



Q	Answer	Marks
1	a) 2400 b) 3957 (about 3960)	3
2	4.62 years	3
3	a) $\frac{dy}{dx} = 6e^{2x}$ b) 24 c) $y = 6x + 3$	4
4	a) $\frac{dm}{dt} = -0.8e^{-0.02t} = -0.02m$ b) 0.294 g per day c) $t = 23.5$ days	7
5	a) $A = 500$, $k = \frac{1}{4} \ln 1.6$ b) 1619 c) the model grows without limit, but food and space will run out	6
6	a) $\log y = \log(ax^n) = \log a + \log x^n = \log a + n \log x$ b) $n = 0.75$, $a = 3.98$	5
7	a) $\log V = 4.2 - 0.08t$ b) $a = 15\,800$, $b = 0.832$ c) each year the value is multiplied by 0.832, so it falls by about 16.8% a year	6
8	a) 95 °C b) 70.3 °C c) 22.9 minutes d) 20 °C, the temperature of the room	7
9	a) $\log T = \log a + n \log L$, a straight line in $\log T$ and $\log L$ b) $n = 0.5$, $a = 2.00$ c) 3.17 s	6
10	a) $\log P = \log a + \log b^t = \log a + t \log b$ b) 2.3404 c) $a = 120$, $b = 1.35$ d) about 1320; $t = 8$ is outside the data, so this is extrapolation and may be unreliable	9
11	a) $\frac{dA}{dt} = 50ke^{kt}$, at $t = 0$: $50k = 4$, $k = 0.08$ b) 250 m ² c) $t = 20.1$ d) $t = 31.1$ days; after that the model predicts more algae than the pond can hold	8
12	a) $300e^{0.04t} = 900e^{-0.02t}$, $e^{0.06t} = 3$, $t = \frac{50}{3} \ln 3$ b) 624 c) $\frac{dG}{dt} = 0.04G$, $\frac{dR}{dt} = -0.02R$ and $G = R$, so the rates are in the ratio 2 : 1 d) e.g. the model never reaches 0, so it cannot show the red squirrels dying out; or it ignores conservation work	9

Full worked solutions, written out by hand, are on the solutions sheet for this topic.