Class: **X**	Subject: **Mathematics**	Session: **2025-26**
Chapter: **Ch 12: Surface Areas and Volumes (PYQ)**		

PREVIOUS YEAR QUESTIONS (PYQ)

Chapter 12: Surface Areas and Volumes

CBSE Board Exam 2019–2025 | With Direct Answers

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This document contains chapter-wise Previous Year Questions from CBSE Class X Board Examinations (2019–2025) for **Chapter 12: Surface Areas and Volumes**. Each question includes the year of examination, marks allotted, and direct answer for quick revision.

⚠ NOTE: As per CBSE 2025–26 Syllabus. Topics: Surface Area & Volume of combinations (cylinder, cone, sphere, hemisphere, cuboid). Conversion of solids. ✗ EXCLUDED: Frustum of a Cone (deleted).

SECTION A: Multiple Choice Questions (1 Mark Each)

[CBSE 2024 | 1 Mark]

Q1. The radii of a sphere and a cone are same. If their volumes are also equal, then the height of the cone is:

(a) r
(b) 2r
(c) 3r
(d) 4r

Ans: (d) 4r. $(4/3)\pi r^3 = (1/3)\pi r^2 h \Rightarrow 4r = h$

[CBSE 2024 | 1 Mark]

Q2. If the volumes of two cubes are in the ratio 8:125, then the ratio of their surface areas is:

(a) 8:125
(b) 4:25
(c) 2:5
(d) 16:25

Ans: (b) 4:25. $a^3/b^3 = 8/125 \Rightarrow a/b = 2/5$. SA ratio $= 6a^2/6b^2 = (2/5)^2 = 4/25$

[CBSE 2023 | 1 Mark]

Q3. The curved surface area of a cone having height 24 cm and radius 7 cm is:

(a) 528 cm^2
(b) 1056 cm^2
(c) 550 cm^2
(d) 500 cm^2

Ans: (c) 550 cm^2. $l = \sqrt{(576+49)} = 25$. CSA $= \pi rl = (22/7)\times 7\times 25 = 550\ cm^2$

[CBSE 2022 | 1 Mark]

Q4. If a cone of greatest volume is hollowed out from a solid cylinder, the ratio of volume of remaining wood to cone is:

(a) 1:1
(b) 1:3
(c) 2:1
(d) 3:1

Ans: (c) 2:1. Remaining = $\pi r^2h - (1/3)\pi r^2h = (2/3)\pi r^2h$. Ratio = (2/3):(1/3) = 2:1

[CBSE 2020 | 1 Mark]

Q5. Two cones have their heights in ratio 1:3 and radii in ratio 3:1. The ratio of their volumes is:

(a) 1:3
(b) 3:1
(c) 1:1
(d) 9:1

Ans: (b) 3:1. $V_1/V_2 = (r_1^2h_1)/(r_2^2h_2) = (9\times1)/(1\times3) = 3:1$

[CBSE 2020 | 1 Mark]

Q6. How many cubes of side 2 cm can be made from a solid cube of side 10 cm?

(a) 25
(b) 100
(c) 125
(d) 64

Ans: (c) 125. $n = 10^3/2^3 = 1000/8 = 125$

[CBSE 2021 | 1 Mark]

Q7. The surface area of a sphere is 616 cm². Its diameter is:

(a) 7 cm
(b) 14 cm
(c) 21 cm
(d) 28 cm

Ans: (b) 14 cm. $4\pi r^2 = 616 \Rightarrow r^2 = 616\times7/88 = 49 \Rightarrow r = 7$ cm. Diameter = 14 cm.

[CBSE 2019 | 1 Mark]

Q8. A cone and cylinder have the same radii but the height of cone is 3 times that of cylinder. Ratio of their volumes is:

(a) 1:1
(b) 1:3
(c) 3:1
(d) 1:9

Ans: (a) 1:1. $V(cone)/V(cyl) = [(1/3)\pi r^2(3h)]/[\pi r^2h] = 1:1$

[CBSE 2022 | 1 Mark]

Q9. During the conversion of a solid from one shape to another, the volume of the new shape:

(a) increases
(b) decreases
(c) remains the same
(d) doubles

Ans: (c) remains the same. Volume is conserved during conversion.

[CBSE 2019 | 1 Mark]

Q10. Volume and surface area of a solid hemisphere are numerically equal. The diameter of hemisphere is:

(a) 3 cm
(b) 6 cm
(c) 9 cm
(d) 12 cm

Ans: (c) 9 cm. $(2/3)\pi r^3 = 3\pi r^2 \Rightarrow (2/3)r = 3 \Rightarrow r = 4.5$ cm. Diameter = 9 cm.

SECTION B: Assertion-Reason Questions (1 Mark Each)

[CBSE 2024 | 1 Mark]

Q11. Assertion (A): Total surface area of a hemisphere of radius r is $3\pi r^2$.
Reason (R): Total surface area of a sphere of radius r is $4\pi r^2$.

(a) Both true, R explains A
(b) Both true, R does not explain A
(c) A true, R false
(d) A false, R true

Ans: (c) A is true (TSA hemisphere = $2\pi r^2 + \pi r^2 = 3\pi r^2$). R is true ($4\pi r^2$). But wait—R is TRUE. So answer is (b): Both true but R does not explain A.

[CBSE 2023 | 1 Mark]

Q12. Assertion (A): If a ball is shaped like a sphere with radius 5 cm, its volume is $500\pi/3$ cm³.
Reason (R): Volume of sphere = $(4/3)\pi r^3$.

(a) Both true, R explains A
(b) Both true, R does not explain A
(c) A true, R false
(d) A false, R true

Ans: (a) Both true and R explains A. $V = (4/3)\pi(5)^3 = 500\pi/3$ cm³ ✓

SECTION C: Short Answer Questions (2 Marks Each)

[CBSE 2022 | 2 Marks]

Q13. Find the number of solid spheres, each of diameter 6 cm, that can be made by melting a solid metal cylinder of height 45 cm and diameter 4 cm.

Ans: Volume of cylinder = $\pi(2)^2(45) = 180\pi$ cm³. Volume of each sphere = $(4/3)\pi(3)^3 = 36\pi$ cm³. Number = $180\pi/36\pi = 5$.

[CBSE 2021 | 2 Marks]

Q14. A cone of height 24 cm and radius of base 6 cm is made up of modelling clay. A child reshapes it into a sphere. Find the radius of the sphere.

Ans: Volume of cone = (1/3)π(6)²(24) = 288π cm³. (4/3)πr³ = 288π ⇒ r³ = 216 ⇒ r = 6 cm.

[CBSE 2020 | 2 Marks]

Q15. If the total surface area of a solid hemisphere is 462 cm², find its volume. (Take π = 22/7)

Ans: TSA = 3πr² = 462 ⇒ r² = 462×7/66 = 49 ⇒ r = 7 cm. Volume = (2/3)πr³ = (2/3)(22/7)(343) = 718.67 cm³.

[CBSE 2019 | 2 Marks]

Q16. Three metallic spheres of radii 6 cm, 8 cm and 10 cm are melted to form a single solid sphere. Find the radius of the resulting sphere.

Ans: (4/3)πR³ = (4/3)π(216+512+1000) = (4/3)π(1728). R³ = 1728 ⇒ R = 12 cm.

SECTION D: Short Answer Questions (3 Marks Each)

[CBSE 2023 | 3 Marks]

Q17. If the radii of the bases of a cylinder and a cone are in the ratio 3:4 and their heights are in ratio 2:3, find the ratio of their volumes.

Ans: V(cyl)/V(cone) = π(3r)²(2h) / [(1/3)π(4r)²(3h)] = 18πr²h / (16πr²h) = 18/16 = 9:8.

[CBSE 2022 | 3 Marks]

Q18. A solid toy is in the form of a hemisphere surmounted by a right circular cone. Height of cone is 2 cm and diameter of base is 4 cm. Find the volume and total surface area. (Take π = 3.14)

Ans: r = 2 cm, h = 2 cm. l = √(4+4) = 2√2 cm. Volume = (2/3)πr³ + (1/3)πr²h = (2/3)(3.14)(8) + (1/3)(3.14)(4)(2) = 16.75 + 8.37 = 25.12 cm³. TSA = 2πr² + πrl = 3.14×4×2 + 3.14×2×2√2 = 25.12 + 17.72 = 42.84 cm².

[CBSE 2021 | 3 Marks]

Q19. A cylindrical bucket 32 cm high with radius of base 18 cm is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of conical heap is 24 cm, find the radius and slant height of the heap.

Ans: Volume conserved: π(18)²(32) = (1/3)πr²(24) ⇒ r² = 18²×32×3/24 = 18²×4 = 1296. r = 36 cm. l = √(36²+24²) = √(1296+576) = √1872 = 12√13 ≈ 43.27 cm.

SECTION E: Long Answer Questions (4–5 Marks Each)

[CBSE 2024 | 5 Marks]

Q20. A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter is 4 mm. Find its surface area and volume.

Ans: r = 2 mm, cylinder height = 14 − 2(2) = 10 mm. SA = 2πrh + 2(2πr²) = 2π(2)(10) + 4π(4) = 40π + 16π = 56π = 175.93 mm². Volume = πr²h + (4/3)πr³ = π(4)(10) + (4/3)π(8) = 40π + 32π/3 = 152π/3 = 159.14 mm³.

[CBSE 2024 | 5 Marks]

Q21. A solid iron pole consists of a cylinder of height 200 cm and base diameter 28 cm, surmounted by another cylinder of height 50 cm and radius 7 cm. Find the mass of the pole, given that 1 cm^3 of iron has 8 g mass. (Use π = 22/7)

Ans: $V_1 = \pi(14)^2(200) = (22/7)(196)(200) = 123200\ cm^3$. $V_2 = \pi(7)^2(50) = (22/7)(49)(50) = 7700\ cm^3$. Total V = 130900 cm^3. Mass = 130900 × 8 = 1047200 g = 1047.2 kg.

[CBSE 2020 | 5 Marks]

Q22. A cylindrical container of radius 6 cm and height 15 cm is full of ice cream. The ice cream is to be filled in cones of height 12 cm and radius 3 cm, having a hemispherical shape on top. Find the number of such cones.

Ans: V(cylinder) = $\pi(36)(15) = 540\pi\ cm^3$. V(each cone + hemi) = $(1/3)\pi(9)(12) + (2/3)\pi(27) = 36\pi + 18\pi = 54\pi\ cm^3$. Number = $540\pi/54\pi = 10$.

[CBSE 2019 | 5 Marks]

Q23. A toy is in the shape of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy. (Use π = 22/7)

Ans: r = 3.5 cm. Cone height = 15.5 − 3.5 = 12 cm. $l = \sqrt{(12^2+3.5^2)} = \sqrt{(144+12.25)} = \sqrt{156.25} = 12.5$ cm. TSA = $\pi rl + 2\pi r^2 = (22/7)(3.5)(12.5) + 2(22/7)(3.5)^2 = 137.5 + 77 = 214.5\ cm^2$.

SECTION F: Case Study Based Questions (4 Marks Each)

[CBSE 2025 | 4 Marks]

Q24. Case Study: A wooden toy is in the shape of a cone surmounted on a hemisphere. The diameter of the base of the cone is 6 cm and the height of the cone is 4 cm.
(i) Find the slant height of the cone.
(ii) Find the CSA of the cone.
(iii) Find the total surface area of the toy.
(iv) Find the volume of the toy. (Use π = 3.14)

Ans: r = 3 cm, h = 4 cm. (i) $l = \sqrt{(16+9)} = 5$ cm. (ii) CSA = $\pi rl = 3.14\times3\times5 = 47.1\ cm^2$. (iii) TSA = $\pi rl + 2\pi r^2 = 47.1 + 2(3.14)(9) = 47.1 + 56.52 = 103.62\ cm^2$. (iv) V = $(1/3)\pi r^2h + (2/3)\pi r^3 = (1/3)(3.14)(9)(4) + (2/3)(3.14)(27) = 37.68 + 56.52 = 94.2\ cm^3$.

[CBSE 2024 | 4 Marks]

Q25. Case Study: A farmer has a field in the shape of a rectangle. She decides to dig a well in the shape of a cylinder of radius 3.5 m and depth 8 m. The earth dug out is spread evenly over the remaining field.
(i) Find the volume of earth dug out. (Use π = 22/7)
(ii) If the field is 30 m × 20 m, find the rise in the level of the field.

Ans: (i) V = $\pi r^2h = (22/7)(3.5)^2(8) = (22/7)(12.25)(8) = 308\ m^3$. (ii) Area of field = $30\times20 = 600\ m^2$. Area of well = $\pi(3.5)^2 = 38.5\ m^2$. Remaining area = 600 − 38.5 = $561.5\ m^2$. Rise = 308/561.5 = 0.548 m = 54.8 cm.

★ PYQ SUMMARY & ANALYSIS

Topic	Years Asked	Frequency	Marks
Combination solids (SA/Volume)	2019–2025	Every Year	3–5
Conversion (melting/recasting)	2019–2025	Every Year	2–5
Cone + Hemisphere toy	2019–2025	6 times	3–5
Cylinder problems	2019–2024	Every Year	1–5
Sphere/Hemisphere (SA/Vol)	2019–2024	Every Year	1–3
Volume ratios (cone/cylinder/sphere)	2019–2024	5 times	1–2
Cubes — number from larger cube	2019–2022	3 times	1
Case Study (toy/well/capsule)	2024–2025	2 times	4

Key Observations for Students:

✔ Combination solids (cone+hemisphere, cylinder+cone) are the MOST asked — 3–5 marks every year.
✔ Volume conservation: when solid is melted and recast, V(old) = V(new). Very common concept.
✔ MUST MEMORIZE: Cylinder V = $\pi r^2 h$, Cone V = $(1/3)\pi r^2 h$, Sphere V = $(4/3)\pi r^3$.
✔ CSA of cone = $\pi r l$ (where $l = \sqrt{(r^2+h^2)}$). TSA hemisphere = $3\pi r^2$.
✔ Always identify which formula to use: TSA vs CSA vs Volume.
✘ Frustum of a Cone is DELETED from 2025–26 syllabus.
✔ Expected marks: 5–8 marks in Board Exam.

"Practice makes perfect. Solve PYQs to master your Board Exam!"

Best Wishes for Your Board Exam!

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