Application of flemmings left hand rule

Working of a DC motor

We provide current and magnetic field to generate a force. This force produces a motion and causes the DC motor to rotate. The working can be expressed using the equation: magnetic field + current = force

- At 0 degrees, the coil is at horizontal position
- Current can be seen to flow in the direction A to B and C to D. The side AB experiences an upwards force and the side CD experiences a downward force, this makes the coil rotate in a clockwise direction
- Once the coil has rotated through 90 degrees, it reaches a vertical position.
- At this point the contact breaks and the current stops flowing however, the momentum of the coil makes it go past the vertical position
- Now it can be seen that the direction of the current has been reversed, hence the direction of the force is also reversed, that is, current now flows from B to A and D to C, therefore the side AB now experiences a downwards force and the side CD experiences an upwards force
- When the coil reaches to 270 degrees it's once again aligned in a vertical position
- Due to a break in the circuit, current once again stops flowing but the momentum of the coil, keeps it in constant rotation
- Finally the coil completes 360 degrees and returns back to its starting point, the whole process is then once again repeated

Questions:

Suggest what changes will make the coil rotate faster

- strong magnet
- Powerful battery
- Using more number of turns on the coil
- Wrapping the coil around a piece of iron
- Using curved magnets

- reversing the poles of the magnet
- Reversion the terminals of the battery

It is sometimes noticed that the motor will not start even when the circuit is arranged properly, suggest a possible reason for this and what can be done to make the motor operate:

If the coil previously came to rest in a vertical position then it will not start, to overcome this problem the coil can be forcefully pushed one way or the other to establish contact

State the function of split ring commutator

They help to reverse the direction of the current when the coil goes past the vertical position that is, at 90 degree and 270 degrees.

Explain the function of split ring commutator

- the split ring commutator will interchange their positions at 90 degrees and 270 degrees
- This helps to reverse the direction of the current in the coil
- as the direction of current reverses, the direction of force also reverses so the side initially moving upwards will now begin to move downwards. This allows the coil to continue rotating in the same direction

Suggest the use of carbon brushes

Carbon brushes behave as a lubricant, they help to minimise friction between the moving parts of the circuit

Why is this structure termed as a DC motor

The arrangement works on a DC supply and the purpose of this arrangement is to make the coil rotate, hence the term DC motor.

Second application of the flemmings left hand rule:

Working of a loud speaker

- a loud speaker is a device which converts electrical energy to sound energy
- A loud speaker consists of an e shaped magnet around which a solenoid is wrapped
- We provide current and magnetic field. This produces a force which causes vibration.
- The coils of the solenoid, are internally connected to the cone of the loudspeaker
- Using the left hand rule, it can be determined that a backward force is experienced, however, when the current is reversed, the direction of the force also reverses making the cone move to the right
- Hence an AC supply can cause the cone to experience vibrations
- These vibrations will make the air molecules undergo a series of alternate compressions and rarefractions there by producing sound energy

Note: when the volume is increased, more current is supplied to this arrangement this causes the magnitude of the force to increase. Hence the cone will now vibrate with a greater amplitude thereby producing a large sound