Question 1.

Solution:

Let the length of the side of cube be 'a' cm.

Volume of each cube = 27 cm^3

Volume of cube = a^3

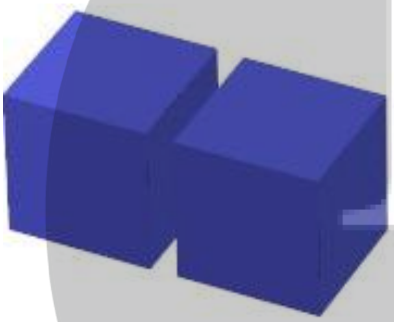
∴ $a^3 = 27 \text{ cm}^3$

⇒ $a = (27 \text{ cm}^3)^{1/3}$

⇒ $a = 3$ cm

Length of a side of cube = 3 cm

Since, two cubes are joined and a cuboid is formed so,



Length of cuboid = l = 2a = 2 × 3 cm = 6 cm

Breadth of cuboid = b = a = 3 cm

Height of cuboid = h = a = 3 cm

Surface area of cuboid = 2 × (l × b + b × h + l × h)

∴ Surface area of resulting cuboid = 2 × (6 × 3 + 3 × 3 + 6 × 3) cm^2

= 2 × (18 + 9 + 18) cm^2

= 2 × 45 cm^2

= 90 cm^2

So, surface area of resulting cuboid is 90 cm^2

Question 2.

Solution:

Let the radius of hemisphere be r cm

Volume of hemisphere is given by $\frac{2}{3}\pi r^3$

Given, volume of hemisphere = 24251/2 cm^3

∴ $\frac{2}{3}\pi r^3 = 24251/2$

⇒ $r^3 = 4851 \times 1/2 \times 3/2 \times 7/22$

⇒ $r^3 = 1157.625\ cm^3$

⇒ $r = (1157.625)^{1/3}$ cm

⇒ r = 10.5 cm

Curved Surface Area of hemisphere = $2\pi r^2$

Curved Surface Area of hemisphere = $2 \times 22/7 \times (10.5)^2\ cm^2$

= 693 cm^2

∴ Curved surface area of hemisphere = 693 cm^2

Question 3.

Solution:

Let the radius of solid sphere be r cm

Total surface area of solid hemisphere = $3\pi r^2$

Given, total surface area of solid hemisphere = 462 cm^2

∴ $3\pi r^2 = 462\ cm^2$

⇒ $3 \times 22/7 \times r^2 = 462\ cm^2$

⇒ $r^2 = 462 \times 1/3 \times 7/22\ cm^2 = 49\ cm^2$

⇒ r = 7 cm

Volume of solid hemisphere = $\frac{4}{3}$ π r^3

= 2/3 × 22/7 × 7^3 cm^3

= 718.67 cm^3

∴ Volume of solid hemisphere is 718.67 cm^3

Question 4.

Solution:

Width of cloth used = 5 m

Diameter of conical tent to be made = 14 m

Let the radius of the conical tent be r m

Radius of conical tent = r = diameter ÷ 2 = 14/2 m = 7 m

Height of conical tent = h = 24 m

Let the slant height of conical tent be l

So, $l = \sqrt{r^2 + h^2}$

⇒ $l = \sqrt{7^2 + 24^2}$ m^2

⇒ l = 25 m

Area of cloth required to make a conical tent = Curved Surface area of conical tent

= πrl

= 22/7 × 7 × 25 m^2

= 550 m^2

Length of cloth used = Area of cloth required ÷ width of cloth

= 550/5 m

= 110 m

∴ Length of cloth used = 110 m

Cost of cloth used = ☐25 per meter

Total Cost of cloth required to make a conical tent = 110 × ☐25
= ☐2750
∴ Total cost of cloth required to make a conical tent = ☐2750

Question 5.

Solution:

Let V_1 be the volume of first cone and V_2 be the volume of second cone.
Then, $V_1:V_2 = 1:4$
Let d_1 be the diameter of first cone and d_2 be the diameter of second cone.
Then $d_1:d_2 = 4:5$
Let h_1 be the height of first cone and h_2 be the height of second cone.
We know that volume of cone is given by V = 1/3 × π(d^2/4)h

$$\frac{V_1}{V_2} = \frac{1}{4}$$

$$\therefore \frac{V_1}{V_2} = \frac{\frac{1}{3}\pi\frac{d_1^2}{4}h_1}{\frac{1}{3}\pi\frac{d_2^2}{4}h_2}$$

$$\frac{V_1}{V_2} = \frac{d_1^2 h_1}{d_2^2 h_2}$$

$$\frac{d_1^2 h_1}{d_2^2 h_2} = \frac{1}{4}$$

$$\Rightarrow \left(\frac{d_1}{d_2}\right)^2 \times \frac{h_1}{h_2} = \frac{1}{4}$$

$$\Rightarrow \left(\frac{4}{5}\right)^2 \times \frac{h_1}{h_2} = \frac{1}{4}$$

$\Rightarrow \frac{16}{25} \times \frac{h_1}{h_2} = \frac{1}{4} \quad \Rightarrow \frac{h_1}{h_2} = \frac{1}{4} \times \frac{25}{16}$

$\Rightarrow \frac{h_1}{h_2} = \frac{25}{64}$

∴ $h_1 : h_2 = 25:64$

∴ Ratio of height of two cones is 25:64.

Question 6.

Solution:

Let the radius of base be 'r' km and slant height be 'l' km

Slant height of conical mountain = 2.5 km

Area of its base = 1.54 km^2

Area of base is given by πr^2

∴ $\pi r^2 = 1.54\ km^2$

⇒ $22/7 \times r^2 = 1.54\ km^2$

⇒ $r^2 = 1.54 \times 7/22\ km^2 = .49\ km^2$

⇒ $r = 0.7$ km

Let 'h' be the height of the mountain

We know,

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

Substituting the values of l and r in the above equation

$2.5^2 = 0.7^2 + h^2$

$h^2 = 2.5^2 - 0.7^2 = 6.25 - 0.49\ km^2$

$h^2 = 5.76\ km^2$

$h = 2.4$ km

∴ Height of the mountain = 2.4 km

Question 7.

Solution:

Let the Radius of the solid cylinder be ‘r’ m and its height be ‘h’ m.
Given,
Sum of radius and height of solid cylinder = 37 m
$r + h = 37$ m
$r = 37 - h$
Total surface area of solid cylinder = 1628 m^2
Total surface area of solid cylinder is given by $2\pi r (h + r)$
$\therefore 2\pi r (h + r) = 1628\ m^2$
Substituting the value of r + h in the above equation
$\Rightarrow 2\pi r \times 37 = 1628\ m^2$
$\Rightarrow r = 1628 \times 7/22 \times 1/2 \times 1/37$ m
$\Rightarrow r = 7$ m
Since ,$r + h = 37$ m
$h = 37 - r$ m
$h = 37 - 7$ m = 30 m
Volume of solid cylinder = $\pi r^2 h$
$= 22/7 \times 7^2 \times 30\ m^2$
$= 4620\ m^2$

Question 8.

Solution:

Let the radius of sphere be ‘r’ cm
Surface area of sphere = 2464 cm^2

Surface area of sphere is given by $4\pi r^2$

∴ $4\pi r^2 = 2464\ cm^2$

⇒ $4 \times 22/7 \times r^2 = 2464\ cm^2$

⇒ $r^2 = 2464 \times ¼ \times 7/22\ cm^2 = 196\ cm^2$

⇒ $r = 14$ cm

Radius of new sphere is double the radius of given sphere.

Let the radius of new sphere be r′ cm

∴ $r' = 2r$

$r' = 2 \times 14$ cm $= 28$ cm

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

$= 4 \times 22/7 \times 28^2\ cm^2$

$= 9856\ cm^2$

∴ Surface area of new sphere is $9856\ cm^2$.

Question 9 .

Solution:

The military tent is made as a combination of right circular cylinder and right circular cone on top.

Total Height of tent = h = 8.25 m

Base diameter of tent = 30 m

Base radius of tent = r = 30/2 m = 15 m

Height of right circular cylinder = 5.5 m

Curved surface area of right circular cylindrical part of tent = $2\pi rh$

Height of conical part = total height of tent − height of cylindrical part

h_{cone} = 8.25 – 5.5 m = 2.75 m
Base radius of cone = 15 m
Let l be the slant height of cone
Then, $l^2 = h_{cone}^2 + r^2 = 2.75^2 + 15^2$ m^2
l^2 = 7.5625 + 225 m^2 = 232.5625
l = 15.25
Curved surface area of conical part of the tent = πrl
Total surface area of the tent = Curved surface area of cylindrical part + curved surface area of conical part
Total surface area of tent = 2πrh + πrl
= πr (2h + l)
= 22/7 × 15 × (2 × 5.5 + 15.25) m^2
= 22/7 × 15 × (11 + 15.25) m^2
= 22/7 × 15 × 26.25 m^2
= 1237.5 m^2
Breadth of canvas used = 1.5 m
Length of canvas used = Total surface area of tent ÷ breadth of canvas used
Length of canvas used = 1237.5\1.5 m = 825 m
∴ Length of canvas used is 825 m.

Question 10.

Solution:

The tent is made as a combination of right circular cylinder and right circular cone on top.

Height of cylindrical part of the tent = h = 3 m
Radius of its base = r = 14 m
Curved surface area of cylindrical part of tent = 2πrh
= 2 × 22/7 × 14 × 3 m^2
= 264 m^2
Total height of the tent = 13.5 m
Height of conical part of the tent = total height of tent – height of cylindrical part.
Height of conical part of the tent = 13.5 – 3 m =10.5 m
Let the slant height of the conical part be l
$l^2 = h_{cone}^2 + r^2$
$l^2 = 10.5^2 + 14^2 = 110.25 + 196\ m^2 = 306.25\ m^2$
l = 17.5 m
Curved surface area of conical part of tent = πrl
= 22/7 × 14 × 17.5 m^2
= 770 m^2
Total surface area of tent = Curved surface area of cylindrical part of tent + Curved surface area of conical part of tent
Total Surface area of tent = 264 m^2 + 770 m^2 = 1034 m^2
Cloth required = Total Surface area of tent = 1034 m^2
Cost of cloth = ☐80/m^2
Total cost of cloth required = Total surface area of tent × Cost of cloth
= 1034 × ☐80
= ☐82720
Cost of cloth required to make the tent is ☐82720

Question 11.

Solution:

The Circus tent is made as a combination of cylinder and cone on top.
Height of cylindrical part of tent = h = 3 m
Base radius of tent = r = 52.5 m
Area of canvas required for cylindrical part of tent = $2\pi rh$
$= 2 \times 22/7 \times 52.5 \times 3 \text{ m}^2$
$= 990 \text{ m}^2$
Slant height of cone = l = 53 m
Area of canvas required for conical part of the tent = πrl
$= 22/7 \times 52.5 \times 53 \text{ m}^2$
$= 8745 \text{ m}^2$
Area of canvas required to make the tent = Area of canvas required for cylindrical part of tent + Area of canvas required for conical part of tent
Area of canvas required to make the tent = $990 + 8745 \text{ m}^2 = 9735 \text{ m}^2$

Question 12.

Solution:

The rocket is in the form of cylinder closed at the bottom and cone on top.
Height of cylindrical part rocket = h = 21 m

Base radius of rocket = r = 2.5 m
Surface Area of cylindrical part of rocket = $2\pi rh + \pi r^2$
= 2 × 22/7 × 2.5 × 21 + 22/7 × 2.5 × 2.5 m^2
= 330 + 19.64 m^2 = 349.64 m^2
Slant height of cone = l = 8 m
Surface Area of conical part of the rocket = πrl
= 22/7 × 2.5 × 8 m^2
= 62.86 m^2
Total surface area of the rocket = Surface Area of cylindrical part of rocket + Surface Area of conical part of rocket
Total surface area of the rocket = 349.64 + 62.86 m^2 = 412.5 m^2

Question 13 .

Solution:

The solid is in the form of a cone surmounted on a hemisphere.
Total height of solid = h = 9.5 m
Radius of Solid = r = 3.5 m
Volume of hemispherical part solid = 2/3 × πr^3
= 2/3 × 22/7 × 3.5^3 m^3
= 89.83 m^3
Height of conical part of solid = h_{cone} = Total height of solid – Radius of solid
Height of conical part of solid = h_{cone} = 9.5 – 3.5 = 6 m
Volume of conical part of solid = 1/3 × $\pi r^2 h_{cone}$
= 1/3 × 22/7 × 3.5^2 × 6 m^3
= 77 m^3

Volume of solid = Volume of hemispherical part solid + Volume of conical part solid
Volume of solid = 89.83 + 77 m^3 = 166.83 m^3

Question 14.

Solution:
The toy is in the form of a cone mounted on a hemisphere.
Total height of toy = h = 31 cm
Radius of toy = r = 7 cm
Surface area of hemispherical part toy = $2\pi r^2$
= $2 \times 22/7 \times 7^2$ cm^2
= 308 cm^2
Height of conical part of toy = h_{cone} = Total height of toy – Radius of toy
Height of conical part of toy = h_{cone} = 31 – 7 = 24 cm
Let the slant height of the conical part be l
$l^2 = h_{cone}^2 + r^2$
$l^2 = 24^2 + 7^2 = 576 + 49$ cm^2 = 625 cm^2
l = 25 cm
Surface area of conical part of toy = πrl
= $22/7 \times 7 \times 25$ cm^2
= 550 cm^2
Total surface area of toy = Surface area of hemispherical part of toy + Surface area of conical part of toy

Question 15 .

Solution:

A toy is in the shape of a cone mounted on a hemisphere of same base radius.

Volume of Toy = 231 cm^3

Base Diameter of toy = 7 cm

Base radius of toy = 7/2 cm = 3.5 cm

Volume of hemisphere = $2/3\ \pi r^3$

= $2/3 \times 22/7 \times 3.5^3$ cm^3

= 89.83 cm^3

Volume of cone = Volume of hemisphere − Volume of toy

= 231 – 89.83 cm^3 = 141.17 cm^3

Volume of cone is given by $1/3\ \pi r^2 h$

Where h is the height of cone

∴ $1/3 \times \pi r^2 h = 141.17$ cm^3

⇒$1/3 \times 22/7 \times 3.5 \times 3.5 \times h = 141.17$ cm^3

⇒$h = 141.17 \times 3 \times 7/22 \times 1/3.5 \times 1/3.5$

⇒ h = 11 cm

Height of cone = 11 cm

Height of toy = Height of cone + Height of hemisphere

= 11 cm + 3.5 cm = 14.5 cm

[Height of hemisphere = Radius of hemisphere]

∴ Height of toy is 14.5 cm.

Question 16.

Solution:

Radius of cylindrical container = r = 6 cm

Height of cylindrical container = h = 15 cm

Volume of cylindrical container = $\pi r^2 h$

= $22/7 \times 6 \times 6 \times 15$ cm^3

= 1697.14 cm^3

Whole ice-cream has to be distributed to 10 children in equal cones with hemispherical tops.

Let the radius of hemisphere and base of cone be r′

Height of cone = h = 4 times the radius of its base

$h' = 4r'$

Volume of Hemisphere = $2/3\ \pi(r')^3$

Volume of cone = $1/3\ \pi(r')^2 h' = 1/3\ \pi(r')^2 \times 4r'$

= $2/3\ \pi(r')^3$

Volume of ice-cream = Volume of Hemisphere + Volume of cone

= $2/3\ \pi(r')^3 + 4/3\ \pi(r')^3 = 6/3\ \pi(r')^3$

Number of ice-creams = 10

∴ total volume of ice-cream = 10 × Volume of ice-cream

= $10 \times 6/3\ \pi(r')^3 = 60/3\ \pi(r')^3$

Also, total volume of ice-cream = Volume of cylindrical container

⇒ $60/3\ \pi(r')^3 = 1697.14$ cm^3

⇒ $60/3 \times 22/7 \times (r')^3 = 1697.14$ cm^3

⇒ $(r')^3 = 1697.14 \times 3/60 \times 7/22 = 27$ cm^3

⇒ r = 3 cm

∴ Radius of ice-cream cone = 3 cm

Question 17.

Solution:

Vessel is in the form of a hemispherical bowl surmounted by a hallow cylinder.

Diameter of hemisphere = 21 cm

Radius of hemisphere = 10.5 cm

Volume of hemisphere = $2/3 \pi r^3 = 2/3 \times 22/7 \times 10.5^3 \text{ cm}^3$

$= 2425.5 \text{ cm}^3$

Total height of vessel = 14.5 cm

Height of cylinder = h = Total height of vessel - Radius of hemisphere

= 14.5 – 10.5 cm = 4 cm

Volume of cylinder = $\pi r^2 h = 22/7 \times 10.5 \times 10.5 \times 4 \text{ cm}^3$

$= 1386 \text{ cm}^3$

Volume of vessel = Volume of hemisphere + Volume of cylinder

$= 2425.5 \text{ cm}^3 + 1386 \text{ cm}^3$

$= 3811.5 \text{ cm}^3$

∴ Capacity of vessel = 3811.5 cm^3

Question 18 .

Solution:

Toy is in the form of a cylinder with hemisphere ends

Total length of toy = 90 cm

Diameter of toy = 42 cm

Radius of toy = r = 21 cm

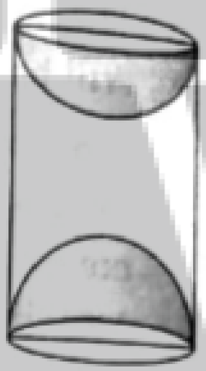
Length of cylinder = l = Total length of toy – 2 × Radius of toy
= 90 – 2 × 21 cm = 48 cm
For cost of painting we need to find out the curved surface area of toy
Curved surface area of cylinder = 2πrl
= 2 × 22/7 × 21 × 48 cm^2
= 6336 cm^2
Curved surface area of hemispherical ends = 2 × 2πr^2
= 2 × 2 × 22/7 × 21 × 21 cm^2
= 5544 cm^2
Surface area of toy = Curved surface area of cylinder + Curved surface area of hemispherical ends
Surface area of toy = 6336 cm^2 + 5544 cm^2 = 11880 cm^2
Cost of painting = Rs 0.70/cm^2
Total Cost of painting = Surface area of toy × Cost of painting
= 11880 cm^2 × Rs 0.70/cm^2 = Rs 8316.00
Total cost of painting the toy = Rs 8316.00

Question 19 .

Solution:
A medicine capsule is in the shape of a cylinder with two hemisphere stuck to each of its ends.
Total length of entire capsule = 14 mm
Diameter of capsule = 5 mm
Radius of capsule = r = Diameter ÷ 2 = 5/2 mm = 2.5 mm

Length of cylindrical part of capsule = l = Total length of entire capsule – 2 × Radius of capsule
= 14 – 2 × 2.5 mm = 14 - 5 mm = 9 mm
Curved surface area of cylindrical part of capsule = 2πrl
= 2 × 3.14 × 9 × 2.5 mm^2
= 141.3 mm^2
Curved surface area of hemispherical ends = 2 × $2\pi r^2$
= 2 × 2 × 3.14 × 2.5 × 2.5 cm^2
= 78.5 mm^2
Surface area of capsule = Curved surface area of cylindrical part of capsule + Curved surface area of hemispherical ends
Surface area of capsule = 141.3 mm^2 + 78.5 mm^2 = 219.8 mm^2

Question 20 .



Solution:

The wooden article was made by scooting out a hemisphere from each end of a cylinder

Let the radius of cylinder be r cm and height be h cm.
Height of cylinder = h = 20 cm
Base diameter of cylinder = 7 cm
Base radius of cylinder = r = diameter ÷ 2 = 7/2 cm = 3.5 cm
Lateral Surface area of cylinder = 2πrh
= 2 × 22/7 × 3.5 × 20 cm^2
= 2 × 22/7 × 3.5 × 20 cm^2
= 440 cm^2
Since, the wooden article was made by scooting out a hemisphere from each end of a cylinder
∴ Two hemispheres are taken out in total
Radius of cylinder = radius of hemisphere
∴ Radius of hemisphere = 3.5 cm
Lateral Surface area of hemisphere = $2\pi r^2$
= 2 × 22/7 × 3.5 × 3.5 cm^2
= 77 cm^2
Total Surface area of two hemispheres = 2 × 77 cm^2 = 154 cm^2
Total surface area of the article when it is ready = Lateral Surface area of cylinder + Lateral Surface area of hemisphere
Total surface area of the article when it is ready = 440 cm^2 + 154 cm^2
= 594 cm^2

Question 21.

Solution:

A solid is in the form of a right circular cone mounted on a hemisphere.
Let r be the radius of hemisphere and cone
Let h be the height of the cone
Radius of hemisphere = r = 2.1 cm
Volume of hemisphere = $2/3\ \pi r^3$
$= 2/3 \times 22/7 \times 2.1 \times 2.1 \times 2.1\ cm^3$
$= 19.404\ cm^3$
Height of cone = h = 4 cm
Radius of cone = r = 2.1 cm
Volume of cone = $1/3\ \pi r^2 h$
$= 1/3 \times 22/7 \times 2.1 \times 2.1 \times 4\ cm^3$
$= 18.48\ cm^3$
Volume of solid = Volume of hemisphere + Volume of cone
$= 19.404\ cm^3 + 18.48\ cm^3 = 37.884\ cm^3$
The solid is placed in a cylindrical tub full of water in such a way that the whole solid is submerged in water, so, to find the volume of water left in the tub we need to subtract volume of solid from cylindrical tub.
Radius of cylinder = r′ = 5 cm
Height of cylinder = h′ = 9.8 cm
Volume of cylindrical tub = $\pi r'^2 h' = 22/7 \times 5 \times 5 \times 9.8\ cm^3$
$= 770\ cm^3$
Volume of water left in the tub = Volume of cylindrical tub – Volume of solid

Volume of water left in the tub = 770 cm^3 – 37.884 cm^3 = 732.116 cm^3
∴ Volume of water left in the tub is 732.116 cm^3

Question 22.

Solution:
Height of solid cylinder = h = 8 cm
Radius of solid cylinder = r = 6 cm
Volume of solid cylinder = $\pi r^2 h$
= 3.14 × 6 × 6 × 8 cm^3
= 904.32 cm^3
Curved Surface area of solid cylinder = $2\pi rh$
Height of conical cavity = h = 8 cm
Radius conical cavity = r = 6 cm
Volume of conical cavity = 1/3 $\pi r^2 h$
= 1/3 × 3.14 × 6 × 6 × 8 cm^3
= 301.44 cm^3
Let l be the slant height of conical cavity
$l^2 = r^2 + h^2$
⇒ $l^2 = (6^2 + 8^2)$ cm^2
⇒ $l^2 = (36 + 64)$ cm^2
⇒ $l^2 = 100$ cm^2
⇒ l = 10 cm
Curved Surface area of conical cavity = πrl

Since, conical cavity is hollowed out from solid cylinder, so, volume and total surface area of remaining solid will be found out by subtracting volume and total surface area of conical cavity from volume and total surface area of solid cylinder.

Volume of remaining solid = Volume of solid cylinder – Volume of conical cavity

Volume of remaining solid = 904.32 cm^3 – 301.44 cm^3

= 602.88 cm^3

Total surface area of remaining solid = Curved Surface area of solid cylinder + Curved Surface area of conical cavity + Area of circular base

Total surface area of remaining solid = $2\pi rh + \pi rl + \pi r^2$

= $\pi r \times (2h + l + r)$

= $3.14 \times 6 \times (2 \times 8 + 10 + 6)$ cm^2

= $3.14 \times 6 \times 32$ cm^2

= 602.88 cm^2

Question 23.

Solution:

Height of solid cylinder = h = 2.8 cm

Diameter of solid cylinder = 4.2 cm

Radius of solid cylinder = r = Diameter ÷ 2 = 2.1 cm

Curved Surface area of solid cylinder = $2\pi rh$

= $2 \times 22/7 \times 2.1 \times 2.8$ cm^2

= $2 \times 22/7 \times 2.1 \times 2.8$ cm^2

= 36.96 cm^2

Height of conical cavity = h = 2.8 cm
Radius conical cavity = r = 2.1 cm
Let l be the slant height of conical cavity
$l^2 = r^2 + h^2$
$\Rightarrow l^2 = (2.8^2 + 2.1^2)\ cm^2$
$\Rightarrow l^2 = (7.84 + 4.41)\ cm^2$
$\Rightarrow l^2 = 12.25\ cm^2$
$\Rightarrow l = 3.5$ cm
Curved Surface area of conical cavity = πrl
= 22/7 × 2.1 × 3.5
= 23.1 cm^2
Total surface area of remaining solid = Curved surface area of solid cylinder + Curved surface area of conical cavity + Area of circular base
Total surface area of remaining solid = $(36.96 + 23.1 + 22/7 \times 2.1^2)\ cm^2$
= $(36.96 + 23.1 + 13.86)\ cm^2$
= 73.92 cm^2

Question 24 .

Solution:

Height of solid cylinder = h = 14 cm
Diameter of solid cylinder = 7 cm
Radius of solid cylinder = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm
Volume of solid cylinder = $\pi r^2 h$
= 22/7 × 3.5 × 3.5 × 14 cm^3

= 539 cm^3
Height of conical cavity = h′ = 4 cm
Radius conical cavity = r′ = 2.1 cm
Volume of conical cavity = $1/3\ \pi r'^2 h'$
= $1/3 \times 22/7 \times 2.1 \times 2.1 \times 4\ cm^3$
= 18.48 cm^3
Since, there are two conical cavities
∴ Volume of two conical cavities = $2 \times 18.48\ cm^3 = 36.96\ cm^3$
Volume of remaining solid = Volume of solid cylinder – Volume of two conical cavity
Volume of remaining solid = $539\ cm^3 - 36.96\ cm^3$
= 502.04 cm^3

Question 25.

Solution:
Height of metallic cylinder = h = 5 cm
Radius of metallic cylinder = r = 3 cm
Volume of solid cylinder = $\pi r^2 h$
= $3.14 \times 3 \times 3 \times 5\ cm^3$
= 141.3 cm^3
Height of conical hole = h′ = 8/9 cm
Radius conical hole = r′ = 3/2 cm
Volume of conical hole = $1/3\ \pi r'^2 h'$
= $1/3 \times 3.14 \times 3/2 \times 3/2 \times 8/9\ cm^3$

= 2.1 cm^3
Volume of metal left in cylinder = Volume of metallic cylinder – Volume of conical hole
Volume of metal left in cylinder = 141.3 cm^3 – 2.1 cm^3
= 139.2 cm^3
Ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape = Volume of metal left in cylinder/ Volume of conical hole
Volume of metal left in cylinder : Volume of conical hole = 139.2 : 2.1
Volume of metal left in cylinder: Volume of conical hole = 464 : 7
Ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape is 464:7

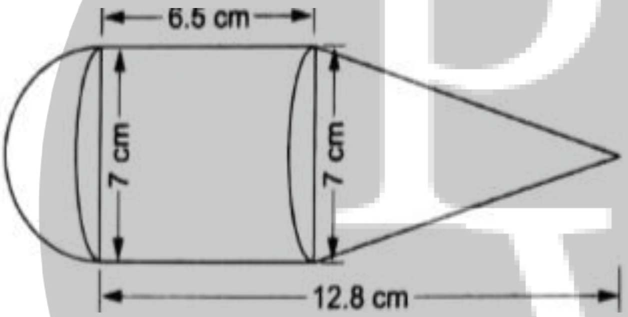
Question 26.

Solution:

Length of cylindrical neck = l = 7 cm
Diameter of cylindrical neck = 4 cm
Radius of cylindrical neck = r = Diameter ÷ 2 = 4/2 cm = 2 cm
Volume of cylindrical neck = $\pi r^2 l$
= 22/7 × 2 × 2 × 7 cm^3
= 88 cm^3
Diameter of spherical part = 21 cm
Radius of spherical part = r′ = Diameter ÷ 2 = 21/2 cm = 10.5 cm
Volume of spherical part = $4/3\ \pi r'^3$

= 4/3 × 22/7 × 10.5 × 10.5 × 10.5 cm^3
= 4851 cm^3
Quantity of water spherical glass vessel with cylindrical neck can hold = Volume of spherical part + Volume of cylindrical neck
Quantity of water spherical glass vessel with cylindrical neck can hold = 4851 cm^3 + 88 cm^3 = 4939 cm^3
Quantity of water spherical glass vessel with cylindrical neck can hold is 4939 cm^3.

Question 27.



Solution:

The solid consisting of a cylinder surmounted by a cone at one end a hemisphere at the other.
Length of cylinder = l = 6.5 cm
Diameter of cylinder = 7 cm
Radius of cylinder = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm
Volume of cylinder = $\pi r^2 l$
= 22/7 × 3.5 × 3.5 × 6.5 cm^3
= 250.25 cm^3
Length of cone = l′ = 12.8 cm – 6.5 cm = 6.3 cm
Diameter of cone = 7 cm

Radius of cone = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm
Volume of cone = 1/3 $\pi r^2 l'$
= 1/3 × 22/7 × 3.5 × 3.5 × 6.3 cm^3
= 80.85 cm^3
Diameter of hemisphere = 7 cm
Radius of hemisphere = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm
Volume of hemisphere = 2/3 πr^3
= 2/3 × 22/7 × 3.5 × 3.5 × 3.5 cm^3
= 89.83 cm^3
Volume of the solid = Volume of cylinder + Volume of cone + Volume of hemisphere
Volume of solid = 250.25 cm^3 + 80.85 cm^3 + 89.83 cm^3
= 420.93 cm^3

Question 28.

Solution:
Length of cubical piece of wood = a = 21 cm
Volume of cubical piece of wood = a^3
= 21 × 21 × 21 cm^3
= 9261 cm^3
Surface area of cubical piece of wood = $6a^2$
= 6 × 21 × 21 cm^2
= 2646 cm^2
Since, a hemisphere is carved out in such a way that the diameter of the hemisphere is equal to the side of the cubical piece.

So, diameter of hemisphere = length of side of the cubical piece
Diameter of hemisphere = 21 cm
Radius of hemisphere = r = Diameter ÷ 2 = 21/2 cm = 10.5 cm
Volume of hemisphere = $2/3\ \pi r^3$
$= 2/3 \times 22/7 \times 10.5 \times 10.5 \times 10.5\ cm^3$
$= 2425.5\ cm^3$
Surface area of hemisphere = $2\pi r^2$
$= 2 \times 22/7 \times 10.5 \times 10.5\ cm^2$
$= 693\ cm^2$
A hemisphere is carved out from cubical piece of wood
Volume of remaining solid = Volume of cubical piece of wood – Volume of hemisphere
Volume of remaining solid = $9261 cm^3 - 2425.5\ cm^3 = 6835.5\ cm^3$
Surface area remaining piece of solid = surface area of cubical piece of wood – Area of circular base of hemisphere + Curved Surface area of hemisphere
Surface area remaining piece of solid = $6a^2 - \pi r^2 + 2\pi r^2$
$= (2646 - 22/7 \times 10.5^2 + 693)\ cm^2$
$= 2992.5\ cm^2$

Question 29.

Solution:
Length of side of cubical block = a = 10 cm

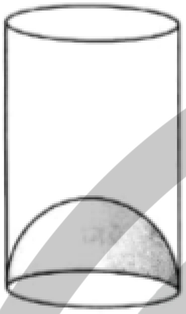
Since, a cubical block is surmounted by a hemisphere, so, the largest diameter of hemisphere = 10 cm
Since, hemisphere will be touching the sides of cubical block.
Radius of hemisphere = r = Diameter ÷ 2 = 10/2 cm = 5 cm
Surface area of solid = Surface area of cube – Area of circular part of hemisphere + Curved surface area of hemisphere
Total Surface area of solid = $6a^2 - \pi r^2 + 2\pi r^2 = 6a^2 + \pi r^2$
$= 6 \times 10 \times 10 \text{ cm}^2 + 3.14 \times 5 \times 5 \text{ cm}^2$
$= 678.5 \text{ cm}^2$
Rate of painting = ☐ 5/100 cm^2
Cost of painting the total surface area of the solid so formed = Total Surface area of solid × Rate of painting
Cost of painting the total surface area of the solid = ☐5/100 × 678.5
= ☐33.925

Question 30.

Solution:
The toy is in the shape of a right circular cylinder surmounted by a cone at one end a hemisphere at the other.
Total height of toy = 30 cm
Height of cylinder = h = 13 cm
Radius of cylinder = r = 5 cm

Curved surface area of cylinder = $2\pi rh$
$= 2 \times 22/7 \times 5 \times 13\ cm^2$
Height of cone = h′ = Total height of toy – Height of cylinder – Radius of hemisphere
Height of cone = h′ = 30 cm – 13 cm – 5 cm = 12 cm
Radius of cone = r = Radius of cylinder
Radius of cone = r = 5 cm
Let the slant height of cone be l
$l^2 = h'^2 + r^2$
$\Rightarrow l^2 = 12^2 + 5^2\ cm^2 = 144 + 25\ cm^2 = 169\ cm^2$
$\Rightarrow l = 13$ cm
Curved surface area of cone = πrl
$= 22/7 \times 5 \times 13\ cm^2$
Radius of hemisphere = r = Radius of cylinder
Radius of hemisphere = r = 5 cm
Curved surface area of hemisphere = $2\pi r^2$
$= 2 \times 22/7 \times 5 \times 5\ cm^2$
Surface area of the toy = Surface area of cylinder + Surface area of cone + Surface area of hemisphere
Surface area of toy = $2\pi rh + \pi rl + 2\pi r^2$
$= \pi r (2h + l + 2r)$
$= 22/7 \times 5 \times (2 \times 13 + 13 + 2 \times 5)\ cm^2$
$= 22/7 \times 5 \times 49\ cm^2$
$= 770\ cm^2$
Surface area of toy is $770\ cm^2$

Question 31.



Solution:

Inner diameter of a glass = 7 cm

Inner radius of glass = r = 7/2 cm = 3.5 cm

Height of glass = h = 16 cm

Apparent capacity of glass = $\pi r^2 h$

= 22/7 × 3.5 × 3.5 × 16 cm^3

= 616 cm^3

Volume of the hemisphere in the bottom = 2/3 πr^3

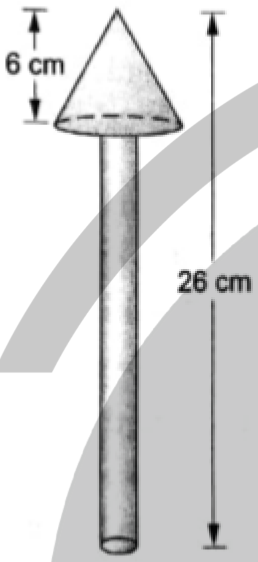
= 2/3 × 22/7 × 3.5^3 cm^3

= 89.83 cm^3

Actual capacity of the class = Apparent capacity of glass – Volume of the hemisphere

Actual capacity of the class = 616 cm^3 – 89.83 cm^3 = 526.17 cm^3

Question 32.



Solution:

The wooden toy is in the shape of a cone mounted on a cylinder
Total height of the toy = 26 cm
Height of conical part = H = 6 cm
Height of cylindrical part = Total height of the toy – Height of conical part
h = 26 cm – 6 cm = 20 cm
Diameter of conical part = 5 cm
Radius of conical part = R = Diameter/2 = 5/2 cm = 2.5 cm
Let L be the slant height of the cone
$L^2 = H^2 + R^2$
$\Rightarrow L^2 = 6^2 + 2.5^2 \text{ cm}^2 = 36 + 6.25 \text{ cm}^2 = 42.25 \text{ cm}^2$
$\Rightarrow$ L = 6.5 cm
Diameter of cylindrical part = 4 cm
Radius of cylindrical part = r = Diameter/2 = 4/2 cm = 2 cm

Area to be painted Red = Curved Surface area of cone + Base area of cone – base area of cylinder

Area to be painted Red = $\pi RL + \pi R^2 - \pi r^2 = \pi (RL + R^2 - r^2)$

$= 22/7 \times (2.5 \times 6.5 + 2.5 \times 2.5 - 2 \times 2)\ cm^2$

$= 22/7 \times (16.25 + 6.25 - 4)\ cm^2$

$= 22/7 \times 18.5\ cm^2$

$= 58.143\ cm^2$

Area to be painted White = Curved Surface area of cylinder + Base area of cylinder

Area to be painted White = $2\pi rh + \pi r^2 = \pi r (2h + r)$

$= 22/7 \times 2 \times (2 \times 20 + 2)\ cm^2$

$= 22/7 \times 2 \times (40 + 2)\ cm^2$

$= 22/7 \times 2 \times 42\ cm^2 = 264\ cm^2$

∴ Area to be painted red is $58.143\ cm^2$ and area to be painted white is $264\ cm^2$.