18. The inner and outer radii of a 7 m long hollow iron right circular cylindrical pipe are 2 cm and 4 cm respectively. If 1000 cm^3 of iron weighs 5 kg, what is the weight of the pipe?

264 kg

132 kg

396 kg

None of the above

Answer (b)

Volume of the iron rod = External volume – Internal volume
= 700 x $\pi(4^2 - 2^2)$ cm^3
= (700 x 22 x 12 cm^3)/7
= 26400 cm^3
= 26.4 x 5 kg = 132 kg

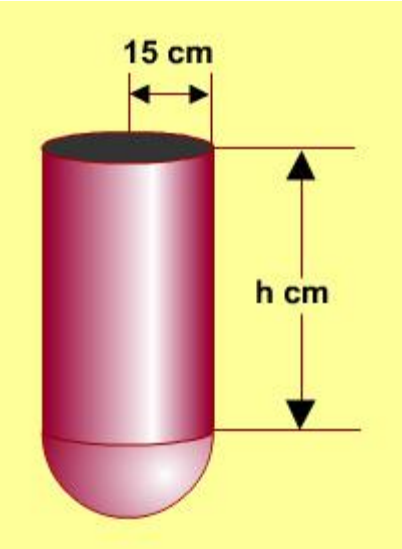
19. A container is in the form of a right circular cylinder surmounted by a hemisphere of the same radius 15 cm as the cylinder. If the volume of the container is 32400π cm ^{3}, then the height h of the container satisfies which one of the following?

135 cm < h < 150 cm

140 cm < h < 147 cm

145 cm < h < 148 cm

139 cm < h < 145 cm



Answer (a)

Volume of the container
= Volume of the cylinder + Volume of the hemisphere
$\Rightarrow \pi 15^2 h + (2\pi 15^3)/3 = 32400\pi$
$\Rightarrow \pi 15^2 (h + 10) = 32400\pi$
$\Rightarrow h + 10 = 32400/225 = 144$
$\Rightarrow h = 134$
$\therefore$ the height of the container = 134 + 15 = 149 cm
Which satisfies 139 cm < h < 145 cm.

20. A cylindrical can of internal diameter 24 cm contains water. A solid sphere of radius 6 cm is completely immersed in water in the cylinder. The water level increases by

0.25 cm

0.5 cm

2 cm

3 cm

Answer (c)

Volume of water increased = Volume of the solid sphere
$= (4\pi 6^3)/3 = 288\ \pi\ cm^3$
If the increase in water level is h cm, then
$\pi 12^2 h = 288\pi$
$\Rightarrow h = 2$ cm.

21. From a cylindrical log whose height is equal to its diameter, the greatest possible sphere has been taken out. What is the fraction of the original log which is cut away?

1/2

1/3

1/4

2/3

Answer (d)

Volume of the cylindrical log
$= \pi r^2 h$ where $h = 2r$
$= \pi r^2 2r = 2\pi r^3$
The radius of the greatest possible sphere = r
Therefore, the volume of this sphere $= (4\pi r^3)/3$
$\Rightarrow$ this volume is $(4\pi r^3)/3 \div 2\pi r^3 = 2/3$ of the volume of the cylindrical log

22. A cylindrical vessel of base radius 14 cm is filled with water to some height. If a rectangular solid of dimensions 22 cm x 7 cm x 5 cm is immersed in it, what is the rise in water level?

0.5 cm

1.0 cm

1.25 cm

1.5 cm

Answer (c)

Volume of the rise of water in the cylindrical vessel = volume of the rectangular solid immersed
If h is the rise in water level
$\pi 14^2 h = (22 \times 7 \times 5)\ cm^3$
$\Rightarrow h = 22 \times 7 \times 5/\pi.14 \times 14$ cm
$\Rightarrow h = 770/196\pi = (770 \times 7)/196 \times 22 = 1.25$ cm

23. A lead pencil is in the shape of a cylinder. The pencil is 21 cm long with radius 0.4 cm and its lead is of radius 0.1 cm. What is the volume of wood in the pencil?

9 cm^3

9.4 cm^3

9.9 cm^3

10.1 cm^3

Answer (c)

Volume of the wood
= volume of the pencil – volume of the lead
= $[\pi(0.4)^2 21 - \pi(0.1)^2 \times 21]\ cm^3$
= $\pi \times 21\ (0.16 - 0.01)\ cm^3$
= $66 \times 0.15\ cm^3 = 9.9\ cm^3$

24. A hollow cylindrical iron pipe of length 1.4 m has bore radius 2.5 cm and thickness of the metal is 1 cm. What is the volume of the iron used in the pipe?

2640 cm^3

2604 cm^3

2460 cm^3

None of the above

Answer (a)

Length of the pipe = 140 cm
Internal radius = 2.5 cm
External radius = 3.5 cm
Volume of the pipe
= $\pi\ (3.5 \times 3.5 - 2.5 \times 2.5) \times 140\ cm^3$
= 2640 cm^3