📘 Class 9 Maths – Ganita Manjari Part II

Chapter 14: Math of Space: Surface Area and Volume

Exercise Set 14.2 – Complete Solutions

Q1. Two cylinders, A and B, are given. The radius of cylinder B is twice that of cylinder A, and the height of cylinder B is half that of cylinder A. Find the ratio of the curved surface area of A to the curved surface area of B. Also find the ratio of the volume of A to the volume of B.

Let the radius of A be **r** and its height be **h**.

Therefore:

Radius of B = **2r**

Height of B = **h/2**

Curved Surface Area

Formula:

CSA = 2πrh

For A:

CSA_a = 2πrh

For B:

CSA_β = 2π(2r)(h/2)

= **2πrh**

Therefore:

$CSA_a : CSA_β = 1 : 1$

Volume

Formula:

$V = πr^2h$

For A:

$V_a = πr^2h$

For B:

$V_β = π(2r)^2(h/2)$

$= π × 4r^2 × h/2$

$=$ **$2πr^2h$**

Therefore:

$V_a : V_β = 1 : 2$

✅ Answer:

Ratio of curved surface areas = 1 : 1

Ratio of volumes = 1 : 2

Q2. The radii of two cylinders are in the ratio 2:3, and their heights are in the ratio 3:2. Find (a) the ratio of their volumes, and (b) the ratio of their curved surface areas.

Let:

$r_1 : r_2 = 2 : 3$

$h_1 : h_2 = 3 : 2$

(a) Ratio of volumes

Volume:

$V = \pi r^2 h$

Therefore:

$V_1 : V_2 = r_1^2 h_1 : r_2^2 h_2$

$= (2^2 \times 3) : (3^2 \times 2)$

$= 12 : 18$

= **2 : 3**

✅ Answer:

Ratio of volumes = 2 : 3

(b) Ratio of curved surface areas

CSA:

$2\pi rh$

Therefore:

$CSA_1 : CSA_2 = r_1 h_1 : r_2 h_2$

$= (2 \times 3) : (3 \times 2)$

$= 6 : 6$

= **1 : 1**

✅ Answer:

Ratio of curved surface areas = 1 : 1

Q3. The edge of a cube measures r cm. The largest possible right circular cylinder is cut out of the cube. What do you think is the volume of the cylinder (in cm^3)?

The cube has side:

r cm

For the largest possible cylinder:

- Diameter of cylinder = r
- Radius = r/2
- Height = r

Volume of cylinder:

$$V = \pi R^2 h$$

$$= \pi(r/2)^2(r)$$

$$= \pi \times r^2/4 \times r$$

$$V = \pi r^3/4$$

✅ **Answer:**

Volume of the cylinder = $\pi r^3/4$ cm^3

Q4. The radius of the base of a cylinder is increased by 10%. At the same time, the height of the cylinder is decreased by x%.

Given that the volume of the cylinder remains unchanged, find the value of x.

Original radius = **r**

Original height = **h**

Original volume:

$V = \pi r^2 h$

New radius:

r + 10% of r

= **1.1r**

Height is decreased by x%, so new height:

$h(1 - x/100)$

The volume remains unchanged:

$\pi(1.1r)^2 \times h(1 - x/100) = \pi r^2 h$

Cancel $\pi r^2 h$:

$1.21(1 - x/100) = 1$

Therefore:

$1 - x/100 = 1/1.21$

$= 100/121$

So:

$x/100 = 1 - 100/121$

$= 21/121$

Therefore:

$x = 100 \times 21/121$

= **$2100/121$**

≈ 17.36%

✅ **Answer:**

x = 2100/121% ≈ 17.36%

Q5. A solid metallic cube of side 12 cm is melted and recast into solid cylindrical rods, each having radius 2 cm and height 12 cm. Find:

(i) The volume of the cube

Side = 12 cm

Volume:

$V = a^3$

$= 12^3$

$= 12 \times 12 \times 12$

= **$1728\ cm^3$**

✅ **Answer:**

$1728\ cm^3$

(ii) The volume of one cylindrical rod

Radius = 2 cm

Height = 12 cm

Volume:

$V = \pi r^2 h$

$= \pi \times 2^2 \times 12$

$= 48\pi$

Using $\pi \approx 22/7$:

$V = 48 \times 22/7$

$= 1056/7$

$\approx 150.86\ cm^3$

✅ Answer:

$48\pi\ cm^3 \approx 150.86\ cm^3$

(iii) The approximate number of complete cylindrical rods that can be formed. ($\pi \approx 22/7$)

Since the cube is melted and recast, the total volume of metal remains unchanged.

Number of rods:

Volume of cube ÷ Volume of one rod

$= 1728 \div (48 \times 22/7)$

$= 1728 \times 7 / 1056$

= **11.4545...**

Only complete rods can be formed.

Therefore:

✅ Answer:

11 complete cylindrical rods

The remaining metal is not enough to form another complete rod.