# Electrical Quantities

## Mark Scheme 1

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|---|---|
| Level | IGCSE |
| Subject | Physics |
| ExamBoard | CIE |
| Topic | Electricity and Magnetism |
| Sub-Topic | Electrical quantities |
| Paper Type | (Extended) Theory Paper |
| Booklet | Mark Scheme 1 |

**Time Allowed:** **63 minutes**

**Score:** **/52**

**Percentage:** **/100**

1 **(a) (i)** . . . . .direction of the force on a positive charge B1

**(ii)** Straight parallel lines from upper to lower plate B1
At least 3 lines drawn. All lines drawn equally spaced,
approximately symmetrical with respect to plates B1
Arrows downwards B1

**(b) (i)** Upward force (on drop) due to electric field / charge on plates B1
= weight of drop B1
Upward force on drop = downward force on drop
OR no resultant / net force on drop
OR forces are balanced (B1)

**(ii)** Drop moves upwards B1
Weight / mass of drop decreases OR downward force decreases
OR Upward force (due to electric field) > weight of drop B1

**[Total: 8]**

2 **(a** electrons / negative charges <u>move</u> towards the rod / to R (ignore just “attracted”)
ignore any mention of positive charges moving
any mention of positive electrons = 0 [1]

**(b)** negative charges (are) close(r) (to the rod) [1]
attraction between opposite charges greater than repulsion between like charges [1]

**(c)** coulomb [1]

3 **(a) (i)** at least three horizontal, parallel lines evenly spaced (ignore edge effects) B1

arrows pointing left to right B1

**(b)** right hand half of ball has more + signs than – signs
AND left hand half of ball has more – signs than + signs M1

equal numbers of + and – signs A1

**(c)** $Q = I\,t$ in any form OR $(I =)\ Q \div t$ OR $2.8 \times 10^{-8} \div 0.05$ C1
$5.6 \times 10^{-7}$ A OR C/s A1

**[Total: 6]**

4 **(a** energy transferred per coulomb/<u>unit</u> charge
OR energy supplied in driving coulomb/<u>unit</u> charge around a circuit
ACCEPT p.d./voltage across battery/power supply B1

**(b) (i)** $V = IR$ in any form OR $(I =)\ V \div R$ C1

2.0 A OR 2 A A1

**(ii)** electrons B1

**(iii)** arrow right to left by heater OR indication of clockwise B1

**(c)** $(E =)\ VIt$ OR $V^2t/R$ OR $I^2Rt$ in any form C1

14 000 J A1

5 **(a** (Q =) It OR $4.1 \times 10^{-5} \times 1.6 \times 10^{7}$ C1
= 660 C A1

**(b)** (R =) V / I OR $1.3 / 4.1 \times 10^{-5}$ C1
= 32 000 Ω OR 32 kΩ A1

**(c)** 1st method: (P =) IV OR $4.1 \times 10^{-5} \times 1.3$
OR 2nd method: (P =) $I^2R$ OR $(4.1 \times 10^{-5})^2 \times 32\,000$
OR 3rd method: (P =) $V^2 / R$ OR $1.3^2 / 32\,000$
OR 4th method: (P =) QV / t OR $660 \times 1.3 / 1.6 \times 10^{7}$ C1

1st and 3rd methods: $5.3 \times 10^{-5}$ W / 0.000053 W
2nd and 4th methods: $5.4 \times 10^{-5}$ W / 0.000054 W A

**[Total: 6]**

6 **(a** coulomb B1

**(b)** **(i)** negative charge(s) on left AND positive charge(s) on right M1
equal number of positive and negative charges AND number of each ≤ 7 A1

**(ii)** electrons / negative charges flow from Earth / on to sphere (NOT protons / positive charges / positive electrons move) B1
total charge negative OR (some) protons / positive charges cancelled B1

**(c)** metal contains free (delocalised) electrons OR electrons can move about B1
electrons in plastic not free to move / fixed

**[Total: 7]**

| | | | | |
|---|---|---|---|---|
| 7 | **(a** | **(i)** | A region in which a force acts upon an (electric) charge/charged object | B1 |
| | | **(ii)** | At least 4 radial straight lines with lines evenly spaced | B1 |
| | | | Arrows on lines pointing away from + charge | B1 |
| | **(b)** | | Use positively charged rod | B1 |
| | | | Place rod close to surface of sphere | B1 |
| | | | Touch sphere (briefly) with finger OR Connect sphere to earth and remove earth connection OR Briefly connect sphere to earth | B1 |
| | | | Remove charged rod | B1 |
| | | | | **[Total: 7]** |

| | | | | |
|---|---|---|---|---|
| 8 | **(a** | | $3^{rd}$ box only indicated, reverses direction | B1 |
| | **(b)** | | straight line up / down page | B1 |
| | | | arrow pointing down page | B1 |
| | | **(ii)** | to the right or left e.c.f. **(b)(i)** | B1 |
| | | | to the right e.c.f. **(b)(i)** | B1 |
| | **(c)** | | $F=ma$ in any form or $F/m$ symbols, words or numbers OR final answer $6 \times 10^{-4}\,m/s^2$ | C1 |
| | | | (a = 0.21 / 0.35 =) $0.6\,m/s^2$ | A1 |
| | | | | **[Total: 7]** |