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**

Q1.

A cell has an emf of 1.5 V and an internal resistance of 0.65 Ω.
The cell is connected to a resistor **R**.

(a) State what is meant by an emf of 1.5 V.

_____

_____

_____

_____

(2)

(b) The current in the circuit is 0.31 A.

Show that the total power output of the cell is approximately 0.47 W.

(1)

(c) Calculate the energy dissipated per second in resistor **R**.

energy dissipated per second = _____ J s^{-1}

(2)

(d) The cell stores 14 kJ of energy when it is fully charged. The cell's emf and internal resistance

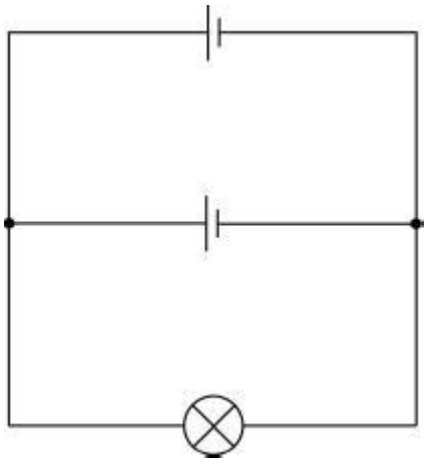
are constant as the cell is discharged.

Calculate the maximum time during which the fully-charged cell can deliver energy to resistor **R**.

maximum time = _____ s

(2)

(e) A student uses two cells, each of emf 1.5 V and internal resistance 0.65 Ω, to operate a lamp. The circuit is shown in the diagram.



The lamp is rated at 1.3 V, 0.80 W.

Deduce whether this circuit provides the lamp with 0.80 W of power at a potential difference (pd) of 1.3 V.
Assume that the resistance of the lamp is constant.

_____

_____

_____

(4)

(f) The lamp operates at normal brightness across a pd range of 1.3 V to 1.5 V.

State and explain how more of these cells can be added to the circuit to make the lamp light at normal brightness for a longer time.
No further calculations are required.

(3)
(Total 14 marks)

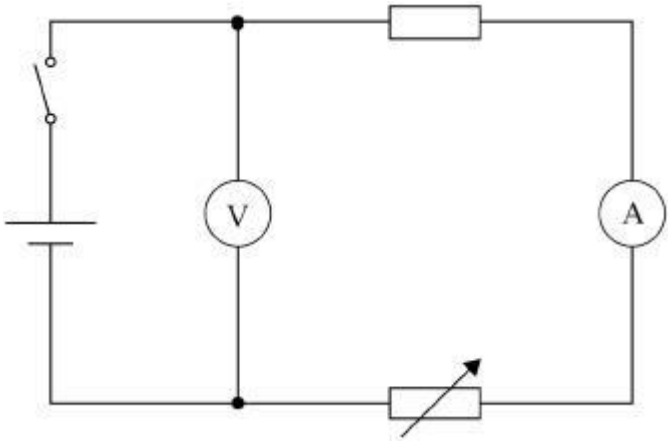
Q2.

Figure 1 shows a circuit used by a student to determine the emf and the internal resistance of a cell.

The cell is connected to a switch, a fixed resistor and a variable resistor.
When the switch is closed, a voltmeter measures the potential difference V across the cell.
An ammeter measures the current I in the circuit.

Readings of V and I are taken as the resistance of the variable resistor is changed from zero to its maximum value.

Figure 1

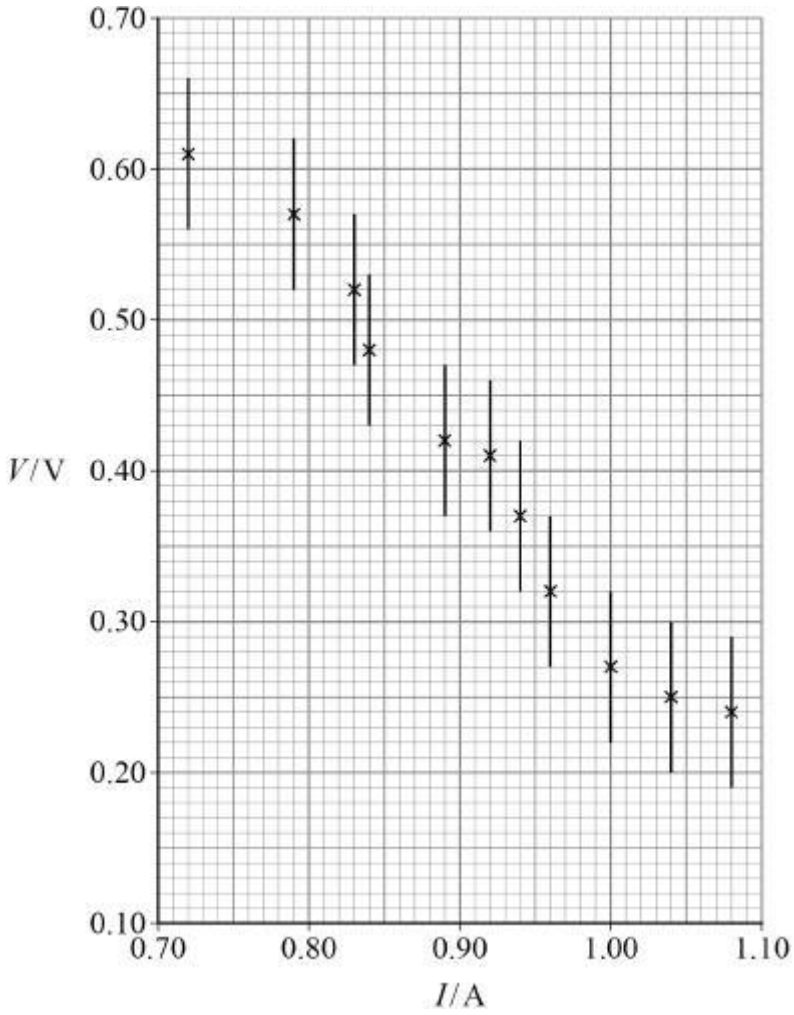


(a) Explain why the student included the fixed resistor in this circuit.

(2)

Figure 2 is a graph of the data recorded for this experiment.

Figure 2



(b) Determine the magnitude of the minimum gradient G_{min} of a line that passes through all the error bars in **Figure 2**.

magnitude of G_{min} = _____

(3)

(c) The maximum gradient G_{max} / V A^{-1} of a line passing through all the error bars in **Figure 2** is –1.3

Determine, using G_{max} and G_{min}, the internal resistance of the cell.

internal resistance = _____ Ω

(2)

(d) The line of best fit passes through the data point (0.94, 0.37).

Determine the emf of the cell.

emf = _____ V

(3)

(Total 10 marks)