CHAPTER – 12

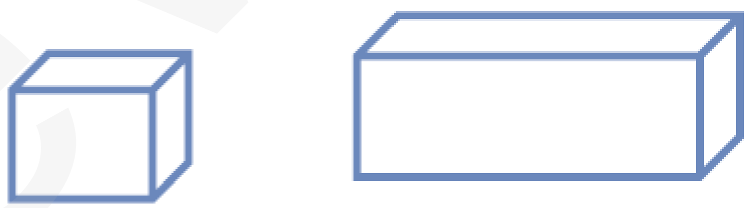
SURFACE AREA AND VOLUME

S.no	Term	Description
1	Mensuration	It is branch of mathematics which is concerned about the measurement of length ,area and Volume of plane and Solid figure
2	Perimeter	a)The perimeter of plane figure is defined as the length of the boundary b)It units is same as that of length i.e. m ,cm,km
3	Area	a)The area of the plane figure is the surface enclosed by its boundary b) It unit is square of length unit. i.e. m^2 , km^2
4	Volume	Volume is the measure of the amount of space inside of a solid figure, like a cube, ball, cylinder or pyramid. Its units are always "cubic", that is, the number of little element cubes that fit inside the figure.

Volume Unit conversion:

1 cm^3	**1mL**	**1000 mm^3**
1 Litre	1000ml	1000 cm^3
1 m^3	10^6 cm^3	1000 L
1 dm^3	1000 cm^3	1 L

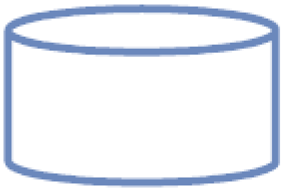
Surface Area and Volume of Cube and Cuboid:



Cube **Cuboid**

Type	Measurement
Surface Area of Cuboid of Length L, Breadth B and Height H	2(LB + BH + LH).
Lateral surface area of the cuboids	2(L + B) H
Diagonal of the cuboids	$\sqrt{L^2 + B^2 + H^2}$
Volume of a cuboids	LBH
Length of all 12 edges of the cuboids	4 (L+B+H).
Surface Area of Cube of side L	$6L^2$
Lateral surface area of the cube	$4L^2$
Diagonal of the cube	$L\sqrt{3}$
Volume of a cube	L^3

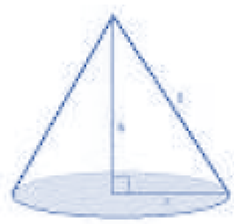
<u>Surface Area and Volume of Right circular cylinder:</u>



Radius	**The radius (r) of the circular base is called the radius of the cylinder**
Height	The length of the axis of the cylinder is called the height (h) of the cylinder
Lateral Surface	The curved surface joining the two base of a right circular cylinder is called Lateral Surface.

Type	Measurement
Curved or lateral Surface Area of cylinder	2πrh
Total surface area of cylinder	2πr (h+r)
Volume of Cylinder	$\pi r^2 h$

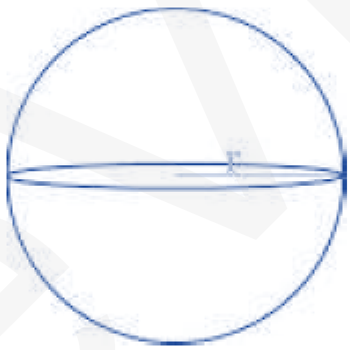
Surface Area and Volume of Right circular cone:



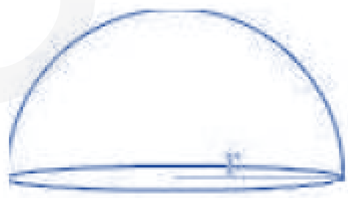
Radius	**The radius (r) of the circular base is called the radius of the cone**
Height	The length of the line segment joining the vertex to the center of base is called the height (h) of the cone.
Slant Height	The length of the segment joining the vertex to any point on the circular edge of the base is called the slant height (L) of the cone.
Lateral surface Area	The curved surface joining the base and uppermost point of a right circular cone is called Lateral Surface

Type	**Measurement**
Curved or lateral Surface Area of cone	πrL
Total surface area of cone	πr (L+r)
Volume of Cone	$\frac{1}{3}\pi r^2 h$

Surface Area and Volume of sphere and hemisphere:



Sphere



Hemisphere

Sphere	**A sphere can also be considered as a solid obtained on rotating a circle About its diameter**
Hemisphere	A plane through the centre of the sphere divides the sphere into two equal parts, each of which is called a hemisphere
radius	The radius of the circle by which it is formed
Spherical Shell	The difference of two solid concentric spheres is called a spherical
Lateral Surface Area for Sphere	Total surface area of the sphere
Lateral Surface area of Hemisphere	It is the curved surface area leaving the circular base

Type	**Measurement**
Surface area of Sphere	$4\pi r^2$
Volume of Sphere	$\frac{4}{3}\pi r^3$
Curved Surface area of hemisphere	$2\pi r^2$
Total Surface area of hemisphere	$3\pi r^2$
Volume of hemisphere	$\frac{2}{3}\pi r^3$
Volume of the spherical shell whose outer and inner radii and 'R' and 'r' respectively	$\frac{4}{3}\pi(R^3 - r^3)$

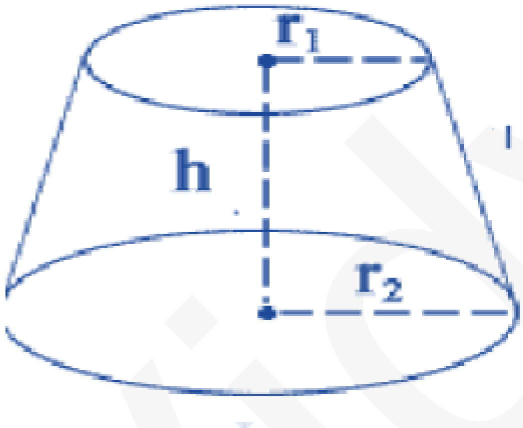
How the Surface Area and Volume are determined:

Area of Circle 	**The circumference of a circle is $2\pi r$. This is the definition of π (pi). Divide the circle into many triangular segments. The area of the triangles is 1/2 times the sum of their bases, $2\pi r$ (the circumference), times their height, r.**

$$A = \frac{1}{2}2\pi r r = \pi r^2$$

Surface Area of cylinder 	This can be imagined as unwrapping the surface into a rectangle.
Surface area of cone	This can be achieved by divide the surface of the cone into its triangles, or the surface of the cone into many thin triangles. The area of the triangles is 1/2 times the sum of their bases, p, times their height, $A = \frac{1}{2}2\pi r s = \pi r s$

Surface Area and Volume of frustum of cone:



h = vertical height of the frustum
l = slant height of the frustum
r_1 and r_2 are radii of the two bases (ends) of the frustum.

Type	Measurement
Volume of a frustum of a cone	$\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$
Slant height of frustum of a cone	$\sqrt{h^2 + (r_1 - r_2)^2}$
Curved surface area of a frustum of a cone	$\pi l(r_1 + r_2)$
Total surface area of frustum of a cone	$\pi l(r_1 + r_2) + \pi(r_1^2 + r_2^2)$