AQA – Electricity – AS Physics P1

1. June/2021/Paper_7407_01/No.06

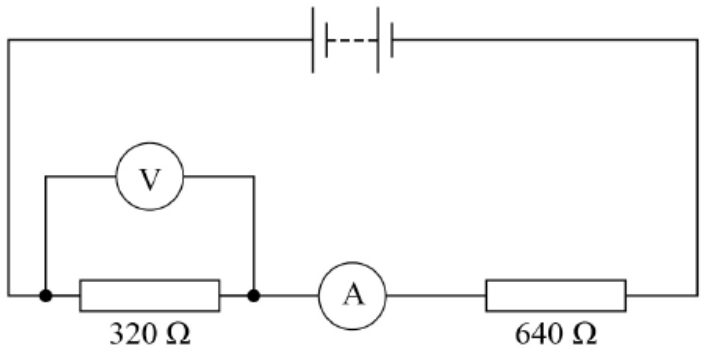
0 6 A battery has an emf of 5.30 V and negligible internal resistance.

0 6 . 1 State what is meant by an emf of 5.30 V for this battery.

[2 marks]

0 6 . 2 **Figure 13** shows the battery connected into a circuit.

Figure 13



The ammeter is ideal.
The voltmeter is non-ideal and has a resistance R.
The reading on the voltmeter is 1.05 V when it is connected across the 320 Ω resistor.

Show that the reading on the ammeter is approximately 7 mA.

[2 marks]

0 6 . 3 Show that the resistance R of the voltmeter is approximately $300\ \Omega$.

[3 marks]

0 6 . 4 The voltmeter is now connected across the battery terminals.

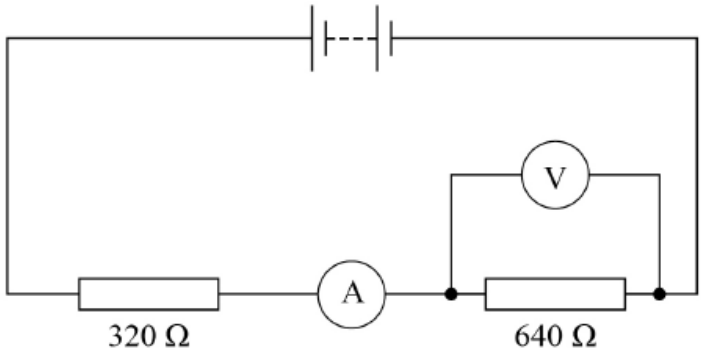
Calculate the power dissipated in the voltmeter.

[2 marks]

power = _____ W

0 6 . 5 The voltmeter is now connected across the 640 Ω resistor as shown in **Figure 14**.

Figure 14



The reading on the voltmeter is 2.10 V.

When the voltmeter was connected across the 320 Ω resistor, as shown in **Figure 13**, the reading on the voltmeter was 1.05 V.

Explain why the sum of these voltmeter readings does **not** equal the emf of the battery.

[2 marks]

2. June/2020/Paper_7407_01/No.05

0 5 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**.

0 5 . 1 State what is meant by an emf of 1.5 V.

[2 marks]

0 5 . 2 The current in the circuit is 0.31 A.

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

[1 mark]

0 5 . 3 Calculate the energy dissipated per second in resistor **R**.

[2 marks]

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

0 5 . 4 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.

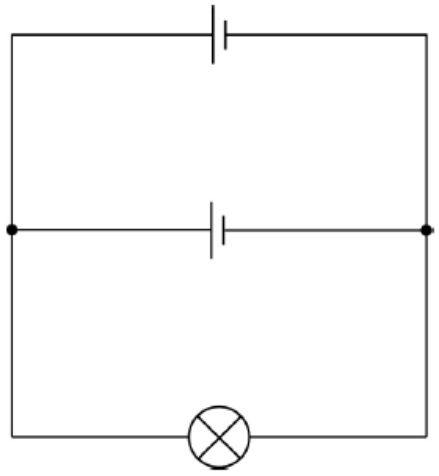
Calculate the maximum time during which the fully-charged cell can deliver energy to resistor **R**.

[2 marks]

maximum time = _____ s

0 5 . 5 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 **Figure 7**.

Figure 7



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 marks]

0 5 . 6 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 marks]