Question Number	Answer	Mark
17a	Use of $V = W / Q$ or $W = VIt$ (1) ε = 1.56 (V) (1) Use of $V = IR$ (1) Sum of e.m.f.s = Sum of p.d.s **Or** see $\varepsilon = V + Ir$ r = 2.6 Ω (1) (1) **OR** Use of $W = Pt$ With $P = I^2R$ (1) with $R = r + 12$ (1) All other data correctly substituted ($50 = (0.107)^2 (r + 12) 300$) (1) r = 2.6 Ω (1) (1) <u>Example of calculation</u> $\varepsilon = W / Q$ = (50 J) / (0.107 A)(300 s) = 1.56 V $\varepsilon = IR + Ir$, 1.56 V = (0.107 A) (12 Ω) + (0.107 A) r, r = 2.56 Ω	**5**
17b	(Increasing R) decreases I **Or (**Increasing R) gives R a greater share of the total resistance in the circuit (1) Less p.d. across internal resistance **Or** Ir becomes less (Accept decrease in 'lost volts') (1)	**2**
17c	Take readings for p.d. and current (1) Change resistance / R (1) Plot a graph of V against I (1) Gradient is $-r$. (1) (MP4 conditional on MP3) (Allow MP3/4 for graph of I-V with gradient $-1/r$) (A sketch graph of V-I with the gradient labelled $-r$ can achieve MP3/4)	**4**
	Total for question 17	**11**