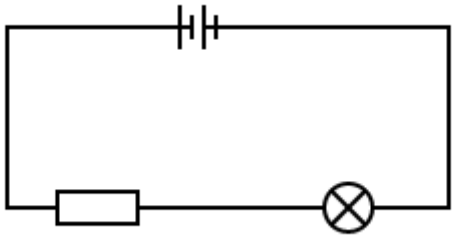
Electricity 3

1. A resistor and a lamp are connected in series to a battery of voltage 12V.



The resistor has a resistance of 10 Ω.

The lamp has a resistance of 20 Ω.

Calculate,

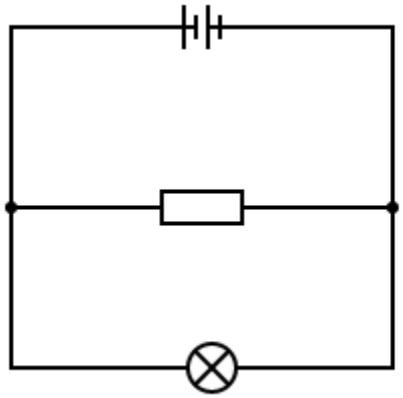
(a) the power dissipated in the resistor.

(b) the power dissipated in the lamp.

(c) the energy supplied by the batter during a period of 5 minutes.

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2. A resistor and a lamp are connected in parallel to a battery of voltage 12V.



The resistor has a resistance of 10 Ω.

The lamp has a resistance of 20 Ω.

Calculate,

(a) the power dissipated in the resistor.

(b) the power of the lamp.

(c) the amount of energy transferred by the lamp during a period of 2 minutes.

3.

Some students carry out investigations with an electric motor.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The students read the statement: 'All the energy supplied to the motor eventually ends up as thermal energy in the surroundings.'

This statement best describes the idea of

(1)

☒ **A** renewable energy

☒ **B** energy efficiency

☒ **C** sustainable energy sources

☒ **D** conservation of energy

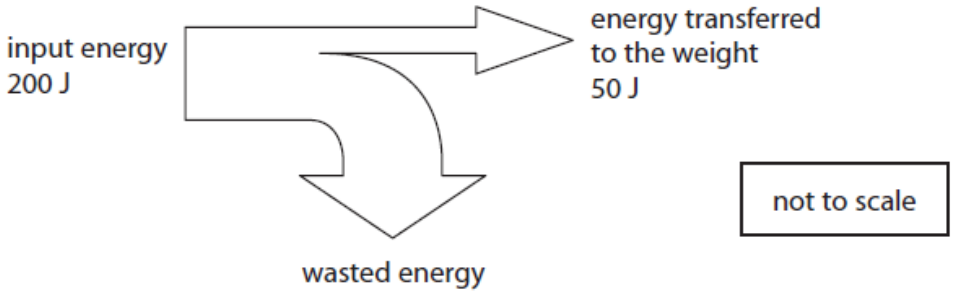
(b) The students use the electric motor to lift a weight.
The current in the motor is 0.5 A.
The potential difference (voltage) across the motor is 6 V.

Calculate the input power to the motor.
State the unit.

(3)

input power = ... unit = ...

(c) The diagram represents the energy transfers in the electric motor.



(i) How much energy is wasted?

(1)

wasted energy = ... J

(ii) Calculate the efficiency of the motor.

(2)

efficiency = ...

(d) The case of the motor is painted black.

Give a scientific reason why the case of the motor is painted black.

(1)

.....

.....

4.

A greenhouse contains an electric heater.



(a) The heater makes good use of the heating effect of an electric current.

Give an example of a device where the heating effect of an electric current is a **disadvantage**.

(1)

.....

.....

(b) This label is attached to the heater.

230 V	500 W
50 Hz	

Use this information to calculate the expected current in the heater.

(3)

current = ... A

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The potential difference across the heater can be measured either in volts or in

(1)

☐ **A** amps per ohm

☐ **B** amps per joule

☐ **C** coulombs per ohm

☐ **D** joules per coulomb

(d) When a charge flows in a resistor, the resistor becomes hot.

Explain why the resistor becomes hot.

(2)

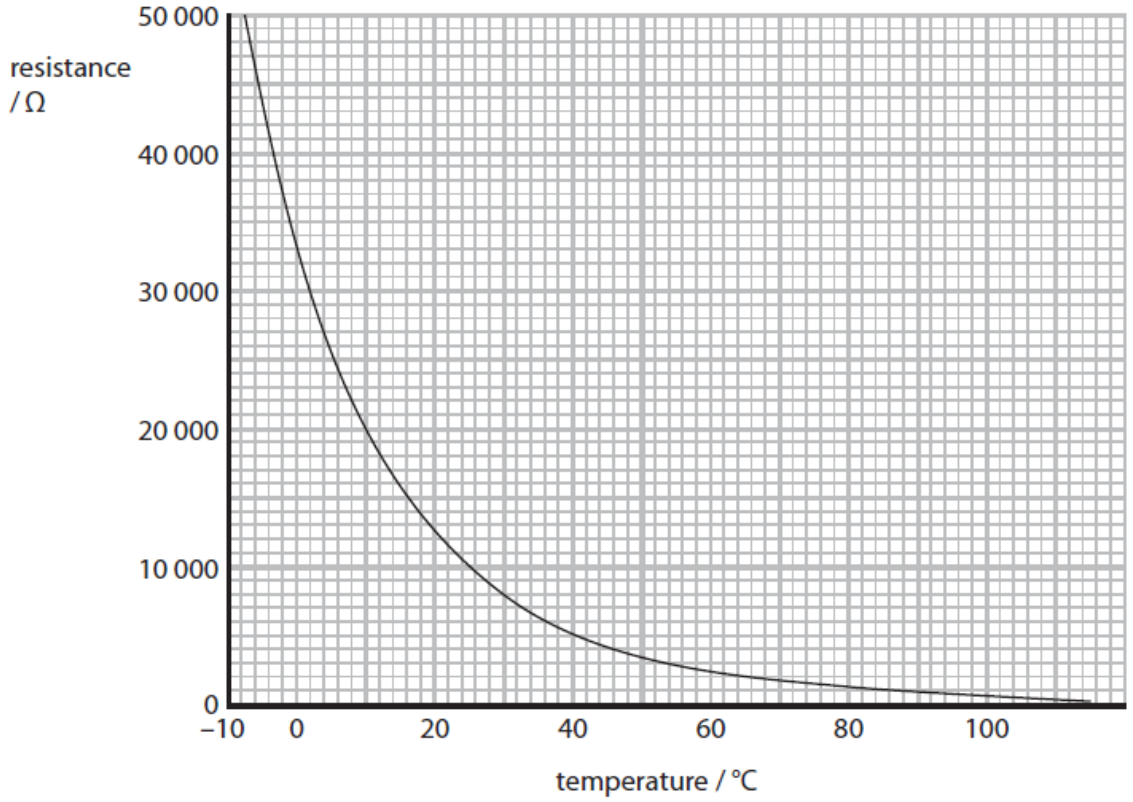
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(e) A thermistor is used to control the heater.
The graph shows how the resistance of the thermistor changes with temperature.



When the temperature is 10 °C, the current in the thermistor is 0.60 mA.

Calculate the potential difference across the thermistor at 10 °C.

(3)

potential difference = ... V

5.

A student uses an electric kettle.



It works from the 230 V mains supply.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

A potential difference of 1 volt is the same as

(1)

☒ **A** 1 joule per coulomb

☒ **B** 1 joule per ohm

☒ **C** 1 watt per ohm

☒ **D** 1 watt per coulomb

(b) The power of the kettle when it is heating water is 1.8 kW.
The mains voltage is 230 V.

(i) Calculate the current in the kettle.

(3)

current = ... A

(ii) The kettle is switched on for 2 minutes.

Calculate the total amount of energy transferred by the kettle in this time.

(2)

energy transferred = ... J

(iii) The heating element of the kettle contains a resistor made from a long length of wire. Explain why an electric current in a resistor makes the resistor heat up.

(2)

.....

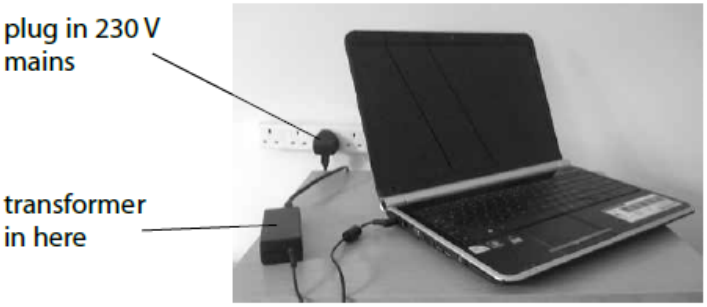
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6.

The photograph shows a laptop computer plugged into the 230 V mains.



(a) The laptop is left on standby.

Its power consumption from the mains is 3.2 W.

The cost of 1 kWh of electrical energy is 14 p.

Calculate the cost of leaving the laptop on standby for 24 hours.

(3)

cost = ... p

(b) When the laptop is in normal use, its power consumption from the mains is 97 W.

Calculate the current drawn from the mains.

(3)

current = ... A

7.

A man monitors how much money he spends on electricity.
He uses a device which calculates the cost of electrical energy used.
He connects his 2.9 kW electric kettle to the 230 V mains supply.

(i) Calculate the current in the kettle element.

(3)

current = ... A

(ii) The device shows that in one week the total cost of the electrical energy used by the kettle is 97 p.
1kW h of electrical energy costs 17 p.

Calculate the length of time for which the kettle has been switched on during the week.

(3)

time = ...hours