Mensuration

TALENT & OLYMPIAD

We are familiar with some of the basic solids like cuboid, cone, cylinder, and sphere. In this chapter we will discuss about how to find the surface area and volume of these figures in our daily life, we come across number of solids made up of combinations of two or more of the basic solids.

Surface Area of Solids

We may get the solids which may be combinations of cylinder and cone or cylinder and hemisphere or cone and hemisphere and so on. In such cases we find the surface area of each part separately and add them to get the surface area of entire solid.

Cylinder

If 'r' is the radius and 'h' is the height of the cylinder, then Curved surface area of the cylinder $= 2\pi rh$ Total surface area of the cylinder $= 27\pi r(r+h)$

Cone

If 'r' be the radius and 'h' be the height of the cone, then Curved surface area of the cone $= 2\pi r l$ Total surface area of the cone $= \pi r(r+l)$

Where, I is the slant height of the cone and is given by $1 = \sqrt{r^2 + h^2}$

Sphere

If 'r' be the radius of the sphere, then Surface area of the sphere $= 4\pi r^2$

Hemisphere

If 'r' be the radius of the hemisphere, then Curved surface area of the hemisphere $= 2\pi r^2$ Total Surface area of the hemisphere $= 3\pi r^2$

🕸 Volume of Solids

The volume of the combined figures is obtained by finding the volume of each part separately and then adding them together.

Cylinder

If 'r' be the radius and 'h' be the height of the cylinder, then Volume of the cylinder $=\pi r^2 h$

Cone

If 'r' be the radius and 'h' be the height of the cone, then

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

Sphere If 'r' be the radius of the sphere, then

Volume of the sphere $=\frac{4}{3}\pi r^3$

Hemisphere If 'r' be the radius of the hemisphere, then

Volume of the hemisphere $=\frac{2}{3}\pi r^3$

Self Evaluation



(a) $42.26m^2$											
	(b) $42.26m^2$										
 (c) 44.56m² (e) None of these 	(d) $36.96 m^2$										
A toy is made by surmounting a cone on a hemisphere of radius 2.1 cm and height of the entire toy is 18 cm Find the area of sheet required to make the toy.											
(a) $36.96 m^2$	(b) $64.562 \ cm^2$										
 (c) 133.32 cm² (e) None of these 	(d) $65.215 \ cm^2$										
A tent is made in such a cone whose radius is sartent. (a) $17.96 m^3$ (c) $18.48 m^3$ (e) None of these	ray that the radius of the base is 1.4 m and height is 3.5 m and is surmoute as the radius of cylindrical part and height 2.1 m. Find the volume of (b) 25.87 m^3 (d) 19.96 m^3	inted by a air in the									
Find the total surface area of the water tank constructed by digging the earth whose length, breadth, and height are 16 m, 14 m, and 12 m respectively.											
(a) 1168 m^2	(b) $1024 \ m^2$										
(c) 996 m^2	(d) 944 m^2										
 (e) None of these A tomb is constructed with parts is 5.6 metre and of the tomb. (a) 416.88 m² (c) 418.88 m² 	hose lower part is cylindrical and upper part is hemispherical. The radiu the height of the cylindrical part is 6.3 metre. Find the inner curved sur (b) $412.696 m^2$ (d) $512.68 m^2$	us of both rface area									
	(e) None of these A toy is made by surmoun Find the area of sheet requ (a) $36.96 m^2$ (c) $133.32 cm^2$ (e) None of these A tent is made in such a w cone whose radius is sam tent. (a) $17.96 m^3$ (c) $18.48 m^3$ (e) None of these Find the total surface area height are 16 m, 14 m, and (a) $1168 m^2$ (c) $996 m^2$ (e) None of these A tomb is constructed wh the parts is 5.6 metre and of the tomb. (a) $416.88 m^2$ (c) $418.88 m^2$	(e) None of these A toy is made by surmounting a cone on a hemisphere of radius 2.1 cm and height of the entire toy. (a) 36.96 m ² (b) 64.562 cm ² (c) 133.32 cm ² (d) 65.215 cm ² (e) None of these A tent is made in such a way that the radius of the base is 1.4 m and height is 3.5 m and is surmout cone whose radius is same as the radius of cylindrical part and height 2.1 m. Find the volume of tent. (a) 17.96 m ³ (b) 25.87 m ³ (c) 18.48 m ³ (d) 19.96 m ³ (e) None of these Find the total surface area of the water tank constructed by digging the earth whose length, bree height are 16 m, 14 m, and 12 m respectively. (a) 1168 m ² (b) 1024 m ² (c) 996 m ² (d) 944 m ² (e) None of these A tomb is constructed whose lower part is cylindrical and upper part is hemispherical. The radiu the parts is 5.6 metre and the height of the cylindrical part is 6.3 metre. Find the inner curved su of the tomb. (a) 416.88 m ² (b) 412.696 m ² (c) 418.88 m ² (d) 512.68 m ²									

6. A space ship is made in such a way that it is conical at one end, hemispherical at other end and cylindrical in middle. If the radius is 6 metre for each part while height of conical part is 2 metre and that of cylindrical part is 4 metre, then find the volume of space inside the space ship.

- (a) 745.59 m^3 (b) 760.25 m^3
- (c) 979.68 m^3 (d) 765.68 m^3
- (e) None of these
- 7. A shuttle cock has the shape of a frustum of a cone mounted on a hemisphere as shown in the figure given below. The entire surface area of the cock is:



- (a) $37.13 \ cm^2$ (b) $74.26 \ cm^2$ (c) $111.39 \ cm^2$ (d) $148.52 \ cm^2$
- (e) None of these
- 8. Mr. Robert purchased a toy for his son Michael. The toy is in the form of hemisphere at one end and in the form of cone at the other end and cylindrical in the middle. The radius and height of the cylindrical part are 5 cm and 13 cm respectively. The radius of hemispherical and conical part is same as that of cylindrical part. If the total length of the toy is 40 cm, then find its total surface area.
 - (a) $911.43 \ cm^2$ (b) $895.5 \ cm^2$ (c) $784.54 \ cm^2$ (d) $1022.56 \ cm^2$ (e) None of these



10. Find the curved surface area of a bucket whose slant height is 4 neter and circumference of its circular ends are 18 cm and 6 cm.

(a) 46 <i>cm</i> ²	(b) $44 \ cm^2$
(c) $48 \ cm^2$	(d) $42 \ cm^2$
(e) None of these	

	Answers – Self Evaluation Test																	
1.	D	2.	С	3.	В	4.	А	5.	С	6.	С	7.	В	8.	А	9.	С	10. C

Self Evaluation Test SOLUTIONS

- 1. Required area = curved surface area of cylinder $= 2\pi rh + \pi r^{2} = \pi (2h + r)$ $= \frac{22}{7} \times \frac{14}{10} (7 + 1.4)m^{2}$ $= 4.4 \times 8.4m^{2} = 36.96m^{2}$
- 2. Required area = 2(lb + bh + hi) = $2(16 \times 14 + 14 \times 12 + 12 \times 16)m^2$ = $2(224 + 168 + 192)m^2$ = $1168m^2$