

## Q1. (2018)

0 5 . 4 To heat the house, the boiler transfers 15 MJ of energy in 10 minutes.

Calculate the power of the boiler.

Write any equation that you use.

[4 marks]

## Q2. (2019)

0 3 A hybrid car has an electric motor and a petrol engine.

a)

0 3 . 2 The electric motor in the car is powered by a battery.

To charge the battery, the car is plugged into the mains supply at 230 V

The power used to charge the battery is 6.9 kW

Calculate the current used to charge the battery.

[4 marks]

b)

0 3 . 3 Mains electricity is an ac supply.

Explain the difference between direct and alternating potential difference.

[2 marks]

c)

0 3 . 4 The cable used to connect the car to the mains electricity supply has a low resistance.

Explain why it is better to use a cable with a low resistance than to use a cable with a high resistance.

[2 marks]

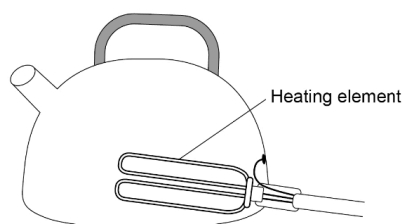
## Q3. (2019)

0 5 A student investigated how the mass of water in an electric kettle affected the time taken for the water to reach boiling point.

The kettle switched off when the water reached boiling point.

Figure 4 shows the kettle.

Figure 4



a)

0 5 . 1 The heating element of the kettle was connected to the mains supply.

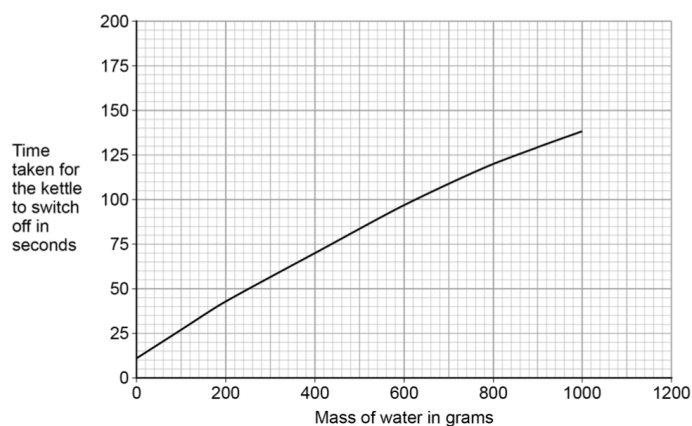
Explain why the temperature of the heating element increased.

[2 marks]

b)

**Figure 5** shows how the mass of water in the kettle affected the time taken for the kettle to switch off.

**Figure 5**



**0 5 . 5** The power of the kettle was 2.6 kW

The kettle took 120 seconds to heat 0.80 kg of water from 18 °C to 100 °C

Calculate the specific heat capacity of water using this information.

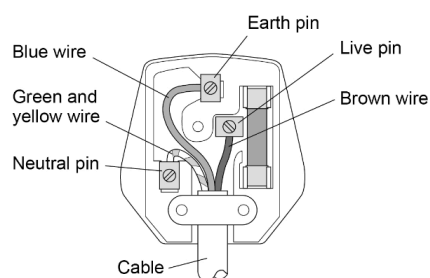
Give your answer to 2 significant figures.

**[6 marks]**

**Q4. (2020)**

**0 1** **Figure 1** shows the inside of a plug.

**Figure 1**



**a)**

**0 1 . 1** The plug is **not** wired correctly.

What should be done to connect the wires in the plug correctly?

**[1 mark]**

**b)**

The correctly wired plug and cable connects a washing machine to the mains electricity supply.

**0 1 . 2** Give the potential difference and frequency of the mains electricity supply in the UK. **[2 marks]**

The potential difference is \_\_\_\_\_ V

The frequency is \_\_\_\_\_ Hz

**c)**

**0 1 . 3** The washing machine is switched on.

What is the potential difference between the neutral wire and the earth wire?

**[1 mark]**

Potential difference = \_\_\_\_\_ V

**d)**

0 1 . 4 The plug has a fuse.

Draw the circuit symbol for a fuse in the space below.

[1 mark]

e)

The washing machine has a metal case.

A fault causes the live wire to make an electrical connection with the metal case of the washing machine.

0 1 . 5 The earth wire is **not** connected to the metal case of the washing machine.

Explain why it would not be safe for a person to touch the metal case.

[2 marks]

f)

0 1 . 6 The earth wire is now connected to the metal case of the washing machine.

Explain why it would now be safe for a person to touch the metal case, even if the live wire touches the metal case.

[2 marks]

Q5. (2021)

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

[1 mark]

Q6. (2021)

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.

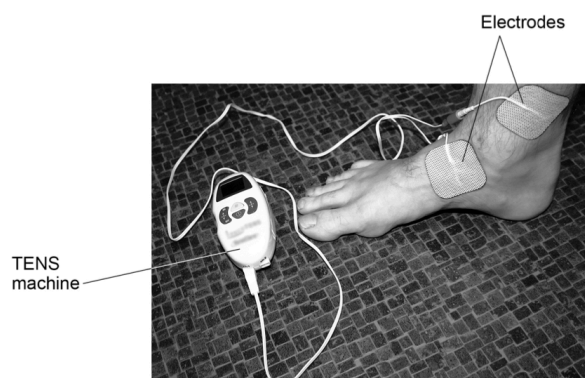
[3 marks]

Q7. (2021)

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



a)

0 5 . 1 The maximum power of the TENS machine is 240 mW.

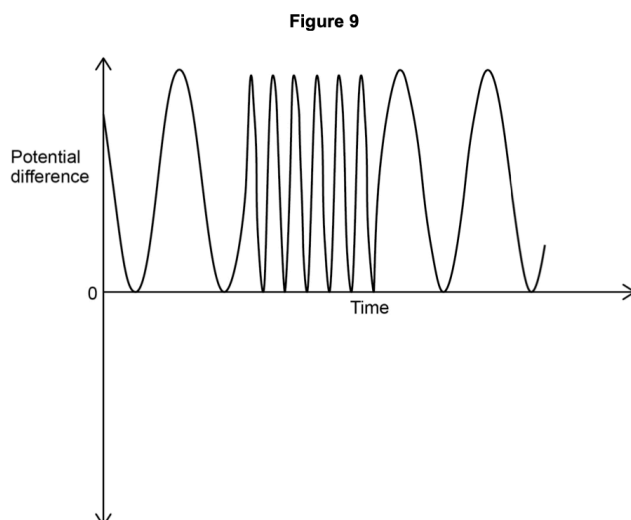
The potential difference across the battery in the TENS machine is 2.5 V.

Calculate the maximum current from the battery.

[4 marks]

b)

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



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

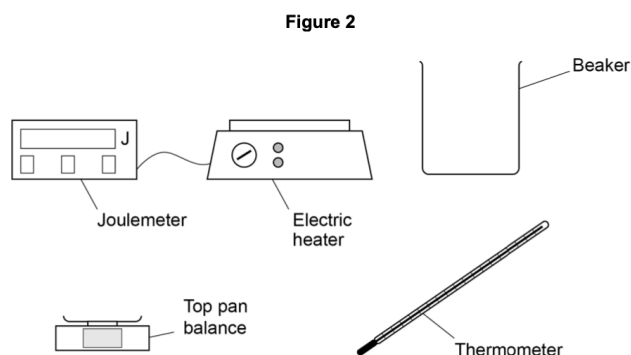
How does **Figure 9** show that the student was **not** correct?

[1 mark]

Q8. (2022)

0 2 A student made measurements to determine the specific heat capacity of vegetable oil.

**Figure 2** shows the equipment used.



A different student did not have a joulemeter and calculated the energy transferred by the electric heater.

Use the Physics Equations Sheet to answer questions **02.3** and **02.4**.

a)

0 2 . 3 Write down the equation linking energy transferred ( $E$ ), power ( $P$ ) and time ( $t$ ).

[1 mark]

b)

0 2 . 4 The electric heater had a power output of 50 watts.

Calculate the time taken for the electric element to transfer 4750 joules of energy to the vegetable oil.

[3 marks]

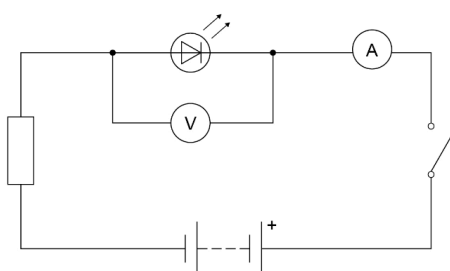
### Q9. (2022)

0 5 The camera in a mobile phone uses an LED to provide light when taking a photograph.

A student investigated how the potential difference across an LED varies with the current in it.

Figure 9 shows the circuit used.

Figure 9



0 5 . 2 The student changed the circuit so that the LED emitted light.

The current in the circuit was 290 mA

The power of the LED was 0.98 W

Calculate the potential difference across the LED.

Use the Physics Equations Sheet.

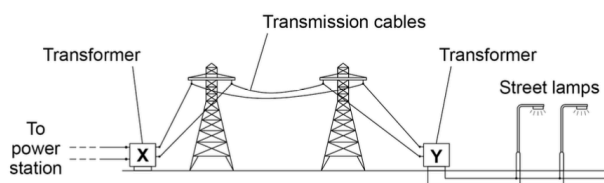
Give your answer to 2 significant figures.

[5 marks]

### Q10. (2023)

0 3 Figure 7 shows how the National Grid transfers energy from a power station to some street lamps.

Figure 7



a)

0 3 . 3 Why is the current in each street lamp less than the current in the secondary coil in transformer Y?

[1 mark]

Tick (✓) **one** box.

Current is used up in the cables between Y and each street lamp.

☐

Some of the current is dissipated to the surroundings.

☐

The cables between Y and the street lamps have electrical resistance.

☐

The street lamps are connected in parallel.

☐

b)

**0 3 . 5** When the current in resistor **R** is 20 mA, the power transferred by resistor **R** is 6.0 W.

Calculate the resistance of resistor **R**.

Use the Physics Equations Sheet.

[4 marks]

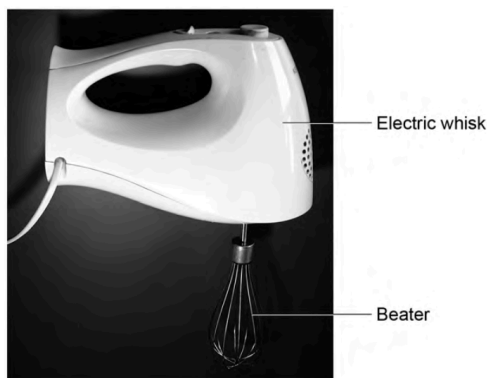
Q11. (2024)

**0 1**

**Figure 1** shows an electric whisk that plugs into the mains electricity supply.

The whisk can mix food by spinning a beater.

**Figure 1**



a)

Use the Physics Equations Sheet to answer questions **01.4** and **01.5**.

**0 1 . 4**

Which equation links current (*I*), power (*P*) and resistance (*R*)?

[1 mark]

Tick (✓) **one** box.

$$P = \frac{I}{R^2} \quad \boxed{\phantom{00}}$$

$$P = IR^2 \quad \boxed{\phantom{00}}$$

$$P = \frac{I^2}{R} \quad \boxed{\phantom{00}}$$

$$P = I^2 R \quad \boxed{\phantom{00}}$$

b)

**0 1 . 5**

The current in the whisk is 500 mA.

The resistance of the whisk is 640 Ω.

Calculate the power of the whisk.

[3 marks]

c)

The whisk has several settings that allow the beater to spin at different speeds.

A faster beater speed needs a greater power input from the mains electricity supply.

**0 1 . 6**

What is the potential difference between the live wire and neutral wire in the mains electricity supply?

[1 mark]

\_\_\_\_\_ V