OCR GCSE GATEWAY PHYSICS A · J249

PHYSICS



EXAM QUESTION PACK

P7.2 POWER AND EFFICIENCY

SCORE	PERCENTAGE
/194	%

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Gateway Physics A (9-1)

Power and efficiency

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **194**.
- The total number of marks may take into account some 'either/or' question choices.

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1 Which wall would allow the **most** heat transfer through the wall?

A **Thick** wall made from a material with **high** thermal conductivity.
B **Thick** wall made from a material with **low** thermal conductivity.
C **Thin** wall made from a material with **high** thermal conductivity.
D **Thin** wall made from a material with **low** thermal conductivity.

Your answer ☐

[1]

2 A radio transfers 30 J of potential energy to 27J of useful energy.

What is the efficiency and energy loss for the radio?

	Efficiency	Energy loss
A	10%	3J
B	10%	27J
C	90%	3J
D	90%	27J

Your answer ☐

[1]

3(a) Kate investigates how well different balls bounce.

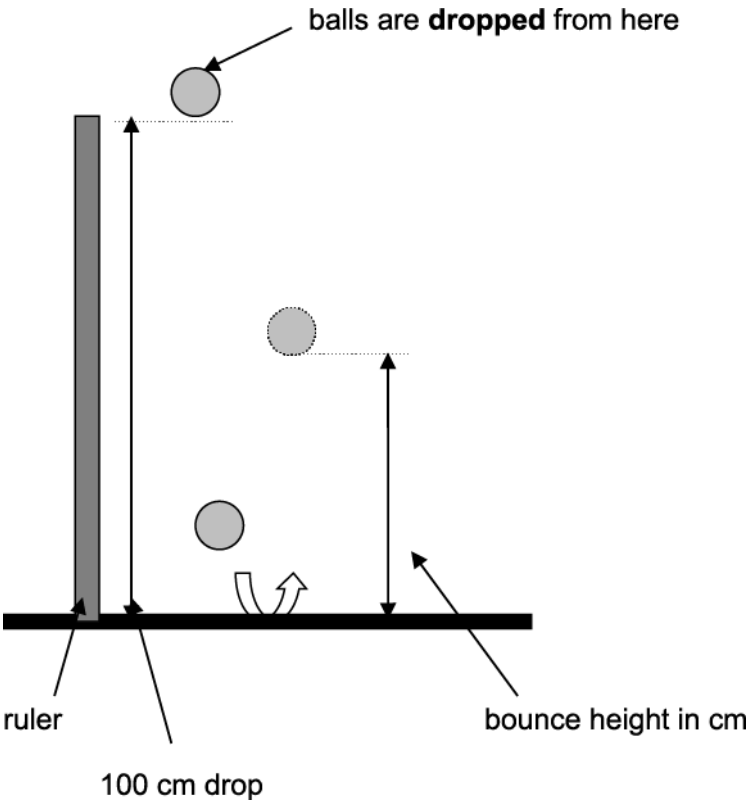
She drops different balls from the same height and measures the height the balls bounce.

She repeats the experiment 3 times for each ball.

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Her results are shown in the table.

Ball	Drop height (cm)	1st reading bounce height (cm)	2nd reading bounce height (cm)	3rd reading bounce height (cm)	Mean bounce height (cm)
Red	100	75	77	73	75
Blue	100	61	62	60	61
Green	100	60	31	58	
White	100	84	86	85	85
Yellow	100	26	24		26

Calculate the **mean** bounce height for the **green** ball.

---

[1]

answer:_____ cm

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(b) Kate missed one result for the **yellow** ball.

Calculate the **missing** result for the **yellow** ball.

---

answer: _____ cm [1]

(c) Evaluate the reliability of the results

Suggest how she could have improved her experiment.

---

[3]

(d)

(i) Kate suggests that 15% of the ball's initial energy was not transferred usefully. Use calculations to show that this is correct and suggest where the energy was transferred to.

---

[2]

(ii) How could the efficiency of the ball be improved?

---

[1]

4 A radio transfers 30 J of potential energy to 27 J of useful energy.

What is the efficiency and energy loss for the radio?

	efficiency	**energy loss**
A	10%	3 J
B	10%	27 J
C	90%	3 J
D	90%	27 J

Your answer ☐

[1]

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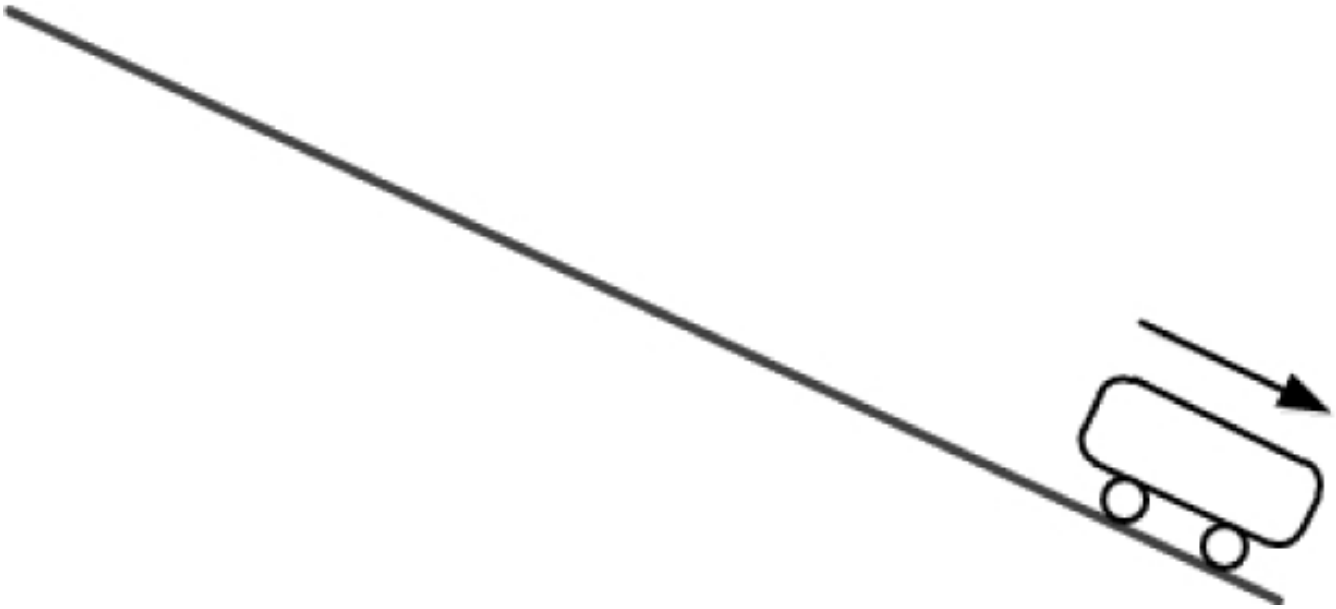
5 Which row **increases** the efficiency of a machine?

	increase energy losses due to friction	**increase** the work output without changing the work input
A	Yes	yes
B	Yes	no
C	No	no
D	No	yes

Your answer ☐

[1]

6 A car rolls down a slope.



The energy at the bottom of the slope is lower than expected.

Suggest **two** ways to improve the efficiency of the roller coaster car.

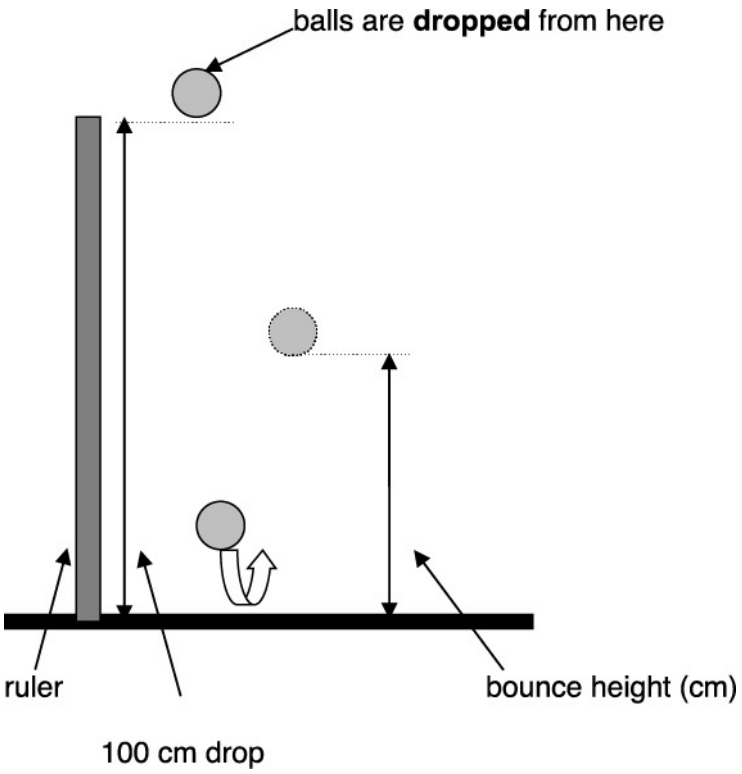
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[2]

7(a) Kate investigates how well different balls bounce.

She drops different balls from the same height and measures the height the balls bounce.

She repeats the experiment 3 times for each ball.



Her results are shown in the table.

Ball	Drop height (cm)	1st reading bounce height (cm)	2nd reading bounce height (cm)	3rd reading bounce height (cm)	Mean bounce height (cm)
blue	100	61	62	60	61
green	100	60	31	59	50
white	100	84	86	85	85
yellow	100	26	24		26

Kate missed one result for the **yellow** ball.

Calculate the **missing** result.

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answer: _____ cm

[1]

(b) Josh does an experiment with bouncing balls.

He does his experiment with a drop height of **200 cm**.

One ball bounces **100** cm.

Josh says that this ball is a better bouncer than any of Kate's.

Use the data and ideas about efficiency to explain why Josh is incorrect.

---

[2]

8(a) Alex has two radiators in her home. They are filled with 10 kg of different liquids.

The radiators have different power ratings.

oil-filled radiator	water-filled radiator
 Heater contains 10 kg of oil 400 W heater Specific heat capacity for oil is 1680 J/kg^{0}C	 Heater contains 10 kg of water 1000 W heater Specific heat capacity for water is 4200 J/kg^{0}C

The heaters are turned on and the temperature of each rises by 40 °C in 1 680 seconds.

Use the data to show that the heaters take the same time to heat up.

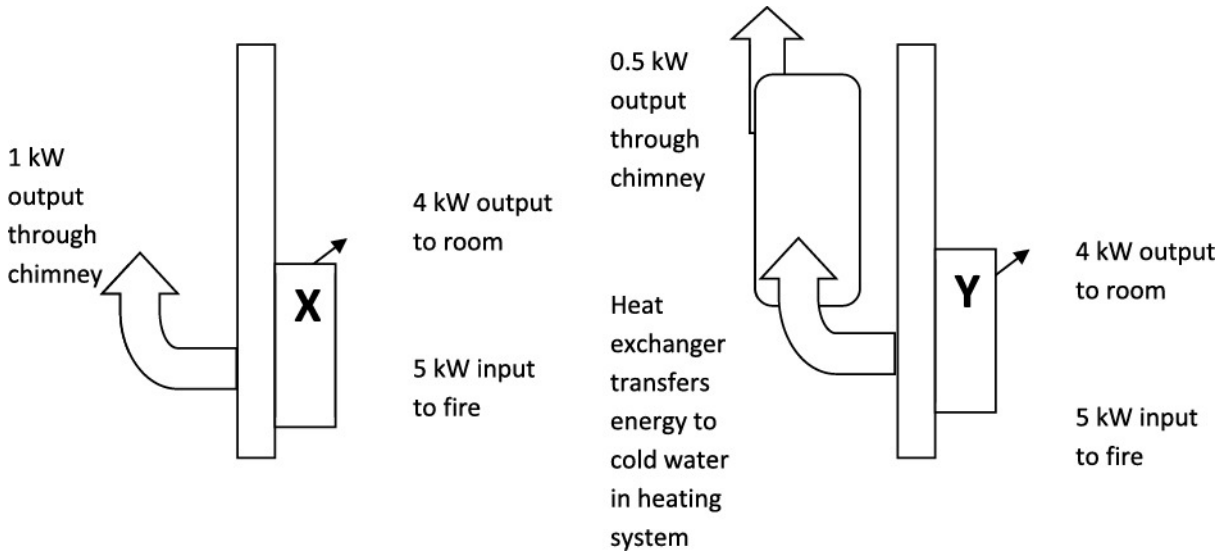
[4]

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(b) Alex has two fires in her home, **X** and **Y** shown in the diagrams below.



Why does Fire **Y** helps save money on the energy bills for her home?

Use calculations of efficiency in your answer.

---

[4]

9 Cars and lorries have different brakes.

Brakes absorb the energy of the vehicle before it comes to rest.

The brakes on lorries have larger brake discs and brake pads than cars.

Brakes are designed for increased air flow.

Explain why this is more important for lorries than cars.

---

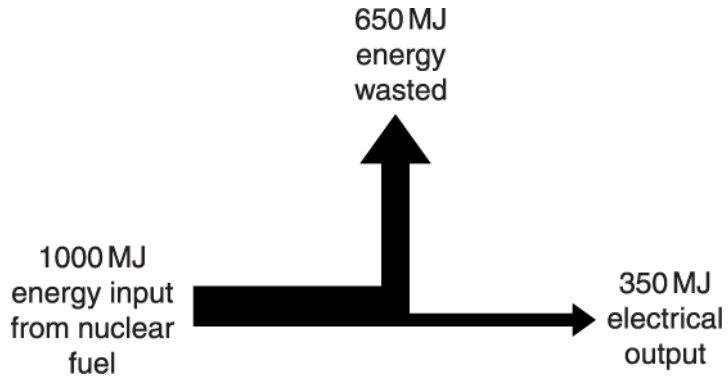
[4]

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10 Look at the diagram. It shows the amount of energy used and wasted in a nuclear power station.



(i) Compare the energy input and all of the energy outputs for the nuclear power station. Suggest how the energy is wasted.

---

[2]

(ii) Calculate the efficiency of this power station.

---

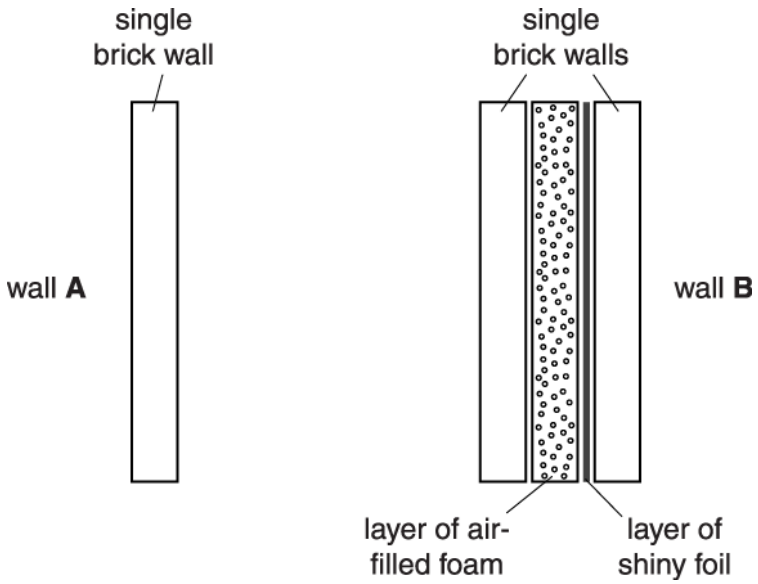
answer

---

[2]

11(a) This question is about insulation in houses.

Look at the diagrams of these two designs of wall that are used in building houses.



Houses with wall **B** lose **less** heat than houses with wall **A**.

Use ideas about conduction, convection and radiation to explain why wall **B** loses less heat than wall **A**.

The quality of written communication will be assessed in your answer.

[6]

(b) Look at the advert about double glazing.

*Buy **Evercosy** double glazing.* *Fitting double glazing to your house will save up to 18% on your energy costs.* *Spend a little and save a lot. Choose Evercosy.*

Simon has double glazing fitted in his house. He thinks it saves him money.
Look at the data.

Year	Double glazing	Annual energy cost in £
2009	none	1200
2010	none	1040
2011	none	1010
2012	fitted	950
2013	fitted	1020
2014	fitted	790

Before he fitted double glazing, Simon's average annual energy cost was £1083.

With an 18% saving the average annual energy cost should be £888.
How do Simon's actual annual energy costs from 2012 onwards compare to this figure?

Suggest reasons for this difference.

--- **[3]**

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12 Ivy wants to insulate her house.

Look at the information on different types of house insulation.

Type of insulation	Cost to fit insulation in £	Money saved each year in heating bills in £
Cavity wall insulation	840	210
Double glazing	4000	160
Draught proofing	120	72
Loft insulation	360	120

Ivy decides against fitting double glazing.

One reason is because it costs a lot to fit.

Use the information in the table to suggest other reasons why she has made this decision.

Do a calculation to explain your answer.

---

[2]

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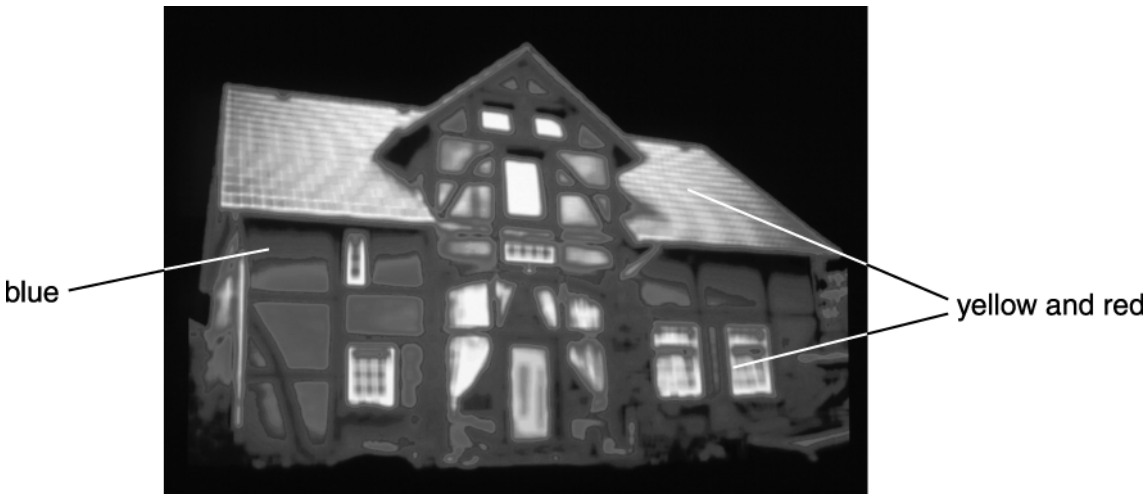
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13 Ivy has an energy survey done on her house.

An engineer takes a thermogram photo of Ivy's house on a cold day.

The thermogram shows where heat escapes from her house.

Look at the black and white copy of the thermogram.



Explain what useful information Ivy can gain from the different colours on this thermogram.

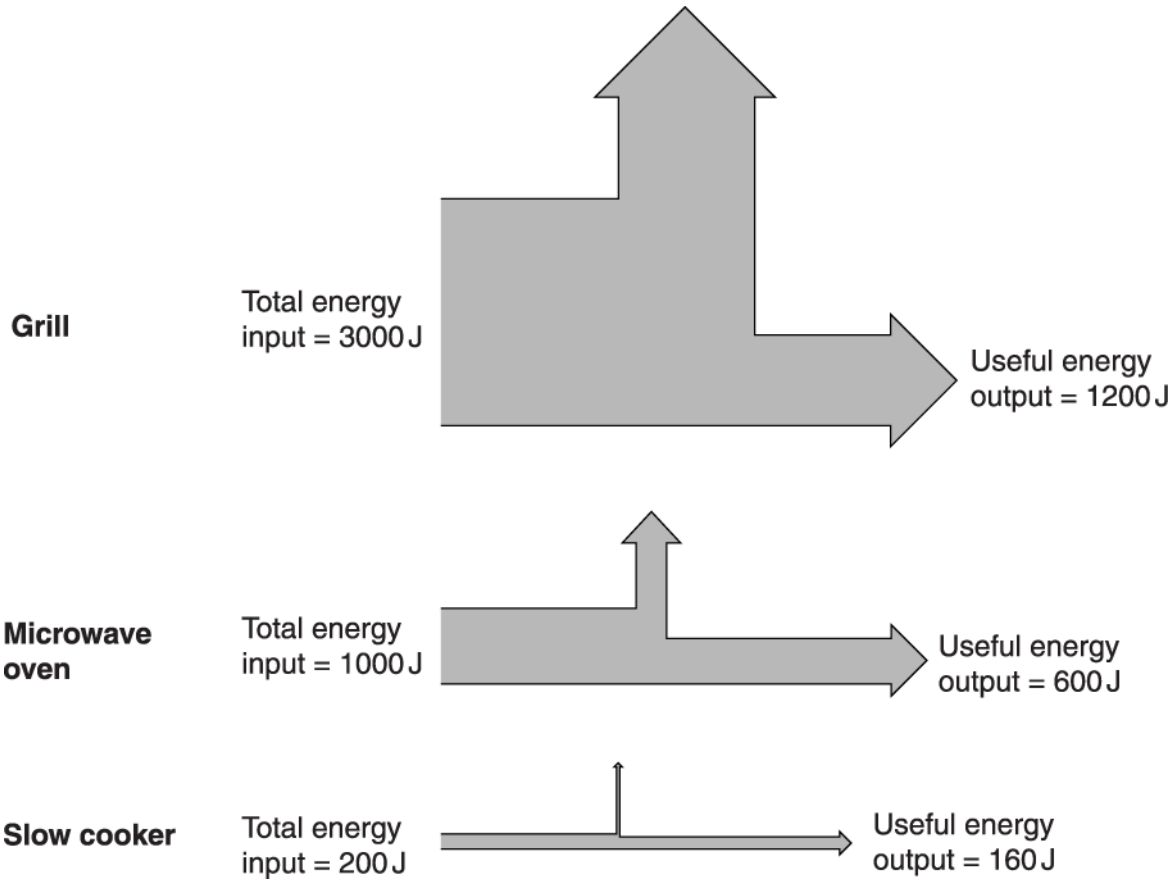
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[2]

14(a) Radhika has many appliances in her kitchen.

She compares the efficiency of the appliances by looking at these Sankey diagrams.

Each diagram shows the energy transferred in 1 second.



Look at the Sankey diagram for the grill.

Calculate the wasted energy for the grill.

Answer _____ J

[1]

(b) Calculate the efficiency of the microwave oven.

Answer _____

[2]

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(c) The slow cooker takes the **longest time** to cook food.

However, it is the **most efficient.**

Use the data to explain both these statements.

---[3]

15(a) Ivy wants to insulate her house.

Look at the information on different types of house insulation.

Type of insulation	Cost to fit insulation in £	Money saved each year in heating bills in £
Cavity wall insulation	840	210
Double glazing	4000	160
Draught proofing	120	72
Loft insulation	360	120

Ivy wants to fit all four types of insulation in her house.

(i) How much money will Ivy save in heating bills each year if she fits all four types of insulation?

---

answer ---[1]

(ii) Ivy only has £4100 to spend on insulating her house.

Is £4100 enough for her to fit **all four** types of insulation?

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Do a calculation to explain your answer.

---[1]

(iii) Ivy decides against fitting double glazing.

One reason is because it costs a lot to fit.

Use the information in the table to suggest other reasons why she has made this decision.

Do a calculation to explain your answer.

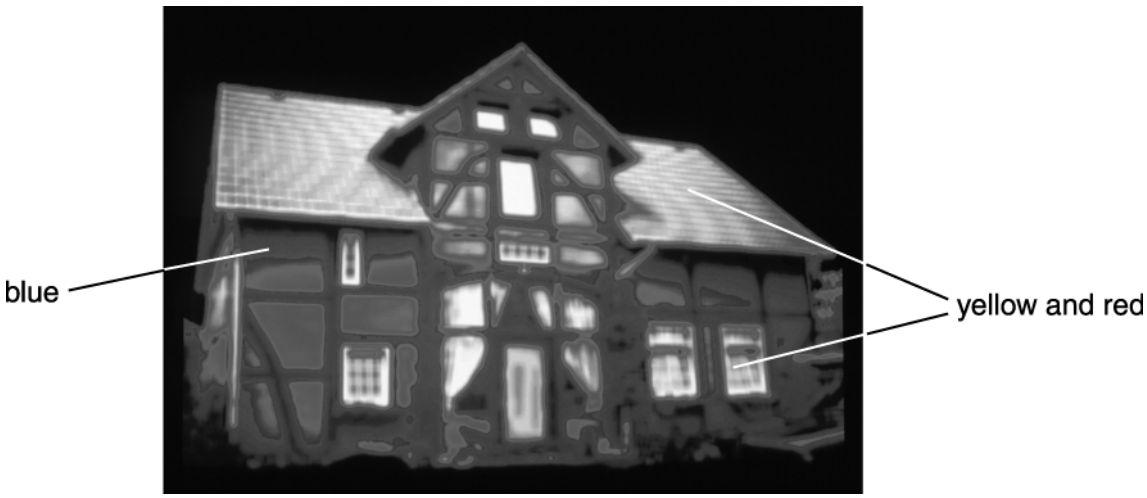
---[2]

(b) Ivy has an energy survey done on her house.

An engineer takes a thermogram photo to show where heat escapes from Ivy's house.

He chooses a cold day to get the best results.

Look at the black and white copy of the thermogram.



Explain in detail how Ivy can use the thermogram to show where heat escapes from her house and suggest why a cold day gives the best results.

The quality of written communication will be assessed in your answer to this question.

[6]

16 Look at the advert about double glazing.

*Buy **Evercosy** double glazing.*

Fitting double glazing to your house will save up to 18% on your energy costs.

Spend a little and save a lot. Choose Evercosy.

Simon has double glazing fitted in his house. He thinks it saves him money.
Look at the data.

Year	Double glazing	Annual energy cost in £
2009	none	1200
2010	none	1040
2011	none	1010
2012	fitted	950
2013	fitted	1020
2014	fitted	790

Before he fitted double glazing, Simon's average annual energy cost was £1083.

With an 18% saving the average annual energy cost should be £888.
How do Simon's actual annual energy costs from 2012 onwards compare to this figure?

Suggest reasons for this difference.

---

[3]

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17 A coal power station has an input power of 500 MW.

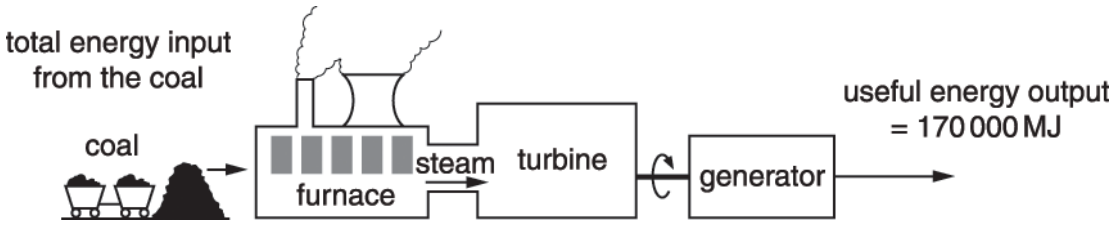
Power generator	% Efficiency
Wind turbine farm	30
Coal power station	34
Nuclear power station	35
Oil power station	32
Gas power station	45

Using information in the table, calculate the energy in MJ wasted each **minute** in this power station.

---

[3]

18 Electricity is generated in power stations.



The efficiency of this power station is 34%.

Calculate the total energy input from the coal.

---

answer _____ MJ

[1]

19(a) Allan wants to reduce energy losses from his house.

He asks an energy adviser for help.

The adviser uses a camera to produce a thermogram of the house.

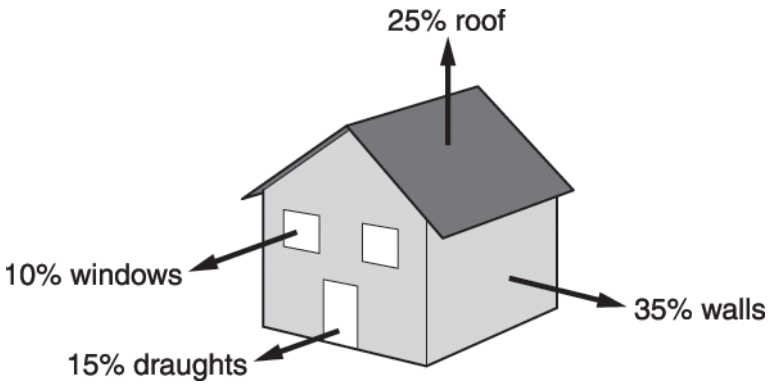
Explain how the thermogram can be used to compare how much heat energy is lost from different parts of the house.

---

[2]

(b) The energy adviser draws a diagram of Allan's house.

It shows where some of the energy losses happen.



Energy saving methods are used to reduce energy losses from this house.

The table shows some costs and savings for four of these methods.

	Energy saving method	Cost to fit in £	Annual saving on energy bills in £	Payback time in years
A	double glazed windows	4800	100	
B	loft (roof) insulation	270	45	
C	draught-proofing	90	30	
D	cavity wall insulation	240	120	

The adviser tells Allan that he should install methods C and D in his house.

Complete the table and use the information to explain why C **and** D are the best methods for Allan to install.

--- [3]

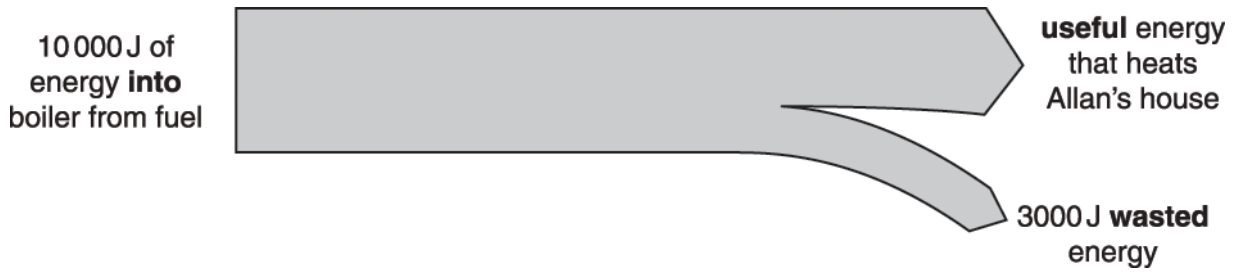
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(c) The energy adviser also suggests that Allan replaces his old central heating boiler.

The Sankey diagram shows energy data for Allan's boiler.



(i) Calculate the efficiency of Allan's boiler.

Give your answer as a percentage.

efficiency _____ %

[3]

(ii) Allan thinks that some of the energy completely disappears.

How could the adviser use the Sankey diagram to explain that this was **not** scientifically correct?

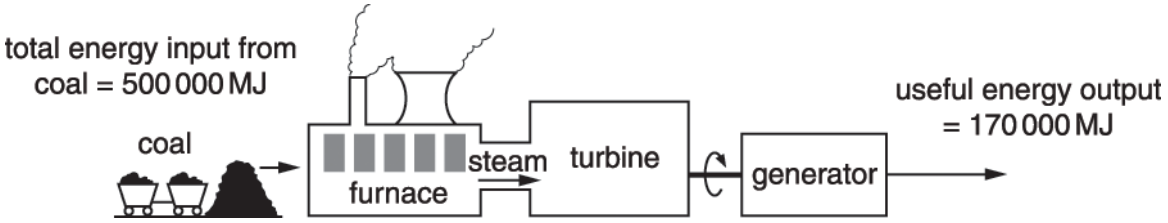
[1]

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20 Electricity is generated in power stations.



Calculate the efficiency of this power station.

---

efficiency _____

[2]

21(a) Allan wants to reduce energy losses from his house.

He asks an energy adviser for help.

The adviser uses a thermal imaging camera to produce a photograph of the house.

It is used to indicate where heat energy is lost from the house.

The adviser writes a report for Allan.

He includes a black and white photocopy of the original photograph in his report.



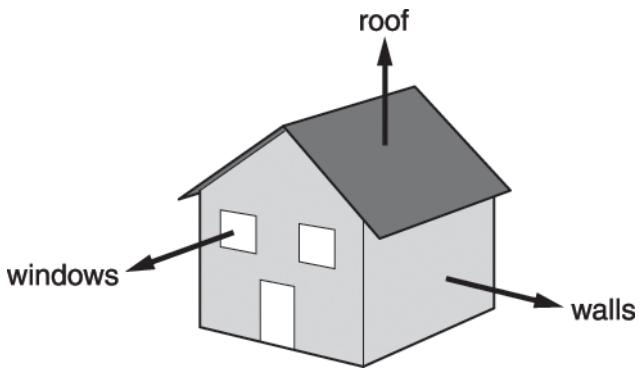
Complete the sentences about the **original** photograph.

The temperature is represented by different _____ .

This type of photograph is known as a _____ .

[2]

(b) The adviser's report has a diagram which shows where some of the energy is lost.



Energy saving methods are used to reduce energy losses from houses.

Many of these methods use air to reduce energy loss.

Describe the energy saving methods that could reduce energy losses from Allan's house using air. Explain how air is important.

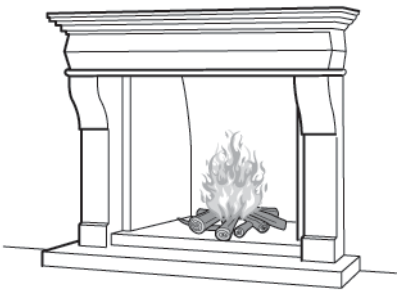
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[3]

22 Look at the information about the two gas heaters.



heater A – in front of the wall



heater B – built into the wall

energy input from gas per second = **3 kJ**
heat output to room per second = **2.4 kJ**

energy input from gas per second = **4 kJ**
heat output to room per second = **2 kJ**

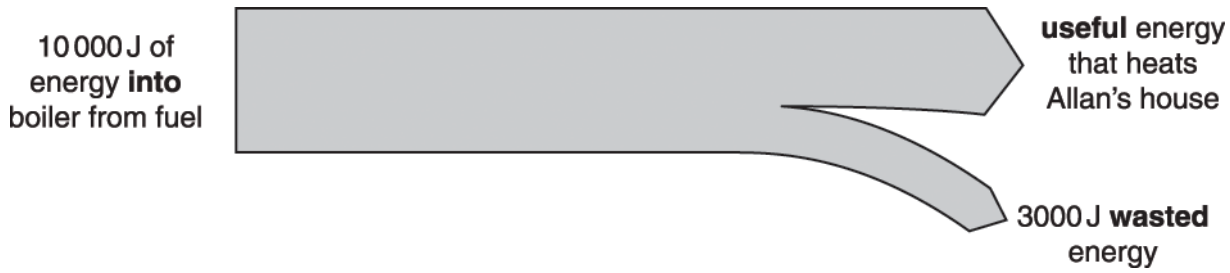
Compare the **efficiency** of the two heaters and explain why they have **different** heat outputs to the room.

The quality of written communication will be assessed in your answer to this question.

[6]

23 An energy adviser suggests that Allan replaces his old central heating boiler.

The Sankey diagram shows energy data for Allan's boiler.



(i) Calculate the efficiency of Allan's boiler.

Give your answer as a percentage.

efficiency _____ %

[3]

(ii) The adviser tells Allan that his boiler is in a low efficiency band.

Band	Efficiency range
A	90% and above
B	86% – 90%
C	82% – 86%
D	78% – 82%
E	74% – 78%
F	70% – 74%
G	below 70%

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Is the energy adviser correct?

answer _____

Explain your answer.

_____

_____ [1]

24(a) Grace researches methods of loft insulation for her house.

Look at the information she finds.

Insulating material	Recommended thickness of insulating material in mm
Phenolic foam	78
Rockwool	128
Polyurethane	76
Polystyrene	124
Spray foam	74
Sheep's wool	132

Suggest which material is the best insulator and explain your answer.

_____

_____

_____ [2]

(b) Grace thinks that she can improve her loft insulation.

She uses a layer of **shiny aluminium foil** under the insulating material.

Explain how shiny aluminium foil can **improve** her loft insulation.

_____

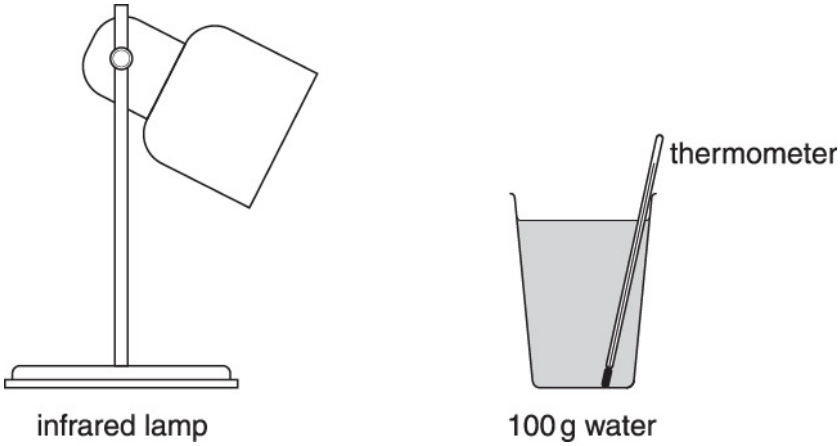
_____ [1]

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25 Alex wants to keep her drinks cool on a hot day.

She does this experiment to find out which cup is best to use.

Look at the diagram.



Alex uses the lamp to warm up 100 g of cold water in a cup.

She places the cup 20 cm from the lamp.

Alex measures the temperature of the water after 1 hour.

She repeats this experiment with three different cups.

Look at her results.

Cup	Material	Surface of cup	Starting temperature in °C	Finishing temperature in °C	Temperature rise in °C
A	polystyrene	shiny	15	23	
B	polystyrene	black	15	29	
C	expanded polystyrene (contains air bubbles)	shiny	15	17	
D	expanded polystyrene (contains air bubbles)	black	15	20	

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Calculate the temperature rise for each cup and complete the table.

Which cup is the **best** for keeping drinks cool on hot sunny days?

Use information about the material and surface of the cups to explain your answer.

The quality of written communication will be assessed in your answer to this question.

[6]

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26(a) Microwave ovens are used to heat food.

Chris looks at information about three microwave ovens.

Microwave oven	Energy input per second in joules	Energy absorbed by food each second in joules	Heating efficiency of the oven
Thermo-wave	1200	600	
Micro-fast	1400	700	
Quick-cook	1000	800	

Calculate the heating efficiency of the Quick-cook oven.

--- [2]

(b) The Thermo-wave and Micro-fast ovens have the **same** heating efficiency.
How does the information in the table show this?

--- [1]

(c) Chris wants to compare the three ovens.
He wants to know which oven heats food the fastest.

Describe an experiment Chris could do to find this out.

--- [3]

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27 Engineers try to make motors as efficient as possible by reducing waste energy through heating.

Look at the information about three new motors.

	Efficiency of motor at different currents		
Name of motor	2 amps	4 amps	6 amps
Duty	93%	92%	87%
Effortless	96%	93%	72%
Factor	95%	94%	87%

The engineer wants to use the motor with a 5 amp current.

Which motor should the engineer use?

_____

Explain your reasons for choosing this motor.

---

[2]

28 Steve investigates different types of insulation.

Look at the table of his results.

Type of insulation	Initial cost in £	Yearly saving in £
double glazing	9000	90
loft insulation	300	150
cavity wall insulation	450	150
draught-proofing	20	40

Steve wants to install insulation in his home.

Use the information in the table to suggest which type of insulation Steve should install first.

Include calculations and an explanation in your answer.

---

[3]

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29 Leo needs new light bulbs for his home.

He can choose halogen bulbs or LED bulbs.

Look at the table.

Type of bulb	Input power in watts	Lifetime in hours	Cost to buy in £
halogen	30	2500	1.50
LED	5	25000	6.00

Both types of bulb have the same brightness.

Compare the two different bulbs and explain which type of bulb Leo should buy for his home.

Include calculations as part of your answer.



The quality of written communication will be assessed in your answer to this question.

[6]

30 A power station has an efficiency of 30% and an energy input of 1 500 000 J.

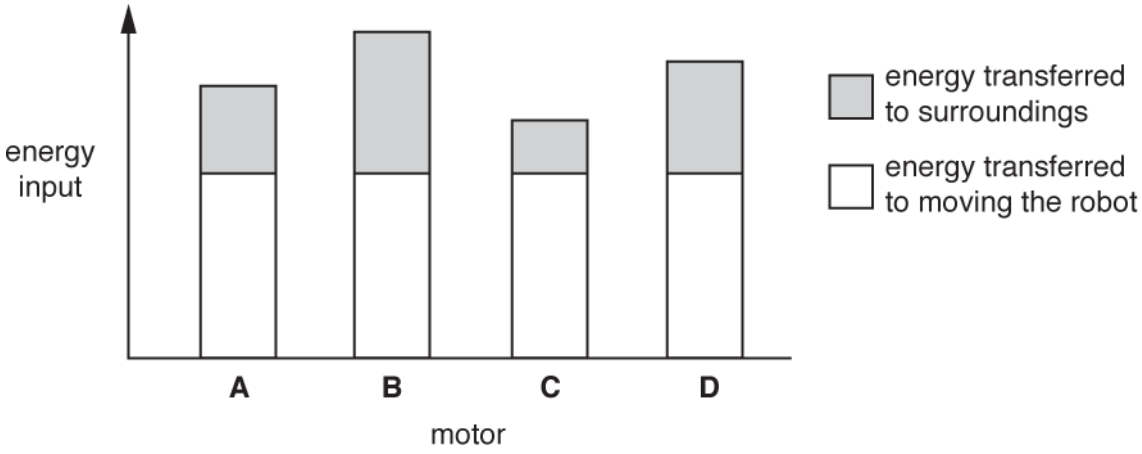
Calculate the wasted energy in the power station.

Answer .....J [3]

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31 A robot has a motor to make it move.

Kate finds information about motors **A**, **B**, **C** and **D**.



Kate says 'the best motor to use is **C**'.

Explain why she is correct.

--- [2]

32 A power station with an energy **input** of 100 MJ has a useful energy output of 30 MJ.

Calculate the efficiency of this power station.

Answer ---------- [2]

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33 A gas fire, used to heat a room, has an input energy transfer of 180 000 J per minute.

The fire has an efficiency of 0.8.

Use the equation: Efficiency = Useful output energy transfer / Input energy transfer

Calculate the useful output energy transfer per minute.

A 600 J

B 2400 J

C 36 000 J

D 144 000 J

Your answer [1]

34 A pump lifts 500 kg of water to a water tank at the top of a building.

The water gains 240 000 J of gravitational potential energy.

The gravitational field strength is 10 N/kg.

Use the equation: Potential energy = Mass × Height × Gravitational field strength

Calculate the height of the water tank.

A 4.8 m

B 48 m

C 240 m

D 480 m

Your answer [1]

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35 A domestic wind turbine has a power rating which varies from 1.0 kW to 3.0 kW.

(i) The domestic wind turbine has an electrical resistance of 23 Ω.

It generates a current of 11 A on a windy day.

Calculate the power output in kW of the turbine on this day.

Answer = ---------- kW **[4]**

() Suggest why the manufacturer gives a range for the power rating of the wind turbine.

---**[1]**

(i) Using just **one** domestic wind turbine may be an unreliable source of power for a house.

State a reason why.

---**[1]**

36 A vehicle has an input power from fuel of 20 kW and a useful output power of 6 kW.

Calculate the power it wastes.

A 3 kW

B 6 kW

C 14 kW

D 20 kW

Your answer ☐ **[1]**

37(a) Look at the information about different electric motors.

Electric motor	Energy input per hour (J)	Useful energy output per hour (J)	Energy 'wasted' per hour (J)
A	72 000	60 000	
B	54 000	36 000	
C	18 000		3 000
D		48 000	12 000
E	54 000	48 000	

(i) Calculate the energy input per hour in J for electric motor **D**.

Answer = _____ J **[2]**

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(ii) Which electric motor has the **lowest** 'wasted' energy in one hour?

---

[1]

(iii) Which electric motor has the **highest** 'wasted' energy in one hour?

---

[1]

(iv) Describe how energy is 'wasted' in an electric motor.

---

[1]

(v) Suggest how this 'wasted' energy can be reduced in an electric motor.

---

[1]

(b) Calculate the % efficiency of electric motor **E**.

Use the equation: Efficiency = Useful output energy transfer / Input energy transfer

Give your answer to **2** significant figures.

Answer = ---------- % **[2]**

38 A domestic wind turbine has a power rating which varies from 1.0 kW to 3.0 kW.

(i) The domestic wind turbine has an electrical resistance of 23 Ω.

It generates a current of 11 A on a windy day.

Calculate the **power** output in kW of the turbine on this day.

Answer = ______________________ kW **[4]**

(ii) Suggest why the manufacturer gives a range for the power rating of the wind turbine.

____

____ **[1]**

(iii) Using just **one** domestic wind turbine may be an unreliable source of power for a house.

State a reason why.

____

____ **[1]**

39 A boiler has an input power of 12 kW from the gas it burns.

Its efficiency is 0.75.

Which row in the table shows the correct values for this boiler?

	Useful output power (kW)	Wasted output power (kW)
A	3	9
B	8	4
C	9	6
D	9	3

Your answer [ ] [1]

40 A TV works with a 12.0 V battery. It has a current of 3.19 A.

Calculate the power rating of the TV.

Power = ... W [3]

41 A boiler has an input energy of 720 kJ from the gas it burns.

It transfers 540 kJ of useful energy to the home.

What is the efficiency of the boiler?

Use the equation: efficiency = useful output energy transfer ÷ total input energy transfer

A 0.12

B 0.75

C 0.90

D 1.33

Your answer ☐ **[1]**

42(a) A student investigates how the thickness of insulation affects the cooling of a cup of tea.

Fig. 16.1 is a diagram of her apparatus.

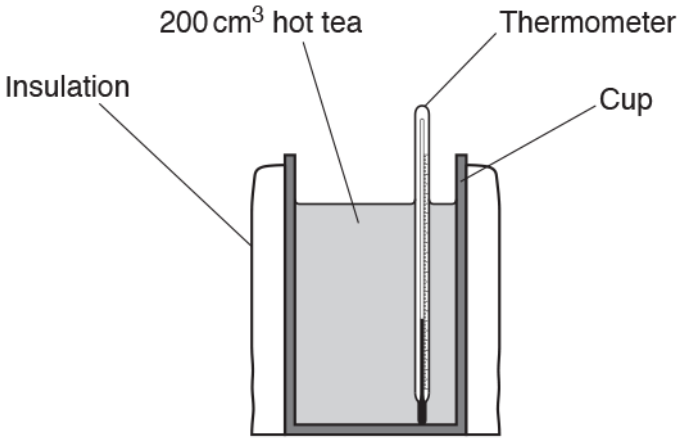


Fig. 16.1

The student wraps a layer of insulation around a cup containing 200 cm^3 of hot tea.

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She measures the temperature of the tea at the start of the experiment and after 10 minutes.

She repeats the experiment with different thicknesses of the insulation.

Table 16.1 shows her results.

Thickness of the insulation (mm)	Temperature of tea (°C)		
	Start	End	Difference
2	90	65	25
4	88	66	22
6	91	72	19
8	89	73	16
10	98	84	14
12	100	60	

Table 16.1

(i) Calculate the temperature difference when the thickness of insulation is 12 mm.

Temperature difference = ... °C **[1]**

(ii) The result when the thickness of the insulation is 12 mm is anomalous.

Suggest a reason why this result appears to be anomalous.

---

[1]

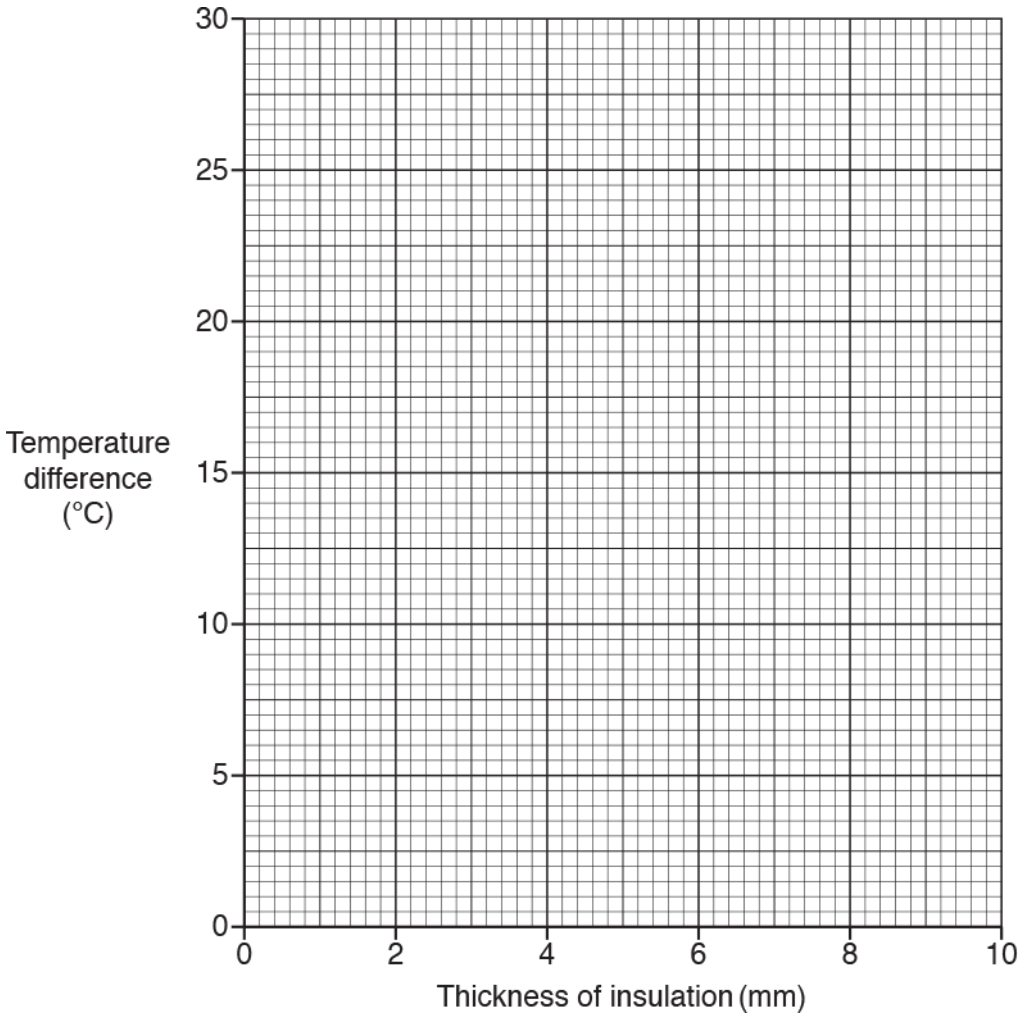
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(b) Plot a graph of the results in **Table 16.1** and draw a line of best fit.

Ignore the anomalous result for 12 mm.



[2]

(c) Describe how the temperature difference is affected as the thickness of the insulation increases.

---

[1]

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(d) Suggest how the thickness of the insulation affects the rate of cooling of the tea.

---

[1]

(e) This experiment could be improved.

Describe two **different** ways of improving the experiment.

1 ---

---

2 ---

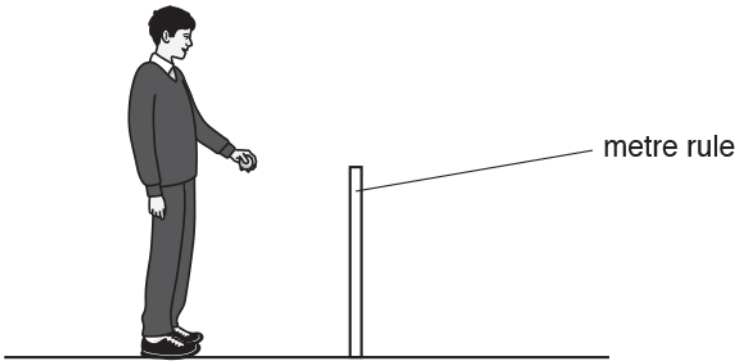
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[2]

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43(a) A student wants to investigate how a ball bounces.

He drops the ball from different heights and measures the bounce height each time.



He calculates the ratio bounce height / drop height.

The table shows his results.

Drop height (cm)	Bounce height (cm)	Bounce height / drop height
100	70	0.70
80	64	0.80
60	54	0.90
40	40	1.00
20		

The student predicts the ratio bounce height / drop height to be 1:1 when the drop height is 20 cm.

(i) Suggest why he has made this prediction.

---

[1]

(ii) Use ideas about energy to explain why this prediction cannot be correct.

---

[1]

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(b) Suggest **two** improvements to his experiment.

1 _____

_____

_____

2 _____

_____

_____

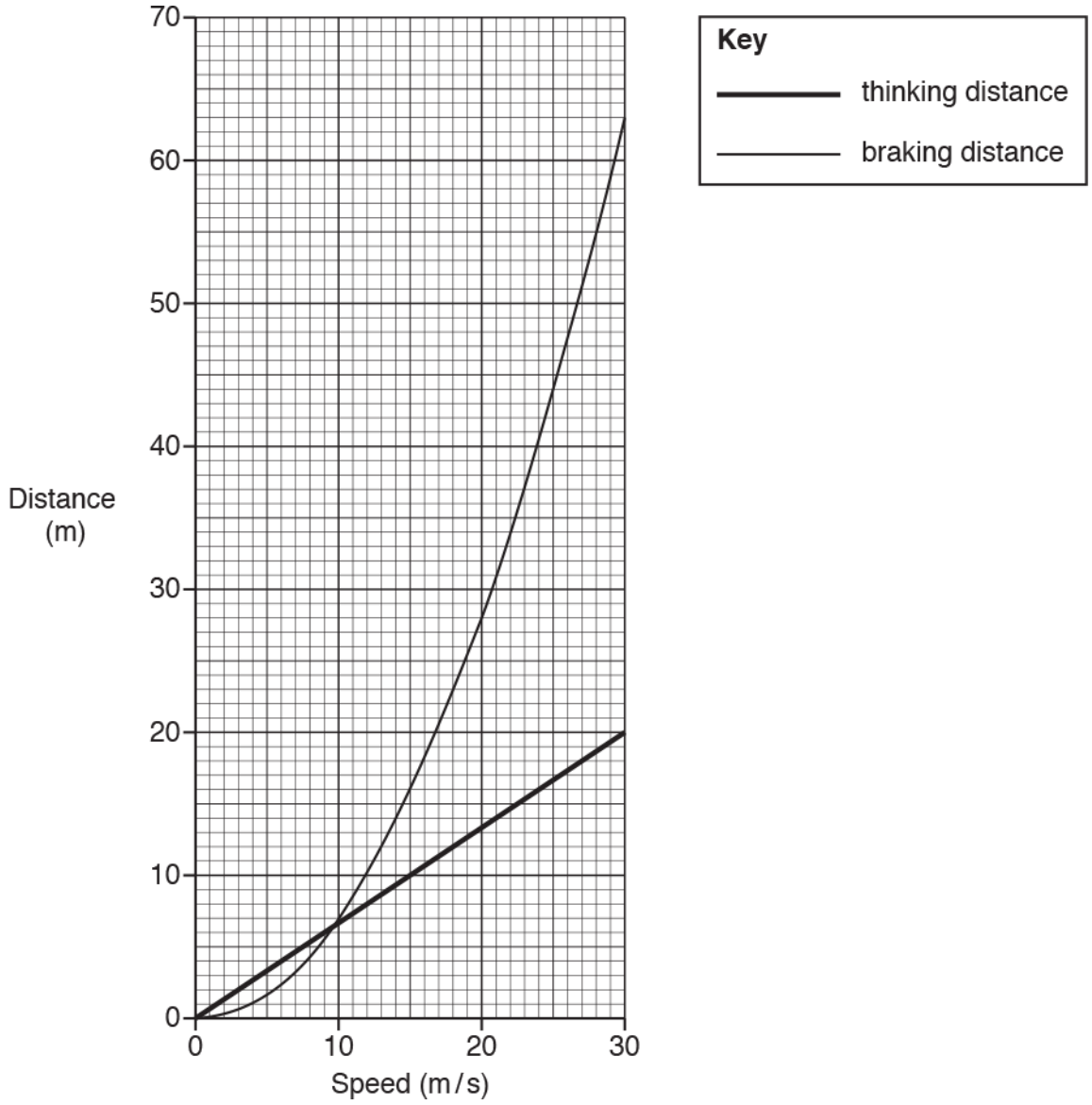
[2]

44 The graph shows thinking and braking distances for a car at different speeds.

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Describe how **thinking distance** varies with increasing speed.

Use data from the graph in your answer.

[2]

45(a) A student investigates the rate of cooling using a cardboard box to model the walls of a building.

She puts a beaker of hot water into the cardboard box. She measures the temperature of the water every two minutes.

She investigates how the rate of cooling changes with the thickness of the walls.

Describe a method she can use to do this investigation.

[3]

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(b) Here are the results of one of her experiments.

Time (minutes)	Temperature of water (°C)
0	90
2	75
4	63
6	54
8	47
10	41
12	37

(i) Plot the results on the grid in **Fig. 22.1**.

Two of the points have been plotted for you.

[2]

(ii) Draw a line of best fit on your graph.

[1]

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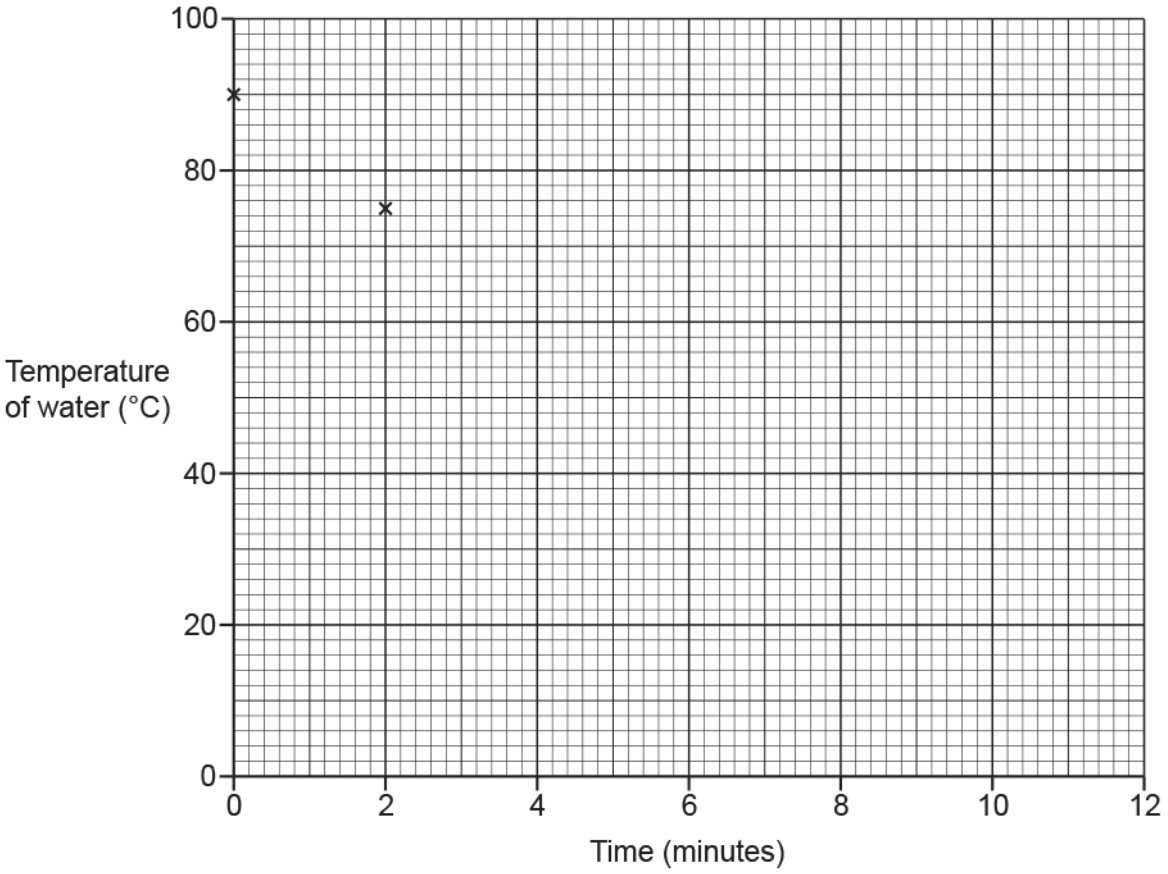


Fig. 22.1

(iii) Describe how the temperature of the water changes with time.
Use data from the graph in **Fig. 22.1** in your answer.

---

[2]

(iv) The thickness of the cardboard box is doubled. Everything else stays the same.

Sketch a line on the graph in **Fig. 22.1** to suggest what these new results may look like.
Label your line **Z**.

[1]

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(v) Suggest **one** way to improve the investigation.

---

[1]

(c) Explain why the rate of cooling of a metal box is different to a cardboard box.
Assume the thickness of the walls is the same in both boxes.

---

[1]

46 A student investigates the rate of cooling using a cardboard box to model the walls of a building.

She puts a beaker of hot water into the cardboard box. She measures the temperature of the water every two minutes.

She investigates how the rate of cooling changes with the thickness of the walls.

Describe a method she can use to do this investigation.

---

[7]

47

(i) **Table 21.1** gives some information about a kettle.

Energy transferred to the kettle	525 000 J
Mass of water	1.2 kg
Starting temperature of water	25 °C
Final temperature of water	100 °C
Specific heat capacity of water	4200 J / kg °C

Table 21.1

Calculate the efficiency of the kettle described in **Table 21.1**.

Give your answer as a percentage.

Use an equation from the data sheet.

Efficiency = ... % **[5]**

(ii) Explain why the efficiency of the kettle is less than 100%.

---

[1]

48 Explain why the rate of cooling of a metal box is different to a cardboard box.

Assume the thickness of the walls is the same in both boxes.

---

[1]

49 Water can be heated using a 12 V heater.

A transformer is used to change a 120 V supply into 12 V.
The current in the secondary coil is 9.0 A.

Calculate the current in the primary coil.

Use an equation from the data sheet.

Current = ... A **[2]**

END OF QUESTION PAPER

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