**Name of the Student**:_____
**Max. Marks : 24 Marks** **Time : 24 Minutes**

Mark Schemes

## Q1.

(a) (i) 230 × √2 = 325 (V) ✔
(2 × 325 =) 650 to 651 V ✔

*allow doubling their incorrect peak voltage (162.6 × 2) by use of* $\sqrt{2}2$ *as an attempt to find peak-to-peak for 1 mark but not just 2 × 230*

**2**

(ii) *(use of* $P = V^2/R$*)*
$P = 230^2/12$ ✔
$P = 4.4 \times 10^3$ (W)✔ cao
2 sig. figs. Incorrect <u>answer must be supported by working</u> ✔

*Allow their incorrect answer (a)(i)*$^2 \div 12$
***Or*** $325^2 \div 12$ *as a use of for 1 mark*
*Alternative*
*For first mark*
$I = \frac{V}{R}$ ***and*** *P=VI allowing their incorrect answer*
*(a)(i) or 325 as sub for V for 1 mark*
*Answers 8.8 kW (325V) and 35 kW (650V)*

**3**

(b) (i) there is a pd / voltage across the cable ✔
pd / voltage across cooker is 230 V minus this pd / voltage ✔
2nd mark depends on 1st mark in all

*The current is lower due to the resistance of cable / The current is lower as circuit resistance increases* ✔
*pd across oven is lower <u>since</u> V=I × Resistance of element* ✔
***or***
*Resistance of the cable is in series with element* ✔
*Voltage splits (in ratio ) across these resistances* ✔

**2**

(ii) resistance of cable = 2 × 3.15 × 0.0150 = 0.0945 ✔

*Allow power 10 error here*

$V = \frac{12}{12 + R_{cable}} \times 230$ ✔

***Or*** $I = \frac{230}{12 + R_{cable}}$ **and** $V = \left(\frac{230}{12 + R_{cable}}\right) \times 12$

=228 V ✔ cao

*Allow their incorrect $R_{cable}$ correctly substituted for 2nd marking*

**3**

(iii) 230 − their (b) (ii) or 19 (A) quoted for current or equivalent seen in equation (230 / 12.0945) ✔

($P$ =) 34.2 to 42.3(W) ✔ correct working

ecf as P = (230- (b)(ii))$^2$ / their $R_{cable}$

**2**

(iv) minimise power loss / maximise efficiency of oven / ensure element gets as hot as possible ✔

avoid overheating / fires ✔

*not just to carry a large current / larger pd across element*

*Either order*

**2**

**[14]**

## Q2.

(a) time base is (switched) off ✔

TO for y-input switched off

*not affected by x plates because these plates are not switched on*

**1**

(b) (i) emf (of battery) ✔

*not just terminal pd*

*TO applied for non-emf statements*

*Allow explanation of emf*

**1**

(ii) (emf = 3 × 2.0 =) 6.0 V ✔

*penalise 1 sf*

**1**

(c) Because the pd across the y plates has decreased ✔

there is a current (in the battery) ✔

there is a pd / voltage across the internal resistance **or** there are (now) lost volts ✔

terminal pd decreases **or** terminal pd now less than emf **or** $IR = \varepsilon - Ir$ ✔

**3**

(d) $V$= 2.5 × 2.0 = 5 V

**or** (use of V=IR) by $I$ = their incorrect voltage ÷18 ✔

*Must see I as subject or their working leading to answer line for use of*

$I$=0.28(A) ✔ cao

**2**

(e) (use of $\varepsilon = IR + Ir$)

6.0 = 2.5 × 2.0 + 0.28× $r$

$$r = \frac{\varepsilon - IR}{I}$$

or correct rearrangement to make *r* subject

or sets $R_{(T)} = \frac{\varepsilon}{0.28}$ = 21.2 or 21.4 (ohms) with subject seen

**or** $\frac{1}{0.28}$ ✔

*r* = 3.4 to 3.6 Ω ✔

*Ecf for* $I$ *and* $V$ ecf ans = $\frac{6 - \text{their V}}{\text{their I}}$

**2**

**[10]**