Question Number	Answer		Mark
18(a)	Draws best fit straight line on graph	**(1)**	
	Use of two corresponding pairs of values of I and t	**(1)**	
	Use of gradient = $-1 / CR$	**(1)**	
	$C = 2.17 \times 10^{-5}$ (F) (rounds to 2.2×10^{-5})	**(1)**	**4**
	Or		
	Draws best fit straight line on graph	**(1)**	
	Use of two corresponding pairs of values of I and t	**(1)**	
	Use of $\ln I = \ln I_0 - t / CR$	**(1)**	
	$C = 2.17 \times 10^{-5}$ (F) (rounds to 2.2×10^{-5})	**(1)**	
	Example of calculation Gradient = $-0.189\ s^{-1}$ $0.191\ s^{-1} = 1 / C \times 240\,000\ \Omega$ $C = 2.17 \times 10^{-5}$ F		
18(b)(i)	Use of $\Delta E_{grav} = mg\Delta h$	**(1)**	
	Use of $E_k = ½ mv^2$ and conservation of energy	**(1)**	
	$v = 0.46\ m\ s^{-1}$	**(1)**	**3**
	Example of calculation $E_{grav} = 0.028\ kg \times 9.81\ N\ kg^{-1} \times 0.011\ m = 3.02 \times 10^{-3}$ J 3.02×10^{-3} J = ½ × 0.028 kg × v^2 $v = 0.464\ m\ s^{-1}$		
18(b)(ii)	Use of $V = V_0 e^{-t/CR}$	**(1)**	
	Or Use of $\ln V = \ln V_0 - t / CR$		
	$t = 1.4 \times 10^{-4}$ s	**(1)**	**2**
	Example of calculation ln (5.43 V / 6.18 V) = $-t / 2.2 \times 10^{-5}$ F × 49 Ω $t = 1.39 \times 10^{-4}$ s		
18(b)(iii)	Use of $W = mg$	**(1)**	
	Use of $p = mv$	**(1)**	
	Use of $F\,\Delta t = \Delta p$	**(1)**	
	F = 93 N which is (much) more than the weight of sphere A, so the suggestion is incorrect (e.c.f from (b)(i) and (b)(ii))	**(1)**	**4**
	Example of calculation $W = mg$ $= 0.028\ kg \times 9.81\ N\ kg^{-1}$		

	= 0.275 N p = 0.028 kg × 0.464 m s^{-1} = 0.013 N s F = 0.013 N s / 1.39 × 10^{-4} s = 93 N	
	Total for question 18	**13**