Surface Areas and Volumes

ASSERTION-REASON BASED QUESTIONS In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true

1. **Assertion:** A solid is hemispherical at the bottom and conical from the top .if the surface area of two parts are equal then the ratio of its radius and height is equal to 1:3.

Reason: Ratio of surface area of the cone to the area of the hemisphere is

Π rL : 2 Πr^2

Answer: (a) Both A and R are true, and R is correct explanation of A.

2.. **Assertion(A) :** If two cubes each of volume 64 cm^3 are joined end to end, the total surface area of the resulting cuboid is 160 cm^2.

Reason(R) : The lateral surface area of a cuboid is 2h(l + b), where l, b and h are the length, breadth and height of the cuboid.

Answer (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

3.. **Assertion(A) :** The ratio of volumes of a cone and a cylinder of equal diameter and equal height is 1:3

Reason(R) : If the diameters of a cone and a cylinder are equal then their radii are also equal.

Answer: (a) Both (A) and (R) are true and (R) is the correct explanation of (A).

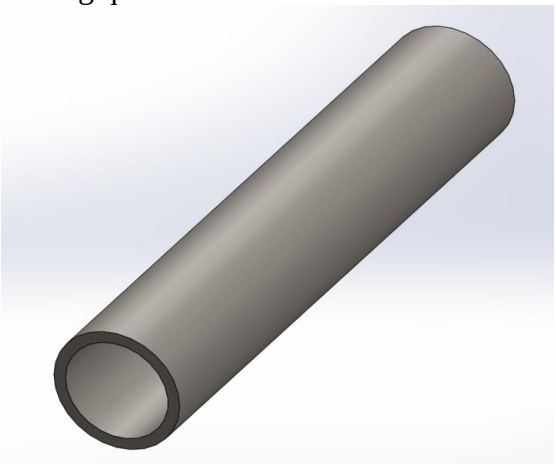
4. **Assertion(A) :** The number of spherical balls each of radius 1 cm that can be made from a solid sphere of lead of radius 8 cm is 512.

Reason(R) : Number of balls = (volume of one ball)/(volume of lead sphere**)**

Answer: (c) (A) is true but (R) is false.

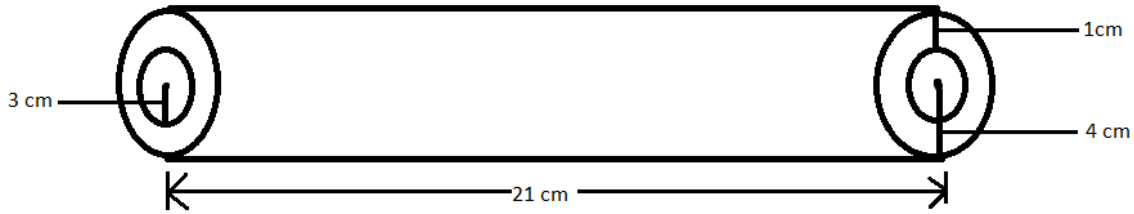
Case Study Questions

1. Shreyan has an old hollow cylindrical pipe at his home. The pipe is 21 cm long and its external diameter is 8 cm. The thickness of the pipe is 1 cm. The density of the pipe is 8 g/cm^3. Answer the following questions based on above information.



(i) What is the curved surface area of inner pipe?
(ii) What is curved surface area of the outer pipe?
(iii) What is the total surface area of the pipe?
(iv) What is the volume of the hollow pipe?
(v) Find weight of the pipe?

Answer:



(i) CSA of inner pipe = $2\pi rh = 2 \times \frac{22}{7} \times 3 \times 21\ cm^2$ = 396 cm^2

(ii) CSA of outer pipe = $2\pi rh = 2 \times \frac{22}{7} \times 4 \times 21\ cm^2$ = 528 cm^2

(iii) Total Surface Area of pipe

= $CSA\ of\ inner\ pipe$ + CSA of outer pipe + $2 \times Area\ of\ ring$

Area of ring = $\pi(R^2 - r^2) = \frac{22}{7}(4+3)(4-3) = 22\ cm^2$

$$\therefore TSA\ of\ pipe = 396 + 528 + 44 = 968\ cm^2$$

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

(v) $Density = \frac{Mass}{Volume} \therefore Mass = Volume \times Density$

$$Mass = 462 \times 8 = 3696\ g = 3.696\ kg$$

2. During a school field trip to a fruit farm, students were served fruit juice in various containers. One group received juice in a cylindrical glass, while another group received juice in a conical cup. After enjoying the juice, they decided to do some math related to the containers. The dimensions of the cylindrical glass are as follows: Radius (r) = 4 cm Height (h) = 10 cm The dimensions of the conical cup are - Radius of the base (R) = 6 cm**,** Height (h) = 8 cm, Now Answer the following questions based on above information

1. What is the volume of the cylindrical glass?
2. What is the volume of the conical cup?
3. What is the total surface area of the cylindrical glass (including the base)?
4. What is the total surface area of the conical cup?
5. Which container had more juice, and by how much?

Answers:

1. 160π cm³ 2. 256π cm 3. Cylindrical glass, 128π cm³ 4. 440 cm² 5. 224 cm²

3. In competition students were told to design a conical tent needs to have diameter 8 m and height of the tent is to be determined to ensure that it can accommodate 50 people comfortably, the tents fabric costs Rs 10 per square meter each person in a tent requires a space of 0.028 m^3 on the basis of above information answer the following questions. (use $\pi = 3.14$)

(i) what is height of tent?
(ii)what is total surface area of tent if tent is enclosed from bottom?
(iii)what is the cost of fabric to make the tent?

Answers

i) Height of tent h = 0.083 m
ii) Total Surface Area of tent =100.49m^2
iii) Cost of fabric = Rs 1004.9

4. In a fair, Manu saw an ice-cream seller selling different flavours of cone ice-creams. He brought one of his favourite chocolate flavour. The height of the ice-cream cone was 12.5 cm and the diameter of the hemispherical part above the cone was 6 cm.
From above information, answer the following questions:

a) Find the slant height of the ice-cream cone?

b) Find the curved surface area of the conical part of the ice-cream.

c) Calculate the volume of the ice-cream in the cone.

d) If radius of the hemisphere is increased by 0.5 cm, then will the quantity of ice-cream filled in the cone be more or less?

Answers

a) Slant height, l= $\sqrt{h^2 + r^2}$

$= \sqrt{156.25 + 9} = 12.85$ cm

b) C.S.A = π r l

$= \frac{22}{7}$ x 3 x 12.85 = 121.16 cm^2

c) Volume = Volume of hemisphere + Volume of cone

$= \frac{1}{3} \pi r^2 (2r + h) = 268.71$ cm^3

d) When r = 3.5 cm,

Volume = 250.25 cubic.cm , which is less than before.

5. . In an adventure camp, students have to stay in a tent. The tent is in the shape of a cylinder surmounted by a conical top. The height and radius of the cylindrical part is 2.5 m and 2 m respectively and the slant height of the top is 3.2 m.
From above information, answer the following questions:

a) What will be the height of the top part of the tent?
b) Find the area of a carpet that can cover the floor of the tent.
c) Find the total canvas used for making the tent and the cost of the canvas at Rs.100 per sq.m.

Or

d) Find the capacity of the tent.

Answers:

. a) Height of cone, h = $\sqrt{l^2 - r^2}$ = $\sqrt{6.24}$ = 2.5 m

b) Area of the carpet = Area of the base of the cylinder

= πr^2 =12.57 m^2

c) Total canvas required = C.S.A of cone + C.S.A of cylinder

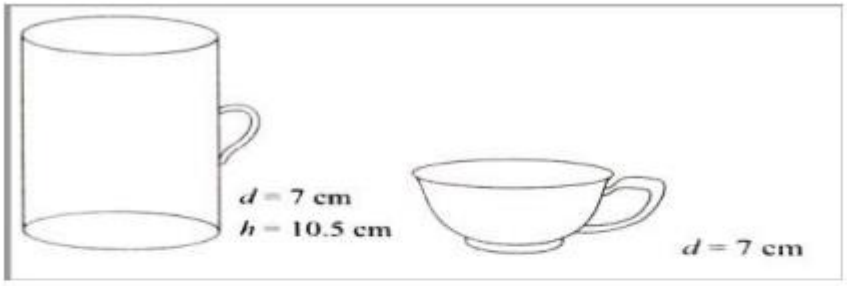
= π r (l + 2h) = 360.8/7 = 51.54 m^2

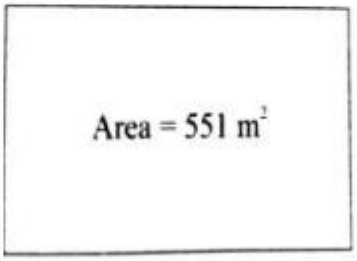
Or

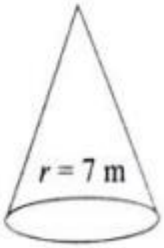
Capacity of the tent = Volume of cone + Volume of cylinder

= $\frac{22}{7}$ x 2 x 2 ($\frac{2.5}{3}$ + 2.5) = 293.04/7 = 41.86 m^3

6. Adventure camps are the perfect place for the children to practice decision making for themselves without parents and teachers guiding their every move. Some students of a school reached for adventure at Sakleshpur. At the camp, the waiters served some students with a welcome drink in a cylindrical glass and some students in a hemispherical cup whose dimensions are shown below. After that they went for a jungle trek. The jungle trek was enjoyable but tiring. As dusk fell, it was time to take shelter. Each group of four students was given a canvas of area 551m2 . Each group had to make a conical tent to accommodate all the four students. Assuming that all the stitching and wasting incurred while cutting, would amount to 1m2 , the students put the tents. The radius of the tent is 7m.







1. Find the volume of cylindrical cup
2. Which container had more juice and by how much?
3. How much space on the ground is occupied by each student in the conical tent.

OR

Find the volume of hemispherical cup.

Answers:

1. $404.25 cm^3$ 2. $314.42 cm^3$ 3. $38.5 m^2$ OR $89.83 cm^3$