Energy Transfers in a System

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.1 Energy
Sub-Topic	Energy Transfers in a System
Difficulty Level	Silver Level
Booklet	Question Paper

Time Allowed: **29 minutes**

Score: **/28**

Percentage: **/100**

Grade Boundaries:

Q1.Figure 1 shows a battery operated remote control car.

Figure 1

(a) The car's battery contains a store of energy.

As the car moves, energy from one store is transferred to another store.

Describe how different stores of energy change as the car moves.

.....

.....

.....

.....

(2)

(b) The car has a top speed of 12 m / s and a mass of 800 g.

Write down the equation that links kinetic energy, mass and speed.

Equation .....

(1)

(c) Calculate the maximum kinetic energy of the car.

.....

.....

.....

Maximum kinetic energy = ... J

(2)

(d) Explain why having a more efficient motor increases the top speed of the car.

.....

.....

.....

.....

(2)

(e) **Figure 2** shows an electric car being charged.

Figure 2

By Alan Trotter Electric Car Charging [CC-BY-2.0]via Flickr

A driver wishes to buy a new car.

The table below gives some data about an electric car and one with a petrol engine.

	Electric car	**Petrol engine car**
Cost (£)	27 000	15 000
Running cost per year (£)	250	2 000
Average lifetime (years)	12	12

Which car would be the most economic over its 12 year lifetime?

Use data from the table above to support your answer.

You should include the difference in cost in your answer.

.....

.....

.....

.....

.....

.....

.....

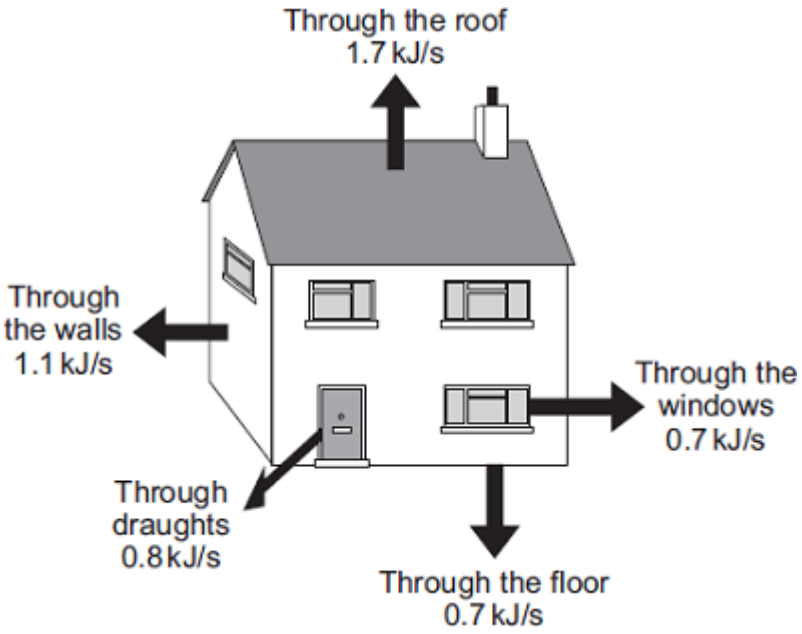
.....

.....

(4)
(Total 11 marks)

Q2.Diagram 1 shows the energy transferred per second from a badly insulated house on a cold day in winter.

Diagram 1



(a) (i) When the inside of the house is at a constant temperature, the energy transferred from the heating system to the inside of the house equals the energy transferred from the house to the outside.

Calculate, in kilowatts, the power of the heating system used to keep the inside of the house in **Diagram 1** at a constant temperature.

1 kilowatt (kW) = 1 kilojoule per second (kJ/s)

.....

Power of the heating system = ... kW

(1)

(ii) In the winter, the heating system is switched on for a total of 7 hours each day.

Calculate, in kilowatt-hours, the energy transferred each day from the heating system to the inside of the house.

.....

.....

Energy transferred each day = ... kWh

(2)

(iii) Energy costs 15 p per kilowatt-hour.

Calculate the cost of heating the house for one day.

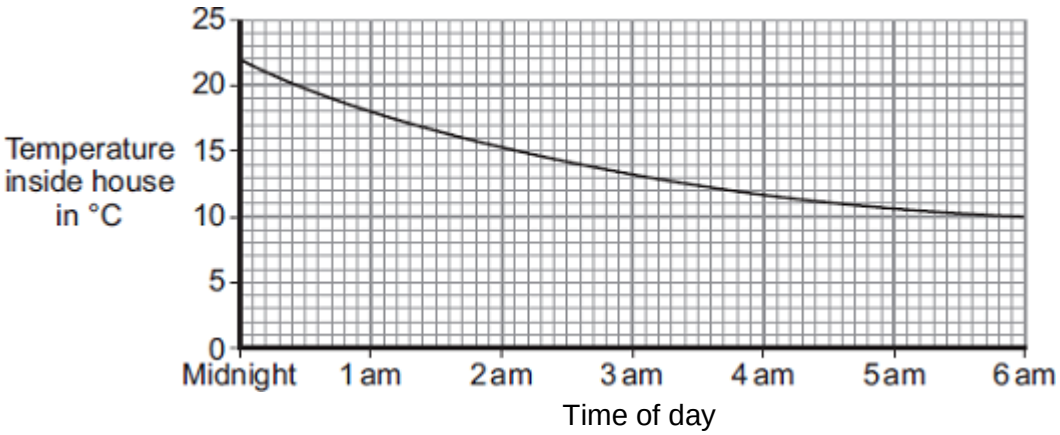
.....

Cost = ...

(1)

(iv) The heating system is switched off at midnight.

The graph shows how the temperature inside the house changes after the heating system has been switched off.



Draw a ring around the correct answer in the box to complete the sentence.

Between midnight and 6 am the rate of energy transfer from

the house	decreases. decreases then stays constant. increases.

Give the reason for your answer.

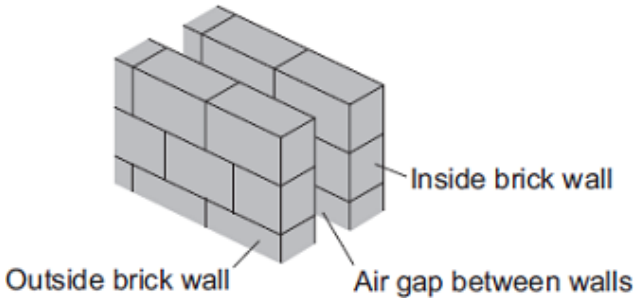
.....

.....

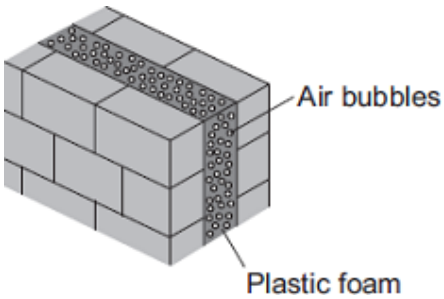
(2)

(b) **Diagram 2** shows how the walls of the house are constructed.
Diagram 3 shows how the insulation of the house could be improved by filling the air gap between the two brick walls with plastic foam.

Diagram 2 **Diagram 3**



U-value of the wall = 0.7



U-value of the wall = 0.3

The plastic foam reduces energy transfer by convection.

Explain why.

.....

.....

.....

.....

(2)
(Total 8 marks)

Q3. A gas burner is used to heat some water in a pan.

Of the energy released by the burning gas by the time the water starts to boil:

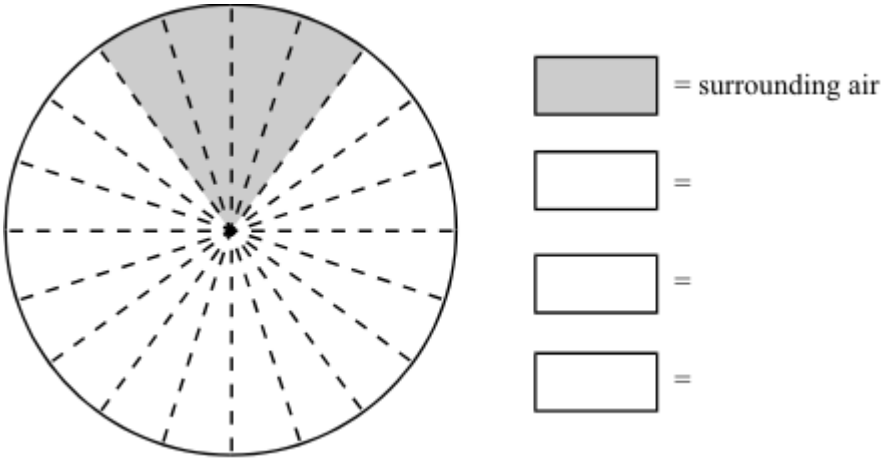
60% has been transferred to the **water**.

20% has been transferred to the **surrounding air**.

13% has been transferred to the **pan**.

7% has been transferred to the **gas burner** itself.

(a) Use the above information to complete the pie-chart.



(3)

(b) Some of the energy released by the burning gas is wasted.

(i) What happens to this wasted energy?

.....

.....

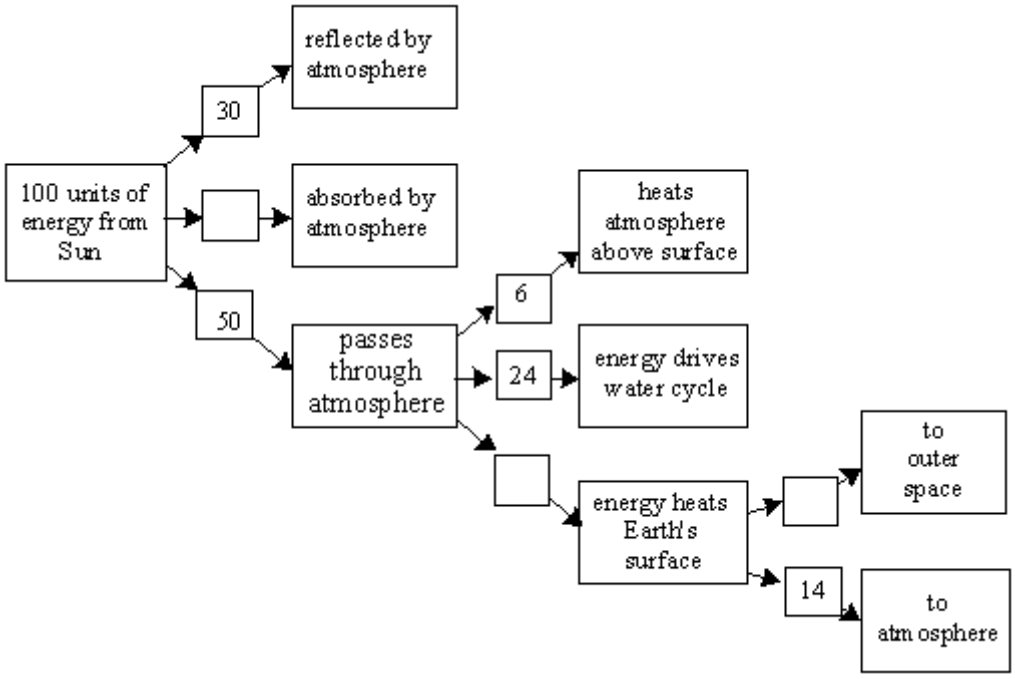
(2)

(ii) What percentage (%) of the energy from the gas is wasted? Answer: ..... %

(1)

(Total 6 marks)

Q4. Complete the boxes on the chart to show what happens to the energy from the Sun.



(Total 3 marks)