Name of the Student:_____

Max. **Marks : 21 Marks**   **Time : 21 Minutes**

Mark Schemes

Q1.

(a) (i)   50(Hz)
             ignore any unit given

1

(ii)   any **two** from:

•   (some) current flows to Earth
       accept ground for Earth

•   current flows through copper braid
       accept current flows through the earth wire
       accept electricity for current in either the first or second marking point
       but not both

•   RCCB detects difference between <u>current</u> in live and neutral wire

2

(iii)   can be reset
       accept does not need replacing

       or

       faster acting
       accept switches circuit off faster

1

(b) (i)   79 200

             *allow **1** mark for correct substitution, ie 11 = $\dfrac{Q}{2 \times 3600}$*
             *an answer 22 gains **1** mark*

2

             coulombs / C
             *do **not** accept c*

1

(ii)   18 216 000
       *accept for **2** marks 18 216 kJ **or** 18.216 MJ*

       or

       230 × their (b)(i) correctly calculated
       *allow **1** mark for correct substitution, ie 230 × their (b)(i) **or***

*allow **1** mark for power calculated as 2530(W)*

2

(c)   increases temperature of thermistor

1

changes resistance (of thermistor)
  *do **not** accept increases resistance (of thermistor)*
  *an answer decreases resistance (of thermistor) gains **2** marks*

1

[11]

Q2.

(a)   d.c. flows in (only) one direction

1

a.c. <u>changes</u> direction (twice every cycle)
  accept a.c. constantly changing direction
  ignore references to frequency

1

(b)   a current flows through from the live wire / metal case to the earth wire
  accept a current flows from live to earth
  *do **not** accept on its own if the current is too high*

1

this current causes the fuse to melt
  accept blow for melt
  *do **not** accept break / snap / blow up for melt*

1

[4]

Q3.

(a)   (i) $\text{efficiency} = \dfrac{\text{useful energy out}\,(\times 100\%)}{\text{total energy in}}$

1.6 (W)

*allow **1** mark for correct substitution ie* $\dfrac{0.2 \,/\, 20}{100} = \dfrac{\text{output}}{8}$

2

(ii) $\text{efficiency} = \dfrac{\text{useful energy out}\,(\times 100\%)}{\text{total energy in}}$

32 (%) / 0.32
or
their (a)(i) ÷ 5 correctly calculated
  ignore any units

1

(b)   (i)   any **two** from:

   •   comparison over same period of time of relative numbers of bulbs
       required eg over 50 000 hours 5 CFL's required to 1 LED

accept an LED lasts 5 times longer

- link number of bulbs to cost eg 5 CFL's cheaper than 1 LED
  an answer in terms of over a period of 50 000 hours CFLs cost £15.50 (to buy), LED costs £29.85 (to buy) so CFLs are cheaper scores both marks
  an answer in terms of the cost per hour (of lifetime) being cheaper for CFL scores 1 mark if then correctly calculated scores both marks

- over the same period of time LEDs cost less to operate (than CFLs)

2

(ii) any **one** from:

- price of LED bulbs will drop
  *do **not** accept they become cheaper*

- less electricity needs to be generated
  accept we will use less electricity

- less CO_2 produced

- fewer chips needed (for each LED bulb)

- fewer bulbs required (for same brightness / light)

- less energy wasted
  *do **not** accept electricity for energy*

1

[6]