Volume of a Cylinder

Objective

To get the formula for the volume of a right circular cylinder in terms of its height and base radius experimentally.

Prerequisite Knowledge

1. Circumference of circle
2. Volume of cuboid

Materials Required

Plastic clay, cutter, thermocol.

Procedure

1. Make a cylinder of plastic clay of height say ‘h’ and base ‘A circle of radius r.

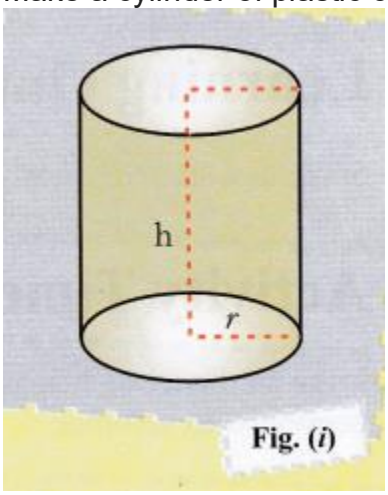
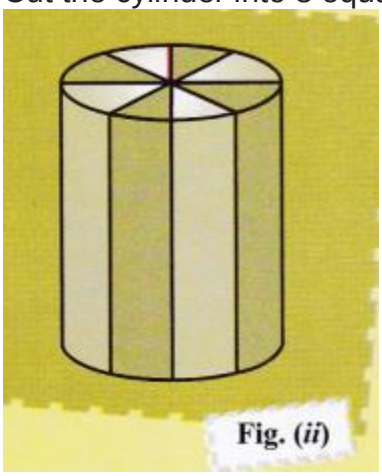
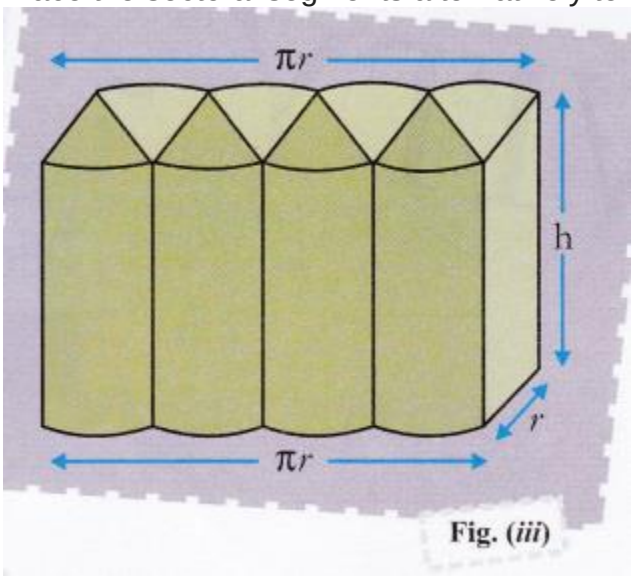


Fig. (*i*)

2. Cut the cylinder into 8 equal sectoral section with the help of cutter.



3. Place the sectoral segments alternatively to form a solid cuboid.



Observation

1. Combine cut out form a cuboid of height h and breadth r, i.e., height of cuboid = height of cylinder;
   breadth of cuboid = radius of cylinder.
2. The length of the cuboid = $\frac{1}{2}$ of the circumference of base of cylinder.
3. Volume of cuboid = Volume of cylinder.
   $V = l \times b \times h = \frac{1}{2} \times 2\pi r \times r \times h = \pi r^2 h$

Result

Thus the volume of cylinder is $\pi r^2 h$.

Learning Outcome

Students will learn how to get the formula for the volume of a cylinder with given height and base radius experimentally.

Activity Time

Make a cylinder of height 10 cm and radius 7 cm. Also make a cone of same height and same radius. Find the relation between their volumes.

Viva Voce

Question 1.
If the radius of base of a right-circular cylinder is halved, then by how much its volume will decrease ?
Answer:
One-fourth.

Question 2.
If the radius of base of cylinder is doubled then the volume of this cylinder will be.
Answer:
Four times

Question 3.
If r is radius and h be height, then volume of a cylinder.
Answer:
$\pi r^2 h$

Question 4.
If the height of a circular cylinder is reduced to one-fourth and the radius of base is doubled, then what effect will be on the volume of the cylinder ?
Answer:
No effect

Question 5.
What is the volume of a right circular cylinder of height 21 cm and base radius 5 cm ?
Answer:
1650 cm

Question 6.
If the radius of the base of a right circular cylinder is halved keeping the height same, then what is the ratio of the volume of the reduced cylinder to that of the original cylinder ?
Answer:
1:4

Question 7.
Is the volume of a cylinder 3 times the volume of a cone of same height and same diameter of the base ?
Answer:
Yes

Question 8.
The cylindrical cans have bases of same size. One of the cans is 10 cm in height and the other is 20 cm in height. What is the ratio of their volumes ?
Answer:
1:2

Multiple Choice Questions

Question 1.
Inner diameter of a cylindrical wooden pipe is 24 cm and its outer diameter is 28 cm. The length of the pipe is 35 cm. If 1 cm^3 of wood has a mass of 0.6 g, then the mass of the pipe is
(a) 3.432 kg
(b) 34.32 kg
(c) 343.2 kg
(d) none of these

Question 2.
What is the capacity of a cylinder with circular base of diameter 7 cm and height 10 cm ?
(a) 384 cm^3
(b) 385 cm^3
(c) 386 cm^3
(d) none of these

Question 3.
Volume of a vessel in the form of a right circular cylinder is 1408 cm^3 and its height is 7 cm. The radius of its base is
(a) 7 cm
(b) 9 cm
(c) 8 cm
(d) none of these

Question 4.
50 circular plates, each of radius 7 cm and thickness $\frac{1}{2}$ cm are placed one above another to form a solid right circular cylinder. Then the volume of cylinder is
(a) 3850 cm^3
(b) 3805 cm^3

(c) 3085 cm^3
(d) none of these

Question 5.
If the diameter of the cross-section of a wire is decreased by 5%, how much per cent will its length be increased so that the volume remains the same ?
(a) 10.8%
(b) 1.08%
(c) 18.0%
(d) 1.80%

Question 6.
A rectangular sheet of paper 44 cm x 18 cm is rolled along its length and a cylinder is formed. Find the volume of the cylinder.
(a) 2772 cm^3
(b) 2727 cm^3
(c) 7272 cm^3
(d) 7722 cm^3

Question 7.
Water is being pumped out through a cylindrical pipe whose internal diameter is 7 cm. If the flow of water is 72 cm per second, how many litres of water is being pumped out in one hour ?
(a) 9979.2 l
(b) 9199.2 l
(c) 7999.2 l
(d) 2799.9 l

Question 8.
A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7 cm. If the bowl is filled with soup up to a height of 4 cm, how much soup the hospital has to prepare daily for 250 patient ?
(a) 38.5 l
(b) 35.8 l
(c) 58.3 l
(d) 3.85 l

Question 9.
If the lateral surface area of a cylinder is 94.2 cm^2 and its height is 5cm, then the volume of the cylinder is
(a) 130.41cm^3
(b) 141.30 cm^3
(c) 114.03 cm^3
(d) none of these

Question 10.
Volume of a cone of base radius 3 cm and height 7 cm is 66 cm^3 . The volume of a cylinder with same base and height is
(a) 198 cm^3
(b) 189 cm^3
(c) 819 cm^3
(d) none of these

Answers

1. (a)
2. (b)
3. (c)
4. (a)
5. (a)
6. (a)
7. (a)
8. (a)
9. (b)
10. (a)