Revision Notes

Class 9 Maths

Chapter 11 – Surface Areas and Volumes

Definitions:

Solids:

Any object occupying fixed space and volume is called a solid.
For example: cube, cuboid, sphere, cylinder, cone etc.

- **Surface area of a Solid:**

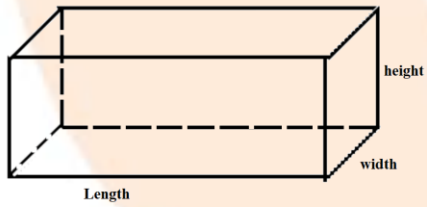
The area occupied by a solid object is known as surface area.
The unit of surface area is taken as square unit.
Example- square meter (m^2).

- **Volume of a solid:**

The measure of the occupied space is called volume of a solid.
The unit of volume is cubic unit.
Example- cubic meter (m^3)

Formulas for different solids:

1. Cuboid



A three-dimensional solid having six rectangular faces is called a cuboid. A cuboid has 6 rectangular faces, 12 edges and 8 vertices with opposite faces of equal dimensions.
The example of a cuboid is a book, matchbox, shoebox etc.

Surface area of cuboid:

$S = 2(lb + bh + lh)$

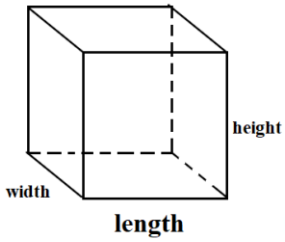
Where l is length, b is breadth and h is the height of the cuboid.

Volume of cuboid:

$V = l \times b \times h$

Where l is length, b is breadth and h is the height of the cuboid.

2. Cube



A cuboid having equal length, breadth and height is called a cube.
For example- ice cubes, dice etc.

Surface area of cube:

$S = 6l^2$

Where l is length of each side of the cube.

Volume of cube:

$V = l^3$

Where l is length of each side of the cube.

3. Cylinders

A solid generated by stacking large number of circular discs along their diameter on top of the other is called a cylinder. For example, circular pillars, circular pipes, measuring cylinders, soft drink cans etc.

Hollow Cylinder

Solids like iron pipes, rubber tubes, etc., are in the shape of hollow cylinders.

Surface area of cylinder:

a) Curved surface area (CSA): $CSA = 2\pi rh$

b) Total Surface area (TSA): $TSA = 2\pi r(r + h)$

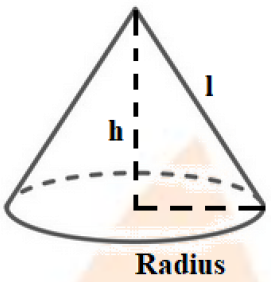
Where r is radius of circular top and bottom and h is the height of cylinder.

Volume of cylinder:

$V = \pi r^2 h$

Where r is radius of circular top and bottom and h is the height of cylinder.

4. Right Circular Cone



The solid generated by the rotation of a right-angled triangle about a right-angled side is called a right circular cone.

Surface area of cone:

a) Curved surface area (CSA): $CSA = \pi rl$

b) Total Surface area (TSA): $TSA = \pi r(r + l)$

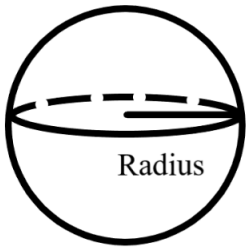
Where r is radius of circular part, h is the perpendicular height and $l = \sqrt{r^2 + h^2}$ is the slant height of the cone.

Volume of cone:

$$V = \frac{1}{3}\pi r^2 h$$

Where r is radius of circular part, h is the perpendicular height of the cone.

5. Sphere



The three-dimensional solid obtained from collection of all the points in space lying at the constant distance called as radius, from the fixed point called centre, is known as sphere.
For example- a bowling ball, cricket ball etc.

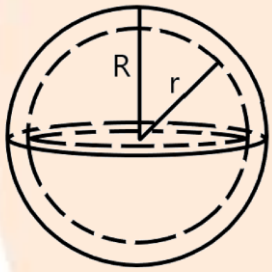
Surface area of sphere:

$SA = 4\pi r^2$
Where r is the radius of sphere.

Volume of sphere:

$V = \frac{4}{3}\pi r^3$
Where r is the radius of the sphere.

6. Spherical Shell



The solid region between two hollow concentric spheres of different radius.
For example- a ping pong ball, football etc.

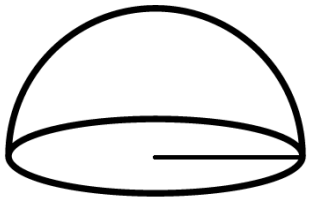
Surface area of shell:

$SA = 4\pi R^2$
Where R is the radius of the outer sphere.

Volume of solid part of shell:

$V = \frac{4}{3}\pi(R^3 - r^3)$
Where R is the radius of outer sphere and r is the radius of the inner sphere.

7. Hemisphere



When a plane slices a solid it into two equal parts, passing through the centre, then each part is called a hemisphere.
For example- a dome shaped roof of a building, ball sliced into equal parts etc.

Surface area of Hemisphere:

a) Curved surface area (CSA): $\text{CSA} = 2\pi r^2$

b) Total Surface area (TSA): $\text{TSA} = 3\pi r^2$

Where r is radius of the circular region.

Volume of hemisphere:

$$V = \frac{2}{3}\pi r^3$$

Where r is the radius of the hemisphere.