# CBSE Test Paper 01
## Chapter 13 Surface Areas and Volumes

**1.** A cylindrical cone sharpened on both the edges is the combination of **(1)**

a. a frustum of a cone and a cylinder
b. two cones and a cylinder
c. a cone and a hemisphere
d. a hemisphere and a cylinder

**2.** A shoe box is a 15cm long, 10cm broad and 9cm high. The volume of the box is **(1)**

a. $1350 cu.cm$
b. $1500 cu.cm$
c. $1200 cu.cm$
d. $1000 cu.cm$

**3.** A plumbline is combination of **(1)**

a. a hemisphere and a cone
b. a hemisphere and a cylinder
c. a cone and a cylinder
d. a sphere and a cylinder

**4.** A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1cm and the height of the cone is equal to its radius. The volume of the solid is **(1)**

a. $\pi\ cm^3$
b. $4\pi\ cm^3$
c. $2\pi\ cm^3$
d. $3\pi\ cm^3$

**5.** The number of spherical balls each of radius 1cm can be made from a solid sphere of lead of radius 6cm is **(1)**

a. 576
b. 512
c. 216
d. 1024

**6.** Find the area of an equilateral triangle having each side of length 10 cm. [Take $\sqrt{3}$ = 1.732.] **(1)**

**7.** The largest cone is curved out from one face of solid cube of side 21 cm. Find the volume of the remaining solid. **(1)**

**8.** What is the ratio of the total surface area of the solid hemisphere to the square of its radius. **(1)**

**9.** A conical military tent having diameter of the base 24 m and slant height of the tent is 13 m, find the curved surface area of the cone. **(1)**

**10.** A cone and a sphere have equal radii and equal volume. What is the ratio of the diameter of the sphere to the height of cone? **(1)**

**11.** The circumference of the base of 10 m high conical tent is 44 m. Calculate the length of canvas used in making the tent if width of canvas is 2 m. **(2)**

**12.** Find the length of the hypotenuse of an isosceles right-angled triangle whose area is 200 $cm^2$. Also, find its perimeter. [Given, $\sqrt{2}$ = 1.41.] **(2)**

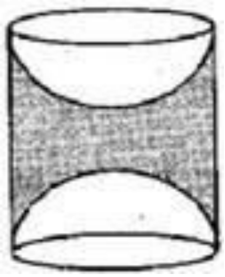
**13.** A 20 m deep well with diameter 7m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform. **(2)**

**14.** How many spherical lead shots of diameter 4 cm can be made out of a solid cube of lead whose edge measures 44 cm? **(3)**

**15.** In a village, a well with 10 m inside diameter, is dug 14 m deep. Earth taken out of it is spread all around to a width of 5 m to form an embankment. Find the height of the embankment. **(3)**

16. From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the

remaining solid to the nearest cm $^2$. **(3)**



**17.** Two cubes each of volume 64 cm$^3$ are joined end to end. Find the surface area and volume of the resulting cuboid. **(3)**

**18.** Water is being pumped out through a circular pipe whose internal diameter is 7 cm. If the flow of water is 72 cm per second, how many litres of water are being pumped out in one hour? **(4)**

**19.** An iron pillar has some part in the form of a right circular cylinder and remaining in the form of a right circular cone. The radius of the base of each of cone and cylinder is 8 cm. The cylindrical part is 240 cm high and the conical part is 36 cm high. Find the weight of the pillar if one cubic cm of iron weighs 7.8 grams. **(4)**

**20.** A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the volume and total surface area of the solid (Use $\pi$ = 22/7). **(4)**

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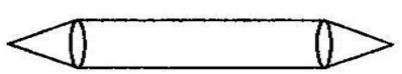
**Solution**

1. b. two cones and a cylinder

   **Explanation:** A cylindrical cone sharpened on both the edges is the combination of two cones and a cylinder.



2. a. $1350 cu.cm$

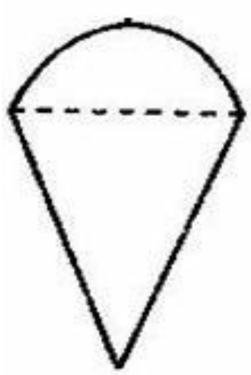
   **Explanation:** Volume of cuboid = $l \times b \times h$

   $\Rightarrow$ Volume of cuboid = $15 \times 10 \times 9$

   = 1350 cu. cm

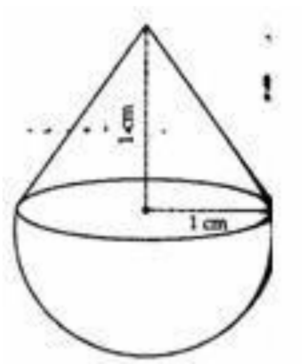
3. a. a hemisphere and a cone

   **Explanation:** A plumbline is a combination of a hemisphere and a cone



4. a. $\pi\ cm^3$

   Explanation:




   Radii of cone = r = 1 cm

   Radius of hemisphere = r = 1 cm (h) = 1cm

   Height of cone $(h) = 1$ h =1 cm

Volume of solid = Volume of cone + Volume of a hemisphere

= $\frac{1}{3}\pi r^2 h+\frac{2}{3}\pi r^3$ = $\frac{1}{3}\pi r^2(h+2r)$

= $\frac{1}{3}\times\pi\times(1)^2(1+2\times 1)$

= $\frac{1}{3}\times\pi\times 3$ = $\pi$ cm$^3$

5. c. 216

**Explanation:** Let the radius of the smaller sphere be $r$ cm and the radius of the bigger sphere is R cm.

Then according to question,

No. of spherical balls = $\frac{\text{Volume of a solid sphere}}{\text{Volume of a spherical ball}}=\frac{\frac{4}{3}\pi \mathrm{R}^3}{\frac{4}{3}\pi r^3}$

= $\frac{\mathrm{R}^3}{r^3}$

= $\frac{6^3}{1^3}$ = 216

6. Area of equilateral triangle = $\frac{\sqrt{3}}{4}\times$ side $^2$

= $\frac{\sqrt{3}}{4}\times 10^2$

= $\frac{\sqrt{3}}{4}\times 100$

=1.732 $\times$ 25

=43.3 cm$^2$

7. Volume of the remaining solid

= Volume of the cube - Volume of the cone

$=(\text{ side })^3-\frac{1}{3}\pi r^2 h$

$=(21)^3-\frac{1}{3}\times\frac{22}{7}\times(10.5)^2\times 21$

= 9261 - 2425,5

= 6835.5 cm$^3$

Hence, volume of the remaining solid is 6835.5 cm$^3$.

8. Let radius of the sphere = r

Ratio = $\frac{\text{Total surface area of hemisphere}}{\text{Square of its radius}}=\frac{3\pi r^2}{r^2}=\frac{3\pi}{1}$

$\therefore$ Total surface area of hemisphere : Square of radius = $3\pi$ :1

9. Diameter of the tent = 24 m

Therefore, radius = 12 m

Curved Surface area = $\pi rl = \frac{22}{7} \times 12 \times 13 = \frac{3432}{7}$ $m^2$

10. Let the radius of both sphere & cone be r.

Let the height of the cone be h.

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

and volume of cone = $\frac{1}{3}\pi r^2 h$

ATQ, $\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$ (given, volumes are equal)

Or, 4r = h

So, Height of cone = 4r

Diameter of sphere = 2r

diameter of sphere : height of cone = 2r : h = 2r : 4r = 1 : 2

11. Circumference of the base = 44 m $\Rightarrow 2\pi r = 44\text{m} \Rightarrow r = 7\text{m}$ h = 10 cm

l = $\sqrt{r^2 \quad h^2} = \sqrt{7^2 \quad 10^2} = \sqrt{49 + 100} = \sqrt{149} +$ $+$ m

Area of canvas required = $\pi rl = \frac{22}{7} \times 7 \times \sqrt{149}\text{m}^2$ = $22\sqrt{149}$ $m^2$

Length of canvas required = $\frac{\text{area of canvas}}{\text{width of canvas}} = \frac{22\sqrt{149}}{2}\text{m} = 11\sqrt{149}\text{m}$

= 11 $\times$ 12.206 m = 134.27

12. Let each equal side be a cm in length.

Then,

$\frac{1}{2} \times a \times a = 200 \Rightarrow$ a = 20 cm

Hypotenuse (h) = $\sqrt{a^2 + a^2}\text{cm}$

= a$\sqrt{2}$ cm = 20$\sqrt{2}$ cm

$= (20 \times 1.414)\text{cm} = 28.28\text{cm}$

$\therefore$ Perimeter of the triangle = (2a + h) cm

= $(2 \times 20 + 28.28)\text{cm}$ = 68.28 cm

13. For well Diameter = 7 m

$\therefore$ Radius (r) = $\frac{7}{2}\text{m}$

Depth (h) = 20 m

$\therefore$ Volume = $\pi r^2 h = \pi\left(\frac{7}{2}\right)^2(20)$

$= 245\pi\text{cm}^3$

For platform Length (L) = 22 m

Breadth (B) = 14 m

Let the height of the platform be Hm.

Then, volume of the platform

$= LBH = 22 \times 14 \times H = 308\text{Hm}^3$

According to the question,

308H = $245\pi$

$\Rightarrow H = \frac{245\pi}{308} \Rightarrow H = \frac{245\times22}{308\times7} \Rightarrow H = 2.5$

Hence, the height of the platform is 2.5 m.

14. We have to find the number of spherical lead shots of diameter 4 cm can be made out of a solid cube of lead whose edge measures 44 cm.

Let n spherical shots can be made.

| Cube | Spherical lead shots |
|---|---|
| a = 44 cm | r = $\frac{4}{2}$ = 2 cm |

∵Solid cube is recasted into n spherical lead shots.

∴ Vol. of n spherical lead shots = Vol. of cube

$\Rightarrow n \cdot \frac{4}{3}\pi r^3 = a^3$

$\Rightarrow n \times \frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2$ = 44 × 44 × 44

⇒ n = $\frac{44\times44\times44\times3\times7}{4\times22\times2\times2\times2}$ = 121 × 21

⇒ n = 2541

Hence, the number of lead shots are 2541.

15. Given the diameter = 10 m

So, the radius of the well = 5 m

Height of the well = 14 m

Width of the embankment = 5m

Therefore, radius of the embankment = 5 + 5 =10 m

Let h' be the height of the embankment,

Hence, the volume of the embankment = Volume of the well

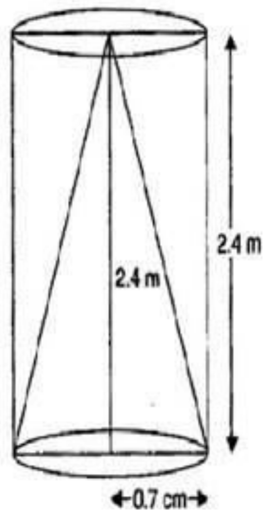
That is, $\pi(R - r)^2h' = \pi r^2 h$

$\Rightarrow (10^2 - 5^2) \times h' = 5^2 \times 14$

$\Rightarrow (100 - 25) \times h' = 25 \times 14$

$\Rightarrow h' = \frac{25\times14}{75} = \frac{14}{3}$

Therefore, h' = 4.67 cm approximately.

16. 


Diameter of the solid cylinder = 1.4 cm

∴ Radius of the solid cylinder = 0.7 cm

∴ Radius of the base of the conical cavity = 0.7 cm

Height of the solid cylinder = 2.4 cm

∴ Height of the conical cavity = 2.4 cm

∴ Slant height of the conical cavity = $\sqrt{(0.7)^2 + (2.4)^2} = \sqrt{0.49 + 5.76}$

$= \sqrt{6.25}$ = 2.5 cm

∴ TSA of remaining solid

= $2\pi(0.7)(2.4) + \pi(0.7)^2 + \pi(0.7)(2.5)$

= $3.36\pi + 0.49\pi + 1.75\pi$

= $5.6\pi$

= $5.6 \times \frac{22}{7}$

= 17.6 $cm^2$ = 18 $cm^2$ (to the nearest $cm^2$)

17. Two cubes each of volume 64 $cm^3$ are joined end to end. We have to find the surface area and volume of the resulting cuboid.

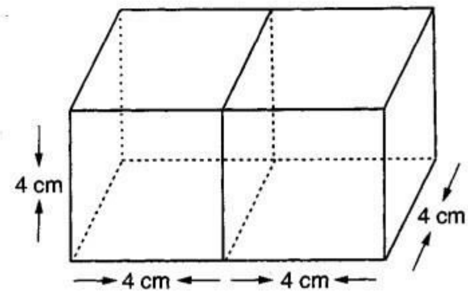
Let the length of each edge of the cube of volume 64 $cm^3$ be x cm. Then,

Volume = 64 $cm^3$

$\Rightarrow x^3 = 64$

$\Rightarrow x^3 = 4^3$

$\Rightarrow$ x = 4 cm




The dimensions of the cuboid so formed are:

L = Length = (4 + 4) cm = 8 cm, b = Breadth = 4 cm and, h = Height = 4 cm

Surface area of the cuboid = 2 (lb + bh + lh)

= 2 $(8 \times 4 + 4 \times 4 + 8 \times 4)\text{cm}^2$ = 160 $\text{cm}^2$

Volume of the cuboid = lbh = $8 \times 4 \times 4\text{cm}^3$ = 128 $\text{cm}^3$

18. We have, Radius of the circular pipe = $\frac{7}{2}$ cm

Clearly, water column forms a cylinder of radius $\frac{7}{2}$ cm. It is given that the water flows out at the rate of 72 cm/sec.

∴Length of the water column flowing out in one second = 72 cm.

Volume of the water flowing out per second

= Volume of the cylinder of radius $\frac{7}{2}$ cm and length 72 cm.

$= \pi \times \left(\frac{7}{2}\right)^2 \times 72\text{cm}^3 = \pi \times \frac{7}{2} \times \frac{7}{2} \times 72\text{cm}^3 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 72\text{cm}^3$ = 2772$\text{cm}^3$

∴We know,

1 litre = 1000$\text{cm}^3$

Now, volume of water in one hour = volume of water per second × 1hour

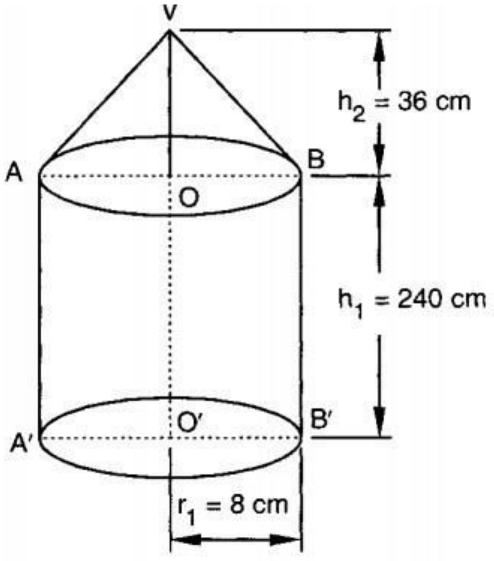
= 2.772 × 3600 litres [ 1 hour= 3600 sec ]

= 9979.2 litres

19. Let us suppose that $r_1$ cm and $r_2$ cm denote the radii of the base of the cylinder and cone respectively. Then,

$r_1 = r_2 = 8$ cm

Let us suppose that $h_1$ and $h_2$ cm be the heights of the cylinder and the cone respectively. Then,




$h_1$ = 240 cm and $h_2$ = 36 cm

∴ Volume of the cylinder = $\pi r_1^2 h_1 \mathrm{cm}^3$

$= (\pi \times 8 \times 8 \times 240)\mathrm{cm}^3$

$= (\pi \times 64 \times 240)\mathrm{cm}^3$

Now, Volume of the cone = $\frac{1}{3}\pi r_2^2 h_2 \mathrm{cm}^3$

$= \left(\frac{1}{3}\pi \times 8 \times 8 \times 36\right) \mathrm{cm}^3$

$= \left(\frac{1}{3}\pi \times 64 \times 36\right) \mathrm{cm}^3$

∴ Total volume of the iron = Volume of the cylinder + Volume of the cone

$= \left(\pi \times 64 \times 240 + \frac{1}{3}\pi \times 64 \times 36\right) \mathrm{cm}^3$

$= \pi \times 64 \times (240 + 12)\mathrm{cm}^3$

$= \frac{22}{7} \times 64 \times 252\mathrm{cm}^3 = 22 \times 64 \times 36\mathrm{cm}^3$

Total weight of the pillar =Volume $\times$Weight per $\mathrm{cm}^3$

$= (22 \times 64 \times 36) \times 7.8\mathrm{gms}$

= 395366.4 gms = 395.3664 kg

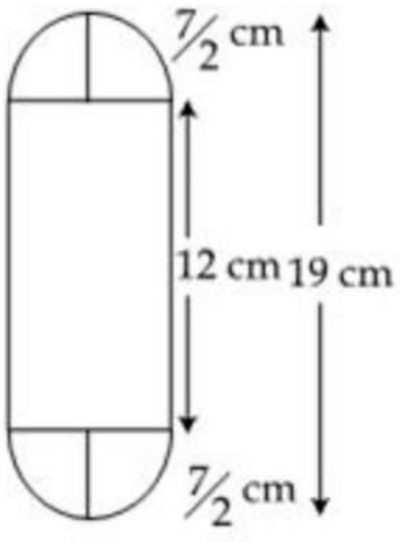
20. Diameter of the cylinder = 7 cm

Therefore radius of the cylinder = $\frac{7}{2} cm$

Total height of the solid = 19 cm

Therefore, Height of the cylinder portion = 19 - 7 = 12 cm

Also, radius of hemisphere = $\frac{7}{2}$ cm




Let V be the volume and S be the surface area of the solid. Then,

V = Volume of the cylinder + Volume of two hemispheres

$\Rightarrow \quad V = \left\{\pi r^2 h + 2\left(\frac{2}{3}\pi r^3\right)\right\} \mathrm{cm}^3$

$\Rightarrow \quad V = \pi r^2\left(h + \frac{4r}{3}\right) \mathrm{cm}^3$

$\Rightarrow \quad V = \left\{\frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times \left(12 + \frac{4}{3} \times \frac{7}{2}\right)\right\} \mathrm{cm}^3$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{50}{3} \mathrm{cm}^3 = 641.66 \mathrm{cm}^3$

and,

S = Curved surface area of cylinder + Surface area of two hemispheres

$\Rightarrow \quad S = \left(2\pi rh + 2 \times 2\pi r^2\right) \mathrm{cm}^2$

$\Rightarrow \quad S = 2\pi r(h + 2r) \mathrm{cm}^2$

$\Rightarrow \quad S = 2 \times \frac{22}{7} \times \frac{7}{2} \times \left(12 + 2 \times \frac{7}{2}\right) \mathrm{cm}^2$

$= \left(2 \times \frac{22}{7} \times \frac{7}{2} \times 19\right) \mathrm{cm}^2$

= 418 $\mathrm{cm}^2$