Solution

S1. Ans.(a)

Sol. $V_1 : V_2 = 1 : 1$

$\pi r_1^2 h_1 : \pi r_2^2 h_2 = 1 : 1$

$\frac{r_1^2}{r_2^2} \times \frac{1}{2} = \frac{1}{1}$

$r_1 : r_2 = \sqrt{2} : 1$

S2. Ans.(a)

Sol. External radius $= \frac{8}{2} = 4$ cm

Thickness = 1 cm

Internal Radius = 4 – 1 = 3 cm

Volume of Material $= \pi h(R^2 - r^2) = \frac{22}{7} \times 21 \times (4^2 - 3^2) = 462 \text{ cm}^3$

1 cm^3 Iron $\rightarrow$ 8 gm

462 cm^3 Iron $\rightarrow \frac{462 \times 8}{1000}$ kg

= 3.696 kg

S3. Ans.(b)

Sol. Let water raised be x.

$2 \times \frac{4}{3}\pi \times (3)^3 = \pi \times (6)^2 \times x$

$72\pi = \pi \times 36x$

$x = 2$ cm

S4. Ans.(a)

Sol.

$\frac{\pi(3)^2 \times n}{\pi(2^2) \times 1} = \frac{3}{1}$

$\frac{9}{4} \times \frac{n}{1} = 3$

$n = \frac{4}{3}$

S5. Ans.(a)

Sol. Volume of water flow per second = $\pi r^2 h = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$

= 462 cm^3

Volume of water pumped out in 1 hour = 462 × 60 × 60 cm^3

= 1663200 cm^3 = 1663.2 liters

S6. Ans.(d)

Sol. Let Radius = r cm, h = 16 cm

$2\pi rh = 1056$

$2 \times \frac{22}{7} \times r \times 16 = 1056$

$r = \frac{21}{2}$ cm

Volume $= \pi r^2 h = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 16 = 5544 \text{ cm}^3$

S7. Ans.(c)

Sol. Volume of solid cylinder = $\pi r^2 h$

Volume of cone $= \frac{1}{3}\pi r^2 h$

Difference $= \pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{2}{3}\pi r^2 h = 628.57$ cubic cm

S8. Ans.(d)

Sol.

$$\frac{2\pi rh}{2\pi rh + 2\pi r^2} = \frac{1}{2}$$

$$\frac{2\pi rh}{616} = \frac{10}{2}$$

$2\pi rh = 308$ …(i)

$2\pi rh + 2\pi r^2 = 616$ …(ii)

From (i) and (ii)

$r = 7$ …(iii)

From (i) and (iii)

$h = 7$

Volume $= \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 7 = 1078 \text{ cm}^3$

S9. Ans.(a)

Sol. Diagonal $= \sqrt{3a^2}$, $\sqrt{3}a = 2\sqrt{3}$, $a = 2$

Volume $= a^3 = 8$

S10. Ans.(a)

Sol. Ratio of volume = 27 : 1

Ratio of edges $= \sqrt[3]{\left(\frac{27}{1}\right)} = 3 : 1$

S11. Ans.(d)

Sol. Water supplied by pipe in 1 hour = $0.3 \times 0.2 \times 20 \times 1000 \text{ m}^3$

$= 1200 \text{ m}^3$

Total time $= \frac{\text{Volume of water to be filled}}{1200} = \frac{200 \times 150 \times 8}{1200} = 200$ hours

S12. Ans.(b)
Sol.

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

$$\frac{r^2 \times h_1}{4r^2 \times h_2} = \frac{2}{3}$$

$$\frac{h_1}{h_2} = \frac{8}{3}$$

S13. Ans.(c)
Sol.

$$\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_1^2 2h_1} = 1:2$$

S14. Ans.(a)
Sol. Volume of cone $= \frac{1}{3}\pi r^2 h = \frac{\pi}{3}(15)^3\ cm^3$

Volume of sphere $= \frac{4}{3}\pi(15)^3 cm^3$

$$\text{Wasted wood \%} = \frac{\frac{4}{3}\pi(15)^3 - \frac{1}{3}\pi(15)^3}{\frac{4}{3}\pi(15)^3} \times 100$$

$= 75\%$

S15. Ans.(b)
Sol. Radius = 5x, height = 12x

$$V = \frac{1}{3}\pi r^2 h$$

$$314\frac{2}{7} = \frac{1}{3} \times \frac{22}{7} \times 5x \times 5x \times 12x$$

$$x^3 = \frac{2200 \times 3 \times 7}{7 \times 22 \times 25 \times 12} = 1$$

$x = 1$
Radius = 5, height = 12
Slant height $= \sqrt{12^2 + 5^2} = 13$ cm

S16. Ans.(c)
Sol. Let one side of cube be x unit
∴ Diameter of sphere = x unit
∴ Required ratio $= x^3 : \frac{4}{3}\pi\frac{x^3}{8} = 6 : \pi$

S17. Ans.(b)
Sol. Required ratio = $(2\pi rh + 2\pi r^2) : 2\pi rh$
$= 2\pi r\ (h + r) : 2\pi rh$
$= (h + r) : h$
$= (7.5 + 3.5) : 7.5$
$= 11 : 7.5 = 22 : 15$

S18. Ans.(c)

Sol. Vol. of new ball $= \frac{3}{4} \times \frac{4}{3}\pi\,(r_1^3 + r_2^3 + r_3^3)$

$= \pi(1^3 + 2^3 + 3^3)$

$= \pi\,(1 + 8 + 27)$

$= 36\pi\ cm^3$

$\therefore \frac{4}{3}\pi r^3 = 36\pi$

$\Rightarrow r^3 = \frac{36 \times 3}{4} = 27$

$\therefore r = \sqrt[3]{27} = 3\ cm$

S19. Ans.(c)

Sol. One side of square $= \sqrt{121} = 11\ cm$

$\therefore$ Length of wire $= 4 \times 11 = 44\ cm$

$\therefore 2\pi r = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = 7\ cm$

$\therefore$ area of circle $= \pi r^2 = \frac{22}{7} \times 7 \times 7$

$= 154\ cm^2$

S20. Ans.(b)

Sol. Angle subtended by the arc of the sector of circle at its centre $= 90°$

Area of circle $= 154$

$\therefore \pi r^2 = 154$

$\Rightarrow \frac{22}{7} \times r^2 = 154 \Rightarrow r^2 = \frac{154 \times 7}{22}$

$\therefore r = 7\ cm$

$\therefore$ Length of arc $= \frac{\theta}{180} \times \pi r$

$= \frac{90}{180} \times \frac{22}{7} \times 7 = 11\ cm$

S21. Ans.(b)

Sol. Let side of cube $= x\ cm$

$\therefore \sqrt{3x} = 6$

$\Rightarrow x = \frac{6}{\sqrt{3}} = 2\sqrt{3}\ cm$

$\therefore$ Volume of cube $= l^3 = 2\sqrt{3} \times 2\sqrt{3} \times 2\sqrt{3}$

$= 24\sqrt{3}\ cm$

S22. Ans.(c)

Sol. Required ratio = Volume of hemisphere : Volume of cylinder

$= \frac{2}{3}\pi r^3 : \pi r^3 = 2 : 3$

S23. Ans.(c)

Sol. Let height of cylinder = h cm and radius of base = r cm.

$\therefore 2\pi r^2 + 2\pi rh = 462$ …(i)

Area of curved surface $= 2\pi rh = \frac{1}{3} \times 462 = 154$

$\therefore 2\pi r^2 + 154 = 462$

$\Rightarrow 2\pi r^2 = 462 - 154 = 308$

$\Rightarrow 2 \times \frac{22}{7} \times r^2 = 308$

$\Rightarrow r^2 = \frac{308 \times 7}{2 \times 22} = 49$

$\Rightarrow r = 7$ cm

$\therefore 2\pi rh = 154$

$\Rightarrow 2 \times \frac{22}{7} \times 7 \times h = 154$

$\Rightarrow h = \frac{154}{2 \times 22} = \frac{7}{2}$ cm

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times \frac{7}{2} = 539\ cm^3$

S24. Ans.(d)

Sol.

$\frac{\text{Curved surface area of cylinder}}{\text{Curved surface area of cone}} = \frac{8}{5}$

$\Rightarrow \frac{2\pi rh}{\pi r\sqrt{h^2+r^2}} = \frac{8}{5}$

$\Rightarrow \frac{h}{\sqrt{h^2 + r^2}} = \frac{4}{5}$

Square both sides

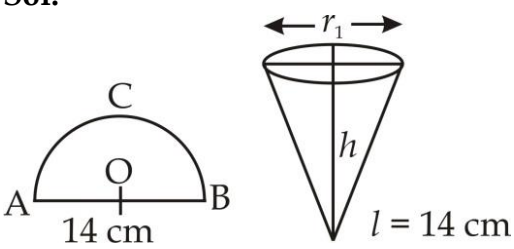
$\frac{h^2}{h^2 + r^2} = \frac{16}{25} \Rightarrow \frac{h^2 + r^2}{h^2} = \frac{25}{16}$

$\Rightarrow 1 + \frac{r^2}{h^2} = \frac{25}{16} \Rightarrow \frac{r^2}{h^2} = \frac{25}{16} - 1 = \frac{9}{16}$

$\therefore \frac{r}{h} = \frac{3}{4}$

S25. Ans.(b)

Sol.



Length of semicircular sheet (ACB) $= \pi r$

$= \frac{22}{7} \times 14 = 44$ cm

Slant height of cone = l = 14 cm
Circumference of the base of the cone
$= 2\pi r_1 = \frac{44}{7} r_1$
$\Rightarrow 44 = \frac{44}{7} r_1 \Rightarrow r_1 = 7$ cm
$h = \sqrt{l^2 - r_1^2} = \sqrt{14^2 - 7^2}$
$= 7\sqrt{3}$ cm
$= 7 \times 1.732 = 12$ cm

S26. Ans.(a)
Sol. Volume of remaining solid
$= \frac{2}{3}\pi r^2 h$
$= \frac{2}{3} \pi \times 6 \times 6 \times 10$
$= 240\pi$ cm^3

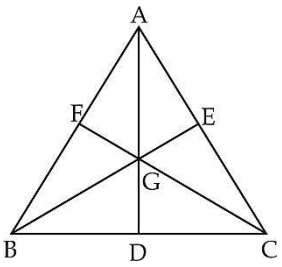
S27. Ans.(c)
Sol. Base area = $\frac{1}{2}$ (sum of parallel sides) × Perpendicular distance
$= \frac{1}{2}(14 + 8) \times 8 = 88$ cm^2
∴ Volume = Base area × Height
$\Rightarrow 1056 = 88 \times h$
$\Rightarrow h = \frac{1056}{88} = 12$ cm

S28. Ans.(a)
Sol. Area of rectangular field
$= \frac{1000}{\frac{1}{4}} = 4000$ m^2
∴ Length $= \frac{4000}{50} = 80$ m
New length of field = 100 m
Area = 100 × 50 = 5000 m^2
∴ Required cost $= \left(5000 \times \frac{1}{4}\right) =$ Rs 1250

S29. Ans.(b)
Sol. Volume of rain water = Base area × height
$= 1000000 \times \frac{2}{100}$
$= 20000$ m^3
Water in tank = 10000 m^3
∴ Required height of water level $= \frac{10000}{1000} = 10$ m

S30. Ans.(b)

Sol. AG = 6 cm



$BG = \frac{2}{3} \times 12 = 8$ cm

$GC = \frac{2}{3} \times 15 = 10$ cm

$\Delta ABG = \frac{1}{2} \times 6 \times 8 = 24$ cm²

∴ Area of $\Delta ABC = 3 \times 24 = 72$ cm²