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(4/6 MARKS QUESTIONS)

1. Show that the semi-vertical angle of the cone of the maximum volume and given slant height is $cos^{-1}1/\sqrt{3}$.

2. Prove that the least perimeter of an isosceles triangle in which a circle of radius r can be inscribed is $6\sqrt{3}r$.

3. Find area of the greatest rectangle that can be inscribed in an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

4. A window is in the form of a rectangle surmounted by a semi circular opening. The total perimeter of the window is 10m. Find the dimensions of the window to admit maximum light through the whole opening.

5. Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius r is $\frac{4r}{3}$. Also show that the maximum volume of the cone is $\frac{8}{27}$ of the volume of the sphere.

6. Show that the surface area of a closed cuboid with square base and given volume is minimum when it is a cube.

7. Prove that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume.

8. An open box with a square base is to be made out of a given quantity of card board of area C^2 square units. Show that the maximum volume of box is $\frac{C^3}{6\sqrt{3}}$ cu units.

9. Show that the right circular cone of least curved surface and given volume has an altitude equal to $\sqrt{2}$ times the radius of the base.

10. Show that the semi vertical angle of a right circular cone of maximum volume and given slant height is $tan^{-1}\sqrt{2}$.

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