

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Mark Schemes

Q1.

(a) Use of $P=VI$ or $P=I^2R$ or $P = \frac{V^2}{R}$ ✓

Use of $\Delta W=P\Delta t$ ✓

OR

Use of $\Delta Q=I\Delta t$ ✓

Use of $W=VQ$ ✓

2.1×10^5 (J) ✓

2 marks if time not converted to seconds (3600 J)

3

(b) Use of $\rho = \frac{RA}{L}$ ✓

0.91 (m) + appropriate conclusion ✓

Allow calculation of R , ρ or A assuming 0.85 m length, and conclusion for second mark:

$R = 3.5 \Omega$

$A = 4.6 \times 10^{-6} \text{ m}^2$

$\rho = 2.1 \times 10^{-5} \Omega \text{ m}$

2

(c) 350 (Ω) ✓

Full marks for correct answer

Max 3 from: ✓ ✓ ✓

15 (mA) read from graph

Allow 14.5 to 15.5

Conversion to A

pd across resistor = $7.4 - 2.2 = 5.2 \text{ V}$

Use of $R = \frac{V}{I}$

Q2.

- (a) Acceptable line ✓

Condone one failure from the following list

- A. Line straight up to point 8 (expect ruled but condone freehand drawing)
- B. Line shows balance of points on each side of drawn line
- C. Line goes within region of data cross
- D. Appropriate continuous transition between line and curve
- E. Beyond point 12 shows either curve of decreasing gradient OR straight line through points 12 to 15
- F. Thin line and non-variable thickness
- G. Line of acceptable quality, eg not hairy or kinked

Please annotate on CMI+

The line must intersect with the cross of the data point.

However, condone point 14 or 15 being off line of best fit for a smooth curve.

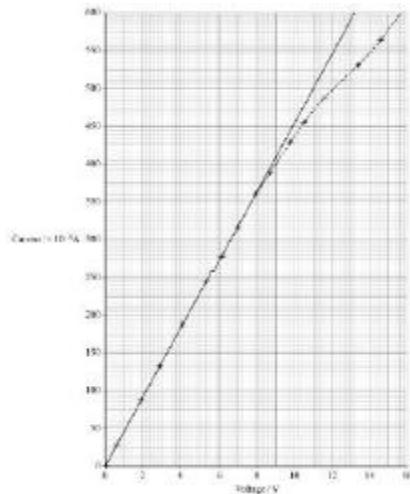
Condone partially erased and redrawn.

Do not allow double line under any circumstance.

Allow a curve with a slight inflection at point 14

(see example below)

Allow a split line where linear section has been extrapolated to the top of the grid e.g.



1

- (b) Circle drawn around data point 9 (8,
- 360×10^{-3}
-) ✓

Condone circle drawn around

data point 10 (8.7, 390×10^{-3})

provided that linear section of line intersects with this cross.

1

- (c) Correct read off for voltage from candidate line 1 ✓

This voltage must be within one half-square of actual value.

Correct answer using $\left(\frac{\frac{\text{their } V}{0.55} - 22.2}{22.2}\right) \times 100$ ₂✓

Penalise mid-calculation rounding.

Condone missing % sign;

2 or 3 significant figures for answer.

Penalise Physics Error of using gradient of tangent to determine the resistance.

2

(d) circuit **D** is correct ₁✓

circuit **A** is incorrect because the ammeter is not measuring the current in **R**

OR

ammeter is not in series with **R**

OR

the ammeter is measuring the current in the power supply ₂✓

circuit **B** is incorrect because the voltage range (shown in the data) cannot be produced

OR

cannot achieve voltage less than (about) 5 V ₃✓

circuit **C** is incorrect because the voltmeter is not in parallel with **R**

OR

the voltmeter is not measuring the voltage across **R**

OR

the voltmeter reading equals emf minus voltage across **R** ₄✓

Ignore unclear or incorrect explanation for MP1

₂✓ ₃✓ and ₄✓ are awarded for correct explanations not for a statement that a circuit is incorrect.

*for ₁✓ accept implied answer that circuit **D** is correct if circuits **A**, **B** and **C** are all stated to be incorrect*

*for ₂✓ any suggestion that in circuit **A** the voltmeter is in the wrong position forfeits the mark*

*Condone circuit **B** is incorrect "because the voltage cannot go down to zero" for ₃✓.*

Or

*Condone circuit **B** is incorrect "there is less variation in voltage because the resistors are in series" ₃✓.*

*for weak statements in MP2 and MP4 1 mark for 'circuit **A** is incorrect because ammeter is in wrong place' and 'circuit **C** is incorrect because voltmeter is in the wrong position'*

*If **A** / **B** / **C** is identified as correct then **MAX 2** for two statements that correctly explain why the others are unsuitable.*

*If no other marks awarded: **MAX 1** for "Circuit **B** is correct because the ammeter is series with resistor **R** and the voltmeter is in parallel with **R**".*

4

[8]