Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Electricity

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

Mark Schemes

Q1.

(a) Work done in moving 1 C of charge through the cell ✔
1.5 J of work is done in moving 1 C of charge through the cell ✔

OR

Amount of energy converted from other forms to electrical energy per 1 C of charge ✔

1.5 J of energy converted from other forms to electrical energy per unit charge (passing across the emf) ✔

OR

Work done in moving 1 C of charge (whole way) round circuit ✔

1.5 J of work is done in moving 1 C of charge the (whole way) round circuit ✔

2nd marking point obtains both marks

***Max 1 mark** available for the following:*

The emf is the terminal pd when there is no current in the cell (and this equals 1.5 V)

1.5 J of energy per 1 C of charge.

Allow a statement of Kirchhoff's 2nd law for 1 mark. Where the law is in symbol form, the meaning of the symbols must be stated. Need a clear communication of internal and external resistances.

2

(b) P = VI

And

(P) = 0.465 (W) ✔

Seen to more than 2 sf with supporting equation with subject seen in working

1

(c) Use of appropriate power equation to determine wasted power
or
power dissipated in **R** = total power – their wasted power ✔

(P =) 0.40 W ✔

Alternative for 1 mark:

Use of $I = \frac{\varepsilon}{R+r}$

Or

pd across R = 1.5 – 0.65 x 0.31

or

pd across R = 1.2985 (V)

or

total resistance = 1.5/ 0.31

or

total resistance = 4.839 (Ω)

or R = 4.2 (Ω)

or $P = I^2$ *x their* R

or

$P = \frac{V^2}{R}$ *using their V and R* ✔

2

(d) Use of $E = P\,t$

or $E = VI\,t$

Or

$E = QV$ **and** $Q = It$ ✔

Allow use of the equation with their values.

An answer of 3.5 x 10^4 is worth 1 mark

(t =) 3.0(1) x 10^4 (s) ✔

2

(e) **MAX 3 from (1 to 4) or (5 to 8)**

It is suitable, because:

(1) Current required in lamp = 0.62 A or use of $I = \frac{P}{V}$ seen

(2) Resistance of lamp = 2.11 Ω or use of $R = \frac{V^2}{P}$ seen ✔

(3) current in each cell = 0.31 A ✔

(4) lost volts = 0.2 V

or

lost volts = 0.65 x 0.31 ✔

Check the diagram in part (e)

Must have the ***correct conclusion to award 4 marks.***

Conclusion: yes, terminal pd = **1.5 – 0.2** seen

or

terminal pd= 1.5 – 0.65 x 0.4 /1.3 ✔

OR

(5) total internal resistance = 0.325 Ω ✔

(6) total resistance in circuit = 2.44 Ω ✔

(7) Resistance of lamp = 2.11 Ω ✔

(8) pd splits in ratio of 0.325:2.11 ✔

Conclusion: yes, pd **across lamp is** $\frac{2.11 \times 1.5}{2.44}$ **(= 1.3 V) seen** ✔

Allow max 3 from a combination of two route [(2) and (7) worth total of 1 mark]

4

(e) (Cells must be added) in parallel ✔

Because:

more energy stored in the bank of cells / less power from each cell ✔

without increasing the voltage across the bulb (above 1.5 V)

or

without increasing the terminal pd (above 1.5V) ✔

Must link the cells being added in parallel to one or both reason to gain three marks.

Alternative:

- *In parallel*
- *Current shared by cells*
- *Takes longer to convert the energy stored in each cell.*

Alternative:

- *In parallel*
- *Less internal resistance*
- *Less power / energy wasted*

Cells in series statement means no marks can be obtained.

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Q2.

(a) to limit (maximum) current (when variable resistor is set to zero) ✔

Accept 'so cell is not short-circuited' for 1 ✔

to prevent overheating (of cell)
OR
to prevent damage to cell
OR
otherwise cell would discharge quickly ✔

'to avoid damaging components' is not enough for 2 ✔

2

(b) Line ruled through bottom of second error bar and top of ninth (3rd from right) error bar ✔

Ignore unit if given. Allow tolerance of 2 mm inside either error bar.

Determines their gradient, with $\Delta x \geq 0.2$ (A) ✔

(–)1.0 ± 0.1 (/ V A^{-1}) ✔

Expect to see 2 sf in any answer

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(c) Attempt to calculate mean of their G_{min} and –1.3 ✔

Allow positive G values

1.1 (Ω) ✔

Ecf from (b). 1 mark max if r given as negative

2

(d) States that ε = $V + Ir$ **OR** calculates R = 0.39 (Ω) ✔

Allow ruled line drawn through (0.94, 0.37) and (0.70, 0.65) ✔

Use of ε = $V + Ir$ **OR** ε = $I(R + r)$ ✔

Adds their gradient to read off at I = 1.0 A ✔ ✔

OR

Use of y=mx+c with their gradient ✔

Intercept (c) determined ✔

1.4 (V) ✔

*Ecf from **(c)**. 3 sf max*

3

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