

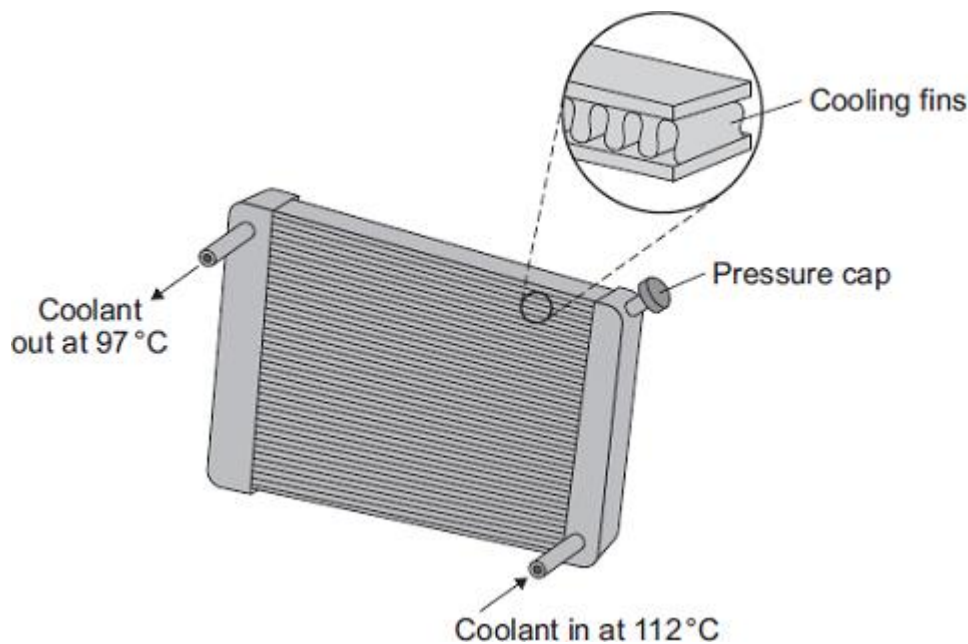
Name of the Student: \_\_\_\_\_

Max. Marks : 27 Marks

Time : 27 Minutes

**Q1.**

The diagram shows a car radiator. The radiator is part of the engine cooling system.



Liquid coolant, heated by the car engine, enters the radiator. As the coolant passes through the radiator, the radiator transfers energy to the surroundings and the temperature of the coolant falls.

(a) Why is the radiator painted black?

\_\_\_\_\_

\_\_\_\_\_

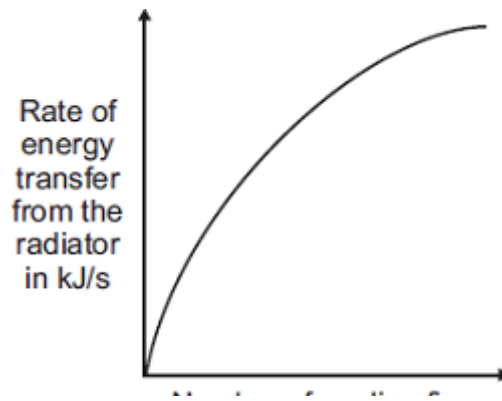
\_\_\_\_\_

\_\_\_\_\_

(2)

(b) Different radiators have different numbers of cooling fins along the length of the radiator.

The sketch graph shows how the number of cooling fins affects the rate of energy transfer from the radiator.



The number of cooling fins affects the rate of energy transfer from the radiator.

Explain how.

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(2)

- (c) When the car engine is working normally, 2 kg of coolant passes through the radiator each second. The temperature of the coolant falls from 112 °C to 97 °C.

Calculate the energy transferred each second from the coolant.

Specific heat capacity of the coolant = 3800 J/kg °C.

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Energy transferred each second = \_\_\_\_\_ J

(3)

- (d) On cold days, some of the energy transferred from a hot car engine is used to warm the air inside the car. This is a useful energy transfer.

What effect, if any, does this energy transfer have on the overall efficiency of the car engine?

Draw a ring around the correct answer.

**decreases the efficiency**

**does not change the efficiency**

**increases the efficiency**

Give a reason for your answer.

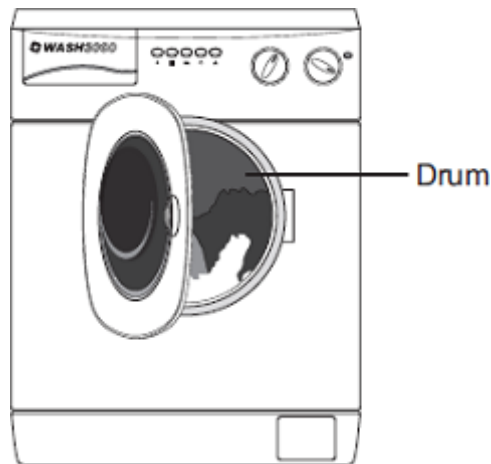
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**Q2.**

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



(a) Complete the following sentences.

(i) An electric motor is designed to transform electrical energy into \_\_\_\_\_ energy.

(1)

(ii) Some of the electrical energy supplied to the motor is wasted as \_\_\_\_\_ energy and \_\_\_\_\_ energy.

(1)

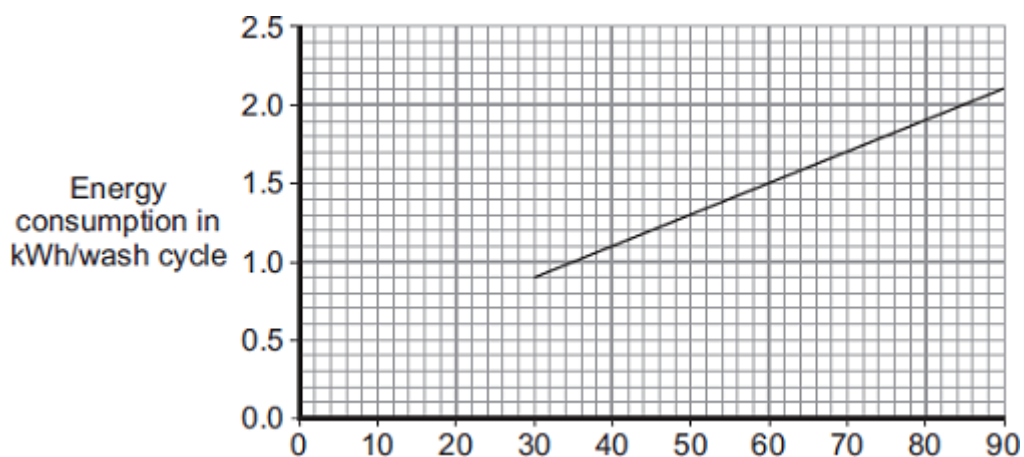
(b) What happens to the energy wasted by the electric motor?

\_\_\_\_\_

\_\_\_\_\_

(1)

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



- (i) Electricity costs 15p per kilowatt-hour (kWh).

The temperature setting is turned down from 40 °C to 30 °C.

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

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

Show clearly how you work out your answer.

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Money saved = \_\_\_\_\_

(2)

- (ii) Reducing the amount of energy used by washing machines could reduce the amount of carbon dioxide emitted into the atmosphere.

Explain why.

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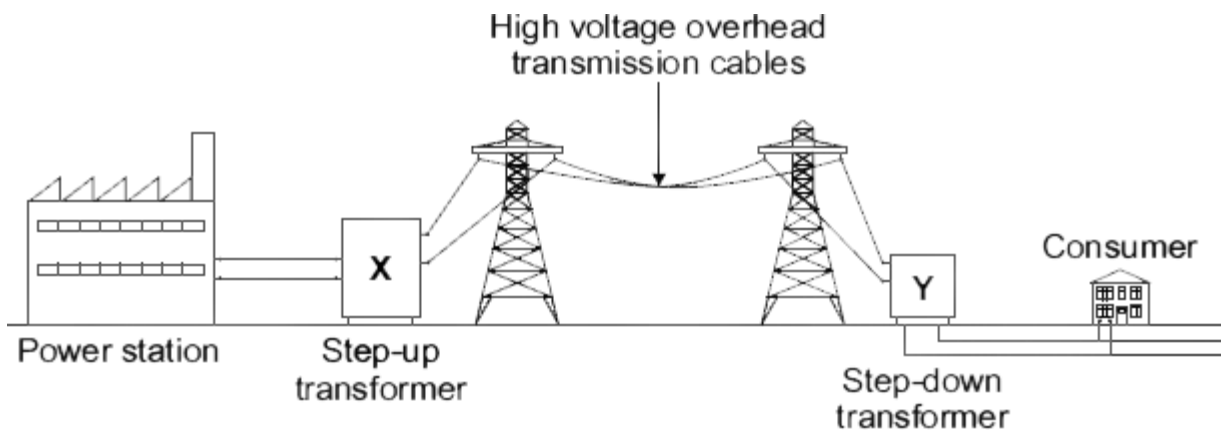
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(2)

(Total 7 marks)

**Q3.**

The diagram shows the National Grid system.



- (a) The National Grid includes step-up transformers.

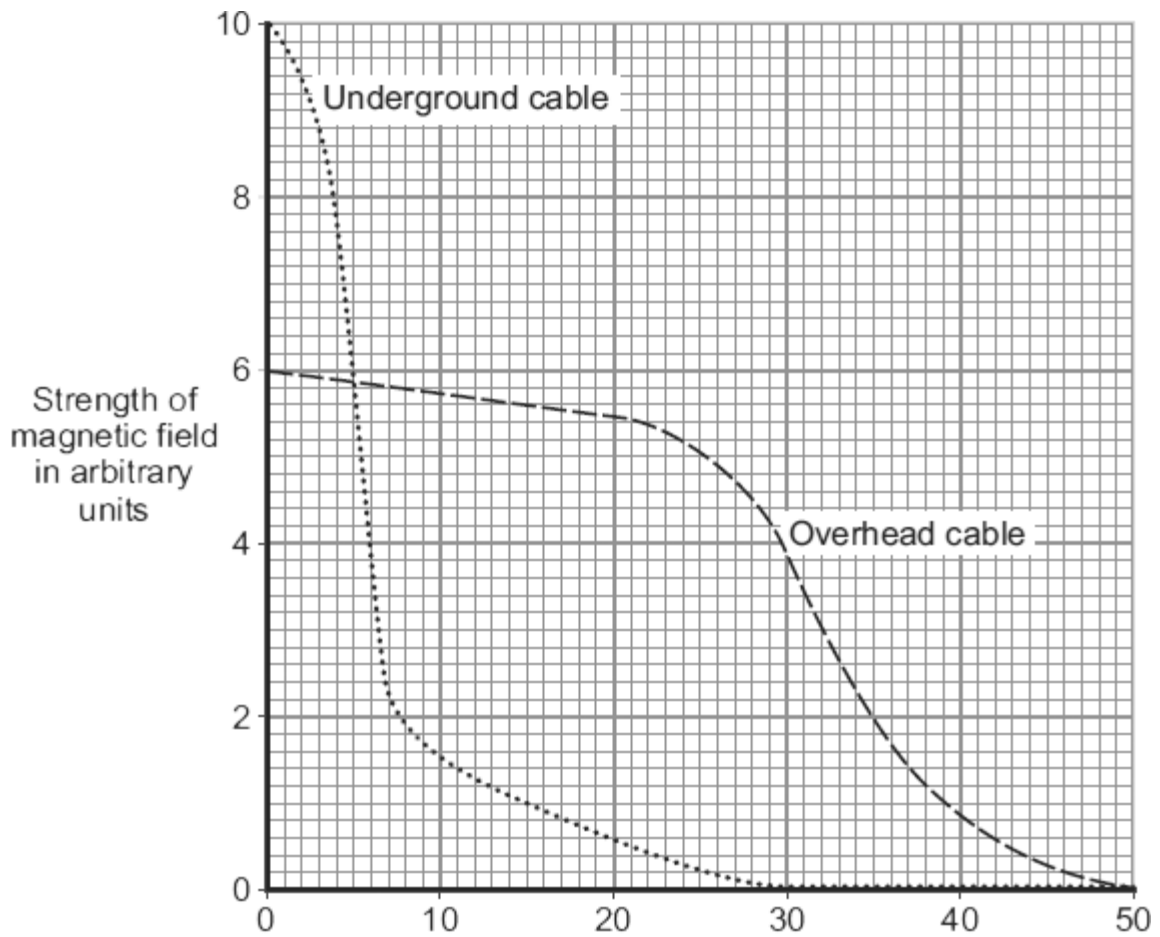
Explain why.

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What conclusions may be drawn from this graph?

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(2)

- (d) Some people think that, because of the magnetic fields, living close to transmission cables is dangerous to health. Laboratory studies on mice and rats exposed to magnetic fields for two or more years found that the magnetic fields had no effect on the animals' health.

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

Using animals in scientific research raises

economic

environmental

ethical

issues.

(1)

(Total 11 marks)