AQA - Electricity – GCSE Combined Science Physics
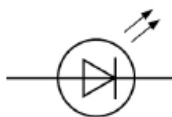
1. June/2021/Paper_1F/No.3

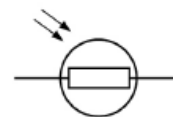| 0 | 3 |

A filament lamp breaks if the electric current in the filament becomes too big.

| 0 | 3 |.| 1 |

What is the correct symbol for a filament lamp?

[1 mark]

Tick (✓) **one** box.

| 0 | 3 |.| 2 |

What is meant by an electric current?

[1 mark]

Tick (✓) **one** box.

The energy carried by each unit of charge   ☐

The flow of electrical charge   ☐

The number of electrons in a circuit   ☐

The speed at which charge moves   ☐

1

A manufacturer investigated the maximum current value of some filament lamps.

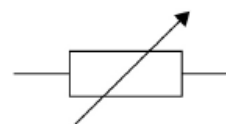**0 3 . 3** **Figure 6** shows the symbols for an ammeter, a battery and a variable resistor.

Figure 6

| Ammeter | Battery | Variable resistor |

The manufacturer connected an ammeter, battery, filament lamp and variable resistor in series.

Draw a circuit diagram to show the manufacturer's circuit.

Include the symbol for a filament lamp from Question 03.1

[1 mark]

0 3 . 4 How could the manufacturer increase the current in the filament lamp?

[1 mark]

Tick (✔) **one** box.

Add an extra ammeter to the circuit. ☐

Decrease the resistance of the variable resistor. ☐

Use a battery with a smaller potential difference. ☐

0 3 . 5   When the potential difference across a filament lamp was 0.75 V, the current in the filament lamp was 0.16 A.

Calculate the power of the filament lamp.

Use the equation:

$$\text{power} = \text{potential difference} \times \text{current}$$

[2 marks]

_____

_____

_____

Power = _____ W

0 3 . 6   Write down the equation which links charge flow (Q), current (I) and time (t).

[1 mark]

_____

0 3 . 7   The manufacturer increased the current in the filament lamp to 200 mA.

Calculate the charge flow through the filament lamp in 15 s.

[3 marks]

_____

_____

_____

_____

Charge flow = _____ C

0 3 . 8 The manufacturer increased the current in the filament lamp from 200 mA.

The filament in the lamp broke when the current reached 320 mA.

How many times greater than 200 mA was the current at which the filament broke?

[1 mark]

_____

_____

_____ times greater

0 3 . 9 The manufacturer tested lots of filament lamps.

The current at which the filament lamps broke was 320 ± 60 mA.

What is the range of currents at which the filament lamps broke?

[1 mark]

Tick (✓) **one** box.

60 mA to 320 mA   ☐

260 mA to 320 mA   ☐

320 mA to 380 mA   ☐

260 mA to 380 mA   ☐

2. June/2021/Paper_1F/No.5(5.1_5.2),(5.5_5.6)

| 0 | 5 |

Figure 9 shows a mobile phone with its battery removed.

Figure 9

A student measured the potential difference across the battery and then put the battery into the phone.

| 0 | 5 | . | 1 |

What is the equation linking current (I), potential difference (V) and resistance (R)?

[1 mark]

Tick (✓) **one** box.

$I = V R$ ☐

$R = I V$ ☐

$V = I R$ ☐

$V = I^2 R$ ☐

0 5 . 2 The current in the electronic circuit in the mobile phone was 0.12 A.

The potential difference across the battery was 3.9 V.

Calculate the resistance of the electronic circuit in the mobile phone.
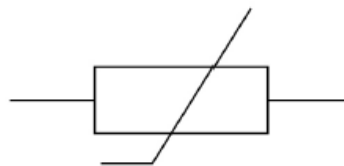
[3 marks]

_____

_____

_____

_____

_____

_____

Resistance = _____ Ω

The mobile phone includes a sensor to monitor the temperature of the battery.

Figure 10 shows the circuit symbol for a component used in the sensor.

Figure 10

0 5 . 5 What component does the circuit symbol shown in **Figure 10** represent?

[1 mark]

_____

0 5 . 6 The temperature of the component in **Figure 10** increases.

The potential difference across the component remains constant.

Explain what happens to the current in the component.

[2 marks]

_____

_____

_____

_____

3. June/2021/Paper_1H/No.1

| 0 | 1 |

Figure 1 shows a mobile phone with its battery removed.

Figure 1

A student measured the potential difference across the battery and then put the battery into the phone.

| 0 | 1 |.| 1 |

What is the equation linking current (I), potential difference (V) and resistance (R)?

[1 mark]

Tick (✓) **one** box.

$I = V R$ ☐

$R = I V$ ☐

$V = I R$ ☐

$V = I^2 R$ ☐

0 1 . 2 The current in the electronic circuit in the mobile phone was 0.12 A.

The potential difference across the battery was 3.9 V.

Calculate the resistance of the electronic circuit in the mobile phone.

[3 marks]

_____

_____

_____

_____

_____

_____

Resistance = _____ Ω

0 1 . 3 Write down the equation which links energy (*E*), power (*P*) and time (*t*).

[1 mark]

_____

0 1 . 4 The battery was fully charged when it was put into the mobile phone.

The battery discharged when the mobile phone was switched on.

The average power output of the battery as it discharged was 0.46 watts.

The time taken to fully discharge the battery was 2500 minutes.

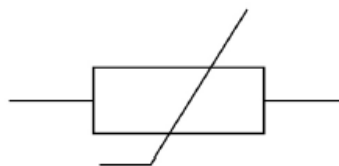Calculate the energy transferred by the battery.

[3 marks]

_____

_____

_____

_____

_____

Energy transferred = _____ J

The mobile phone includes a sensor to monitor the temperature of the battery.

Figure 2 shows the circuit symbol for a component used in the sensor.

Figure 2

| 0 | 1 |.| 5 | What component does the circuit symbol shown in **Figure 2** represent?

[1 mark]

_____

| 0 | 1 |.| 6 | The temperature of the component in **Figure 2** increases.

The potential difference across the component remains constant.

Explain what happens to the current in the component.
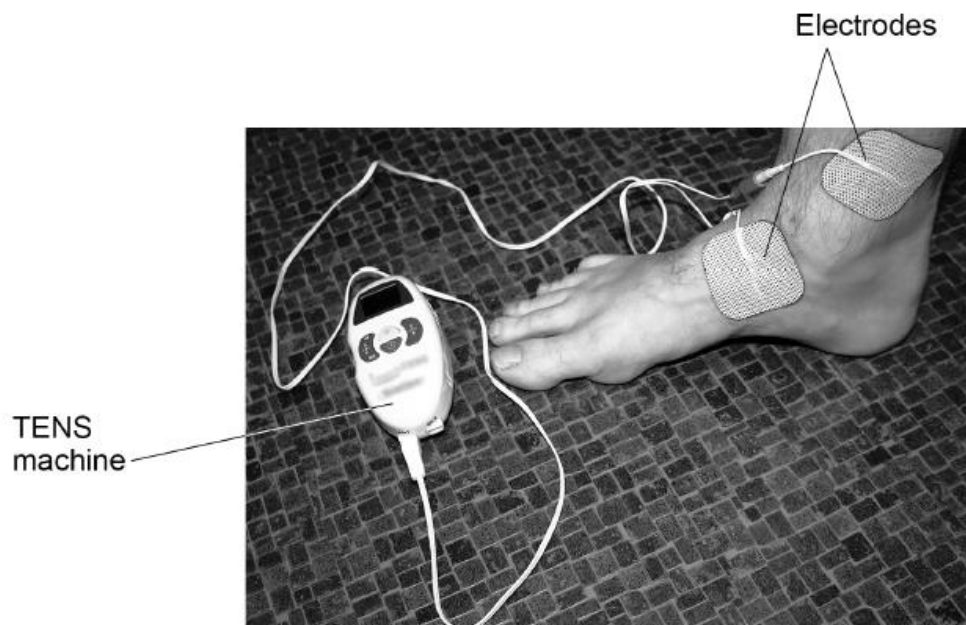
[2 marks]

_____

_____

_____

_____

4. June/2021/Paper_1H/No.5

| 0 | 5 |

A TENS machine uses an electrical current to relieve pain.

Figure 8 shows the electrodes of a TENS machine connected across an ankle.

Figure 8

| 0 | 5 |.| 1 |

The maximum power of the TENS machine is 240 mW.

The potential difference across the battery in the TENS machine is 2.5 V.

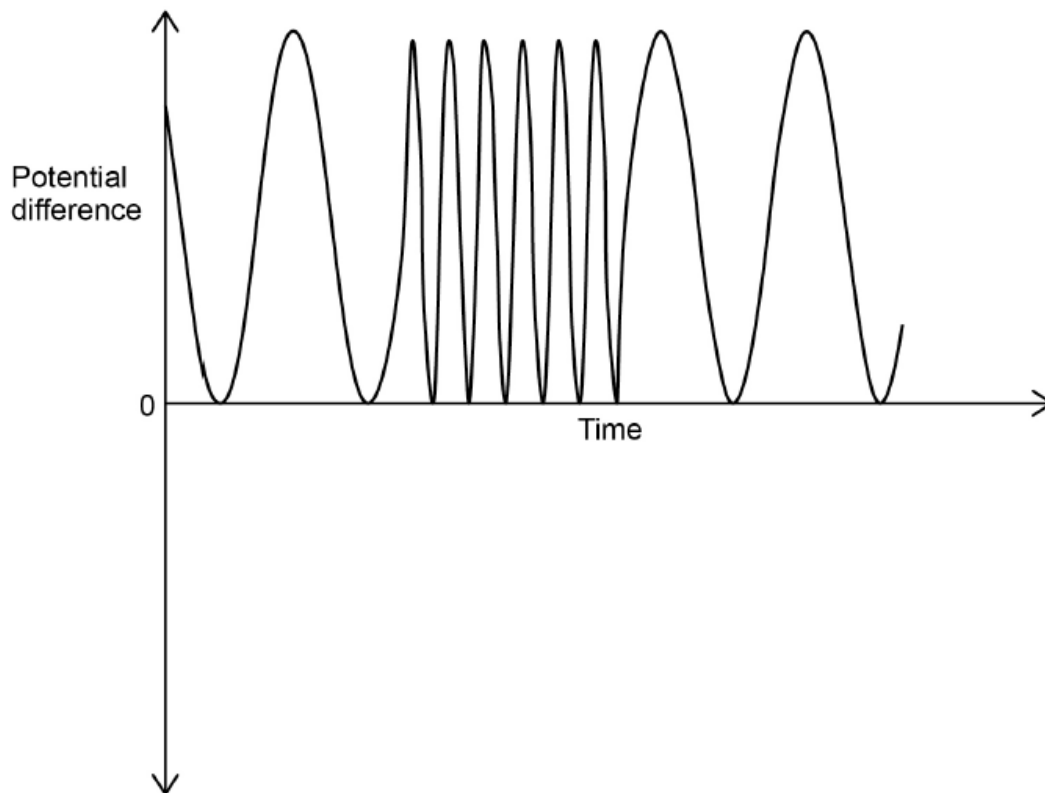Calculate the maximum current from the battery.

[4 marks]

Maximum current = _____ A

0 5 . 2 **Figure 9** is a sketch graph showing how the potential difference across the electrodes varies with time.

Figure 9

A student concluded that there was an alternating potential difference across the electrodes.

How does **Figure 9** show that the student was **not** correct?
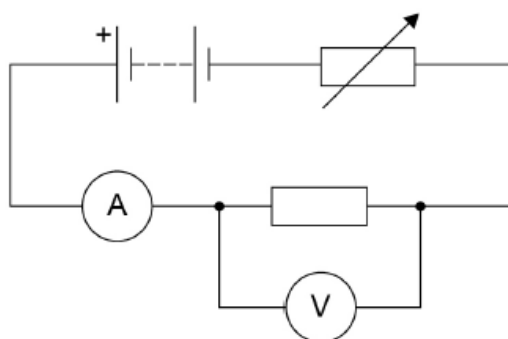
[1 mark]

_____

_____

13

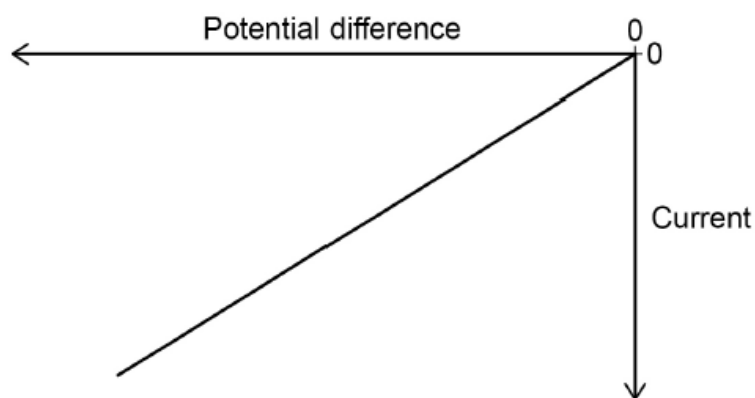Figure 10 shows a circuit the student built using the battery from the TENS machine.

Figure 10

The student recorded how the current in the resistor varied with the potential difference across the resistor.

Figure 11 shows a sketch graph of the results.

Figure 11

0 5 . 3   What relationship does **Figure 11** show?

[1 mark]

_____
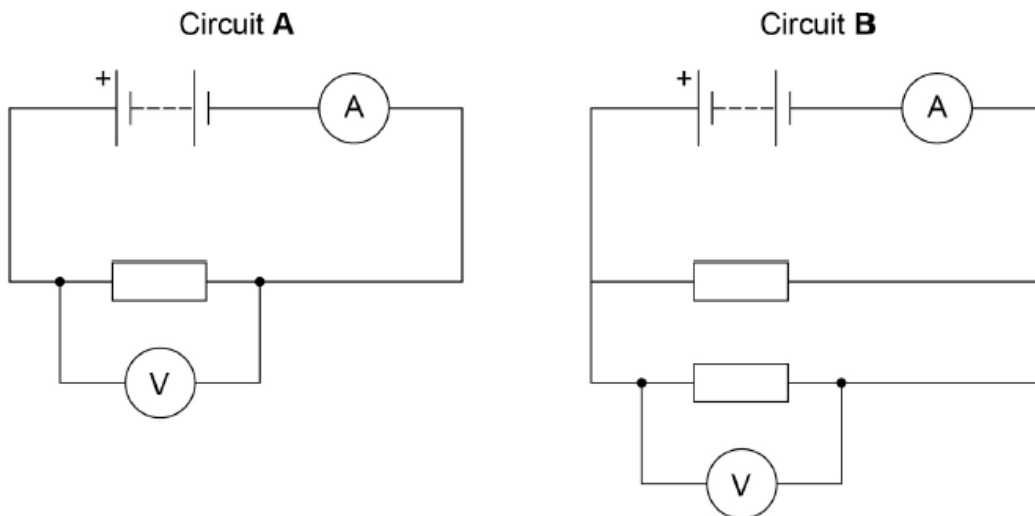
_____

0 5 . 4 **Figure 12** shows two more circuits that the student built using the battery from the TENS machine.

Figure 12

Circuit **A**

Circuit **B**

The resistors all have the same resistance.

Compare the readings on the voltmeter and ammeter in circuit **A** and circuit **B**.

[3 marks]

Voltmeter _____

_____

_____

Ammeter _____

_____

_____