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 $r_1 = 100$m and $r_2 = 50$m respectively.

The volume of the reservoir is

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

$$= \frac{1}{3}\pi(100^2 + 100 \times 50 + 50^2) \times h$$

$$= \frac{1}{3} \times \frac{22}{7} \times 17500 \times h$$

$$= \frac{1}{3} \times 22 \times 2500 \times h \text{ cm}^3$$

$$= \frac{1}{3} \times 22 \times 2500 \times h \times 10^6 \text{ m}^3$$

$$= \frac{1}{3} \times 22 \times 2500 \times h \times 10^3 \text{ litres}$$

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

$$l = \sqrt{(r_1 - r_2)^2 + h^2}$$

$$= \sqrt{(100 - 50)^2 + 24^2}$$

$$= \sqrt{3076}$$

$$= 55.46169 \text{ meter}$$
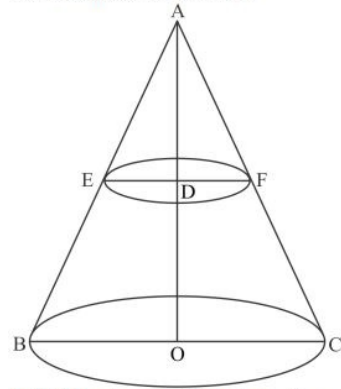
The lateral surface area of the reservoir is

$$S_1 = \pi(r_1 + r_2) \times l$$

$$= \pi \times (100 + 50) \times 55.46169$$

$$= \pi \times 150 \times 55.46169$$

$$= 26145.225 \text{ m}^2$$

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

$$\frac{DE}{AD} = \cot 45°$$

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

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

From the triangle AOB, we have

$$\frac{OB}{OA} = \cot 45°$$

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

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

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

$$V_1 = V$$

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

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

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

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

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

Hence, the length of the wire is 23893.33 m.

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