AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



EXAM QUESTION PACK

4.2.3 DOMESTIC USES AND SAFETY (PACK 2)

SCORE	PERCENTAGE
/249	%

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

Diagram 1 shows a hairdryer.
Diagram 2 shows how the heaters and fan of the hairdryer are connected to a 3-pin plug.
The hairdryer does not have an earth wire.

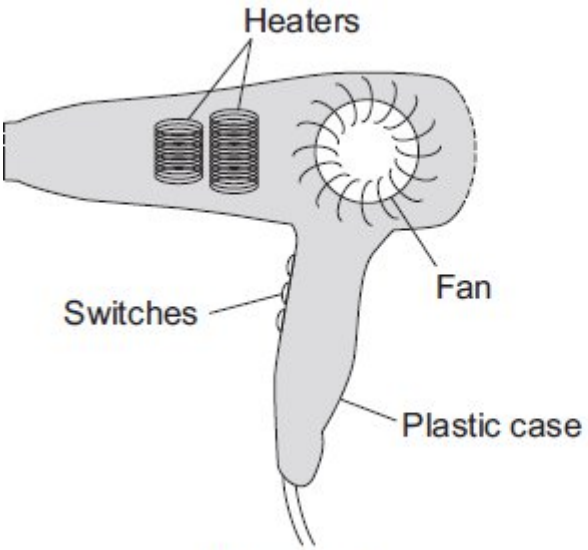


Diagram 1

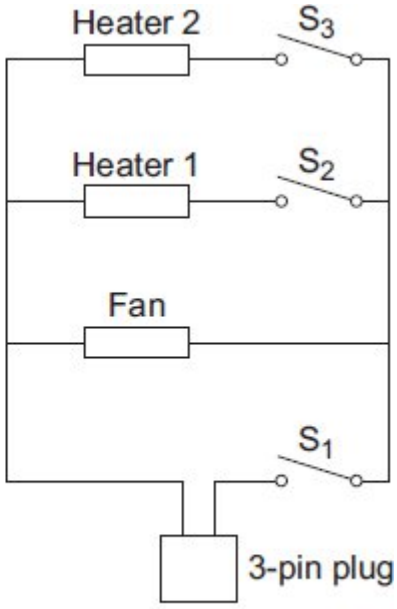


Diagram 2

(a) What colour is the insulation around the wire connected to the live pin inside the plug?

_____

(1)

(b) Why does the hairdryer **not** need an earth wire?

_____

_____

(1)

(c) All the switches are shown in the OFF position.

(i) Which switch or switches have to be ON to make:

(1) only the fan work; _____

(2) heater 2 work? _____

(2)

(ii) The heaters can only be switched on when the fan is also switched on.

Explain why.

_____

_____

STEMUP.CO.UK

_____

_____

_____

(2)

(d) The table shows the current drawn from the 230 volt mains electricity supply when different parts of the hairdryer are switched on.

	Current in amps
Fan only	1.0
Fan and heater 1	4.4
Fan and both heaters	6.5

Calculate the maximum power of the hairdryer.

Show clearly how you work out your answer and give the unit.

_____

_____

Maximum power = _____

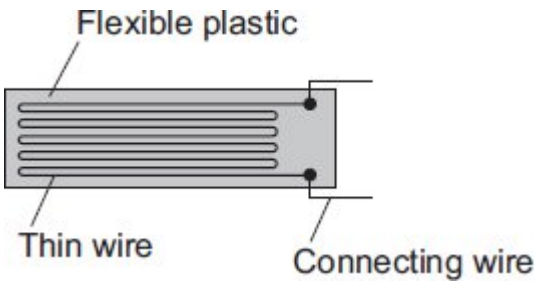
(3)

(Total 9 marks)

Q2.

The diagram shows a strain gauge, which is an electrical device used to monitor a changing force.

Applying a force to the gauge causes it to stretch.
This makes the electrical resistance of the wire change.



STEMUP.CO.UK

(a) (i) Using the correct symbols, **add** to the diagram to show how a battery, an ammeter and a voltmeter can be used to find the resistance of the strain gauge drawn above.

(2)

(ii) When in use, the strain gauge is always connected to a d.c. power supply, such as a battery.

How is a d.c. (direct current) power supply different from an a.c. (alternating current) power supply?

_____

_____

_____

(1)

(b) Before any force is applied, the unstretched gauge, correctly connected to a 3.0 V battery, has a current of 0.040 A flowing through it.

(i) Calculate the resistance of the unstretched gauge.

Show clearly how you work out your answer.

_____

_____

Resistance = _____ Ω

(2)

(ii) Stretching the gauge causes the current flowing through the gauge to decrease.

What happens to the resistance of the gauge when it is stretched?

_____

_____

(1)

(iii) What form of energy is stored in the gauge when a force is applied and the gauge stretches?

_____

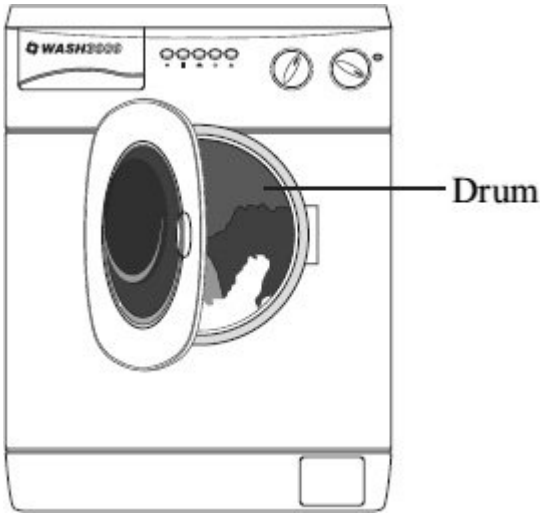
(1)

(Total 7 marks)

Q3.

The picture shows a new washing machine. When the door is closed and the machine switched on, an electric motor rotates the drum and washing.

STEMUP.CO.UK



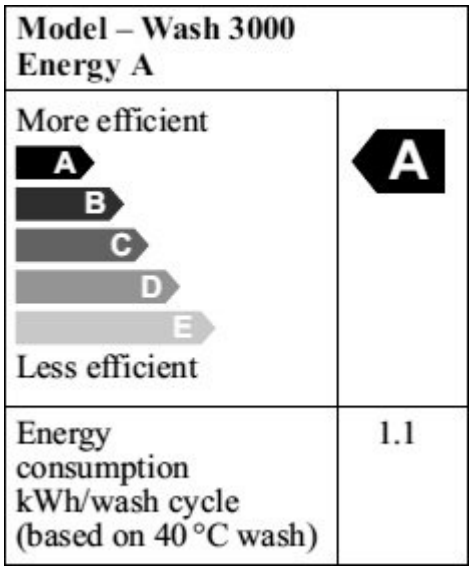
(a) What happens to the energy wasted by the electric motor?

_____

_____

(1)

(b) The diagram shows the label from the new washing machine.



An 'A' rated washing machine is *more energy efficient* than a 'C' rated washing machine.

Explain what being *more energy efficient* means.

_____

_____

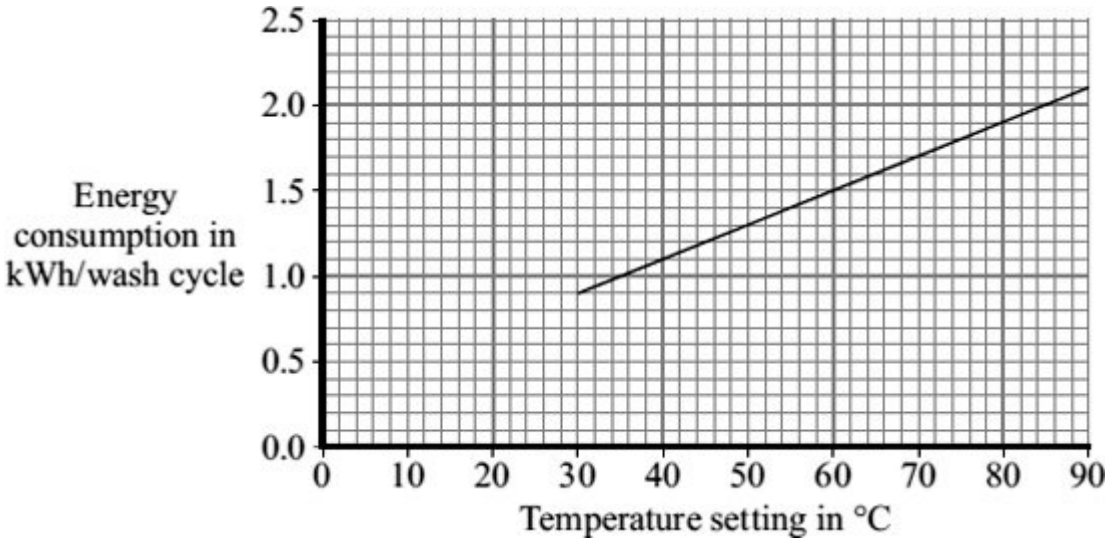
_____

_____

(2)

STEMUP.CO.UK

(c) The graph shows that washing clothes at a lower temperature uses less energy than washing them at a higher temperature. Using less energy will save money.



(i) Electricity costs 12 p per kilowatt-hour (kWh).
The temperature setting is turned down from 40 °C to 30 °C.

Use the graph and equation in the box to calculate the money saved each wash cycle.

total cost = number of kilowatt-hours × cost per kilowatt-hour

Show clearly how you work out your answer.

_____

_____

Money saved = _____ p

(2)

(ii) Suggest why reducing the amount of energy used by washing machines could reduce the amount of carbon dioxide emitted into the atmosphere.

_____

_____

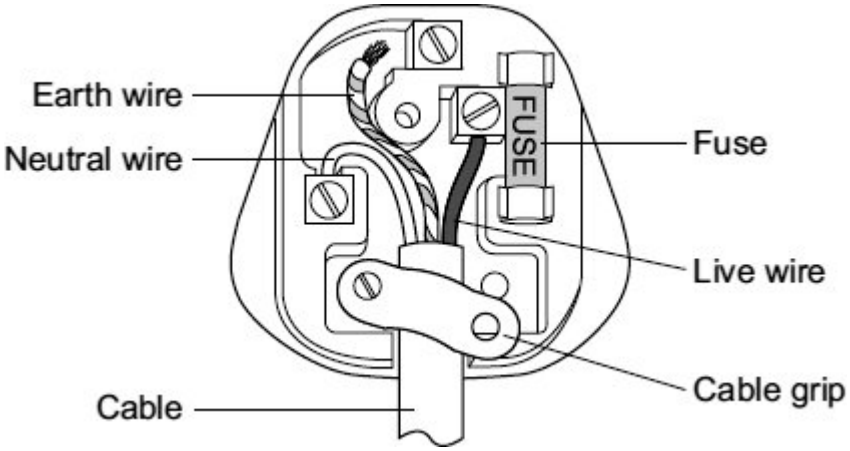
(1)

(Total 6 marks)

Q4.

(a) The diagram shows the inside of an incorrectly wired three-pin plug.

STEMUP.CO.UK



(i) What **two** changes need to be made so that the plug is wired correctly?

1. _____

_____

2. _____

_____

(2)

(ii) Which one of the wires inside a plug is there to make an appliance with a metal case safer to use?

_____

(1)

(iii) The fuse inside a plug is a safety device.

Explain what happens when too much current passes through a fuse.

_____

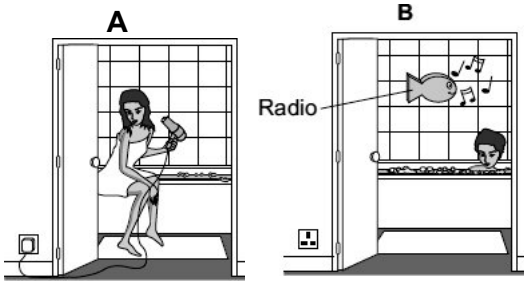
_____

_____

_____

(2)

(b) Each of these pictures shows an electrical appliance being used in a bathroom.



STEMUP.CO.UK

Using the hairdryer in picture **A** is dangerous. However, it is safe to use the battery-operated radio in picture **B**.

Explain why.

_____

_____

_____

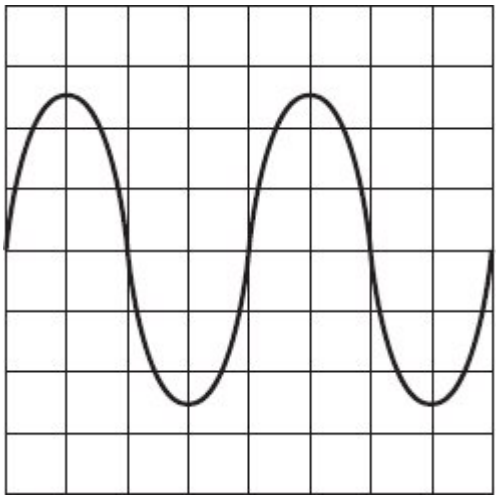
_____

(2)

(Total 7 marks)

Q5.

An oscilloscope is connected to an alternating current (a.c.) supply.
The diagram shows the trace produced on the oscilloscope screen.



Each horizontal division on the oscilloscope screen represents 0.002 s.

(a) Calculate the frequency of the alternating current supply.

Show clearly how you work out your answer and give the unit.

_____

_____

_____

Frequency = _____

(3)

(b) What is the frequency of the a.c. mains electricity supply in the UK?

_____

(1)

(Total 4 marks)

STEMUP.CO.UK

Q6.

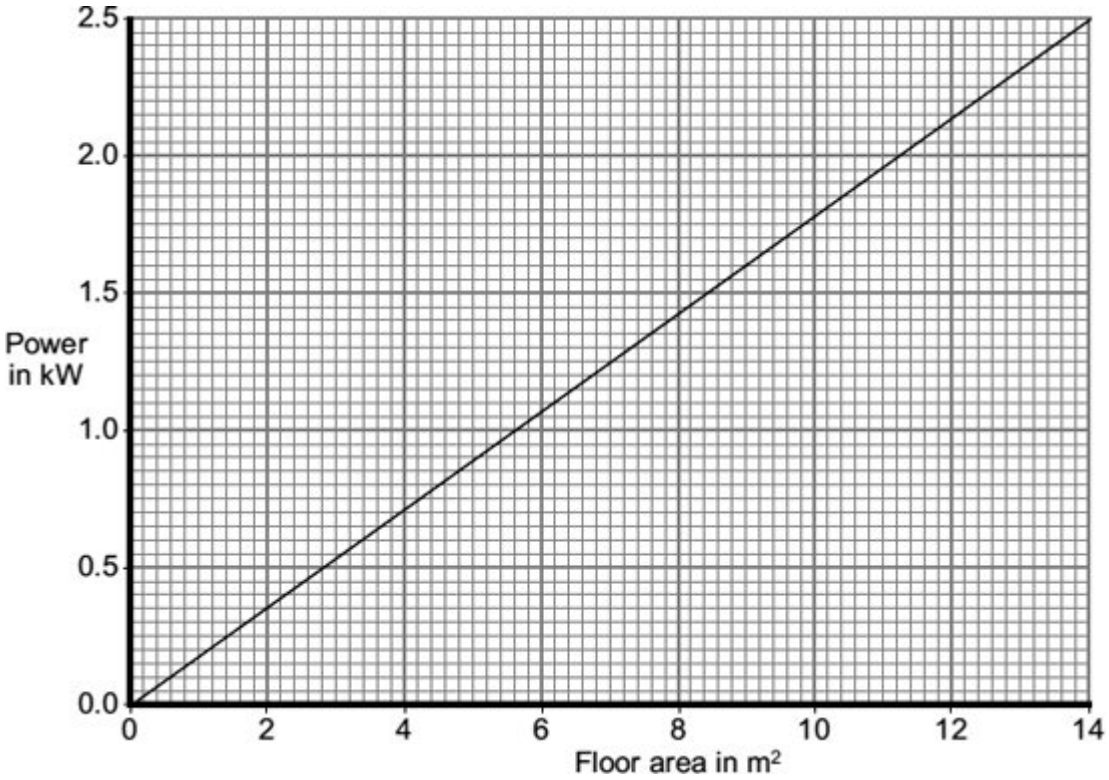
A homeowner has installed electric underfloor heating in the kitchen. When the heating is switched on, an electric current flows through wires running under the tiled floor surface.

(a) What is an electric current?

_____

(1)

(b) The graph shows how the power output of an underfloor heating system depends on the area of the floor that is heated.



The area of the homeowner's kitchen floor is 9.0 m^2.

Calculate, using the graph, the current drawn from the 230 V mains supply by the heating system.

Show clearly how you work out your answer and give the unit.

_____

_____

_____

_____

Current = _____

(4)

(Total 5 marks)

Q7.

STEMUP.CO.UK

(a) Use numbers given in the box to complete the following sentences.

12	**50**	**110**	**230**

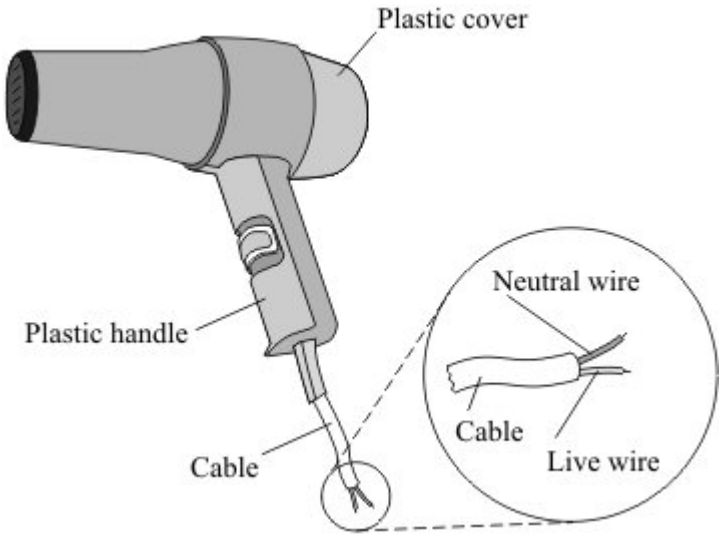
In the UK, the mains electricity supply is _____ volts.

The frequency of the UK mains electricity supply is _____ hertz.

(2)

(b) The diagram shows a hairdryer designed to be used with the UK mains supply.

The cable connecting the hairdryer to the plug does not have an earth wire.



(i) Why does the hairdryer **not** need a cable with an earth wire?

_____

_____

(1)

(ii) Which **one** of the following materials are the two wires inside the cable made from?

Draw a ring around your answer.

aluminium **copper** **steel**

(1)

(Total 4 marks)

Q8.

(a) Describe the difference between an alternating current (a.c.) and a direct current (d.c.).

_____

_____

_____

STEMUP.CO.UK

_____

(2)

(b) The diagram shows the information plate on the bottom of an electric wallpaper steamer.



(i) Calculate the current used by the steamer.

Show clearly how you work out your answer.

_____

_____

Current _____ A

(2)

(ii) Which **one** of the following fuses should be used inside the plug of the steamer?

Draw a ring around your answer.

1 A **3 A** **5 A** **10 A** **13 A**

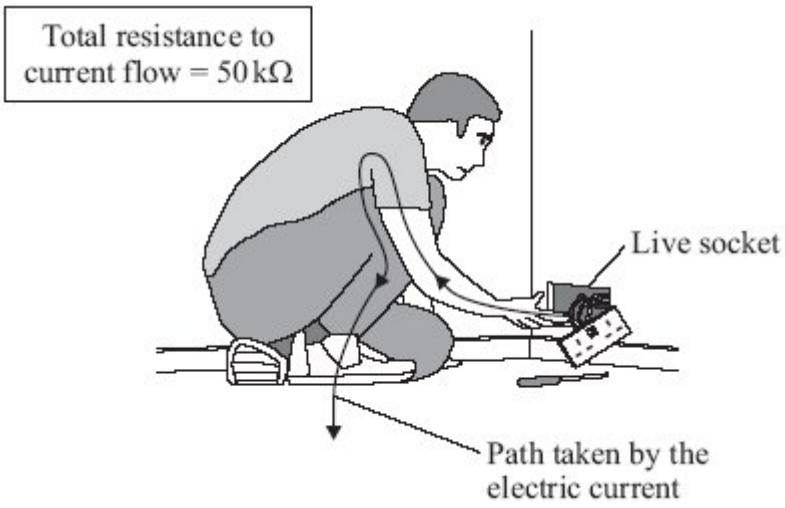
(1)

(Total 5 marks)

Q9.

The diagram shows someone accidentally touching the live wire inside a dismantled 230 volt mains electricity socket.

A current flows through the person giving him an electric shock.



(a) (i) Calculate the current that will flow through the person.

Show clearly how you work out your answer.

STEMUP.CO.UK

_____

_____

Current = _____ A

(2)

(ii) Rubber is a good insulator.

Explain why it is a good idea for electricians to wear rubber soled boots when working.

_____

_____

_____

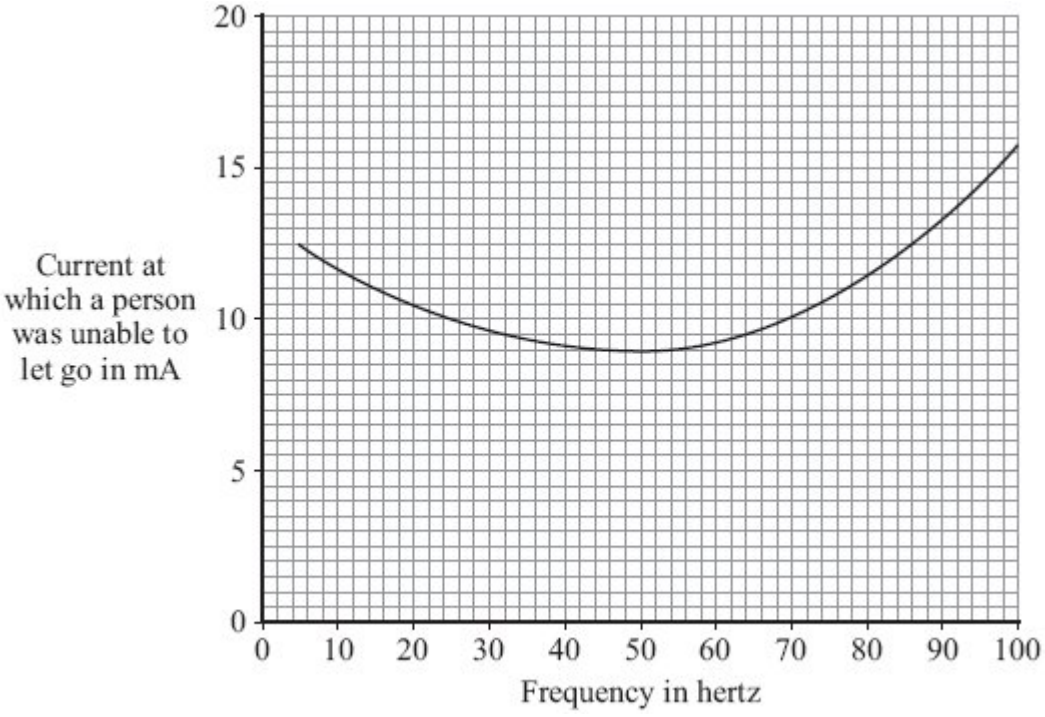
_____

(2)

(b) If the current flowing through a person is too high, the person cannot let go of the electrical source.

Different people were tested to see whether the ability to let go of an electrical source depended on the frequency of the current.

The results of the test are shown in the graph.



(i) What is the frequency of the mains electricity supply in the UK?

_____

(1)

STEMUP.CO.UK

(ii) From a safety point of view, is the frequency of the UK mains electricity supply suitable?

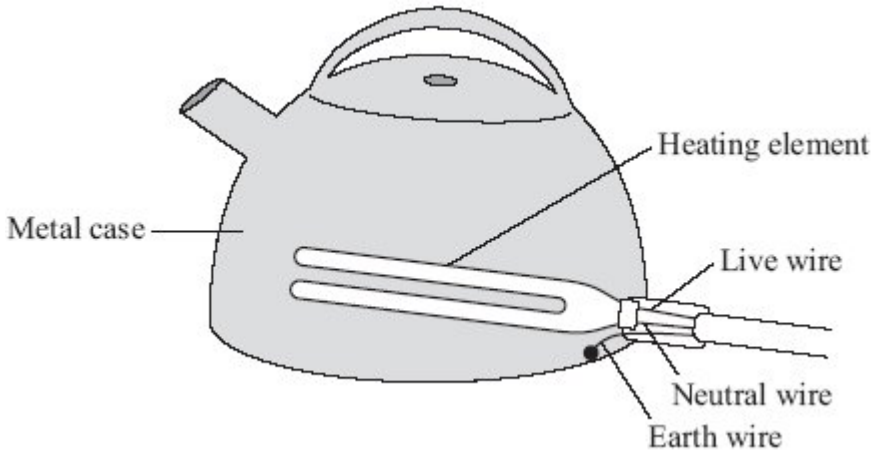
Give a reason for your answer.

_____

_____

(1)

(c) The diagram shows how the electric supply cable is connected to an electric kettle. The earth wire is connected to the metal case of the kettle.



If a fault makes the metal case live, the earth wire and the fuse inside the plug protect anyone using the kettle from an electric shock.

Explain how.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q10.

(a) Each letter **A, B, C, D** and **E** represents an energy transformation.

A electrical to gravitational potential

B electrical to heat

C electrical to kinetic

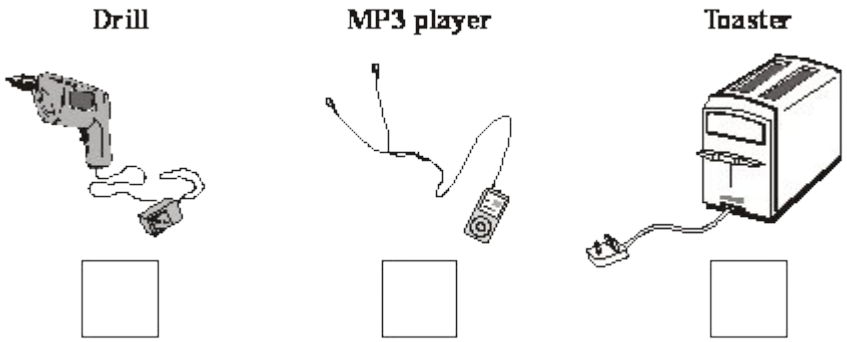
D electrical to light

E electrical to sound

STEMUP.CO.UK

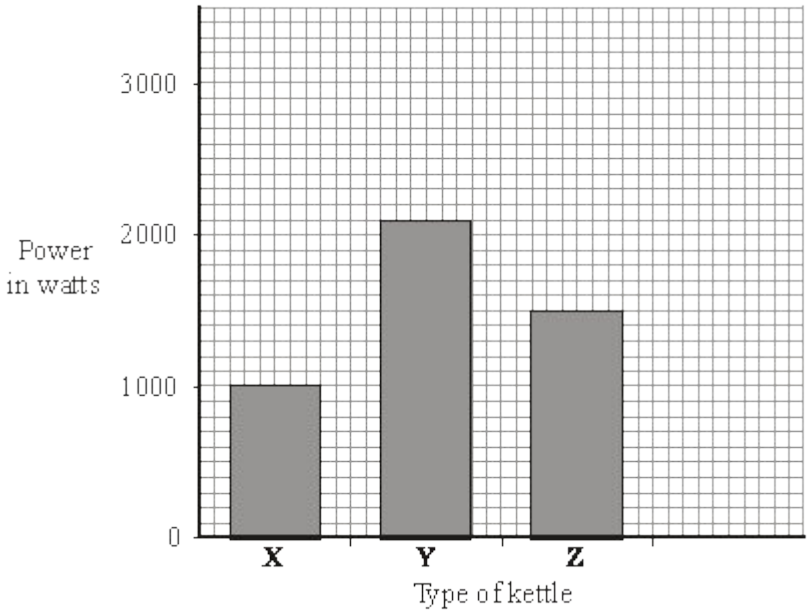
Match each of the following devices to the useful energy transformation that it is designed to make.

Write the correct letter, **A, B, C, D** or **E**, in the box below the device. Use each letter once or not at all.



(3)

(b) The bar chart shows the power of three electric kettles.



(i) What is the power of kettle **Y**?

_____

(1)

(ii) In one week each kettle is used for a total of 30 minutes.

Which kettle costs the most to use?

_____

(1)

(iii) A new 'express boil' kettle boils water faster than any other kettle.

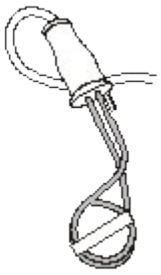
Draw a fourth bar on the chart to show the possible power of an 'express boil' kettle.

(1)

STEMUP.CO.UK

(c) Some friends are going on holiday. They want to be able to boil water to make their own hot drinks. They cannot decide which to take, a travel kettle or a small portable immersion heater that can be placed in a mug.





Travel Kettle
• 1 k W element
• Holds 1 litre
• Works on 110V or 230V
• Washable water filter

Immersion heater
• 0.4 k W element
• Heates up to 0.5 litres of water
• Works on 230 V only
• Small compact size

(i) Give **one** advantage of taking the travel kettle.

_____

_____

(1)

(ii) Give **one** advantage of taking the immersion heater.

_____

_____

(1)

(Total 8 marks)

Q11.

(a) Look at this electrical safety information poster.

STEMUP.CO.UK

Get it right!
Choose the right fuse.

Most fuses are 3 A or 13 A.

To choose the right fuse you must know the power of the appliance.



Power is marked on the information plate.

Power over 700 W use a 13 A fuse.	Power under 700 W use a 3 A fuse.
• Fan heaters • Kettles • Dishwashers • Washing machines	• Radios • Table lamps • Portable TVs • Electric blankets

(i) Complete the table to show which size fuse, 3 A or 13 A, should be fitted to each of the appliances.

Appliance	Power rating	Fuse
Hairdryer	1600 W	
Electric saw	350 W	
Food mixer	1200 W	

(2)

(ii) The plug of an electric kettle has been wrongly fitted with a 3 A fuse.

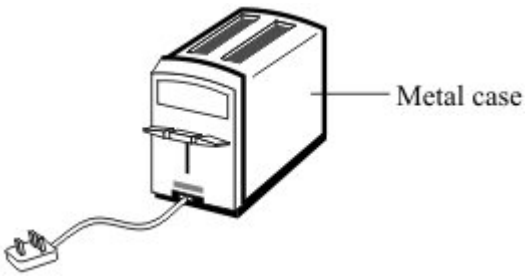
What will happen to the fuse when the kettle is switched on?

_____

_____

(1)

(b) The drawing shows a toaster, which takes a current of 4 A from the 230 V mains electricity supply.



(i) Use the equation in the box to calculate the power of the toaster.

STEMUP.CO.UK

Power (watt, W)	=	current (ampere, A)	×	potential difference (volt, V)

Show clearly how you work out your answer.

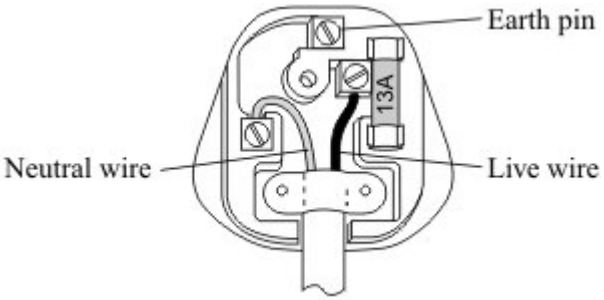
_____

_____

Power = _____ W

(2)

(ii) A householder rewires the toaster with a new cable and plug. The diagram shows how the new cable has been connected to the plug.



Explain why the toaster may **not** be safe to use.

_____

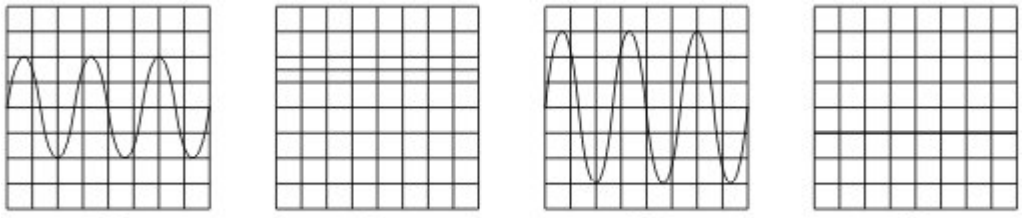
_____

_____

_____

(2)

(c) The diagram shows the oscilloscope traces produced by four different electricity supplies. The settings on the oscilloscope are the same for each electricity supply.



(i) Which **two** supplies give a direct current (d.c.)?

_____ and _____

(1)

(ii) Supply **K** provides a peak potential difference of 6 V.

What is the peak potential difference provided by supply **M**?

STEMUP.CO.UK

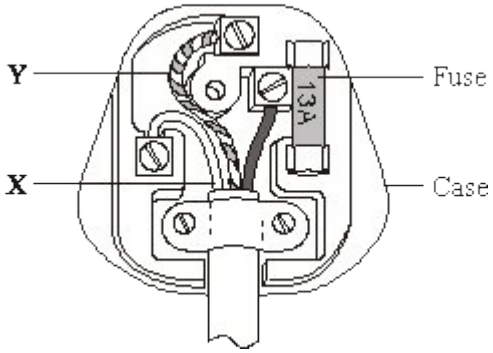
_____

(1)

(Total 9 marks)

Q12.

(a) The diagram shows the inside of a correctly wired three-pin plug.



(i) What colour is the insulation on the wire labelled **X**?

Draw a ring around your answer.

blue **brown** **green/yellow**

(1)

(ii) What name is given to the wire labelled **Y**?

Draw a ring around your answer.

earth **live** **neutral**

(1)

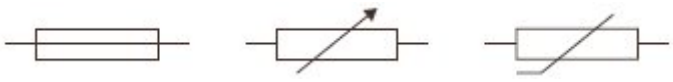
(iii) What material would be suitable for the case of the plug?

_____

(1)

(iv) Which **one** of the following is the correct circuit symbol for a fuse?

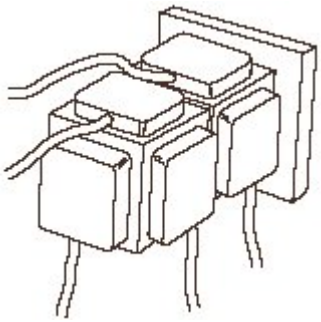
Draw a ring around your answer.



(1)

(b) A householder does not have enough electric sockets in the kitchen. To overcome the problem, the householder uses two adaptors to plug five appliances into a single electric socket.

STEMUP.CO.UK



Explain why this is dangerous.

_____

_____

_____

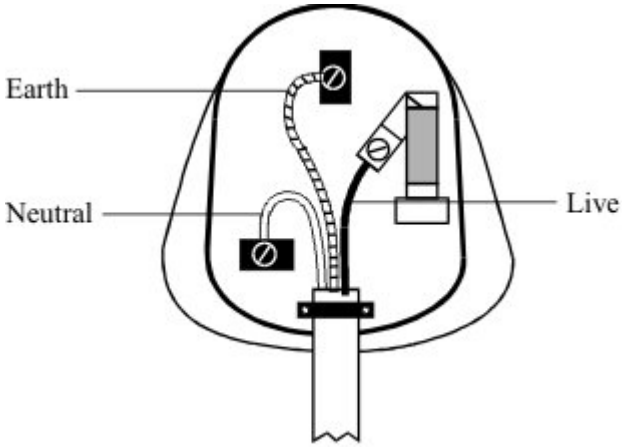
_____

(2)

(Total 6 marks)

Q13.

The diagram shows the inside of a mains plug.



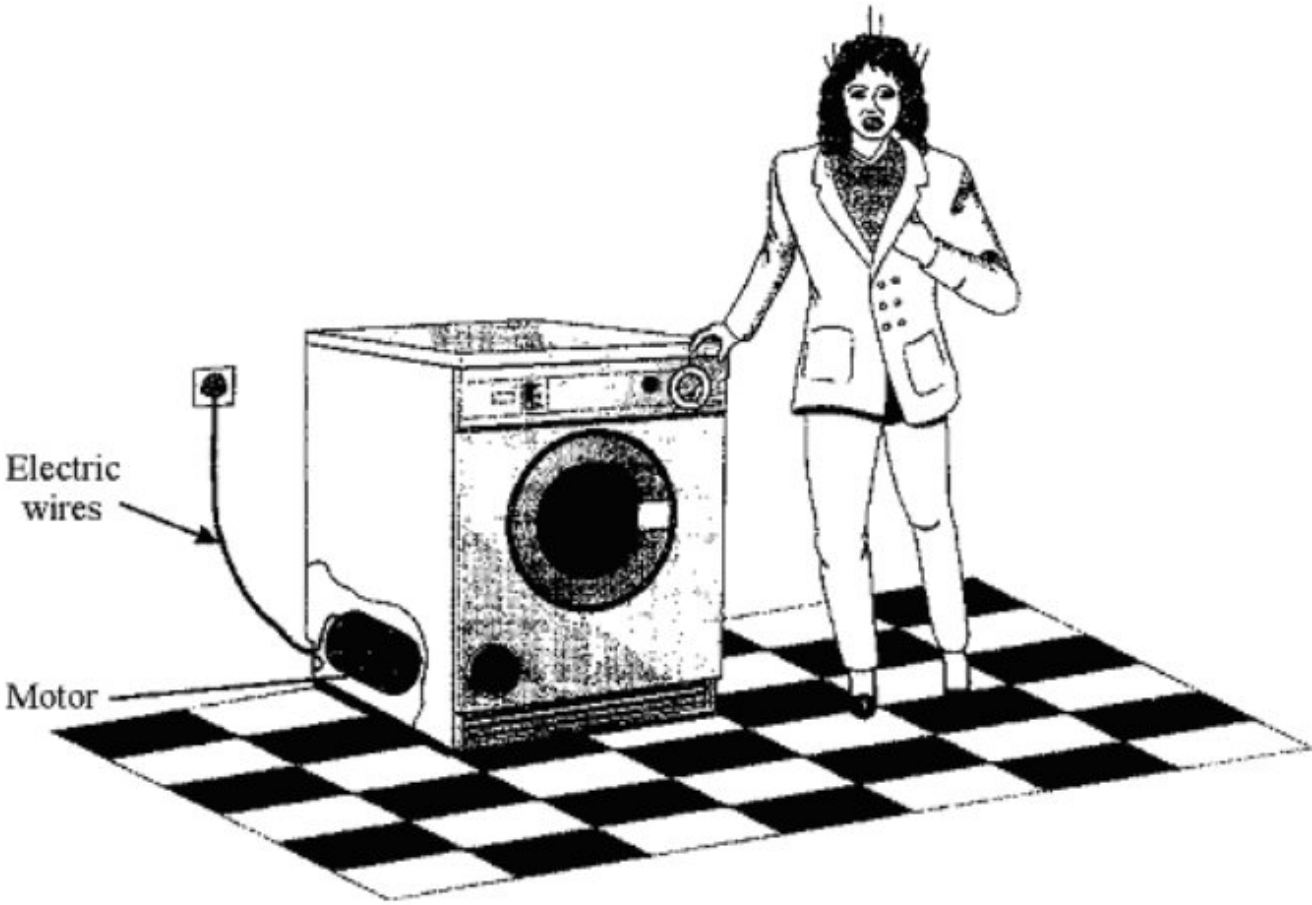
(a) Complete the table.

Wire	Colour of insulation
Earth	
Live	
Neutral	

(3)

(b) The diagram shows a washing machine without an earth connection. The live wire has become loose and is touching the metal case of the washing machine.

STEMUP.CO.UK



(i) Draw on the diagram the path taken by the electricity when the person touches the metal case of the machine.

(1)

(ii) Describe how the path of the electricity would change if the washing machine had an earth connection.

_____

_____

_____

(2)

(c) Some electrical appliances use a cable which does not have an earth wire. Which **one** of the following appliances can safely use this type of cable?

hairdrier iron refrigerator

_____

Give a reason for your answer.

_____

_____

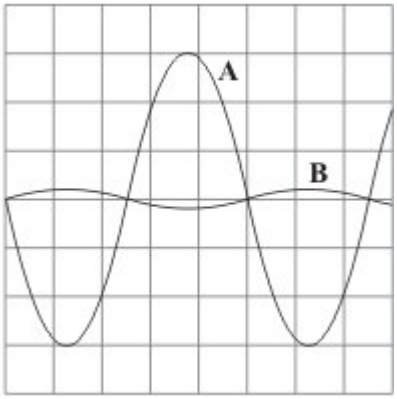
(2)

(Total 8 marks)

STEMUP.CO.UK

Q14.

The diagram shows two oscilloscope traces, **A** and **B**.



Trace **A** shows how the potential difference between the live and neutral terminals of an electricity supply changes with time.

(a) Describe how the potential of the live terminal varies with respect to the neutral terminal of the electricity supply.

_____

_____

(2)

(b) What does trace **B** show?

_____

_____

(1)

(c) Each horizontal division on the oscilloscope represents 0.005 s.

(i) What is the period of this electricity supply?

_____

Period = _____ seconds

(1)

(ii) Calculate the frequency of the supply.

_____

Frequency = _____ hertz

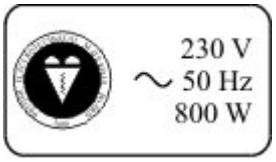
(1)

(Total 5 marks)

Q15.

The information plate on a hairdrier is shown.

STEMUP.CO.UK



(a) What is the power rating of the hairdrier?

_____

(1)

(b) (i) Write down the equation which links current, power and voltage.

_____

(1)

(ii) Calculate the current in amperes, when the hairdrier is being used. Show clearly how you work out your answer.

_____

_____

_____

_____

Current = _____ amperes

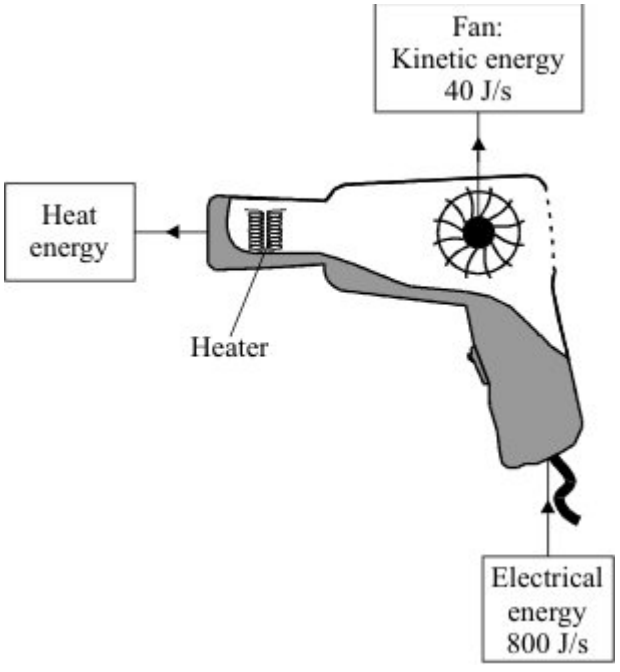
(2)

(iii) Which **one** of the following fuses, 3A, 5A or 13A, should you use with this hairdrier?

_____

(1)

(c) The hairdrier transfers electrical energy to heat energy and kinetic energy.



STEMUP.CO.UK

Calculate the efficiency of the hairdrier in transferring electrical energy into heat energy.

_____

_____

_____

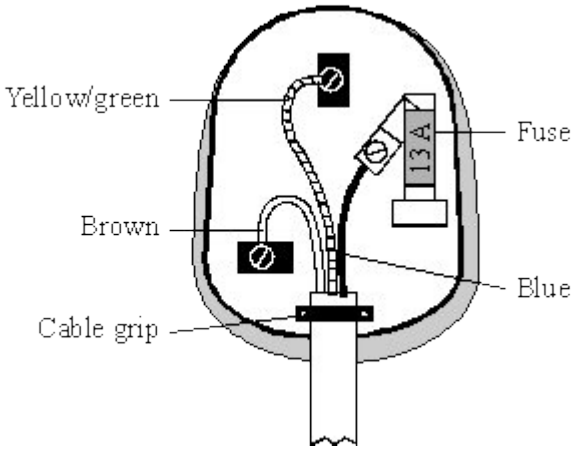
Efficiency = _____

(2)

(Total 7 marks)

Q16.

(a) The diagram shows a 13 amp plug.



(i) What is wrong with the way this plug has been wired?

_____

_____

(1)

(ii) Why do plugs have a fuse?

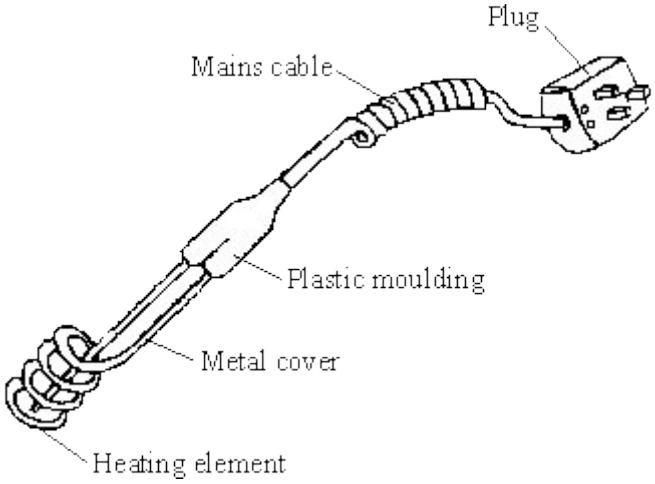
_____

_____

(1)

(b) The diagram shows an immersion heater which can be used to boil water in a mug.

STEMUP.CO.UK



Which part of the immersion heater should be connected to the earth pin of the plug?

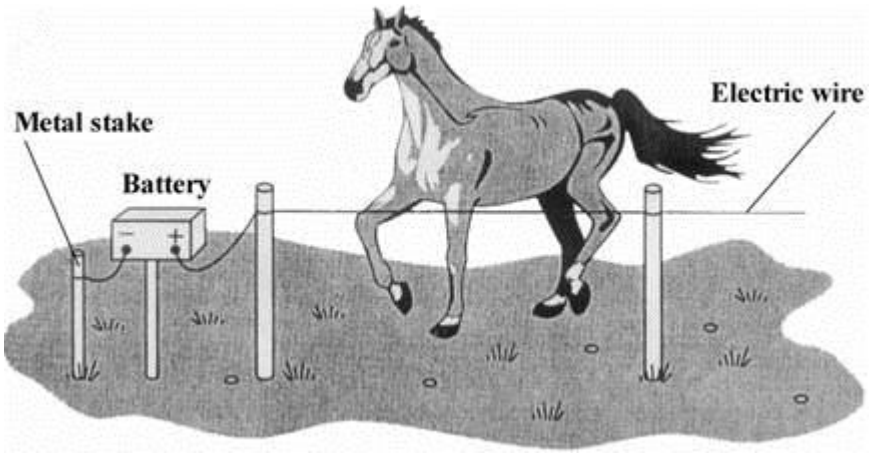
_____

(1)

(Total 3 marks)

Q17.

(a) The diagram shows an electric fence, designed to keep horses in a field.



When a horse touches the wire the horse receives a mild electric shock. Explain how.

_____

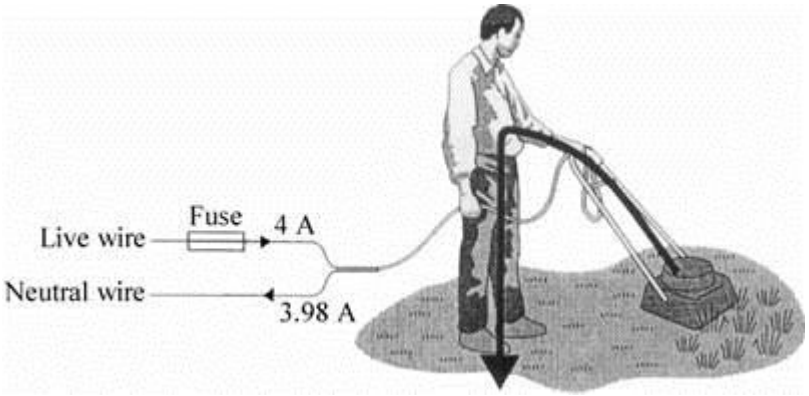
_____

_____

(2)

(b) The diagram shows how a person could receive an electric shock from a faulty electrical appliance. Using a residual circuit breaker (RCB) can help to protect the person against receiving a serious shock.

STEMUP.CO.UK



(i) Compare the action of an RCB to that of a fuse.

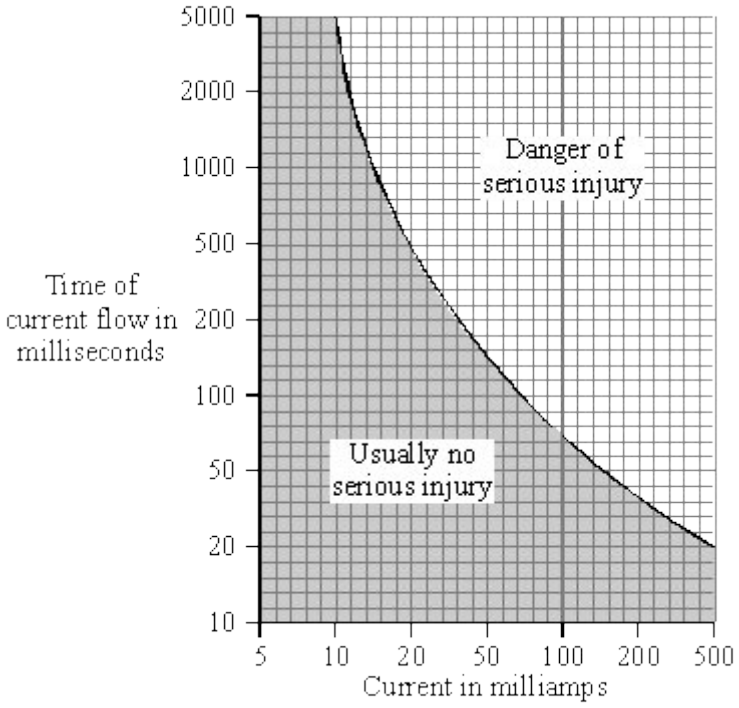
_____

_____

_____

(2)

(ii) The graph illustrates how the severity of an electric shock depends upon both the size of the current and the time for which the current flows through the body.



Within how long must the RCB cut off the current if the person using the lawnmower is to be in no danger of serious injury?

_____

_____

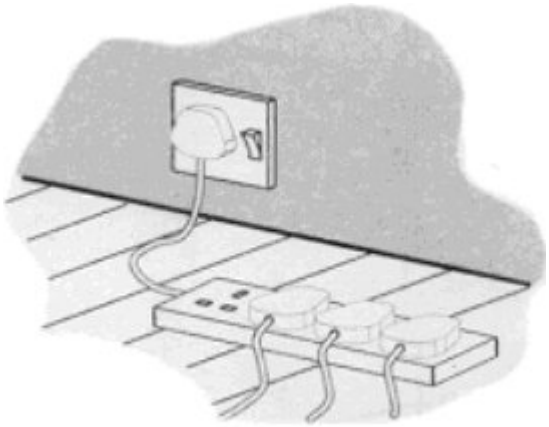
Time = _____ milliseconds

STEMUP.CO.UK

(2)
(Total 6 marks)

Q18.

(a) An adaptor can be used to connect up to four appliances in parallel to one 230 V mains socket. The adaptor is fitted with a 13 A fuse. The table gives a list of appliances and the current they draw from a mains socket.



Appliance	**Current**
computer	1 A
hairdryer	4 A
heater	8 A
iron	6 A
television	2 A

(i) What current will flow to the adaptor when the television, computer and hairdryer are plugged into the adaptor?

_____

Current = _____ A

(1)

(ii) Write down the equation which links current, electrical power and voltage.

_____

(1)

(iii) Calculate the electrical power used when the television, computer and hairdryer are plugged into the adaptor. Show clearly how you work out your answer and give the unit.

_____

_____

STEMUP.CO.UK

_____

Electrical power = _____

(2)

(iv) What would happen to the fuse if the heater is also plugged into the adaptor?

Give a reason for your answer.

_____

_____

(2)

(b) The diagram shows **two** of the appliances.



Iron



Hairdryer

(i) For safety reasons, it is important that the iron has an earth wire connected to its outer metal case. Explain why.

_____

_____

_____

_____

(2)

(ii) The hairdryer does not have an earth wire. It is safe to use because it is double *insulated.* Explain what the term *double insulated* means.

_____

_____

_____

_____

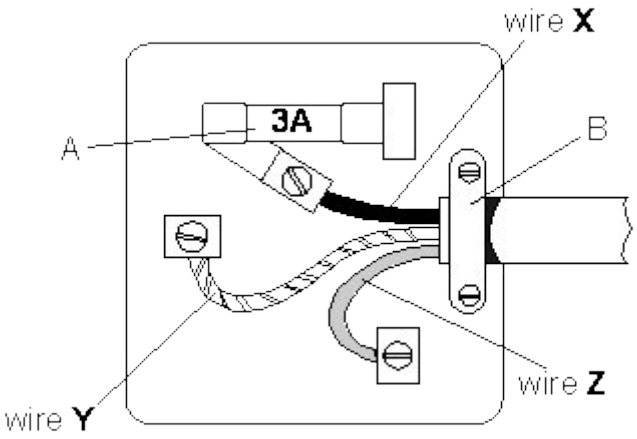
(2)

(Total 10 marks)

Q19.

The diagram below shows an electric mains plug.

STEMUP.CO.UK



(a) Name the parts of the plug labelled **A** and **B.**

A _____

B _____

(2)

(b) Name the colour of each of the wires **X, Y** and **Z.**

X _____

Y _____

Z _____

(3)

(c) Name a suitable material for the case of the plug.

_____

(1)

(d) Electric fires have three wires connected in the plug. One is the live wire to feed electric current in, another is the neutral (return) wire.

(i) What is the third wire called?

_____

(1)

(ii) Why is it important that the third wire is also connected?

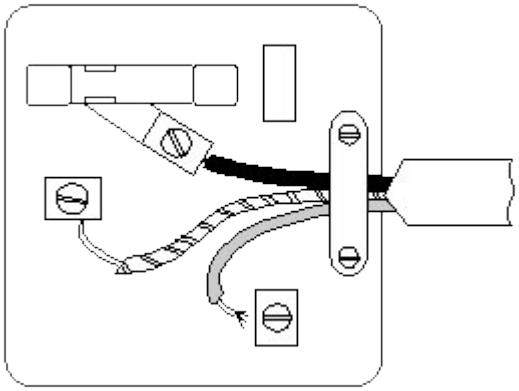
_____

_____

(1)

(e) The diagram below shows a badly wired mains plug.

STEMUP.CO.UK



Look at the plug carefully. What **four** changes should be made to make the plug safe?

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

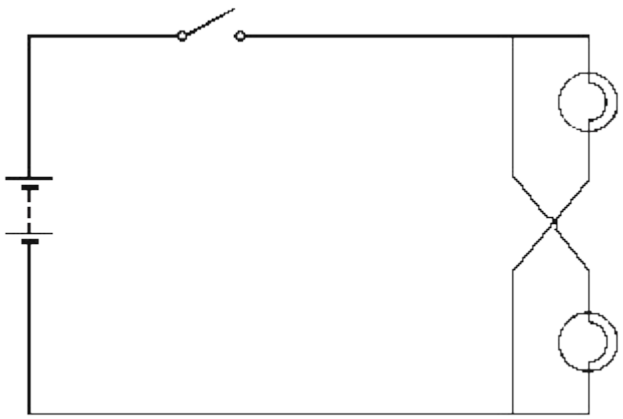
_____

(4)

(Total 12 marks)

Q20.

The circuit diagram below shows a circuit used to supply electrical energy to the two headlights of a car.



The current through the filament of one car headlight is 3.0 A. The potential difference across each of the two headlights is 12 V.

(a) Suggest a suitable fuse for the circuit. _____

(1)

STEMUP.CO.UK

(b) Calculate the resistance of the headlight filament when in use.

_____

_____

_____

_____

Answer _____ W

(2)

(c) Calculate the power supplied to the two headlights of the car.

_____

_____

_____

Answer _____ W

(2)

(d) The fully charged car battery can deliver 72 kJ of energy at 12 V. How long can the battery keep the headlights fully on?

_____

_____

_____

Answer _____ s

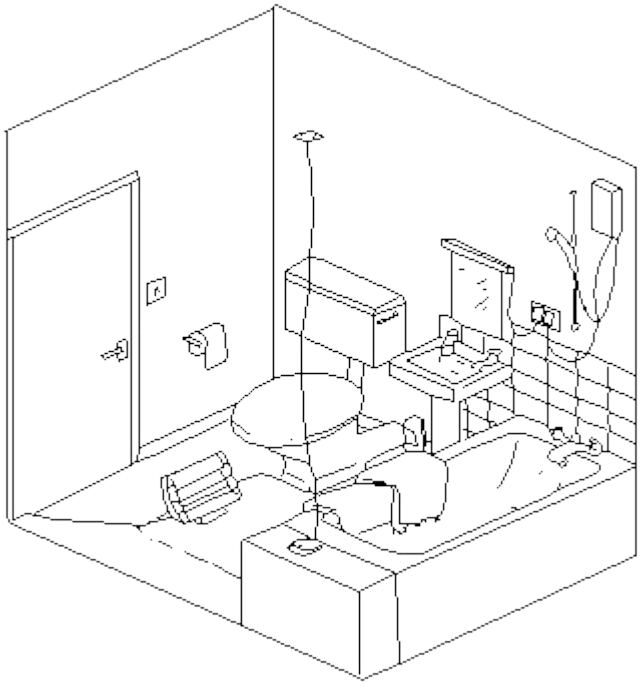
(2)

(Total 7 marks)

Q21.

(a) The picture below shows the bathroom in a house.

STEMUP.CO.UK



Describe **three** examples of dangerous practice in the use of mains electricity in this bathroom.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(b) In the table below three electrical appliances are listed with their power ratings and the number of hours they are used each week.

ELECTRICAL APPLIANCE	POWER RATINGS (W)	TIME USED EACH WEEK (h)	k Wh USED EACH WEEK
TV	200	35	
Kettle	2000	2	
Toaster	1000	1	
Cooker	11 500	7	

(i) Complete the table by inserting the number of kWh used by each appliance each week.

STEMUP.CO.UK

(ii) Which appliance would cost the least to run per week?

_____

(iii) The cost of running a toaster is 8p per week. How much does it cost to run the kettle each week?

_____

_____

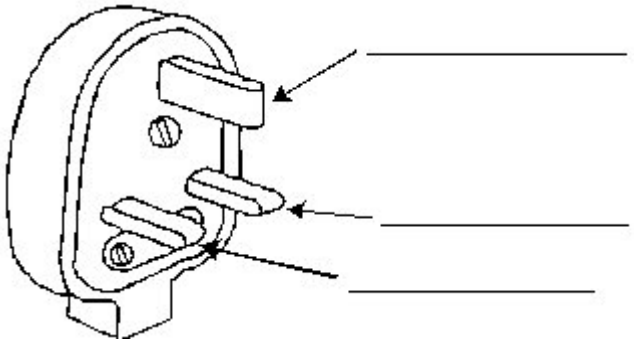
_____

(6)

(Total 9 marks)

Q22.

(a) The diagram below shows the three pins in a mains plug. The pins connect with the live, neutral and earth terminals in a socket.



On the diagram, label each pin to show which is:

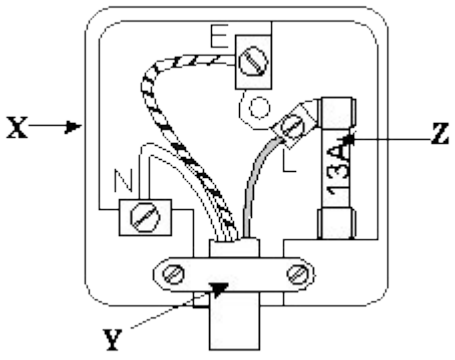
the live pin,

the neutral pin,

the earth pin.

(3)

(b) The diagram below shows the inside of a mains plug.



(i) Name **one** material which could be used for the part labelled **X**.

_____

STEMUP.CO.UK

(ii) Complete the sentences below.

The part labelled **Y** is called the _____ .

This is used to hold the _____ firmly in place.

The component labelled **Z** is the _____ .

(iii) The plug is used with an electric fire.
Which part of the electric fire is connected to the earth pin?

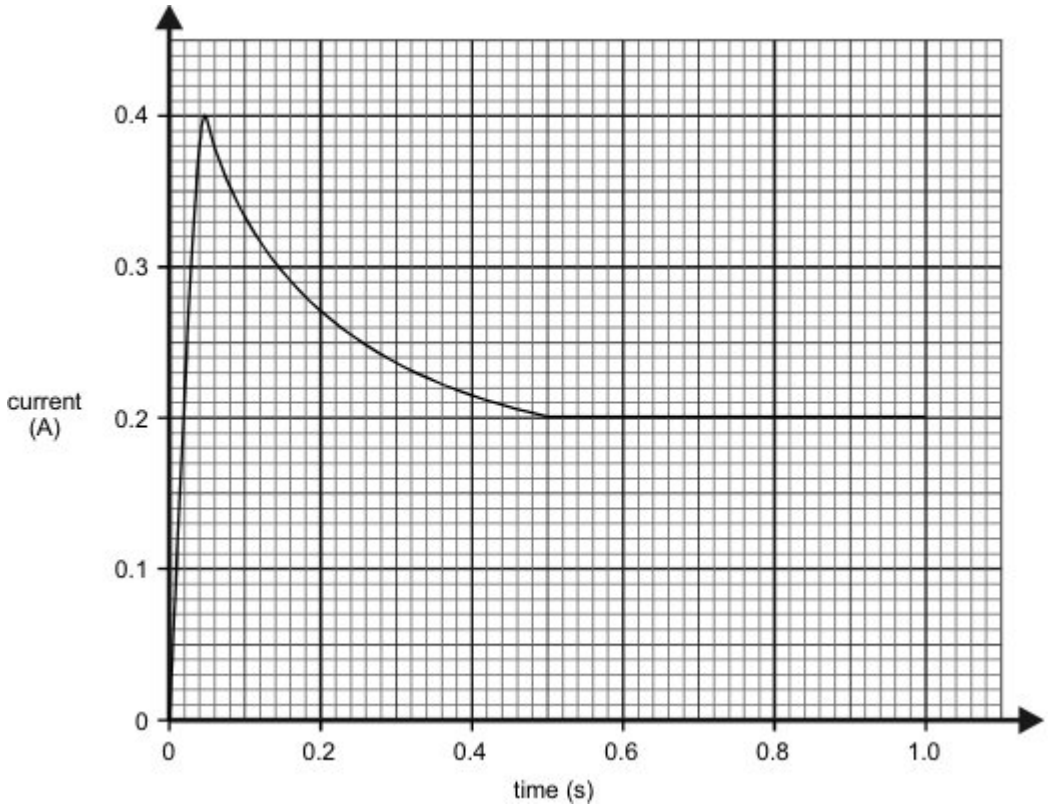
_____

(5)

(Total 8 marks)

Q23.

When a mains lamp is switched on it takes 0.5 seconds for the filament to reach its normal operating temperature. The way in which the current changes during the first second after switching on is shown in the sketch graph below. Mains voltage is 240 V.



(a) Calculate the resistance of the filament whilst the lamp is drawing the **maximum** current.

_____

_____

_____

(3)

STEMUP.CO.UK

(b) Describe how the resistance of the lamp changes after the current has reached its maximum value.

_____

_____

(2)

(c) Calculate the **maximum** power taken by the lamp.

_____

_____

_____

(2)

(d) Calculate the power of the lamp in normal use.

_____

_____

_____

(2)

(e) Calculate the energy used by the lamp in six hours of normal use.

_____

_____

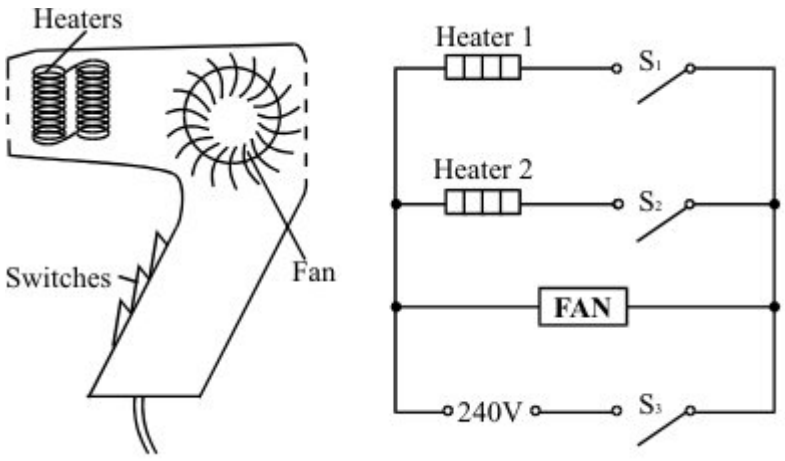
_____

(3)

(Total 12 marks)

Q24.

The diagrams show a hair-dryer and the circuit inside the hair-dryer.



(a) Switches S_1, S_2 and S_3 are all shown in the **OFF** position.

STEMUP.CO.UK

Which switch or switches have to be **ON** to make:

(i) only the fan work? _____

(ii) both heaters work? _____

(2)

(b) (i) What happens to the current in the circuit when the heaters are switched on?

_____

(ii) Suggest why it is important to have the fan working when the heaters are switched on.

_____

_____

_____

(3)

(c) This hair-dryer has a plastic case. It is connected to a mains socket by a 3-pin plug. The cable connecting the hair-dryer to the plug contains only two wires.

(i) Write down the colour of the insulation on the wires.

Wire 1 _____

Wire 2 _____

(ii) Which of the usual three wires is **not** needed?

_____

(iii) This hair-dryer is safe to use without the third wire. Explain why.

_____

_____

_____

(5)

(d) The following information is stamped on the hair-dryer.



(i) Which number tells us how fast the hair-dryer uses energy?

_____

(ii) On what else does the energy used by the hair-dryer depend?

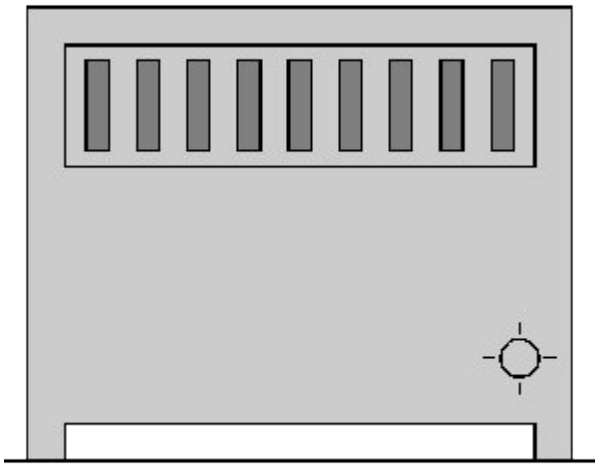
_____

STEMUP.CO.UK

(2)
(Total 12 marks)

Q25.

(a) The diagram shows a fan heater.



(i) A current of 11A flows when the fan heater is working normally.
Fuses of value 3A, 5A, 10A and 13A are available.
Which one should be used in the plug of the fan heater?

_____

(1)

(ii) A fault caused a much higher than normal current to flow in the heater.
Describe what happened to the wire in the fuse.

_____

_____

_____

_____

(2)

(b)

You may find this equation useful when answering this part of the question **energy transferred (kWh) = power (kilowatt, kW) × time (hour, h)**

(i) The power of the fan heater is 2.75 kW.
Calculate how many kilowatt hours of energy are transferred when the fan heater is used for 6 hours.

_____

_____

STEMUP.CO.UK

_____

Number of kilowatt hours _____

(2)

(ii) How much will it cost to use the fan heater for 6 hours if one Unit of electricity costs 7p?

_____

_____

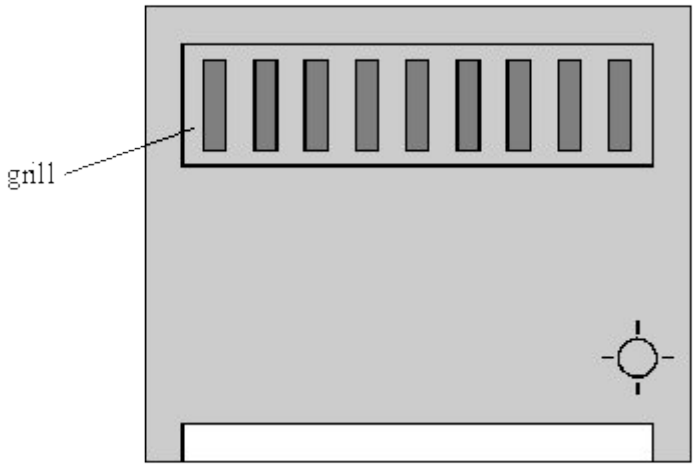
Cost _____ p

(2)

(Total 7 marks)

Q26.

The diagram shows a fan heater.



(a) Complete this sentence.

The fan heater is designed to transfer electrical energy as _____

energy and _____ energy.

(2)

(b) The fan heater is connected to the mains by a three core cable.

(i) Why are the wires in the cable made out of copper?

_____

(ii) Why are the wires in the cable covered by plastic?

_____

(2)

(c)

You may find this equation useful when answering this part of the question

STEMUP.CO.UK

energy transferred (kWh) = power (kilowatt, kW) × time (hour, h)

(i) The power of the fan heater is 2.75 kW.
Calculate how many kilowatt hours (kWh) of energy are transferred when the fan heater is used for 6 hours.

_____

_____

Number of kilowatt hours _____

(2)

(ii) How much will it cost to use the fan heater for 6 hours if one Unit of electricity costs 7p?

_____

_____

Cost _____ p

(2)

(d) A fault caused a much higher than normal current to flow in the heater.
Describe what happened to the wire in the fuse.

_____

_____

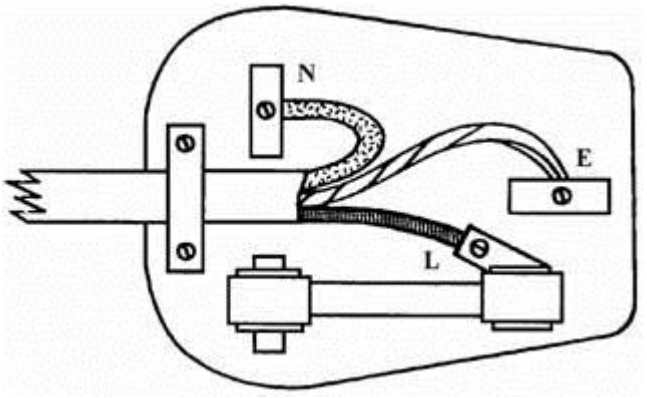
_____

(2)

(Total 10 marks)

Q27.

The diagram shows the inside of a 3-pin plug.



(a) What colour wire should be connected to each terminal?

Terminal **E** _____

STEMUP.CO.UK

Terminal **N** _____

Terminal **L** _____

(3)

(b) Name **two** parts inside the 3-pin plug which help to make it safe.

1. _____

_____

2. _____

_____

(2)

(Total 5 marks)

Q28.

(i) Write the equation which shows the relationship between the electric *current*, the *power* and the *voltage*.

_____

_____

(1)

(ii) Calculate the power if the current is 5 A and the voltage is 400 000 V. Show clearly how you work out your answer and give the unit.

_____

_____

Power = _____

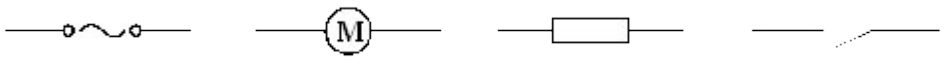
(2)

(Total 3 marks)

Q29.

In a hairdryer circuit there is a heater and a motor. It is important that the motor is always running when the heater is switched on.

(a) Using the symbols shown below only **once** each, draw a circuit for a hairdryer.



STEMUP.CO.UK

(2)

(b) Modern hairdryers are described as *double insulated.*

Explain what this term means.

_____

_____

_____

(2)

(c) On a modern hairdryer handle it states:

1600 W 230 V 50 Hz

(i) [A] Write an equation which shows the relationship between current, power and voltage.

_____

(1)

[B] Calculate the current in the hairdryer when it is on full power.
Show clearly how you get your answer.

_____

_____

Current = _____ A

(2)

(ii) [A] Write an equation which shows the relationship between current, resistance and voltage.

_____

(1)

[B] The resistance of the heater is 20 ohms. Calculate the resistance of the motor.

Show clearly how you get your answer.

_____

_____

Resistance = _____ ohms

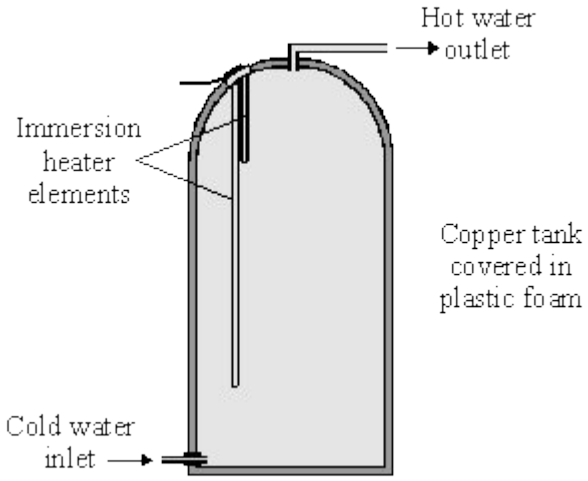
(2)

(Total 10 marks)

Q30.

The diagram shows a type of electric immersion heater in a hot water tank. These hot water tanks are normally found in airing cupboards.

STEMUP.CO.UK



Information on the immersion heater states:

230 V
10 A

(a) (i) What is the equation which shows the relationship between power, current and voltage?

_____

(1)

(ii) Calculate the power of the heater. Show clearly how you get to your answer and give the units.

_____

Power = _____

(2)

(b) (i) What rating of fuse should be in the immersion heater circuit?

_____

(1)

(ii) There are three wires in the cable to the immersion heater. Two of the wires are connected to the immersion heater. The third wire is connected to the copper tank.

Explain the function of this third wire and the fuse in the circuit.

_____

_____

_____

_____

(3)

(c) (i) What is the equation which shows the relationship between resistance, current and voltage?

STEMUP.CO.UK

_____

(1)

(ii) Calculate the resistance of the heater. Show clearly how you get to your answer and give the units.

_____

Resistance = _____

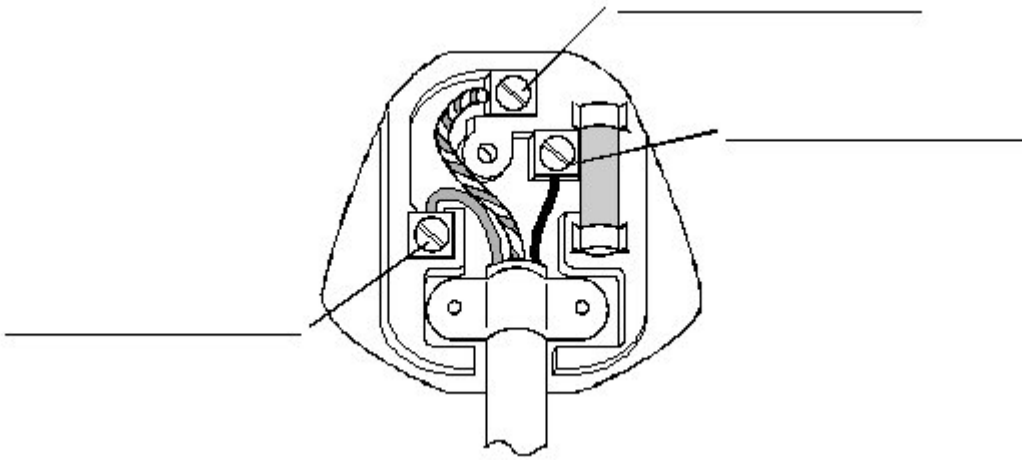
(2)

(Total 10 marks)

Q31.

The diagram shows the inside of a mains plug.

(a) Label the earth, live and neutral pins.



(3)

(b) (i) Explain how the earth wire and the fuse protect a person from an electric shock when there is a short circuit to the metal case of an appliance.

_____

_____

_____

_____

_____

_____

(4)

(ii) What is the most appropriate size fuse rating for a fuse in a television?

Circle the correct answer.

3 A 5 A 13 A

(1)

(Total 8 marks)

STEMUP.CO.UK

Q32.

A combination oven can cook food by using three methods; a microwave generator, a grill and a heating element.

voltage	230 V
microwave power (max)	900 W
grill power	1300 W
convection heater power	1200 W

(a) What is the current when the oven is operating using full microwave power? Give the equation and show your working.

_____

_____

_____

Current = _____ A

(3)

(b) It is possible to cook using infrared radiation, from the grill, and microwaves. What is the maximum current in the oven when using both together?

_____

_____

_____

Current = _____ A

(2)

(c) For baking and roasting, the microwave is used at 450 W and the convection heating element is on fully at 1200 W. A thawed or fresh medium-sized chicken takes 30 minutes to cook.

Calculate the energy transferred in kilowatt-hours.

Use:

units (kWh) = power (kW) × time (h)

_____

_____

_____

Energy = _____ kWh

(2)

(d) Why is a combination oven of this sort more economical than a convection-only oven?

_____

STEMUP.CO.UK

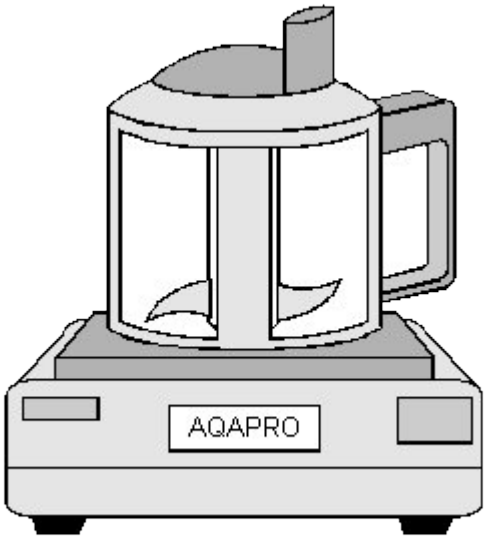
_____

(1)

(Total 8 marks)

Q33.

The drawing shows a food processor. It has an electric motor. Inside is a blade which spins round and cuts up the food.



The food processor is designed to transfer electrical energy to kinetic energy. However some of the energy is wasted as heat and sound.

The power input to the food processor is 1150 W. The power of the spinning blade is 900 W.

(i) Calculate how much energy is wasted when the food processor is used for two minutes.

Show clearly how you get to your answer and give the unit.

_____

_____

Energy = _____

(3)

(ii) Why does the food processor produce sound when it is switched on?

_____

_____

(1)

(Total 4 marks)

Q34.

Carefully read the following extract from a safety leaflet. Then answer the questions.

STEMUP.CO.UK

An RCD adaptor is an automatic safety switch. It should be used when there is a particular risk of electric shock. For example, it is recommended that it is used with an electric lawnmower.

Inside one make of RCD is an electromagnet that holds the switch closed so that the RCD is switched on. An electronic circuit in the RCD monitors the difference between the current in the live wire and the current in the neutral wire.

If something goes wrong and this difference is greater than 30 milliamps then the RCD will trip (= switch off) within 40 milliseconds.

(a) Suggest **two** reasons why there is a particular risk of an electric shock when using an electric lawnmower.

1. _____

_____

2. _____

_____

(2)

(b) Why will there be a difference between the current in the live wire and the current in the neutral wire if something goes wrong?

_____

_____

(1)

(c) (i) Use the words charge, current and time to write an equation which shows the relationship between them.

_____

(1)

(ii) Calculate how much charge flows when a current of 30 milliamps passes for 40 milliseconds.

Clearly show how you get to your answer and give the unit.

_____

_____

Charge = _____

(3)

(Total 7 marks)

STEMUP.CO.UK