Question	Scheme	Marks	AOs
8(a)	Vol $V_1 = (\pi)\int_{(0)}^{(8)} y^2 \mathrm{d}x = (\pi)\int_{(0)}^{(8)} x^{\frac{4}{3}} \mathrm{d}x$	B1	1.1b
	$= (\pi)\left[\dfrac{x^{\frac{7}{3}}}{\frac{7}{3}}\right]_{(0)}^{(8)}$	M1	1.1b
	$= (\pi)\left[\dfrac{3\times 8^{\frac{7}{3}}}{7} - 0\right]$	M1	1.1b
	$= \pi \times \dfrac{3\times 2^7}{7} = \dfrac{384\pi}{7}$ *	A1*	2.1
		(4)	
(b)	Attempts to find the ratio of volume of V_2 to total volume, using $\pi\int x^2 \mathrm{d}y$ to get V_2.	M1	3.1a
	Vol $V_2 = (\pi)\int_{(0)}^{(4)} x^2 \mathrm{d}y = (\pi)\int_{(0)}^{(4)} y^3 \mathrm{d}y$	B1	1.1b
	So Vol $V_2 = (\pi)\left[\dfrac{y^4}{4}\right]_0^4 = (\pi)\left(\dfrac{4^4}{4} - 0\right)$	M1	1.1b
	$= 64\pi$	A1	1.1b
	So probability V_2 selected in a single trial is $p = \dfrac{64\pi}{64\pi + \frac{384\pi}{7}}\left(= \dfrac{7}{13}\right)$	M1	1.1b
	Identifies binomial distribution needed, $X \sim \mathrm{B}(10, \text{their } p)$.	M1	3.1a
	$P(X = 8) = {}^{10}C_8\left(\dfrac{7}{13}\right)^8\left(\dfrac{6}{13}\right)^2 = 0.0677$ (4 d.p.)	A1	1.1b
		(7)	
			(11 marks)

Notes:

(a)

B1: Correct integral with $y^2 = x^{\frac{4}{3}}$. No need for π or limits for this mark.

M1: Attempts the integration ($x^n \to x^{n+1}$).

M1: Applies limits 0 and 8, subtracts correct way. The lower limit of zero may be missing for this mark.

A1*: Simplifies to correct answer, no errors. Evidence of the lower limit being correctly applied should be seen for this mark.

(b)

M1: A full method to find the ratio V_2 / Total Volume to establish the probability V_2 is drawn in a single trial.

B1: Correct integral, need not have π or limits at this stage.

M1: Attempts the integration and applies limits of 4 and 0.

A1: Correct volume for V_2

M1: Combines result of (a) and their second integral to find the probability V_2 is drawn in a single trial, ie $p = \dfrac{\text{their } V_2 \text{ volume}}{\text{Sum of both volumes}}$ or ratio $V_1 : V_2 = \dfrac{384\pi}{7} : 64\pi = 6:7$, so $p = \dfrac{7}{13}$

M1: Demonstrates awareness of the binomial distribution being needed. This may be implied by a correct value (from calculator) if a correct p has been seen, or may be evidenced by writing out the distribution as shown in scheme.

A1: Correct answer to 4 decimal places.