Surface Areas and Volumes

CHAPTER 13

TRY YOURSELF SOLUTIONS

1. We have, radius (r) of base of cylindrical part = radius (r) of base of conical part = 14 m
Height (h) of cylindrical part = 5 m
Height (h_1) of conical part = 15.5 – 5 = 10.5 m

Slant height (l) of conical part = $\sqrt{r^2+h_1^2}$

$=\sqrt{(14)^2+(10.5)^2} = \sqrt{196+110.25} = \sqrt{306.25} = 17.5\text{m}$

Total area to be painted = curved surface area of cylindrical part + curved surface area of conical part

$= 2\pi rh + \pi rl = \pi r[2h + l] = \frac{22}{7}\times 14[2\times 5+17.5]$

= 44[10 + 17.5] = 44 × 27.5 = 1210 m^2

Hence, cost of painting the tent = ₹(1210 × 75) = ₹ 90750

2. Total surface area of cube = 6(side)^2
= 6 × 6 × 6 = 216 cm^2

Radius of hemisphere, r = 3.5/2 cm

Base area of hemisphere = $\pi r^2 = \frac{22}{7}\times\frac{3.5}{2}\times\frac{3.5}{2}$

$= 11 \times 0.5 \times \frac{3.5}{2} = 9.625\ cm^2$

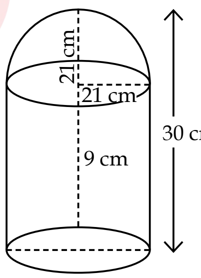
Curved surface area of hemisphere = $2\pi r^2$

$= 2\times\frac{22}{7}\times\left(\frac{3.5}{2}\right)^2 = 11\times 0.5\times 3.5 = 19.25\,cm^2$

∴ Total surface area of block = Total surface area of cube – Base area of hemisphere + Curved surface area of hemisphere
= 216 – 9.625 + 19.25 = 225.625 cm^2

3. Radius (r) of cylinder = Radius (r) of hemisphere

$= \frac{42}{2} = 21$ cm



Height of cylinder (h)
= 30 – 21 = 9 cm

Inner surface area of the vessel = Curved surface area of cylinder + curved surface area of hemisphere

$= 2\pi rh + 2\pi r^2 = 2\pi r(h + r)$

$= 2\times\frac{22}{7}\times 21\times(9+21) = 44\times 3\times 30 = 3960\,cm^2$

4. Curved surface area of the hemispherical part of radius $r = 2\pi r^2$ sq. units.

Radius of conical part = $\frac{1}{2}r$ and its slant height = l

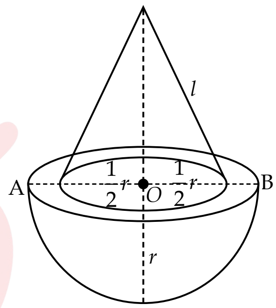
Curved surface area of the conical part

$= \pi\times\frac{1}{2}r\times l = \frac{\pi}{2}rl$ sq.units

Area of the exposed upper base of the hemisphere

$= \pi\left[r^2-\left(\frac{1}{2}r\right)^2\right] = \pi\left[r^2-\frac{1}{4}r^2\right]$

$= \frac{3}{4}\pi r^2$ sq.units.

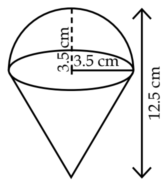


Total surface area of the solid = Curved surface area of hemispherical part + Area of exposed upper base of hemisphere + Curved surface area of conical part.

$= 2\pi r^2 + \frac{3}{4}\pi r^2 + \frac{\pi}{2}rl = \frac{8\pi r^2+3\pi r^2}{4} + \frac{\pi}{2}rl$

$= \frac{11\pi}{4}r^2 + \frac{\pi}{2}rl = \frac{\pi}{4}(11r+2l)r$ sq.units

5. Radius of hemispherical part (r)
= Radius of conical part (r) = 3.5 cm
Height of conical part (h) = 12.5 – 3.5 = 9 cm
Volume of ice-cream in the cone = Volume of conical part + Volume of hemispherical part

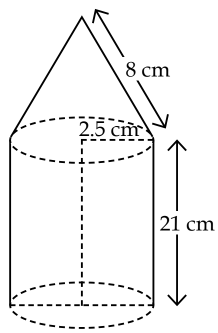


$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3 = \frac{1}{3}\pi r^2[h+2r]$

$= \frac{1}{3}\times\frac{22}{7}\times(3.5)^2[9+2(3.5)]$

$= \frac{1}{3}\times\frac{22}{7}\times 12.25\times 16 = \frac{4312}{21} = 205.33\ cm^3$

6. For cylindrical part;
Radius (r) = 2.5 cm
and height (h) = 21 cm



∴ Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7}\times 2.5\times 2.5\times 21$

= 412.5 cm^3

For conical part;
Radius (r) = 2.5 cm
Slant height (l) = 8 cm

∴ Height (h_1) = $\sqrt{l^2-r^2} = \sqrt{(8)^2-(2.5)^2}$

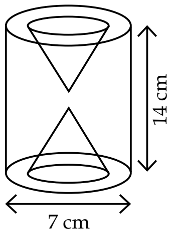
$= \sqrt{64-6.25} = \sqrt{57.75} = 7.6$ cm (Approx.)

∴ Volume of cone $= \frac{1}{3}\pi r^2 h_1 = \frac{1}{3}\times\frac{22}{7}\times 2.5\times 2.5\times 7.6$

= 1045/21 = 49.76 cm^3

$\therefore$ Volume of rocket = Volume of cylindrical part + Volume of conical part = 412.5 + 49.76 = 462.26 cm^3

7. We have, radius of cylinder (r) = 7/2 cm



Height of cylinder (h) = 14 cm

Radius of both cones, (r_1) = 2.1 cm

Height of both cones, (h_1) = 4 cm

Volume of the remaining solid

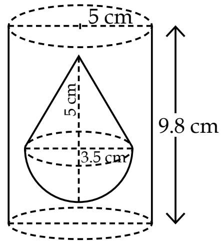
= Volume of cylinder – 2 × Volume of cone

$= \pi r^2 h - 2 \times \frac{1}{3}\pi r_1^2 h_1$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14 - \frac{2}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 4$

= 539 – 36.96 = 502.04 cm^3

8. Radius of cylinder (r) = 5 cm



Height of cylinder (h) = 9.8 cm

Volume of cylinder when it is full of water = $\pi r^2 h$

$= \pi(5)^2 \times 9.8 = 245\pi$ cm^3

Now, radius of cone (r_1)

= radius of hemisphere (r_1) = 3.5 cm

Height of cone (h_1) = 5 cm

Volume of water displaced = Volume of the solid = Volume of cone + volume of hemisphere

$= \frac{1}{3}\pi r_1^2 h_1 + \frac{2}{3}\pi r_1^3 = \frac{1}{3}\pi r_1^2 [h_1 + 2r_1]$

$= \frac{1}{3}\pi(3.5)^2[5 + 2(3.5)] = \frac{1}{3}\pi(12.25)[12] = 49\pi$ cm^3

Volume of water left in the tub = Volume of cylinder when it is full of water – Volume of water displaced

$= 245\pi - 49\pi = 196\pi = 196 \times \frac{22}{7} = 616\,\text{cm}^3$