Question	Scheme	Marks	AOs
9(a)	$(5, 15) \Rightarrow 15 = \dfrac{\sqrt{225\times 5^2 - 2025}}{a} \Rightarrow a = \ldots$	M1	3.3
	$a = 4$	A1	1.1b
		(2)	
(b)	Evidence of the use of $\pi\int x^2\,\mathrm{d}y$ for the curve BC or the curve CD	M1	3.1b
	For BC $V_1 = \dfrac{\pi}{225}\int\left(16y^2 + 2025\right)\mathrm{d}y$ or $\pi\int\left(\dfrac{16}{225}y^2 + 9\right)\mathrm{d}y$	A1ft	1.1b
	For CD $V_2 = 25\pi\int(16 - y)\,\mathrm{d}y$ or $\pi\int(400 - 25y)\,\mathrm{d}y$	A1	1.1b
	$V_1 = \dfrac{\pi}{225}\int_0^{15}\left(16y^2 + 2025\right)\mathrm{d}y$ or $\pi\int_0^{15}\left(\dfrac{16}{225}y^2 + 9\right)\mathrm{d}y$	M1	3.3
	$V_2 = 25\pi\int_{15}^{16}(16 - y)\,\mathrm{d}y$ or $\pi\int_{15}^{16}(400 - 25y)\,\mathrm{d}y$	M1	3.3
	$V_1 = \dfrac{\{\pi\}}{225}\left[\dfrac{16y^3}{3} + 2025y\right]_0^{15}$ or $\{\pi\}\left[\dfrac{16y^3}{675} + 9y\right]_0^{15}$	A1ft	1.1b
	$V_2 = 25\{\pi\}\left[16y - \dfrac{y^2}{2}\right]_{15}^{16}$ or $\{\pi\}\left[400y - \dfrac{25y^2}{2}\right]_{15}^{16}$	A1ft	1.1b
	$V = V_1 + V_2 = \dfrac{\pi}{225}(18000 + 30375) + 25\pi\left(128 - \dfrac{255}{2}\right)$ $V = V_1 + V_2 = 215\pi + 12.5\pi$	M1	3.4
	$V = \dfrac{455\pi}{2}\,\mathrm{cm}^3$ or $227.5\pi\,\mathrm{cm}^3$	A1	2.2b
		(9)	

(c)	E.g. • The equation of the curve may not be a suitable model • The sides of the candle will not be perfectly curved/smooth • There will be a whole in the middle for the wick	B1	3.5b
		(1)	
(d)	Makes an appropriate comment that is consistent with their value for the volume and 700 cm^3. E.g. a good estimate as 700 cm^3 is only 15 cm^3 less than 715 cm^3	B1ft	3.5a
		(1)	
			(13 marks)

Notes

(a)

M1: Substitutes (5, 15) into the equation modelling the curve in an attempt to find the value of a

A1: Infers from the data in the model, the value of a

(b)

M1: Uses either model to obtain x^2 in terms of y and applies $\pi \int x^2 \, dy$

A1ft: Correct expression for the volume generated by the curve BC (follow through their a value)

A1: Correct expression for the volume generated by the curve CD

M1: Chooses limits appropriate to their model for the curve BC

M1: Chooses limits appropriate to their model for the curve CD

A1ft: Correct integration (follow through their a value)

A1ft: Correct integration follow through on their volume as long it is of the form $Ay - By^2$

M1: Uses the model to find the sum of volumes

A1: $\frac{455\pi}{2}$

Note: Use of calculator for integration maximum score M1 A1ft A1 M1 M1 A0ft A0ft M1 A1

(c)

B1: States an acceptable limitation of the model

(d)

B1ft: Compares the actual volume to their answer to part (b) and makes an assessment of the model with a reason.