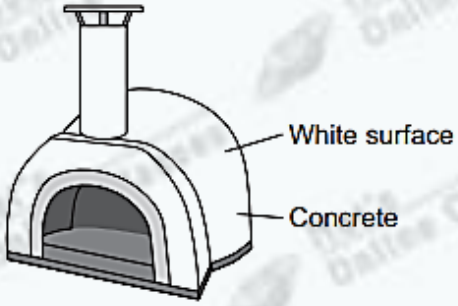
Energy

Total mark – 14

Question: 1

1 **Figure 1** shows an outdoor pizza oven.

Figure 1



1 (a) The pizza oven is designed to stay hot for a long time.

Use the correct answer from the box to complete each sentence. Each answer may be used once, more than once or not at all.

[2 marks]

conduction	**convection**	**radiation**

The white surface reduces energy transfer by _____ .

The concrete has a low U-value which means energy is transferred

slowly by _____ .

1 (b) The pizza oven is heated by burning wood.

What type of fuel is wood?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
biofuel	
fossil fuel	
non-renewable fuel	

1 (c) The concrete used to make the pizza oven has a specific heat capacity of 880 J/kg °C
The mass of the concrete is 250 kg

Calculate the energy transferred to the concrete to increase its temperature by 380 °C

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

_____

Energy transferred = _____ J

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	radiation conduction		1 1	AO2 1.1.3a 1.1.3c
1(b)	biofuel		1	AO1 1.4.1a
1(c)	83 600 000 (J)	accept 83600 kJ or 83.6 MJ allow **1** mark for correct substitution provided no subsequent step ie E = 250 x 880 x 380	2	AO2 1.1.4d
Total			**5**	

Question: 2

1 (c) The total power input to a pumped storage power station is 600 MW.

The useful power output is 540 MW.

1 (c) (i) Calculate the efficiency of this pumped storage power station.
Use the correct equation from the Physics Equations Sheet.

[2 marks]

Efficiency = _____

1 (c) (ii) Calculate how much power is wasted by the pumped storage power station.

[1 mark]

Power = _____ MW

1 (c) (iii) How is the temperature of the surroundings affected by the energy wasted by the pumped storage power station?

[1 mark]

1(c)(i)	90% or 0.9(0)	an answer of 0.9(0) with a unit gains **1** mark an answer of 90 with no unit or an incorrect unit gains **1** mark	2	AO2 1.2.1d
1(c)(ii)	60 (MW)	allow 10%	1	AO2 1.2.1b
1(c)(iii)	increased		1	AO1 1.2.1c

Question: 3

2 The electric kettle shown in **Figure 2** is used to boil water.

Figure 2

2 (b) Why is the total energy input to the kettle higher than the energy used to heat the water?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
Energy is absorbed from the surroundings.	
Energy is used to heat the kettle.	
The kettle is more than 100% efficient.	

2 (c) In one day, 0.6 kWh of energy is transferred from the mains electricity supply to the kettle.

The energy costs 15 pence per kWh.

Calculate the cost of using the kettle for one day.

[2 marks]

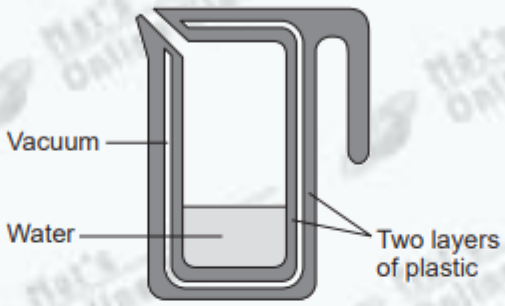
_____

_____

Cost = _____ pence

2 (d) A new type of electric kettle is made from two layers of plastic separated by a vacuum.
After the water in the kettle has boiled, the water stays hot for at least 2 hours.
The new kettle is shown in **Figure 3**.

Figure 3



2 (d) (i) Which energy transfers does a vacuum reduce?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
conduction and radiation	
conduction and convection	
convection and radiation	

2 (d) (ii) Using the new kettle may reduce the householder's energy bill.
Suggest **one** reason why.

[1 mark]

_____

_____

2(b)	Energy is used to heat the kettle.		1	AO2 1.2.1b
2(c)	9 (pence)	allow **1** mark for correct substitution ie 0.6 x 15 provided no subsequent step	2	AO2 1.3.1d
2(d)(i)	conduction and convection		1	AO1 1.1.3a
2(d)(ii)	any **one** from: • water stays hotter for longer (than a 'conventional' kettle) • water boiled less often • less energy transferred to the surroundings • (new design is) more efficient		1	AO2 1.2