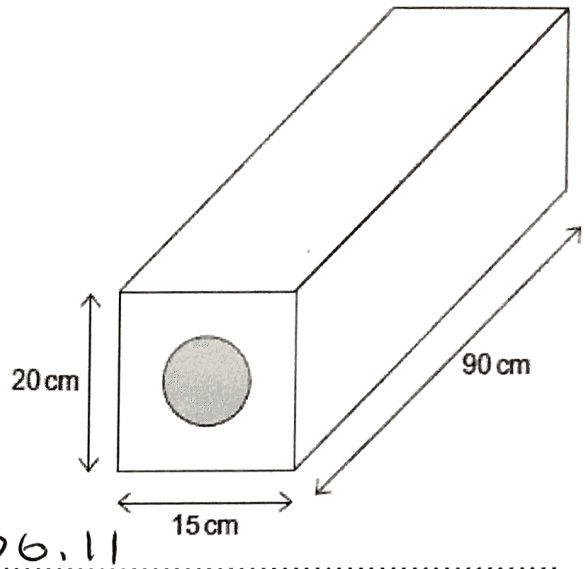
End of Unit Test Name: Answers

Volume and Surface Area - HIGHER

Calculator allowed

1. This building block is in the shape of a cuboid. The block contains one steel cylindrical rod of length 90 cm. The radius of the rod is 4 cm. The rest of the block is concrete. Work out the volume of concrete in the block.



Cuboid = $20 \times 15 \times 90$

$= 27000 cm^3$

Cylinder = $\pi \times 4^2 \times 90$

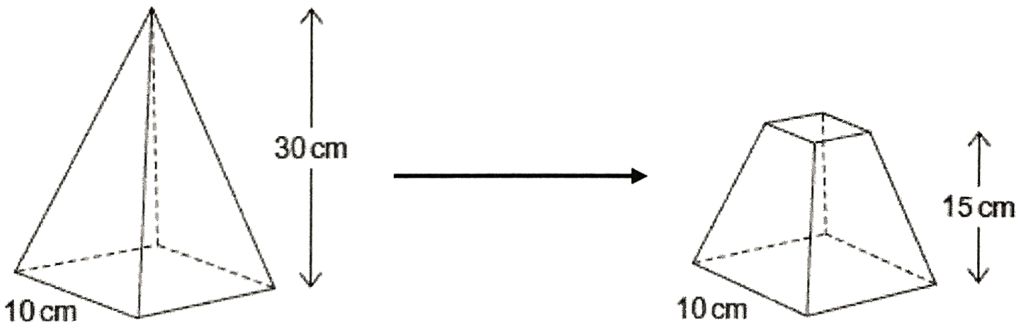
$= 4523.89 cm^3$

$27000 - 4523.89 = 22476.11$

Answer 22476.11 cm^3

(Total 5 marks)

2. A pyramid has a square base of side 10 cm a height of 30 cm



It is cut horizontally at a height of 15 cm. The top pyramid is removed to leave this frustum. You are given the formula:

Volume of pyramid = $\frac{1}{3}$ × area of base × vertical height

Calculate the volume of the frustum.

$\frac{1}{3} \times 10^2 \times 30 = 1000 cm^3$

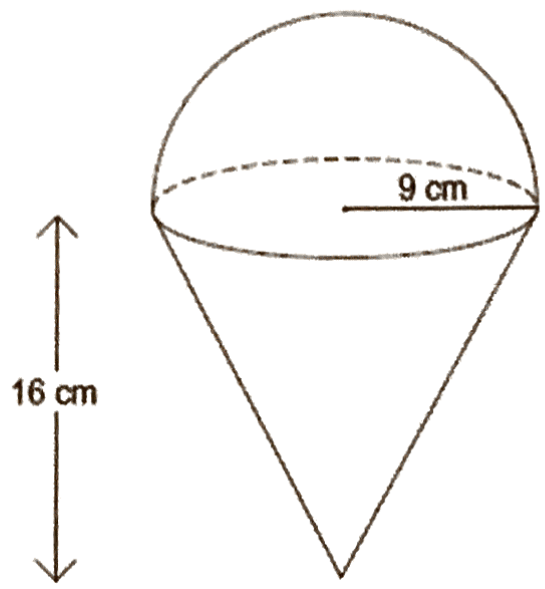
$\frac{1}{3} \times 5^2 \times 15 = 125 cm^3$

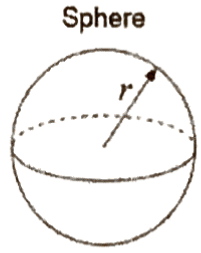
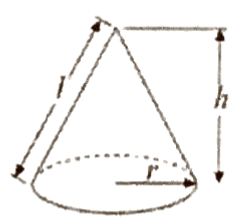
$1000 - 125 = 875 cm^3$

Answer 875 cm^3

(Total 3 marks)

3. A hemisphere and a cone each have radius 9 cm. They are joined together to make a toy.



Formulae Sheet	
Perimeter, area, surface area and volume formulae	
Sphere	Cone
	
Volume = $\frac{4}{3}\pi r^3$ Surface Area = $4\pi r^2$	Volume = $\frac{1}{3}\pi r^2 h$ Curved Surface Area = $\pi r l$

Work out the total volume of the toy.

Hemisphere = $\frac{\frac{4}{3} \times \pi \times 9^3}{2}$ = 1526.81 cm^3

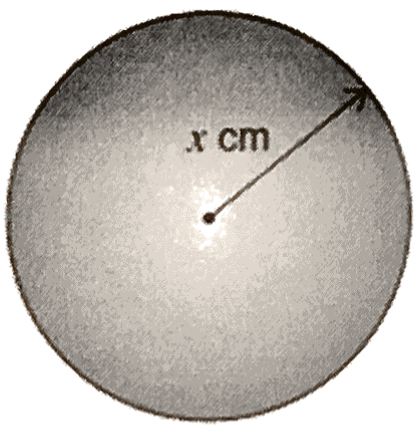
Cone = $\frac{1}{3} \times 9^2 \times \pi \times 16$ = 1357.17

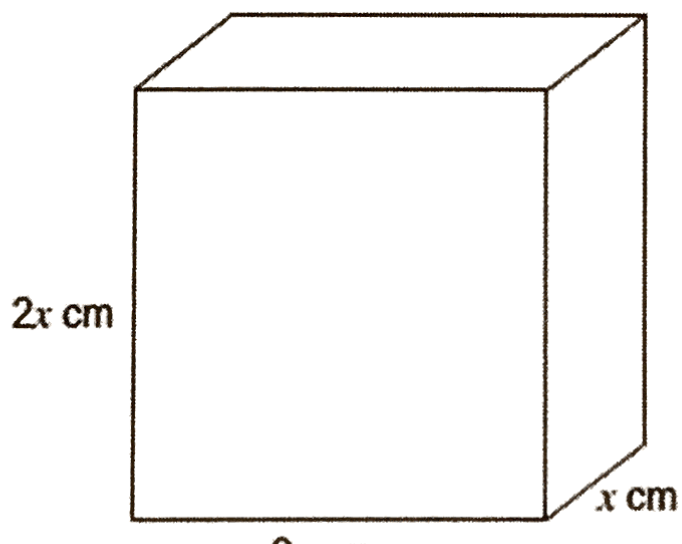
1526.81 + 1357.17 = 2883.98

Answer 2883.98 cm^3

(Total 4 marks)

4. A sphere has a radius of x cm. A cuboid has edges of length x cm, width $2x$ cm and height $2x$ cm. Show clearly that the sphere has the larger volume.





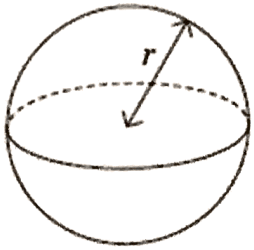
Cuboid = $2x \times 2x \times x = 4x^3$

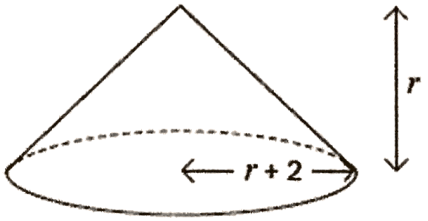
Sphere = $\frac{4 \times \pi \times x^3}{3} = \frac{4\pi x^3}{3}$

Since $\pi > 3$, $\frac{\pi}{3} > 1$, $\therefore$ volume of sphere is greater than the volume of the cuboid.

(Total 3 marks)

5. The volume of the sphere is equal to the volume of the cone.





Work out the value of r. Do **not** use trial and improvement. You **must** show your working.

$\frac{4}{3}\pi r^3 = \frac{\pi r (r+2)^2}{3}$

$4r^2 = r^2 + 4r + 4$

$3r^2 - 4r - 4 = 0$

$(3r + 2)(r - 2) = 0$

$r = -\frac{2}{3}$ (Not possible, $r > 0$)

$r = 2$

	r	-2
$3r$	$3r^2$	$-6r$
2	$2r$	-4

Answer $r = 2$ units

(Total 5 marks)

(Total for test = 20 marks)