Question	Scheme	Marks	AOs
7(a)	$V = \pi\int_{-1.545}^{1.257} x^2\,\mathrm{d}y$	**B1**	1.1a
	$\int x^2\,\mathrm{d}y = \frac{1}{16}\int 6-3y^2+y\cos\left(\frac{5}{2}y\right)\mathrm{d}y \to Ky - Ly^3 + \ldots$	**M1**	3.1a
	$\int y\cos\left(\frac{5}{2}y\right)\mathrm{d}y = y.\frac{2}{5}\sin\left(\frac{5}{2}y\right) - \int 1.\frac{2}{5}\sin\left(\frac{5}{2}y\right)\mathrm{d}y$ $= \frac{2}{5}y\sin\left(\frac{5}{2}y\right) + \frac{4}{25}\cos\left(\frac{5}{2}y\right)(+c)$	**M1**	1.1b
	$\int x^2\,\mathrm{d}y = \frac{1}{16}\left(6y - y^3 + \frac{2}{5}y\sin\left(\frac{5}{2}y\right) + \frac{4}{25}\cos\left(\frac{5}{2}y\right)\right)(+c)$	**A1**	1.1b
	$\int_{-1.545}^{1.257} x^2\,\mathrm{d}y = \frac{1}{16}\left[6y - y^3 + \frac{2}{5}y\sin\left(\frac{5}{2}y\right) + \frac{4}{25}\cos\left(\frac{5}{2}y\right)\right]_{-1.545}^{1.257}$ $= \frac{1}{16}\left(5.3954\ldots - (-6.1101\ldots)\right) = \ldots$	**dM1**	3.4
	Volume = $\pi \times \frac{11.505\ldots}{16} = 2.26$ cm³ (2.2591159…)	**A1**	3.2a
		(6)	
(b)	Max volume for 100 berries (as we know volume of the largest) is $100 \times 2.26 \approx 226$ cm³	**B1ft**	1.1b
	e.g. but not all the berry will become juice (e.g. skin, flesh, seeds may not pulp) and not all will be as big as the largest, so the berries are not likely to produce 200 cm³ of juice.	**B1**	2.2b
		(1)	
			(8 marks)

Notes:

(a)

B1: Selects the correct volume of revolution formula to use, with correct limits in evidence.

M1: Makes x^2 the subject of the equation and attempts to integrate with the correct form for the constant and term in y^2

M1: Applies integration by parts fully on the $y\cos\left(\frac{5}{2}y\right)$ term in the correct direction. Allow slips in the coefficients, but the form must be correct.

A1: Correct integration of the x^2 equation.

dM1: Applies the limits to their integral. No need for the π for this mark.

A1: Correct volume including units. Accept awrt 2.26 cm^3. Allow 0.719π cm^3.

(b)

B1ft: Attempts to estimate the volume of juice produced by 100 berries - look for their (a) multiplied by 100.

B1: Draws a suitable conclusion with reason given. Accept as shown, but also allow a reason along the lines of 200 ml is less than 90% of the possible 226 ml, so probably will fill the cup with juice.