

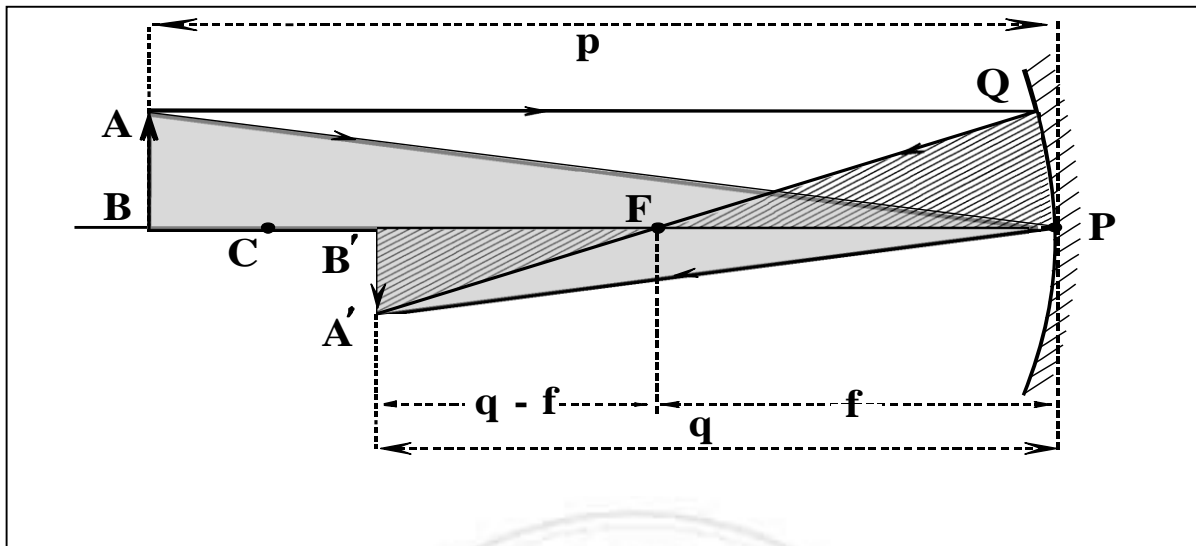
IMPORTANT QUESTIONS FOR SECTION C:

06 MARKS FOR EACH QUESTION

1, With the help of ray diagram derive Mirror equation.

DIAGRAM:

2-MARKS



WORKING: (3 MARKS)

If we want to derive spherical mirror formula then we take object AB behind the centre of curvature of a concave mirror then image A'B' will form in between focus and centre of curvature and it is real, inverted and small in size as shown in ray diagram.

From figure ΔAPB and $\Delta A'PB'$ are similar to each other therefore:

$\Delta APB \longleftrightarrow$

$\Delta A'PB'$

$$\frac{\overline{A'B'}}{\overline{AB}} = \frac{\overline{PB'}}{\overline{PB}}$$

$$\frac{\overline{A'B'}}{\overline{AB}} = \frac{q}{p} \dots\dots\dots \text{Eq. (i)}$$



From figure ΔPFQ and $\Delta A'FB'$ are similar to each other therefore:

$$\Delta PFQ \longleftrightarrow \Delta A'FB'$$

$$\frac{\overline{A'B'}}{\overline{PQ}} = \frac{\overline{FB'}}{\overline{FP}}$$

Here $\left\{ \begin{array}{l} \overline{PQ} = \overline{AB} \\ \overline{FB'} = q - f \\ \overline{FP} = f \end{array} \right\}$ We put in above

$$\frac{\overline{A'B'}}{\overline{AB}} = \frac{q - f}{f} \dots\dots \text{Eq. (ii)}$$

By comparing equation (i) and equation (ii) we get:

$$\frac{q - f}{f} = \frac{q}{p}$$

$$\frac{q - f}{q f} = \frac{1}{p}$$

$$\frac{q}{q f} - \frac{f}{q f} = \frac{1}{p}$$

$$\frac{1}{f} - \frac{1}{q} = \frac{1}{p}$$

$$\boxed{\frac{1}{f} = \frac{1}{p} + \frac{1}{q}} \dots\dots \text{Proved}$$

REQUIRED ANSWER= 1 MARK



2. Write Four properties of each Alpha rays, Beta rays and Gamma rays.

1. PROPERTIES OF ALPHA PARTICLES: (0.5 MARK FOR EACH PROPERTY)

- i. The mass of each alpha particle is nearly four times the mass of hydrogen nucleus.
- ii. The charge on each alpha particle is positive and equal to twice the charge on a proton.
- iii. The ionization capability of alpha rays is very large.
- iv. Penetration power of these rays is very small.
- v. Alpha rays produce fluorescence in certain substances.
- vi. When these rays are allowed to pass through a thin metal foil for example a gold foil. Then they are scattered through large angles.
- vii. Alpha rays can induce artificial radio activity in certain nuclei.
- viii. These rays produce burns and sores on human body.
- ix. Alpha rays get absorbed after passing through a small distance in air.
- x. They are emitted with a velocity ranging 1.4×10^7 to 1.7×10^7 m/s.

2. PROPERTIES OF BETA RAYS: (0.5 MARK FOR EACH PROPERTY)

- i. The kinetic energy of beta rays is less than that of α rays.
- ii. These rays effect the photographic plate.
- iii. These rays produce fluorescence easily, especially in barium platino-cyanides.
- iv. Due to their small mass, these rays as compared to α - particle, are easily scattered by the nuclei of atoms.
- v. The ionization power of these rays is very small.
- vi. The velocity of β -rays is from 9×10^7 m/s, to 27×10^7 m/s

3. PROPERTIES OF GAMMA RAYS: (γ -RAYS)

(0.5 MARK FOR EACH PROPERTY)

- i. γ - rays produce feeble fluorescence when incident on a screen coated with barium platino-cyanides.
- ii. They eject electron when incident on metals.
- iii. The speed of these rays is equal to that of light (3×10^8 m/s).
- iv. Like α -rays, these rays also get absorbed in various materials.
- v. Penetrating power of γ -rays is very large. It is about hundred times larger than that of β rays.

3. Define Simple Harmonic Motion and prove with diagram that the motion of a body attached to the end of spring execute simple harmonic motion.

SIMPLE HARMONIC MOTION:

DEFINITION: (2 MARKS)

Such a vibratory motion in which

- 1) The magnitude of acceleration is directly proportional to the magnitude of displacement.
- 2) The direction of acceleration always towards mean position but the direction of displacement away from the mean position called Simple Harmonic Motion. Mathematically it can be expressed as:

$$a \propto -x$$

PROOF:

CONSTRUCTION: (3 MARKS)

If one end of a spring tight with fixed support and other end attach with a point mass. If a point mass displaced from equilibrium position "O" to "P" and then release the body oscillate back and forth and according to Hook's law

"Restoring force is directly proportional to the displacement of a vibratory body"

$$F \propto -x$$

DIAGRAM: (1 MARK)

$$F = -kx$$

But $F = ma$

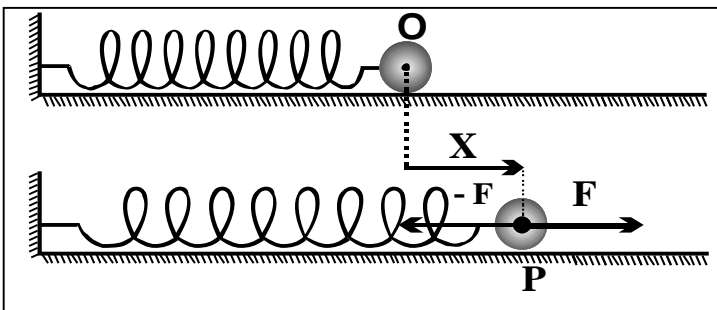
By comparing both equation we get

$$ma = -kx$$

$$a = -\frac{k}{m}x$$

$$a = -\text{constant } x$$

$$a \propto -x$$



4. Give construction and working of electric bell?

DEFINITION: 1 MARK

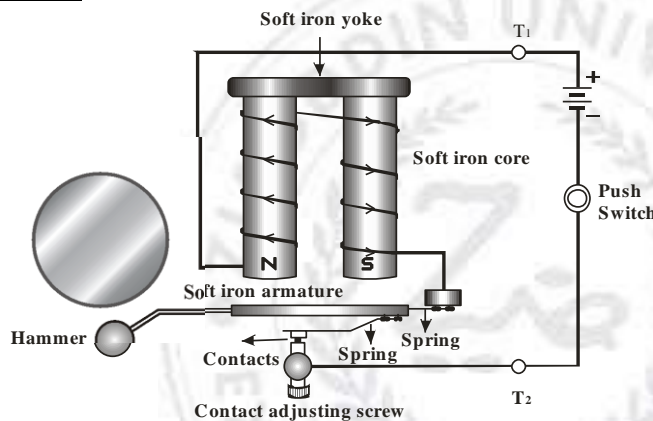
“Electric bell is a device which converts electric energy into sound energy.”

CONSTRUCTION: 1.5 MARKS

- 1) An electric bell consist an electromagnet.
- 2) One end of the windings is connected to a terminal T_1 and the other to a spring.
- 3) The spring. The spring is mounted on a soft-iron stripe called “Armature”.
- 4) A rod is attached to the armature.
- 5) The free end of the rod carries a small hammer which can strike against a bell.
- 6) A very light spring is attached to a contact adjusting screw which is joined to second terminal T_2 by a wire.

The electric circuit is completed through a battery and push switch button connected to the terminal T_1 and T_2

DIAGRAM: 2 MARKS



WORKING: 1.5 MARKS

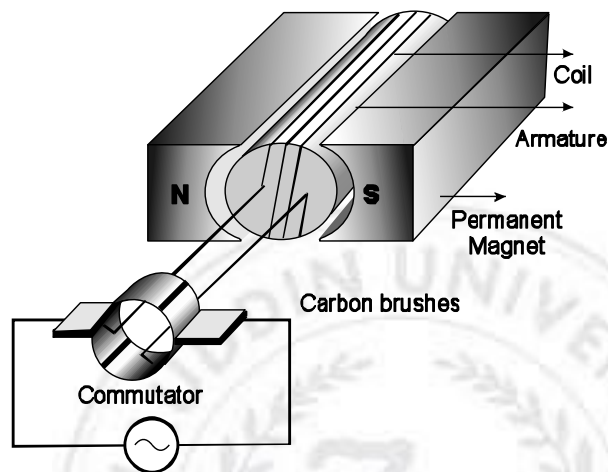
When the push button is pressed the electric circuit is completed and the armature is attracted towards the electromagnet as a result, the small spring gets detached from the screw due to which the electric circuit is broken and the electromagnet is demagnetized. Due to this, armature is brought back by the spring to its original position. Contact of the spring with the screw is now remade which completes the circuit. This action is repeated over and over again. Consequently, the armature vibrates and hammer attached to its strikes the gong and the bell rings and sound is produced

5. **what is an electric motor write the factor on which the speed of an electric motor depends.**

ELECTRIC MOTOR: 1 MARK

It is a device, which converts electrical energy into mechanical energy.

DIAGRAM: 2 MARKS



CONSTRUCTION: 1 MARK

It consists of suspended rectangular coil between the poles of a permanent magnet. The ends of the coil are attached to a split copper ring, which rotates along the coil. This split ring made to have a continues contact with the two stationary pieces of carbon called brushes, which are connected to a battery. The current enters through one brush and leaves through the other.

WORKING: 1 MARK

When electric current pass through the coil a mechanical force act on the coil and electrical energy is converted into mechanical energy

SPEED: 1 MARK

The speed of rotation of a magnet depends on the following factors

- i. The magnitude of current through the rotor.
- ii. The magnetic field strength of the permanent magnet.
- iii. Number of turns in the coil of rotor.
- iv. Permeability of its armature.

6. Describe the construction and working of compound microscope with the help of ray diagram.

DEFINITION: 1 MARK

A compound microscope is an optical instrument used to see very small object such as germs and other microbes.

CONSTRUCTION: 2 MARK

It consists of two converging lenses one is called object and other is called eye piece. Both object and eye piece are mounted at the end of the metallic tube which can slide into or out of each other.

OBJECTIVE:

The convex lens near the object is called objective. It is of short focal length and small aperture.

EYE PIECE:

The second convex lens near the eye is called eye piece. It is of long focal length and large aperture.

WORKING: 1 MARK

If we placed the object **AB** just behind the focus of objective then it gives real, inverted and magnified image **A'B'**. Now we adjust eye piece such that image **A'B'** acts as object and inside the focus of eye piece this lens gives final image **A''B''** at least distance of distinct vision and it is virtual, inverted, highly magnified and most clear. As shown in the ray diagram.

DIAGRAM: 2 MARKS

