SNBP INTERNATIONAL & SENIOR SECONDARY SCHOOL, CHIKHALI, PUNE

Affiliation no: 1130703

ACADEMIC SESSION 2024-25

CLASS NOTES : Chapter 11 – Surface Areas and Volumes

Subject- Mathematics   **Class- IX**

Prepared by: Prashant Baheti

Exercise 11.1

1. Diameter of the base of a cone is 10.5 cm, and its slant height is 10 cm. Find its curved surface area. (Assume π=22/7)

Solution:

Radius of the base of cone = diameter/ 2 = (10.5/2)cm = 5.25cm

The slant height of the cone, say l = 10 cm

CSA of the cone is = $\pi r l$

= (22/7)×5.25×10 = 165 cm^2

Therefore, the curved surface area of the cone is 165 cm^2.

2. Find the total surface area of a cone, if its slant height is 21 m and the diameter of its base is 24 m. (Assume π = 22/7)

Solution:

Radius of cone, r = 24/2 m = 12m

Slant height, l = 21 m

Formula: Total Surface area of the cone = $\pi r(l+r)$

Total Surface area of the cone = (22/7)×12×(21+12) m^2

= 1244.57m^2

3. Curved surface area of a cone is 308 cm^2, and its slant height is 14 cm. Find

(i) radius of the base and (ii) total surface area of the cone.

(Assume π = 22/7)

Solution:

The slant height of the cone, l = 14 cm

Let the radius of the cone be r.

(i) We know the CSA of cone = πrl

Given: Curved surface area of a cone is 308 cm²

$(308) = (22/7) \times r \times 14$

$308 = 44\ r$

$r = 308/44 = 7$ cm

The radius of a cone base is 7 cm.

(ii) Total surface area of cone = CSA of cone + Area of base (πr²)

Total surface area of cone = $308 + (22/7) \times 7^2 = 308 + 154 = 462$ cm²

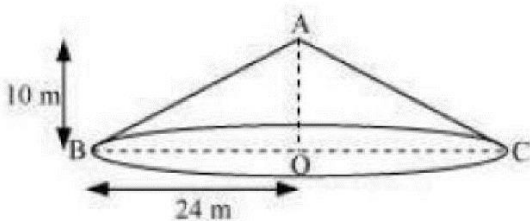Therefore, the total surface area of the cone is 462 cm².

4. A conical tent is 10 m high, and the radius of its base is 24 m. Find

(i) slant height of the tent.

(ii) cost of the canvas required to make the tent, if the cost of 1 m² canvas is Rs 70.

(Assume π=22/7)

Solution:

Let ABC be a conical tent.

Height of conical tent, h = 10 m

Radius of conical tent, r = 24m

Let the slant height of the tent be l.

(i) In the right triangle ABO, we have

$AB^2 = AO^2 + BO^2$ (using Pythagoras' theorem)

$l^2 = h^2 + r^2$

$= (10)^2 + (24)^2$

$= 676$

$l = 26$ m

Therefore, the slant height of the tent is 26 m.

(ii) CSA of tent $= \pi r l$

$= (22/7) \times 24 \times 26$ m^2

Cost of 1 m^2 canvas = Rs 70

Cost of (13728/7)m^2 canvas is equal to Rs (13728/7)×70 = Rs 137280

Therefore, the cost of the canvas required to make such a tent is Rs 137280.

5. What length of tarpaulin 3 m wide will be required to make a conical tent of height 8 m and base radius 6m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. [Use π=3.14]

Solution:

Height of the conical tent, h = 8m

Radius of the base of the tent, r = 6m

Slant height of the tent, $l^2 = (r^2 + h^2)$

$l^2 = (6^2 + 8^2) = (36 + 64) = (100)$

or l = 10 m

Again, CSA of conical tent $= \pi r l$

$= (3.14 \times 6 \times 10)$ m^2

$= 188.4$ m^2

Let the length of the tarpaulin sheet required be L.

As 20 cm will be wasted,

The effective length will be (L-0.2m).

The breadth of tarpaulin = 3m (given)

Area of sheet = CSA of the tent

[(L–0.2)×3] = 188.4

L-0.2 = 62.8

L = 63 m

Therefore, the length of the required tarpaulin sheet will be 63 m.

6. The slant height and base diameter of the conical tomb are 25m and 14 m, respectively. Find the cost of whitewashing its curved surface at the rate of Rs. 210 per 100 m². (Assume π = 22/7)

Solution:

Slant height of the conical tomb, l = 25m

Base radius, r = diameter/2 = 14/2 m = 7m

CSA of the conical tomb = πrl

= (22/7)×7×25 = 550

CSA of the conical tomb= 550m²

Cost of whitewashing 550 m² area, which is Rs (210×550)/100

= Rs. 1155

Therefore, the cost will be Rs. 1155 while whitewashing the tomb.

7. A joker's cap is in the form of a right circular cone of base radius 7 cm and height 24cm. Find the area of the sheet required to make 10 such caps. (Assume π =22/7)

Solution:

Radius of the conical cap, r = 7 cm

Height of the conical cap, h = 24cm

Slant height, $l^2 = (r^2+h^2)$

= (7^2+24^2)

= (49+576)

= (625)

Or l = 25 cm

CSA of 1 conical cap = πrl

= (22/7)×7×25

= 550 cm^2

CSA of 10 caps = (10×550) cm^2 = 5500 cm^2

Therefore, the area of the sheet required to make 10 such caps is 5500 cm^2.

8. A bus stop is barricaded from the remaining part of the road by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40 cm and height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m^2, what will be the cost of painting all these cones? (Use π = 3.14 and take √(1.04) =1.02)

Solution:

Given:

Radius of cone, r = diameter/2 = 40/2 cm = 20cm = 0.2 m

Height of cone, h = 1m

Slant height of cone is l, and l^2 = (r^2+h^2)

Using given values, l^2 = (0.2^2+1^2)

= (1.04)

Or l = 1.02 m

Slant height of the cone is 1.02 m.

Now,

CSA of each cone = πrl

= (3.14×0.2×1.02)

= 0.64056 m

CSA of 50 such cones = (50×0.64056) = 32.028

CSA of 50 such cones = 32.028 m^2

Again,

Cost of painting 1 m² area = Rs 12 (given)

Cost of painting 32.028 m² area = Rs (32.028×12)

= Rs.384.336

= Rs.384.34 (approximately)

Therefore, the cost of painting all these cones is Rs. 384.34.

Exercise 11.2

1. Find the surface area of a sphere of radius

(i) 10.5cm (ii) 5.6cm (iii) 14cm

(Assume π=22/7)

Solution:

Formula: Surface area of a sphere (SA) = $4\pi r^2$

(i) Radius of a sphere, r = 10.5 cm

SA = $4\times(22/7)\times10.5^2$ = 1386

Surface area of a sphere is 1386 cm²

(ii) Radius of a sphere, r = 5.6cm

Using formula, SA = $4\times(22/7)\times5.6^2$ = 394.24

Surface area of a sphere is 394.24 cm²

(iii) Radius of a sphere, r = 14cm

SA = $4\pi r^2$

= $4\times(22/7)\times(14)^2$

= 2464

Surface area of a sphere is 2464 cm²

2. Find the surface area of a sphere of diameter

(i) 14cm (ii) 21cm (iii) 3.5cm

(Assume π = 22/7)

Solution:

(i) Radius of sphere, r = diameter/2 = 14/2 cm = 7 cm

Formula for the surface area of sphere = $4\pi r^2$

= 4×(22/7)×7^2 = 616

Surface area of a sphere is 616 cm^2

(ii) Radius (r) of sphere = 21/2 = 10.5 cm

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

= 4×(22/7)×10.5^2 = 1386

Surface area of a sphere is 1386 cm^2

Therefore, the surface area of a sphere having a diameter 21 cm is 1386 cm^2

(iii) Radius(r) of a sphere = 3.5/2 = 1.75 cm

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

= 4×(22/7)×1.75^2 = 38.5

Surface area of a sphere is 38.5 cm^2

3. Find the total surface area of a hemisphere of radius 10 cm. [Use π=3.14]

Solution:

Radius of the hemisphere, r = 10cm

Formula: Total surface area of the hemisphere = $3\pi r^2$

= 3×3.14×10^2 = 942

The total surface area of the given hemisphere is 942 cm^2.

4. The radius of a spherical balloon increases from 7cm to 14cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.

Solution:

Let r_1 and r_2 be the radii of the spherical balloon and spherical balloon when air is pumped into it, respectively. So,

$r_1 = 7$cm

$r_2 = 14$ cm

Now, Required ratio = (initial surface area)/(Surface area after pumping air into balloon)

$= 4\pi r_1{}^2/4\pi r_2{}^2$

$= (r_1/r_2)^2$

$= (7/14)^2 = (1/2)^2 = ¼$

Therefore, the ratio between the surface areas is 1:4.

5. A hemispherical bowl made of brass has an inner diameter 10.5cm. Find the cost of tin-plating it on the inside at the rate of Rs 16 per 100 cm^2. (Assume π = 22/7)

Solution:

Inner radius of hemispherical bowl, say r = diameter/2 = (10.5)/2 cm = 5.25 cm

Formula for the surface area of hemispherical bowl $= 2\pi r^2$

$= 2 \times (22/7) \times (5.25)^2 = 173.25$

Surface area of the hemispherical bowl is 173.25 cm^2

Cost of tin-plating 100 cm^2 area = Rs 16

Cost of tin-plating 1 cm^2 area = Rs 16 /100

Cost of tin-plating 173.25 cm^2 area = Rs. (16×173.25)/100 = Rs 27.72

Therefore, the cost of tin-plating the inner side of the hemispherical bowl at the rate of Rs 16 per 100 cm^2 is Rs **27.72.**

6. Find the radius of a sphere whose surface area is 154 cm^2. (Assume π = 22/7)

Solution:

Let the radius of the sphere be r.

Surface area of sphere = 154 (given)

Now,

$4\pi r^2 = 154$

$r^2 = (154 \times 7)/(4 \times 22) = (49/4)$

$r = (7/2) = 3.5$

The radius of the sphere is 3.5 cm.

7. The diameter of the moon is approximately one-fourth of the diameter of the earth.

Find the ratio of their surface areas.

Solution:

If the diameter of the earth is said d, then the diameter of the moon will be d/4 (as per the given statement).

Radius of earth = d/2

Radius of moon = ½×d/4 = d/8

Surface area of moon = $4\pi(d/8)^2$

Surface area of earth = $4\pi(d/2)^2$

$$\text{Ratio of their Surface areas} = \frac{4\pi \left(\dfrac{d}{8}\right)^2}{4\pi \left(\dfrac{d}{2}\right)^2} = 4/64 = 1/16$$

The ratio between their surface areas is 1:16.

8. A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5cm. Find the outer curved surface of the bowl. (Assume π =22/7)

Solution:

Given:

Inner radius of the hemispherical bowl = 5cm

Thickness of the bowl = 0.25 cm

Outer radius of the hemispherical bowl = (5+0.25) cm = 5.25 cm

Formula for outer CSA of the hemispherical bowl = $2\pi r^2$, where r is the radius of the hemisphere.

= 2×(22/7)×(5.25)^2 = 173.25 cm^2

Therefore, the outer curved surface area of the bowl is 173.25 cm^2.

9. A right circular cylinder just encloses a sphere of radius r (see fig. 13.22). Find

(i) surface area of the sphere,

(ii) curved surface area of the cylinder,

(iii) ratio of the areas obtained in(i) and (ii).

Fig. 13.22

Solution:

(i) Surface area of the sphere = $4\pi r^2$, where r is the radius of sphere

(ii) Height of the cylinder, h = r+r =2r

The radius of the cylinder = r

CSA of the cylinder formula = $2\pi rh$ = $2\pi r(2r)$ (using value of h)

= $4\pi r^2$

(iii) Ratio between areas = (Surface area of sphere)/(CSA of Cylinder)

= $4\pi r^2 / 4\pi r^2$ = 1/1

The ratio of the areas obtained in (i) and (ii) is 1:1.

Exercise 11.3

1. Find the volume of the right circular cone with

(i) radius 6cm, height 7 cm (ii) radius 3.5 cm, height 12 cm (Assume π = 22/7)

Solution:

Volume of cone = (1/3) πr²h cube units

Where r be radius and h be the height of the cone

(i) Radius of the cone, r = 6 cm

Height of the cone, h = 7cm

Ley V be the volume of the cone, so we have

V = (1/3)×(22/7)×36×7

= (12×22)

= 264

The volume of the cone is 264 cm³.

(ii) Radius of the cone, r = 3.5cm

Height of the cone, h = 12cm

Volume of the cone = (1/3)×(22/7)×3.5²×7 = 154

Hence,

The volume of the cone is 154 cm³.

2. Find the capacity in litres of a conical vessel with

(i) radius 7cm, slant height 25 cm (ii) height 12 cm, slant height 13 cm

(Assume π = 22/7)

Solution:

(i) Radius of the cone, r =7 cm

Slant height of the cone, l = 25 cm

$$\text{Height of cone, } h = \sqrt{l^2 - r^2}$$
$$h = \sqrt{25^2 - 7^2}$$
$$h = \sqrt{625 - 49}$$

or h = 24

Height of the cone is 24 cm

Now,

Volume of the cone, $V = (1/3) \pi r^2 h$ (formula)

$V = (1/3) \times (22/7) \times 7^2 \times 24$

$= (154 \times 8)$

$= 1232$

So, the volume of the vessel is 1232 cm³

Therefore, the capacity of the conical vessel = (1232/1000) liters (because 1L = 1000 cm³)

= 1.232 Liters.

(ii) Height of the cone, h = 12 cm

Slant height of the cone, l = 13 cm

$$\text{Radius of cone, } r = \sqrt{l^2 - h^2}$$
$$r = \sqrt{13^2 - 12^2}$$
$$r = \sqrt{169 - 144}$$

r = 5

Hence, the radius of the cone is 5 cm.

Now, Volume of the cone, $V = (1/3) \pi r^2 h$

$V = (1/3) \times (22/7) \times 5^2 \times 12$ cm³

$= 2200/7$

Volume of the cone is 2200/7 cm³

Now, Capacity of the conical vessel= 2200/7000 litres (1L = 1000 cm³)

= 11/35 litres

3. The height of a cone is 15cm. If its volume is 1570cm³, find the diameter of its base. (Use π = 3.14)

Solution:

Height of the cone, h = 15 cm

Volume of cone =1570 cm³

Let r be the radius of the cone

As we know, volume of the cone, $V = (1/3) \pi r^2 h$

So, $(1/3) \pi r^2 h = 1570$

$(1/3) \times 3.14 \times r^2 \times 15 = 1570$

$r^2 = 100$

$r = 10$

Radius of the base of the cone 10 cm.

4. If the volume of a right circular cone of height 9cm is 48π cm³, find the diameter of its base.

Solution:

Height of cone, h = 9cm

Volume of cone = 48π cm³

Let r be the radius of the cone.

As we know, volume of the cone, $V = (1/3) \pi r^2 h$

So, $1/3 \pi r^2 (9) = 48 \pi$

$r^2 = 16$

$r = 4$

Radius of the cone is 4 cm.

So, diameter = 2×Radius = 8

Thus, diameter of the base is 8cm.

5. A conical pit of a top diameter 3.5m is 12m deep. What is its capacity in kilolitres?

(Assume π = 22/7)

Solution:

Diameter of conical pit = 3.5 m

Radius of conical pit, r = diameter/ 2 = (3.5/2)m = 1.75m

Height of pit, h = Depth of pit = 12m

Volume of cone, V = (1/3) $\pi r^2 h$

V = (1/3)×(22/7) ×(1.75)^2×12 = 38.5

Volume of the cone is 38.5 m^3

Hence, capacity of the pit = (38.5×1) kiloliters = 38.5 kiloliters.

6. The volume of a right circular cone is 9856cm^3. If the diameter of the base is 28cm, find

(i) height of the cone

(ii) slant height of the cone

(iii) curved surface area of the cone

(Assume π = 22/7)

Solution:

Volume of a right circular cone = 9856 cm^3

Diameter of the base = 28 cm

(i) Radius of cone, r = (28/2) cm = 14 cm

Let the height of the cone be h

Volume of cone, V = (1/3) $\pi r^2 h$

(1/3) $\pi r^2 h$ = 9856

(1/3)×(22/7) ×14×14×h = 9856

h = 48

The height of the cone is 48 cm.

$$\text{(ii) Slant height of cone, } l = \sqrt{r^2 + h^2}$$
$$l = \sqrt{14^2 + 48^2} = \sqrt{196 + 2304} = 50$$

Slant height of the cone is 50 cm.

(iii) curved surface area of cone = $\pi r l$

= (22/7)×14×50

= 2200

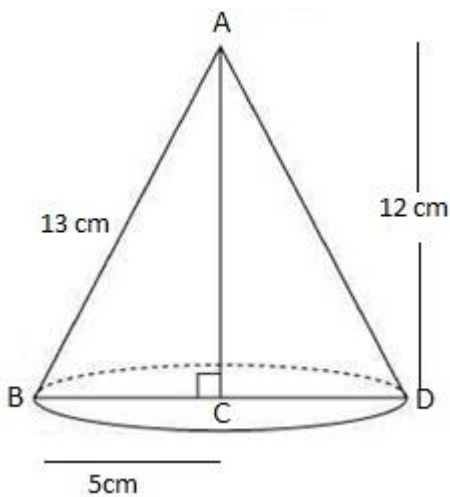Curved surface area of the cone is 2200 cm².

7. A right triangle ABC with sides 5cm, 12cm and 13cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

Solution:

Height (h)= 12 cm

Radius (r) = 5 cm, and
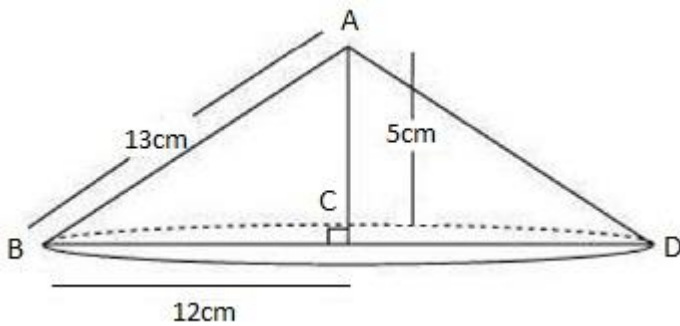
Slant height (l) = 13 cm

Volume of cone, V = (1/3) πr²h

V = (1/3)×π×5²×12

= 100π

Volume of the cone so formed is 100π cm³.

8. If the triangle ABC in Question 7 is revolved about the side 5cm, then find the volume of the solids so obtained. Find also the ratio of the volumes of the two solids obtained in Questions 7 and 8.

Solution:

A right-angled ΔABC is revolved about its side 5cm, a cone will be formed of radius as 12 cm, height as 5 cm, and slant height as 13 cm.

Volume of cone = (1/3) πr²h, where r is the radius and h is the height of the cone.

= (1/3)×π×12×12×5

= 240 π

The volume of the cones formed is 240π cm³.

So, the required ratio = (the result of question 7) / (the result of question 8) = (100π)/(240π) = 5/12 = 5:12.

9. A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas.

(Assume π = 22/7)

Solution:

Radius (r) of heap = (10.5/2) m = 5.25

Height (h) of heap = 3m

Volume of heap = (1/3)πr²h

= (1/3)×(22/7)×5.25×5.25×3

= 86.625

The volume of the heap of wheat is 86.625 m³.

Again,

Area of canvas required= CSA of cone = $\pi r l$, where $l = \sqrt{r^2 + h^2}$
After substituting the values, we have
CSA of cone = $[\frac{22}{7} \times 5.25 \times \sqrt{(5.25)^2 + 3^2}]$

= (22/7)×5.25×6.05

= 99.825

Therefore, the area of the canvas is 99.825 m².

Exercise 11.4

1. Find the volume of a sphere whose radius is

(i) 7 cm (ii) 0.63 m

(Assume π =22/7)

Solution:

(i) Radius of the sphere, r = 7 cm

Using, Volume of the sphere = (4/3) πr³

= (4/3)×(22/7)×7³

= 4312/3

Hence, volume of the sphere is 4312/3 cm³

(ii) Radius of the sphere, r = 0.63 m

Using, volume of sphere = (4/3) πr³

= (4/3)×(22/7)×0.63³

= 1.0478

Hence, volume of the sphere is 1.05 m³ (approx).

2. Find the amount of water displaced by a solid spherical ball of diameter

(i) 28 cm (ii) 0.21 m

(Assume π =22/7)

Solution:

(i) Diameter = 28 cm

Radius, r = 28/2 cm = 14cm

Volume of the solid spherical ball = $(4/3) \pi r^3$

Volume of the ball = $(4/3) \times (22/7) \times 14^3 = 34496/3$

Hence, volume of the ball is $34496/3$ cm^3

(ii) Diameter = 0.21 m

Radius of the ball = 0.21/2 m = 0.105 m

Volume of the ball = $(4/3) \pi r^3$

Volume of the ball = $(4/3) \times (22/7) \times 0.105^3$ m^3

Hence, volume of the ball = 0.004851 m^3

3. The diameter of a metallic ball is 4.2cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm^3? (Assume π=22/7)

Solution:

Given,

Diameter of a metallic ball = 4.2 cm

Radius(r) of the metallic ball, r = 4.2/2 cm = 2.1 cm

Volume formula = $4/3 \pi r^3$

Volume of the metallic ball = $(4/3) \times (22/7) \times 2.1$ cm^3

Volume of the metallic ball = 38.808 cm^3

Now, using the relationship between density, mass and volume,

Density = Mass/Volume

Mass = Density × volume

= (8.9×38.808) g

= 345.3912 g

Mass of the ball is 345.39 g (approx).

4. The diameter of the moon is approximately one-fourth of the diameter of the earth. What fraction of the volume of the earth is the volume of the moon?

Solution:

Let the diameter of the earth be "d". Therefore, the radius of the earth will be d/2.

Diameter of the moon will be d/4, and the radius of the moon will be d/8.

Find the volume of the moon.

Volume of the moon = (4/3) πr³ = (4/3) π (d/8)³ = 4/3π(d³/512)

Find the volume of the earth

Volume of the earth = (4/3) πr³= (4/3) π (d/2)³ = 4/3π(d³/8)

Fraction of the volume of the earth is the volume of the moon

$$\text{Volume of the moon/ volume of the earth} = \frac{\frac{4}{3}\pi(\frac{d^3}{512})}{\frac{4}{3}\pi(\frac{d^3}{8})} = 8/512 = 1/64$$

Answer: Volume of the moon is of the 1/64 volume of the earth.

5. How many litres of milk can a hemispherical bowl of diameter 10.5cm hold? (Assume π = 22/7)

Solution:

Diameter of the hemispherical bowl = 10.5 cm

Radius of the hemispherical bowl, r = 10.5/2 cm = 5.25 cm

Formula for volume of the hemispherical bowl = (2/3) πr³

Volume of the hemispherical bowl = (2/3)×(22/7)×5.25³ = 303.1875

Volume of the hemispherical bowl is 303.1875 cm³

Capacity of the bowl = (303.1875)/1000 L = 0.303 litres(approx.)

Therefore, the hemispherical bowl can hold 0.303 litres of milk.

6. A hemispherical tank is made up of an iron sheet 1cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank. (Assume π = 22/7)

Solution:

Inner Radius of the tank, (r) = 1m

Outer Radius (R) = 1.01m

Volume of the iron used in the tank = $(2/3) \pi(R^3 - r^3)$

Put values,

Volume of the iron used in the hemispherical tank = $(2/3) \times (22/7) \times (1.01^3 - 1^3) = 0.06348$

So, volume of the iron used in the hemispherical tank is $0.06348 \ m^3$.

7. Find the volume of a sphere whose surface area is 154 cm². (Assume π = 22/7)

Solution:

Let r be the radius of a sphere.

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

$4\pi r^2 = 154 \ cm^2$ (given)

$r^2 = (154 \times 7)/(4 \times 22)$

$r = 7/2$

The radius is 7/2 cm.

Now,

Volume of the sphere = $(4/3) \pi r^3$

$$\text{Volume of the sphere} = (4/3) \times (22/7) \times (7/2)^3 = 179\frac{2}{3}$$
$$\text{Volume of the sphere is } 179\frac{2}{3} \ cm^3$$

8. A dome of a building is in the form of a hemisphere. From inside, it was whitewashed at the cost of Rs. 4989.60. If the cost of white-washing is 20 per square metre, find the

(i) inside surface area of the dome (ii) volume of the air inside the dome

(Assume π = 22/7)

Solution:

(i) Cost of whitewashing the dome from inside = Rs 4989.60

Cost of whitewashing 1m² area = Rs 20

CSA of the inner side of dome = 498.96/2 m² = 249.48 m²

(ii) Let the inner radius of the hemispherical dome be r.

CSA of the inner side of dome = 249.48 m^2 (from (i))

Formula to find CSA of a hemisphere = $2\pi r^2$

$2\pi r^2$ = 249.48

$2\times(22/7)\times r^2$ = 249.48

r^2 = (249.48×7)/(2×22)

r^2 = 39.69

r = 6.3

So, the radius is 6.3 m.

Volume of air inside the dome = Volume of hemispherical dome

Using the formula, the volume of the hemisphere = $2/3\ \pi r^3$

= (2/3)×(22/7)×6.3×6.3×6.3

= 523.908

= 523.9(approx.)

Answer: The volume of air inside the dome is 523.9 m^3.

9. Twenty-seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S'. Find the

(i) radius r' of the new sphere,

(ii) ratio of Sand S'.

Solution:

Volume of the solid sphere = $(4/3)\pi r^3$

Volume of twenty seven solid sphere = $27\times(4/3)\pi r^3$ = $36\ \pi\ r^3$

(i) New solid iron sphere radius = r'

Volume of this new sphere = $(4/3)\pi(r')^3$

$(4/3)\pi(r')^3$ = $36\ \pi\ r^3$

$(r')^3$ = $27r^3$

r'= 3r

Radius of the new sphere will be 3r (thrice the radius of the original sphere)

(ii) Surface area of the iron sphere of radius r, $S = 4\pi r^2$

Surface area of the iron sphere of radius r'= $4\pi (r')^2$

Now

$S/S' = (4\pi r^2)/(4\pi (r')^2)$

$S/S' = r^2/(3r')^2 = 1/9$

The ratio of S and S' is 1: 9.

10. A capsule of medicine is in the shape of a sphere of diameter 3.5mm. How much medicine (in mm³) is needed to fill this capsule? (Assume π = 22/7)

Solution:

Diameter of the capsule = 3.5 mm

Radius of the capsule, say r = diameter/ 2 = (3.5/2) mm = 1.75mm

Volume of the spherical capsule = $4/3 \pi r^3$

Volume of the spherical capsule = $(4/3)\times(22/7)\times(1.75)^3 = 22.458$

Answer: The volume of the spherical capsule is 22.46 mm³.