Surface Areas and Volumes Ex.16.1 Q1

Answer :

We are given a solid sphere with radius $R = 8$ cm.
From this sphere we have to make spherical balls of radius $r = 1$ cm.
Let the no. of balls that can be formed be n.
We know,
Volume of a sphere $= \frac{4}{3}\pi r^3$.
So, volume of the bigger solid sphere $= \frac{4}{3}\pi (8)^3$ ..... (a)
Volume of one smaller spherical ball $= \frac{4}{3}\pi (1)^3$ ..... (b)
We know, the volume of the solid sphere should be equal to the sum of the volumes of the n spherical balls formed.
So, using (a) and (b), we get,

$$\Rightarrow n \times \frac{4}{3}\pi (1)^3 = \frac{4}{3}\pi (8)^3$$

$$\Rightarrow n \times \frac{4}{\cancel{3}}\cancel{\pi} (1)^3 = \frac{4}{\cancel{3}}\cancel{\pi} (8)^3$$

Therefore, $n = (8)^3$

$$n = 512$$

Hence, the no. of balls of radius $r = 1$ that can be formed out of solid sphere of radius $R = 8$ is 512.

Surface Areas and Volumes Ex.16.1 Q2

Answer :

We are given a metallic block of dimension $= 11 \text{ dm} \times 1 \text{ m} \times 5 \text{ dm}$
We know that, $1 \text{ dm} = 10^{-1} \text{m}$
So, the volume of the given metallic block is

$$= 11 \times 10^{-1} \times 1 \times 5 \times 10^{-1}$$

$$= 55 \times 10^{-2} \text{ m}^3$$

We want to know how many spherical bullets can be formed from this volume of the metallic block. It is given that the diameter of each bullet should be 5 cm.
We know,
Volume of a sphere $= \frac{4}{3}\pi (r)^3$
Here, $r = 25 \times 10^{-3}$ m
Let the no. of bullets formed be n.
We know that the sum of the volumes of the bullets formed should be equal to the volume of the metallic block.

$$\Rightarrow 55 \times 10^{-2} = n \times \frac{4}{3} \times \frac{22}{7} \times \left(25 \times 10^{-3}\right)^3$$

$$n = \frac{55 \times 3 \times 7 \times 10^{-2}}{4 \times 22 \times 25 \times 25 \times 25 \times 10^{-9}}$$

$$= \frac{21 \times 10^7}{(2 \times 5)^3 \times 25}$$

$$= \frac{21 \times 10^7}{10^3 \times 25}$$

$$= 8400$$

Hence the no. of bullets that can be formed is 8400.

Surface Areas and Volumes Ex.16.1 Q3

Answer :

We have one spherical ball of radius 3 cm

So, its volume $= \frac{4}{3}\pi(3)^3$ ..... (a)

It is melted and made into 3 balls.

The first ball has radius 1.5 cm

So, its volume $= \frac{4}{3}\pi(1.5)^3$ ..... (b)

The second ball has radius 2 cm

So, its volume $= \frac{4}{3}\pi(2)^3$ ..... (c)

We have to find the radius of the third ball.

Let the radius of the third ball be r

The volume of this third ball $= \frac{4}{3}\pi(r)^3$ ..... (d)

We know that the sum of the volumes of the 3 balls formed should be equal to the volume of the given spherical ball.

Using equations (a), (b), (c) and (d)

$$\frac{4}{3}\pi(r)^3 + \frac{4}{3}\pi(1.5)^3 + \frac{4}{3}\pi(2)^3 = \frac{4}{3}\pi(3)^3$$

$$\Rightarrow (r)^3 + (1.5)^3 + (2)^3 = (3)^3$$

$$r^3 = 27 - 8 - \frac{27}{8}$$

$$r^3 = \frac{7 \times 27 - 64}{8}$$

$$r^3 = \frac{125}{8}$$

$$\Rightarrow r = \frac{5}{2} = 2.5 \text{ cm}$$

Hence the diameter of the third ball should be 5 cm

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