Candidate forename					Candidate surname				

Centre number					Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE GATEWAY SCIENCE
B621/01
SCIENCE B

Unit 1 Modules B1 C1 P1 (Foundation Tier)

TUESDAY 24 JANUARY 2012: 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, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

- Use black ink. HB pencil may be used for graphs and diagrams only.

- Answer <u>ALL</u> the questions.

- Read each question carefully. Make sure you know what you have to do before starting your answer.

- 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.

- The total number of marks for this paper is <u>60</u>.

EQUATIONS

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

wave speed = frequency × wavelength

power = voltage × current

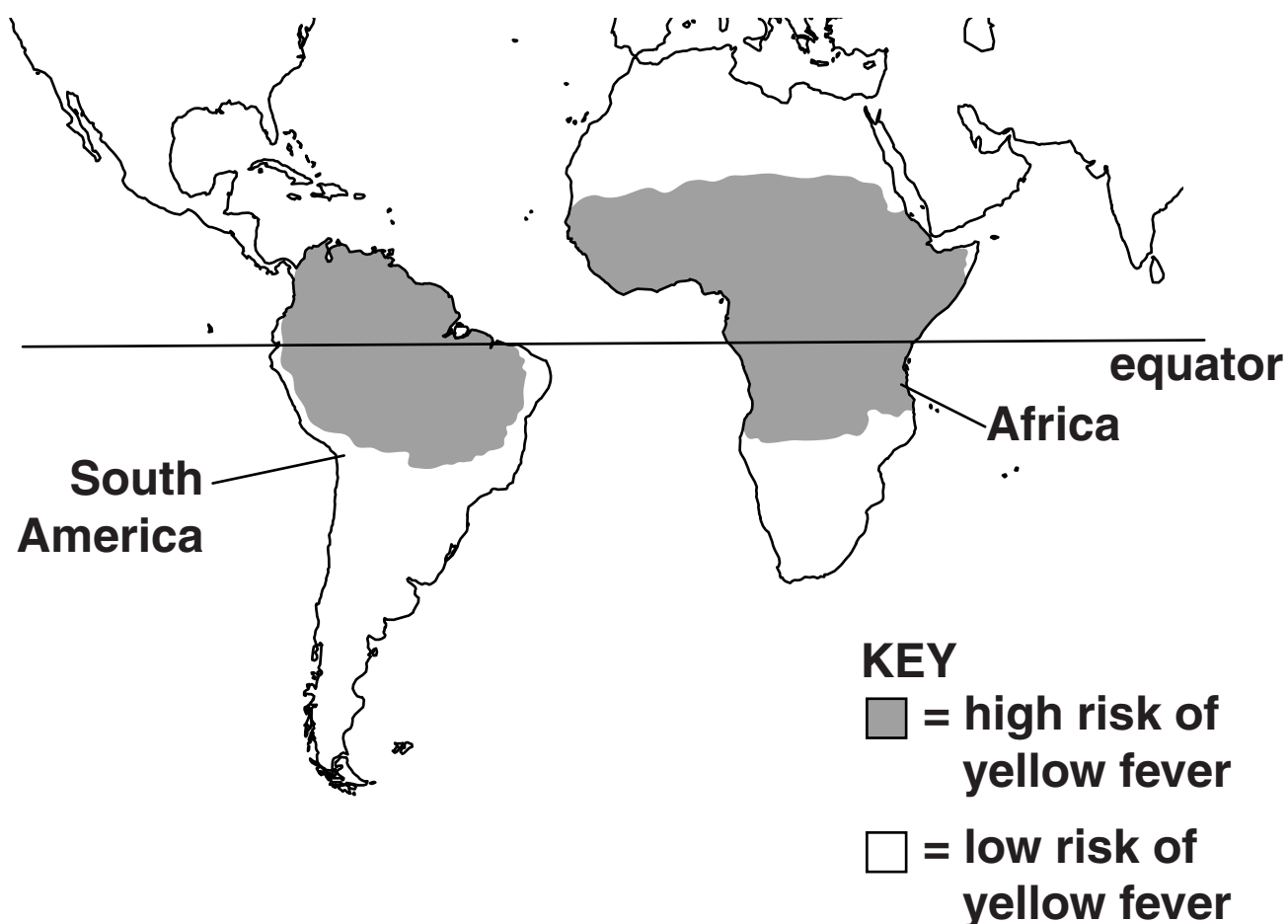energy (kilowatt hours) = power (kW) × time (h)

Answer ALL the questions.

SECTION A – MODULE B1

1   **Geoff is planning to travel to Africa.**

Yellow fever is a disease which only occurs in South America and Africa.

The map shows areas where people get yellow fever in South America and Africa.

KEY

▣ = **high risk of yellow fever**

☐ = **low risk of yellow fever**

(a) **What does the map show about where people get yellow fever in South America and Africa?**

_____

_____ **[1]**

(b) Yellow fever is caused by a virus.

Finish the table by writing in the cause of two other conditions.

Choose your answers from this list.

BACTERIA

FUNGI

INHERITED GENES

PROTOZOA

CONDITION	CAUSE
cystic fibrosis	
athlete's foot	

[2]

[Total: 3]

2 (a) In some places in the world people live at high altitude.

These people are often good athletes.

This is because their bodies are very good at getting oxygen from the air.

Scientists have been studying why this is.

The scientists studied

- each athlete's pulse rate

- how much haemoglobin was in their blood

- how much iron was in their diet.

(i) Describe how the scientists could measure pulse rate.

_____

_____

_____ [2]

(ii) The amount of iron in the diet might affect the amount of haemoglobin in the blood.

Suggest why.

_____

_____ [1]

(b) (i) Some athletes try to improve their performance by taking drugs.

Which type of drug is most likely to improve an athlete's performance?

Put a (ring) around the correct answer.

ANABOLIC STEROIDS

ASPIRIN

LSD

TEMAZEPAM   [1]

(ii) Stimulants can help an athlete run faster.

They do this by increasing the breathing rate and pulse rate.

Explain how these changes may help the athlete run faster.

_____

_____

_____

_____ [3]

(c) When athletes run, their bodies generate more heat.

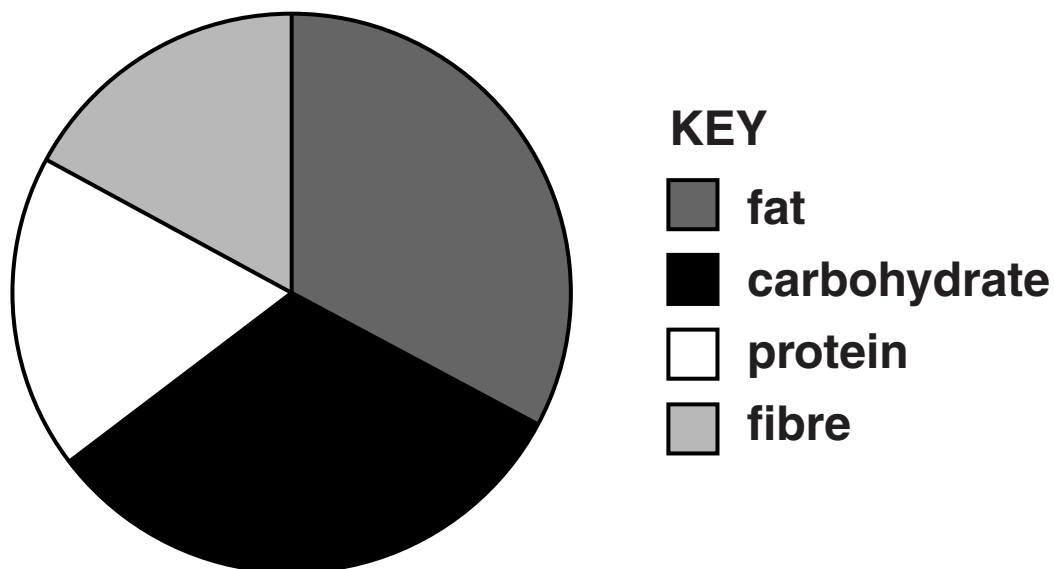Write down ONE change in their bodies that lets them lose more heat.

_____ [1]

[Total: 8]

3   Four people decide to go on four different diets.

The table opposite shows each person's daily intake when they are on their diets.

(a) The pie chart shows one person's diet.

KEY
- fat
- carbohydrate
- protein
- fibre

Which person's diet is shown on the pie chart?

_____ [1]

(b) Which person's diet would be best for preventing constipation?

_____ [1]

(c) Arthur's diet is the LEAST suitable for a growing teenager.

Write down ONE reason why.

_____ [1]

PERSON	ENERGY IN kJ	FAT IN g	CARBOHYDRATE IN g	PROTEIN IN g	FIBRE IN g
Jilly	5406	120	16	62	16
Arthur	3570	12	154	32	62
Gazza	4692	78	76	44	40
Aqsa	5134	102	30	68	18

(d) Jilly has a body mass of 80 kg.

    (i) Calculate Jilly's recommended daily average (RDA) protein intake.

       Use the formula below to help you.

       RDA in g = 0.75 × body mass in kg

       Jilly's RDA = _____ g   **[1]**

    (ii) Does Jilly's diet provide her with enough protein?

       answer _____
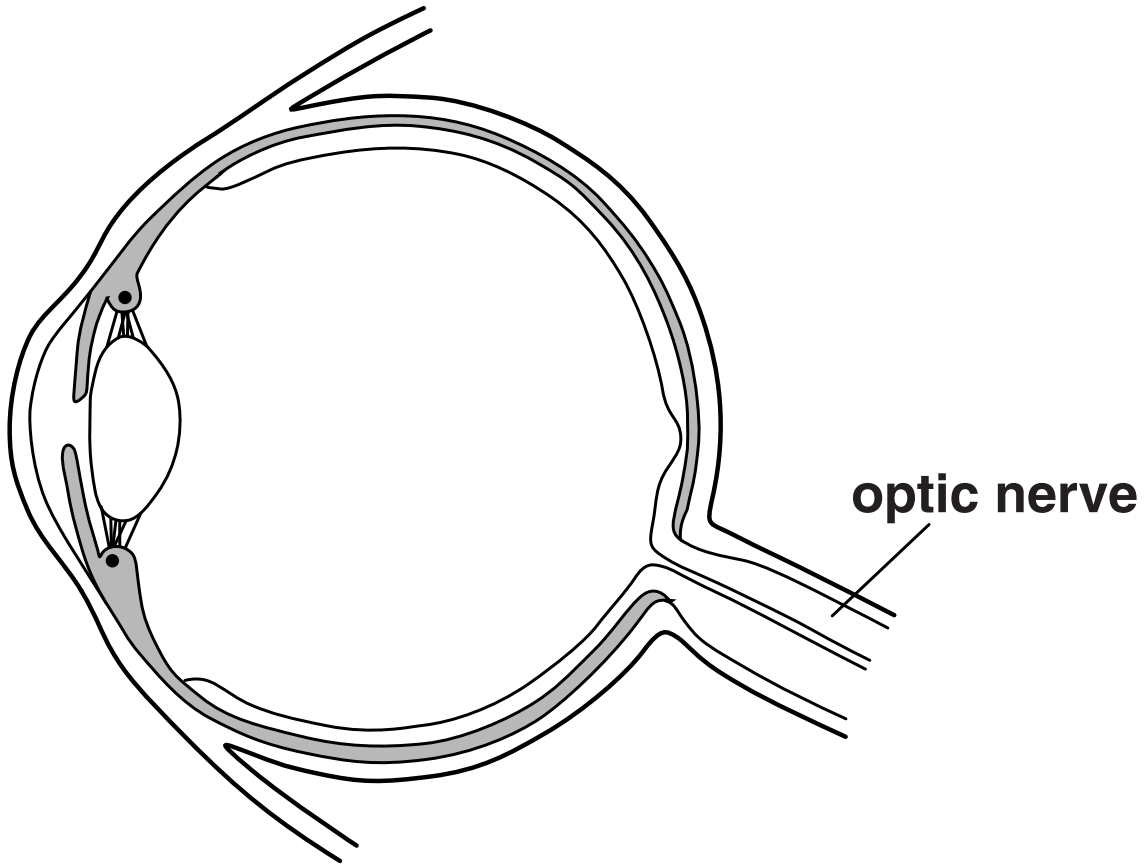
       Explain your answer.

       _____ **[1]**

                           [Total: 5]

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Please turn over for Question 4.

4 **Look at the diagram of the eye.**

optic nerve

(a) The optic nerve has been labelled.

Add TWO more labels to the diagram to show the positions of the

- **lens**

- **cornea.**

[2]

(b) Some people have problems with their eyes.

These problems are caused by something wrong in the eyes.

Finish the table.

EYE PROBLEM	WHAT IS WRONG IN THE EYES
long-sight	
red-green colour blindness	

[2]

[Total: 4]

SECTION B – MODULE C1

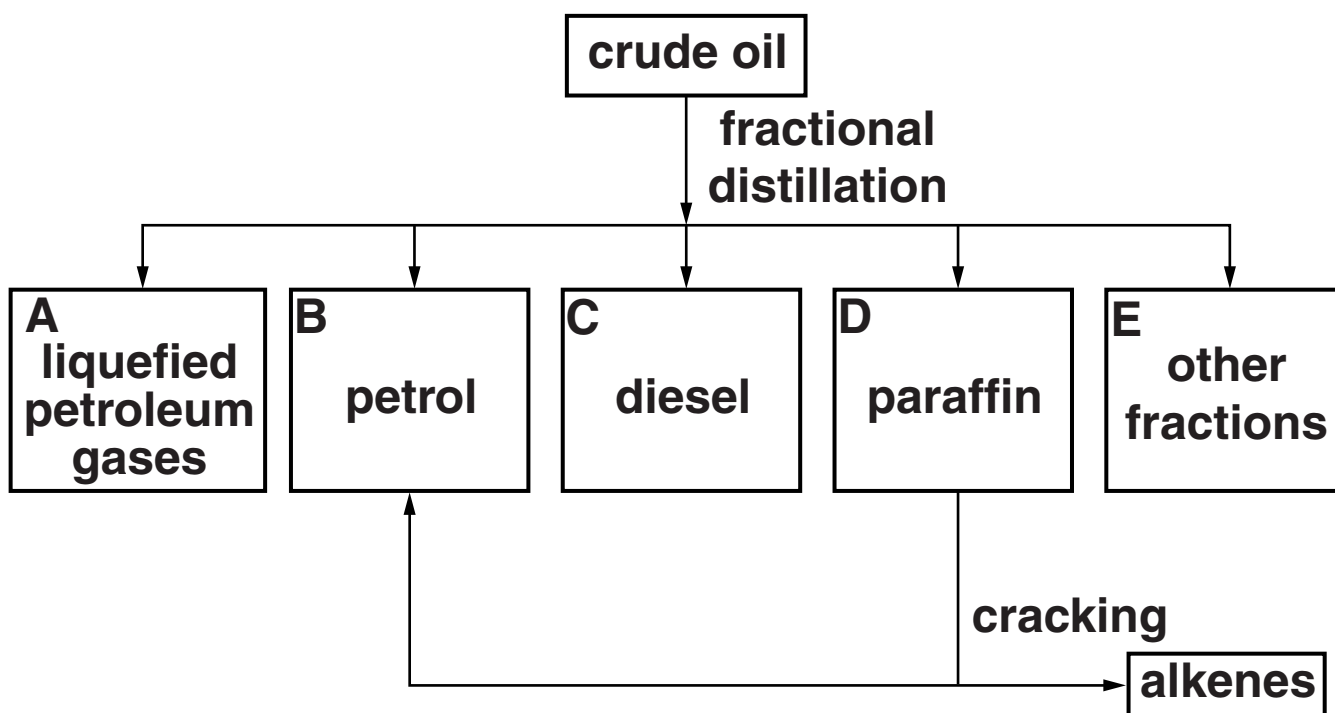**5** **Crude oil is used to make many substances.**

(a) Crude oil is a fossil fuel.

Fossil fuels are non-renewable.

Explain why.

_____

_____ **[1]**

(b) Look at the flow chart.

It shows some of the substances that can be made from crude oil.

```
                    ┌──────────┐
                    │ crude oil│
                    └──────────┘
                         │    fractional
                         │    distillation
                         ▼
```

A liquefied petroleum gases	B petrol	C diesel	D paraffin	E other fractions

cracking

alkenes

(i) Fractional distillation separates crude oil into fractions.

Write down the name of one of the other fractions.

Choose from

BITUMEN

CARBOHYDRATE

COAL

NYLON

answer _____ [1]

(ii) Cracking breaks down large hydrocarbon molecules.

Smaller, more useful molecules are made.

Write down ONE substance made by cracking the paraffin fraction.

_____ [1]

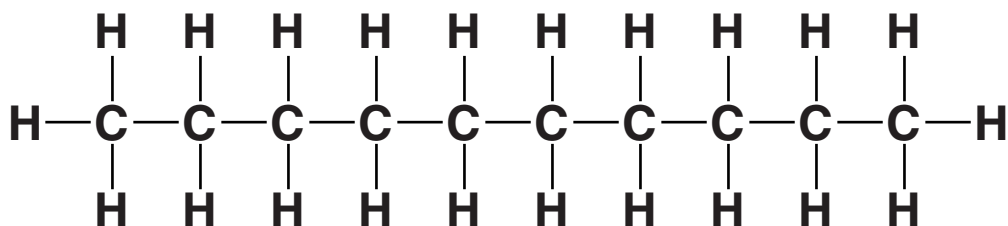(c) Each fraction contains hydrocarbon molecules.

Look at the table opposite.

(i) A hydrocarbon has a boiling temperature of 189 °C.

In which fraction is this hydrocarbon found?

Choose from the table.

answer _____[1]

(ii) Look at the displayed formula for hydrocarbon X.

Write down the names of the TWO elements which are bonded together in a hydrocarbon.

_____ and _____ [1]

(iii) In which fraction is hydrocarbon X found?

Choose from the table.

answer _____[1]

[Total: 6]

16

FRACTION	NUMBER OF CARBON ATOMS IN EACH HYDROCARBON MOLECULE	BOILING TEMPERATURE IN °C
liquefied petroleum gases (LPG)	1–4	below 30
petrol	5–9	30–175
paraffin	10–16	176–275
diesel	12–25	276–375

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6 Aircraft use a hydrocarbon fuel to power their jet engines.

(a) A gas in the air reacts with the fuel when it burns.

Which gas?

_____ [1]

(b) The owners of the aircraft want to change the fuel the engines burn.

Two of the factors the owners need to think about are

- the energy released per kilogram

- the cost.

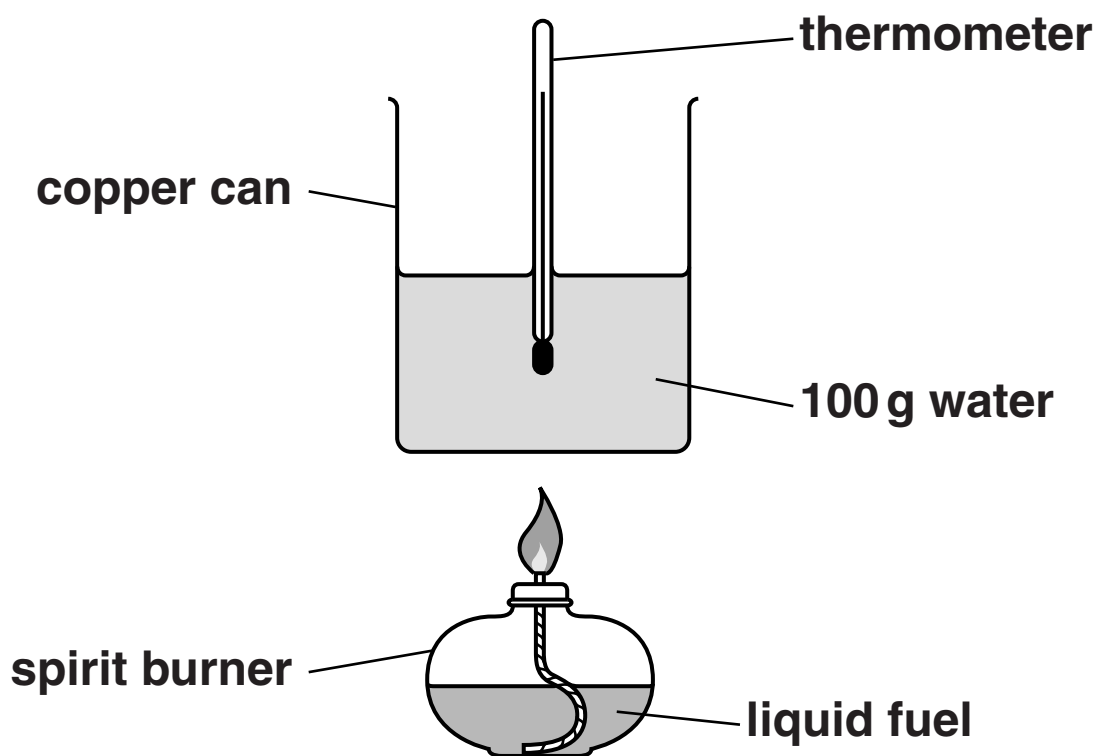Write down two OTHER factors the owners need to think about.

1 _____

_____

2 _____

_____ [2]

(c) Cristina wants to compare the energy released by four different liquid fuels.

Look at the diagram of the apparatus she uses.

Each time she burns 2.0 grams of the liquid fuel.

She measures the temperature of the water at the start.

She measures the temperature again when all the fuel has burnt.

Look at her results.

FUEL	TEMPERATURE OF WATER AT START IN °C	TEMPERATURE OF WATER AT END IN °C
A	20	46
B	18	46
C	21	47
D	23	39

(i) Which fuel releases the most energy?

fuel _____

Explain your answer. _____

_____ [2]

(ii) Cristina notices that all the fuels burn with a yellow flame and make lots of soot.

Suggest why.

_____ [1]

[Total: 6]

7 **Many foods and drinks contain food additives.**

Look at the bottle of mayonnaise.

OCR

Real
MAYONNAISE
SMOOTH AND CREAMY

Easy Squeeze!

The mayonnaise contains some food additives.

One of these additives is benzoic acid.

(a) Benzoic acid has the molecular formula $C_7H_6O_2$.

How many atoms are there in one molecule of benzoic acid, $C_7H_6O_2$?

Choose from

3

6

8

9

13

15

17

answer _____ [1]

(b) The mayonnaise contains an ANTIOXIDANT.

What is the job of an antioxidant?

_____

_____ [1]

(c) The mayonnaise contains oil and water.

It also contains an EMULSIFIER.

(i) Why is it important that mayonnaise contains an emulsifier?

_____

_____ [1]

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

_____ [1]

(d) The mayonnaise bottle is made of a plastic.

Two properties of this plastic are

- it will not break when dropped

- it is non-biodegradable.

(i) Write down one OTHER property of the plastic that makes it suitable to make the bottle for the mayonnaise.

_____

_____ [1]

(ii) What does NON-BIODEGRADABLE mean?

_____

_____ **[1]**

(iii) Many plastic bottles are thrown away in dustbins.

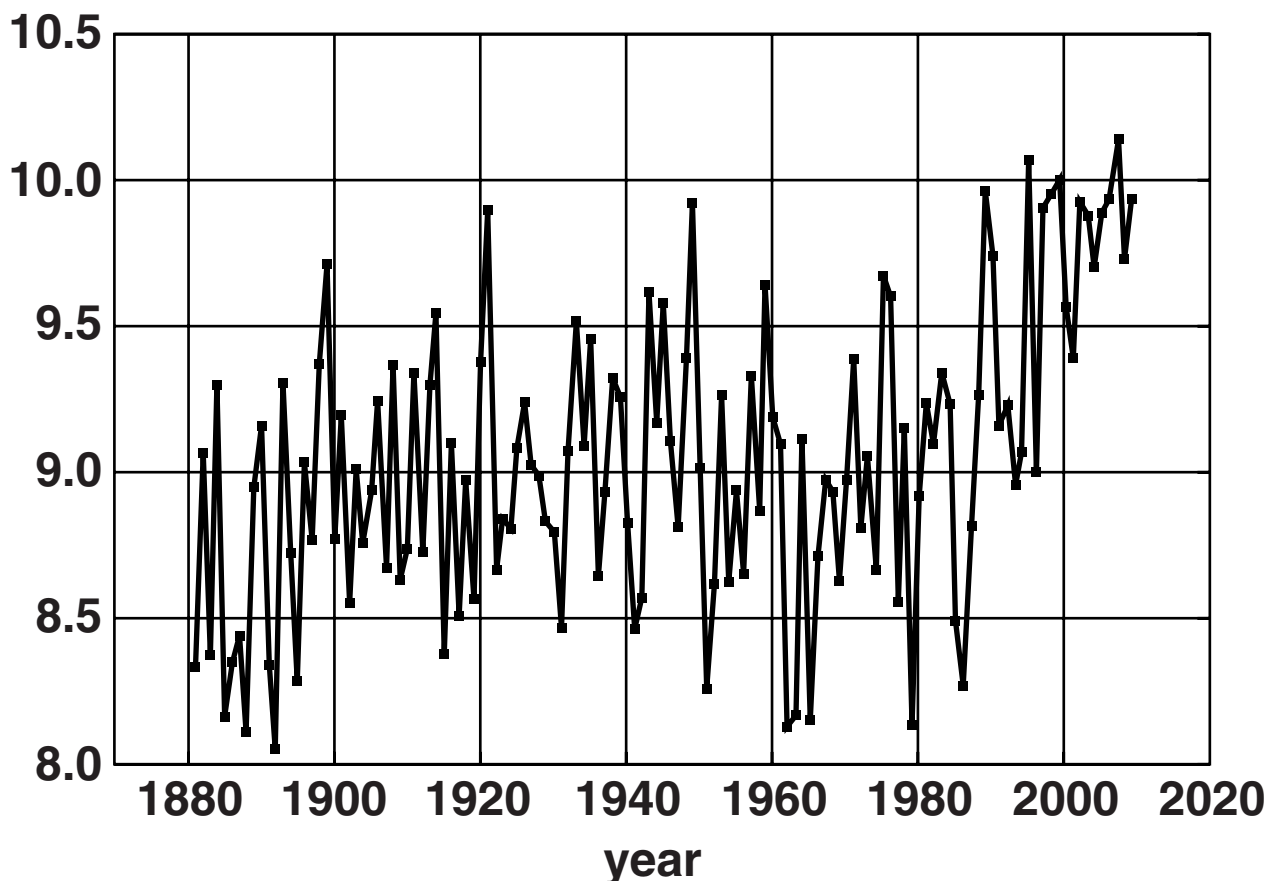**Write about the different ways in which waste plastics (polymers) can be disposed of.**

_____

_____

_____

_____ **[2]**

[Total: 8]

SECTION C – MODULE P1

8 **Look at the graph.**

It shows the average annual temperature recorded at one weather station.

average annual temperature in °C

(a) The graph suggests that the temperature of the Earth has increased during the last 20 years.

Suggest TWO reasons why the Earth's temperature has increased.

1 _____

2 _____ **[2]**

(b) Weather patterns are affected by natural phenomena and by human activity.

   (i) Dust from a large volcano spreads as a layer around the Earth.

      How will this affect the Earth's temperature?

_____

_____ [1]

   (ii) Dust from a town centre factory can raise the temperature of the town.

      Explain why.

_____

_____ [1]

[Total: 4]

9   This question is about ways of reducing energy loss from the home.

(a) Tina puts a length of thick fabric at the bottom of her dining room door.

It helps to keep the room warm.

How does the thick fabric reduce energy loss?

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

It absorbs energy from the room and radiates it back into the room. ☐

It is a form of draught proofing and reduces the amount of cold air that can enter the room. ☐

It reduces energy loss by conduction because the fabric is a good conductor. ☐

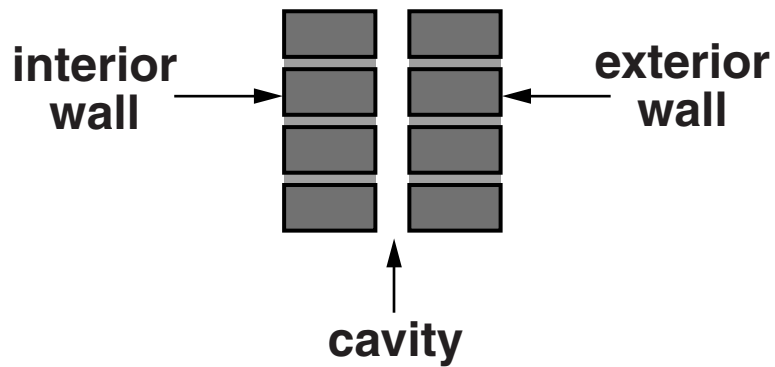It reduces energy loss by radiation because it reflects energy back into the room. ☐

[1]

(b) The room has thick curtains and blinds which reduce energy loss through the windows.

Suggest one OTHER way of reducing energy loss through the windows.

_____ [1]

(c) The diagram shows the cavity between the outer and inner walls of Tina's home.

interior wall →   ← exterior wall

↑ cavity

The cavity is filled with air.

(i) What happens to the air in the cavity when its temperature rises?

_____ [1]

(ii) Tina investigates ways of insulating her home.

She finds the following information.

INSULATION	INSTALLATION COST IN £	PAYBACK TIME IN YEARS
cavity wall insulation	250	2
double glazing	5000	50
draught proofing	100	4
loft insulation	250	1.7

She decides to buy CAVITY WALL INSULATION.

Foam is injected into the wall cavity.
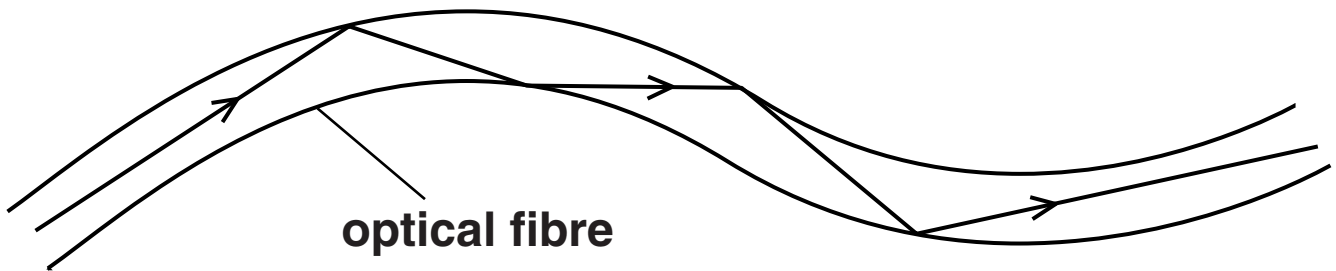
How much will she save on energy bills each year?

_____

_____

answer £ _____   [1]

[Total: 4]

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Please turn over for Question 10.

10 **Sam uses infrared radiation to transmit a voice message along an optical fibre.**

optical fibre

(a) **What happens to the infrared radiation in the fibre when it reaches a glass-air boundary?**

_____ [1]

(b) **Infrared radiation travels at a particular speed in space.**

What else travels at the same speed as infrared radiation?

Put (rings) around the TWO correct answers.

LIGHT WAVES

P WAVES

RADIO WAVES

SOUND WAVES

S WAVES

[2]

(c) The voice message is produced as an ANALOGUE signal.

It is changed into a DIGITAL signal before it is transmitted along the optical fibre.

Finish the sentences to describe the difference between an analogue signal and a digital signal.

An analogue signal _____

_____ .

A digital signal _____

_____ . [2]

(d) Suggest ONE OTHER use for infrared radiation.

_____ [1]

[Total: 6]

33

11 Microwave radiation is used to transmit mobile phone signals.

(a) One frequency used by mobile phones is 900 000 000 Hz.

The wavelength of the radiation is 0.333 m.

Calculate the speed of microwave radiation.

The equations on page 3 may help you.

_____

_____

_____

answer _____ m/s   **[1]**

(b) Write down ONE OTHER use for microwave radiation in the home.

_____ **[1]**

(c) There are concerns about children using mobile phones.

Some scientists think that using mobile phones a lot may harm children's health.

Suggest why they are concerned that using mobile phones may harm children's health.

_____

_____

_____ **[2]**

[Total: 4]

12 Most physical quantities have their own unit.

Draw a straight line from each QUANTITY to its correct UNIT. One has been done for you.

QUANTITY	UNIT
	°C
energy	J
mass	kg
temperature	m
	W

[2]

[Total: 2]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2						3	4	5	6	7	0
												4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4						11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12						27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111		

For elements in groups 3–7 and 0 below period 5:

3	4	5	6	7	0
70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86

Elements with atomic numbers 112-116 have been reported but not fully authenticated

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1
H
hydrogen
1

The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number

40