PRACTICE PAPER

ICSE CLASS 10 – MATHEMATICS

Chapter 20 : Cylinder, Cone and Sphere

STEP-BY-STEP SOLUTIONS & MARKING SCHEME · Maximum Marks: 40

Formulae used (π = 22/7)

Cylinder: curved surface = $2\pi rh$; total surface = $2\pi r(h + r)$; volume = $\pi r^2 h$. Hollow cylinder: volume of material = $\pi(R^2 - r^2)h$.

Cone: $l^2 = r^2 + h^2$; curved surface = πrl; total surface = $\pi r(l + r)$; volume = $\frac{1}{3}\pi r^2 h$.

Sphere: surface = $4\pi r^2$; volume = $\frac{4}{3}\pi r^3$. Hemisphere: curved surface = $2\pi r^2$; total surface = $3\pi r^2$; volume = $\frac{2}{3}\pi r^3$. Melting and recasting: volume is unchanged.

SECTION A (20 Marks)

Question 1 [8 × 1 = 8]

Part	Ans.	Working
(i)	**(b)**	$2\pi rh = 2 \times (22/7) \times 7 \times 10 = 440$ cm².
(ii)	**(c)**	$l = \sqrt{(6^2 + 8^2)} = \sqrt{100} = 10$ cm.
(iii)	**(d)**	$4\pi r^2 = 4 \times (22/7) \times 49 = 616$ cm².
(iv)	**(a)**	Curved surface $2\pi r^2$ + flat base $\pi r^2 = 3\pi r^2$.
(v)	**(b)**	$\pi r^2 h : \frac{1}{3}\pi r^2 h = 3 : 1$.
(vi)	**(c)**	Number = $(3^3) \div (1^3) = 27$.
(vii)	**(b)**	(A) is false: the cone's volume is one-third of the cylinder's. (R) is true.
(viii)	**(c)**	Both true: the water displaced equals the volume of the sphere, which is why the level rises.

Question 2 [4 + 4 + 4 = 12]

(i)

(a) $2\pi rh = 1320 \Rightarrow 2 \times (22/7) \times 10.5 \times h = 1320 \Rightarrow 66h = 1320$ [1]

h = 20 cm [1]

(b) Volume = $\pi r^2 h = (22/7) \times 10.5 \times 10.5 \times 20$ [1]

= **6930 cm³** [1]

(ii)

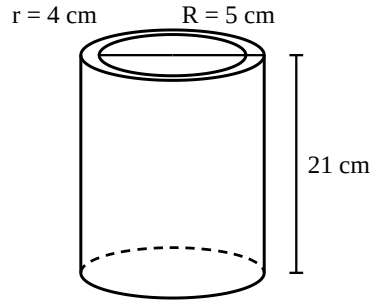
(a) $l = \sqrt{(r^2 + h^2)} = \sqrt{(21^2 + 28^2)} = \sqrt{1225} =$ **35 cm** [1]

(b) Volume = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times (22/7) \times 21 \times 21 \times 28$ [1]

= **12936 cm³** [1]

(c) Total surface area = $\pi r(l + r) = (22/7) \times 21 \times (35 + 21) = 22 \times 3 \times 56 =$ **3696 cm²** [1]

(iii)



$V = \pi(R^2 - r^2)h = 594\ cm^3$

(a) Volume of metal = $\pi(R^2 - r^2)h = (22/7) \times (5^2 - 4^2) \times 21$ [1]

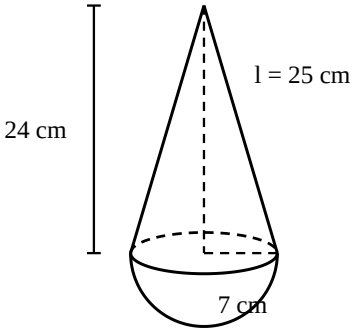
$= (22/7) \times 9 \times 21 =$ **$594\ cm^3$** [1]

(b) Mass = volume × density = 594 × 8 = 4752 g [1]

= **4.752 kg** [1]

SECTION B (20 Marks) — any two questions

Question 3 [3 + 3 + 4 = 10]



(i)

$l^2 = r^2 + h^2 = 7^2 + 24^2 = 625 \Rightarrow$ **$l = 25$ cm** [1]

Curved surface area of the cone = $\pi rl = (22/7) \times 7 \times 25$ [1]

= **$550\ cm^2$** [1]

(ii)

Curved surface area of the hemisphere = $2\pi r^2 = 2 \times (22/7) \times 7 \times 7$ [1]

= **$308\ cm^2$** [1]

The flat face is joined to the cone, so total surface area = 550 + 308 = **$858\ cm^2$** [1]

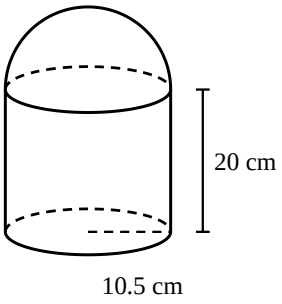
(iii)

Volume of cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times (22/7) \times 49 \times 24 = 1232\ cm^3$ [2]

Volume of hemisphere = $\frac{2}{3}\pi r^3 = \frac{2}{3} \times (22/7) \times 343 = 2156/3\ cm^3$ [1]

Volume of toy = 1232 + 2156/3 = 5852/3 = **$1950\frac{2}{3}\ cm^3$** [1]

Question 4 [3 + 3 + 4 = 10]



cyl. 1320 · hemisphere 693 · base 346.5 (cm²)

(i)

Curved surface area of the cylinder = $2\pi rh$ [1]

$= 2 \times (22/7) \times 10.5 \times 20$ [1]

$=$ **1320 cm²** [1]

(ii)

Curved surface area of the hemisphere = $2\pi r^2 = 2 \times (22/7) \times 10.5 \times 10.5 =$ **693 cm²** [2]

Total surface area = curved (cylinder) + curved (hemisphere) + base circle = 1320 + 693 + πr^2 = 1320 + 693 + 346.5 = **2359.5 cm²** [1]

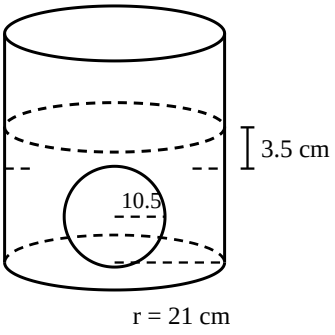
(iii)

Volume of cylinder = $\pi r^2 h = (22/7) \times 10.5 \times 10.5 \times 20 = 6930$ cm³ [2]

Volume of hemisphere = $\frac{2}{3}\pi r^3 = \frac{2}{3} \times (22/7) \times 10.5^3 = 2425.5$ cm³ [1]

Volume of solid = 6930 + 2425.5 = **9355.5 cm³** [1]

Question 5 [3 + 3 + 4 = 10]



V(sphere) = 4851 cm³

(i)

Volume of sphere = $\frac{4}{3}\pi r^3$ [1]

$= \frac{4}{3} \times (22/7) \times 10.5 \times 10.5 \times 10.5$ [1]

$=$ **4851 cm³** [1]

(ii)

Volume of water displaced = volume of sphere = 4851 cm³; this equals $\pi R^2 h$ for the rise h [1]

$(22/7) \times 21 \times 21 \times h = 4851 \Rightarrow 1386h = 4851$ [1]

h = 3.5 cm [1]

(iii)

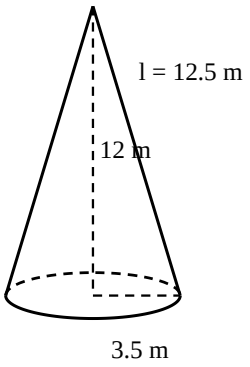
Volume of cone = volume of sphere (melting does not change the volume) [1]

⅓ × (22/7) × 21 × 21 × H = 4851 [1]

462H = 4851 [1]

H = 10.5 cm [1]

Question 6 [3 + 3 + 4 = 10]



(i)

$l^2 = r^2 + h^2 = 3.5^2 + 12^2 = 12.25 + 144$ [1]

$l^2 = 156.25$ [1]

l = 12.5 m [1]

(ii)

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

$= \frac{1}{3} \times (22/7) \times 3.5 \times 3.5 \times 12$ [1]

= **154 m³** [1]

(iii)

Area of canvas = curved surface area = $\pi rl = (22/7) \times 3.5 \times 12.5 = 137.5\ m^2$ [2]

Length of canvas = area ÷ width = 137.5 ÷ 1.25 = **110 m** [1]

Cost = 110 × 90 = **₹ 9,900** [1]

— End of Solutions —