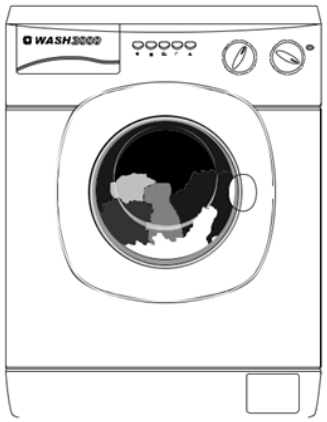
Conservation of Energy and Power and Energy Forms 1

Q:1 **(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 mark)

(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 marks)

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

_____

_____

(1 mark)

(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 mark)

Q :2 (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

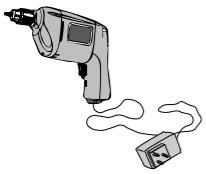
D.electrical to light

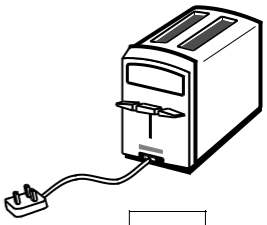
E.electrical to sound

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.

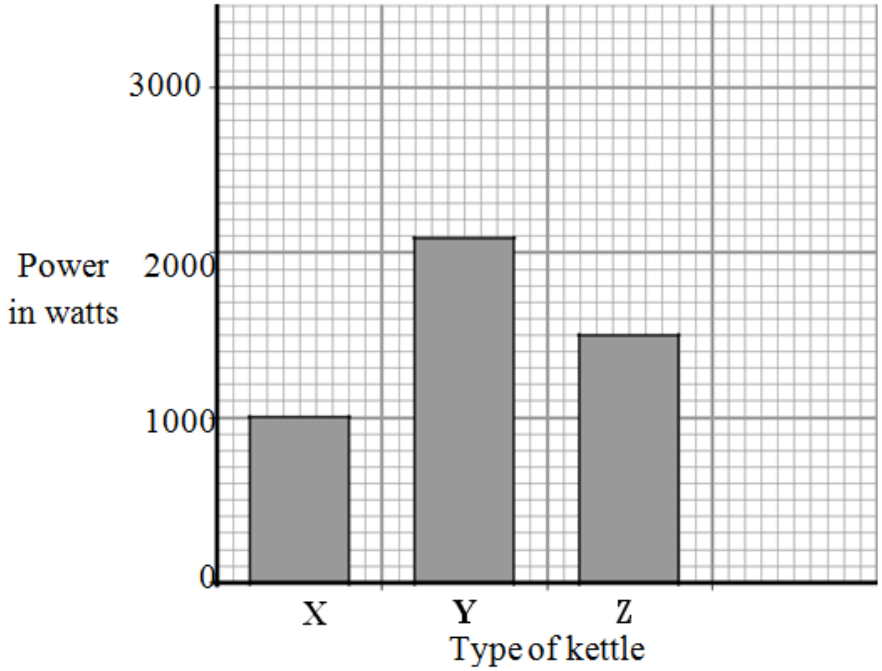
Drill **MP3 player** **Toaster**





(3 marks)

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



(i) What is the power of kettle Y?

_____

(1 mark)

(ii) In one week each kettle is used for a total of 30 minutes. Which kettle costs the most to use?

_____

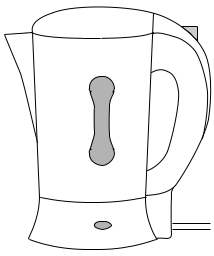
(1 mark)

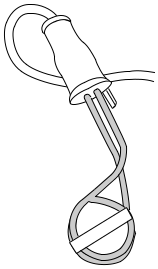
(iii)A new 'express boil' kettle boils water faster than any other kettle.

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

(1 mark)

(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	Immersion heater
1 kW element	0.4 kW element
Holds 1 litre	Heats up to 0.5 litres of water
Works on 110 V or 230 V	Works on 230 V only
Washable water filter	Small compact size

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

_____

_____

(1 mark)

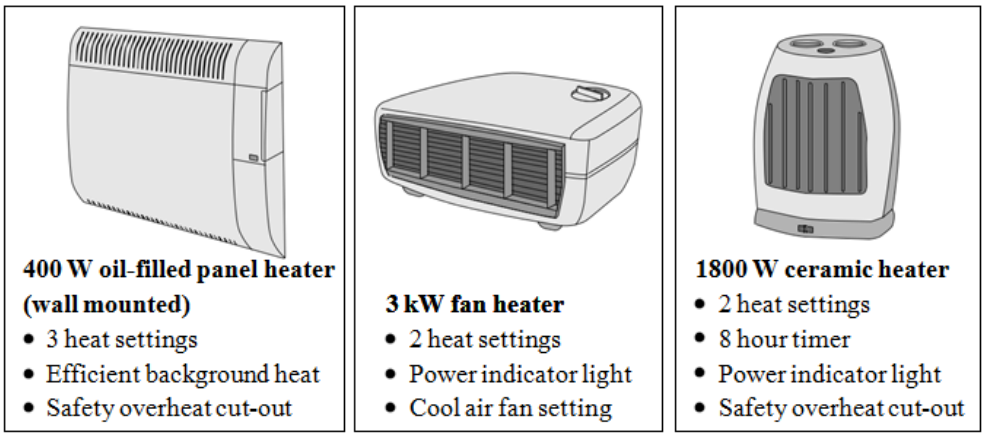
(ii) Give one advantage of taking the immersion heater.

._____

_____

(1 mark)

Q:3 The pictures show three different types of electric heater.



400 W oil-filled panel heater (wall mounted)
- 3 heat settings
- Efficient background heat
- Safety overheat cut-out

3 kW fan heater
- 2 heat settings
- Power indicator light
- Cool air fan setting

1800 W ceramic heater
- 2 heat settings
- 8 hour timer
- Power indicator light
- Safety overheat cut-out

(a) The ceramic heater is run on full power for 5 hours.

Use the following equation to calculate, in kilowatt-hours, the amount of energy transferred from the mains to the heater.

energy transferred = power × time

Show clearly how you work out your answer.

Energy transferred = _____ kilowatt-hours

(2 marks)

(b) Which heater will be the most expensive to run on its highest heat setting?

(1 mark)

(c) A heater is needed for a small office.

Comparing each type of heater with the other two, give one advantage of using each type of heater in the office.

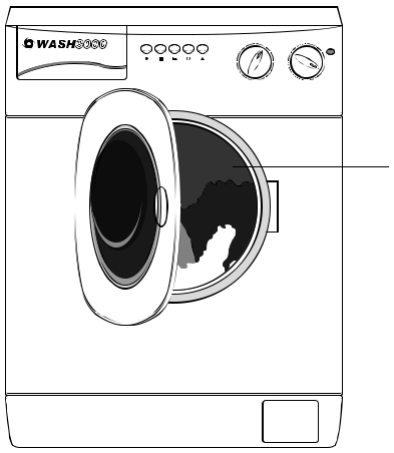
oil-filled panel heater

fan heater

ceramic heater

(3 marks)

Q: 4 The picture shows a new washing machine. When the door is closed and the machine switched on, an electric motor rotates the drum and washing.



(a) Complete the following sentences.

(a)(i) An electric motor is designed to transform electrical energy into _____ energy.

(1 mark)

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

(1 mark)

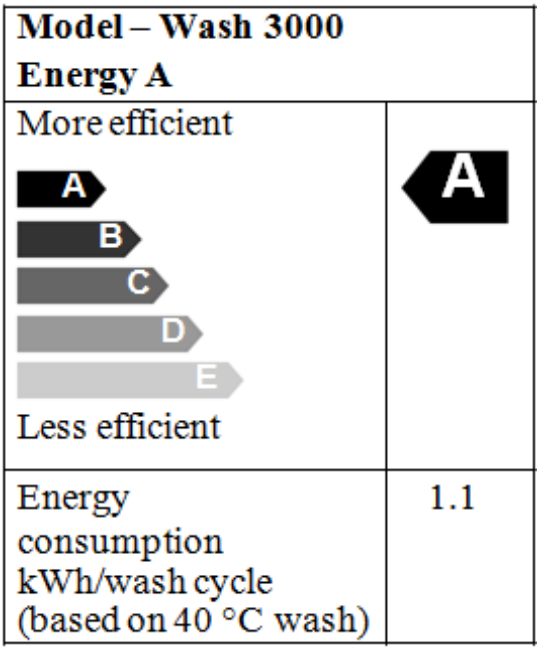
(b) What happens to the energy wasted by the electric motor?

_____

_____

(1 mark)

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



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

Explain what being more energy efficient means.

_____

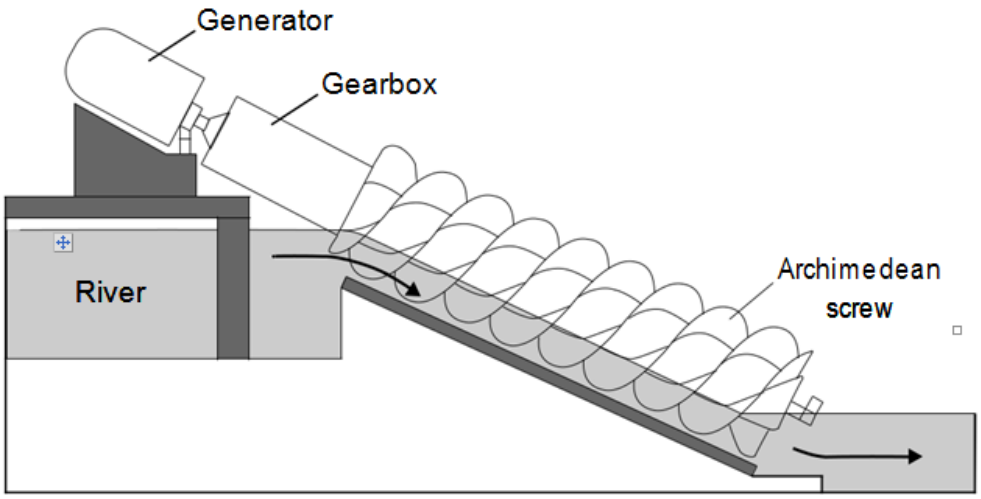
_____

_____

(2 marks)

Q:5 The diagram shows a small-scale, micro-hydroelectricity generator which uses the energy of falling river water to generate electricity. The water causes a device, called an Archimedean screw, to rotate.

The Archimedean screw is linked to the generator by a gearbox.



(a) Complete the following sentence by drawing a ring around the correct word in the box.

The gravitational potential energy of the falling water is transformed into the

chemical
electrical energy
kinetic

of the Archimedean screw.

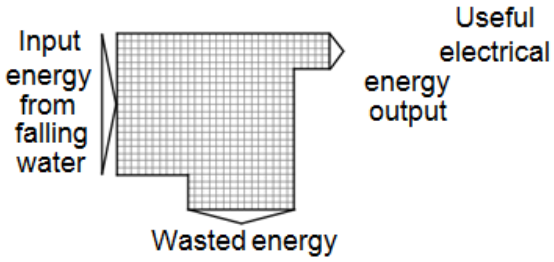
(1 marks)

(b)A micro-hydroelectric generator is very efficient. Most of the input energy from the falling water is transformed into useful electrical energy.

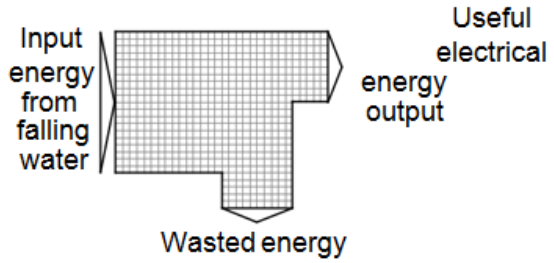
Which one of the following Sankey diagrams, X, Y or Z, shows the energy transformations produced by this generator?

Write your answer, X, Y, or Z, in the box.

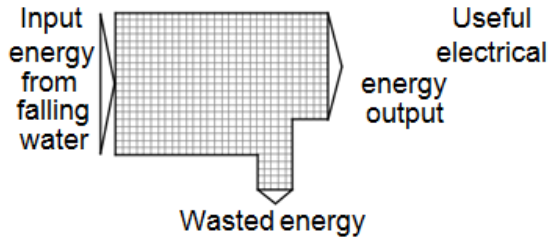
Sankey diagram **X**



Sankey diagram **Y**



Sankey diagram **Z**



Sankey diagram ☐

(1 mark)

(c)A micro-hydroelectric system generates about 60 kW of electricity, enough for 50 homes. A conventional large-scale hydroelectric power station may generate more than 5 000 000 kW of electricity.

(c) (i) Give one advantage of a conventional large-scale hydroelectric power station compared to a micro-hydroelectric system.

_____

_____

(1 mark)

(c) (ii) Which one of the following statements gives a disadvantage of a conventional large-scale hydroelectric power station compared to a micro-hydroelectric system?

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

Energy is wasted as heat and sound.

Large areas of land are flooded.

A constant flow of water is needed.

(1 mark)

(d) The electricity generated by the micro-hydroelectric system is transferred directly to local homes. The electricity generated by a conventional large-scale hydroelectric power station is transferred to homes anywhere in the country through a system of cables and transformers.

(d) (i) What name is given to the system of cables and transformers used to transfer electricity to homes anywhere in the country?

_____

(1 mark)

(d) (ii) Using short cables to transfer electricity to local homes is much more efficient than using very long cables to transfer electricity to homes anywhere in the country.Why?

_____

_____

(1 mark)

(e) Nepal is a mountainous country with over 6000 rivers. In Nepal, 9000 kW of electricity are generated using micro-hydroelectric generators.Suggest one reason why in the UK much less electricity is generated using micro-hydroelectric generators, than in Nepal.

_____

_____

(1 mark)

Total marks=31