

1	(a)(i)	37.3 or 37.26 to 37.27	5	M2 for $\pi \times 0.35 \times \sqrt{0.35^2 + 1.5^2}$ oe or M1 for $0.35^2 + 1.5^2$ or better M1 for $\pi \times 0.35^2$ M1 for $2 \times \pi \times 0.35 \times 16$
	(a)(ii)	6.35 or 6.349 to 6.351	3	M1 for $\pi \times 0.35^2 \times 16$ M1 for $\frac{1}{3} \times \pi \times 0.35^2 \times 1.5$
	(a)(iii)	22.2 or 22.3 or 22.24 to 22.26	3	M2 for $17.5 \times 3.5 \times 1.4 - 10 \times$ <i>their(a)(ii)</i> or M1 for $17.5 \times 3.5 \times 1.4$
	(b)	154 or 154.3 to 154.4	3	M2 for $450 \times \left(\sqrt{\frac{98}{200}}\right)^3$ oe or M1 for $\left(\sqrt{\frac{98}{200}}\right)^3$ or $\left(\sqrt{\frac{200}{98}}\right)^3$ oe or for $\left(\frac{450}{V}\right)^2 = \left(\frac{200}{98}\right)^3$ oe

	(a)(i)	$\frac{2}{3}\pi(3.6)^3 + \frac{2}{3}\pi(5.4)^3 + \pi(3.6)^2 \times 6.5$	M3	M1 for either $\frac{2}{3}\pi(3.6)^3$ or $\frac{2}{3}\pi(5.4)^3$ M1 for $\pi(3.6)^2 \times 6.5$
		692.1 to 692.2...	A1	
	(a)(ii)	33.6 or 33.60 to 33.62	4	M3 for $\left(\frac{0.6}{3.6}\right)^3 \times 692 \times 10.49$ oe or M2 for $\left(\frac{0.6}{3.6}\right)^3 \times 692$ oe or M1 for $\left(\frac{0.6}{3.6}\right)^3$ or $\left(\frac{3.6}{0.6}\right)^3$ oe If 0 scored, SC1 for <i>their</i> volume $\times 10.49$
	(b)(i)	12π final answer	2	M1 for $\frac{216}{360} \times 2\pi \times 10$ oe After 0 scored SC1 for final answer 8π or $12\pi + 20$
	(b)(ii)	302 or 301.5 to 301.6...	4	M1 for $2\pi r = \text{their (b)(i)}$ oe or for $\frac{216}{360} \times \pi \times 10^2 = \pi \times r \times 10$ oe and M1 for $[h =] \sqrt{10^2 - \text{their } 6^2}$ oe and M1 for $[V =] \frac{1}{3}\pi(\text{their } 6)^2 \times (\text{their } 8)$

3	(a)(i)	118	1	
	(a)(ii)	X is 8.3 cm from B	2	M1 for $(332 \div 200) \times 5$ oe
	(a)(iii)	1 : 4000	2	M1 for $200 \div 5$ or 200×100 , both soi
	(b)	1.13 or 1.128 to 1.129	5	M4 for $4.5 \times \sqrt[3]{\frac{0.385 \times 8000}{195200}}$ oe or $\sqrt[3]{\frac{4.5^3 \times 0.385 \times 8000}{195200}}$ oe or M3 for $\sqrt[3]{\frac{0.385}{\text{their } 24.4}}$ or $\sqrt[3]{\frac{\text{their } 3080}{195200}}$ or $\frac{0.385}{\text{their } 24.4} = \frac{l^3}{4.5^3}$ oe or M2 for $\frac{\text{their } 24.4}{0.385}$ or $\frac{0.385}{\text{their } 24.4}$ oe or B2 for 24.4 or 3080 seen or M1 for $195\,200 \div 8000$ or for 0.385×8000
4	(a)	$PMR = MSR = \text{right angle[s] or } 90^\circ$	B1	
		$PRM = MRS$ same angle	B1	
		AAA oe	B1	Dep on B1B1 and no errors seen
	OR $MPR = SMR$ 3rd angle of triangle			
	(b)(i)	5.5	2	M1 for $\frac{x}{4.5} = \frac{9.9}{8.1}$ oe
	(b)(ii)	16.7 or 16.73 to 16.74	2	M1 for $25 \times \left(\frac{8.1}{9.9}\right)^2$ oe or $25 \times \left(\frac{4.5}{\text{their } 5.5}\right)^2$ oe

5	(a)(i)	4.095	2	B1 for figs 4095 or M1 for $\frac{525 \times 7.8}{1000}$
	(a)(ii)	15	3	B2 for 35 OR M2 for $\frac{1}{2}(10+4) \times 5 \times L = 525$ oe M1 for $\frac{1}{2}(10+4) \times 5$ oe
	(a)(iii)	455 or 454.9...	6	M3 for <i>their</i> $[BD =] \sqrt{3^2 + 5^2} \times (\text{their } 15)$ [$\times 2$] or B2 for $\sqrt{34}$ or 5.83 or 5.830 to 5.831 or M1 for $5^2 + \left(\frac{1}{2}(10-4)\right)^2$ and M1 for <i>their</i> 35×2 M1 for $(\text{their } 15) \times 10$ and $(\text{their } 15) \times 4$
	(a)(iv)	4200	3	M2 for $525 \times \left(\frac{10}{5}\right)^3$ oe or M1 for $\left(\frac{10}{5}\right)^3$ or $\left(\frac{5}{10}\right)^3$ oe
	(b)	182.875 ... 307.125 final answer	3	B2 for either seen or M1 for 10 ± 0.5 or 6 ± 0.5 or 4 ± 0.5 oe
6	(a)(i)	10.2	2	M1 for $\frac{YZ}{13.6} = \frac{15.3}{20.4}$ oe or better

	(a)(ii)	143.1	3	M2 for $\left(\frac{20.4}{13.6}\right)^2 \times 63.6$ oe or M1 for $\left(\frac{20.4}{13.6}\right)^2$ or $\left(\frac{13.6}{20.4}\right)^2$ oe Alt method M2 for $\frac{1}{2} \times 20.4 \times 15.3 \times \sin R$ where R is $\sin^{-1}\left(\frac{63.6}{0.5 \times 13.6 \times \text{their(a)(i)}}\right)$ or M1 for $R = \sin^{-1}\left(\frac{63.6}{0.5 \times 13.6 \times \text{their(a)(i)}}\right)$
	(b)	0.55	3	M2 for [ratio of areas] = $\left(\sqrt[3]{\frac{37.5}{64.8}}\right)^2$ or $\left(\sqrt[3]{\frac{64.8}{37.5}}\right)^2$ oe or M1 for [ratio of lengths] = $\sqrt[3]{\frac{37.5}{64.8}}$ or $\sqrt[3]{\frac{64.8}{37.5}}$ oe or for $\left(\frac{0.792}{x}\right)^3 = \left(\frac{64.8}{37.5}\right)^2$ oe
7	(a)	20	2	M1 for $\frac{360}{18}$ or $180 - \frac{16 \times 180}{18}$
	(b)	4.5	2	M1 for $\frac{BE}{6.75} = \frac{5.2}{5.2 + 2.6}$ oe
	(c)	5.8[0] or 5.798 to 5.799	3	M2 for $2 \times \sqrt[3]{\frac{780}{32}}$ oe or M1 for $\sqrt[3]{\frac{780}{32}}$ or $\sqrt[3]{\frac{32}{780}}$ or $\frac{2^3}{l^3} = \frac{32}{780}$
	(d)	$QN = NR$ [given]	B1	
		Two correct pairs of angles with reasons from	B2	B1 for any correct pair of angles with reason or two correct pairs of angles with no/wrong reasons
		angle $PQN =$ angle SRN alternate		
		angle $QPN =$ angle RSN alternate		
		angle $PNQ =$ angle SNR [vertically] opposite		
		ASA [implies congruent]	B1	dep on B1 B2

8	(a)(i)	81° <u>Angle at centre is twice angle at circumference</u> oe	2	B1 for 81°
	(a)(ii)	81° Alternate segment [theorem] oe	2	FT <i>their</i> (a)(i) B1FT for 81°
	(a)(iii)	123° <u>Angles on a straight line</u> [= 180] Opposite angles in a <u>cyclic quadrilateral</u> are supplementary oe	3	FT <i>their</i> acute (a)(ii) + 42 B1 for each element
	(b)(i)	Angle <i>PTU</i> = angle <i>PRQ</i> corresponding Angle <i>PUT</i> = angle <i>PQR</i> corresponding Angle <i>RPQ</i> is common oe	M2	Accept in any order M1 for one correct pair with reason If 0 scored, SC1 for two correct pairs of equal angles identified with incorrect/no reasons
		Corresponding angles are equal oe	A1	
	(b)(ii)(a)	4 : 7 oe	1	
	(b)(ii)(b)	41.25 oe	3	M2 for $20 \times \left(\frac{7}{4}\right)^2$ oe or $20 \times \frac{7^2 - 4^2}{4^2}$ oe or M1 for $\left(\frac{7}{4}\right)^2$ or $\left(\frac{4}{7}\right)^2$ or $\frac{7^2 - 4^2}{4^2}$ or $\frac{4^2}{7^2 - 4^2}$
9	(a)	187	2	M1 for $220 \times \left(1 - \frac{15}{100}\right)$ oe or B1 for 33 seen
	(b)	19.8	3	M2 for $29.7 \times \sqrt[3]{\frac{0.4}{1.35}}$ oe or M1 for $\sqrt[3]{\frac{0.4}{1.35}}$ or $\sqrt[3]{\frac{1.35}{0.4}}$ oe seen or for $\frac{29.7^3}{x^3} = \frac{1.35}{0.4}$ oe
	(c)	12.4 or 12.44...	3	M1 for $90 \times 75 \times h = 7 \times \text{figs } 12$ B1 for $1000 \text{ cm}^3 = 1 \text{ litre}$ soi

10	(a)(i)	Angle $ABC=52$ nfw	B1	ALTERNATIVE [Reflex] angle $AOC = 256$
		Opposite angles in cyclic quad oe Angles in opposite segments	B1	Angle at centre = $2 \times$ angle at circumference/arc
		[Angle $AOC=104$] Angle at centre = $2 \times$ angle at circumference/arc nfw	B1	Angles around a point
	(a)(ii)	22 nfw	2	B1 for angle $OAC = 38$ or angle $CAD = 24$
	(a)(iii)	28	1	
	(a)(iv)	36.6 or 36.62 to 36.63 nfw	3	B2 for 7.4 or 17.42 to 17.43 or M2 for $9.6 \times 2 + \frac{104}{360} \times 2 \times \pi \times 9.6$ or M1 for $\frac{104}{360} \times 2 \times \pi \times 9.6$
	(b)(i)	81	3	M2 for $\frac{A}{36} = \left(\sqrt[3]{\frac{2187}{648}} \right)$ oe or better or for $A \times \frac{648}{36} \times \sqrt[3]{\frac{2187}{648}} = 2187$ oe or better or M1 for $\frac{A^3}{36^3} = \frac{2187^2}{648^2}$ oe or $\sqrt[3]{\frac{2187}{648}}$ or $\sqrt[3]{\frac{648}{2187}}$
	(b)(ii)	8.05 or 8.051 to 8.052...	3	M2 for $\left[r^3 = \right] \frac{2187 \times 3}{4 \times \pi}$ oe or M1 for $\frac{4\pi r^3}{3} = 2187$ SC2 for $\frac{648 \times 3}{4 \times \pi}$ or SC1 for $\frac{4\pi r^3}{3} = 648$