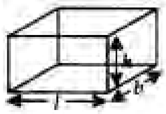
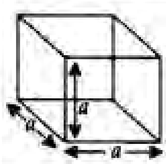
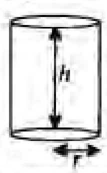
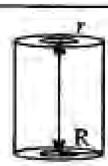
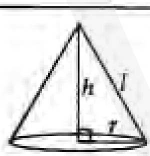
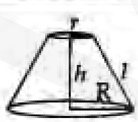
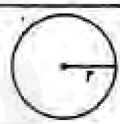
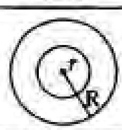
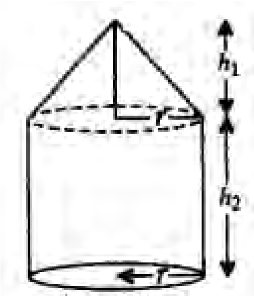
CBSE Class 10 Maths Notes Chapter 12 Surface Areas and Volumes

TABLE FOR SURFACE AREA AND VOLUME

Solid	Figures	Curved surface area (1)	Plane area (2)	Total area [1 + 2]	Volume	Remarks
Cuboid		Also known as lateral surface area $= 2(lh + bh)$	Area of: Top face $= lb$ Bottom face $= lb$ $\therefore lb + lb = 2lb$	$2(lb + bh + hl)$	$l.b.h$	l : length b : breadth h : height
Cube		Lateral surface area $= 4a^2$	Area of: Top face $= a^2$ Bottom face $= a^2$ $\therefore a^2 + a^2 = 2a^2$	$4a^2 + 2a^2 = 6a^2$	a^3	a : Side of cube
Right circular cylinder closed at top		Curved surface area $= 2\pi rh$	Area of: Top face $= \pi r^2$ Bottom face $= \pi r^2$ $\therefore \pi r^2 + \pi r^2 = 2\pi r^2$	$2\pi r^2 + 2\pi rh$ Or, $2\pi r(r + h)$	$\pi r^2 h$	r : radius h : height of cylinder
Right circular cylinder open at top		Curved surface area $= 2\pi rh$	Area of: Top face $= 0$ Bottom face $= \pi r^2$ $\therefore 0 + \pi r^2 = \pi r^2$	$2\pi rh + \pi r^2$ Or, $\pi r(2h + r)$	$\pi r^2 h$	r : radius h : height of cylinder
Hollow cylinder (Pipe)		$2\pi Rh$ • External surface area $= 2\pi Rh$ • Internal surface area $= 2\pi rh$	Area of: Top face $= \pi(R^2 - r^2)$ Bottom face $= \pi(R^2 - r^2)$	$2\pi Rh + 2\pi rh + 2\pi(R^2 - r^2)$	$\pi R^2 h - \pi r^2 h$ (External Vol. - Internal Vol.)	R : Radius of outer base r : radius of inner base h = height
Cone		πrl	Area of: Bottom Face $= \pi r^2$	$\pi r^2 + \pi rl$ Or, $\pi r(r + l)$	$\frac{1}{3}\pi r^2 h$	h = height of cone r = radius of cone l = slant height $= \sqrt{h^2 + r^2}$
Frustum		$\pi l(R + r)$	Area of: Top Face $= \pi r^2$ Bottom Face $= \pi R^2$	$\pi r^2 + \pi R^2 + \pi l(R + r)$	$\frac{1}{3}\pi h \cdot (R^2 + r^2 + Rr)$	h = height of frustum r = radius of top face R = Radius of base l = slant height
Sphere		$4\pi r^2$	None	$4\pi r^2$	$\frac{4}{3}\pi r^3$	r : radius of sphere
Hemisphere		$2\pi r^2$	πr^2	$3\pi r^2$	$\frac{2}{3}\pi r^3$	r : radius of hemisphere
Spherical shell		$4\pi R^2$ (Outer) $4\pi r^2$ (Inner)	None	$4\pi R^2 + 4\pi r^2$	$\frac{4}{3}\pi \cdot (R^3 - r^3)$	R:Radius of outer shell r:Radius of inner shell

SURFACE AREA AND VOLUME OF COMBINATIONS

Cone on a Cylinder.



Circus tent

r = radius of cone & cylinder;

h_1 = height of cone

h_2 = height of cylinder

Total Surface area = Curved surface area of cone + Curved surface area of cylinder + area of circular base

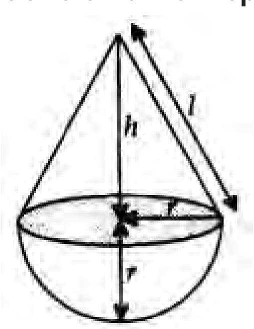
= $\pi rl + 2\pi rh_2 + \pi r^2$;

Slant height, l = $\sqrt{r^2 + h_1^2}$

Total Volume = Volume of cone + Volume of cylinder

= $\frac{1}{3}\pi r^2 h_1 + \pi r^2 h_2$

Cone on a Hemisphere:



h = height of cone;

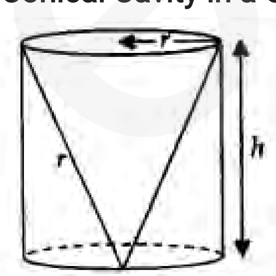
l = slant height of cone = $\sqrt{r^2 + h^2}$

r = radius of cone and hemisphere

Total Surface area = Curved surface area of cone + Curved surface area of hemisphere = $\pi rl + 2\pi r^2$

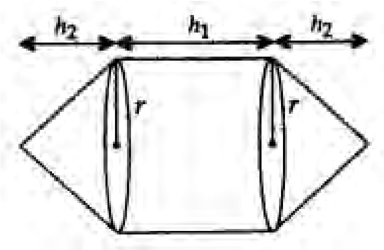
Volume = Volume of cone + Volume of hemisphere = $\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

Conical Cavity in a Cylinder



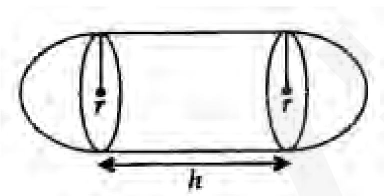
r = radius of cone and cylinder;
h = height of cylinder and conical cavity;
l = Slant height
Total Surface area = Curved surface area of cylinder + Area of bottom face of cylinder + Curved surface area of cone = 2πrh + πr^2 + πrl
Volume = Volume of cylinder − Volume of cone = $\pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{2}{3}\pi r^2 h$

Cones on Either Side of Cylinder.



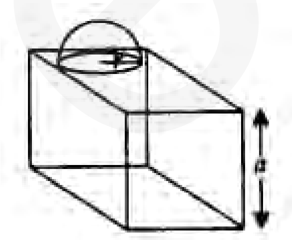
r = radius of cylinder and cone;
h_1 = height of cylinder
h_2 = height of cones
Slant height of cone, l = $\sqrt{h_2^2 + r^2}$
Surface area = Curved surface area of 2 cones + Curved surface area of cylinder = 2πrl + $2\pi r h_1$
Volume = 2(Volume of cone) + Volume of cylinder = $\frac{2}{3}\pi r^2 h_2 + \pi r^2 h_1$

Cylinder with Hemispherical Ends.



r = radius of cylinder and hemispherical ends;
h = height of cylinder
Total surface area= Curved surface area of cylinder + Curved surface area of 2 hemispheres = 2πrh + $4\pi r^2$
Volume = Volume of cylinder + Volume of 2 hemispheres = $\pi r^2 h + \frac{4}{3}\pi r^3$

Hemisphere on Cube or Hemispherical Cavity on Cube



a = side of cube;

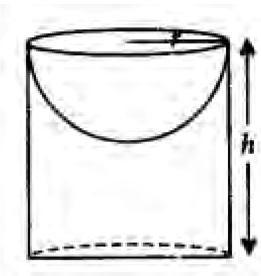
r = radius of hemisphere.

Surface area = Surface area of cube – Area of hemisphere face + Curved surface area of hemisphere

= $6a^2 - \pi r^2 + 2\pi r^2 = 6a^2 + \pi r^2$

Volume = Volume of cube + Volume of hemisphere = $a^3 + \frac{4}{3}\pi r^3$

Hemispherical Cavity in a Cylinder



r = radius of hemisphere;

h = height of cylinder

Total surface area = Curved surface area of cylinder + Surface area of base + Curved surface area of hemisphere

= $2\pi rh + \pi r^2 + 2\pi r^2 = 2\pi rh + 3\pi r^2$

Volume = Volume of cylinder – Volume of hemisphere = $\pi r^2 h - \frac{2}{3}\pi r^3$