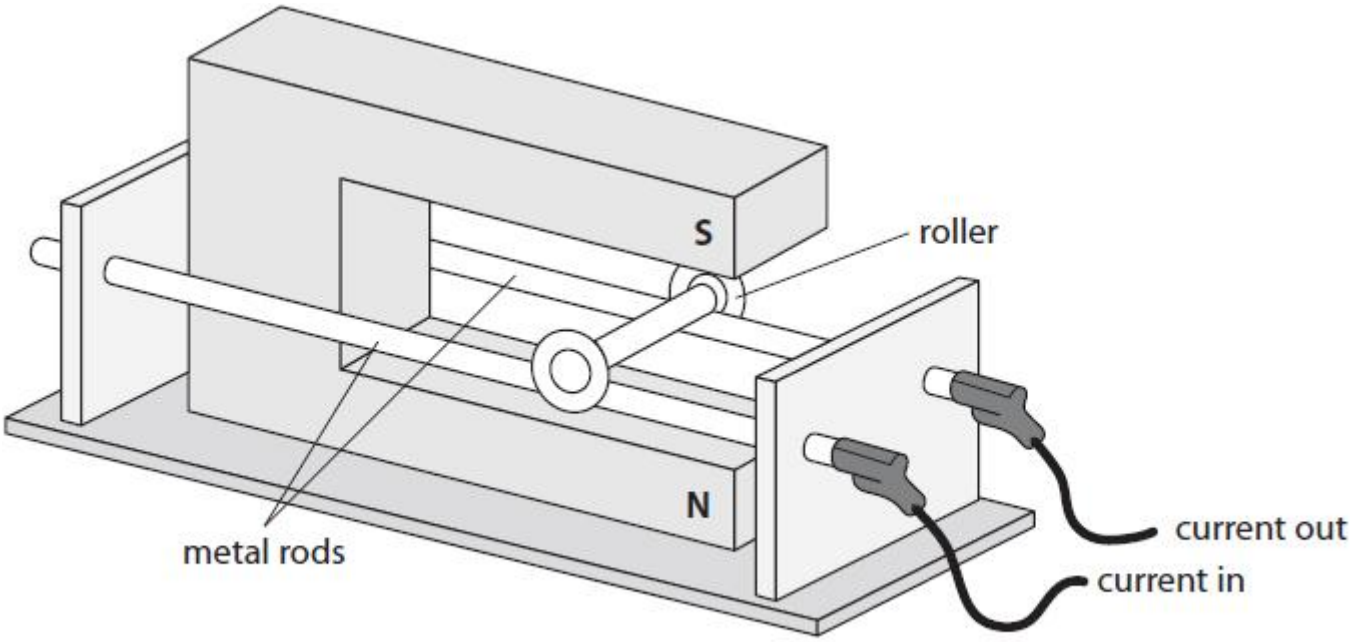


Figure 8

(i) The magnetic flux density of the magnetic field at the roller is 1.2 T.

The current in the roller is 2.5 A.
The length of the roller carrying the current is 0.060 m.
Calculate the force on the roller.
Use the equation

$$F = B \times I \times l$$

(2)

force on the roller = ... N

(ii) Describe how Fleming's left-hand rule can be used to determine the direction of the force acting on the roller.

You may draw a diagram to help your answer.

(3)

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(iii) Draw an arrow on Figure 8 to show the direction of the force acting on the roller.

(1)

(Total for question = 6 marks)

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