Math of Space: Surface Area and Volume

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A cone has radius 14 cm and height 48 cm. Its slant height is:

(a) 51 cm **(b)** 62 cm **(c)** 34 cm **(d)** 50 cm

2. The curved surface area of a cone with radius 14 cm and slant height 50 cm (π = 22/7) is:

(a) 2,816 cm^2 **(b)** 4,400 cm^2 **(c)** 2,200 cm^2 **(d)** 616 cm^2

3. The surface area of a sphere of radius 70 cm (π = 22/7) is:

(a) 1,437,333 1/3 cm^2 **(b)** 30,800 cm^2
(c) 46,200 cm^2 **(d)** 61,600 cm^2

4. The total surface area of a solid hemisphere of radius 14 cm (π = 22/7) is:

(a) 2,464 cm^2 **(b)** 1,232 cm^2 **(c)** 1,848 cm^2 **(d)** 1,862 cm^2

5. The curved surface area of a cone is:

(a) πrh **(b)** πr^2 **(c)** πrl **(d)** $2\pi rh$

6. The volume of a sphere of radius 35 cm (π = 22/7) is:

(a) 179,666 2/3 cm^3 **(b)** 539,000 cm^3
(c) 15,400 cm^3 **(d)** 89,833 1/3 cm^3

7. The volume of a cone with radius 21 cm and height 28 cm (π = 22/7) is:

(a) 25,872 cm^3 **(b)** 38,808 cm^3 **(c)** 12,936 cm^3 **(d)** 1,848 cm^3

8. Assertion (A): The curved surface area of a cone with radius 56 cm and slant height 70 cm is 12,320 cm^2 (π = 22/7).
Reason (R): The curved surface area of a cone is $\pi r^2 h$.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Find the total surface area of a cone with radius 14 cm and slant height 50 cm (π = 22/7).

10. Find the volume of a hemisphere of radius 42 cm (π = 22/7).

11. The surface area of a sphere is 39,424 cm^2 ($\pi = 22/7$). Find its radius.

12. Find the volume of a cone with diameter 70 cm and height 12 cm ($\pi = 22/7$).

13. Two spheres have radii in the ratio 7 : 9. Find the ratio of their volumes.

14. A cone of radius 14 cm has a volume of 1,848 cm^3 ($\pi = 22/7$). Find its height.

15. A hemispherical bowl has an inner radius of 84 cm. How many litres of juice can it hold ($\pi = 22/7$)?

16. Find the curved surface area of a cone with base diameter 140 cm and slant height 74 cm ($\pi = 22/7$).

Section C — Word problems — 4 × 4 = 16 marks

17. A conical tent has a base radius of 7 m and a slant height of 12 m. Find the canvas needed and its cost at Rs 172 per m^2 ($\pi = 22/7$).

18. The dome of a building is a hemisphere of radius 35 m. Find the cost of painting its outer surface at Rs 38 per m^2 ($\pi = 22/7$).

19. An ice-cream cone has radius 7 cm and height 6 cm. How much ice-cream do 19 such cones hold ($\pi = 22/7$)?

20. A metal sphere of radius 2 cm is melted and recast into cones of radius 1 cm and height 2 cm. How many cones are made?

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Answer key

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Q	Answer	Working
1	**(d) 50 cm**	$\sqrt{(14^2 + 48^2)} = \sqrt{2500} = 50$
2	**(c) 2,200 cm²**	$\pi rl = 22/7 \times 14 \times 50 = 2{,}200$
3	**(d) 61,600 cm²**	$4\pi r^2 = 4 \times 22/7 \times 70^2 = 61{,}600$
4	**(c) 1,848 cm²**	$3\pi r^2 = 3 \times 22/7 \times 14^2 = 1{,}848$
5	**(c) πrl**	r = radius, l = slant height
6	**(a) 179,666 2/3 cm³**	$(4/3)\pi r^3 = 4/3 \times 22/7 \times 35^3 = 179{,}666\ 2/3$
7	**(c) 12,936 cm³**	$(1/3)\pi r^2 h = 1/3 \times 22/7 \times 21^2 \times 28 = 12{,}936$
8	**(c) A is true, but R is false.**	A is true: $\pi rl = 22/7 \times 56 \times 70 = 12{,}320$. R is false.
9	**2,816 cm²**	$\pi r(l + r) = 22/7 \times 14 \times 64 = 2{,}816$
10	**155,232 cm³**	$(2/3)\pi r^3 = 2/3 \times 22/7 \times 42^3 = 155{,}232$
11	**56 cm**	$4 \times 22/7 \times r^2 = 39{,}424$, so $r^2 = 3136$, r = 56
12	**15,400 cm³**	r = 35; $(1/3) \times 22/7 \times 35^2 \times 12 = 15{,}400$
13	**343 : 729**	volume goes as r^3: $7^3 : 9^3$
14	**9 cm**	$(1/3) \times 22/7 \times 14^2 \times h = 1{,}848$, so h = 9
15	**1241.856 litres**	$(2/3) \times 22/7 \times 84^3 = 1{,}241{,}856\ cm^3$ = 1241.856 litres
16	**16,280 cm²**	r = 70; $\pi rl = 22/7 \times 70 \times 74 = 16{,}280$
17	**264 m²; Rs 45,408**	$\pi rl = 22/7 \times 7 \times 12 = 264\ m^2$; × 172 = 45,408
18	**Rs 292,600**	$2\pi r^2 = 2 \times 22/7 \times 35^2 = 7{,}700\ m^2$; × 38 = 292,600
19	**5,852 cm³**	one cone = $(1/3) \times 22/7 \times 49 \times 6 = 308$; × 19 = 5,852
20	**16 cones**	$(4/3)\pi \times 2^3 \div ((1/3)\pi \times 1^2 \times 2) = 4 \times 8 \div 2 = 16$

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