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 $= \dfrac{4}{3}\pi r^3$.

So, volume of the bigger solid sphere $= \dfrac{4}{3}\pi(8)^3$ ...... (a)

Volume of one smaller spherical ball $= \dfrac{4}{3}\pi(1)^3$ ...... (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,

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

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

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 $= \dfrac{4}{3}\pi(r)^3$

Here, $r = 25 \times 10^{-3}\ \text{m}$

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 $= \dfrac{4}{3}\pi(3)^3$ ...... (a)

It is melted and made into 3 balls.

The first ball has radius 1.5 cm

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

The second ball has radius 2 cm

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

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

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

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

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

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

$\Rightarrow r = \dfrac{5}{2} = 2.5$ cm

Hence the diameter of the third ball should be 5 cm