

Volume and Area of 3D shapes Past Paper Answers GCSE Edexcel - Calculator

1.

Answer	Mark	Mark scheme	Additional guidance
3.75	P1	works to find vol of frustum eg $\frac{1}{3}\pi(3.6)^2 \times 6.4 - \frac{1}{3}\pi(1.8)^2 \times 3.2$ or $86.858.. - 10.857..$ (=24.192π or 76.00..)	
	P1	works to find vol of hemisphere eg $\frac{1}{2} \times \frac{4}{3} \pi \times 3.6^3$ (=31.104π or 97.7....)	781.7... by use of diameter does not get the mark
	P1	mass of frustum as [vol]×density eg “76.00” × 2.4 (=182.4..) or mass of hemisphere as [vol]×density eg “97.7....”×4.8 (=469.037...)	[vol] is their volume which could be fit using the radius, using the diameter, or could be another value as long as it is stated as being the volume, or clearly intended from working.
	P1	mean density as total mass ÷ total volume eg (“182.4..” + “469.037”) ÷ (“76....” + “97.7..”) or “651.4..” ÷ “173.7....”	All figures must come from correct method shown.
	A1	answer in the range 3.7 to 3.8	

2.

Answer	Mark	Mark scheme	Additional guidance
905	P1	for correct use of formula for the volume of a sphere eg $\frac{1}{4} \times \frac{4}{3} \times \pi \times r^3$ (= 576π or 1809...) OR $576\pi \times 4$ or 2304π or $7238..$ (= $\frac{4}{3} \times \pi \times r^3$)	We do not need to see what is in the brackets to award this mark. The contents of the bracket alone would score P0
	P1	for a complete correct process to find r, eg $r = \sqrt[3]{\frac{576 \times 4 \times 3}{4}}$ or $r = 12$	Could be shown in several stages $\sqrt[3]{\frac{576 \times 4 \times 3}{4}} = \sqrt[3]{1728}$
	P1	for a process to find the curved surface area eg $\frac{4 \times \pi \times [\text{radius}]^2}{4}$ (=144π or 452...) OR the surface area of both flat surfaces eg $(2 \times \frac{\pi \times [\text{radius}]^2}{2})$ OR complete expression for the total surface area eg $\frac{4\pi r^2}{4} + \frac{\pi r^2}{2} \times 2$ oe	Radius used must be clearly identified as their radius of the solid
	P1	for process to find the complete surface area eg $\frac{4 \times \pi \times [\text{radius}]^2}{4} + (2 \times \frac{\pi \times [\text{radius}]^2}{2})$	
	A1	answer in the range 904.7 – 905 or 288π (SCB2 for an answer in the range 358.1 – 359.2)	If an answer is given in the range but then incorrectly rounded, award full marks.

3.

$\frac{4}{3 \times 2} \pi x^3 + \frac{4}{3} \pi x^3 = 2 \pi x^3$ $(2x)^2 \pi h = 4x^2 \pi h$ $4x^2 \pi h = 2 \pi x^3$	$h = \frac{x}{2}$	<p>P1 Process to find volume of cone or hemisphere</p> <p>P1 Process to total volume of solid</p> <p>P1 Process to find volume of cylinder</p> <p>P1 Equates 2 volumes</p> <p>A1 Reaches $h = \frac{x}{2}$</p>
---	-------------------	---

4.

75π	<p>P1 starts process by using $\frac{250}{3} \pi$ and $\frac{1}{2} \times \frac{4}{3} \pi r^3$ to find radius</p> <p>P1 starts process using $\frac{1}{2}$ curved surface area eg $(4 \times \pi \times "5"^{m2}) \div 2$</p> <p>P1 complete process shown eg $(4 \times \pi \times "5"^{m2}) \div 2 + (\pi \times "5"^{m2})$</p> <p>A1 for 75π</p>
---------	---

5.

$l = 20x$ $x = 3$	<p>20736</p> <p>P1 for a first step to solve the problem eg method to find the slant height of the cone or the volume equals $768\pi x^3$</p> <p>P1 for setting up an equation for the curved surface area in terms of x eg $2160\pi = \pi \times 12x \times 20x$</p> <p>P1 for complete method to find the value of x</p> <p>P1 for a method to find the volume or value of V</p> <p>A1 cao</p>
-------------------	---

6.

1361	<p>P1 process using similar triangles to find base of small cone eg. 4 cm used as diameter or 2 cm used as radius</p> <p>P1 process to find volume of one cone</p> <p>P1 complete process to find volume of frustum</p> <p>P1 complete process to find mass or $1360 - 1362$</p> <p>A1 1361 or 1360 or 1400</p>
--------	--

7.

756π	<p>5</p> <p>M1 for $\frac{1}{3}\pi r^2 \times 10 (=270\pi)$</p> <p>A1 for $r = 9$</p> <p>M1 (dep on M1) for $\frac{1}{2} \times \frac{4}{3} \pi \times "9"^{m3} (=486\pi)$</p> <p>M1 for $270\pi + "486\pi" \text{ oe}$</p> <p>A1 cao</p>
----------	---

8.

Working	Answer	Mark	Notes
	75π	3	M1 for $(4 \times \pi \times 5^2) \div 2$ oe M1 for $\pi \times 5^2$ oe A1 for 75π accept 235.5 Condone the use of $\pi = 3.14\dots$

9.

Working	Answer	Mark	Notes
$\frac{1}{3} \times \pi \times 15^2 \times 40$ $-\frac{1}{3} \times \pi \times 7.5^2 \times 20$	8250	4	B1 for 15cm as diameter or 7.5 cm as radius of smaller cone (may be marked on diagram or used in a formula) M1 for a numerical expression for the volume of one cone eg. $\frac{1}{3} \times \pi \times 15^2 \times 40$ (=9424...) or $\frac{1}{3} \times \pi \times 7.5^2 \times 20$ (=1178...) M1 for $\frac{1}{3} \times \pi \times 15^2 \times 40$ oe $-\frac{1}{3} \times \pi \times 7.5^2 \times 20$ oe A1 for answer in the range 8240 – 8250 OR B1 for 2^3 M1 for a numerical expression for the volume of the large cone eg. $\frac{1}{3} \times \pi \times 15^2 \times 40$ (=9424...) M1 volume of frustrum = $\frac{7}{8} \times \frac{1}{3} \times \pi \times 15^2 \times 40$ oe A1 for answer in the range 8240 – 8250

10.

$\text{Vol cylinder} = \pi \times (2x)^2 \times 9x$ $= 36\pi x^3$ $36\pi x^3 = \frac{4}{3} \pi r^3$ $r^3 = 27x^3$	$3x$	3	M1 for sub. into $\pi r^2 h$ eg. $\pi \times (2x)^2 \times 9x$ oe M1 for $\pi \times (2x)^2 \times 9x = \frac{4}{3} \pi r^3$ oe A1 oe eg. $\sqrt[3]{\frac{36x^3}{4}} = \frac{4}{3}$ NB : For both method marks condone missing brackets around the 2x
---	------	---	--