Q1.

The diagram shows a simple type of car rear window heater. The six heating elements are exactly the same.

Each heating element has a resistance of 5 Ω. The current passing through each element is 0.4 A.

(i) Calculate the total resistance of the six heating elements.

Show clearly how you work out your answer.

___________________________________________________________________

___________________________________________________________________

Total resistance = _______________ ohms

(ii) Why is the current passing through each element the same?

___________________________________________________________________

___________________________________________________________________

(iii) What is the total current passing through the whole circuit?

___________________________________________________________________

(iv) How is the 12 volt potential difference of the car battery shared between the six heating elements?

___________________________________________________________________

(Total 5 marks)

Q2.

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.

(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.

(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.

Q3.

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

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

____________________________________________________________________________________
____________________________________________________________________________________

(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?

____________________________________________________________________________________
____________________________________________________________________________________

(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.

____________________________________________________________________________________
____________________________________________________________________________________

____________________________________________________________________________________
____________________________________________________________________________________

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

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

\[
\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}
\]

Show clearly how you work out your answer.

Give your answer in pence.

\[
\text{Cost} = \underline{__________________________} \text{ pence}
\]

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.

Q4.  
(a) The diagram shows the energy transformations produced by a TV.
(i) Calculate the efficiency of the TV, using the information in the diagram.
Show clearly how you work out your answer.

Efficiency = _______________

(ii) What eventually happens to the useful energy transferred by the TV?

(b) Electrical appliances left on standby use energy.

The bar chart shows the power for the appliances that one family leaves on standby when they go on holiday.

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Average ‘standby power’ in watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact stereo</td>
<td>6</td>
</tr>
<tr>
<td>DVD player</td>
<td>4</td>
</tr>
<tr>
<td>Microwave oven</td>
<td>3</td>
</tr>
<tr>
<td>Computer</td>
<td>2</td>
</tr>
<tr>
<td>TV</td>
<td>5</td>
</tr>
<tr>
<td>Video recorder</td>
<td>6</td>
</tr>
</tbody>
</table>

The family is on holiday for a total of 175 hours.

(i) Use the information in the bar chart and the equation in the box to calculate the energy wasted by leaving the compact stereo on standby while the family is on holiday.

```
\text{energy transferred} = \text{power} \times \text{time}
\text{(kilowatt-hour, kWh)} = \text{(kilowatt, kW)} \times \text{(hour, h)}
```

Show clearly how you work out your answer.

Energy wasted = _______________ kilowatt-hours
(ii) Electricity costs 12 p per kilowatt-hour.

Use the equation in the box to calculate the cost of leaving the compact stereo on standby while the family is on holiday.

\[
\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}
\]

Show clearly how you work out your answer.

\[
\text{Cost} = \underline{\underline{\text{ }}} \text{p}
\]  

(1)

(c) A headline from a recent newspaper article is shown below.

Leaving appliances on standby damages the environment.

Explain why leaving appliances on standby damages the environment.

\[
\begin{align*}
\underline{\underline{\text{}}} \\
\underline{\underline{\text{}}} \\
\underline{\underline{\text{}}} \\
\underline{\underline{\text{}}} \\
\underline{\underline{\text{}}} \\
\underline{\underline{\text{}}} \\
\underline{\underline{\text{}}} \\
\end{align*}
\]

(2)

(Total 8 marks)

Q5.

(a) The graphs, A, B and C, show how the current through a component varies with the potential difference (p.d.) across the component.

Draw a line to link each graph to the correct component. Draw only three lines.
Each of the circuits, J, K and L, include two diodes.

In which **one** of the circuits, J, K or L, would the filament lamp be on?

Q6.
A circuit was set up as shown in the diagram.
(a) Each cell provides a potential difference of 1.5 volts.

(i) What is the total potential difference provided by the four cells in the circuit?

______________________________________________________________________________________

Total potential difference = _______________ volts

(1)

(ii) What will be the reading on the voltmeter?

______________________________________________________________________________________

(1)

(b) The current through the lamp is 0.20 amps.
The current through the resistor is 0.10 amps.

What is the reading on the ammeter?

______________________________________________________________________________________

Reading on ammeter = _______________ amps

(1)

(c) Use a phrase from the box to complete the following sentence.

 greater than  equal to  smaller than

The resistance of the lamp is _______________ 60 Ω.

Give a reason for your answer.

______________________________________________________________________________________

______________________________________________________________________________________

(2)

(Total 5 marks)

Q7.

(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

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

<table>
<thead>
<tr>
<th>Type of Kettle</th>
<th>Power in Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1000</td>
</tr>
<tr>
<td>Y</td>
<td>2000</td>
</tr>
<tr>
<td>Z</td>
<td>1500</td>
</tr>
</tbody>
</table>

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

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

Which kettle costs the most to use?
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.

<table>
<thead>
<tr>
<th>Travel Kettle</th>
<th>Immersion heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1 kW element</td>
<td></td>
</tr>
<tr>
<td>• Holds 1 litre</td>
<td></td>
</tr>
<tr>
<td>• Works on 110V or 230V</td>
<td></td>
</tr>
<tr>
<td>• Washable water filter</td>
<td></td>
</tr>
<tr>
<td>• 0.4 kW element</td>
<td></td>
</tr>
<tr>
<td>• Heats up to 0.5 litres of water</td>
<td></td>
</tr>
<tr>
<td>• Works on 230 V only</td>
<td></td>
</tr>
<tr>
<td>• Small compact size</td>
<td></td>
</tr>
</tbody>
</table>

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

________________________________________________________________________
________________________________________________________________________

(1)

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

________________________________________________________________________
________________________________________________________________________

(1)

(Total 8 marks)

Q8.

The diagram shows the label from a new freezer.
(a) An old freezer has an energy consumption per year of 350 kWh.

Use the equation in the box to calculate the extra cost of using the old freezer for one year compared with using a new ‘A’ rated freezer.

\[
\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}
\]

Assume 1 kilowatt-hour (kWh) of energy costs 12 p.

Show clearly how you work out your answer.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Extra cost per year = £ __________________________ (2)

(b) The price of the new freezer was reduced in a sale.

Reducing the price reduces the payback time for replacing the old freezer from 12 years to 9 years.

Calculate, in pounds, how much the new freezer was reduced in the sale.

Show clearly how you work out your answer.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Price reduced by = £ __________________________ (2)

(c) An advertisement in a shop claims that:

‘Replacing an old freezer with a new ‘A’ rated freezer will benefit the environment.’

Do you agree that replacing the freezer will benefit the environment?

Answer yes or no. _______________

Explain the reasons for your answer.
Q9.

(a) The diagram shows the circuit used to investigate the resistance of a material. The diagram is incomplete; the ammeter and voltmeter are missing.

(i) Draw the symbols for the ammeter and voltmeter on the diagram in the correct places.

(ii) How can the current through the material be changed?

(b) The material, called conducting putty, is rolled into cylinders of different lengths but with equal thicknesses.

Graph 1 shows how the resistance changes with length.
(i) Why has the data been shown as a line graph rather than a bar chart?

__________________________________________________________________________
__________________________________________________________________________

(1)

(ii) The current through a 30 cm length of conducting putty was 0.15 A.

Use Graph 1 to find the resistance of a 30 cm length of conducting putty.

\[
\text{Resistance} = \text{________________________ ohms}
\]

(1)

(iii) Use your answer to (b)(ii) to calculate the potential difference across a 30 cm length of conducting putty.

Show clearly how you work out your answer.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

\[
\text{Potential difference} = \text{________________________ volts}
\]

(2)

(c) A second set of data was obtained using thicker pieces of conducting putty. Both sets of results are shown in Graph 2.
Q10.

(i) What is the relationship between the resistance and the thickness of the conducting putty?

________________________________________________________________________________________

________________________________________________________________________________________

(1)

(ii) Name one error that may have reduced the accuracy of the results.

________________________________________________________________________________________

(1)

(iii) How could the reliability of the data have been improved?

________________________________________________________________________________________

________________________________________________________________________________________

(1)

(Total 10 marks)

Q10.

The pictures show six different household appliances.

Fan heater  Iron  Hairdryer  Vacuum cleaner  Table lamp  Kettle
(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. _________________________________________________________________

(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.

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

<table>
<thead>
<tr>
<th></th>
<th>Useful energy transferred each second in joules</th>
<th>Wasted energy transferred each second in joules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan heater L</td>
<td>1200</td>
<td>10</td>
</tr>
<tr>
<td>Fan heater M</td>
<td>1200</td>
<td>20</td>
</tr>
</tbody>
</table>

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

Fan heater L is more efficient than fan heater M.

Q11.

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.

\[
\text{Total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}
\]

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)

Q12.
(a) The circuit diagram drawn below includes a component labelled X.
(i) Calculate the potential difference across the 8 ohm resistor. Show clearly how you work out your answer.

Potential difference = _______________ volts

(ii) What is the potential difference across component X?

(b) The graph shows how the resistance of component X changes with temperature.

(i) What is component X?

(ii) Over which range of temperatures does the resistance of component X change the most? Put a tick (✓) next to your choice.

0 °C to 20 °C

20 °C to 40 °C
Q13.

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.

___________________________________________________________________
Q14.
(a) The picture shows a new washing machine.

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

![Washing Machine Diagram]

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

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

<table>
<thead>
<tr>
<th>Wash cycle</th>
<th>Average power during cycle</th>
<th>Time taken to run cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOT</td>
<td>1.5 kW</td>
<td>2 hours</td>
</tr>
<tr>
<td>COOL</td>
<td>1.1 kW</td>
<td>1½ hours</td>
</tr>
<tr>
<td>FAST</td>
<td>1.0 kW</td>
<td>¾ hour</td>
</tr>
</tbody>
</table>

(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.

\[
\text{energy transferred} = \text{power} \times \text{time}
\]

\[
\text{energy transferred} = ________________ \text{ kWh}
\]
(ii) Why does it cost more to use the washing machine on the HOT cycle than on the COOL or FAST cycle?

______________________________________________________________

______________________________________________________________


(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.

______________________________________________________________

______________________________________________________________

(Total 5 marks)

Q15.
The drawing shows three identical cells and two identical lamps joined in a circuit.

(a) Use the correct symbols to draw a circuit diagram for this circuit.

(b) Each of the cells provides a potential difference (voltage) of 1.5 volts. What is the total potential difference (voltage) provided by all three cells?

______________________________________________________________ volts
(c) Complete this sentence by crossing out the **two** lines in the box that are wrong.

The current through lamp 2 will be **bigger than** the current through lamp 1.

(Total 5 marks)

**Q16.**

(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) Calculate the efficiency of the television set.

______________________________________________________________

______________________________________________________________

**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.

___________________________________________________________________

___________________________________________________________________

Q17.

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

<table>
<thead>
<tr>
<th>Device</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toaster</td>
<td>1.2 kW</td>
</tr>
<tr>
<td>Fan</td>
<td>30 W</td>
</tr>
<tr>
<td>Personal Stereo</td>
<td>10 W</td>
</tr>
</tbody>
</table>

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

The diagrams show the readings on a domestic electricity meter in April and July.
How many Units (kWh) of electricity were used between the two meter readings?

____________________________________________________________________________

____________________________________________________________________________

Number of Units = ______________________

(1)

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)

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

____________________________________________________________________________

____________________________________________________________________________

Energy transferred = ______________________ kWh

(2)

(Total 9 marks)

Q18.

A set of Christmas tree lights is made from twenty identical lamps connected in series.

(a) Each lamp is designed to take a current of 0.25 A. The set plugs directly into the 230 V mains electricity supply.

(i) Write down the equation that links current, potential difference and resistance.
(ii) Calculate the resistance of **one** of the lamps. Show clearly how you work out your final answer and give the unit.

Resistance = ________________

(iii) What is the total resistance of the set of lights?

Total resistance = ________________

(b) How does the resistance of a filament lamp change as the temperature of the filament changes?

Q19.

The drawing shows the circuit used to investigate how the current through a 5 ohm (Ω) resistor changes as the potential difference (voltage) across the resistor changes.
(a) Draw, in the space below, a circuit diagram of this circuit. Use the correct symbols for each part of the circuit.

(b) (i) Write down the equation that links current, potential difference and resistance.

______________________________________________________________

(ii) Calculate the potential difference across the 5 ohm (Ω) resistor when the current through the resistor equals 0.4 A. Show clearly how you work out your final answer.

______________________________________________________________

______________________________________________________________

potential difference = _______________________ volts

(2)

(iii) Complete the graph to show how the current through the resistor changes as
the potential difference across the resistor increases from 0 V to 3 V. Assume the resistor stays at a constant temperature.

(c) The resistor is replaced by a 3 V filament lamp. The resistance of the lamp increases as the potential difference across it increases. Why?

___________________________________________________________________

___________________________________________________________________

(Total 8 marks)

Q20.

The diagram shows a 12 volt lighting system. Each lamp has a power of 32 watts.

(i) Write down the equation that links current, potential difference and power.

___________________________________________________________________

(Total 1 mark)

(ii) Calculate the input current to the lighting system. Show clearly how you work out your answer.

___________________________________________________________________

___________________________________________________________________

current = _________________________________ A

(Total 2 marks)
Q21.
The circuit shown has four identical ammeters.

(a) The table gives the current through two of the ammeters.

(i) Complete the table to show the current through the other two ammeters.

<table>
<thead>
<tr>
<th>Ammeter</th>
<th>Reading on ammeter in amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_1$</td>
<td></td>
</tr>
<tr>
<td>$A_2$</td>
<td>0.2</td>
</tr>
<tr>
<td>$A_3$</td>
<td>0.3</td>
</tr>
<tr>
<td>$A_4$</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Which one of the following statements is correct. Tick (✓) the box next to your choice.

- The resistance of $P$ is more than 20 Ω.  
- The resistance of $P$ is equal to 20 Ω.  
- The resistance of $P$ is less than 20 Ω.  

Give a reason for your choice.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(2)
(b) (i) Write down the equation that links current, potential difference and resistance.

(ii) Calculate the reading on the voltmeter. Show clearly how you work out your answer.

Voltmeter reading = ______________ volts.

(iii) State the potential difference of the power supply.

(c) A second circuit contains an unknown component labelled X.

As component X is heated, the reading on the ammeter goes up.

What is component X?

Give a reason for your answer.

Q22.

(a) Draw lines to join the picture to the correct circuit symbol. The lamp has been done for you.
(b) A family tent is to be fitted with a simple lighting circuit.

The diagram shows the first circuit used.

(i) Are the lamps connected in series or in parallel?

(ii) This is not a good circuit for using in the tent. Why?
The diagram shows the second circuit used.

(iii) Give two reasons why this circuit is better than the first circuit.

1. ____________________________________________________________

2. ____________________________________________________________

Q23.

(a) The diagram shows a 13 amp plug.

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

________________________________________________________________

________________________________________________________________

(ii) Why do plugs have a fuse?

________________________________________________________________

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

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

___________________________________________________________________

(Total 3 marks)

Q24.

(a) The diagram shows the voltage-current graphs for three different electrical components.

![Graphs A, B, C]

Which one of the components A, B or C could be a 3 volt filament lamp? Explain the reason for your choice.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

(3)

(b) Using the correct symbols draw a circuit diagram to show how a battery, ammeter and voltmeter can be used to find the resistance of the wire shown.
(c) When correctly connected to a 9 volt battery the wire has a current of 0.30 amperes flowing through it.

(i) Give the equation that links current, resistance and voltage.

\[ \text{Current} \times \text{Resistance} = \text{Voltage} \]

(1)

(ii) Calculate the resistance of the wire. Show clearly how you work out your answer and give the unit.

\[ \text{Resistance} = \frac{\text{Voltage}}{\text{Current}} \]

Resistance = ________________

(3)

(iii) When the wire is heated, the current goes down to 0.26 amperes. State how the resistance of the wire has changed.

\[ \text{Resistance} = \frac{\text{Voltage}}{\text{Current}} \]

Resistance = ________________

(1)

(Total 11 marks)

Q25.

(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?

1. _______________________________
2. _______________________________

(Mark 2)

(Total 5 marks)

Q26.

(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 __________________.

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

________________________________________________________________________

________________________________________________________________________
(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?

___________________________________________________________________

(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  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 ________________ .

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

___________________________________________________________________

___________________________________________________________________

(Q27. Total 6 marks)

The diagram below shows an electric mains plug.
(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.
Look at the plug carefully. What **four** changes should be made to make the plug safe?

1. _________________________________________________________________
   __________________________________________________________________

2. _________________________________________________________________
   __________________________________________________________________

3. _________________________________________________________________
   _________________________________________________________________

4. _________________________________________________________________
   __________________________________________________________________

   (4) (Total 12 marks)

Q28.

The diagram below shows how one type of fuel gauge in a car works. A sliding contact makes contact with a resistance wire wound in a coil (rheostat). It is connected to a float via a pivot P. When the petrol level changes the circuit resistance changes. This causes the pointer in the fuel gauge to move and show how much petrol is in the petrol tank.
The circuit diagram is shown below.

The petrol gauge is an ammeter. Explain why the reading on the ammeter falls as the petrol is used.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
(Total 3 marks)

Q29.
(a) The picture below shows the bathroom in a house.

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

1. _________________________________________________________________
___________________________________________________________________
___________________________________________________________________
2. _________________________________________________________________
   __________________________________________________________________

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.

<table>
<thead>
<tr>
<th>ELECTRICAL APPLIANCE</th>
<th>POWER RATINGS (W)</th>
<th>TIME USED EACH WEEK (h)</th>
<th>k Wh USED EACH WEEK</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>200</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Kettle</td>
<td>2000</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Toaster</td>
<td>1000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cooker</td>
<td>11 500</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

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

(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?

Q30.
There are many forms of energy. Some of these forms of energy can be “stored” ready to
be used when the energy is needed. The chemical energy in fuels is one example of
stored energy.

(a) Complete the following sentences by adding the missing words.

The chemical energy in fuels such as coal came originally from the ____________ .

Energy from fuels can be used to ________________________________________ .

(b) An electric milk float has its batteries charged up overnight. Early in the morning the
milkman sets off on his round. Describe the energy transfers which take place in the
milk float as the milkman does his rounds.
(c) Give another example of energy other than fuels which can be classed as “stored” energy. Give a use of the “stored” energy.

Type of “stored” energy ________________________________________________

Use ___________________________________________________________________

(Total 8 marks)
(b) Describe how the resistance of the lamp changes after the current has reached its maximum value.

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

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

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

---

**Q32.**

(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.

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

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

(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?
________________________________________________________________________

Q33.
Some electronic calculators use light emitting diodes (LEDs) to display numbers. Each number in a display consists of up to seven LEDs. The LEDs are arranged as shown in the diagram below. The different numbers are formed by switching different LEDs on at the same time. The LEDs are labelled A to G.

A simplified circuit to provide power to the LEDs is shown below.
(a) Explain why each LED has its own switch.

___________________________________________________________________

___________________________________________________________________

(2)

(b) What number is displayed when all switches except E are closed?

___________________________________________________________________

(1)

(c) Which switches would be open if the number 3 is to be displayed?

___________________________________________________________________

(1)

(d) Which of the numbers 0 to 9 draws least current from the battery? Explain your answer.

Number _______________________

Explanation _________________________________________________________

___________________________________________________________________

(2)

(Total 6 marks)

Q34.

The circuit diagram below shows a battery connected to a lamp and a switch.
(a) State what happens to the lamp when:

(i) the switch is open (OFF);

(ii) the switch is closed (ON).

(b) When the switch is closed what problem is caused in the circuit?

(c) In the space below draw a circuit diagram to show how the switch should be correctly connected to the lamp and battery.

Q35.

The diagram shows a fan heater.

(a) Complete this sentence.

The fan heater is designed to transfer electrical energy as __________________ energy and __________________ energy.

(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

\[
\text{energy transferred (kWh)} = \text{power (kilowatt, kW)} \times \text{time (hour, h)}
\]

(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)
Mark schemes

Q1.

(i) 30

allow 1 mark for showing correct method i.e. 5 × 6 or 12 ÷ 0.4

(ii) connected in series

insufficient they are not connected in parallel

(iii) 0.4

(iv) equally/ evenly

the same is insufficient
allow credit for candidates that correctly mention pd across the connecting wires
accept (nearly) 2 V (each)

[5]

Q2.

(a) electrical

sound

correct order only

(b) the energy transformed by the TV will be destroyed

(c) a higher efficiency than

[4]

Q3.

(a) (i) France

(ii) any one from:

• different homes have different appliances(*)
• different homes have different numbers of appliances(*)
  (*) accept all homes are different
• standby power not the same for all appliances
• some people will switch appliances off
  accept named appliances
  accept people waste different amounts of energy
• homes have different numbers of residents
• can’t measure every (individual) home
  accept any sensible suggestions
  do not accept answers in terms of accurate / precise etc

(b) (i) increases amount of energy wasted
  accept (encourages) people to leave appliances on (standby)
  accept increases it

(ii) any two from:
• less electricity needed / generated
• fewer power stations needed
• less coal is burned
  do not accept coal is non-renewable / running out
  answers in terms of fuel stocks neutral
• less pollutant gases produced
  accept named gases
  accept harmful for pollutant
  accept greenhouse gases
  accept reduce / slow / stop global warming
  accept reduces acid rain

(c) joule

(d) (i) 6800
  accept £68 for 3 marks an answer of 68 gains 2 marks
  allow 2 marks for correct substitution ie 400 × 17
  allow 1 mark for obtaining 400
  answers of 7480, 4760, 12920, 4080 gain 2 marks

(ii) a small . . . . . . electricity

Q4.
(a) (i) 0.6
  accept 60 %
  allow 1 mark for useful energy = 480
  answer 0.6 with any unit or 60 gains 1 mark only

(ii) transferred to surroundings
  accept goes into the air
  accept heats the surroundings up
  accept gets spread out
  accept transferred into heat (only)
do not accept wasted / lost unless qualified
destroyed negates mark
transferred into light / sound negates mark

(b) (i) 1.75
   allow 1 mark for converting to kW
   answers of 0.7, 0.525, 0.35, 0.875, 1.05, 5.25 gains 1 mark
   answers of 1750 or 17.5 gains 1 mark  

(ii) 21p or £0.21 or their (b)(i) × 12  

(c) any two from:
   • (more) electricity needs to be generated
     (more) electricity is being used
   • (more) power stations needed
   • (more) fossil fuels burnt
     accept named fossil fuel
   • (more) pollutant gases emitted
     accept named gas
     accept harmful for pollutant
     accept greenhouse gases
     accept atmospheric pollution
     accept answer in terms of any form of electricity generation
     and an associated environmental problem  

Q5.  
(a) three lines drawn correctly
allow 1 mark for 1 correct line
if more than one line goes from a graph, both are incorrect

(b)  J  

Q6.

(a)  (i)  6  
     (ii)  6 (volts)  
     accept their (a) (i) ignore any units

(b)  0.30  
     accept 0.3

(c)  smaller(than)
a bigger current flows through the lamp

only accept if 'smaller than' is given
accept converse
accept a correct calculation
accept resistance is half of 60
accept resistance = 30 (Ω)
do not accept answers in terms of p.d

Q7.

(a) electric drill C

MP3 player E

toaster B

(b) (i) 2100

no unit required / ignore units
accept 2.1 kW must have units for this

(ii) Y

(iii) bar drawn with any height greater than Y

ignore width of bar

(c) (i) any one from:

answers must be a comparison

• holds more water
do not accept 1 litre of water on its own

• works in other countries
accept a named country
accept works at 2 voltages

• boils faster

• has a more powerful element
do not accept 1 kW element on its own

• can filter water

ignore can wash filter

(ii) any one from:

• it weighs less
smaller to pack
cheaper to use

answers must be a comparison
or state why the chosen feature is an advantage
accept boils enough for one drink

Q8.

(a) £15

allow 1 mark for use of 125 (kWh)
allow 1 mark for an answer 1500
allow both marks for 1500 pence / p
allow 1 mark for correct calculation of annual cost for either freezer (£27 and £42)

(b) £45

or their (a) × 3

allow 1 mark for correct use of 3
allow 1 mark for 12 – 9 = 3

(c) any two from:

the marks are for the explanation

yes plus explanation

• less electricity / energy needed / used
  accept less energy wasted

• less (fossil) fuels burned
  accept a named fossil fuel
  do not accept conserving (fossil) fuels

• less polluting gases emitted
  accept a named polluting gas / greenhouse gases / carbon emissions / reduce global warming
  accept an answer in terms of nuclear fuel
  eg less nuclear fuel required (1)
  less nuclear waste (1)

or no plus explanation

• old freezer must be disposed of

• hazardous chemicals inside freezer
  accept CFC gases

• (lot of) energy used in producing new freezer
Q9.

(a) (i) ammeter symbol correct and drawn in series

\[ \text{accept} \]
\[ \text{do not accept lower case a} \]

voltmeter symbol correct and drawn in parallel with the material

\[ \text{do not accept} \]

(ii) adjust / use the variable resistor

\[ \text{accept change the resistance} \]

or change the number of cells

\[ \text{accept battery for cell} \]
\[ \text{accept change the p.d / accept change the voltage} \]
\[ \text{accept increase / decrease for change} \]

(b) (i) data is \textbf{continuous} (variable)

1

(ii) 36 (Ω)

\[ \text{correct answer only} \]

1

(iii) 5.4 or their (b)(ii) × 0.15

\[ \text{allow 1 mark for correct substitution} \]

2

(c) (i) the thicker the putty the lower the resistance

\[ \text{answer must be comparative} \]
\[ \text{accept the converse} \]

1

(ii) any \textbf{one} from:

- measuring length incorrectly
  \[ \text{accept may be different length} \]

- measuring current incorrectly
  \[ \text{do not accept different currents} \]

- measuring voltage incorrectly
  \[ \text{do not accept different voltage} \]

- ammeter / voltmeter incorrectly calibrated

- thickness of putty not uniform

- meter has a zero error
  \[ \text{accept any sensible source of error eg putty at different temperatures} \]
  \[ \text{do not accept human error without an explanation} \]
  \[ \text{do not accept pieces of putty not the same unless qualified} \]
do not accept amount of putty not same
do not accept systematic / random error

(iii) repeat readings
    accept check results again
    accept do experiment again
    accept do it again
    accept compare own results with other groups
    do not accept take more readings

Q10.

(a) iron
    hairdryer
    kettle
    answers can be in any order
    1

(b) sound
    1

(c) is more efficient than
    1

[10]

Q11.

(a) £19.20
    allow 1 mark for correct substitution
    ie 160 × 12
    allow 1 mark for an answer (£)1920
    an answer of 1920p gains both marks
    an answer of £40.80 gains both marks
    allow 1 mark for 340 × 12
    2

(b) 340
    allow 1 mark for correctly using the reading 62580
    ie 62920 – 62580
    accept £40.80 for both marks
    2

[5]

Q12.

(a) (i) 4 (V)
    allow 1 mark for correct substitution
    2

(ii) 5 (V) or (9 – their (a)(i)) correctly calculated
e.c.f

[4]
**do not allow a negative answer**

(b) (i) **thermistor**

(c.a.o)  

(ii) 0°C to 20°C

[5]

**Q13.**

(a) alternates

- accept switches
- accept (constantly) changes
- accept goes up and down

between positive and negative

(b) potential difference between the neutral and earth (terminal)

- accept voltage for p.d

or potential of the neutral terminal with respect to earth

(c) (i) 0.025 (s)

(ii) 40 (Hz)

- accept 1 ÷ their (a)(i)

[5]

**Q14.**

(a) kinetic

- accept movement

(b) (i) 3 (kWh)

- allow 1 mark for selecting the correct information

(ii) transfers more energy

- accept transform or use for transfer
- accept electricity for energy

- allow higher (average) power and switched on for more time

(iii) any one from:

- use the internet
- brochures
- reading adverts
• visiting shops
• recommendation from friends / plumbers

Q15.
(a) circuit symbol for a lamp correct

\[ \text{accept} \]

accept any standard of drawing providing circuit would work

\[ \text{circuits symbol for a cell correct} \]

2 lamps drawn in parallel with 3 cells
polarity of cells must be correct (+ to –) but cells may be either way around

(b) 4.5

(c) the same as
accept any clear indication of the correct answer

Q16.
(a) (i) heat

(ii) temperature increases or (cause) convection (currents)
accept gets warmer
accept gets hotter

(iii) 60% or 0.6
60 without % scores 1 mark
0.6 with a unit scores 1 mark
60 with incorrect unit scores 1 mark
\[ \frac{120}{200} \]

or correct substitution for 1 mark
Q17.
(a) each correct line scores 1 mark

(b) toaster

(c) (i) 400

(ii) £24 or 2400p

(d) 6

Q18.
(a) (i) potential difference = current × resistance

*accept voltage or pd for potential difference*

*accept V = I × R*

*accept correct transformation*

*do not accept V = C × R*

*do not accept V = A × R*
Q19.

(a) all symbols correct

\[ \text{accept push switch symbol switch may be open or closed} \]

any lines through symbols = 0 marks

(b) as temperature increases, resistance increases

\[ \text{accept hotter for temperature increase} \]

\[ \text{do not accept a reference to resistance only i.e. it / resistance goes up} \]

1

[7]

(ii) 46

credit correct transformation for 1 mark
allow 1 mark for use of 11.5 V or division of final resistance by 20

a final answer of 920 gains 2 marks only

ohm(s)

\[ \text{accept symbol } \Omega \]

\[ \text{do not accept } \Omega \text{ s} \]

unit / symbol mark can be awarded in (iii) provided unit / symbol is omitted in (ii)

1

(iii) 920 (ohms) or their (a)(ii) × 20

1

voltmeter must be across resistor only

\[ \text{two cells are required in the diagram} \]

\[ \text{ignore the order of the components} \]

\[ \text{allow small gaps in circuit} \]

\[ \text{omission of any component = 0 marks} \]
(b) (i) potential difference = current × resistance 
   accept voltage or p.d. for potential difference 
   accept \( V = I \times R \)

   accept \( \begin{array}{cc} \text{V} \\ \text{I} \end{array} \) provided \( I \times R \) subsequent use correct

   do not accept \( C \) for current

(ii) 2
   allow 1 mark for correct substitution 
   wrong working loses both marks

(iii) straight line drawn through the origin 
   judge by eye
   straight line passes through \( I = 0.4, V = \text{their (b)(ii) / 2 and 0.0} \)
   this mark may be awarded if all points shown including these points are correct even if no line is drawn 
   N.B. a curve scores 0 marks

(c) temperature increases 
   accept filament lamp / it gets hotter 
   allow heat for temperature

Q20.
(i) power = potential difference × current 
   accept voltage for potential difference 
   accept \( P = V \times I \) 
   or correct transposition

   accept \( \begin{array}{cc} \text{P} \\ \text{V} \end{array} \) provided subsequent method correct

(ii) 8
   allow 1 mark for correct substitution or transformation or an answer 2.67 / 2.7

Q21.
(a) (i) \( A_1 = 0.5 \) 
   ignore any units
A^4 = 0.5
allow 1 mark for A^4 ≠ 0.5

(ii) the resistance of P is more than 20 Ω
1

a smaller current goes through P / A_2 (than 20 Ω)
dependent on getting 1st mark correct
accept converse

(b) (i) potential difference = current × resistance
1
accept pd / voltage for potential difference
accept V = I × R, correct symbols and correct case only
accept volts = amps × ohms
accept

V
I
R
provided subsequent method is correct
allow combination of
physical quantities and named units
allow voltage = I × R

(ii) 6
allow 1 mark for correct substitution

(iii) 6
accept their (b)(ii)

(c) thermistor or

accept correct circuit symbol
allow phonetic spelling

resistance goes down (as temperature of thermistor goes up)
do not accept changes for goes down

do not accept an answer in terms of current only
answers in terms of other components are incorrect

Q22.
(a) all 3 lines drawn correctly
(1 only correct, 1 mark)
deduct one mark if more than one line from or to a single box

(b) (i) series

(ii) any one from:

- both lamps or lights must be on together
- if one blows, the other goes out
- switch controls both bulbs
  do not accept bulbs dimmer

(iii) any two from

- each lamp or light can be switched on independently
- if one lamp blows the other stays on
- switching the second lamp on does not affect brightness of first
  or bulbs brighter (than in first circuit) or energy explanation

Q23.

(a) (i) live and neutral wrong way around
  accept blue and brown wrong way round or in the wrong place
  for credit both wires must be given
  do not accept the wires are in the wrong holes

(ii) to protect the appliance
  accept melt or blow or burns out if too much current or power or energy or electricity flows
  accept to stop too much current or power or energy or electricity flowing
  accept stop overheating or a fire
  do not accept 'safety' unless qualified by above
Q24.

(a) C

award mark if A and B identified as not filament lamp

resistance increases

negated by wrong statement e.g. current goes down

as the lamp gets hot

accept as current (through lamp) or voltage (across lamp) increases

do not accept non-ohmic reason independent of choice of component

(b) ammeter wire and battery only in series

non standard symbols acceptable if correctly identified (labelled) for ammeter, voltmeter and battery

voltmeter only in parallel with wire or battery

all in series or ammeter in parallel neither of these two marks awarded

all symbols correct

ignore lines drawn through centres of symbols

(c) (i) voltage = current × resistance

accept $V = I \times R$

accept volts = amps × ohms

do not accept $V = C \times R$

\[ \begin{tikzpicture}
    \node (v) at (0,0) {V};
    \node (i) at (-1,-1) {I};
    \node (r) at (-1,-2) {R};
    \draw (v) -- (i); \draw (v) -- (r);
\end{tikzpicture} \]

accept

if subsequent method correct

(ii) 30

accept correct substitution for 1 mark (9/0.3)

ohms

accept correct symbol $\Omega$

(iii) goes up
Q25.
(a) (i) electrons  

(ii) ammeter  

[11]

Q26.
(a) (i) any one from:  

- water to the mug  
- water to the air  
- mug to the air  
- mug to the table  

both required  
direction of transfer must be correct  

(ii) when temperatures are the same  

accept a specific example eg when the temperature of the water and mug are the same  

accept radiant heat transfer will never stop  

(b) wood  

1  

(c) (i) conduction  

accept convection if not given as 3rd answer  

insulator  

1  

(ii) any one from:  

[5]  

do not accept any rebuilding of house
double glazing

loft insulation
  
  *accept roof for loft*  

1

carpets

(cavity) wall insulation
  
  *do not accept closing doors and windows*  

draft excluders

foil behind radiators
  
  *accept blocking chimney*  

paint inside walls white

[6]

Q27.

(a) A – fuse  
B – (cable) grip  
  
  *for 1 mark each*  

2

(b) X – brown/red  
Y – green + yellow/green  
Z – blue/black  
  
  *for 1 mark each*  

3

(c) any plastic/rubber  
  
  *for 1 mark*  

1

(d) (i) earth  
  
  *for 1 mark*  

1

(ii) metal appliance needs earthing/safety qualified  
  
  *for 1 mark*  

1

(e) cut less insulation on earth; neutral wire needs connecting;  
fit fuse properly; cable grip needs to be an outer cable or allow identifying faults  
  
  *for 1 mark each*  

4  

[12]

Q28.

level drops as petrol used;  
causes circuit resistance to increase;  
causes current to decrease  
  
  *for 1 mark each*  

or if change not specified;
Q29.

(a) Mains socket – once only
Shower cable can get wet
Trailing cable to fire (not heater unless fire clearly identified)
Use of fire
Free running cable from ceiling
Appliance on side of bath
Use of ordinary light switch
Free cable to sink light
any 3 each for 1 mark

(b) (i) 7, 4, 1, 80.5
Four right – 2
Three right – 1
All right in W – 1

(ii) Toaster

(iii) 32p
gets 3 marks
Else 8 \times 4
gets 2 marks
Else unit cost = 8p
gets 1 mark

Q30.

(a) Sun
Any valid
for 1 mark each

(b) From electric/pe or chemical in battery
for 1 mark

to ke, light, sound, heat
3 for 1 mark each

(c) Gravitational pe OR just pe
For any gravity feed
OR Elastic pe
any valid
OR Food
For maintaining body/life etc.
OR Any descriptive answer
e.g. water in a high lake used to produce hydroelectric power

\[ 2 \text{ for 1 mark each} \]

Q31.
(a) Current = 0.4A (1)
R = \frac{V}{I} or 240/0.4 (1)
R = 600 ohm (1)

(b) Doubles
\textit{gets 2 marks}
OR gets bigger
\textit{gets 1 mark}

(c) \[ P = V.I \text{ or } 240 \times 0.4 \]
\[ P = 96W \]
\textit{for 1 mark each}

(d) \[ 1 = 0.2A \]
\[ P = 48W \]
\textit{for 1 mark each}
\textit{BUT may get equation mark here if not in (c)}

(e) \[ P = V.I.t \ (1) \]
\[ P = 240 \times 0.2 \times 6 \times 3600 \]
\textit{OR} \[ P = 48 \times 6 \times 3600 \]
\textit{gets 1 mark}

\[ P = 1036800 \text{ W} \]
\textit{gets 1 mark}

Q32.
(a) Earth
return/neutral
live
\textit{for 1 mark each}

(b) (i) rubber/plastic
\textit{for 1 mark}

(ii) cable/wire/grip
\textit{cable/wires}
\textit{fuse}
Q33.
(a) to switch on/off independently OWTTE
   *for 1 mark each
   2

(b) 9
   *for 1 mark
   1

(c) B and E
   *for 1 mark
   1

(d) 1
   Two/least number of LED used
   *for 1 mark each
   2
   [6]

Q34.
(a) (i) the lamp will be on/will give out light
   *1

(ii) the lamp will be off/will not give out any light
   *1

(b) (very) large current flows
or damage the battery/overheat the battery
or short circuit
or wire get hot
   *1

(c) switch connected in series with lamp and battery
   *1
   [4]

Q35.
(a) heat / thermal
kinetic / movement
   *each for 1 mark
   2
(b) (i) its a good (electrical) conductor  
\textit{for 1 mark}  
1
(ii) its a good (electrical) \textbf{insulator} / very \textbf{poor conductor}  
\textit{for 1 mark}  
1

(c) (i) \(2.75 \times 6\)  
gains 1 marks  
but  
16.5  
gains 2 marks  
2
(ii) (c)(i) \(\times 7\) or no. of kW h \(\times\) cost/kW h  
gains 1 marks  
but  
115.5 or e.c.f if correct  
gains 2 marks  
2

(d) it would heat and melts / blows / burns out / breaks circuit  
any two for 1 mark each (fuse wire just breaks – gains 1)  
(blowds up – gets 0)  
(fuse causing wire to melt gets 1)  
2