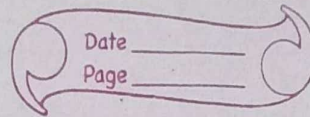


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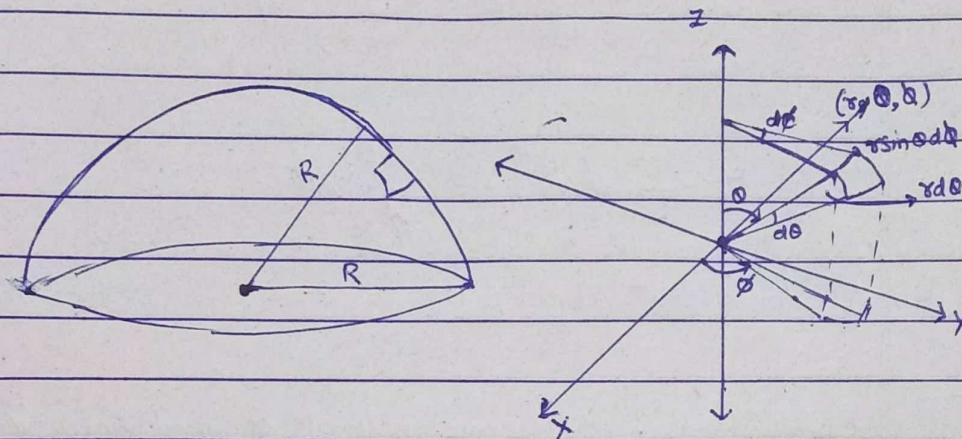
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## Physics-2 Assignment-1

Using spherical Co-ordinate System, Calculate the Surface area of the Curved Surface & plane base of a hemisphere of radius 'R'.



$$dA = r \sin \theta d\phi \cdot r d\theta$$

$$= r^2 \sin \theta d\theta d\phi$$

$$\{ r = R \}$$

# With spherical co-ordinate, we can define a hemisphere of radius 'R' by all co-ordinate points, where  $0 \leq \phi \leq 2\pi$  &  $0 \leq \theta \leq \pi/2$

$$A = \iint dA = \iint R^2 \sin \theta d\theta d\phi = R^2 \int_{\theta=0}^{\pi/2} \int_{\phi=0}^{2\pi} d\phi \sin \theta d\theta$$

$$A = R^2 \int_0^{\pi/2} \left[ \phi \right]_0^{2\pi} \sin \theta d\theta = 2\pi R^2 \int_0^{\pi/2} \sin \theta d\theta$$

$$A = 2\pi R^2 \left[ -\cos \theta \right]_0^{\pi/2} = 2\pi R^2$$

Curved Surface Area of Hemisphere is  $2\pi R^2$  Ans



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# For the area of the plane Surface :

$$A = \int_{\phi=0}^{2\pi} \int_{r=0}^R r dr d\phi$$

$$A = \int_{\phi=0}^{2\pi} \left[ \frac{r^2}{2} \right]_0^R d\phi = \frac{R^2}{2} \int_0^{2\pi} d\phi$$

$$A = \frac{R^2}{2} \phi \Big|_0^{2\pi} = \frac{R^2}{2} \times 2\pi$$

$$A = \pi R^2$$

Surface Area of the plane base of a hemisphere is  
 $= \pi R^2$