Chapter - 13

Surface Areas and Volumes

(Assertion and Reasoning Questions)

In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Q.1. Assertion (A): Total surface area of the cylinder having radius of the base 14 cm and height 30 cm is 3872 cm^2.

Reason (R): If r be the radius and h be the height of the cylinder, then total surface area = $(2\pi rh + 2\pi r^2)$.

Q.2. Assertion (A): The slant height of the frustum of a cone is 5 cm and the difference between the radii of its two circular ends is 4 cm. Than the height of the frustum is 3 cm.

Reason (R): Slant height of the frustum of the cone is given by $l = \sqrt{(R-r)^2 + h^2}$.

Q.3. Assertion (A): If the height of a cone is 24 cm and diameter of the base is 14 cm, then the slant height of the cone is 15 cm.

Reason (R): If r be the radius and h the slant height of the cone, then slant height $= \sqrt{h^2 + r^2}$.

Q.4. Assertion (A): Two identical solid cube of side 5 cm are joined end to end. Then total surface area of the resulting cuboid is 300 cm^2 .

Reason (R): Total surface area of a cuboid is 2 (lb + bh + lh)

Q.5. Assertion (A): If the radius of a cone is halved and volume is not changed, then height remains same.

Reason (R): If the radius of a cone is halved and volume is not changed then height must become four times of the original height.

Q.6. Assertion (A): The radii of two cones are in the ratio 2:3 and their volumes in the ratio 1:3. Then the ratio of their heights is 3:2.

Reason (R): $\text{Volume of the cone} = \frac{1}{3}\pi r^2.h$

Q.7. Assertion (A): If a ball is in the shape of a sphere has a surface area of 221.76 cm^2 , then its diameter is 8.4 cm.

Reason (R): If the radius of the sphere be r , then surface area,

$S = 4\pi r^2$, i.e. $r = \frac{1}{2}\sqrt{\frac{S}{\pi}}$.

Q.8. Assertion (A): The number of coins 1.75 cm in diameter and 2 mm thick is formed from a melted cuboid 10cm × 5.5cm × 3.5cm is 400.

Reason (R): Volume of a cylinder =$\pi r^2 h$ cubic units and area of cuboid = (l × b × h) cubic units.

Q.9. Assertion (A): No. of spherical balls that can be made out of a solid cube of lead whose edge is 44 cm, each ball being 4 cm. in diameter, is 2541

Reason (R): $\text{Number of balls} = \frac{\text{Volume of one ball}}{\text{volume of lead}}$

Q.10. Assertion (A): If the volumes of two spheres are in the ratio 27:8. Then their surface areas are in the ratio 3:2.

Reason (R): Volume of the sphere $= \frac{4}{3}\pi r^3$ and its surface area = $4\pi r^2$

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ANSWER KEY

Q.1 : (a)

$$\begin{aligned}\text{Total surface area} &= 2\pi rh + 2\pi r^2 \\ &= 2\pi r(h + r) \\ &= 2 \times \frac{22}{7} \times 14(30 + 14) = 88(44) \\ &= 3872\,\text{cm}^2\end{aligned}$$

Q.2 : (a)

$$\begin{aligned}\text{We have,} \qquad l &= 5\,\text{cm},\ R - r = 4\,\text{cm} \\ 5 &= \sqrt{(4)^2 + h^2} \\ 16 + h^2 &= 25 \\ h^2 &= 25 - 16 = 9 \\ h &= 3\,\text{cm}\end{aligned}$$

Q.3 : (d)

$$\begin{aligned}\text{Slant height} &= \sqrt{(14/2)^2 + (24)^2} \\ &= \sqrt{49 + 576} \\ &= \sqrt{625} = 25\end{aligned}$$

Q.4 : (d)

When cubes are joined end to end, it will form a cuboid.

l = 2 x 5 = 10 cm, b= 5 cm

and h = 5 cm

Total surface area = 2(lb + bh + lh)

= 2(10 x 5+5 X 5+10 x 5)

= 2 X 125 = 250 cm^2

Q.5 : (d)

$$\frac{V_1}{V_2} = \frac{(1/3)\pi r^2 h_1}{(1/3)\pi (r/2)^2 h_2} = \frac{4h_1}{h_2}$$

As $V_1 = V_2$

$h_2 = 4h_1$

Q.6 : (d)

We have, $$\text{ratio of volume} = \frac{\frac{1}{3}\pi \times (2x)^2 \times h_1}{\frac{1}{3}\pi \times (3x)^2 \times h_2}$$

$$\frac{1}{3} = \frac{4}{9} \times \frac{h_1}{h_2}$$

$$\frac{h_1}{h_2} = \frac{3}{4}$$

$$h_1 : h_2 = 3 : 4$$

Q.7 : (a)

Q.8 : (a)

$$\text{Number of coins} = \frac{\text{volume of cuboid}}{\text{volume of one coin}}$$

$$= \frac{10 \times 5.5 \times 3.5}{\pi \times \frac{1.75}{2} \times \frac{1.75}{2} \times 0.2}$$

$$\frac{10 \times 5.5 \times 3.5}{\frac{22}{7} \times \frac{1.75}{2} \times \frac{1.75}{2} \times 0.2} = 400$$

Q.9 : (c)

Q.10 : (d)

We have, $\frac{\frac{4}{3}\pi R^3}{\frac{4}{3}\pi r^3} = \frac{27}{8}$

$$\frac{R^3}{r^3} = \frac{27}{8}$$

$$\frac{R}{r} = \frac{3}{2}$$

Ratio of surface area $= \frac{4\pi R^2}{4\pi r^2} = \frac{R^2}{r^2} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$