PART D Physics

1	**E**	First, find the p.d. across the cell The combined resistance in series = 30Ω $\therefore V = IR = 0.4 \times 30 = 12\,V$ Next, find the new resistance of the circuit $\frac{1}{R_T} = \frac{1}{25} + \frac{1}{5} \quad \therefore R_T = \frac{25}{6}$ And the new current $= \frac{V}{R} = \frac{12 \times 6}{25} = \frac{72}{25} \overset{\times 4}{=} \frac{288}{100}$ $\therefore I = 2.88\,A$ (E)
2	**E**	Background count is 40 counts per minute So, count rate from sample 240(-40) → 80(-40) in 90 min count rate ∝ No. of undecayed nuclei $\therefore$ 200 → 40 % remaining $\frac{40}{200} \times 100 = 20\%$ Original count rate of sample only = 200 counts per minute After one half life this drops to 100 but add background to make 140 counts per minute. From graph this is: 40 minutes. So half life is 40 min % remaining is 20% } (E)
3	**E**	Gradient of straight section of graph $= \frac{\Delta d}{\Delta t} = \frac{480 - 230}{12 - 7} = \frac{250}{5}$ $\therefore$ terminal velocity = 50 ms-1 At terminal velocity F = weight = $k v^2 = 0.5 \times 50^2$ $= 0.5 \times 2500$ $\therefore$ Answer is (E) $= 1250\,N$

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