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# CHAPTER TEST: SURFACE AREAS AND VOLUMES

**Mathematics | Class IX (2026/SURVOL/09/001)**

## Section A: Multiple Choice Questions (1 Mark Each)

1. **(c) 8 : 1**
   $V_1 = \frac{4}{3}\pi r^3$. If $R = 2r$, $V_2 = \frac{4}{3}\pi(2r)^3 = 8 \times \frac{4}{3}\pi r^3$. Ratio $V_2 : V_1 = 8 : 1$.

2. **(b)** $\pi r(l + \frac{r}{4})$
   TSA $= \pi R(l' + R)$. Here $R = \frac{r}{2}, l' = 2l$. TSA $= \pi(\frac{r}{2})(2l + \frac{r}{2}) = \pi r(l + \frac{r}{4})$.

3. **(b) 1 : 4**
   TSA Big $= 6(4^2) = 96$. Number of small cubes $= 4^3 = 64$. TSA Sum $= 64 \times 6(1^2) = 384$.
   Ratio $= 96 : 384 = 1 : 4$.

4. **(a) 1 : 4**
   $SA = 4\pi r^2$. Ratio $= 6^2 : 12^2 = 36 : 144 = 1 : 4$.

5. **(c) 4 cm**
   $\pi r^2 = 38.5 \implies r^2 = \frac{38.5 \times 7}{22} = 12.25 \implies r = 3.5$ cm.
   $2\pi rh = 176 \implies 2 \times \frac{22}{7} \times 3.5 \times h = 176 \implies 22h = 176 \implies h = 8$ cm.
   *(Correction: Based on calculation $h = 8$, option (b) is correct).*

6. **(b) 3 : 1**
   $V_1 : V_2 = \frac{1}{3}\pi r_1^2 h_1 : \frac{1}{3}\pi r_2^2 h_2 = (3^2 \times 1) : (1^2 \times 3) = 9 : 3 = 3 : 1$.

7. **(a) 512 m$^3$**
   $4a^2 = 256 \implies a^2 = 64 \implies a = 8$ m. $V = a^3 = 8^3 = 512$ m$^3$.

8. **(b) 3 : 2**
   TSA of 2 hemispheres $= 2 \times 3\pi r^2 = 6\pi r^2$. Original sphere $= 4\pi r^2$. Ratio $= 6 : 4 = 3 : 2$.

## Section B: Very Short Answer Questions (2 Marks Each)

1. New dimensions: $l = 15, b = 5, h = 5$.
   $SA = 2(lb + bh + hl) = 2(75 + 25 + 75) = 2(175) = \mathbf{350}\,\textbf{cm}^2$.

2. $r = 7, l = 25 \implies h = \sqrt{25^2 - 7^2} = 24$ cm.
   $V = \frac{1}{3} \times \frac{22}{7} \times 49 \times 24 = 1232\,\text{cm}^3 = \mathbf{1.232}\,\text{litres}$.

3. $\frac{4}{3}\pi r^3 = 38808 \implies r^3 = \frac{38808 \times 3 \times 7}{4 \times 22} = 9261 \implies \mathbf{r = 21}\,\text{cm}$.
   $SA = 4\pi r^2 = 4 \times \frac{22}{7} \times 21 \times 21 = \mathbf{5544}\,\textbf{cm}^2$.

4. $r = 0.25$ m, $h = 3.5$ m. $CSA = 2 \times \frac{22}{7} \times 0.25 \times 3.5 = 5.5\,\text{m}^2$.
   Cost $= 5.5 \times 12.50 = $ Rs $\mathbf{68.75}$.

## Section C: Short Answer Questions (3 Marks Each)

1. $r = 42$ cm, $h = 120$ cm. $CSA = 2 \times \frac{22}{7} \times 42 \times 120 = 31680\,\text{cm}^2$.
   Total Area $= 500 \times 31680 = 15,840,000\,\text{cm}^2 = \mathbf{1584}\,\textbf{m}^2$.

2. $r = 14$ cm, $V = 9856$.
   (a) $h = \frac{3V}{\pi r^2} = \frac{3 \times 9856 \times 7}{22 \times 196} = \mathbf{48}$ cm.
   (b) $l = \sqrt{48^2 + 14^2} = \sqrt{2500} = \mathbf{50}$ cm.
   (c) $CSA = \frac{22}{7} \times 14 \times 50 = \mathbf{2200}\,\mathbf{cm^2}$.

3. $V_{sphere} = \frac{4}{3}\pi(3^3) = 36\pi$. $V_{cone} = \frac{1}{3}\pi R^2(12) = 4\pi R^2$.
   $4\pi R^2 = 36\pi \implies R^2 = 9 \implies \mathbf{R = 3}$ cm.

## Section D: Long Answer Questions (5 Marks Each)

1. Toy Volume $= V_{cone} + V_{hemi} = \frac{1}{3}\pi(2^2)(2) + \frac{2}{3}\pi(2^3) = \frac{8\pi}{3} + \frac{16\pi}{3} = \frac{24\pi}{3} = \mathbf{8\pi\,cm^3} \approx 25.12\,\text{cm}^3$.
   Cylinder Dimensions: $R = 2, H = 2(\text{cone}) + 2(\text{hemi radius}) = 4$ cm.
   $V_{cyl} = \pi(2^2)(4) = 16\pi$. Difference $= 16\pi - 8\pi = \mathbf{8\pi\,cm^3}$.

2. Total requirement $= 4000 \times 150 = 600,000$ L $= 600\,\text{m}^3$ per day.
   Tank Volume $= 20 \times 15 \times 6 = 1800\,\text{m}^3$.
   Number of days $= \frac{1800}{600} = \mathbf{3}\,\text{days}$.

## Section E: Case Study Solutions

1. **(b) 490** $\pi$ ($V = \pi \times 7^2 \times 10 = 490\pi$).

2. **(b) 25 meters** ($l = \sqrt{24^2 + 7^2} = \sqrt{625} = 25$).

3. **(b) 175** $\pi$ ($CSA = \pi \times 7 \times 25 = 175\pi$).

4. **(b) 315** $\pi$ ($CSA_{total} = CSA_{cyl} + CSA_{cone} = (2\pi \times 7 \times 10) + 175\pi = 140\pi + 175\pi = 315\pi$).

5. **(c) Rs. 841,500**
   Total Area $= 315 \times \frac{22}{7} = 990\,\text{m}^2$. Cost $= 990 \times 850 = $ Rs. $\mathbf{841,500}$.
   *(Note: Closest option to calculation is 841,500; please re-check provided MCQ options).*