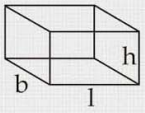
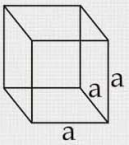
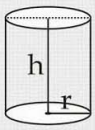
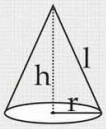
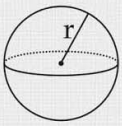
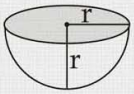
Volume and Surface Area of Solids

Name of the solid	Figure	Volume	Lateral/Curved Surface Area	Total Surface Area
Cuboid		lbh	2lh + 2bh or 2h(l+b)	2lh+2bh+2lb or 2(lh+bh+lb)
Cube		a^3	$4a^2$	$4a^2+2a^2$ or $6a^2$
Right circular cylinder		πr^2h	$2\pi rh$	$2\pi rh + 2\pi r^2$ or $2\pi r(h+r)$
Right circular cone		$\frac{1}{3}\pi r^2h$	πrl	$\pi rl + \pi r^2$ or $\pi r(l+r)$
Sphere		$\frac{4}{3}\pi r^3$	$4\pi r^2$	$4\pi r^2$
Hemisphere		$\frac{2}{3}\pi r^3$	$2\pi r^2$	$2\pi r^2+\pi r^2$ or $3\pi r^2$

Q1.

Answer :

(b) 17

Length of the diagonal of a cuboid $= \sqrt{l^2+b^2+h^2}$

$\therefore \sqrt{l^2+b^2+h^2} = \sqrt{12^2+9^2+8^2} = \sqrt{144+81+64} = \sqrt{289} = 17\ cm$

Q2.

Answer :

(b) $125\ cm^3$

Total surface area $= 6a^2 = 150\ cm^2$, where a is the length of the edge of the cube.

$\Rightarrow 6a^2 = 150$

$\Rightarrow a = \sqrt{\frac{150}{6}} = \sqrt{25} = 5\ cm$

$\therefore$ Volume$= a^3 = 5^3 = 125\ cm^3$

Q3.

Answer :

(c) $294\ cm^2$

Volume$= a^3 = 343\ cm^3$
$\Rightarrow a = \sqrt[3]{343} = 7\ cm$
$\therefore$ Total surface area$= 6a^2 = 6 \times 7 \times 7 = 294\ cm^2$

Q4.

Answer :

(c) $294\ cm^2$

Volume$= a^3 = 343\ cm^3$
$\Rightarrow a = \sqrt[3]{343} = 7\ cm$
$\therefore$ Total surface area$= 6a^2 = 6 \times 7 \times 7 = 294\ cm^2$

Q5.

Answer :

(c) 6400

Volume of each brick$= 25 \times 11.25 \times 6 = 1687.5\ cm^3$
Volume of the wall$= 800 \times 600 \times 22.5 = 10800000\ cm^3$
$\therefore$ No. of bricks $= \frac{10800000}{1687.5} = 6400$

Q6.

Answer :

(c) 1000

Volume of the smaller cube$= (10\ cm)^3 = 1000\ cm^3$
Volume of box$= (100\ cm)^3 = 1000000\ cm^3$ [1 m = 100 cm]
$\therefore$ Total no. of cubes $= \frac{100 \times 100 \times 100}{10 \times 10 \times 10} = 1000$

Q7.

Answer :

(a) $48\ cm^3$

Let *a* be the length of the smallest edge.
Then the edges are in the proportion *a* : 2*a* : 3*a*.
Now, surface area$= 2(a \times 2a + a \times 3a + 2a \times 3a) = 2(2a^2 + 3a^2 + 6a^2) = 22a^2 = 88\ cm^2$

$\Rightarrow a = \sqrt{\frac{88}{22}} = \sqrt{4} = 2$
Also, 2*a* = 4 and 3*a* = 6
$\therefore$ Volume$= a \times 2a \times 3a = 2 \times 4 \times 6 = 48\ cm^3$

Q8.

Answer :

(b) 1: 9

$\frac{\text{Volume } 1}{\text{Volume } 2} = \frac{1}{27} = \frac{a^3}{b^3}$

$\Rightarrow a = \frac{b}{\sqrt[3]{27}} = \frac{b}{3}$ or $b = 3a$ or $\frac{b}{a} = 3$

Now, $\frac{\text{surface area } 1}{\text{surface area } 2} = \frac{6a^2}{6b^2} = \frac{a^2}{b^2} = \frac{(b/3)^2}{b^2} = \frac{1}{9}$

$\therefore$ Ratio of the surface areas $= 1 : 9$

Q9.

Answer :

(c) 164 sq cm

Surface area $= 2(10 \times 4 + 10 \times 3 + 4 \times 3) = 2(40 + 30 + 12) = 164\ cm^2$

Q10.

Answer :

(c) 36 kg

Volume of the iron beam $= 9 \times 0.4 \times 0.2 = 0.72\ m^3$

$\therefore$ Weight $= 0.72 \times 50 = 36\ kg$

Q11.

Answer :

(a) 2 m

42000 L = 42 m^3

Volume $= lbh$

$\therefore$ Height $(h) = \frac{\text{volume}}{lb} = \frac{42}{6 \times 3.5} = \frac{6}{6 \times 0.5} = 2\ m$

Q12.

Answer :

(b) 88

Volume of the room $= 10 \times 8 \times 3.3 = 264\ m^3$

One person requires 3 m^3.

$\therefore$ Total no. of people that can be accommodated $= \frac{264}{3} = 88$

Q13.

Answer :

(a) 30000

Volume $= 3 \times 2 \times 5 = 30\ m^3 = 30000$ L

Q14.

Answer :

(b) $1390\ cm^2$

Surface area $= 2(25 \times 15 + 15 \times 8 + 25 \times 8) = 2(375 + 120 + 200) = 1390\ cm^2$

Q15.

Answer :

(d) $64\ cm^2$

Diagonal of the cube $= a\sqrt{3} = 4\sqrt{3}\ cm$

i.e., a = 4 cm

$\therefore$ Volume $= a^3 = 4^3 = 64\ cm^3$

Q16.

Answer :

(b) 486 sq cm

Diagonal $= \sqrt{3}a\ cm\ = 9\sqrt{3}cm$
i.e., $a = 9$
∴ Total surface area $= 6a^2 = 6 \times 81 = 486\ cm^2$

Q17.

Answer :

(d) If each side of the cube is doubled, its volume becomes 8 times the original volume.

Let the original side be a units.
Then original volume = a^3 cubic units
Now, new side = $2a$ units
Then new volume = $(2a)^3$ sq units = 8 a^3cubic units
Thus, the volume becomes 8 times the original volume.

Q18.

Answer :

(b) becomes 4 times.

Let the side of the cube be a units.
Surface area = $6a^2$ sq units
Now, new side = $2a$ units
New surface area = $6(2a^2)$ sq units = $24a^2$ sq units.
Thus, the surface area becomes 4 times the original area.

Q19.

Answer :

(a) 12 cm

Total volume $= 6^3 + 8^3 + 10^3 = 216 + 512 + 1000 = 1728\ cm^3$
∴ Edge of the new cube$= \sqrt[3]{1728} = 12\ cm$

Q20.

Answer :

(d) $625\ cm^3$

Length of the cuboid so formed = 25 cm
Breadth of the cuboid = 5 cm
Height of the cuboid = 5 cm
∴ Volume of cuboid$= 25 \times 5 \times 5 = 625\ cm^3$

Q21.

Answer :

(d) 44 m^3

Diameter = 2 m
Radius = 1 m
Height = 14 m
$\therefore\ \text{Volume} = \pi r^2 h = \frac{22}{7} \times 1 \times 1 \times 14 = 44\ m^3$

Q22.

Answer :

(b) 12 m

Diameter = 14 m
Radius = 7 m
Volume = 1848 m^3

$\text{Now, volume} = \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times h = 1848\ m^3$
$\therefore\ h\ =\ \frac{1848}{22 \times 7} = 12\ m$

Q23.

Answer :

(c) 4 : 3

Here,

$\frac{\text{Total surface area}}{\text{Lateral surface area}} = \frac{2\pi r(h+r)}{2\pi rh}$
$= \frac{h+r}{h}$
$= \frac{20+60}{60}$
$= \frac{4}{3}$
$= 4:3$

Q24.

Answer :

(d) 640

$\text{Total no. of coins} = \frac{\text{volume of cylinder}}{\text{volume of each coin}} = \frac{\pi \times 3 \times 3 \times 8}{\pi \times 0.75 \times 0.75 \times 0.2} = 640$

Q25.

Answer :

(b) 84 m

$\text{Length} = \frac{\text{volume}}{\pi r^2 2} = \frac{66 \times 7}{22 \times 0.05 \times 0.05} = 8400\ cm\ =\ 84\ m$

Q26.

Answer :

(a) 1100 cm^3

Volume$= \pi r^2 h = \frac{22}{7} \times 5 \times 5 \times 14 = 1100\ cm^3$

Q27.

Answer :

(a) 1837 cm^2

Diameter = 7 cm
Radius =3.5 cm
Height = 80 cm

$\therefore$ Total surface area$= 2\pi r\left(r+h\right) = 2 \times \frac{22}{7} \times 3.5\left(3.5+80\right) = 22\left(83.5\right) = 1837\ cm^2$

Q28.

Answer :

(b) 396 cm^3

Here, curved surface area$= 2\pi rh = 264\ cm^3$
$\Rightarrow r = \frac{264 \times 7}{2 \times 22 \times 14} = 3\ cm$
$\therefore\ \text{Volume} = \pi r^2 h = \frac{22}{7} \times 3 \times 3 \times 14 = 396\ cm^3$

Q29.

Answer :

(a) 770 cm^3

Diameter = 14 cm

Radius = 7 cm

Now, curved surface area$= 2\pi rh = 220\ cm^2$

$\Rightarrow h = \frac{220\times7}{2\times22\times7} = 5\ cm$

$\therefore$ Volume $= \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 5 = 770\ cm^3$

Q30.

Answer :

(c) 20:27

We have the following :

$\frac{r_1}{r_2} = \frac{2}{3}$

$\frac{h_1}{h_2} = \frac{5}{3}$

$\therefore \frac{V_1}{V_2} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \frac{20}{27}$