| Question | Scheme | Marks |
|---|---|---|
| **10(a)** | $\frac{1}{243}=3^{-5}$ | B1 |
| | $9^{3y}=3^{6y}$ | B1 |
| | $\frac{9^{3y}}{243}=3^{-5}\times 3^{6y}\Rightarrow \frac{9^{3y}}{243}=3^{(6y-5)}$ * | M1A1 cso |
| | | [4] |
| **(b)** | $27^{(x-2)}=3^{3(x-2)}=3^{(3x-6)}$ | M1 |
| | $6y-5=3x-6\Rightarrow (6y-3x-1=0)$ | M1 |
| | $\log_4 2=\frac{1}{2}$ | B1 |
| | $\log_{10}\sqrt{6xy}=\frac{1}{2}\log_{10}(6xy)\Rightarrow \log_{10}(6xy)=1$ | M1 |
| | $1=\log_{10}10\Rightarrow \log_{10}(6xy)=\log_{10}10\Rightarrow 6xy=10$ | M1 |
| | $3x-6y-1=0$<br>$6xy=10$ | |
| | **Method A** | |
| | $6y=\frac{10}{x}\ \Rightarrow\ 3x-\frac{10}{x}-1=0\Rightarrow 3x^2-x-10=0$ | M1 |
| | $3x^2-x-10=(3x+5)(x-2)=0\Rightarrow x=2,\ -\frac{5}{3}$ | M1 |
| | $3\times 2-6y-1=0\Rightarrow 6y=5\Rightarrow y=\frac{5}{6}$ | A1 |
| | $3\times\left(-\frac{5}{3}\right)-6y-1=0\Rightarrow -6y=6\Rightarrow y=-1$ | |
| | $x=2\quad y=\frac{5}{6}$ or $x=-\frac{5}{3}\quad y=-1$ | A1 |
| | | [9] |
| | **Method B** | |
| | $3x=\frac{5}{y}\Rightarrow \frac{5}{y}-6y-1=0\Rightarrow 6y^2+y-5=0$ | M1 |
| | $6y^2+y-5=(6y-5)(y+1)=0\Rightarrow y=\frac{5}{6},\ -1$ | M1 |
| | $3x-6\times\frac{5}{6}-1=0\Rightarrow 3x=6\Rightarrow x=2$ | A1 |
| | $3x-6\times(-1)-1=0\Rightarrow 3x=-5\Rightarrow x=-\frac{5}{3}$ | |
| | $x=2\quad y=\frac{5}{6}$ or $x=-\frac{5}{3}\quad y=-1$ | A1 |
| | | [9] |
| | | **Total 13 marks** |

| Question | Scheme | Marks |
|---|---|---|
| **10** | $\dfrac{9^{3y}}{243} = 27^{(x-2)}$<br>$1\log_{10}\sqrt{6xy} = \log_4 2$ | |
| **(a)** | Writes down $\dfrac{1}{243} = 3^{-5}$<br>May be seen as $\frac{1}{243} = \frac{1}{3^5}$ later correctly used as $3^{-5}$ when combining terms. | B1 |
| | Writes down $9^{3y} = 3^{6y}$ | B1 |
| | Combines the terms $\dfrac{9^{3y}}{243} = 3^{-5} \times 3^{6y} = 3^{(6y-5)}$ | M1 |
| | For the correct expression with no errors.<br>$\dfrac{9^{3y}}{243} = 3^{(6y-5)}$ * | A1<br>cso<br>[4] |
| **(b)** | For dealing with the power of 3 to give $27^{(x-2)} = 3^{3(x-2)} = 3^{(3x-6)}$ | M1 |
| | For equating the powers of 3 to give the equation<br>$6y-5 = 3x-6 \Rightarrow (6y-3x-1=0)$ | M1 |
| | For stating $\log_4 2 = \dfrac{1}{2}$ | B1 |
| | For dealing with the square root<br>$\log_{10}\sqrt{6xy} = \dfrac{1}{2}\log_{10}(6xy) = \left(\dfrac{1}{2}\right) \Rightarrow \log_{10}(6xy) = 1$ | M1 |
| | For correctly removing all logarithms from the second equation<br>$1 = \log_{10} 10 \Rightarrow \log_{10}(6xy) = \log_{10} 10 \Rightarrow 6xy = 10$ | M1 |
| $3x-6y-1=0$<br>$6xy=10$ | | |
| | **Method A** | |
| | For substituting<br>$6y = \dfrac{10}{x}$ into the linear equation to give $3x - \dfrac{10}{x} - 1 = 0$ and attempting to form a 3TQ $3x^2 - x - 10 = 0$<br>OR for substituting<br>$y = \frac{1}{6}(3x-1)$ into $6xy = 10$ to give $x(3x-1) = 10$ and attempting to form a 3TQ $3x^2 - x - 10 = 0$ | M1 |
| | For attempting to solve their 3TQ<br>$3x^2 - x - 10 = (3x+5)(x-2) = 0 \Rightarrow x = 2,\ -\dfrac{5}{3}$ | M1 |

| | | |
|---|---|---|
| | For finding the values of $y$<br>$3\times 2-6y-1=0\Rightarrow 6y=5\Rightarrow y=\frac{5}{6}$<br>$3\times\left(-\frac{5}{3}\right)-6y-1=0\Rightarrow -6y=6\Rightarrow y=-1$<br>$x=2 \quad y=\frac{5}{6}$ or $x=-\frac{5}{3} \quad y=-1$<br>Answers must be given in pairs, pairing may be implied from working. | A1<br><br><br><br>A1<br>[9] |
| | **Method B** | |
| | For substituting<br>$3x=\frac{10}{2y}\Rightarrow 3x=\frac{5}{y}$ into the linear equation to give $\frac{5}{y}-6y-1=0$<br>and attempting to form a 3TQ $6y^2+y-5=0$<br>OR<br>for substituting $x=\frac{1}{3}(6y+1)$ into $6xy=10$ to give<br>$2(6y+1)y=10$ and attempting to form a 3TQ $6y^2+y-5=0$ | M1 |
| | For attempting to solve their 3TQ<br>$6y^2+y-5=(6y-5)(y+1)=0\Rightarrow y=\frac{5}{6},\ -1$ | M1 |
| | For finding the values of $x$<br>$3x-6\times\frac{5}{6}-1=0\Rightarrow 3x=6\Rightarrow x=2$<br>$3x-6\times(-1)-1=0\Rightarrow 3x=-5\Rightarrow x=-\frac{5}{3}$<br>$x=2 \quad y=\frac{5}{6}$ or $x=-\frac{5}{3} \quad y=-1$ | A1<br><br><br><br>A1<br>[9] |
| | | **Total 13 marks** |