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Class: X
Subject: Math's
Topic: Surface area and volumes
No. of Questions e: 20
Duration: 60 Min
Maximum Marks: 60

Q1. Three solid metallic spheres of radii 6, 8 and 10 centimeters are melted to form a single solid sphere. The radius of the sphere so formed is _____.
A. 24 cm
B. 16 cm
C. 18 cm
D. 12 cm

Solution: D
Sum of volume of 3 spheres= sum of volume of single sphere
$= \frac{4}{3}\pi 6^3 + \frac{4\pi}{3}8^3 + \frac{4\pi}{3}10^3 = \frac{4}{3}\pi R^3$
$R^3 = 6^3 + 8^3 + 10^3$
$= 216 + 515 + 1000$
$R = 12$

Q2. The number of solid spheres, each of diameter 6 cm that could be molded to form a solid metal cylinder of height 45 cm and diameter 4 cm, is……..
A. 3
B. 4
C. 5
D. 6

Solution: C

Volume of metal cylinder= $\pi r^2 h$
$= \pi \times 2 \times 2 \times 45$
Volume of solid sphere= $\frac{7}{3}\pi R^3$
$= \frac{4}{3}\pi 3 \times 3 \times 3$
No of spheres= $\frac{\text{volume of cylinder}}{\text{volume of sphere}} = \frac{45}{3\times 3} = 5$

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Q3. A hemispherical bowl is made of steel of 0.25cm thickness. The inner radius of the bowl is 5 cm. The volume of steel used is……..

A. 42.15 cm3
B. 41.52 cm3
C. 41.25 cm3
D. 40 cm3

Solution: C
Volume of steel used = outer volume – inner volume

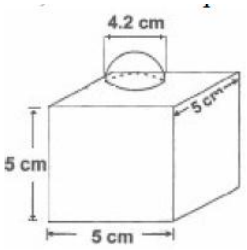
$$= \frac{2}{3}\pi[(R+T)^3 - (R)^3]$$
$$= \frac{2}{3}\pi(5.25^3 - 5^3$$
$$= 41.25\ cm^3$$

Q4 A Cuboidal metal of dimensions 44 cm x 30 cm x 15 cm was melted and cast into a cylinder Of height 28 cm. its radius is__.
A. 20 cm
B. 15 cm
C. 10 cm
D. 25 cm

Solution: B
Volume of cuboid = volume of cylinder

$$44 \times 30 \times 15 = \pi \times r^2 \times 28$$
$$r^2 = \frac{44\times30\times15\times17}{22\times28}$$
$$r = 15cm$$

Q5. The decorative block shown in figure is made of two solids, a cube and a hemisphere. The base of the block is a cube with edge 5 cm, and the hemisphere fixed on the top ha a diameter of 4.2cm. The total surface area of the block is.



A. 150 cm2
B. 160.86 cm2
C. 162.86cm2

D. 163.86cm2

Solution: D
Total SA = SA of block + CSA of sphere – bottom area of sphere
$= 6 \times 5^2 + 2\pi \times (2.1)^2 - \pi(2.1)^2$
$= 6 \times 25 + \pi \times 2.1 \times 2.1$
$= 163.86\text{cm}2$

Q6. A sphere of radius 6 cm is dropped into a cylindrical vessel partly filled with water. The radius of the vessel is 8 cm. If the spheres submerged completely, then the surface of the water rises by ____.
A. 4.5 cm
B. 3 cm
C. 4 cm
D. 2 cm

Solution: A
Increase in volume of cylinder= volume of sphere

$$= \pi r^2 h = \frac{4}{3}\pi R^3$$ Increase in water level

$$h = \frac{4\times6\times6\times6}{3\times8\times8} = 4.5 \text{ cm}$$

Q7. If the radii of the circular ends of a bucket of height 40 cm are of lengths 35 cm and 14 cm, then the volume of the bucket in cubic centimeters is.
A. 60060
B. 80080
C. 70040
D. 80160

Solution: B
Frustum

Volume=$\frac{\pi h}{3}(R^2 + r^2 + rR)$

$= \frac{22\times40}{7\times3} \times 40(35^2 + 14^2 + 14 \times 34)$

$= \frac{22}{7\times3} \times 40 \times 7[35 \times 5 + 14 \times 2 + 14 \times 5$

$= \frac{22}{3}40[35 \times 5 + 14 \times 7]$
$= \frac{22}{3} \times 40 \times 7 \times 39$
= 80080 cm

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Q8. A cylindrical vessel of diameter 4cm is partly filled with water. 300 lead balls are dropped in it. The rise in water level is 0.8 cm. The diameter of each ball is _____.
A. 0.8 cm
B. 0.4 cm
C. 0.2 cm
D. 0.5 cm

Solution: B
Volume rise in vessel = 300× volume of balls

$$\pi \times 2 \times 2 \times 0.8 = 300 \times \frac{4}{3} \times r^3 \times \pi$$

$$r^3 = \frac{0.8\pi}{100\pi} = \frac{8}{1000}$$

$$r = \frac{2}{10} = 0.2\text{cm}$$
$$d = 2r = 0.4 \text{ cm}$$

Q9. A cylindrical vessel of height 32 cm and 18 cm as the radius of the base, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, the radius of its base is _____.
A. 12 cm
B. 24 cm
C. 36 cm
D. 48 cm

Solution: C
Volume of conical heap= volume of cylindrical vessel

$$\frac{1}{3}\pi \times 24 \times r^2 = \pi \times 32 \times 18^2$$

$$r^2 = \frac{32}{24} \times 3 \times 18$$

$$r = 36\text{cm}$$

Q10. A bucket is in the form of a frustum of a cone, its depth is 15 cm and the diameters of the top and the bottom are 56 cm and 42 cm respectively. Find how many liters the bucket can hold.
A. 13 liters
B. 27 liters

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C. 42.94 liters
D. 28.49 liters

Solution: D
Just apply the formula of volume of frustum $\frac{\pi}{3}h(R^2 + r^2 + \pi R)$

Q11 A cuboid has length 10 cm, breadth 8 cm and height 8 cm. What is the length of its diagonal?

A. $\sqrt{52}$ cm
B. $2\sqrt{57}$ cm
C. 26 cm
D. $4\sqrt{57}$ cm

Solution: B

If ℓ is the length of the cuboid, b is the breadth and h is the height, then the length of its diagonal is $\sqrt{\ell^2 + b^2 + h^2}$

Thus, the length of the diagonal of the Solution cuboid is $\sqrt{10^2 + 8^2 + 8^2}$

$= \sqrt{100 + 64 + 64}$

$= \sqrt{228}$

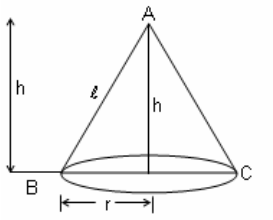
$= 2\sqrt{57}$ cm

Q12. What is the curved surface area of a cone with base radius 4 cm and height 3 cm?

A. 62.86 cm^2
B. 37.71 cm^2
C. 75.43 cm^2
D. 113.14 cm^2

Solution: A

If r is the base radius and h is the height of the cone, then the curved surface area of the cone is $\pi r\ell$ and $\ell = \sqrt{r^2 + h^2}$, where ℓ is the slant height of the cone.



Thus, the slant height of the cone = $\sqrt{4^2 + 3^2}$ = $\sqrt{16+9}$ = 5 cm
the curved surface area of the cone = $\pi \times 4 \times 5$
= $\frac{22}{7} \times 4 \times 5 = 62.86$ cm^2

Q13. The curved surface area of a cylinder is 88 m^2 and its height is 7 m. Find the radius of its base.

A. 2 m
B. 4 m
C. 1 m
D. 6 m

Solution: A

If r and h are the radius of the base and the height of a cylinder, respectively, then the curved surface area of the cylinder is 2πrh.
Thus, the curved surface area of the cylinder = 2πrh = 88 m^2
$\Rightarrow 2 \times \frac{22}{7} \times r \times 7$ m = 88 m^2
$\Rightarrow$ r = $\frac{88}{22 \times 2}$ m = 2 m
Radius of the base of the cylinder = 2 m

Q14. The radius and slant height of a cone are 2 cm and 5 cm, respectively. Find its total surface area.

A. 22 cm^2
B. 44 cm^2
C. 66 cm^2
D. 88 cm^2

Solution: B
If r and l are the radius and slant height of a cone, respectively, then the total surface area of the cone = πr (ℓ + r)

Thus, the total surface area of the cone = πr (ℓ + r) = $\frac{22}{7} \times 2(5 + 2)$ cm^2 = 44 cm^2

Q15. If the radius of a sphere is doubled, its surface area becomes _____.

A. 2 times
B. 8 times
C. 4 times
D. 16 times

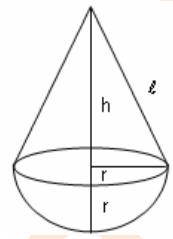
Solution: C

If r is the radius of a sphere, then its surface area is $4\pi r^2$.
Thus, the surface area of the given sphere = $4\pi (2r)^2$
= $4 \times 4\pi r^2$
So, the surface area of the sphere of radius 2r = 4 times the surface area of the sphere of radius.

Q16. A toy is in the shape of a cone surmounted on a hemisphere. If s, p and q are the surface area of the toy, the curved surface area of the hemisphere and the curved surface area of the cone, respectively, then which of the following relationships is true?

A. s + p = q
B. p = s – q
C. q = p – s
D. s + 2q = p

Solution: C
The total surface area of the toy = s



Curved surface area of the cone = q
Curved surface area of the hemisphere = p
the total surface area of the toy = Curved surface area of the cone + Curved surface area of the hemisphere
$\Rightarrow$ s = q + p
$\Rightarrow$ p = s – q

Q17. If the total surface area of a cube is 96 cm^2, find its volume.

A. 96 cm^3
B. 48 cm^3
C. 64 cm^3
D. 144 cm^3

Solution: C

If a is the length of the edge of a cube, then the total surface area of the cube is $6a^2$ and the volume of the cube is a^3.
Thus, the total surface area of cube = $6a^2 = 96\ cm^2$

$\Rightarrow a^2 = \frac{96}{6}$

$\Rightarrow a^2 = 16 \Rightarrow a = \sqrt{16} = 4$
Length of the edge of cube = 4 cm
and the volume of cube = $a^3 = 4^3 = 64\ cm^3$

Q18. The diagonal, length and breadth of a cuboid are $2\sqrt{14}$ cm, 6 cm and 4 cm respectively. What is the height of the cuboid?

A. 6 cm
B. 16 cm
C. 2 cm
D. 46 cm

Solution: C
If ℓ, b, h are the length, breadth and the height of the cuboid respectively, then the diagonal of the cuboid is $\sqrt{\ell^2 + b^2 + h^2}$.

The diagonal of the given cuboid = $\sqrt{\ell^2 + b^2 + h^2} = 2\sqrt{14}$ cm

$\Rightarrow \sqrt{6^2 + 4^2 + h^2} = 2\sqrt{14}$

$\Rightarrow 6^2 + 4^2 + h^2 = (2\sqrt{14})^2$
$\Rightarrow 36 + 16 + h^2 = 4 \times 14$
$\Rightarrow h^2 = 56 - 36 - 16 = 4$
$\Rightarrow h = \sqrt{4} = 2$
Thus, the height of the cuboid = 2 cm

Q19. A cone of height 15 cm and diameter 7 cm is mounted on a hemisphere of the same radius. Find the volume of the combination so formed.

A. 237.41 cm^3
B. 712.25 cm^3
C. 282.33 cm^3
D. 218.16 cm^3

Solution: C

Height of the cone (h) = 15 cm
Diameter of the cone = 7 cm

Radius of the cone = $\frac{\text{diameter}}{2} = \frac{7}{2}$ cm

Radius of the hemisphere = $\frac{7}{2}$ cm

Volume of the combination = Volume of the cone + Volume of the hemisphere

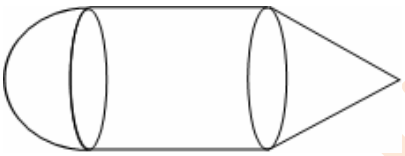
$$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$$

$$= \frac{1}{3}\pi r^2 [h + 2r]$$

$$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}[15 + 2 \times \frac{7}{2}] \text{ cm}^3$$

$= 282.33 \text{ cm}^3$

Q20. A hemisphere, a cylinder and a cone are joined as shown in the figure. C_1, C_2 and C_3 represent the curved surface areas of the hemisphere, the cylinder and the cone, respectively. Which of the following expressions represents the total surface area of the figure?



A. $C_1 + C_2 + 2C_3$
B. $C_1 + C_2 + C_3$
C. $C_1 + C_2 – C_3$
D. None of these

Solution: B

If C_1, C_2 and C_3 are the curved surface areas of the hemisphere, the cylinder and the cone, respectively, then the total surface area of the given solid is $C_1 + C_2 + C_3$.