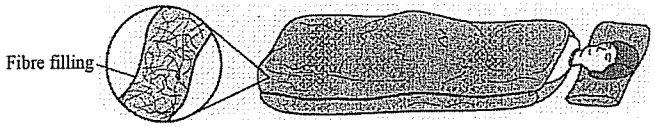
Kinetic theory and Energy transfer by heating

1. Many people use a sleeping bag when they sleep in a tent. Sleeping bags, designed to keep a person warm, have a fibre filling.



(i) Complete the sentence by choosing the correct words from the box.

conduction	convection	radiation

The fibre is designed to reduce heat transfer by .....

and .....

(ii) Explain why the fibre is good at reducing heat loss from a person sleeping in the bag.

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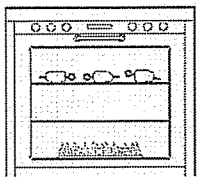
(Total 3 marks)

2. The diagram shows potatoes being baked in a gas oven. Each potato has a metal skewer pushed through it.



(a) Explain how heat is transferred by the process of convection from the gas flame at the bottom of the oven to the potatoes at the top of the oven.

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(3)

(b) The metal skewers help the potatoes to cook by transferring heat to the inside of the potatoes.

By what method is heat transferred through a metal skewer?

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(1)

(c) When the potatoes are taken from the oven, they start to cool down.

Suggest **one** factor that will affect how fast a potato cools down.

.....

(1)

(d) If the potatoes need to be kept hot, they may be wrapped in shiny aluminium foil.

Why does this help to keep the potatoes hot?

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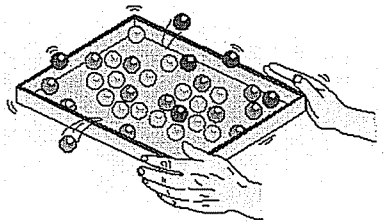
(1)

(Total 6 marks)

3. (a) The diagram shows a tray of marbles being shaken from side to side. As this happens some of the marbles jump out of the tray.



Explain how the tray of marbles is acting as a model for the evaporation of a liquid.

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(2)

(b) Before giving an injection, a nurse dabs some alcohol onto the patient's arm. This makes the patient's skin feel cold.

Why does the alcohol make the patient's skin feel cold?

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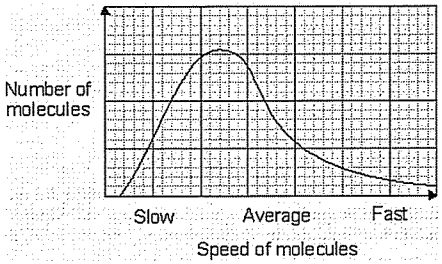
(1)

(c) The graph shows that the molecules in a liquid do not all have the same speed.



Use the information in the graph to explain why a liquid cools down when it evaporates.

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(4)
(Total 7 marks)

Transferring electrical energy

1. This question is about useful electrical devices.

   Match devices, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

   A fan

   B lamp

   C oven

   D radio

1	an electrical device designed to produce sound energy
2	an electrical device designed to produce light energy
3	an electrical device designed to produce kinetic energy
4	an electrical device designed to produce heat (thermal energy)

2. The table compares data for two types of lamp.

	Filament lamp	Compact fluorescent lamp CFL)
Cost	80p	£3.00
Efficiency	0.2	0.8
Expected life	1000 hours	8000 hours

   (a) People may decide **not** to buy CFLs because CFLs are . . .

   1 more expensive to buy.

   2 more efficient.

   3 cheaper to run.

   4 longer lasting.

   (b) A filament lamp with a power rating of 100 W gives 2000 units of light.

   What power rating would a CFL need to provide 2000 units of light?

   1 8000 W

   2 20 W

   3 25 W

   4 25 kW

Progress check
Unit P1, P1.3.1
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energy transferred (kilowatt-hour, kWh) = power (kilowatt, kW) × time (hour, h)

total cost = number of kilowatt-hours × cost per kilowatt-hour

Electricity costs 15 p per kWh

(c) What will be the cost of using a 100 W filament lamp during its expected life?

1 £1.50

2 £15.00

3 £150.00

4 £1500.00

(d) In its lifetime, a security light is used for 15 000 hours.

How much would you expect to spend on buying CFLs for the security light in that time?

1 £5.63

2 £6.00

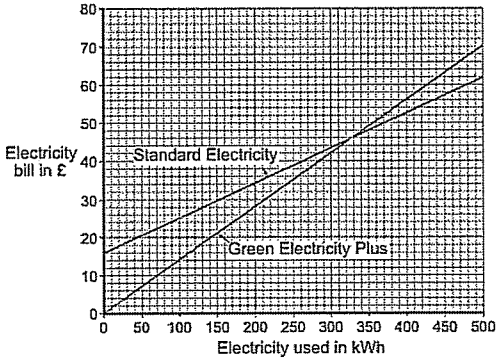
3 £12.00

4 £45.00

3. An electricity company has two ways of charging for electricity – Standard Electricity and Green Electricity Plus. The fixed charge is an additional charge added every three months to the bill sent to customers buying Standard Electricity.

Way of charging	Cost per kilowatt-hour	Fixed charge for three months
Standard Electricity	9 p	£16.25
Green Electricity Plus	14 p	£0

The graph shows how the electricity bill changes with the number of kilowatt-hours of electricity used in three months for the two ways of charging.



(a) The graph shows that . . .

1 the Green Electricity Plus way is cheaper if the customer uses 400 kilowatt-hours.

2 the Standard Electricity way is cheaper if the customer uses 325 kilowatt-hours.

3 the Standard Electricity way is cheaper if the customer uses 200 kilowatt-hours.

4 the Green Electricity Plus way is cheaper if the customer uses 150 kilowatt-hours.

(b) The electricity company claims that electricity sold under the Green Electricity Plus payment plan is electricity that has been generated from non-polluting sources.

The electricity will be generated from . . .

1 renewable sources.

2 coal.

3 nuclear fuels.

4 oil.

(c) The diagram shows part of a Green Electricity Plus bill.

Green Electricity Plus

First meter reading	Second meter reading	No. of kWh used
35785		

Cost per kWh – 14p TOTAL COST £19.04

total cost = number of kilowatt-hours × cost per kilowatt-hour

What is the second meter reading?

1 35649

2 35772

3 35798

4 35921

(d) The Green Electricity Plus way is advertised as having no *fixed charge*. This may make a customer think that their electricity bills will be less.

To decide whether the bill will actually be smaller, the customer should . . .

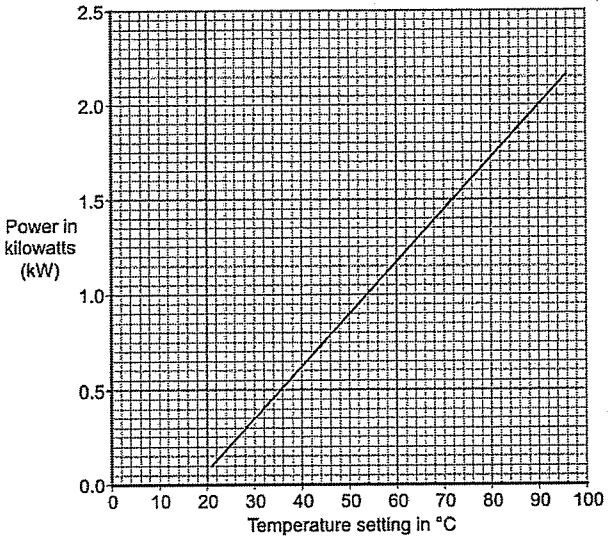
1 trust the advertisement.

2 check on an independent website.

3 switch to the Green Plus way.

4 ask a company salesman.

4. The graph shows how the power of a washing machine changes when it is set to different temperatures.



(a) What relationship does the graph show?

1 As the temperature setting increases, the power increases.

2 As the temperature setting increases, the power decreases.

3 As the temperature setting decreases, the power increases.

4 There is no relationship.

(b) Which of the following, according to the graph, is the power for a temperature setting of 90 °C?

1 1.90 kW

2 1.95 kW

3 2.00 kW

4 2.10 kW

(c) Which of the following, according to the graph, is the temperature needed for 1.5 kW of power?

1 70 °C

2 71 °C

3 72 °C

4 75 °C