CBSE 10th Maths 2024-2025

Chapter - 12 Surface Areas and Volumes

Competency-Based Questions

Multiple Choice Questions

Q.1 A solid iron cylinder is melted to form rods of the same height. The radius of the ir rods is $\frac{1}{4}$ of the radius of the cylinder.

How many rods were made?

- **1.**4
- **2.** 16
- **3.** 64
- 4. (depends on the volume of the cylinder)

Answer. (2)

Q.2 6 spherical glitter balls with diameter 1 cm are present in a cylindrical candle made with transparent wax as shown in the figure below.



(Note: The figure is not to scale.)

Find the volume of wax used to make the candle.

- **1.** 70π cm3
- **2.**71π cm3
- **3.** 72π cm3
- **4.** 73π cm3

Answer. (2)

Q.3 Bipin is making iced tea in 2.2 litre jar. He adds some ice spherical balls of diameter 2 cm into the jar, followed by 1.32 litre of tea until it's full. How many ice spheres does he add to the cup?

(Note: 1 ml = 1 cm ³ and take π as $\frac{22}{7}$.)

- **1.** 26.25
- **2.** 210
- **3.** 315
- **4.** 1050

Answer. (2)

Q.4 Solid B is made using Solid A by cutting a smaller cylinder through the centre which is then pushed from below such that it protrudes from the top as shown below.



(Note: The figure is not to scale.)

(Note: The figure is not to scale.) Which of these is true about the volume and surface area of the two solids?

- **1.** Both the volume and the surface area of the solids are different.
- **2.** Both the volume and the surface area of the solids are the same.
- **3.** The volume of the solids is different but the surface area of the solids is the same.
- **4.** The volume of the solids is the same but the surface area of the solids is different.

Answer. (4)

Q.5 Ajit makes a hemispherical clay pot with inner radius 12 cm and 3 cm uniform thickness.

Find the volume of clay used to make the pot.

- **1.** 243π cm³
- **2.** 1098π cm³
- **3.** 1152π cm³
- **4.** 2250π cm³

Answer. (2)

Q.6 Two identical solid cubes are joined by a side to form a cuboid.

What fraction of the surface area of the 2 cubes is the surface area of the cuboid?



Answer. (1)

Q.7 A solid hemisphere with radius 20 cm is melted to form 8 cones of the height 20 cm.

Which of these is the radius of the cones?

- **1.** 5 cm
- **2.** 2√10 cm
- **3.** 10 cm
- **4.** 10√2 cm

Answer. (3)

Q.8 A toy company manufactures hollow foam bullets with plastic tops for their toy guns, the dimensions of which are shown in the figure below.



(Note: The figure is not to scale.)



(Note: The figure is not to scale.)

What is the volume of the foam used to make a set of 10 bullets?

- **1.** 80π cm3
- **2.** 160π cm3
- **3.** 180π cm3
- **4.** 240π cm3

Answer. (2)

Free Response Questions

Q.9 State whether the following statement is true or false. Explain your answer.

If a cylinder and a cone have equal radii and equal volume, then the height of the cylinder is 3 times that of the cone.

Answer.

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Writes the equation by equating the volumes as \pi r^2 H = \frac{1}{3} \pi r^2 h, where H is the height of cylinder, h is the height of cone and r is the radius.
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Simplifies the above to get $H = \frac{h}{3}$ and concludes that the statement is false.

Q.10 Two solid hemispheres are joined together to make a sphere.

The total surface area of the sphere is ______ the sum of the total surface areas of the hemispheres.

Fill in the blank and give a valid reason.

Answer. Writes that the total surface area of the sphere is less than the sum of the total surface areas of the hemispheres.

Gives reason that, since two solid hemispheres are joined, the areas of the flat surfaces of the hemispheres are not part of the surface area of the sphere.

Q.11 Find the radius of the solid cylinder with height equal to its radius and total surface area of 144π cm^2 . Show your work

Answer. Takes height as h and radius as r.

Writes h = r

Writes 2π rh + 2π r² = 144π cm²

Writes 4π r² = 144π cm²

Q.12 What is the length of the side of a cube if its volume and surface area are numerically equal? Show your work.

Answer. Writes $s^3 = 6 s^2$, where s is the side length of the cube.

Solves the above equation to get s = 6 units.

Case Study

Answer the questions based on the information given.

Kinjal is running a lemonade stand in her apartment complex's Diwali fair. Her mother gave her a cylindrical container to store the lemonade as shown by the figure below. She uses cylindrical paper cups of height 10 cm and radius 2.8 cm to serve the lemonade. To avoid spillage, she fills the cups only up to 75% of their height. She sells each cup for Rs 10.



(Note: The figure is not to scale.)

While selling the lemonade, Kinjal runs out of cups. She goes to the store and buys the first set of paper cups she finds. The dimensions and the shape of the new paper cup is shown in the figure below. She continues to fill the cups up to 75% of their height.



(Note: The figure is not to scale.)

(Note: Take π as $\frac{22}{7}$.)

Q.13 Find the capacity of the cylindrical container. Show your work.

Answer.

Calculates the volume of the cylindrical container as $\pi r^2 h = (\frac{22}{7})(12.5)^2 (28) = 13750 \text{ cm}^3$.

Q.14 She fills 10 litres of lemonade in the container.

What is the maximum amount she would make if all the 10 litres of lemonade were to be sold in the original set of cups.

Show your work. (Note: 1 litre = 1000 cm³)

Answer. Finds the height till which lemonade is poured in the cup as 75% of 10 cm = 7.5 cm.

Finds the amount of lemonade in the container as $10 \times 1000 = 10000 \text{ cm}^3$.

Calculates the volume of lemonade poured in the cylindrical paper cup as:

Volume of lemonade poured in the cup = $\pi r^2 h = \frac{22}{7} \times (2.8)^2 \times 7.5 = 184.8 \text{ cm}^3$.

Writes the maximum amount of cups sold by her as $\frac{\text{Total}}{\text{Total}}$ volume of lemonade/Volume of 1 cup of lemonade)} = $\frac{10000}{184.8}$.

Solves the equation in the previous step to get 54.11 and rounds it to 54 cups.

Calculates the maximum amount made by Kinjal as $54 \times 10 = Rs. 540$.

Q.15 Find the amount of lemonade she fills in a single new cup. Show your work.

Answer. Writes new height of cup = 75% of 12 cm = 9 cm.

Hence, the height of cylindrical part is 6 cm and the height of conic part is 3 cm.

Calculates the volume of lemonade filled in the cup as:

Volume of Cylinder + Volume of cone = $\pi r^2 H + \frac{1}{3} \pi r^2 h$ = $\frac{22}{7} \times (2.8)^2 \times 6 + \frac{1}{3} \times \frac{22}{7} \times (2.8)^2 \times 3 = 172.48 \text{ cm}^3$.