

<b>Candidate Forename</b>		<b>Candidate Surname</b>	
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<b>Centre Number</b>						<b>Candidate Number</b>				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**B621/02**

**GATEWAY SCIENCE**

**SCIENCE B**

**Unit 1 Modules B1 C1 P1 (Higher Tier)**

**FRIDAY 28 MAY 2010: Morning**

**DURATION: 1 hour**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the Question Paper  
A calculator may be used for this paper**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Pencil**

**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer ALL the questions.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

## **INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- A list of physics equations is printed on page three.
- The Periodic Table is provided separately.
- The total number of marks for this paper is 60.

## EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

$$\text{energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{fuel energy input} = \text{waste energy output} + \text{electrical energy output}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy supplied} = \text{power} \times \text{time}$$

$$\text{energy (kilowatt hours)} = \text{power (kW)} \times \text{time (h)}$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

**Answer ALL the questions.**

**SECTION A – MODULE B1**

**1 Dominic has cystic fibrosis.**

**He has inherited cystic fibrosis from his parents.**

**(a) Neither of Dominic’s parents have cystic fibrosis.**

**What does this tell you about the allele that causes cystic fibrosis?**

\_\_\_\_\_ [1]

**(b) Cystic fibrosis can cause a number of changes in the body.**

**It often stops the pancreas from working properly.**

**The pancreas stops making enzymes such as lipase and the hormone insulin.**

**(i) Write down the job of the enzyme LIPASE.**

\_\_\_\_\_ [1]

**(ii) Write down the name of the disorder caused by a lack of insulin.**

\_\_\_\_\_ [1]

**(c) Cystic fibrosis can also stop the liver working properly.**

**It may not make enough bile and may develop cirrhosis.**

**(i) Write down what bile does to fat droplets.**

\_\_\_\_\_ [1]

**(ii) Write down ONE OTHER possible cause of cirrhosis.**

\_\_\_\_\_ [1]

**[Total: 5]**

**2 Most people take their hands away very quickly if they pick up a hot object.**

**The heat from the object is detected by pain receptors in the skin.**

**(a) Nerve cells carry impulses from the pain receptors to the central nervous system.**

**Put a tick (✓) next to the type of nerve cells that carry these impulses.**

**motor neurone**

**relay neurone**

**sensory neurone**

**[1]**

**(b) Scientists have been investigating a young boy and his family.**

**The family cannot feel pain.**

**This is because they all have inherited a mutation in a single gene.**

**The gene codes for a chemical that turns on the nerve cells that carry impulses.**

**In people with the mutation the chemical does not work.**

**(i) What type of chemical do genes code for?**

\_\_\_\_\_ [1]

**(ii) A mutation causes a change in the structure of the chemical produced.**

**How does it cause this change?**

\_\_\_\_\_  
\_\_\_\_\_ [1]

**(c) The scientists hope that they can make a drug that will also turn off the nerve cells.**

**This drug would prevent pain without altering any other parts of the body.**

**If the scientists produce a drug it will need to be tested.**

**Describe how scientists might perform a DOUBLE BLIND test on a new drug.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

**[Total: 6]**

**3 Anthony and Declan are talking about their fitness.**

**They both measure their resting pulse rate and blood pressure.**

**ANTHONY**

**Resting pulse rate 95  
Blood pressure 150/95 mmHg**

**DECLAN**

**Resting pulse rate 75  
Blood pressure 130/80 mmHg**

**(a) (i) Anthony's and Declan's blood pressure readings each have two numbers.**

**Why does the blood pressure reading include two numbers?**

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[1]



**(ii) Anthony's blood pressure is higher than Declan's.**

**This could be because of differences in their diets.**

**Finish this sentence to suggest ONE possible difference in their diets.**

**Anthony's diet might contain \_\_\_\_\_**

\_\_\_\_\_ . [1]

**(b) Anthony decides to exercise to get fitter.**

**He reads in a book that he should only increase his pulse rate to 70% of its maximum value.**

**This should make sure that he respire aerobically not anaerobically.**

**Write down ONE advantage of respiring aerobically rather than anaerobically.**

\_\_\_\_\_

\_\_\_\_\_ [1]

(c) Anthony's book says that there are different types of fitness.

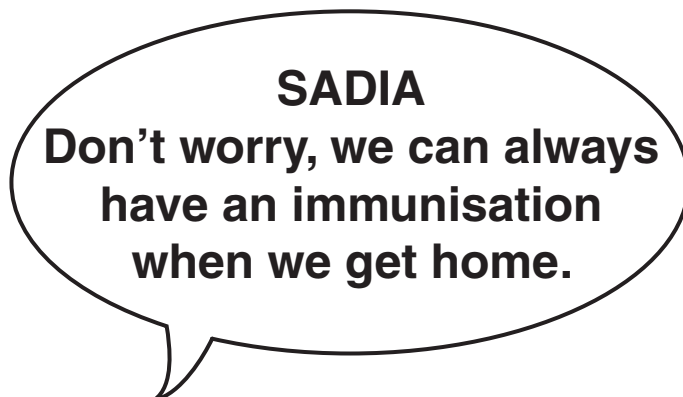
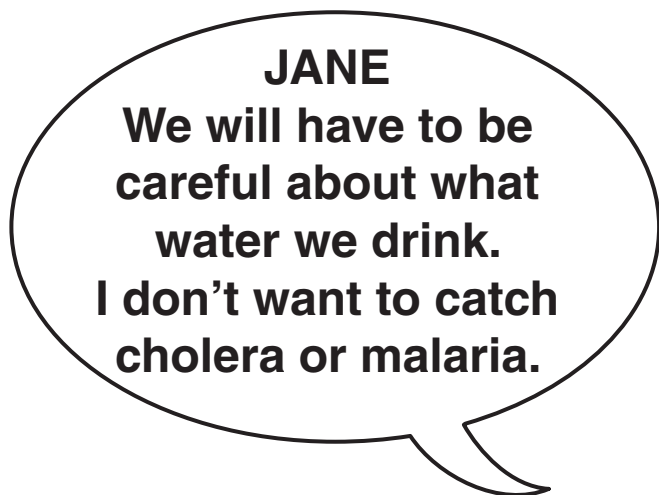
Draw straight lines to link each TYPE OF FITNESS with its DEFINITION and a METHOD OF MEASUREMENT.

TYPE OF FITNESS	DEFINITION	METHOD OF MEASUREMENT
agility	The ability to change the position of the body quickly.	Measure how long a person can cycle without going above a certain pulse rate.
flexibility	A muscle's ability to perform a maximum contraction time after time.	Measure how far a person can stand from a wall and bend forward to touch the wall with their knees.
stamina	The ability of part of the body to achieve a wide range of movement.	Measure how fast a person can run zig-zagging between cones.

[2]

[Total: 5]

**4 Jane and Sadia are planning a holiday to Africa.**



**(a) Jane is worried about getting malaria.**

**Jane is unlikely to get malaria from drinking water.**

**(i) How is malaria usually spread?**

\_\_\_\_\_ [1]

**(ii) If a person has malaria they develop a high body temperature.**

**Explain how a very high body temperature can be harmful to the body.**

\_\_\_\_\_  
\_\_\_\_\_ [2]

**(b) Sadia says that they can have immunisations when they get home.**

**Why is it better to have immunisations BEFORE they go on holiday?**

**Put a tick (✓) in the box next to the correct reason.**

**It is less likely to produce side effects if the antigens are not already present in the blood.**

**It would produce antibodies in the blood in preparation for possible antigens.**

**It would destroy any antigens in the blood before they go on holiday.**

**It would provide passive immunity which lasts for a long time.**

**[1]**

**[Total: 4]**

## SECTION B – MODULE C1

5 This question is about food and food additives.

An additive is given an E number.

Look at the table. It gives some information about E numbers.

<b>TYPE OF FOOD ADDITIVE</b>	<b>E NUMBER RANGE</b>
food colours	E101 to E199
preservatives	E200 to E299
antioxidants	E300 to E321
emulsifiers and stabilisers	E400 to E499
sweeteners	E950 to E967

Look at the food label found on a packet of instant drink.

### INGREDIENTS

Sugar, drinking chocolate, skimmed milk powder, vegetable oil, instant coffee, lactose, dried glucose syrup, E340, E452, E331, milk proteins, salt

(a) What type of food additive is E452?

\_\_\_\_\_ [1]

**(b) Emulsifiers help oil and water to mix and not separate.**

**(i) Describe how emulsifiers keep oil and water from separating.**

**Your answer should include**

- the structure of an emulsifier molecule**
- how the molecule works.**

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**[2]**

- (ii) Write down the name of one food that contains an emulsifier.

Choose from:

COOKING OIL

CHICKEN

ORANGE SQUASH

MAYONNAISE

answer \_\_\_\_\_ [1]

- (c) Baking powder is a raising agent which contains sodium hydrogencarbonate,  $\text{NaHCO}_3$ .

Sodium hydrogencarbonate breaks down when heated.

Sodium carbonate,  $\text{Na}_2\text{CO}_3$ , water and carbon dioxide are made.

Write a BALANCED SYMBOL equation for this reaction.

\_\_\_\_\_ [2]

- (d) What is the test for carbon dioxide?

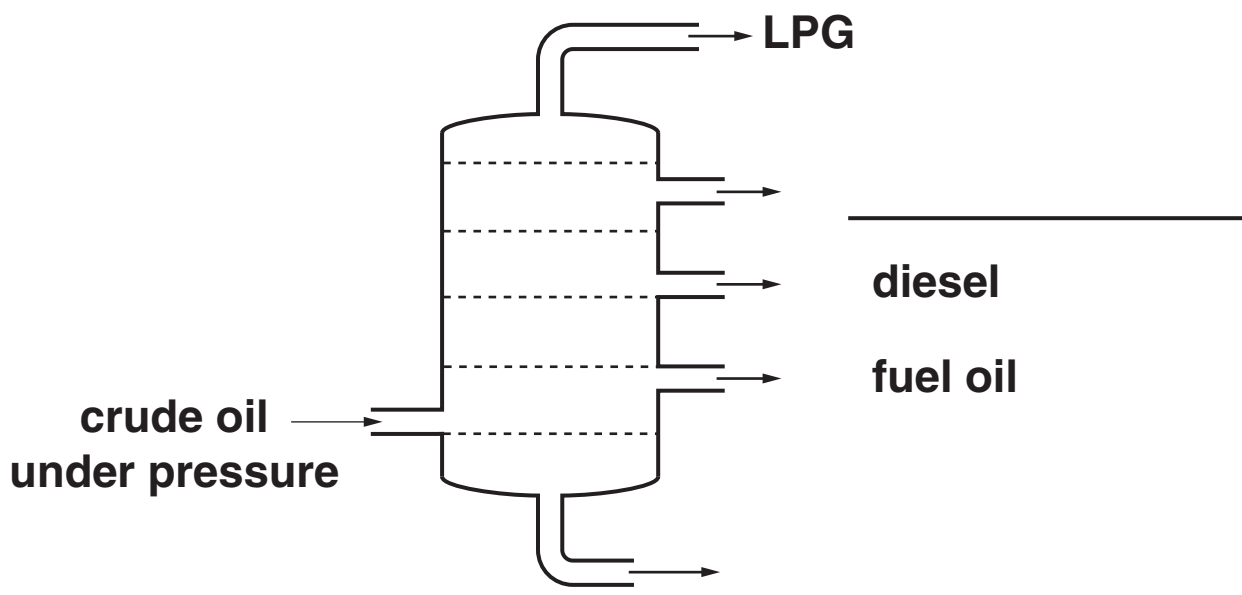
substance used \_\_\_\_\_

result \_\_\_\_\_ [2]

[Total: 8]

6 This question is about fractional distillation and cracking.

Look at the diagram. It shows a fractionating column.



A fractionating column separates crude oil into FRACTIONS.

(a) Complete the diagram to show the missing fractions.

Choose from:

**BITUMEN**

**HEATING OIL**

**PETROL**

**WAXES**

[2]



**(b) Crude oil can be separated by fractional distillation.**

**Answer these questions to explain how.**

**(i) What happens to the intermolecular forces between hydrocarbon molecules during fractional distillation?**

\_\_\_\_\_ [1]

**(ii) Why do large molecules have a higher boiling temperature than small molecules?**

\_\_\_\_\_ [1]

**(c) Some fractions from crude oil can be cracked.**

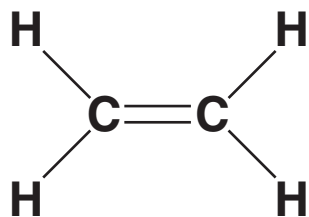
**Cracking converts large molecules into smaller petrol molecules.**

**Ethene is also made.**

**(i) Write down ONE use of ethene.**

\_\_\_\_\_ [1]

(ii) Look at the displayed formula of ethene.



Ethene is UNSATURATED.

Explain what is meant by unsaturated.

\_\_\_\_\_ [1]

(iii) Write down the MOLECULAR formula of ethene.

\_\_\_\_\_ [1]

[Total: 7]

**7 Liz is designing a new power station.**

**She must choose a fuel to burn in the power station.**

**One of the factors she needs to consider is the cost of the fuel.**

**(a) Write about the OTHER factors Liz needs to think about when she chooses the fuel.**

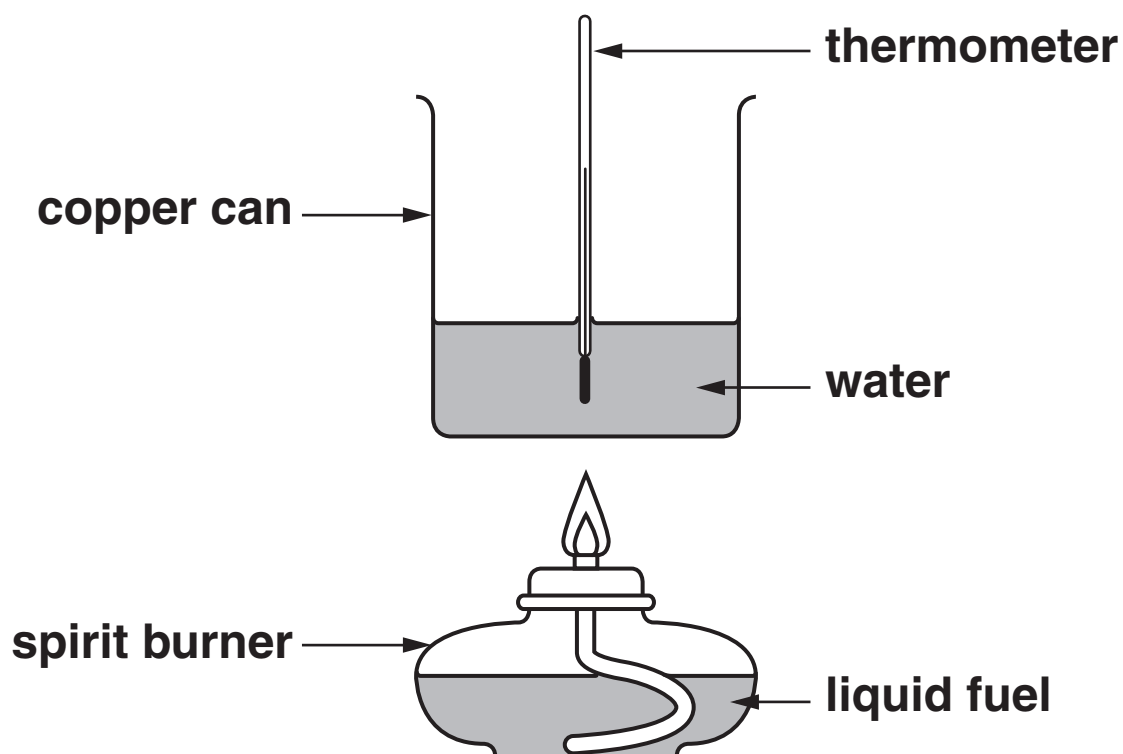
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[2]

(b) Look at the diagram. It shows the apparatus Liz uses to compare three fuels.



When 1.5 g of ethanol is burned, 17640 J of energy is transferred.

Calculate the energy transferred when 1.0 g of ethanol is burned.

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answer \_\_\_\_\_ J [2]

(c) Burning fuels is an EXOTHERMIC reaction.

What is meant by an exothermic reaction?

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 [1]

[Total: 5]

## SECTION C – MODULE P1

**8 This question is about waves.**

**(a) Look at the statements about MICROWAVES.**

**Some statements are true and some are false.**

**Put a tick (✓) in the correct box next to each statement.**

**Two have been done for you.**

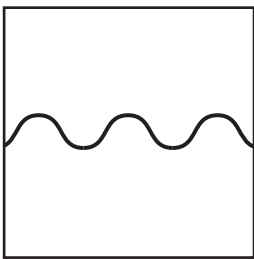
	<b>TRUE</b>	<b>FALSE</b>
<b>They are electromagnetic waves.</b>		
<b>They are longitudinal.</b>		✓
<b>They penetrate to the centre of all foods.</b>		
<b>They are absorbed by water molecules.</b>	✓	
<b>They can go through plastic.</b>		
<b>They are reflected by metals.</b>		
<b>They can be absorbed by body tissues and cause burns.</b>		

**[2]**

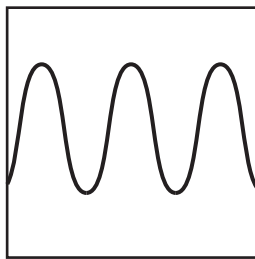
**(b) Anna uses an oscilloscope to study different waves.**

**She does NOT change the settings on the oscilloscope.**

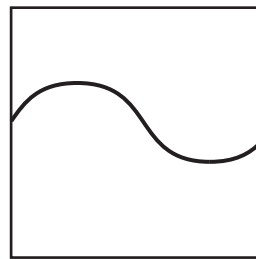
**Look at the traces she sees.**



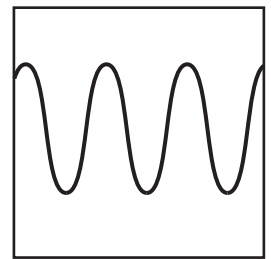
**A**



**B**



**C**



**D**

**(i) Which trace shows the wave with the lowest frequency?**

**Choose from:            A            B            C            D**

**answer \_\_\_\_\_ [1]**

**(ii) Which trace shows the wave with the smallest amplitude?**

**Choose from:            A            B            C            D**

**answer \_\_\_\_\_ [1]**

**[Total: 4]**

9 This question is about light rays in glass.

(a) The critical angle for a glass-air boundary is  $42^\circ$ .

What is meant by CRITICAL ANGLE?

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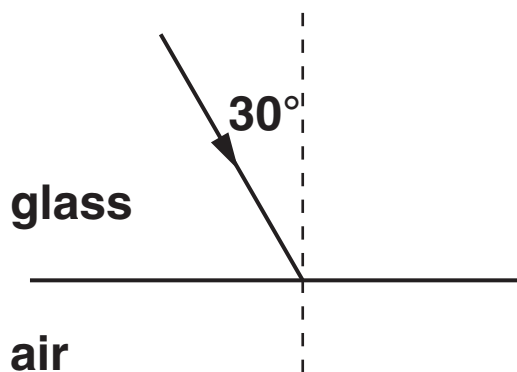
[1]

(b) Look at the three diagrams.

They show light rays incident at the boundary between glass and air.

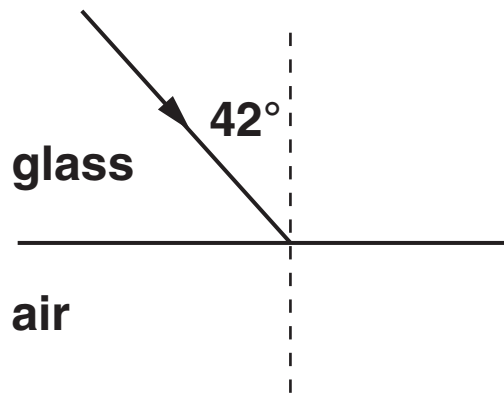
The critical angle for the glass-air boundary is  $42^\circ$ .

(i) Complete the path of the ray to show what happens after it meets the boundary.



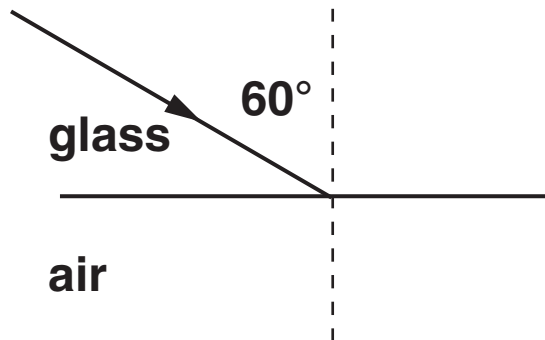
[1]

- (ii) Complete the path of the ray to show what happens after it meets the boundary.



[1]

- (iii) Complete the path of the ray to show what happens after it meets the boundary.



[1]

- (c) One advantage of using optical fibres is that the signals can be MULTIPLEXED.

What is multiplexing?

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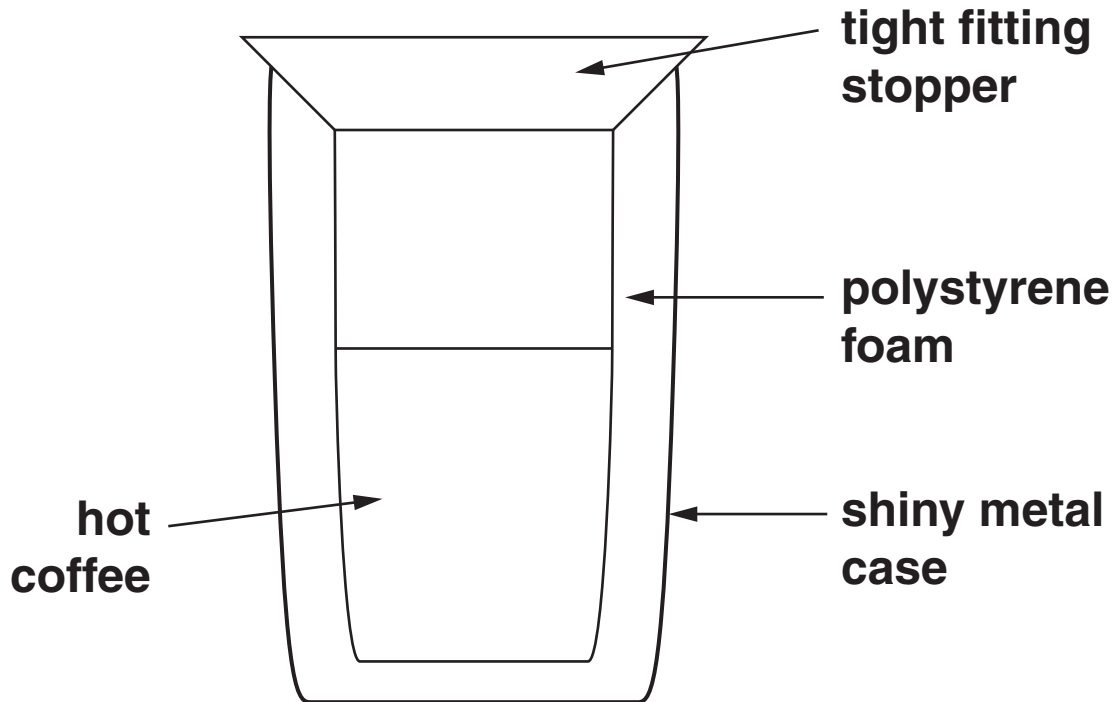
[1]

[Total: 5]



10 (a) Look at the diagram of a thermal mug.

It is used to keep coffee hot.



Explain how the thermal mug reduces energy transfer.

In your answer write about

- conduction
- convection
- radiation.

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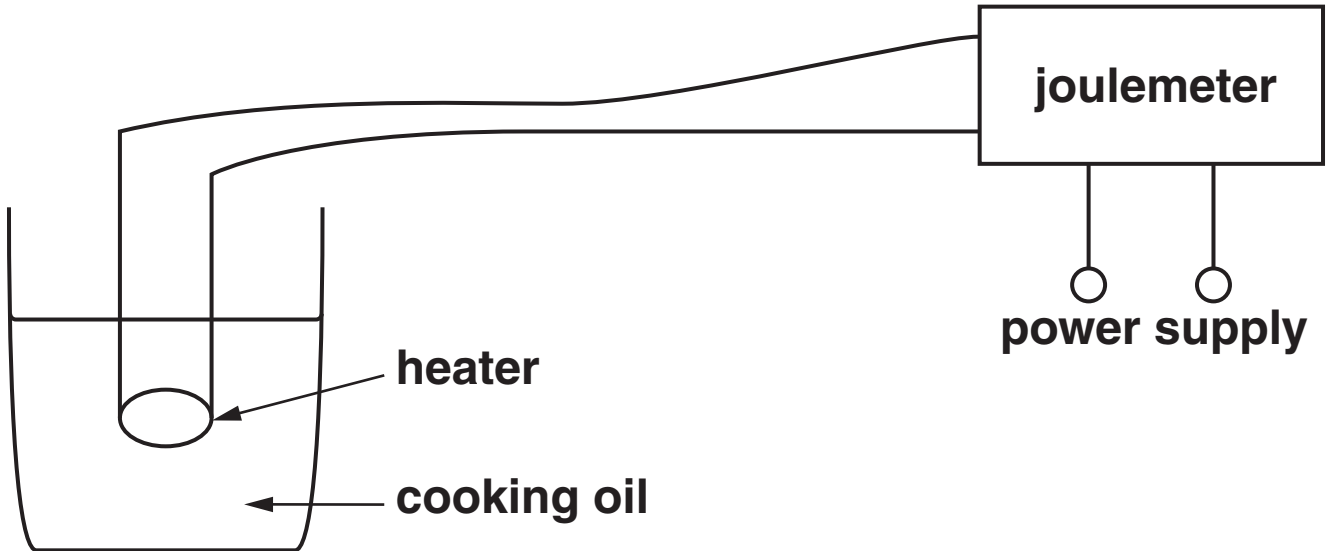
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[3]

**(b) Ben has a beaker containing 0.18 kg of cooking oil.  
The starting temperature of the cooking oil is 20 °C.  
Look at the diagram.**



**He supplies 9000 J of energy to the cooking oil.**

**The specific heat capacity of cooking oil is  
800 J/kg °C.**

**Calculate the final temperature of the cooking oil  
after heating.**

**Ignore any heat losses.**

**The equations on page 3 may help you.**

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**answer \_\_\_\_\_ [3]**

**[Total: 6]**

**11 Look at the information about energy saving methods.**

<b>INSULATION METHOD</b>	<b>COST TO FIT IN £</b>	<b>PAYBACK TIME IN YEARS</b>	<b>SAVINGS EACH YEAR IN £</b>	<b>ENERGY SAVED EACH YEAR IN kWh</b>
<b>cavity wall insulation</b>	<b>960</b>	<b>4.0</b>	<b>240</b>	<b>2000</b>
<b>double glazing</b>	<b>3000</b>	<b>15.0</b>	<b>200</b>	<b>1667</b>
<b>draught excluders</b>	<b>48</b>	<b>0.5</b>	<b>96</b>	<b>800</b>
<b>loft insulation</b>	<b>240</b>	<b>2.0</b>	<b>120</b>	

**(a) Draught excluders ONLY save £96 each year.**

**Andy still decides to fit them.**

**Suggest why.**

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**[1]**

**(b) Energy costs 12p per kWh.**

**How many kWh of energy does loft insulation save each year?**

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**answer** \_\_\_\_\_ **kWh** [1]

**[Total: 2]**

**12 Both human activity and natural phenomena can affect the environment.**

**(a) The eruption of a volcano causes a fall in the temperature of the land around the volcano.**

**Explain why.**

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**[1]**

**(b) Human activity has lead to an increase in the amount of ultraviolet light reaching the Earth.**

**Explain how human activity caused the increase in ultraviolet light reaching the Earth.**

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**[2]**

**[Total: 3]**

**END OF QUESTION PAPER**

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