Question Number	Scheme	Marks
9.(a)	Attempts to use $7\,500 = 12\,400 + 14d$ to find 'd'	M1
	Finds $d = (-350)$ and uses this in $12\,400 + 4d$	M1
	Lithium mined in Year 5 is 11 000	A1
		(3)
(b)	Attempts $\frac{15}{2}(12400 + 7500)$ or $\frac{15}{2}\{2\times12400 + 14\times-350\} = 149\,250$	M1, A1
		(2)
(c)	Attempts to use $7\,500 = 12\,400r^{14}$ to find 'r'	M1
	Finds $r = (0.9647)$ and uses this in $12\,400 \times r^{9}$	M1
	Lithium mined in Year 10 $8580 \leqslant \mathbb{L} \leqslant 9000$	A1
		(3)
(d)	Limit = $\frac{12400}{1-'0.9647'} = 351\,300$ Accept $310\,000 \leqslant S_{\infty} \leqslant 351\,600$	M1, A1
		(2)
		(10 marks)

]

(a)

M1: Attempts to use the AP formula in an attempt to find 'd'

Accept an attempt at $7\,500 = 12\,400 + 14d$ resulting in a value for d.

Accept the calculation $\frac{7500 - 12400}{14}$ condoning slips on the 7500 and 12400

M1: A correct attempt, using $12\,400 + 4d$, to find the mass of lithium mined in year 5.

You may award this following an "incorrect" AP formula with $15d$ being used instead of $14d$

Eg $7\,500 = 12\,400 + 15d$ or more likely $\frac{7500 - 12400}{15}$ usually leading to an answer of awrt 11093

A1: Lithium mined in Year 5 is 11 000

(b)

M1: Any correct method to find the sum of the AP .

Look for $\frac{15}{2}\{2\times12400 + 14\times-350\} = ...$ following through on their 'd'

OR $\frac{15}{2}(12400 + 7500) = ...$ using first + last formula

A1: 149 250

(c)

M1: Attempts to use the GP nth term formula in an attempt to find 'r'

Accept an attempt at $7\,500 = 12\,400r^{14} \Rightarrow r^{14} = \dfrac{7500}{12400} \Rightarrow r = ...$ condoning numerical slips on the values.

Accept the calculation $\sqrt[14]{\dfrac{7500}{12400}}$

M1: A correct attempt, using $12\,400 \times r^{9}$, to find the 10th term ft their positive r

You may award this following an "incorrect" GP formula with 15 being used instead of 14

Eg following $7\,500 = 12\,400r^{15}$. or $r = \sqrt[15]{\dfrac{7500}{12400}}$.

A1: Accept awrt in the range $8580 \leqslant \mathbb{L} \leqslant 9000$

(d)

M1: A correct method for the sum to infinity of a GP.

Look for an attempt at $\dfrac{12400}{1-'0.9647'}$ following through on their 0.9647

Allow this mark only if their $|r| < 1$

A1: Accept awrt in the range $310\,000 \leqslant S_{\infty} \leqslant 351\,600$

Question Number	Scheme	Marks
10.(a)	$y = \dfrac{\sqrt{x}\left(100 - x^2\right)}{40} = \dfrac{5}{2}x^{\frac{1}{2}} - \dfrac{1}{40}x^{\frac{5}{2}}$	
	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{5}{4}x^{-\frac{1}{2}} - \dfrac{1}{16}x^{\frac{3}{2}}$	M1, A1
	Stationary point $\dfrac{5}{4}x^{-\frac{1}{2}} - \dfrac{1}{16}x^{\frac{3}{2}} = 0 \Rightarrow x^2 = 20$	dM1
	$x = 2\sqrt{5}$	A1
		(4)
(b)	$\displaystyle\int \frac{5}{2}x^{\frac{1}{2}} - \frac{1}{40}x^{\frac{5}{2}}\,\mathrm{d}x = \frac{5}{3}x^{\frac{3}{2}} - \frac{1}{140}x^{\frac{7}{2}}$	M1, A1
	$\dfrac{5}{3}k^{\frac{3}{2}} - \dfrac{1}{140}k^{\frac{7}{2}} = 0 \Rightarrow k^2 = \dfrac{140\times 5}{3} = \dfrac{700}{3}$	dM1
	$\Rightarrow k = \sqrt{\dfrac{700}{3}}$ or $\dfrac{10}{3}\sqrt{21}$	A1
		(4)
		(8 marks)

(a)

M1: An attempt to differentiate.
Writes as a sum of two terms and reduces the power of at least one term by 1

A1: $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{5}{4}x^{-\frac{1}{2}} - \dfrac{1}{16}x^{\frac{3}{2}}$ which may be left unsimplified

dM1: Sets $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 0$ **and** proceeds to find a value for x^2 or kx^2

A1: $x = 2\sqrt{5}$ or exact equivalent

(b)

M1: An attempt to integrate.
Writes as a sum of two terms and increases the power of at least one term by 1

A1: $\dfrac{5}{3}x^{\frac{3}{2}} - \dfrac{1}{140}x^{\frac{7}{2}}$ which may be left unsimplified. Ignore $+C$

dM1: Substitutes $x = k$ in their $\dfrac{5}{3}x^{\frac{3}{2}} - \dfrac{1}{140}x^{\frac{7}{2}} = 0$ with only two terms in k [and any constant terms eliminated by cancelling] **and** solves for k^2

A1: $k = \dfrac{10}{3}\sqrt{21}$ or exact equivalent