EXERCISE – 15B

Answer 1:

Given :

diameter = 28 cm

so, radius (r) = 14 cm $\left(r=\frac{d}{2}\right)$

height (h) =40 cm

Find

(i) Curved surface area of cylinder = ?

Curved Surface area of cylinder = 2πrh sq. Unit

$$= 2 \times \left(\frac{22}{7}\right) \times 14 \times 40$$

$$= 160 \times 22\text{cm}^2$$

$$= 3520\ \text{cm}^2$$

(ii) Total Surface area of cylinder = {2πr(r+h)} sq. Unit

$$= 2 \times \left(\frac{22}{7}\right) \times 14 \times (14 + 40)$$

$$= 88 \times 54\text{cm}^2$$

$$= 4752\ \text{cm}^2$$

(iii) Volume of cylinder = $\pi r^2 h$ cubic Unit

$$= \left(\frac{22}{7}\right) \times 14^2 \times 40$$

$$= 44 \times 560\text{cm}^3$$

$$= 24640\ \text{cm}^3$$

Answer 2: Given :

diameter of bowl (d) = 7 cm

so, radius (r) = 3.5 cm $\left(r=\frac{d}{2}\right)$

height (h) of bowl = 4 cm

Find

Amount of Soup in bowl = ?

Capacity of bowl = volume of bowl = Soup for 1 patient

$= \pi r^2 h$ cubic Unit

$= \left(\frac{22}{7}\right) \times (3.5)^2 \times 4 cm^3$

$= 154\ cm^3$

$= 0.154$ litre $(1\ cm^3 = 0.001$ litre$)$

so, for 250 patient $= 250 \times Soup for 1 patient$

$= 250 \times 0.154$ litre

$= 38.5$ litre

Answer 3:

Given :

Radius of pillar (r) = 20 cm = 0.2 m (1cm = .1 m)

Height (h) = 10 m

Concrete required for one pillar = Volume of pillar

$= \pi r^2 h$ cubic Unit

$= \left(\frac{22}{7}\right) \times (0.2)^2 \times 10 m^3$

$= 1.256\ m^3$

so, Concrete required for 14 pillars $= 14 \times Concrete required for one pillar$

$= \quad 14 \times 1.256 m^3$

$= 17.6\ m^3$

Answer 4:

(i)

Given: length (l) = 5 cm

breadth (b) = 4 cm

height (h) = 15 cm

Capacity of tin with rectangular base = Volume of Tin

$= l \times b \times h$cubic Unit

$= \quad 5 \times 4 \times 15 cm^3$

$= 300\ cm^3$

(ii) Given:

dimeter (d) = 7 cm

so, radius (r) = 3.5 cm

height (h) = 10 cm

Capacity of plastic cylinder = volume of Cylinder

$= \pi r^2 h$ cubic Unit

$= \left(\frac{22}{7}\right) \times (3.5)^2 \times 10 cm^3$

$= 385\ cm^3$

Capacity of Plastic Cylinder is greater by 85 cm^3 than Capacity of Tin

Answer 5:

Given:

No. Of pillars = 20

Diameter (d) =50 cm = 0.5 m (1 cm = 0.1 m)

so, radius (r) =0.25 m

Height (h) = 4 m

Cost of Cleaning = 14 rs per m^2

Curved Surface area of one pillar = 2πrh sq. Unit

$$= 2 \times \left(\frac{22}{7}\right) \times (0.25) \times 4m^2$$

$= 6.28\ m^2$

Cost of Cleaning for one Pillar = $Cost of Cleaning \times Area of one pillar$

$= 14 \times 6.28$

= Rs 87.92

Cost of Cleaning for 20 Pillar = 20 × 87.92 20 x 87.92

= Rs 1760 (approx)

Answer 6: Given:

Curved Surface area = 4.4 m^2

radius (r) = 0.7 m

height = ?

Curved Surface area = 2πrh = 4.4 m^2

$\Rightarrow 2 \times \left(\frac{22}{7}\right) \times (0.7) \times h = 4.4$

$\Rightarrow$ h = 1 m

Volume of Cylinder = $\pi r^2 h$ cubic Unit

$= \left(\frac{22}{7}\right) \times (0.7)^2 \times 1m^3$

$= 1.54\ m^3$

Answer 7: Given:

Curved Surface area = 94.2 cm^2

height(h) = 5 cm

Find

(i) Radius of its base = ?

Curved Surface area = $2\pi rh = 94.2\ cm^2$

$\Rightarrow 2 \times 3.14 \times r \times 5 = 94.2 \qquad (\pi = 3.14)$

$\Rightarrow \quad r = 3$ cm

(ii) Volume of cylinder = $\pi r^2 h$ cubic unit

$= 3.14 \times 3^2 \times 5\ cm^3$

$= 141.3\ cm^3$

Answer 8: Given:

Capacity of Closed Cylinder = 15.4 litre

$= 15400\ cm^3 \qquad (1 \text{ litre} = 1000\ cm^3)$

height(h)= 1m = 100 cm

Area of metal sheet = total surface area of vessel = $2\pi r(r+h)$

let's find radius of vessel

Volume of vessel = Capacity of vessel = 15400 cm^3

$\Rightarrow \pi r^2 h = 15400$

$\left(\frac{22}{7}\right) \times (r)^2 \times 100 = 15400$

$r^2 = 49$

$\Rightarrow \quad r = 7$ cm

Area of metal sheet = total surface are of cylindrical vessel

$= 2\pi r(r+h)$ sq. Unit

$= 2 \times \left(\frac{22}{7}\right) \times 7 \times (7 + 100)\text{cm}^2$

$= 4708\ \text{cm}^2$

Answer 9:

Given:

Inner diameter (d) = 24 cm

⇒ Inner radius (r) = 12 cm

Outer diameter (D)= 28 cm

⇒ Outer radius (R) = 14 cm

length = height(h) = 35 cm

volume of wooden pipe in cm^3

$= \pi(R^2 - r^2)h$

$= \left(\frac{22}{7}\right) \times (14^2 - 12^2) \times 35$

$= \frac{22}{7} \times (196 - 144) \times 35\text{cm}^3$

$= \frac{22}{7} \times (52) \times 35\ \text{cm}^3$

$= 5720\ \text{cm}^3$

1 cm^3 of wood has a mass of 0.6 gm

⇒ Mass of pipe

$= 5720 \times 0.6g$

= 3432 gm

= 3.432 kg (1000 gm = 1 kg)

Answer 10: Given:

diameter (d) = 5 cm

⇒ radius (r) =2.5 cm

length (h) $= 28\text{ m} = 280\text{ cm}$

Total radiating surface = curved surface area of pipe

$= 2\pi rh$ sq. Unit

$= 2 \times \left(\frac{22}{7}\right) \times 2.5 \times 2800$

$= 44{,}000\text{ cm}^2$

Answer 11: Given:

radius (r) $= 10.5$ cm

height (h) $= 60$ cm

volume of solid cylinder $= \pi r^2 h$ cubic unit

$= \frac{22}{7} \times (10.5)^2 \times 60\text{ cm}^3$

$= 20790\text{ cm}^3$

thus, it is given that material of cynlinder weighs 5 g per cm^3

so, weight of cylinder $= 20790 \times 5g$

$= 103950$ gm

$= 103.95$ kg (1 kg = 1000 gm)

Answer 12: Given:

Curved Surface area $= 1210\text{ cm}^2$

diameter (d) $= 20$ cm

$\Rightarrow$ radius (r) $= 10$ cm

height (h) =?

Curved Surface area $= 2\pi rh$ sq. Unit $= 1210\text{ cm}^2$

$\Rightarrow 2 \times \left(\frac{22}{7}\right) \times 10 \times h = 1210$

h $= 19.25$ cm

volume of cylinder $= \pi r^2 h$ cubic unit

$$= \frac{22}{7} \times (10)^2 \times 19.25 \text{ cm}^3$$

$$= 6050 \text{ cm}^3$$

Answer 13: Given:

Curved Surface area $= 4400 \text{ cm}^2$

Circumference of base $= 110$ cm

let radius $= r$ and height $= h$ for the cynlinder.

Circumference of base $= 2\pi r = 110$ cm

$$\Rightarrow 2 \times \left(\frac{22}{7}\right) \times r = 110$$

r $= 17.5$ cm

Curved Surface area $= 2\pi rh = 4400 \text{ cm}^2$

$$\Rightarrow 2 \times \left(\frac{22}{7}\right) \times 17.5 \times h = 4400$$

h $= 40$ cm

Volume of Cylinder $= \pi r^2 h$ cubic unit

$$= \frac{22}{7} \times (17.5)^2 \times 40 \text{ cm}^3$$

$$= 38{,}500 \text{ cm}^3$$

Answer 14: Given:

Volume of Cylinder $= 1617 \text{ cm}^3$

$$\frac{radius(r)}{height(h)} = \frac{2}{3}$$

$$\Rightarrow \quad r = \frac{2h}{3} \quad \text{.... eq.(i)}$$

Total surface area = ?

Volume of Cylinder = $\pi r^2 h$ = 1617 cm

putting the value of r from eq.(i) in formula, we get

$\frac{22}{7} \times \left(\frac{2h}{3}\right)^2 \times h = 1617$

$\frac{22}{7} \times \left(\frac{2h}{3}\right) \times \left(\frac{2h}{3}\right) \times h = 1617$

$h^3 = 1157.625$

$\Rightarrow \quad h = \sqrt[3]{1157.625}$

h = 10.5 cm

thus, $r = \frac{2h}{3} = \frac{2x10.5}{3}$

r = 7 cm

Total Surface area of Cylinder = $2\pi r(r + h)$ sq. Unit

$= 2 \times \left(\frac{22}{7}\right) \times 7 \times (7 + 10.5)$

$= 2 \times \left(\frac{22}{7}\right) \times 7 \times (17.5)$

$= 770 \text{ cm}^2$

Answer 15: Given:

Total Surface area = 462 cm^2

Curved surface area = $\frac{1}{3}$(total surface area)

$= \frac{1}{3}(462) \text{ cm}^2$

$= 154 \text{ cm}^2$

Total Surface area =

$$2\pi r(r + h) = 462 \text{ cm}^2 \quad \ldots\ldots\ldots \text{ eq. (i)}$$

Curved surface area =

$$2\pi rh = 154 \text{ cm}^2 \quad \ldots\ldots\ldots\ldots \text{ eq.(ii)}$$

Divide eq.(i) by eq.(ii) , we get

$\frac{r+h}{h} = 3$

$\Rightarrow \quad r + h = 3h$

$r = 2h \quad \ldots\ldots\ldots\ldots$ eq.(iii)

putting the value of r in eq.(ii) , we get

$2 \times \left(\frac{22}{7}\right) \times 2h \times h = 154$

$\Rightarrow \quad h^2 = \frac{49}{4}$

$h = \frac{7}{2} = 3.5$ cm

thus, $r = 2h = 2 \times \frac{7}{2} = 7$ cm

volume of Cylinder = $\pi r^2 h$ cubic unit

$= \frac{22}{7} \times 7^2 \times 3.5 \text{ cm}^3 = 539 \text{ cm}^3$

Answer 16: Given:

Total Surface area = 231 cm^2

Curved surface area = $\frac{2}{3}$(total surface area)

$= \frac{2}{3}(231) \text{ cm}^2$

$= 154 \text{ cm}^2$

Total Surface area =

$2\pi r(r + h) = 231\ cm^2$ ..... eq. (i)

Curved surface area =

$2\pi rh = 154\ cm^2$ ..... eq.(ii)

Divide eq.(i) by eq.(ii) , we get

$\frac{r+h}{h} = \frac{3}{2}$

$\Rightarrow \quad 2r + 2h = 3h$

$r = \frac{h}{2}$ ..... eq.(iii)

putting the value of r in eq.(ii) , we get

$2 \times \left(\frac{22}{7}\right) \times \left(\frac{h}{2}\right) \times h = 154$

$\Rightarrow \quad h^2 = 49$

$h = \sqrt{49} = 7\ cm$

thus, $r = \frac{h}{2} = \frac{7}{2} = 3.5\ cm$

volume of cylinder = $\pi r^2 h$ cubic unit

$= \frac{22}{7} \times (3.5)^2 \times 7\ cm^3 = 269.5\ cm^3$

Answer 17: Given:

total surface area = $616\ cm^2$

$\frac{curved surface area}{total surface area} = \frac{1}{2}$

$\Rightarrow \frac{2\pi rh}{2\pi r(r+h)} = \frac{1}{2}$

$\frac{h}{r+h} = \frac{1}{2}$

$\Rightarrow \quad 2h = r+h$

$h = r \quad$ ..... eq.(i)

total surface area $= 616\ cm^2$

$\Rightarrow \quad 2\pi r(r + h) = 616$

$2 \times \left(\frac{22}{7}\right) \times r \times (r + r) = 616 \quad$ { h = r from eq.(i) }

$r^2 = 49$

$r = \sqrt{49} = 7$ cm

$\Rightarrow \quad r = h = 7cm$

Volume of Cylinder $= \pi r^2 h$ cubic unit

$= \frac{22}{7} \times 72 \times 7$

$= 1078\ cm^3$

Answer 18: Given:

diameter ofbucket $= 28$ cm

$\Rightarrow$ radius (r) $= 14$ cm

height of bucket $(h_b) = 72$ cm

length of rectangular tank (l) $= 66$ cm

breadth (b) $= 28$ cm

let height of rectangular tank $= h_t$

Volume of bucket $= \pi r^2 h$ cubic unit

$= \frac{22}{7} \times 14^2 \times 72\ cm^3$

$= 44352\ cm^3$

Volume of rectngular tank = l . b . h

$= 66 \times 28 \times ht \text{cm}^3$

$= 1848h_t \text{ cm}^3$

Volume of bucket = Volume of rectngular tank

$\Rightarrow \quad 44352 = 1848h_t$

$h_t = 24$ cm

Answer 19: Given:

Height of barrel = 7 cm

diameter(d) = 5 mm

$\Rightarrow$ radius (r) = 2.5 mm = .25 cm (1 cm = 0.1 mm)

Volume of barrel = $\pi r^2 h$ cubic unit

$= \frac{22}{7} \times (0.25)^2 \times 7 \text{cm}^3$

$= 1.375 \text{ cm}^3$

1 full barrel is used to write 330 words

$\Rightarrow 1.375 \text{ cm}^3$ used to write 330 words

so , $\frac{1}{5}$litre = 200 cm^3 can be used for

$= (330 \text{ x } \frac{1}{1.375} \text{x } 200)$ = 48000 words

Answer 20: Given:

Volume of gold = 1 cm^3

diameter = 0.1 mm

so, radius (r) = 0.05 mm = 0.005 cm (1 mm = 0.1 cm)

let the length of wire is l

Volume of gold = $\pi r^2 l = 1\ cm^3$

$\Rightarrow \frac{22}{7} \times (0.005)^2 \times l = 1$

l = 12727.27 cm

= 127.27 m (1 m =100 cm)

Answer 21: Given:

Internal diameter = 3 cm

∴ radius (r) =1.5 cm

height (h) = 1m = 100 cm

thickness (t) = 1 cm

external radius (R) = Internal radius (r) + thickness (t)

$\Rightarrow r + t = 1.5 + 1$

= 2.5 cm

Volume of cast iron pipe = External volume – Internal Volume

$= \pi R^2 h - \pi r^2 h$

$= \pi(R^2 - r^2)h$

$= \frac{22}{7} \times ((2.5)^2 - (1.5)^2) \times 100$

$= \frac{22}{7} \times 4 \times 100$

$= \frac{8800}{7} cm^3$

Weight of iron = $\frac{8800}{7}$x 21 gm (Given 1 cm^3 = 21 gm)

= 26400 gm

= 26.4 kg

Answer 22: Given:

Internal diameter = 10.4 cm

⇒ Internal radius (r) =5.2 cm

height (h) $= 25$ cm

thickness (t) $= 8$ mm $= 0.8$ cm

external radius (R) = Internal radius (r) + thickness (t)

$= r + t$

$= 5.2 + 0.8$

$= 6.0$ cm

Volume of cylindrical tube = External volume – Internal Volume

$= \pi R^2 h - \pi r^2 h$

$= \pi(R^2 - r^2)h$

$= \frac{22}{7} \times ((6)^2 - (5.2)^2) \times 25 cm^3$

$= 704\ cm^3$

Answer 23:

Given:

diameter of bucket $= 140$ cm

$\therefore$ radius (r) $= 70$ cm

height of bucket (h_b) $= 1$ m $= 100$ cm

Total Surface area of Cylinder $= 2\pi r(r + h)$ sq. Unit

$= 2 \times \left(\frac{22}{7}\right) \times 70 \times (70 + 100)$

$= 2 \times \left(\frac{22}{7}\right) \times 70 \times 170$

$= 74800\ cm^2$

$= 7.48\ m^2$ ($1\ cm^2 = 0.0001\ m^2$)

Answer 24:

Given:

radius of large vessel(R) = 15 cm

height (H) =32 cm

radius of glass (r) = 3 cm

height (h) = 8 cm

Price of one glass = 15 rs

total no of glass filled by vessel $= \frac{volumeoflargevessel}{volumeofoneglass} = \frac{\pi R^2 H}{\pi r^2 h}$

$= \frac{R^2 H}{r^2 h}$

$= \frac{15x15x32}{3x3x8}$

$= 100$

Total amount of money $= priceofoneglass \times totalnoofglass$

$= 15 \times 100$

$= 1500$ rs

Answer 25:

Given:

Insidediameter = 10 m

⇒ inner radius (r) = 5 m

height (h) = 8.4 m

width of embankment = 7.5 m

radius of embankment (R) = inner radius + width of embankment

= 5 m + 7.5 m

= 12.5 m

let height of embankment is H

Volume dug out from well = volume of earth in embankment

$\pi r^2 h = \pi(R^2 - r^2)H$

$5 \times 5 \times 8.4 = ((12.5)^2 - 5^2) \times H$

H = 1.6 m

Answer 26:

Given:

speed of water = 30 cm per sec

Area of cross section = 5 cm^2

time = 1 minute

Volume of water flows in one sec = area of cross section x length of water flows in 1s

$= 5 \times 30 = 150\ cm^3$

water flows in one minute = water flows in one sec x 60

$= 150 \times 60$

$= 9000\ cm^3$

= 9 litre ($1\ cm^3 = 0.001$ litre)

Answer 27:

Given: diameter of tank = 1.4 m

⇒ radius (R) = 0.7 m

height (H) = 2.1 m

diameter of pipe = 3.5 cm = 0.35 m

⇒ radius (r) = 0.175 m

rate of flow = 2 m per sec

Volume of tank = $\pi R^2 H$ cubic unit

$= \pi \times (0.7)^2 \times 2.1$

$= \frac{1029\pi}{1000}$ m^3

volumeof water flow in 1 s = area of cross section x rate of flow per sec

$= \pi r^2 \times 2$

$= \frac{22}{7} \times (0.175)^2 \times 2$

$= \frac{49\pi}{80000}$m^3

let the time required to fill the tank is t seconds

water flow in t sec by pipe = volume of tank

t x $\frac{49\pi}{80000} = \frac{1029\pi}{1000}$

⇒ t = 1680 s

= 28 minutes

Answer 28:

Given:

diameter of container = 56 cm

⇒ radius (r) = 28 cm

dimension of rectangular solid = (32 cm x 22 cm x 14 cm)

Volume of Solid = l.b.h

$=32 \times 22 \times 14 cm^3$

$= 9856\ cm^3$

let the rise in level of container is h cm.

Volume of container = $\pi r^2 h$ cubic unit

$= \frac{22}{7} \times 28 \times 28 \times h$

$= 2474h$

Volume of solid = volume of container with height h and base radius 28 cm

$\Rightarrow \quad 9856 = 2474h$

$h = 4$ cm

Answer 29:

Given:

height (h) = 280 m

diameter = 3 m

$\Rightarrow$ radius (r) = 1.5 m

rate = 15 rs per m^3

rate of cementing =10 rs m^2

volume of tube well = $\pi r^2 h$ cubic unit

$= \frac{22}{7} \times 1.5 \times 1.5 \times 280 m^3$

$= 1980\ m^3$

(i) price for sinking 1 m^3 is 15 rs

so , for 1980 $m^3 = 1980 \times 15$

$= 29700$ rs

(ii) Cost of cementing = ?

Curved Surface area = $2\pi rh$

$$= 2 \times \left(\frac{22}{7}\right) \times 1.5 \times 280$$

$$= 2640 \text{ m}^2$$

rate for cementing 1 m^2 = 10 rs

so, for 2640 m^2 $= 2640 \times 10$

$$= 26400 \text{ rs}$$

Answer 30:

Given:

Weight of wire = 13.2 kg

diameter = 4 mm

$\Rightarrow$ radius (r) = 2 mm = 0.2 cm

let the length of wire is h cm

Thus, volume of wire x 8.4 g = (13.2×1000) g

$\pi r^2 h$ x 8.4 = 13200

$\frac{22}{7} \times 0.2 \times 0.2 \times h \times 8.4 = 13200$

$\Rightarrow$ h = 12500 cm = 125 m

Answer 31:

Given:

total cost for inner surface = 3300 rs

height (h) = 10 m

rate = 30 rs per m^2

(i) inner curved surface area of vessel $= \frac{totalcost}{rate}$

$= \frac{3300}{30} = 110\ m^2$

(ii) let inner radius = r metre

inner Curved Surface area $= 2\pi rh = 110\ m^2$

$$2 \times \left(\frac{22}{7}\right) \times r \times 10 = 110$$

$\Rightarrow$ $h = 1.75$ m

(iii) capacity of vessel = volume of vessel $= \pi r^2 h$ cubic unit

$= \frac{22}{7} \times 1.75 \times 1.75 \times 10$

$= 96.25\ m^3$

Answer 32:

Given:

height (h) = 14 cm

let inner radii = r cm

and outer radii = R cm

Difference between surfaces area $= 88\ cm^2$

$\Rightarrow$ $(2\pi Rh - 2\pi rh) = 88$

$(R - r) = \frac{88}{2\pi h} = 1$ cm .....eq(i)

Volume of the tube $= \pi R^2 h - \pi r^2 h = 176\ cm^3$

$\pi h(R^2 - r^2) = 176$

$\Rightarrow \frac{22}{7} \times 14 \times (R + r) \times (R - r) = 176$ $\quad a^2 - b^2 = (a + b)(a - b)$

putting value of eq(i) we get

$\frac{22}{7} \times 14 \times 1 \times (R + r) = 176$

$\Rightarrow$ (R+r) =4 ..... eq.(ii)

thus, Solving eq.(i) and eq.(ii) we get

R = 2.5 cm

r = 1.5 cm

Answer 33:

Given:

Dimension = 30 cm x 18 cm

(i) Rolling by length

if we roll by length then breadth will be equal to height i.e,

h = 18 cm

and length will be equal to circumference of cylinder i.e,

$2\pi r = 30$ cm

$\Rightarrow$ $r = \frac{15}{\pi}$cm

Volume of Cylinder = $\pi r^2 h$ cubic unit

$= \pi \times \left(\frac{15}{\pi}\right) \times \left(\frac{15}{\pi}\right) \times 18$ $\quad cm^3 = \frac{4050}{\pi} cm^3$

(i) Rolling by breadth

if we roll by breadth then length will be equal to height i.e,

h = 30 cm

and breadth will be equal to circumference of cylinder i.e,

$2\pi r = 18$ cm

$\Rightarrow \quad r = \frac{9}{\pi}$cm

Volume of Cylinder $= \pi r^2 h$ cubic unit

$= \pi \times \left(\frac{9}{\pi}\right) \times \left(\frac{9}{\pi}\right) \times 30 \quad$ cm^3

$= \frac{2430}{\pi}$cm^3

Ratio $= \frac{Volume of Cylinder folded by length}{Volume of Cylinder folded by breadth}$

$= \frac{\left(\frac{4050}{\pi}\right)}{\left(\frac{2430}{\pi}\right)} = \frac{405}{243} = \frac{5}{3}$

$= 5 : 3$