Surface Areas and Volumes Ex.16.3 Q10

Answer :

Let the depth of the frustum cone like reservoir is h m. The radii of the top and bottom circles of the frustum cone like reservoir are r_1 =100m and r_2 =50m respectively.

The volume of the reservoir is

$$V=\frac{1}{3}\pi(r_1^2+r_1r_2+r_2^2)\times h$$
$$=\frac{1}{3}\pi(100^2+100\times 50+50^2)\times h$$
$$=\frac{1}{3}\times\frac{22}{7}\times 17500\times h$$
$$=\frac{1}{3}\times 22\times 2500\times h \text{ cm}^3$$
$$=\frac{1}{3}\times 22\times 2500\times h\times 10^6 \text{ m}^3$$
$$=\frac{1}{3}\times 22\times 2500\times h\times 10^3 \text{ litres}$$

Given that the volume of the reservoir is 44×10^7 litres. Thus, we have

$$\frac{1}{3}\times 22\times 2500\times h\times 10^3=44\times 10^7$$
$$\Rightarrow h=\frac{3\times 44\times 10^7}{22\times 2500\times 10^3}$$
$$\Rightarrow h=24$$

Hence, the depth of water in the reservoir is $\boxed{24\text{ m}}$

The slant height of the reservoir is

$$l=\sqrt{(r_1-r_2)^2+h^2}$$
$$=\sqrt{(100-50)^2+24^2}$$
$$=\sqrt{3076}$$
$$=55.46169 \text{ meter}$$

The lateral surface area of the reservoir is

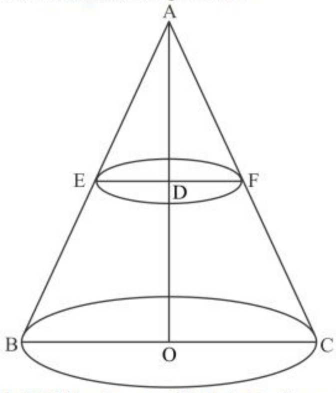
$$S_1=\pi(r_1+r_2)\times l$$
$$=\pi\times(100+50)\times 55.46169$$
$$=\pi\times 150\times 55.46169$$
$$=26145.225 \text{ m}^2$$

Hence, the lateral surface area is $\boxed{26145.225\text{ m}^2}$

Surface Areas and Volumes Ex.16.3 Q11

Answer :

We have the following situation



Let ABC be the cone. The height of the metallic cone is AO=20cm. The cone is cut into two parts at the middle point of its axis. Hence, the height of the frustum cone is AD=10cm. Since, the angle A is right angled, so each of the angles B and C are 45 degrees. Also, the angles E and F each are equal to 45 degrees. Let the radii of the top and bottom circles of the frustum cone are r_1 cm and r_2 cm respectively.

From the triangle ADE, we have

$$\frac{DE}{AD} = \cot 45^\circ$$

$$\Rightarrow \frac{r_1}{10} = 1$$

$$\Rightarrow \quad r_1 = 10 \text{ cm}$$

From the triangle AOB, we have

$$\frac{OB}{OA} = \cot 45^\circ$$

$$\Rightarrow \frac{r_2}{20} = 1$$

$$\Rightarrow \quad r_2 = 20 \text{ cm}$$

The volume of the frustum cone is

$$V = \frac{1}{3}\pi(r_1^2 + r_1 r_2 + r_2^2) \times h$$

$$= \frac{1}{3}\pi(10^2 + 10 \times 20 + 20^2) \times 10$$

$$= \frac{1}{3} \times \frac{22}{7} \times 700 \times 10$$

$$= \frac{22000}{3} \text{ cm}^3$$

The radius of the wire is $\frac{1}{32}$ cm. Let the length of the wire be l cm. Then, the volume of the wire is

$$V_1 = \pi\left(\frac{1}{32}\right)^2 \times l \text{ cm}^3$$

Since, the frustum is drawn in the wire, their volumes must be equal. Hence, we have

$$V_1 = V$$

$$\Rightarrow \pi\left(\frac{1}{32}\right)^2 \times l = \frac{22000}{3}$$

$$\Rightarrow \quad l = \frac{22000 \times (32)^2 \times 7}{3 \times 22}$$

$$\Rightarrow \quad l = \frac{1000 \times (32)^2 \times 7}{3}$$

$$\Rightarrow \quad l = 2389333.33 \text{ cm}$$

$$\Rightarrow \quad l = 23893.33 \text{ m}$$

Hence, the length of the wire is 23893.33 m.

*********** END **********