Question Number	Answer		Mark
17a	Use of sum of e.m.f. = sum of p.d. Correct rearrangement leading to given equation **Or** Total resistance of circuit = $R + r$ Correct rearrangement with total resistance replaced by $\frac{\varepsilon}{I}$ <u>Example of rearrangement</u> $\varepsilon = I(R + r)$, so $\frac{\varepsilon}{I} = R + r$, so $R = \frac{\varepsilon}{I} - r$	(1) (1) (1) (1)	**2**
17b	Gradient calculation (to calculate ε) $\varepsilon = 1.5$ V $r = 2\ \Omega$ **OR** $r = 2\ \Omega$ (read from y-intercept) Use of co-ordinates from the graph with the formula $\varepsilon = 1.5$ V	(1) (1) (1) (1) (1) (1)	**3**
17c	Current (in r/R/circuit) decreases Reference to $P = I^2r$ (Do not allow if R used instead of r) P decreases, so student is correct (MP3 dependent on MP2) **OR** V across r decreases Reference to $P = V^2/r$ (Do not allow if R used instead of r) P decreases, so student is correct (MP3 dependent on MP2) **OR** V across r decreases $P = VI$ **and** current (in r/R/circuit) decreases P decreases, so student is correct (MP3 dependent on MP2) **OR** Current (in r/R/circuit) decreases $P = VI$ **and** p.d. across r decreases P decreases, so student is correct (MP3 dependent on MP2)	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	**3**