CLASS ACTIVITIES FOR ELECTROMAGNETISM

1. **Magnets**

(a) State the two types of magnets and give an example of each type.
(b) State the unit of magnetic field.
(c) What is an electromagnet?

2. **Right Hand Screw Rule**

(a) State how the right hand screw rule is used for

(i) a straight conductor
(ii) a solenoid

(b) What convention is used to show magnetic field

(i) into the page
(ii) out of the page
(iii) up the page
(iv) down the page
(v) to the right
(vi) to the left

(c) What convention is used to show current

(i) into the page
(ii) out of the page
(iii) up the page
(iv) down the page
(v) to the right
(vi) to the left

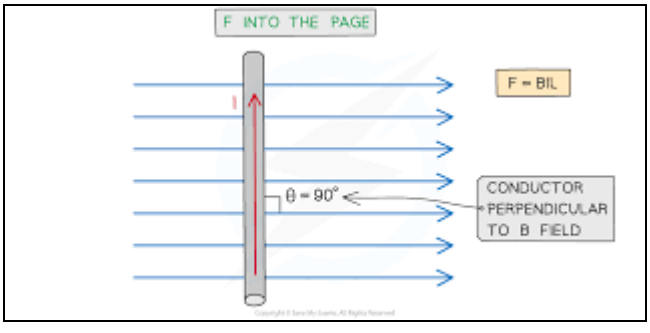
3. **Solenoid**

(a) What type of magnet is a solenoid?
(b) State three factors that affect the strength of an electromagnet.
(c) State three advantages of an electromagnet.
(d) State two differences between magnetically hard and magnetically soft materials.

4. **Electric Bell**

Explain how an electric bell works

5. **Force on current carrying wire**



A 0.2m long wire which carries a current of 3A is placed perpendicular to the magnetic field of strength 0.8T. Find the magnetic force experienced by the wire.

$F = BIL \Rightarrow F = (0.8)(3)(0.2) \Rightarrow$ $\boxed{F = 0.48N}$ $\boxed{\text{B = 0.8T, I = 3A , L = 0.2m, F = ?}}$

(a) Find the magnetic force on the wire which is placed a perpendicular t the magnetic field.

(i) B = 0.2T, I = 5A, L = 0.4m
(ii) B = 0.4T, I = 0.2A, L = 20cm
(iii) B = 200mT, $I = 500\mu A$, $L = 0.01km$

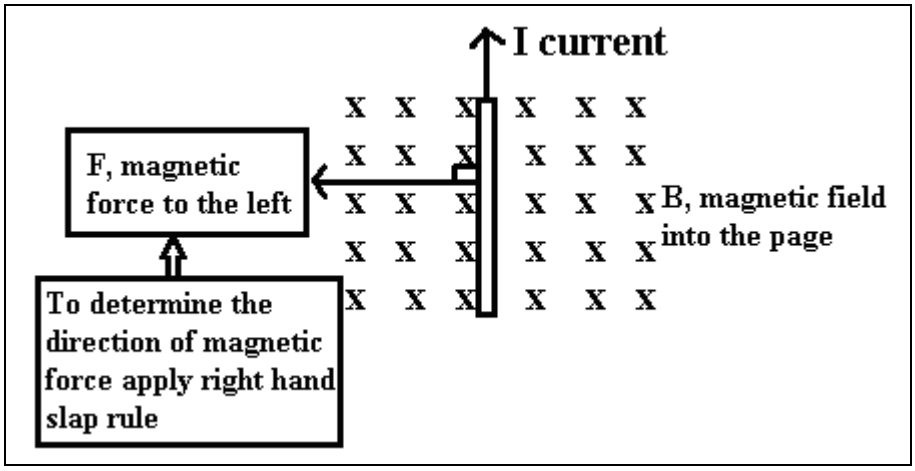
(b) A 0.5m long wire which carries a current of 4A is placed perpendicular to the magnetic field of strength 0.2T. Find the magnetic force experienced by the wire.

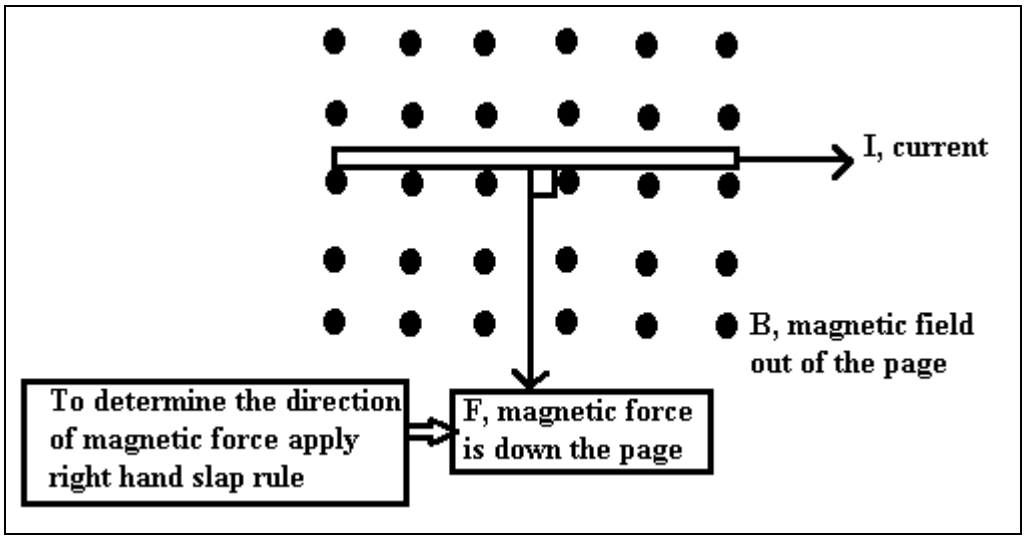
(c) All wires placed **<u>parallel</u>** to the magnetic field will **<u>not</u>** experience any magnetic force because the magnetic field lines do not cut the wire.

A 0.4m long wire which carries a current of 2A is placed parallel to the magnetic field of strength 0.5T. Find the magnetic force experienced by the wire.

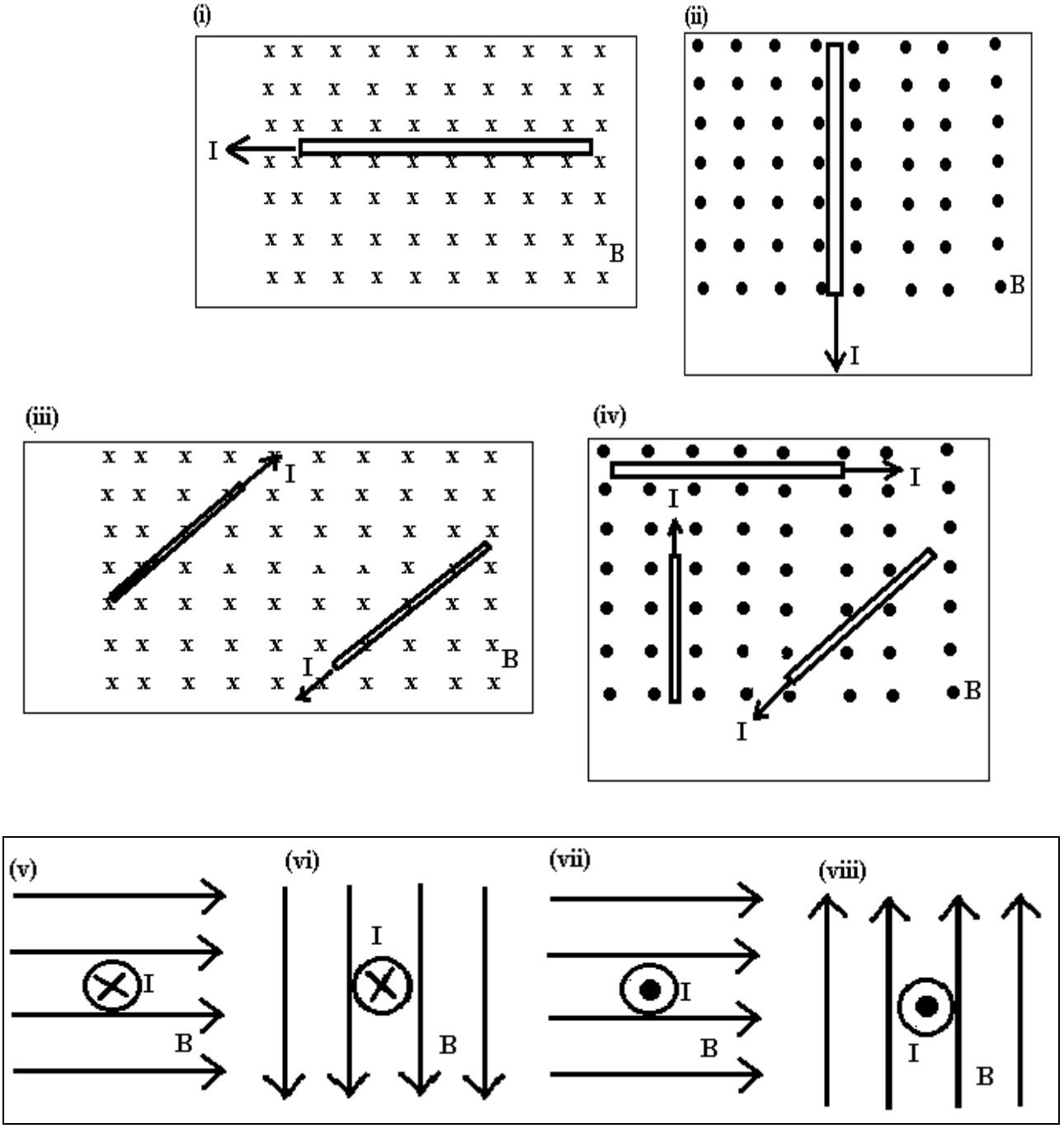
6. **Right hand slap rule**

(a) State how the right hand slap rule is used for a straight current carrying conductor.





(b) Use the right hand slap rule to determine the direction of the magnetic force.



7. **Moving coil meter**

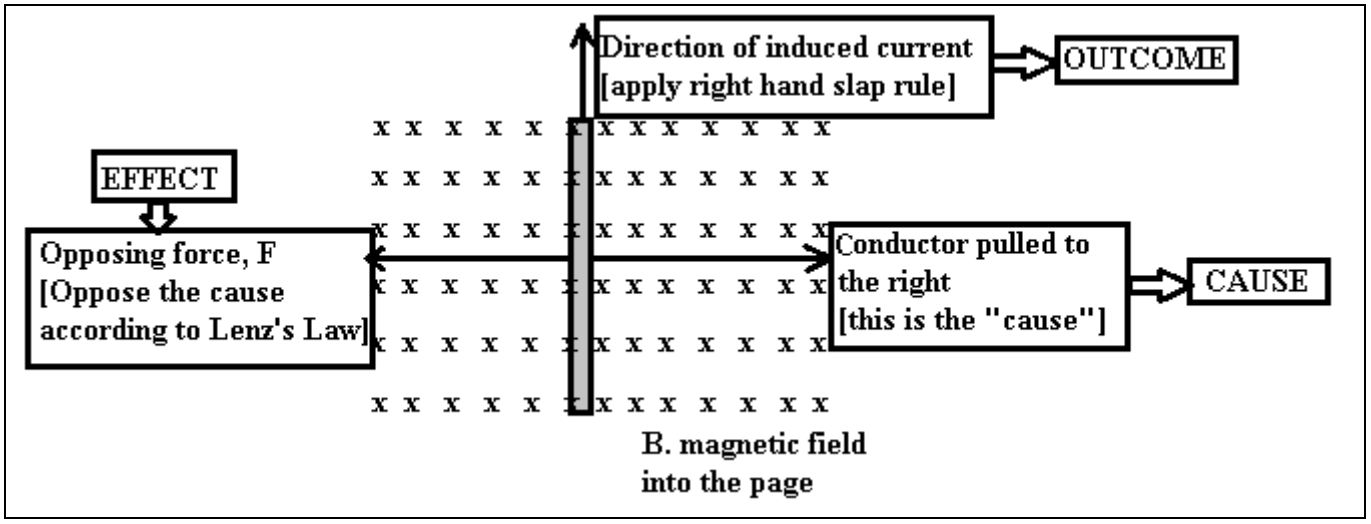
(a) Give an example of moving coil meter
(b) State the principle involved in the working of moving coil meter.

8. **Electromagnetic induction**

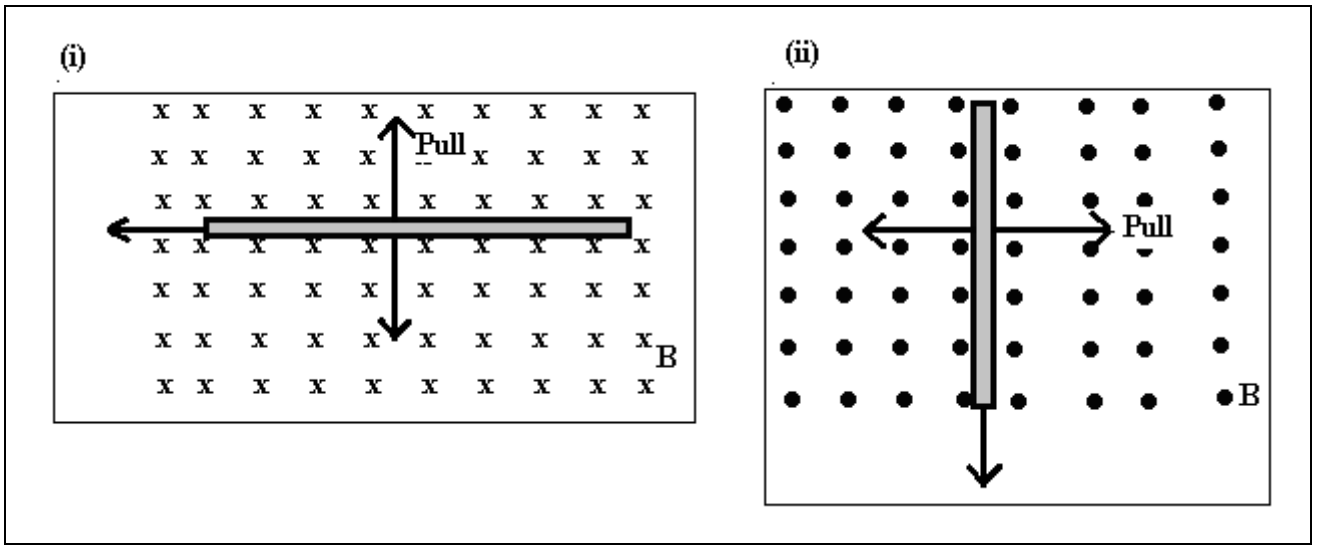
Explain what is electromagnetic induction

9. **Lenz's Law**

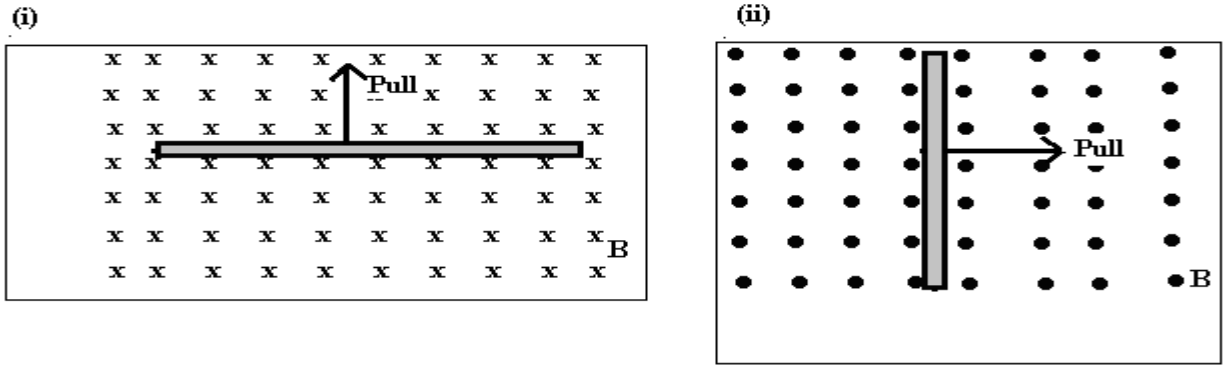
(a) State Lenz's Law



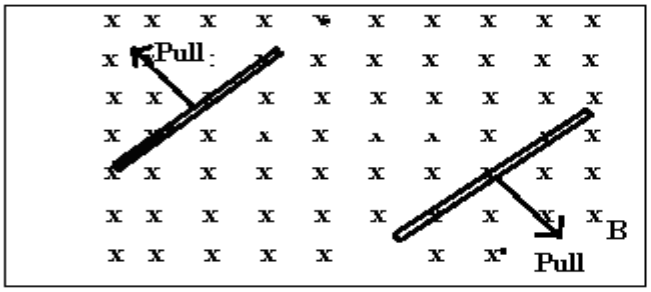
(b) Label cause, effect and outcome for each of the following.



(c) Apply Lenz's Law and Right Hand slap rule to find the direction of the induced current.



(iii)



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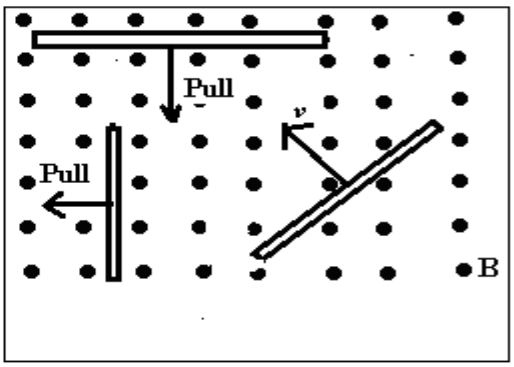
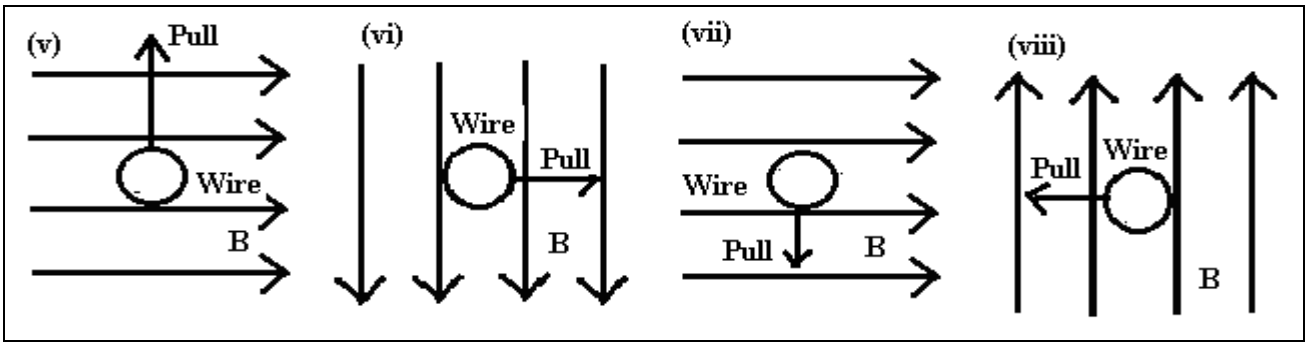
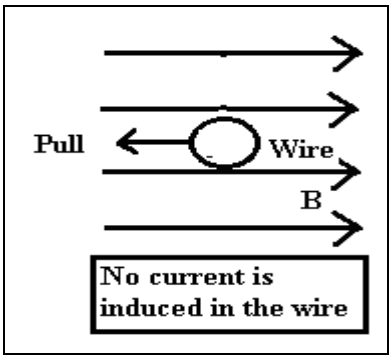




If the wire is pulled **parallel** to the magnetic field **no current will be induced** in the wire because the wire does not cut the magnetic field



10. **Induced EMF**

A 0.2 m long wire is pulled at a velocity of 10m/s perpendicular to the magnetic field of strength 0.8T. Find the emf induced across the wire.

$V = BLv \Rightarrow V = (0.8)(0.2)(10) \Rightarrow \boxed{V = 1.6 Volts}$ $\boxed{\text{B = 0.8T, L = 0.2m, } v \text{ = 10m/s, V = ?}}$

(a) Find the emf induced across the conductor when it is pulled perpendicular to magnetic field.

(i) B = 0.2T, L = 0.4m, v = 8m/s

(ii) B = 0.4T, L = 50cm v = 12m/s

(iii) $B = 500\mu T$, $L = 100mm$, $v = 0.004\frac{km}{s}$

(b) A 0.4 m long wire is pulled at a velocity of 12m/s perpendicular to the magnetic field of strength 0.5T. Find the emf induced across the wire.

11. **Alternating current generator**

What is the function of slip rings in an ac generator?

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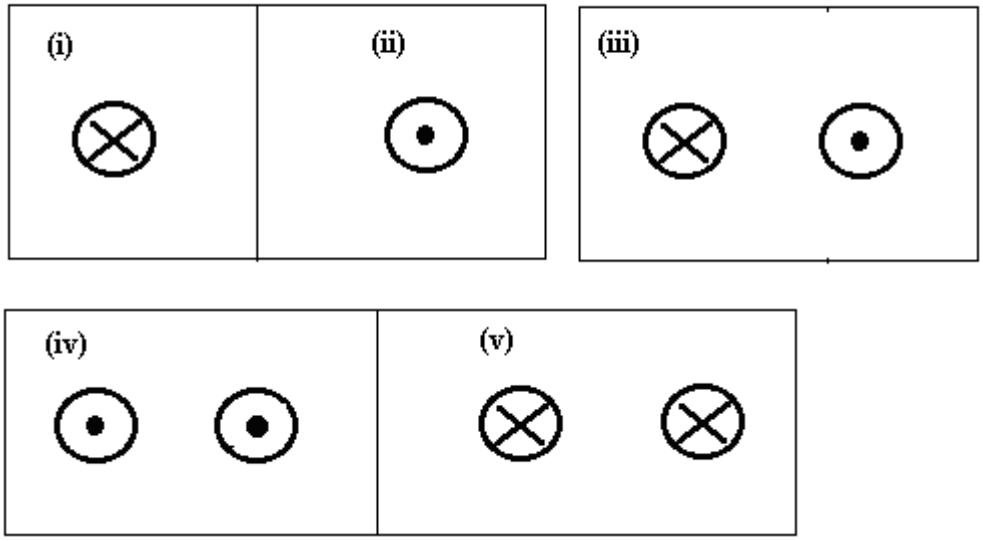
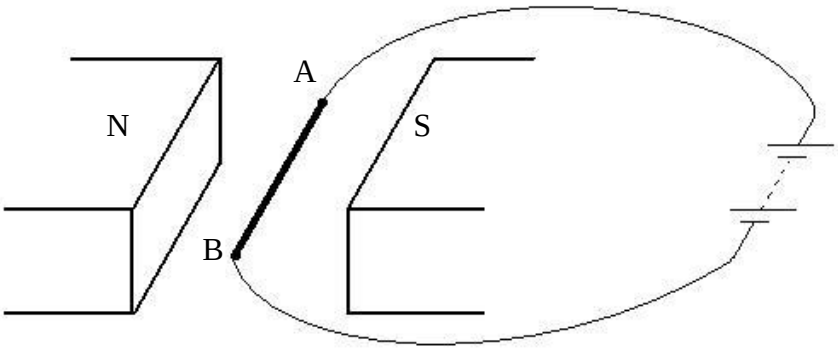
8. (a) The strength of an electromagnet depends on three factors. State these three factors.

(b) Which rule or law should be used to determine the direction of the magnetic force on a current carrying conductor is

(c) Draw the magnetic field around the wires.



(d) A metal rod, **AB**, is connected to a battery, and placed between the poles of two magnets, as shown in the diagram below.



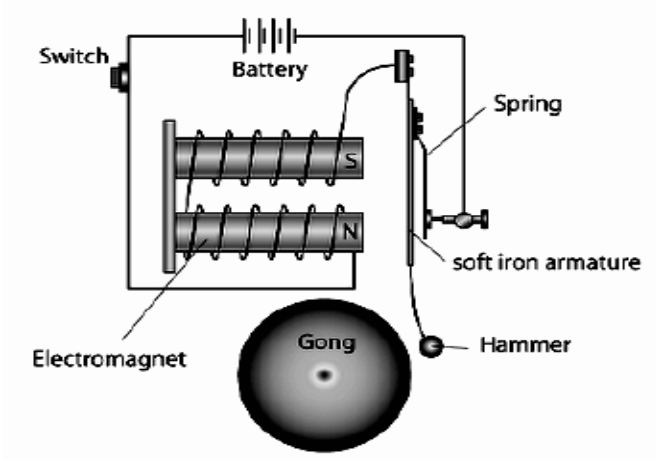
(i) Draw the diagram of the magnets and indicate the direction of the magnetic field produced by the magnet by an arrow.

(ii) Use **one** of the terms: **"left, right, up, down, into the page, out of the page"**, to identify the direction of the magnetic force on the rod.

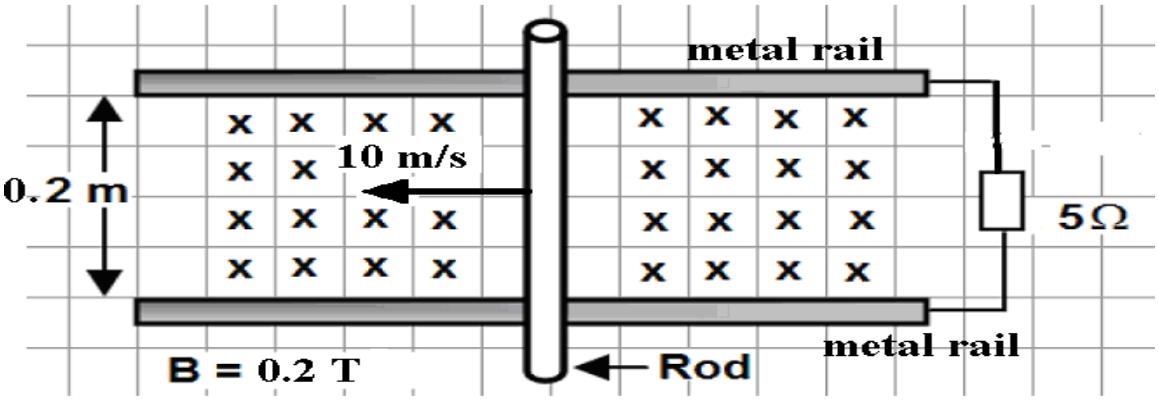
(iii) Calculate the size of the magnetic force experienced by the rod, using the information given below:

- Strength of the magnetic field = 1.50 T
- Current = 4 A
- Length of rod in the field = 0.10 m

(e) The diagram of an electric bell is given below. With reference to the information given in the diagram explain how an electric bell works.



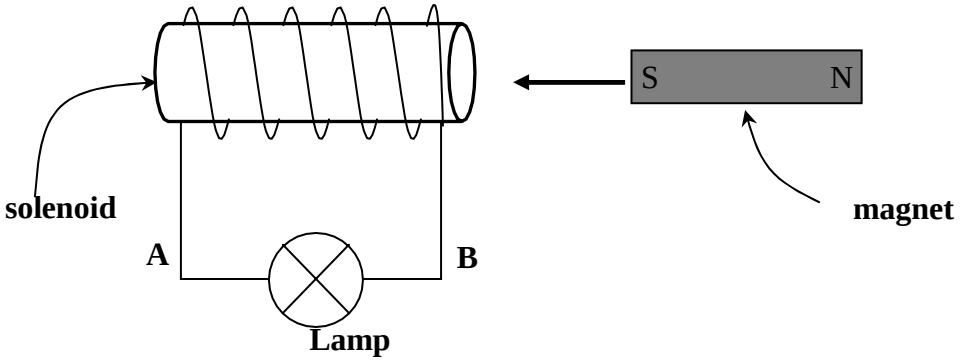
(f) A conducting rod resting on metal rails is pulled across a uniform magnetic field as shown



Find

(i) the potential difference induced across the conductor.
(ii) the current induced in the conductor.
(iii) the direction of induced current in the conductor.
[State whether it is up↑ or down ↓ the conductor]
(iv) the magnitude of the magnetic force on the conductor.

(g) Refer to the diagram below and answer the questions that follow.



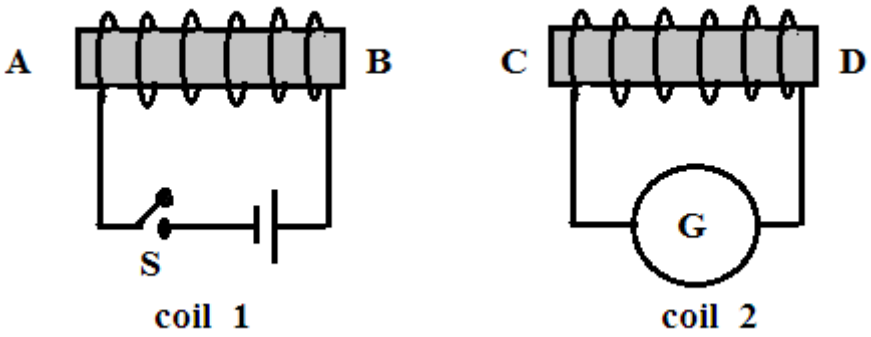
Susan finds that she can produce electricity by moving the magnet into the solenoid, although the current produced is small.

(i) Describe one thing that she can do to increase the current.

(ii) Use Lenz's Law to determine the direction of the current through the lamp above. [State whether it is **A → B** or **B → A**]

(iii) Susan also finds out that she cannot produce electricity if the magnet is held stationary inside the solenoid. Briefly explain the reason for this.

(h) Two coils of conducting wires are placed close to each other. Coil 1 is connected to a power supply while coil 2 is connected to a galvanometer as shown in the diagram below.



(i) What will be the induced pole at ends A, B, C and D at the **instant when switch S is closed**?

(ii) Describe in words what would be observed in the galvanometer at the **instant when switch S is closed**.

(iii) What will be the induced pole at ends A, B, C and D at the **instant when switch S is opened**?[from closed position]