	Exponential functions (Half-life)	
1	The amount A_t micrograms of a certain radioactive substance remaining after t years decreases according to the formula $A_t = A_0e^{-0.003t}$, where A_0 is the amount present initially Find the half-life of this substance	4
2	Polonium P-210 is a radioactive substance which decays according to the law $M_t = M_0e^{-0.005t}$, where M_0 is the initial mass and M_t is the mass remaining after t days Determine the half-life of Polonium P-210	4
3	The concentration of a pesticide in soil can be modelled by the equation $P_t = P_0e^{-0.028t}$. Where P_0 is the initial concentration, Pt is the concertation at time t t is time in days after the application of the pesticide Determine the half-life of this pesticide	4
4	A small meteor passes through a dust shower. It picks up particles and gains weight (kg) in time t (hours) according to the expression $W_t = 1.2e^{0.06t}$ (a) What was the initial weight of the meteor (b) How long will it take for the meteor to double in weight	 1 4
5	The number of bacteria in a sample being monitored is increasing according to the formula $B_t = 100e^{0.7t}$. B_t is the number of bacteria after t hours. (a) Calculate the number of bacteria present at the start of the monitoring process (b) How long, in hours and minutes, will it take for the sample to triple in size	 1 5

	Exponential Half-Life - Answers		
1	Set up a half-life equation i.e. Take natural logs of both sides Simplify Solve to find t	$1 = 2e^{-0.003t}$ $\frac{1}{2} = e^{-0.003t}$ $\log_e(\frac{1}{2}) = \log_e e^{-0.003t}$ $\log_e(\frac{1}{2}) = -0.003t$ $\frac{\log_e(1/2)}{-0.003} = t$, t = 231 years	
2	Set up a half-life equation i.e. Take natural logs of both sides Simplify Solve to find t	$1 = 2e^{-0.005t}$ $\frac{1}{2} = e^{-0.005t}$ $\log_e(\frac{1}{2}) = \log_e e^{-0.005t}$ $\log_e(\frac{1}{2}) = -0.005t$ $\frac{\log_e(1/2)}{-0.005} = t$, t = 138.6 days	
3	Set up a half-life equation i.e. Take natural logs of both sides Simplify Solve to find t	$1 = 2e^{-0.028t}$ $\frac{1}{2} = e^{-0.028t}$ $\log_e(\frac{1}{2}) = \log_e e^{-0.028t}$ $\log_e(\frac{1}{2}) = -0.028t$ $\frac{\log_e(1/2)}{-0.028} = t$, t = 24.8 days	
4	Substitute t = 0 into the equation Set up an equation i.e. Take natural logs of both sides Simplify Solve to find t	$W_t = 1.2e^0$, W_t = 1.2 Kg $2.4 = 1.2e^{0.06t}$ $2 = e^{0.06t}$ $\log_e(2) = \log_e e^{0.06t}$ $\log_e(2) = 0.06t$ $\frac{\log_e(2)}{0.06} = t$, t = 11.55 hours	
5 (b)	Substitute t = 0 into the equation Set up an equation i.e. Take natural logs of both sides Simplify Solve to find t Answer in hours and minutes	$B_t = 100e^0$, $B_t = 100$ $300 = 100e^{0.7t}$ $3 = e^{0.7t}$ $\log_e(3) = \log_e e^{0.7t}$ $\log_e(3) = 0.7t$ $\frac{\log_e(3)}{0.7} = t$, t = 1.5694 hours 1 hour and 34 minutes	