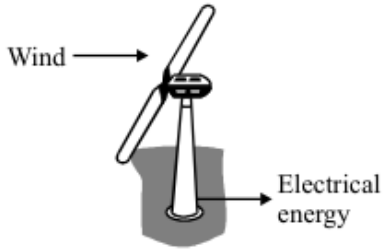
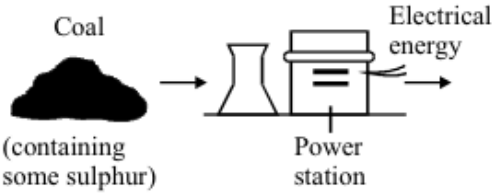
Q1. Electricity is a useful form of energy.

(a) Different energy sources can be used to generate electricity.

Wind is an energy source	**Coal, a fossil fuel, is an energy source**
	
This wind turbine generates 1 MW. (1 MW = 1000 kW)	This coal-fired power station generates 1000 MW.
Electricity demand in the UK can be 48 000 MW.	

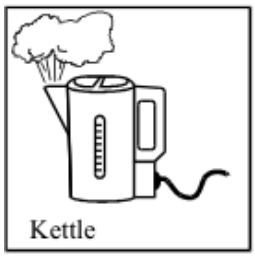
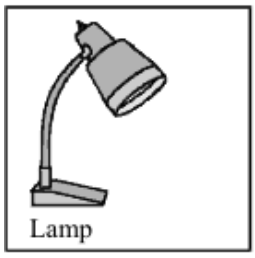
Give **one** advantage and **one** disadvantage (other than cost) of using each energy source to generate electricity in the UK.

Advantage	**Disadvantage**
Using wind	Using wind ....
Using coal	Using coal ....

(4)

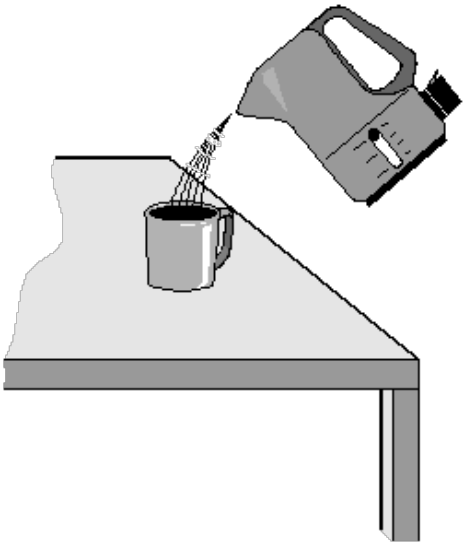
(b) List **A** shows three electrical devices.
List **B** gives the type of useful energy transferred.

Draw a straight line from each electrical device in List **A** to the useful energy it transfers in List **B.**

List A	**List B**
Electrical device	**Useful energy transferred**
 Kettle	heat
 Radio	light
 Lamp	sound

(2)
(Total 6 marks)

Q2. (a) The diagram shows hot water being poured into a mug.



(i) Complete the sentence by choosing the correct words from the box. Each word may be used once or not at all.

air	mug	table	water

Heat energy is being transferred from the ..... to the ..... .

(1)

(ii) When will this transfer of heat energy stop?

.....

.....

(1)

(b) In the box are the names of four types of fuel used to heat homes.

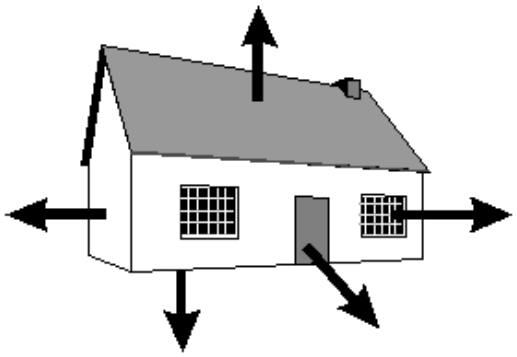
coal	gas	oil	wood

Which **one** of these types of fuel is renewable?

.....

(1)

(c) The diagram shows where heat energy is lost from a house.



(i) Complete the sentences by choosing the correct words from the box. Each word may be used once or not at all.

conduction	conductor	convection	electric	evaporation	insulator

The amount of heat energy lost through the windows by

..... can be reduced by using thick curtains. The

curtains trap a layer of air and air is a good ..... .

The curtains will also stop ..... currents pulling

cold air into the room through small gaps in the window.

(3)

(ii) Write down **one** other way of reducing heat loss from a house.

.....

.....

(1)

(Total 7 marks)

##

(a) (i) Complete the sentence by choosing the correct word from the box.

electrons	neutrons	protons

An electric current is a flow of .....

(1)

(ii) What is the name and circuit symbol for the instrument used to measure electric current?

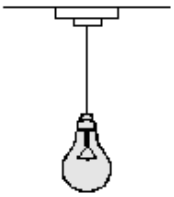
Name: .....

Symbol:

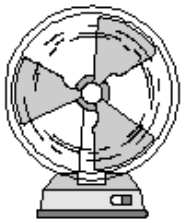
(2)

(b) When an electric current flows through a wire, the wire will get hot. **Two** of the following make use of this heating effect. Which **two**?

Microwave oven



Light bulb



Fan

Hairdryer

1. .....

2. .....

(2)

(c) A 0.2 kW light bulb is switched on for 3 hours.

Use the following equation to calculate, in kWh, how many units of electrical energy are transferred to the bulb during the 3 hours.

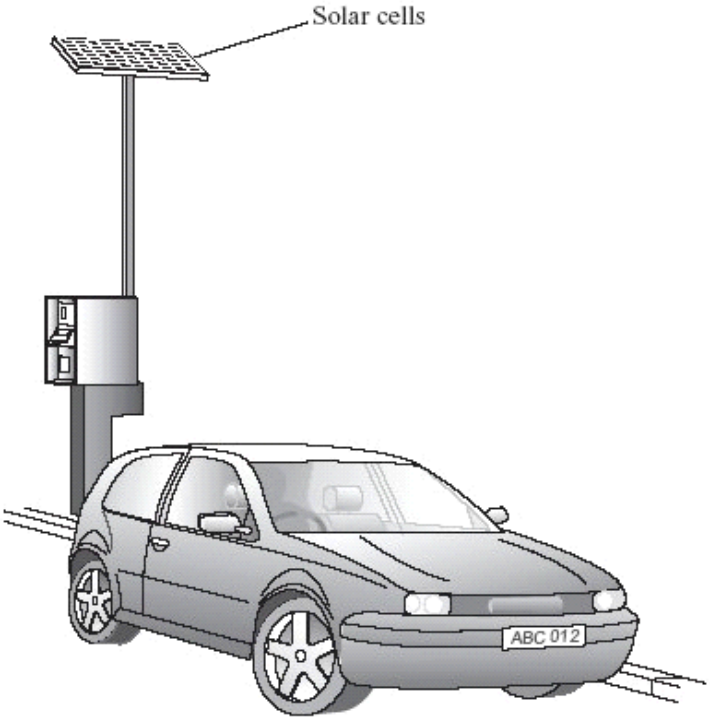
units = power × time

.....

Number of units = kWh .....

(2)
(Total 7 marks)

Q4. A castle is a long way from the nearest town. Batteries power the car park ticket machine. Solar cells are used to keep the batteries charged.



(a) Complete the following sentences by choosing the correct words from the box. Each word may be used once or not at all.

chemical	**electrical**	**heat**	**light**	**sound**

(i) The energy input to the solar cells is ..... energy.

(1)

(ii) The useful energy output from the solar cells is ..... energy.

(1)

(b) For every 500 J of energy absorbed by the solar cells, 75 J of energy are transferred to the batteries.

Use the following equation to calculate the efficiency of the solar cells. Show clearly how you work out your answer.

$$\text{Efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

.....

.....

Efficiency = ……

(2)

(c) Which **one** of the following statements gives the main reason for using solar cells to charge the batteries?

Tick (✓) the box next to your choice.

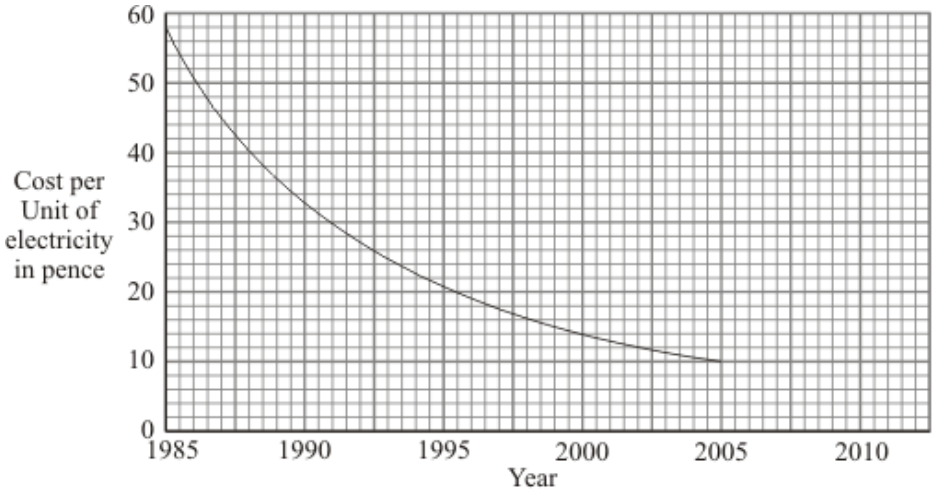
Solar cells give a constant supply of electricity. ☐

A few solar cells can provide a large amount of electricity. ☐

The ticket machine is a long way from other electricity supplies. ☐

(1)

(d) The graph shows how the cost of producing electricity using solar cells has changed.



Use the graph to predict the cost of one Unit of electricity in 2010.

.....

(1)

(Total 6 marks)

Q5. (a) List **A** shows three electrical devices. List **B** gives different forms of useful energy. Draw a straight line from each of the devices in List **A** to the useful energy form it produces in List **B**.Draw only **three** lines.

List A Device	List B Useful energy
Toaster 	Light
Fan 	Kinetic
Personal stereo 	Sound
	Heat

(3)

(b) The power of each device is given in the table.

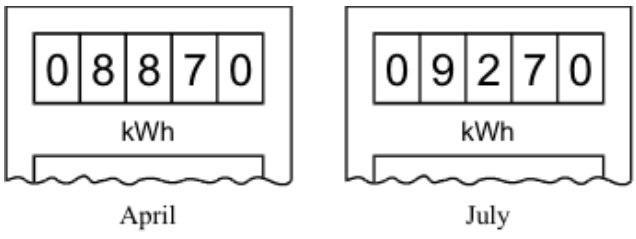
Device	**Power**
Toaster	1.2 kW
Fan	30 W
Personal Stereo	10 W

Which **one** of the devices will transfer the most energy in 10 minutes?

.....

(1)

(c) The diagrams show the readings on a domestic electricity meter in April and July.



(i) How many Units (kWh) of electricity were used between the two meter readings?

.....

.....

Number of Units = ...

(1)

(ii) One Unit costs 6p.

Use the following equation to calculate the cost of the electrical energy used between the two meter readings. Show clearly how you work out your answer.

total cost = number of Units × cost per Unit

.....

.....

Cost = ...

(2)

(d) A 3000 watt electric cooker is switched on for 2 hours.

Use the following equation to calculate the number of Units of energy transferred by the cooker. Show clearly how you work out your answer.

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

.....

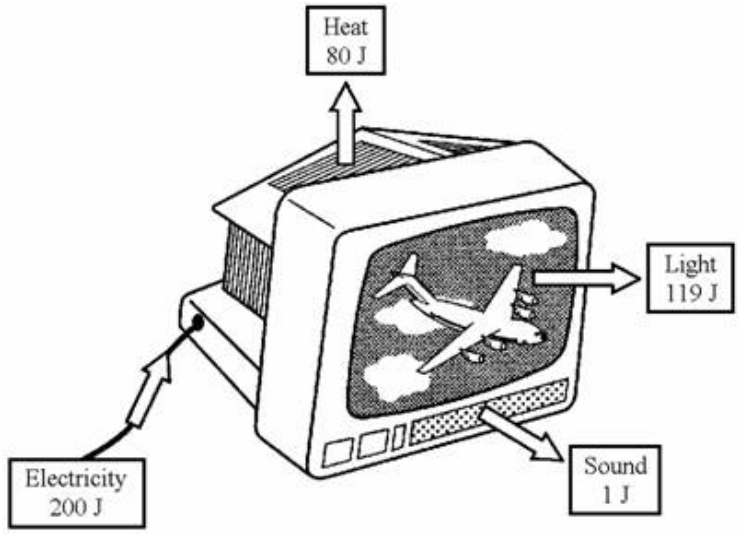
.....

Energy transferred = ...kWh

(2)

(Total 9 marks)

Q6. (a) The drawing shows the energy transferred each second by a television set.



(i) What form of energy is transferred as waste energy by the television set?

.....

(1)

(ii) What effect will the waste energy have on the air around the television set?

.....

(1)

(iii) Use the following equation to calculate the efficiency of the television set.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

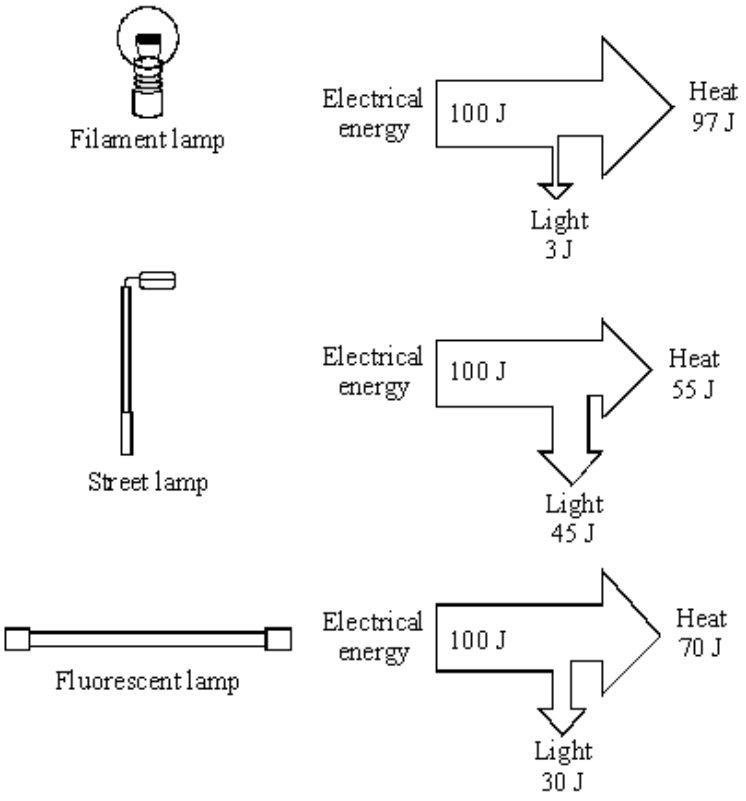
.....

.....

Efficiency = ...

(2)

(b) The diagrams show the energy transferred each second for three different types of lamp. For each lamp the electrical energy input each second is 100 joules.



Which type of lamp is the most efficient?

.....

Give a reason for your choice.

.....

.....

(2)

(Total 6 marks)

Q7. (a) The picture shows a new washing machine.

Complete the following sentence using **one** of the words in the box.

kinetic	**light**	**sound**

A washing machine is designed to transform electrical energy into heat and

..... energy

(1)

(b) The instruction booklet for the washing machine contains the following information.

Wash cycle	Average power during cycle	Time taken to run cycle
HOT	1.5 kW	2 hours
COOL	1.1 kW	1½ hours
FAST	1.0 kW	¾ hour

(i) Use the following equation to calculate the energy transferred, in kilowatt-hours, to the washing machine during the HOT wash cycle. Show how you work out your answer.

energy transferred = power × time

.....

.....

Energy transferred = ... kWh

(2)

(ii) Why does it cost more to use the washing machine on the HOT cycle than on the COOL or FAST cycle?

.....

.....

(1)

(iii) Before buying a washing machine, a householder researched several makes to find out which washing machine was the most energy efficient.

Write down **one** way that he could have done this research.

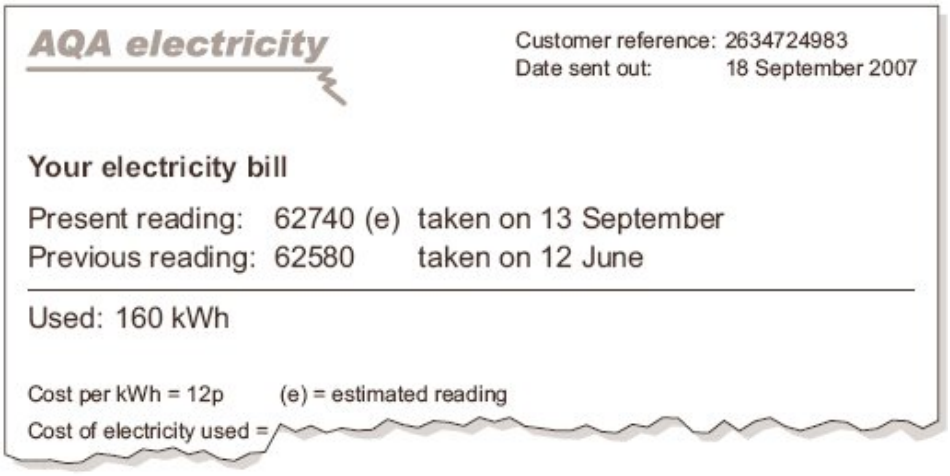
.....

.....

(1)

(Total 5 marks)

Q8. A householder was out shopping when her electricity meter reading should have been taken. The electricity company estimated the reading and sent the following bill. Unfortunately, the bill was damaged in the post.



(a) Use the equation in the box to calculate the cost of the electricity used between 12 June and 13 September.

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

Show clearly how you work out your answer.

.....

.....

Total cost = ...

(2)

(b) The estimated reading shown on the bill was not very accurate. The correct reading was 62920.

How many kilowatt-hours of electricity had the householder actually used between 12 June and 13 September?

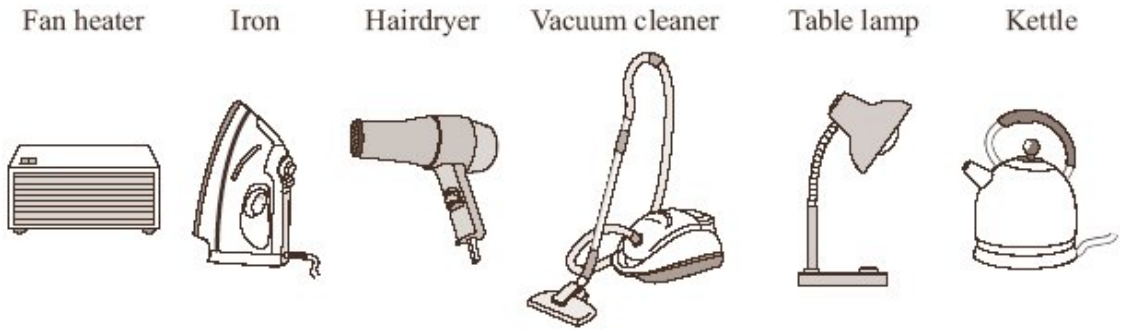
.....

.....

(2)

(Total 4 marks)

Q9. The pictures show six different household appliances.



(a) Four of the appliances, including the fan heater, are designed to transform electrical energy into heat.

Name the other **three** appliances designed to transform electrical energy into heat.

1 .....

2 .....

3 .....

(3)

(b) Complete the following sentence using **one** of the words from the box.

chemical	**heat**	**kinetic**	**sound**

Energy that is not usefully transformed by the fan heater is wasted as

..... energy.

(1)

(c) The table gives information about two different fan heaters.

	Useful energy transferred each second in joules	**Wasted energy transferred each second in joules**
Fan heater **L**	1200	10
Fan heater **M**	1200	20

Complete the following sentence by drawing a ring around the line in the box that is correct.

Fan heater **L** | is more efficient than / has the same efficiency as / is less efficient than | fan heater **M**.

(1)

(Total 5 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

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.

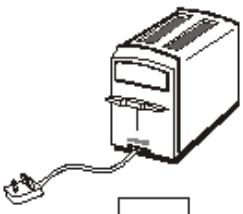
Drill

☐

MP3 player

☐

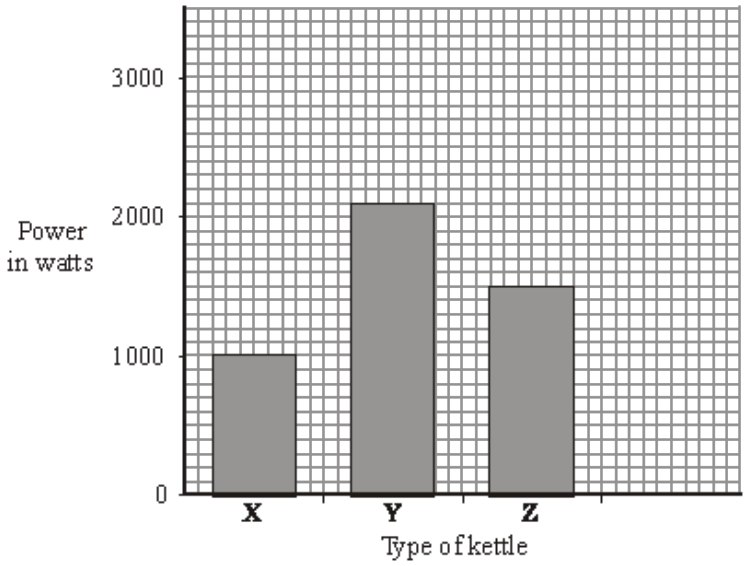
Toaster



☐

(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)

(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 110 V or 230 V
• 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.

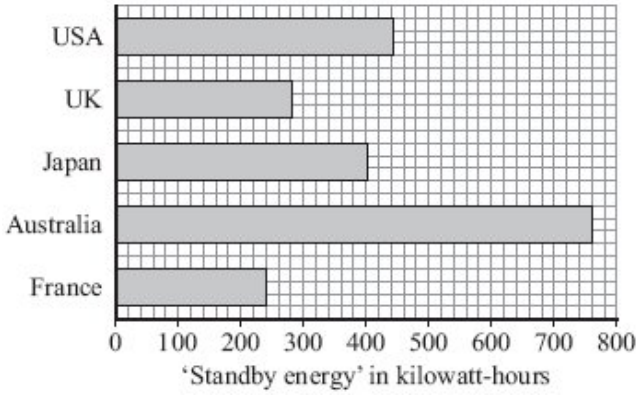
.....

.....

(1)
(Total 8 marks)

Q11. Electrical appliances that are left on standby still use energy.

The bar chart compares the *average* amount of 'standby energy' wasted each year in every home in five countries.



(i) In which country are the homes that waste, on average, the smallest amount of 'standby energy'?

Draw a ring around your answer.

Australia **France** **Japan** **UK** **USA**

(1)

(ii) Suggest a reason why an *average* value is used for the 'standby energy' wasted in the homes.

.....

.....

(1)

(b) (i) Australia has one of the lowest electricity prices in the world.

How does this low price seem to affect the amount of 'standby energy' wasted?

.....

.....

(1)

(ii) In Australia, most electricity is generated in coal-burning power stations. The Australian government wants less electricity to be wasted.

Wasting less electricity would be good for the Australian environment.

Explain why.

.....

.....

.....

.....

(2)

(c) Energy is not usually measured in kilowatt-hours.

Which **one** of the following units is usually used to measure energy?

Draw a ring around your answer.

hertz **joule** **watt**

(1)

(d) (i) Electricity in Japan costs the equivalent of 17 pence per kilowatt-hour.

Use the information in the bar chart and the equation in the box to calculate how much the 'standby energy' used in an average Japanese home costs each year.

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

Show clearly how you work out your answer.

Give your answer in pence.

.....

.....

Cost = ... pence

(3)

(ii) In Japan, the largest proportion of electricity is generated using nuclear fuels.

Which **one** of the following statements gives a good reason for using nuclear fuels to generate electricity?

Put a tick (✓) in the box next to your answer.

A nuclear power station is very expensive to build. ☐

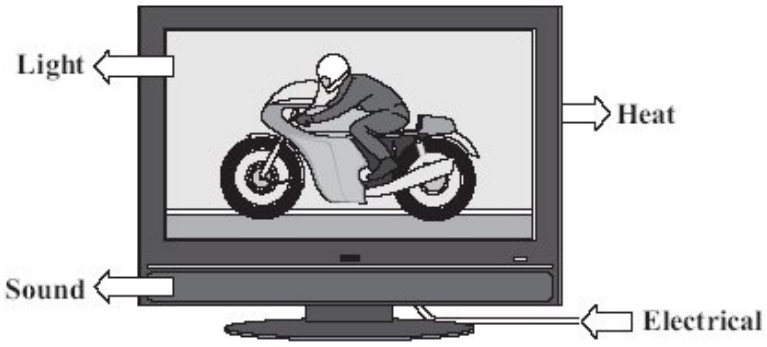
A small amount of nuclear fuel generates a large amount of electricity. ☐

It is easy to store nuclear waste safely. ☐

(1)

(Total 10 marks)

Q12. The diagram shows the energy transformations produced by a TV.



(a) Use words from the diagram to complete the following sentence.

The TV is designed to transform ..... energy into

light and ..... energy.

(2)

(b) Which **one** of the following statements is **false**?

Put a tick (✓) in the box next to the **false** statement.

The energy transformed by the TV makes the surroundings warmer. ☐

The energy transformed by the TV becomes spread out. ☐

The energy transformed by the TV will be destroyed. ☐

(1)

(c) Two different makes of television, **A** and **B**, transform energy at the same rate.
Television **A** wastes less energy than television **B**.

Complete the following sentence by drawing a ring around the correct line in the box.

Television **A** has [a higher efficiency than / the same efficiency as / a lower efficiency than] television **B**.

(1)
(Total 4 marks)

Q13. The instruction booklet for a washing machine contains the following information.

Wash cycle	Average power during cycle	Time taken to run cycle
HOT	1.6 kW	2 hours
COOL	1.1 kW	1 ¼ hours
FAST	1.2 kW	¾ hour

(a) Electricity costs 15 pence per kilowatt-hour.

Calculate, in pence, the cost of using the washing machine for one **HOT** wash cycle.

Write down the equation you use, and then show clearly how you work out your answer.

.....

.....

.....

.....

Cost = ... pence

(2)

(b) Why does it cost more to use the washing machine on the **HOT** cycle than on the **COOL** or the **FAST** cycle?

.....

.....

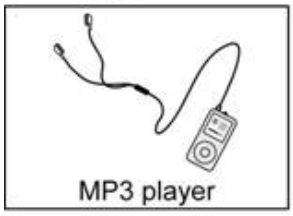
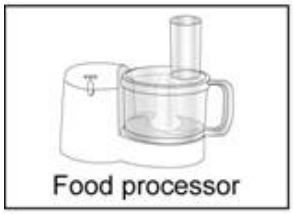
(1)

(Total 3 marks)

Q14. The diagrams in **List A** show three electrical appliances. Each appliance is designed to transfer electrical energy.

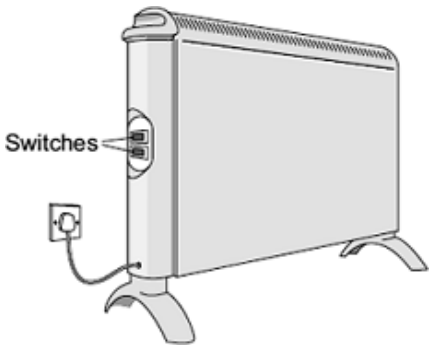
Draw **one** straight line from each appliance in **List A** to the useful energy output produced by that appliance in **List B**.

Draw only **three** lines.

List A Appliance	List B Useful energy output
 MP3 player	Light
 Food processor	Sound
 Desk lamp	Electrical
	Kinetic

(Total 3 marks)

Q15. (a) The diagram shows two switches on a room heater. The heater has three power settings. The power produced by two of the settings is given in the table.



Setting	Power in kW
Low	0.5
Medium	1.5
High	

(i) When both switches are on, the heater works at the high power setting.

What is the power of the heater when it is switched to the **high** power setting?

.....

Power = ... kW

(1)

(ii) The heater is used on the **medium** power setting. It is switched on for three hours.

Use the equation in the box to work out the energy transferred from the mains to the heater in three hours.

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

Show clearly how you work out your answer.

.....

.....

Energy transferred = ... kWh

(2)

(iii) Electricity costs 12 pence per kilowatt-hour.

Use the equation in the box to calculate how much the heater costs to use on **medium** power for three hours.

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

Show clearly how you work out your answer.

.....

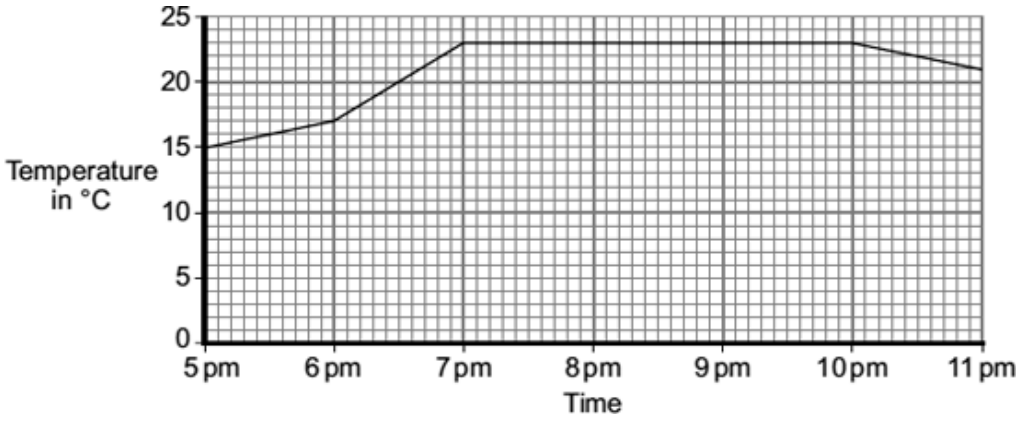
.....

Total cost = ... pence

(2)

(b) The heater is used to warm a room.

The graph shows how the temperature of the room changes from the moment the heater is switched on.



The heater was first used on the medium setting.

(i) At what time was the heater setting changed to the **high** setting?

.....

Give a reason for your answer.

.....

.....

.....

(2)

(ii) From 7 pm until 10 pm, the temperature of the room is **not** changing.

Which **one** of the following statements gives the reason why the temperature of the room is **not** changing?

Put a tick (✓) in the box next to your answer.

The room is losing energy slower than the heater supplies energy. ☐

The room is losing energy as fast as the heater supplies energy. ☐

The room is losing energy faster than the heater supplies energy. ☐

(1)

(Total 8 marks)

Q16. The diagram shows four electrical appliances. Each appliance is designed to transform electrical energy into one form of output energy.


Kettle


Toaster


Radio


Hair straighteners

(a) Which **one** of the appliances is designed to give a different form of output energy from the other three appliances?

.....

Give a reason for your answer.

.....

.....

(2)

(b) The power of each appliance is given in the table.

Appliance	**Power**
Kettle	2.5 kW
Toaster	920 W
Radio	15 W
Hair straighteners	75 W

Each appliance is switched on for 5 minutes.

Which appliance transforms the most energy?

.....

(1)

(c) The 75 watt hair straighteners are switched on for a few minutes each day.
In one year, the amount of energy transferred from the mains electricity supply to the hair straighteners is 4 kilowatt-hours.

Electricity costs 15 p per kilowatt-hour.

Use the equation in the box to calculate the yearly cost of using the hair straighteners.

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

Show clearly how you work out your answer.

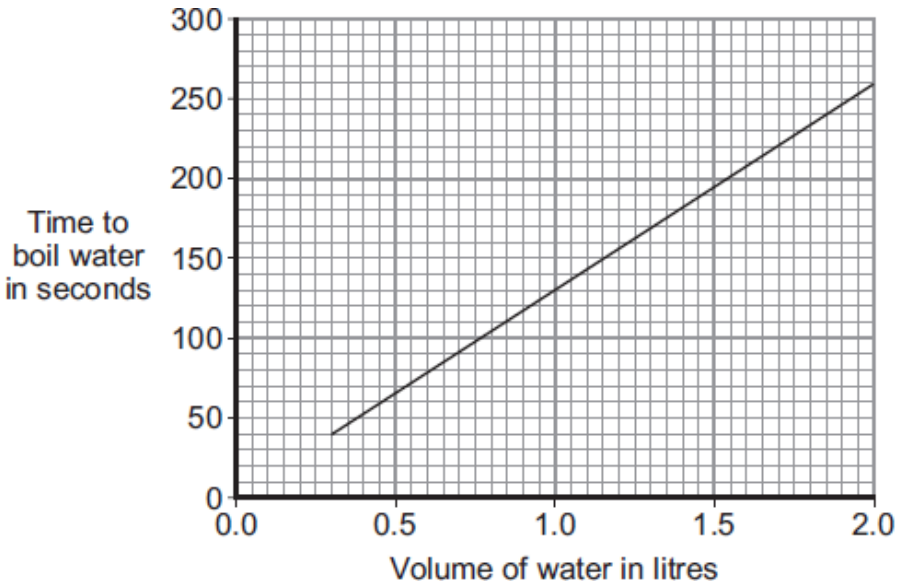
.....

.....

Total cost = ... pence

(2)

(d) The graph shows how the time to boil water in an electric kettle depends on the volume of water in the kettle.



A householder always fills the electric kettle to the top, even when only enough boiling water for one small cup of coffee is required.

Explain how the householder is wasting money.

.....

.....

.....

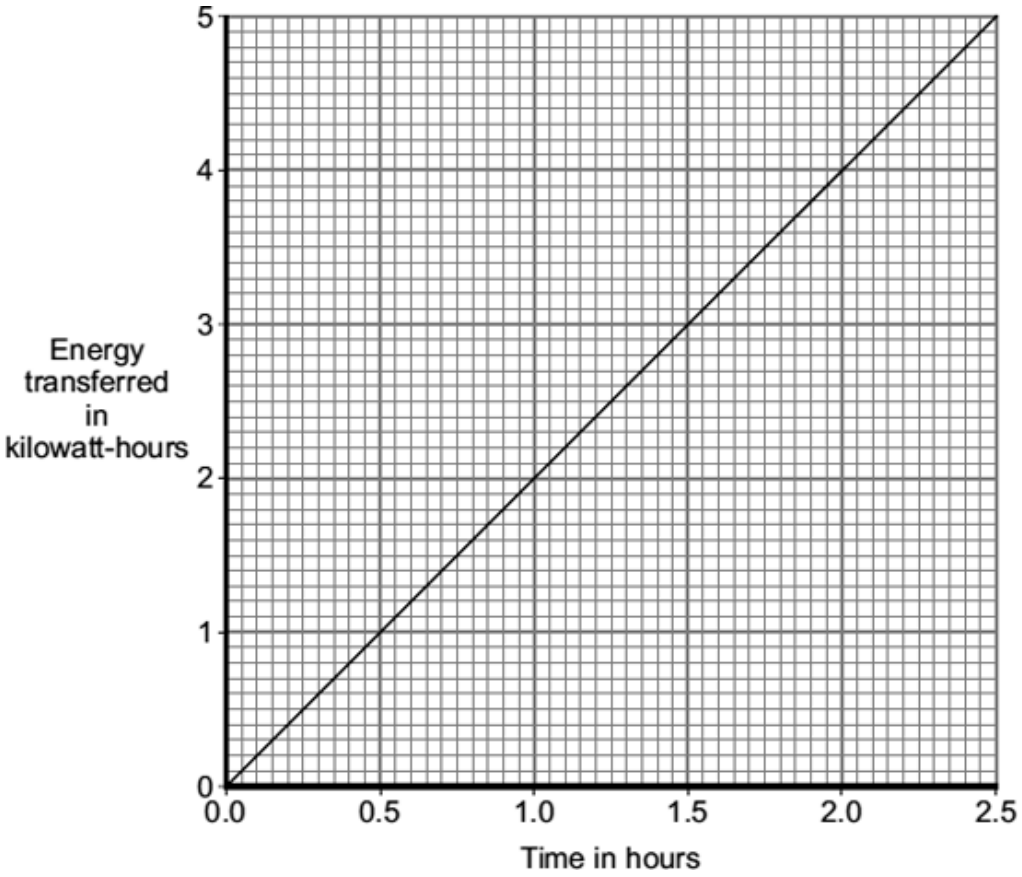
.....

.....

.....

(3)
(Total 8 marks)

Q17. The graph shows how the energy transferred by a 2 kW electric kettle varies with the time, in hours, that the kettle is switched on.



(a) In one week, the kettle is used for a total of 1.5 hours.
Electricity costs 15 p per kilowatt-hour.

Use the equation in the box to calculate the cost of using the kettle for the week.

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

Show clearly how you work out your answer.

.....

.....

Cost = ... p

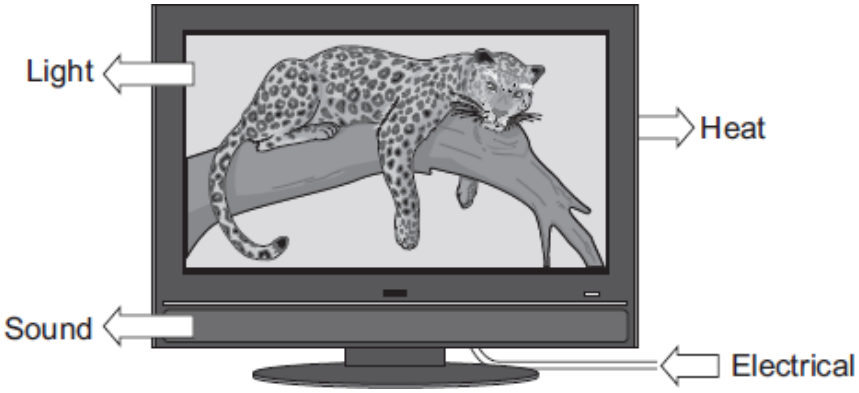
(2)

(b) Draw a new line on the graph to show how the energy transferred by a 1 kW kettle varies with time.

(1)

(Total 3 marks)

Q18. (a) The diagram shows the energy transformations produced by a television.



When the television is working, 1200 joules of energy are supplied to the television every second. The useful energy transferred by the television is 720 joules every second.

(i) Use the equation in the box to calculate the efficiency of the television.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

Show clearly how you work out your answer.

.....

.....

Efficiency = ...

(2)

(ii) Use **one** word from the diagram to complete the following sentence.

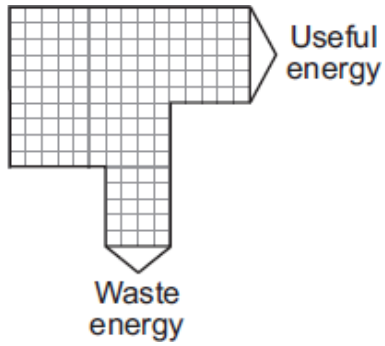
The electrical energy that is **not** usefully transformed by the television is wasted as

..... .

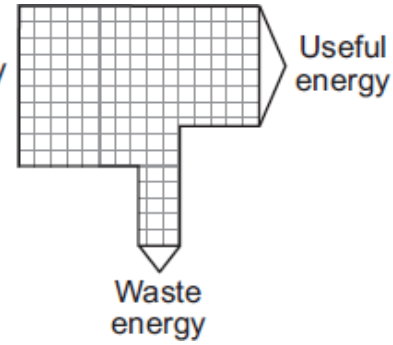
(1)

(b) Drawn below are the Sankey diagrams for three televisions, **J**, **K** and **L**.
The diagrams are drawn to the same scale.

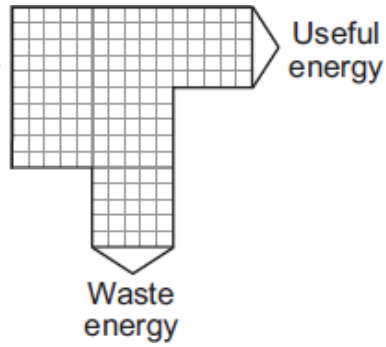
J



K



L



Which **one** of the televisions, **J**, **K** or **L**, is the most efficient?

Write your answer in the box.

Give a reason for your answer.

.....

.....

(2)

(c) A homeowner is sent an electricity bill every 3 months. The total amount of electrical energy used during one 3-month period was 800 kilowatt-hours.
Electrical energy costs 15p per kilowatt-hour.

Use the equation in the box to calculate the cost of the energy transferred from the mains electricity supply.

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

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

.....

.....

Cost = ...

(2)

(Total 7 marks)

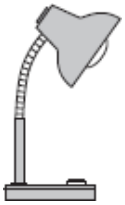
Q19. Each letter, **A**, **B**, **C**, **D** and **E**, represents an energy transformation.

A electrical to chemical
B electrical to heat
C electrical to kinetic
D electrical to light
E electrical to sound

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

Write the correct letter, **A**, **B**, **C**, **D** or **E**, in the box below each device.

Use each letter no more than once.

Fan	**Kettle**	**Lamp**	**Radio**
			
☐	☐	☐	☐

(Total 4 marks)

Q20. (a) The bar chart shows the power of three different electric hairdryers.

(i) Which **one** of the hairdryers, **A**, **B** or **C**, would transfer the most energy in 5 minutes?

Write the correct answer in the box.

(1)

(ii) A small 'travel' hairdryer has a power of 500 watts.

Draw a fourth bar on the bar chart to show the power of the 'travel' hairdryer.

(1)

(b) A family shares the same hairdryer.
The hairdryer has a power of 1.2 kW. The hairdryer is used for a total of 2 hours each week.

(i) Calculate how many kilowatt-hours (kWh) of energy the hairdryer transfers in 2 hours.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

.....

.....

Energy transferred = ... kWh

(2)

(ii) Electricity costs 15 pence per kWh.

Calculate the cost of using the hairdryer for 2 hours.

Show clearly how you work out your answer.

.....

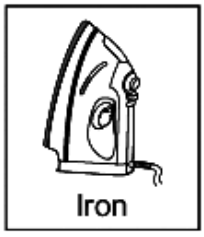
.....

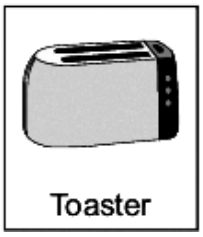
Cost = ... pence

(2)

(Total 6 marks)

Q21. The appliances shown below transfer electrical energy to other types of energy.





(a) The vacuum cleaner is designed to transfer electrical energy to kinetic energy.

Three more of the appliances are also designed to transfer electrical energy to kinetic energy. Which **three**?

Draw a ring around each correct appliance.

3

(b) Which **two** of the following statements are true?

Tick (✓) **two** boxes.

Appliances only transfer part of the energy usefully. ☐

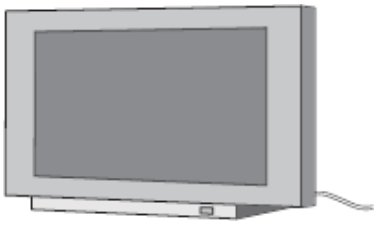
The energy transferred by appliances will be destroyed. ☐

The energy transferred by appliances makes the surroundings warmer. ☐

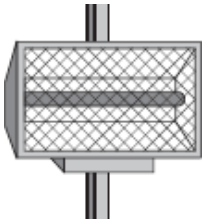
The energy output from an appliance is bigger than the energy input. ☐

(2)
(Total 5 marks)

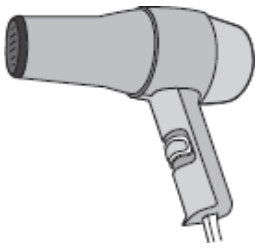
Q22. The data included in the diagrams gives the power of the electrical appliances.



TV
160 W

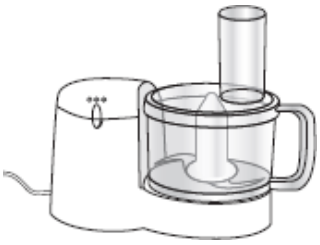


Radiant heater
1.0 kW



Hairdryer
1100 W

Sandwich toaster
1.1 kW



Food processor
0.4 kW

Table lamp
40 W

(a) (i) Which appliance is designed to transform electrical energy to light and sound?

.....

(1)

(ii) Which **two** appliances transform energy at the same rate?

..... and .....

(1)

(b) During one week, the food processor is used for a total of 3 hours.

(i) Use the equation in the box to calculate the energy transferred, in kilowatt-hours, by the food processor in 3 hours.

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

Show clearly how you work out your answer.

.....

.....

.....

.....

Energy transferred = ... kWh

(2)

(ii) Electricity costs 15 pence per kilowatt-hour.

Use the equation in the box to calculate the cost of using the food processor for 3 hours.

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

Show clearly how you work out your answer.

.....

.....

.....

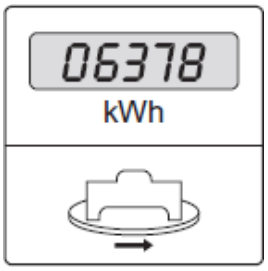
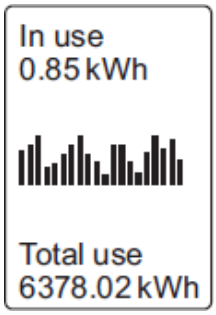
.....

Cost = ... pence

(2)

(c) A homeowner decides to monitor the amount of electrical energy used in his home.

He can do this by using an electricity meter or by using a separate electronic device.

Electricity meter	Electronic device
Records to the nearest kilowatt-hour	Records to the nearest 1/100th kilowatt-hour
	

(i) Use one word from the box to complete the following sentence.

precise	reliable	valid

The reading given by the electronic device is more ..... than the reading given by the electricity meter.

(1)

(ii) Monitoring the electrical energy used in a home may help people to save money by encouraging them to use less electricity.

Explain why, apart from saving money, it is important for people to use less electricity.

.....

.....

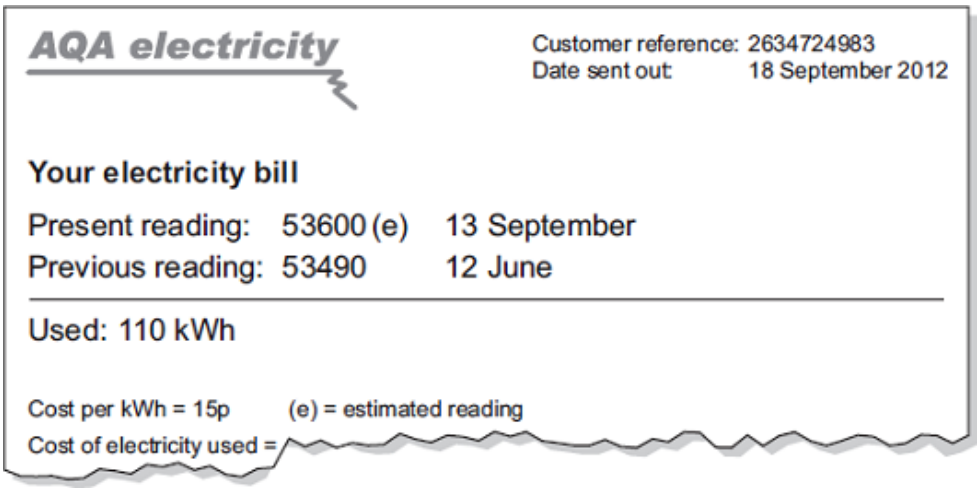
.....

.....

(2)

(Total 9 marks)

Q23. A householder was out shopping when her electricity meter reading should have been taken. The electricity company estimated the reading and sent the following bill. Unfortunately, the bill was damaged in the post.



(a) Use the equation in the box to calculate the cost of the electricity used between 12 June and 13 September.

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

Show clearly how you work out your answer.

.....

.....

Total cost = ...

(2)

(b) The estimated reading shown on the bill was not very accurate. The correct reading was 53782.

How many kilowatt-hours of electricity had the householder actually used between 12 June and 13 September?

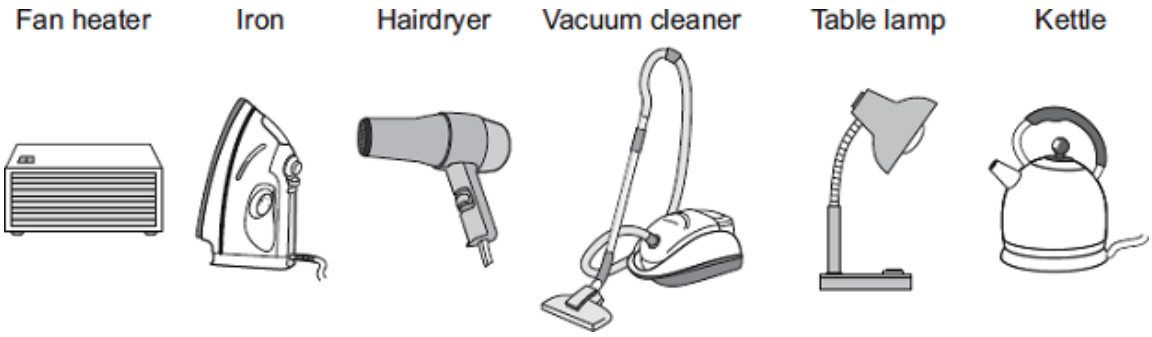
.....

.....

(2)

(Total 4 marks)

Q24. The pictures show six different household appliances.



(a) Four of the appliances, including the fan heater, are designed to transform electrical energy into heat.

Name the other **three** appliances designed to transform electrical energy into heat.

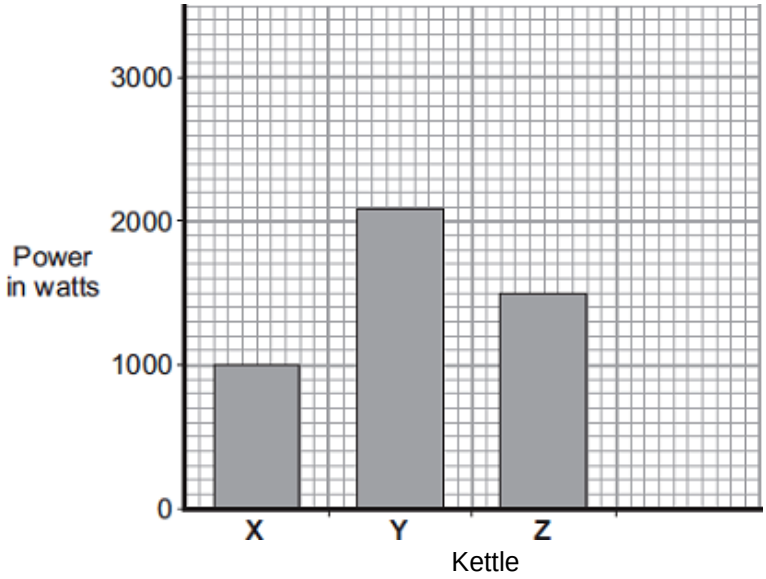
1 .....

2 .....

3 .....

(3)

(b) The bar chart shows the power of three electric kettles, **X**, **Y** and **Z**.



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

Which kettle costs the most to use?

Put a tick (✓) next to your answer.

X ☐

Y ☐

Y ☐

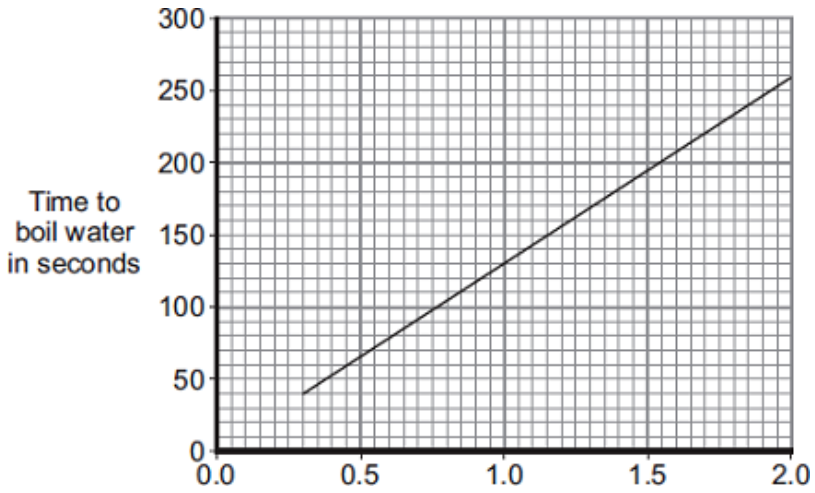
(1)

(ii) 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)

(c) The graph shows how the time to boil water in an electric kettle depends on the volume of water in the kettle.



A householder always fills the electric kettle to the top, even when only enough boiling water for one small cup of coffee is wanted.

Explain how the householder is wasting money.

.....

.....

.....

.....

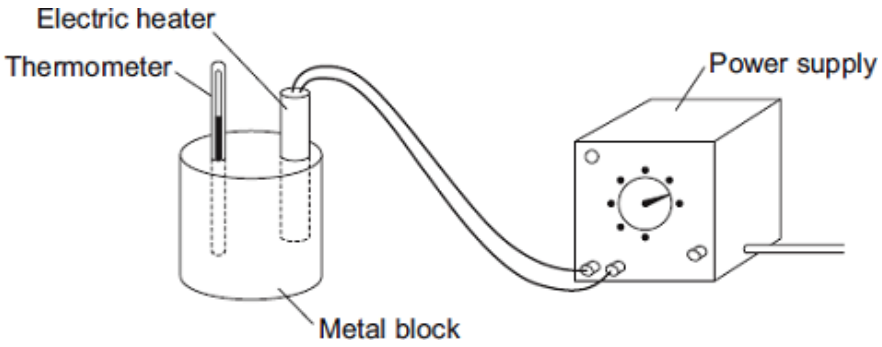
.....

.....

(3)

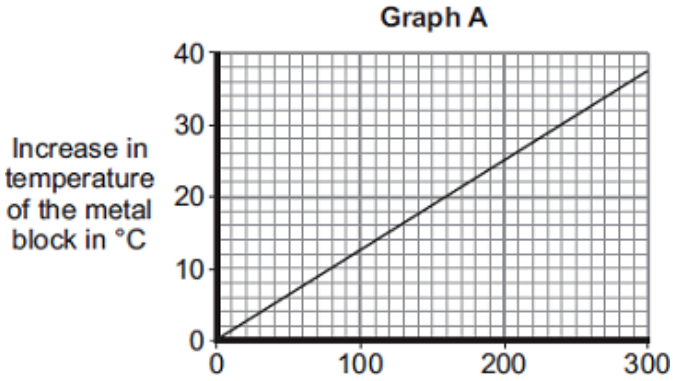
(Total 8 marks)

Q25. (a) A student used the apparatus drawn below to investigate the heating effect of an electric heater.



(i) Before starting the experiment, the student drew **Graph A**.

Graph A shows how the student expected the temperature of the metal block to change after the heater was switched on.



Describe the pattern shown in **Graph A**.

.....

.....

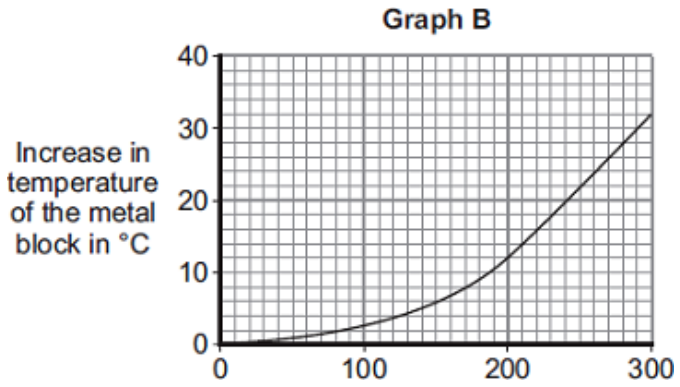
.....

.....

(2)

(ii) The student measured the room temperature. He then switched the heater on and measured the temperature of the metal block every 50 seconds.

The student calculated the increase in temperature of the metal block and plotted **Graph B**.



After 300 seconds, **Graph B** shows the increase in temperature of the metal block is lower than the increase in temperature expected from **Graph A**.

Suggest **one** reason why.

.....

.....

(1)

(iii) The power of the electric heater is 50 watts.

Calculate the energy transferred to the heater from the electricity supply in 300 seconds.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Energy transferred = ... J

(2)

(b) The student uses the same heater to heat blocks of different metals. Each time the heater is switched on for 300 seconds.

Each block of metal has the same mass but a different specific heat capacity.

Metal	Specific heat capacity in J/kg°C
Aluminium	900
Iron	450
Lead	130

Which **one** of the metals will heat up the most?

Draw a ring around the correct answer.

aluminium **iron** **lead**

Give, in terms of the amount of energy needed to heat the metal blocks, a reason for your answer.

.....

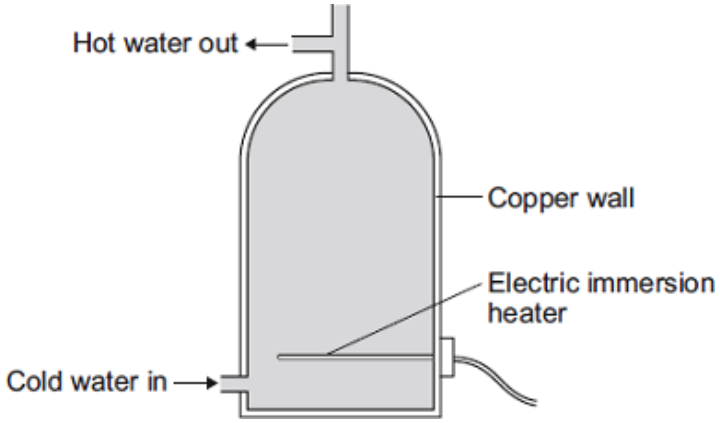
.....

.....

.....

(2)

(c) A homeowner uses an electric immersion heater to heat the water in his hot water tank. The hot water tank has no insulation.



(i) Draw a ring around the correct answer to complete each sentence.

Energy is transferred through the water by

conduction.
convection.
evaporation.

Energy is transferred through the copper wall of the hot water tank by

conduction.
convection.
evaporation.

(2)

(ii) To keep the water in the tank hot for longer, the homeowner fits an insulating jacket around the tank. The insulating jacket costs £12 to buy.

The homeowner expects to save £16 each year from reduced energy bills.

Calculate the pay-back time for the insulating jacket.

.....

.....

Pay-back time = ... years

(2)

(Total 11 marks)