SURFACE AREA AND VOLUME

LEVEL (1)

1. Two cubes each with 12cm. edge are joined end to end. Find the surface area of the resulting cuboid.

2. Three cubes of metal whose edges are 3cm., 4cm. and 5cm. are melted and formed into a single cube. Find its edge.

3. Find the curved surface area of a right circular cylinder of height 13.5 cm. and radius of whose base is 7 cm.

4.The radii of end of frustum of a cone 40 cm high are 20 cm and 11 cm. Find its slant height.

SOLUTIONS

1. Length of resulting cuboid = 12+12 =24cm.

Breadth= 12cm. Height = 12cm

S.A. of resulting cuboid = 2(lb+bh+hl)

=2(288+144+288)

=2 x 720

=1440 cm.^{2}

2. Volume of new cube= Volume of 3 cubes

= 3^3+ 4^3 +5^3

=27+64+125

=216 cm.^{3}

Side of new cube = $\sqrt[3]{216}$

= 6 cm.

3. height of cylinder (h)=13.5 cm.

Radius of base (r) = 7 cm.

C.S.A of cylinder = 2πrh

=2 x 22/7 x 7 13.5

= 704 cm.

4. The radii of end of frustum of a cone 40 cm high are 20 cm and 11 cm. Find its slant height.

Solution: l= $\sqrt{h2 + (r1 - r2)2}$

$= \sqrt{1600 + 81}$ =$\sqrt{1681}$

=41 cm

LEVEL(2)

1. A solid sphere of radius 12cm. is melted and recast into spherical balls of radius 1 cm. Find the number of balls made?

2. The material of a cone is converted into the shape of a cylinder of equal radius. If the height of a cylinder is 5cm. , find the height of a cone.

3. A cone, a hemisphere and a cylinder stand on equal bases and have the same heights. Show that their volumes are in the ratio 1:2:3.

4. Volume of two spheres are in the ratio 64:27. Find the ratio of their surface areas.

SOLUTIONS

1. Vol. of sphere = 4/3 π x 12^3

Vol. of spherical ball = 4/3 π x 1^3

Let n is the no. of balls

n x 4/3 π x 1^3 = 4/3 π x 12^3

n = 1728 balls

2. 1/3 πr^2h = π r^2 H

h = 3H

= 3 x 5 =15cm.

3. 1/3 π x 8^2 x h : 2/3 π x r^3: π x r^2 x h

1/3 h : 2/3 r : h

1/3 h : 2/3 h : h (r=h)

1 : 2 : 3

4. Let radius of two spheres are r and R

$\frac{\frac{4}{3}\pi R^3}{\frac{4}{3}\pi r^3} = \frac{64}{27}$

$\frac{R^3}{r^3} = \frac{64}{27}$

$\frac{R}{r} = \frac{4}{3}$

$R = \frac{4}{3}r$

Surface area of sphere with radius R = $4\pi R^2$

Surface area of sphere with radius r = $4\pi r^2$

$\frac{4\pi R^2}{4\pi r^2}$ = 16 : 9

LEVEL(3)

1. A solid hemispherical at the bottom and conical above it. If the surface area of the two parts are equal, find the ratio of its radius and the height of conical part.

2.Two identical cubes each have volume 64 cm^3 are joined together end to end. What is the surface area of the resulting cuboid?

3. How many spherical lead shots of diameter 4 cm can be made out of a solid cube of lead whose edge measure 44 cm.

4. A heap of rice is in the form of a cone of diameter 9 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap?

SOLUTIONS

1. Let h is the height of cone

$\pi rl = 2\ \pi r^2$

$\sqrt{(h^2+r^2)} = 2r$

$r/h = 1: \sqrt{3}$

2. Volume of cube first = 64 cm^3

Side of cube first a= $\sqrt[3]{64}$ = a= 4 cm

Volume of cube second = b= $\sqrt[3]{64}$ = b= 4 cm

Length of resultant cuboid l = a+b= 4+4 = 8 cm

Breadth of resultant cuboid b= 4 cm

Height of resultant cuboid h = 4 cm

Surface area of cuboid = 2(lb+bh++hl)

= 2(8×4+4×4+4×8)

=2(32+16=32)

= 2(80)

= 160 cm^2

3. Length of cube = a = 44 cm

Volume of cube = a^3 = $(44)^3$ →1

Diameter of spherical lead slot d =4 cm

Diameter of spherical lead slot r = 2 cm

Volume of 1 slot = $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (2)^3$

Volume of 1 slot =$\frac{4}{3} * \frac{22}{7}$ *8 ⟶ 2

No. of lead slots = Volume of cube/ volume of 1 spherical slot

$(44)^3 / \frac{4}{3} * \frac{22}{7}$ *8 = $44 * 44 * 44 * 7 * 3$ /4 *22*8

= 2541

4. Diameter of cone d = 9 m

Radius of cone r = $\frac{9}{2}\ m$

Height of cone h = 3.5 m

Volume of rice = $\frac{1}{3}\pi r^2$h

$\frac{1}{3} * \frac{22}{7} * \left(\frac{9}{2}\right)^2$ *3.5

$$\frac{1}{3} * \frac{22}{7} * \frac{9}{2} * \frac{9}{2} * \frac{35}{10}$$

Volume of rice = 74.25 cm^3

L = $\sqrt{r^2 + h^2}$ = $\sqrt{(4.5)^2+(3.5)^2}$ = $\sqrt{20.25 + 12.25}$ = $\sqrt{32.25}$

Areas of convas required to cover heap = Lateral S.A of Cone =πrl

$\frac{22}{7} * \frac{9}{2} * 56.7$ =89.1 m^2

LEVEL(4)

1. A Sphere of diameter 12 cm. is dropped into a cylindrical vessel partly filled with water. The diameter if the vessel is 16cm. if the sphere is completely submerged , then the water level rises by what height

2. A sphere of radius 10.5 cm. is melted and then recast into smaller cones of radius 3.5 cm. and height 3 cm. Find the no. of cone.

3. How many shots each having diameter 3 cm can be made from a cuboidal lead solid of dimensions 9 cm x11 cm x 12 cm?

4.A hemispherical bowl of internal radius 9 cm is full of liquid. The liquid is to be filled into cylindrical shaped bottles each of radius 1.5 cm and height 4 cm. How many bottles are needed to empty the bowl?

SOLUTIONS

1. Radius of sphere (r) =12/2 =6cm.

Vol. of sphere $= 4/3\ \pi r^3$

$=4/3\ \pi x\ 6^3$

$=288\pi$ cm.^{3}

Radius of cylindrical vessel = 16/2 =8cm.

Let height of water level raised(R) = h cm.

Vol. of water level raised = π x R^2x h

$=\pi$ x 8^2 x h

$=64\pi$ h cm.^{3}

$64\pi h = 288\pi$

h = 4.5 cm.

2. Let R is the radius of sphere and r is the radius of cone

& n is the no. of cones

n x$\pi(3.5)^2$ h $=4/3\ \pi$ x R^3

n= 126

3. Volume of cubiodal lead =lxbxh =9x11x12 cm^3

Diameter of slot = d= 3 cm

Radius of slot =3/2 cm

Vol. of 1 slot(spherical)=$\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (\frac{3}{2})^3$

No. of slot = Volume of cuboid/Volume of I slot= $\frac{9\times11\times12}{\frac{4}{3}\times\frac{22}{7}\times\{\frac{3}{2}\}^3}$

No. of slot =$9 \times 11 \times 12 \times 3 \times 7 \times 2 \times 2 \times 2/4 \times \frac{22}{7} \times 3 \times 3 \times 3$

No. of slots = 84

4. Radius of hemi spherical Ball =R= 9 cm

Volume of hemi sphere Ball = $\frac{2}{3}\pi\ R^3$

Radius of cylindrical bottle = r = 1.5 cm

Length of cylindrical bottle =h= 4 cm

Volume of 1 cylindrical bottle = πr^2h

No. of cylindrical bottles = Volume of hemi spherical / Volume of 1 Bottle

$\frac{2}{3} * \ \pi R^3 / \pi r^2$h

$\frac{2}{3} * (9)^3 /(1.5)^2 * 4 \ = \frac{2}{3} \times 9 \times 99 \times 10 \times 1 \times 0/1.5 \times 1.5 \times 4$

= 54 bottles