CLASS-10

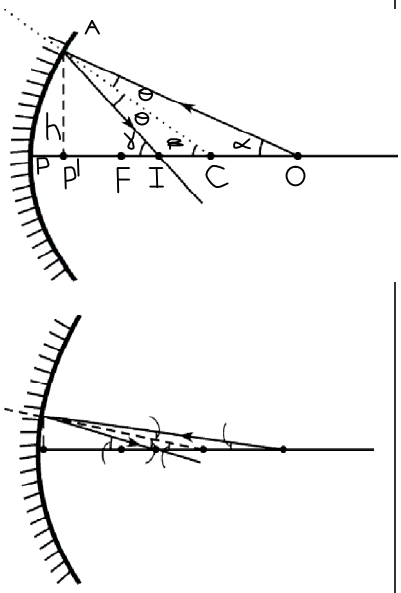
PHYSICAL SCIENCE

PERIOD PLANS

CHAPTER: 03 – REFLECTION OF LIGHT BY DIFFERENT SURFACES

PERIOD PLAN-10 : Derivation of formula for curved mirrors

Sign convection to the mirror formula

Content Analysis	Class Room Environment	Teaching Learning Material
Derivation of formula for curved mirrors: A ray coming from the point O which is on the principal axis of the mirror falls on the mirror at point A which is at height 'h' from the axis and after reflection, passes through point I which is also on the axis. Here AC is the normal. The angle of incidence (angle OAC) nagamurthy.weebly.com The angle of reflection (angle CAI) are equal Observe 3 right angled triangles ΔAOP^{I}, ΔACP^{I} and ΔAIP^{I}. from these Tan $\alpha = P^{I}A/ P^{I}O = h / P^{I}O = h/PO$ Tan $\beta = P^{I}A/ P^{I}C = h / P^{I}C = h/PC$ Tan $\gamma = P^{I}A/ P^{I}I = h / P^{I}I = h/PI$ If 'h' is very small and For very small angles P^{I} coincides with P. Then $P^{I}O = PO$, $P^{I}C = PC$, $P^{I}I = PI$. And Tan $\alpha = \alpha$, Tan $\beta = \beta$, Tan $\gamma = \gamma$. So $\alpha = h/PO$, $\beta = h/PC$, $\gamma = h/PI$. In a Δ, sum of the interior angles is equal to the exterior angle. From ΔAOC , $\beta = \alpha + \theta \rightarrow \theta = \beta - \alpha$ From ΔACI , $\gamma = \beta + \theta = \beta + \beta - \alpha = 2\beta - \alpha$ $\rightarrow \alpha + \gamma = 2\beta \rightarrow h/PO + h/PI = 2\ h/PC \rightarrow 1/PO + 1/PI = 2/PC$ **Sign convention for the parameters related to the mirror equation:** 1. All distances should be measured from the pole. 2. The distances measured in the direction of incident light, to be taken positive and those measured in the direction opposite to incident light to be taken negative. 3. Height of object (Ho) and height of image (Hi) are positive if measured upwards from the axis and negative if measured downwards. Substitute the values of PC, PO and PI in related equation according to the sign convention. Radius of curvature PC = –R ; Object distance PO = –u Image distance PI = –v then $2/–R = 1/–u + 1/–v \rightarrow 2/R = 1/u + 1/v$ radius of curvature(R) = 2 (focal length) = 2f $2/2f = 1/u + 1/v \rightarrow 1/f = 1/u + 1/v$ This mirror formula should be used according to the sign convention in every situation.	**Conversation:** about derivation of mirror formula. **Explanation:** The theory and mathematical concepts.  	

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