Electrical Quantities

Mark Scheme 2

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electrical quantities
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 2

Time Allowed: **63 minutes**

Score: **/52**

Percentage: **/100**

1 **(a**   more negatives in top half than bottom half   M1

       roughly same no of positives as negatives   A1

     (b) clearly more negatives than positives, anywhere in / on block   B1

     (c) wire removed first   M1

           charges kept in block OR so no charge can flow to or from block
           NOT any mention of positive charges moving
           accept reverse argument   A1

     (d) (charging by) induction   NOT e.m. induction OR earthing   B1

                                                                 [Total: 6]

2 **(a**   at least **three** vertical lines between the plates   B1

       equally spaced **OR** some curvature at the ends   B1

       at least one correct (upwards) arrow **AND** none wrong   B1

     (b) **(i)** ($I=$) Q/t **OR** 0.000 000 042 / 0.000 000 035 **OR** $4.2 \times 10^{-8} / 3.5 \times 10^{-8}$ C1

            1.2×10^n for any n   C1

            1.2 A   A1

         (ii) contains electrons   C1

            electrons are free to <u>move</u>   A1

                                                                [Total: 8]

3 **(a (i)** rectifier / diode

    (ii) frequency (of A.C. supply)   B1

  (b) $(P =) IV$ **OR** 0.5×5.3 **OR** 500×5.3 C1
              2.6 W **OR** 2600 mW

    (ii) $(E =) Pt$ **OR** IVt **OR** $2.65 \times 1.5 \times 3600$ **OR** $0.5 \times 5.3 \times 1.5 \times 3600$ C1
           14000 J   A1

  (c) energy only underlined   B1

                                                          [Total: 7]

4 **(a** mark **(i)** and **(ii)** together:
    mention of free electrons   B1
    (current is) flow/movement of free electrons   B1
    insulators contain no free electrons / metals contain many free electrons   B1

  (b) (i) chemical (energy) to electrical (energy)   **IGNORE** heat)

    (ii) (energy =) VIt **OR** $120 \times 96 \times 10$ (**OR** $\times 60$ **OR** $\times 10 \times 60$)
           OR $11\,520 \times 10$ (**OR** $\times 60$ **OR** $\times 10 \times 60$)   C1
           6.9×10^6 J   A1

    (iii) 96×120 **OR** $1.2 / 1.15(2) \times 10^4$ **OR** $12\,000 / 11\,500 / 11\,520$
           1.0×10^4 W   A1

                                                           [Total: 8]

5   **(a** $(P_i =)$ 260 $(\times 2) \times$ length $\times$ breadth $(= 260 \times 0.1)$, words, symbols or numbers   C1
         note: gets this mark if omits factor of 2
         $(P_i = 2 \times 260 \times 0.25 \times 0.2 =)$ 26 W   A   [2]

  (b) $(P_o = 0.95 \times 20 =)$ 19 (W)   B1
         efficiency = output (energy) / input (energy)
         accept power for energy
         E = candidate's P_o/candidate's P_i evaluated (= 0.73 or 73%), accept fraction (19/26) C1
         0.73% or bald 73 gets unit penalty   A1   [3]

  (c)   A OR B in series with C connected across 20 V   M
         parallel combination of A and B only   A1   [2]

  (d) $1 / R = 1 / R_1 + 1 / R_2$ OR $R = R_1 R_2 / (R_1 + R_2)$ in any form OR $R_1 R_2 / (R_1 + R_2)$ C1
         words, symbols or numbers
         12 Ω A1   [2

                                                                              [Total: 9]

6   **(a**   in copper/metals/conductors, electrons (free to move)   B1
         in nylon/insulators electrons fixed/not free (to move)   B1

  (b)   (negatively charged nylon) rod near to sphere   B1
         earth/touch (with hand) the sphere   B1
         remove earth/hand (and remove rod)   B1

  (c)   <u>at least four</u> equally spaced, radial lines from surface   M1
         <u>at least one</u> outward arrow AND none wrong   A1   [7]

7 **(a)** **(i)** $(I =) P/V$ OR 18 000/120 OR 18/120 — C1

150 A — A1

(ii) $(E =)Pt$ OR $18\,000 \times 30 \times 60$ OR $18\,000 \times 1800$ OR $18\,000 \times 30$ OR 5.4×10^{5} — C1

3.2×10^{7} J OR 9.0 kWh — A

(b) any three of:

(high voltage means) low(er) current

for given supply power

(low(er) current means) less heat/thermal energy (generated in cables) OR $P = I^{2}R$

for given resistance (of cables)

cables heated by current — B3 [7]