SURFACE AREA AND VOLUME

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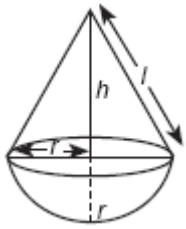
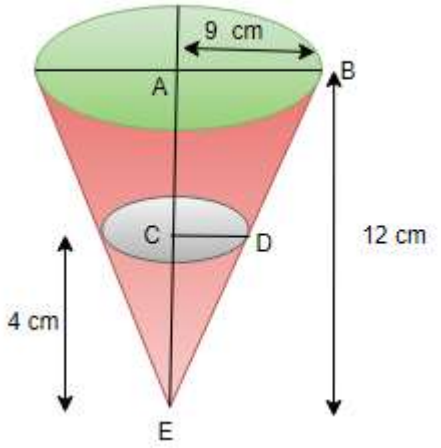
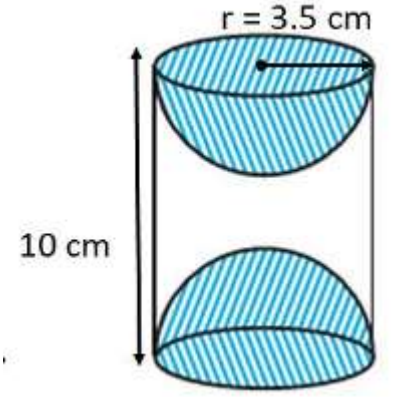
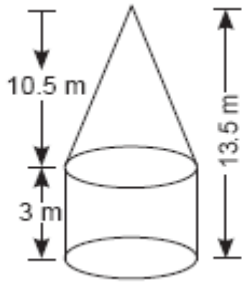
1.	Two cubes each of volume 27 cm^3 are joined end to end to form a solid. Find the surface area of the resulting cuboid. (A) 80 cm^2 (B) 90 cm^2 (C) 45 cm^2 (D) 36 cm^2
	ANS: Let the length of each edge of the cube be x cm Volume = x^3 cm^3 ⇒ $27 = x^3 \Rightarrow x = 3$ cm Length of the cuboid formed = 3 cm + 3 cm = 6 cm breadth, b = 3 cm, height, h = 3 cm Surface area of the cuboid fomed = $2(lb + bh + hl)$ $= 2(6 \times 3 + 3 \times 3 + 3 \times 6)$ $= 2(18 + 9 + 18) = 2 \times 45 = 90$ cm^2
2	Two cubes each of side 4 cm are joined end to end. Find the surface area of the resulting cuboid. (A) 160 cm^2 (B) 60 cm^2 (C) 32 cm^2 (D) 36 cm^2
	ANS: Length of resulting cuboid, l = 4 cm + 4 cm = 8 cm, breadth, b = 4 cm, height, h = *4* cm Surface area of cuboid = 2 ($l \times b + b \times h + h \times l$) = 2 ($8 \times 4 + 4 \times 4 + 8 \times 4$) = 160 cm^2
3	A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm, partly filled with water. If the sphere is completely submerged, then the water level rises (in cm) by (A) 3 cm (B) 9cm (C) 5cm (D) 6 cm
	(A) 3 cm
4	A sphere and a cube have equal surface areas. The ratio of the volume of the sphere to that of cube is____ (A) $\sqrt{2}:\sqrt{\pi}$ (B) $\sqrt{3}:\sqrt{2\pi}$ (C) $\sqrt{\pi}:\sqrt{6}$ (D) $\sqrt{6}:\sqrt{\pi}$
	(D) $\sqrt{6}:\sqrt{\pi}$ Let the radius = r and side = x S.A = of sphere = SA of cube $4\pi r^2 = 6x^2$ $x = \sqrt{\frac{2\pi}{3}}.r$ Volume of cube $= \left(\sqrt{\frac{2\pi}{3}}.r\right)^3$ Required ratio = $\frac{4}{3}\pi r^3 \div \left(\sqrt{\frac{2\pi}{3}}.r\right)^3$ $= \sqrt{6}:\sqrt{\pi}$
5	The base radii of two right circular cones of the same height are in the ratio 3 : 5. Find the ratio of their volumes. (A) 4 : 25 (B) 9 : 25 (C) 25 : 9 (D) 3: 5
	ANS: ANS: 9 : 25. Let r_1 be $3x$ and r_2 be $5x$, $h_1 = y$ (say) and $h_2 = y$ (say). Volume of cone I = $\frac{1}{3}\pi \times 9x^2 \times y$ Volume of cone II = $\frac{1}{3}\pi \times 25x^2 \times y$ ⇒ Volume of cone I : volume of cone II = $\frac{1}{3}\pi . 9x^2 . y : \frac{1}{3}\pi . 25x^2 . y = 9 : 25$.
6	The circumference of the base of a 9 m high wooden solid cone is 44 m. Find the volume of the cone. [Use π = 22/7] (A) 42 m^2 (B) 432 m^2 (C) 262 m^2 (D) 462 m^2
	ANS: Let radius of the base be r m ; h = 9 m

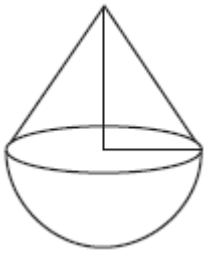
	Circumference of the base = 2 π r = 44 m $\Rightarrow 2 \times \frac{22}{7} \times r = 44$ $\Rightarrow$ r = 7 m Volume of the cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi 7^2 \times h = \frac{1}{3} \times 22 \times 7 \times 9 = 462\ m^2$
7.	If two solid hemispheres of the same base radius r are joined together along their bases, then curved surface area of this new solid is _____ (A) $4\pi r^2$ (B) $6\pi r^2$ (C) $3\pi r^2$ (D) $8\pi r^2$
	(A) $4\pi r^2$
8	A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm partly filled with water. If the sphere is completely submerged, then the water level rises (in cm) by (A) 3 (B) 4 (C) 5 (D) 6
	(A) 3
9	If a right circular cylinder just encloses a sphere of radius r. Find curved surface area of the cylinder
	ANS: Radius of the cylinder = radius of the sphere = r and height of the cylinder = diameter of the sphere = 2 × radius = 2 × r = 2r Curved surface area of the cylinder = 2π rh = 2 π r × 2r = 4 π r^2 sq units 
10	A solid is in the shape of a cone mounted on a hemisphere of same base radius. If the curved surface areas of the hemispherical part and the conical part are equal, then find the ratio of the radius and the height of the conical part. 
	ANS: Let radius of the base be r Height of conical part = h Slant height of conical part = l $l = \sqrt{h^2 + r^2}$ _____(i) ATQ 2 π r^2 = $\pi r l$ l = 2r Equation (i) becomes $\Rightarrow 2r = \sqrt{h^2 + r^2}$ $\Rightarrow 4r^2 = h^2 + r^2$ $\Rightarrow$ $h^2 = 3r^2$ $\frac{r^2}{h^2} = \frac{1}{3} \Rightarrow \frac{r}{h} = \frac{1}{\sqrt{3}}$
11	A solid cube is cut into two cuboids of equal volumes. Find the ratio of the total surface area of the given cube and that of one of the cuboids.
	ANS: Let edge of the cube be 2x is cut into two cuboids. Dimension of each cuboid are 2x, 2x, x. Total surface area of the cube = 6 (edge)^2 = 6(2x)^2 = 6 × 4x^2 = 24x^2 Total surface area of one of the cuboid = 2(lb + bh + lh) = 2(2x × 2x + 2x × x + 2x × x) = 2(4x^2 + 2x^2 + 2x^2) = 16x^2 Total surface area of cube : Total surface area of one cuboid = 24x^2 : 16x^2 = 3 : 2
12	The base radii of two right circular cylinders of the same height are in the ratio 3 : 5. Find the ratio of their curved surface area.
	ANS: Let radii of the cylinders be r_1 = 3x and r_2 = 5x, height = h $\frac{CSA\ of\ Cylinder\ I}{CSA\ of\ Cylinder\ II} = \frac{2\pi r_1 h}{2\pi r_2 h}$

	$= \frac{2\pi \times 3x \times h}{2\pi \times 5x \times h} = \frac{3}{5}$ Required ratio = 3 : 5
13	A cylinder and a cone have equal radii of their bases and equal heights. If their curved surface areas are in the ratio 8 : 5, show that the ratio of radius of each to the height of each is 3 : 4.
	ANS: Let radius be *r* and the height be *h*. Curved surface area of cylinder = $2\pi\ rh$ Curved surface area of cone = $\pi\ r\sqrt{h^2 + r^2}$ $\frac{2\pi rh}{\pi\ r\sqrt{h^2+r^2}} = \frac{8}{5}$ $\Rightarrow \frac{h}{\sqrt{h^2+r^2}} = \frac{4}{5}$ $\Rightarrow 25\ h^2 = 16\ (r^2 + h^2)$ $9\ h^2 = 16\ r^2$ $\frac{r}{h} = \frac{3}{4}$
14	There are two cones. The curved surface area of one is twice that of the other. The slant height of the latter is twice that of the former. Find the ratio of their radii.
	ANS: Let C_1, C_2 be the C.S.A of two cones. $C_1 = 2C_2$, $2l_1 = l_2$, l_1, l_2 be the slant heights and r_1, r_2 be the radii of two cones: $\Rightarrow C_1 = 2C_2$ [Given] $\Rightarrow\ \pi\ r_1 l_1 = 2\pi\ r_2 l_2$ $\Rightarrow r_1 l_1 = 2r_2\ 2l_1$ $\Rightarrow r_1 = 4r_2$ $r_1 : r_2 = 4 : 1$
15	The radii of the bases of a cylinder and a cone are in the ratio 3 : 5 and their heights are in the ratio 3 : 4. What is the ratio of their volumes?
	ANS: Let the ratio of radii be *x* radii of the bases are 3x and 5x and let ratio of heights be *y*. heights of the cylinder and cone will be 3*y* and 4*y*. Ratio of the volumes $= \frac{\pi\ (3x)^2 \times 3y}{\frac{1}{3}\pi \times (5x)^2 \times 4y} = \frac{3\times 9\times 93}{25\times 4} = \frac{81}{100}$ Ratio is 81 : 100
16	A cone and a sphere have equal radii and equal volume. What is the ratio of the diameter of the sphere to the height of cone?
	ANS: Let their radii be *r*. Let height of the cone be *h*. Volume of sphere = $\frac{4}{3}\ \pi\ r^3$ and volume of cone = $\frac{1}{3}\ \pi\ r^2 h$ ATQ $\frac{4}{3}\ \pi\ r^3 = \frac{1}{3}\ \pi\ r^2 h$ [Given] $4r = h$ Height of cone = 4*r* Diameter of sphere = 2*r* diameter : height of cone = $2r : h = 2r : 4r = 1 : 2$
17	The areas of three adjacent faces of a rectangular block are in the ratio of 2 : 3 : 4 and its volume is 9000 cu. cm, find the length of the shortest side
	ANS: Let length = *l*, breadth = *b* and height = *h* $\text{lb} : \text{bh} : \text{lh} = 2 : 3 : 4$ $\Rightarrow \text{lb} = 2\text{x}, \text{bh} = 3\text{x}, \text{lh} = 4\text{x}$ $\Rightarrow \text{lb} \times \text{bh} \times \text{lh} = 2\text{x} \times 3\text{x} \times 4\text{x}$ $\Rightarrow\ l^2 \times b^2 \times h^2 = 24x^3$ $\Rightarrow\ (9000)^2 = 24x^3$

	$x^3 = \frac{9000 \times 9000}{24}$ $x = 150$ $\frac{l \times b \times b \times h}{l \times h} = \frac{2x \times 3x}{4x}$ $b^2 = \frac{3}{2} \times 150 = 225$ $\Rightarrow b = 15\ cm$
18	A cone, a hemisphere and a cylinder stand on equal bases and have the same height. Find the ratio of their volumes.
	ANS: Let radius of base be x $\Rightarrow$ height = x Volume of cone : volume of hemisphere : volume of cylinder $= \frac{1}{3}\pi x^2 \times x : \frac{2}{3}\pi x^3 : \pi x^2 \times x$ = 1 : 2 : 3
19	50 circular plates, each of radius 7 cm and thickness $\frac{1}{2}$ cm, are placed one above another to form a solid right circular cylinder. Find the total surface area and the volume of the cylinder so formed.
	ANS: r = 7 cm, $h = \frac{1}{2} \times 50 = 25\ cm$ Volume of the cylinder = $\pi\ r^2h = \frac{22}{7} \times 7 \times 7 \times 25$ cm^3 = 3850 cm^3 Total surface area of the cylinder = 2π r($r + h$) $= 2 \times \frac{22}{7} \times 7\ (7 + 25) = 44 \times 32 = 1408$ cm^2
20	An inverted cone of vertical height 12 cm and the radius of base 9 cm contains water to a depth of 4 cm. Find the area of the interior surface of the cone not in contact with the water. [Use π = 22/7]
	$\Delta ABE \sim \Delta CDE$ $\frac{AB}{CD} = \frac{AE}{CE} \Rightarrow \frac{9}{CD} = \frac{12}{4}$ $\Rightarrow$ CD = 3 cm Slant height of cone = $\sqrt{144 + 81} = \sqrt{225} = 15$ Curved surface area = $\pi\ rl = \pi \times 9 \times 15 = 135\pi$ cm^2 Slant height of conical part containing water = 5 cm Curved surface area of conical part containing water = $\pi \times 3 \times 5 = 15\pi$ cm^2 Surface area not in contact with water = 135π cm^2 – 15π cm^2 = 120π cm^2 = $120 \times \frac{22}{7}$ cm^2 = 377.14 cm^2
	
21	The sum of the radius of the base and the height of a solid cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 cm^2, find the volume of the cylinder. [$\pi = \frac{22}{7}$]
	ANS: Let radius of the base be r $r + h$ = 37 cm [Given] h = (37 – r) cm Total surface area = $2\pi\ r\ (r + h) \Rightarrow 1628 = 2 \times \frac{22}{7} \times r \times 37$ $r = 1628 \times \frac{7}{22 \times 2 \times 37} = 7$ $\Rightarrow r$ = 7 cm $\Rightarrow h$ = (37 – 7) cm = 30 cm Volume of the cylinder = $\pi\ r^2h = \frac{22}{7} \times (7)^2 \times 30$ cm^3 = $22 \times 7 \times 30$ cm^3 = 4620 cm^3
22	A sector of a circle of radius 12 cm has the angle 120°. It is rolled up so that two bounding radii are joined together to form a cone. Find the volume of the cone.
	ANS: Length of the arc = $\frac{\pi r\theta}{180} = \frac{120}{180} \times \frac{22}{7} \times 12$ = circumference of the base of the cone

	Let radius of cone be r $2 \times \pi \times r = \frac{120}{180} \times \frac{22}{7} \times 12 \quad \Rightarrow \quad r = \frac{2}{3} \times \frac{12}{2} = 4\ cm$ r = 4 cm, l = 12 cm $h^2 = l^2 - r^2 = 12^2 - 4^2 = 144 - 16$ $\Rightarrow h^2 = 128 \Rightarrow h = \sqrt{128} = 8\sqrt{2}\ cm$ Volume of the cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 16 \times \sqrt{2}$ = 189.61 cm^3
23	Solid spheres of diameter 6 cm are dropped into a cylindrical beaker containing some water and are fully submerged. If the diameter of the beaker is 18 cm and the water rises by 40 cm, find the number of solid spheres dropped in the water.
	ANS: Diameter of sphere = 6 cm $\Rightarrow$ radius of sphere = 3 cm Volume of sphere = $\frac{4}{3}\pi r^3$ Volume of one sphere = $\frac{4}{3}\pi r^3 = 36\pi$ Volume of water displaced by one sphere = $\pi\ r^2 h$ Diameter of beaker = 18 cm radius of beaker = 9 cm Volume of water displaced by spheres = $\pi \times 9 \times 9 \times 40$ cm^3 Number of spheres = $\frac{volume\ of\ water\ displaced}{volume\ of\ one\ sphere} = \frac{\pi \times 9 \times 9 \times 40}{36\pi} = 90$
24	A rectangular reservoir is 120 m long and 75 m wide. At what speed per hour must water flow into it through a square pipe of 20 cm wide so that the water rises by 2.4 m in 18 hours?
	ANS: Length of reservoir = 120 m and width = 75 m, Height of water = 2.4 m Volume of water flow in 18 hrs = 120 × 75 × 2.4 = 21600 m^3 Hence volume of water that should flow in 1 hr = $\frac{2100}{18}$ = 1200 m^3 Area of cross-section of pipe = $\frac{20}{100} \times \frac{20}{100} = .04\ m^2$ Length of water column in 1 hour = $\frac{volume}{area} = \frac{1200}{.04} = 30000\ m$ Speed of water = 30000 m/h = 30 km/h
	A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article. 
	ANS: Here, r = 3.5 cm, h = 10 cm Total surface area of rocket = C.S.A. of cylinder + C.S.A. of 2 hemisphere = $2\pi r h + 4\pi r^2 = 2\pi r(h + 2r)$ = $2 \times \frac{22}{7} \times 3.5(10 + 7)$ = 22×17 cm^2.

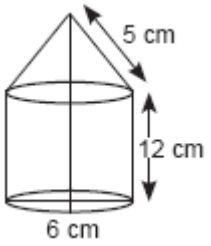
	= 374 cm^2
25	A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the volume and surface area of the solid
	Volume of the solid = volume of the cylinder + 2 × volume of one hemisphere Volume of the solid = $\pi r^2 h + 2 \times \frac{2}{3} \pi r^3 = \pi r^2 \left(h + \frac{4}{3} r\right)$ $= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \left(12 + \frac{4}{3} \times \frac{7}{2}\right)$ $= 641.67\ cm^3$ Surface Area = $2\pi rh + 2 \times 2\pi r^2 = 2 \times \frac{22}{7} \times \frac{7}{2} \left(12 + 2 \times \frac{7}{2}\right)$ $= 418\ cm^2$
26	Circumference of the edge of hemispherical bowl is 132 cm. Find the capacity of the bowl.
	ANS: Let the radius of the bowl be $r\ cm$ Circumference of the bowl = 132 cm $2\pi r = 132 \Rightarrow 2 \times \frac{22}{7} \times r = 132 \Rightarrow r = \frac{132 \times 7}{2 \times 22} = 21 cm$ capacity of the bowl = $\frac{2}{3} \pi r^3 = \frac{2}{3} \times \frac{22}{7} \times 21 \times 21 \times 21\ cm^3$ Capacity of the bowl $= 19404\ cm^3$
27	A tent is in the shape of a right circular cylinder up to a height of 3 m and then becomes a right circular cone with a maximum height of 13.5 m above the ground. i) Find the surface area of the tent. ii) Calculate the cost of painting the inner side of the tent at the rate of ₹ 2 per m^2, if the radius of the base is 14 m
	Radius = 14 m Height of cylinder = 3 m Height of cone = (13.5 – 3) = 10.5 m Slant height of cone = $\sqrt{r^2 + h^2}$ = $\sqrt{(14)^2 + (10.5)^2}$ = 17.5 m Area to be painted = $2\pi rh + \pi rl = \pi r(2h + l)$ $= \frac{22}{7} \times 14\ (2 \times 3 + 17.5) = 44(6 + 17.5) = 1034\ m^2$ Cost of painting 1 m^2 = Rs. 2 Cost of painting 1034 m^2 = Rs. 2 × 1034 = Rs. 2068
	
28	The sum of the radius of the base and the height of a solid cylinder is 37 cm. If the total surface area of the solid cylinder is $1628\ cm^2$, find the volume of the cylinder. [$\pi = \frac{22}{7}$]
	ANS: Let radius of the base be r r + h = 37 cm [Given] h = (37 – r) cm Total surface area = 2π r (r + h) $\Rightarrow 1628 = 2 \times \frac{22}{7} \times r \times 37$ $\Rightarrow r = 1628 \times \frac{7}{22 \times 2 \times 37} = 7\ cm$ $h = (37 - 7)\ cm = 30\ cm$

	volume of the cylinder $= \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 30 = 22 \times 7 \times 30 = 4620\ cm^3$ ANS: Let radius of the ball be *r* cm Volume of water increased = $\frac{22}{7} \times 16 \times 16 \times 9$ cm^3 Volume of a ball = $\frac{4}{3} \times \frac{22}{7} \times r^3$ Volume of cylinder = volume of ball $\frac{22}{7} \times 16 \times 16 \times 9 = \frac{4}{3} \times \frac{22}{7} \times r^3$ $r^3 = \frac{16 \times 16 \times 9 \times 3}{4} = 1728$ $r = 12\ cm$
29	A cylindrical tub of radius 16 cm contains water to a depth of 30 cm. A spherical iron ball is dropped into the tub and thus level of water is raised by 9 cm. What is the radius of the ball?
	ANS: Radius of the base of cone = 21 cm  Volume of cone = $\frac{2}{3}$ volume of hemisphere $\frac{1}{3} \pi r^2 h = \frac{2}{3} \times \frac{2}{3} \pi r^3$ $h = \frac{4}{3} r = \frac{4}{3} \times 21 = 28\ cm$ $l^2 = h^2 + r^2 = 28^2 + 21^2 = 784 + 441 = 1225$ $l = 35\ cm$ Surface area of the toy = $\pi rl + 2\pi r^2$ = $\frac{22}{7} \times 21 \times 35$ cm^2 + $2 \times 22 \times 21 \times 21$ cm^2 = 2310 cm^2 + 2772 cm^2 = 5082 cm^2
30	A cylindrical tub of radius 16 cm contains water to a depth of 30 cm. A spherical iron ball is dropped into the tub and thus level of water is raised by 9 cm. What is the radius of the ball? $\left(\pi = \frac{22}{7}\right)$
	ANS: Let radius of the ball be *r* cm Volume of water increased = $\frac{22}{7} \times 16 \times 16 \times 9\ cm^3$ Volume of a ball = $\frac{4}{3} \times \frac{22}{7} \times r^3$ Volume of cylinder = volume of ball $\Rightarrow \frac{22}{7} \times 16 \times 16 \times 9 = \frac{4}{3} \times \frac{22}{7} \times r^3$ $r^3 = \frac{16 \times 16 \times 9 \times 3}{4} \Rightarrow$ r = 12 cm
31	A cube of side 4 cm is cut into cubes of side 1 cm, and then total surface area of all the small cubes is _____. ANS: 384 cm^2
32	Three cubes of iron whose edges are 6 cm, 8 cm and 10 cm respectively are melted and formed into a single cube. The edge of the new cube formed is _____.
33	A copper sphere of radius 3 cm is beaten and drawn into a wire of diameter 0.2 cm. The length of the wire is _____.
34	The ratio of the volume of a cube to that of a sphere which will fit inside the cube is _____.
35	A cube of side 6 cm is cut into a number of cubes, each of side 2 cm. The number of cubes will be _____. ANS: 27

36	The base radii of two right circular cylinders of the same height are in the ratio 3 : 5. Find the ratio of their curved surface area. ANS: 3 : 5
37	A cylinder and a cone have equal radii of their bases and equal heights. If their curved surface areas are in the ratio 8 : 5, show that the ratio of radius of each to the height of each is 3 : 4. ANS: $r : h = 3 : 4$
38	There are two cones. The curved surface area of one is twice that of the other. The slant height of the latter is twice that of the former. Find the ratio of their radii. ANS: $r_1 : r_2 = 4 : 1$
39	The radii of the bases of a cylinder and a cone are in the ratio 3 : 5 and their heights are in the ratio 3 : 4. What is the ratio of their volumes? ANS: 81 : 100
40	A cone and a sphere have equal radii and equal volume. What is the ratio of the diameter of the sphere to the height of cone? ANS: 1 : 2 SUJITHKUMAR KP
41	The areas of three adjacent faces of a rectangular block are in the ratio of 2 : 3 : 4 and its volume is 9000 cu. cm, find the length of the shortest side. ANS: 15 cm.
42	The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. Find the ratio of their volumes. ANS: 1 : 2 : 3
43	If the radius of the base of a right circular cylinder is halved, keeping the height same, what is the ratio of the volume of the reduced cylinder to that of the original? ANS: 1 : 4
44	50 circular plates, each of radius 7 cm and thickness $\frac{1}{2}$ cm, are placed one above another to form a solid right circular cylinder. Find the total surface area and the volume of the cylinder so formed. ANS: 1408 cm^2
45	The total surface area of a solid cylinder is 231 cm^2. If the curved surface area of this solid cylinder is $\frac{2}{3}$ of its total surface area, find its radius and height. [$\pi = \frac{22}{7}$] ANS: $h = 7\ cm, r = \frac{7}{2}$
46	An iron pipe 20 cm long has exterior diameter equal to 25 cm. If the thickness of the pipe is 1 cm, find the whole surface area of the pipe. ANS: 3168 cm^2
47	The circumference of the base of 10 m high conical tent is 44 m. Calculate the length of canvas used in making the tent if width of canvas is 2 m. ANS: 134.27 m
48	An inverted cone of vertical height 12 cm and the radius of base 9 cm contains water to a depth of 4 cm. Find the area of the interior surface of the cone not in contact with the water. [$\pi = \frac{22}{7}$] ANS: = 377.14 cm^2
49	The sum of the radius of the base and the height of a solid cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 cm^2, find the volume of the cylinder. [$\pi = \frac{22}{7}$] ANS: 4620 cm^3
50	The length of a hall is 20 m and width 16 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height and the volume of the hall. ANS: 2844.4 m^3
51	The cost of painting the total outside surface of a closed cylindrical oil tank at 60 paise per sq. dm is ₹ 237.60. The height of the tank is 6 times the radius of the base of the tank. Find its volume. ANS: 509.14 dm^3
52	A conical tent is to accommodate 11 persons. Each person must have 4 sq m of space on the ground and 20 m^3 of air to breathe. Find the height of the cone. ANS: 15 metres.
53	A sector of a circle of radius 12 cm has the angle 120°. It is rolled up so that two bounding radii are joined together to form a cone. Find the volume of the cone. ANS: 189.61 cm^3
54	A hemispherical bowl of internal radius 9 cm is full of water. Its contents are emptied in a cylindrical vessel of internal radius 6 cm. Find the height of water in the cylindrical vessel. ANS: h = 13.5 cm
55	A hemispherical bowl of internal diameter 30 cm contains some liquid. This liquid is to be filled into cylindrical shaped bottles each of diameter 5 cm and height 6 cm. Find the number of bottles necessary to empty the bowl. ANS: 60
56	Solid spheres of diameter 6 cm are dropped into a cylindrical beaker containing some water and are fully submerged. If the diameter of the beaker is 18 cm and the water rises by 40 cm, find the number

	of solid spheres dropped in the water. ANS: 90
57	A rectangular reservoir is 120 m long and 75 m wide. At what speed per hour must water flow into it through a square pipe of 20 cm wide so that the water rises by 2.4 m in 18 hours? ANS: Speed of water = 30000 m/h = 30 km/h
58	How many metres of cloth 1 m 10 cm wide, will be required to make a conical circus tent whose height is 12 m and the radius of whose base is 10 m? Also determine the cost of the cloth at ₹ 7 per m. ANS: 3123.96
59	The internal and external diameters of a hollow hemispherical vessel are 24 cm and 25 cm respectively. The cost to paint 1 cm^2 of the surface is ₹ 0.05. Find the total cost to painting the vessel all over. ANS: 96.28
60	The volumes of two spheres are in the ratio 64 : 27. Find their radii if the sum of their radii is 21 cm. ANS: $r_1 = 4 \times 3 = 12$ cm and $r_2 = 3 \times 3$ cm = 9 cm.
61	A cone of height 24 cm has a curved surface area of 550 cm^2. Find its volume. [$\pi = \frac{22}{7}$] ANS: 1232 cm^3
62	A heap of wheat is in the form of a cone of diameter 9 m and height 3.5 m. Find its volume. How much canvas cloth is required to just cover the heap? (Use π = 3.14) ANS: 80.541 m^2
63	The diameter of a sphere is 42 cm. It is melted and drawn into a cylindrical wire of 28 cm in diameter. Find the length of the wire. ANS: = 63 cm
64	How many spherical lead shots each 4.2 cm in diameter can be obtained from a rectangular solid of lead with dimensions 66 cm × 42 cm × 21 cm [$\pi = \frac{22}{7}$] ANS: 1500
65	Marbles of diameter 1.4 cm are dropped into a cylindrical beaker of diameter 7 cm, containing some water. Find the number of marbles that should be dropped into the beaker so that the water level rises by 5.6 cm. ANS: 105
66	A vessel in the form of a hemispherical bowl is full of water. Its contents are emptied in a right circular cylinder. The internal radii of the bowl and the cylinder are 3.5 cm and 7 cm respectively. Find the height to which the water will rise in the cylinder ANS: $\frac{7}{12}$ cm
67	A cylindrical tub of radius 16 cm contains water to a depth of 30 cm. A spherical iron ball is dropped into the tub and thus level of water is raised by 9 cm. What is the radius of the ball? ANS: r = 12 cm
68	A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed. What fraction of water overflows? ANS: $\frac{3}{8}$
69	A right circular cone is 4.1 cm high and the radius of its base is 2.1 cm. Another right circular cone is 4.3 cm high and the radius of the base is 2.1 cm. Both the cones are melted and recast into a sphere. Find the diameter of the sphere ANS: 4.2 cm
70	A solid iron rectangular block of dimensions 4.4 m, 2.6 m and 1 m is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. Find the length of the pipe. ANS: h = 112 m
71	From a solid cylinder whose height is 15 cm and diameter 16 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [Take $\pi = 3.14$] ANS: 1381.6 cm^2
72	A rectangular sheet of paper 30 cm × 18 cm can be transformed into the curved surface of a right circular cylinder in two ways either by rolling the paper along its length or by rolling it along its breadth. Find the ratio of the volumes of the two cylinders thus formed. ANS: 5 : 3
73	A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the volume and surface area of the solid. ANS: 418 cm^2
74	A solid right circular cone of diameter 14 cm and height 8 cm is melted to form a hollow sphere. If the external diameter of the sphere is 10 cm, find the internal diameter of the sphere. ANS: d = 6 cm

75	Water flows out through a circular pipe whose internal radius is 1 cm, at the rate of 80 cm/second into an empty cylindrical tank, the radius of whose base is 40 cm. By how much will the level of water rise in the tank in half an hour? ANS: h = 90 cm
76	A cylindrical vessel with internal diameter 10 cm and height 10.5 cm is full of water. A solid cone of base diameter 7 cm and height 6 cm is completely immersed in water. Find the volume of water displaced out of the cylindrical vessel. ANS: Volume of water displaced = volume of cone = 77 cm^3
77	Water is flowing at the rate of 15 km/hour through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm? ANS: 21cm in 2 h
78	A solid is in the form of a right circular cone mounted on a hemisphere. The radius of the hemisphere is 2.1 cm and the height of the cone is 4 cm. The solid is placed in a cylindrical tub, full of water, in such a way that the whole solid is submerged in water. If the radius of the cylinder is 5 cm and its height is 9.8 cm, find the volume of the water left in the cylindrical tub. [$\pi = \frac{22}{7}$] ANS: 732.116
79	An iron spherical ball has been melted and recast into smaller balls of equal size. If the radius of each of the smaller balls is $\frac{1}{4}$ of the radius of the original ball, how many such balls are made? Compare the surface area of all the smaller balls combined together with that of the original ball. ANS: 4:1
80	From a solid cylinder whose height is 8 cm and radius 6 cm, a conical cavity of height 8 cm and of base radius 6 cm, is hollowed out. Find the volume of the remaining solid correct to two places of decimal. Also find the total surface area of the remaining solid. [$\pi = 3.14$] ANS: 603.18
81	A solid cylinder of diameter 12 cm and height 15 cm is melted and recast into 12 toys in the shape of a right circular cone mounted on a hemisphere. Find the radius of the hemisphere and total height of the toy if height of the cone is 3 times the radius. ANS: 12 cm
82	Four right circular cylindrical vessels each having diameter 21 cm and height 38 cm are full of ice cream. The ice cream is to be filled in cones of height 12 cm and diameter 7 cm having a hemispherical shape on the top. Find the total number of such cones which can be filled with ice cream. ANS: 216 cones can be filled.
83	Two cubes each with 6 cm edge are joined end to end. The surface area of the resulting cuboid is _____.
84	Match the column : (1) Surface area of cuboid — (A) $\pi r^2 h$ (2) Surface area of closed right cylinder — (B) $2\pi r\,(h + r)$ (3) Total surface area of right cone — (C) $\pi r l + \pi r^2$ (4) Total surface area of hemisphere — (D) $3\pi r^3$ (E) $3\pi r^2$ (F) $2[lb + bh + lh]$ (a) 1 → A, 2 → C, 3 → D, 4 → E (b) 1 → F, 2 → B, 3 → C, 4 → E (c) 1 → B, 2 → C, 3 → D, 4 → E (d) 1 → F, 2 → E, 3 → C, 4 → A
85	A rocket is in the form of a right circular cylinder closed at the lower end and surmounted by a cone with the same radius as that of the cylinder. The diameter and height of the cylinder are 6 cm and 12 cm, respectively. If the slant height of the conical portion is 5 cm, find the total surface area and

	volume of the rocket [Use π= 3.14].
86	ANS: Here, r = 3 cm, h = 12 cm and l = 5 cm. Total surface area of rocket = C.S.A. of cone + C.S.A. of cylinder + area of base = $\pi rl + 2\pi rh + \pi r^2 = \pi r(l + 2h + r)$ = 3.14 × 3(5 + 24 + 3)  = 9.42 × 32 = 301.44 cm^2. Volume of the rocket = $V_{Cone} + V_{Cylinder}$ = $\frac{1}{3}\pi r^2h + \pi r^2h = \pi r^2\left(\frac{1}{3} \times h_{Cone} + h_{Cylinder}\right)$ l = 5 cm, r = 3 cm, $l_2 = r^2 + h^2$ $25 = 9 + h^2$ $16 = h^2$ —h = 4 cm Volume of the rocket = $3.14 \times 9\left(\frac{1}{3} \times 4 + 12\right)$ = $3.14 \times 9\left(\frac{4 + 36}{3}\right) = \frac{3.14 \times 9 \times 40}{3}$ = 376.8 cm^3.

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ALPHA 10