

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**GATEWAY SCIENCE**  
**SCIENCE B**

**B621/01**

Unit 1 Modules B1 C1 P1 (Foundation Tier)

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

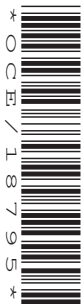
**OCR Supplied Materials:**  
None

**Other Materials Required:**

- Pencil
- Ruler (cm/mm)

**Thursday 14 January 2010**  
**Morning**

**Duration: 1 hour**



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- 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.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**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 two.
- The Periodic Table is printed on the back page.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

## 2

### EQUATIONS

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

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

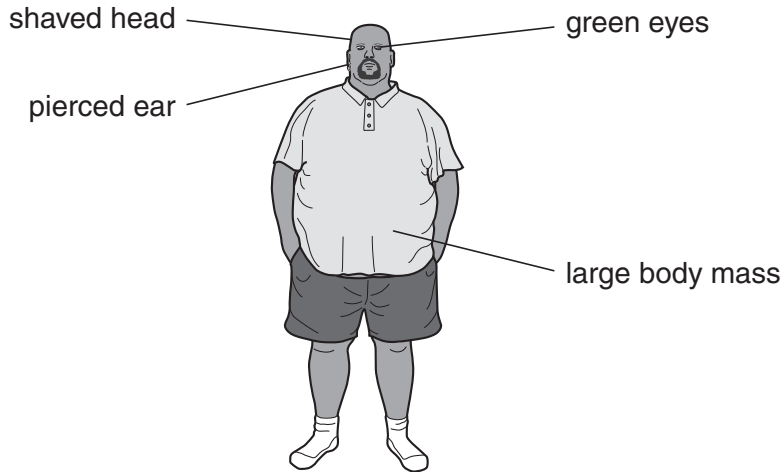
$$\text{power} = \text{voltage} \times \text{current}$$

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

Answer **all** the questions.

**Section A – Module B1**

1 Look at Rob.



(a) Some of Rob’s features are controlled only by genes, some only by the environment and some by both.

Put ticks (✓) in the table to show how each feature is controlled.

The first one has been done for you.

feature	controlled only by genes	controlled only by the environment	controlled by both genes and the environment
green eyes	✓		
large body mass			
pierced ear			
shaved head			

[3]

(b) Rob’s green eye colour is controlled by his genes.

Rob has a daughter. She does not have green eyes.

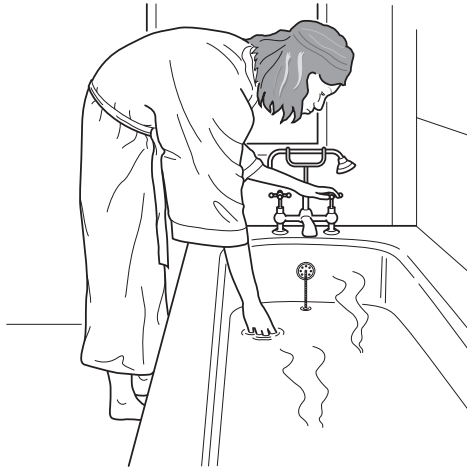
Suggest why she does **not** have green eyes.

.....

..... [1]

[Total: 4]

2 Lynne is going to have a bath.



She puts her hand in the water and quickly pulls it out because it is too hot.

(a) This response is a reflex.

Write down **two** ways that you can tell that this response is a reflex.

1 .....

2 ..... [2]

(b) Which sense organ is Lynne using to sense that the water is too hot?

..... [1]

(c) How does information get to Lynne's brain to tell her that the water is too hot?

..... [1]

[Total: 4]

3 Richard is feeling hot.

He decides to measure his body temperature.

(a) Describe how he should measure his body temperature.

In your answer, write about

- the apparatus he should use
- how he should use the apparatus.

.....  
.....  
..... [2]

(b) Body heat is produced when cells respire.

What **two** substances does a cell need to respire?

1 .....  
2 ..... [2]

(c) (i) What should Richard's normal body temperature be?

..... [1]

(ii) Why is it important that Richard's body temperature stays at this value?

..... [1]

[Total: 6]

4 This question is about being healthy.

(a) A balanced diet contains all the following food types.

**carbohydrate**

**fat**

**protein**

**minerals**

**vitamins**

**fibre**

**water**

The amount of each food type you should eat varies from person to person.



Mary



Vicki

Mary is in a swimming club and swims every day.

Vicki is the same age and weight as Mary, but does **not** exercise as much.

How should Mary's diet be different from Vicki's?

In your answer, write about

- which food type or types she should have more or less of than Vicki
- the reason or reasons for this.

.....

.....

..... [2]

(b) Vicki is concerned about her health.

She measures her mass and height so she can calculate her BMI (body mass index).

Vicki's mass is 60 kg.

Her height is 170 cm.

Calculate Vicki's BMI.

Use the formula

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in m})^2}$$

answer ..... [2]

(c) Vicki's BMI shows she is not overweight.

Having a high BMI increases the risk of getting heart disease.

(i) Smoking can also increase the risk of heart disease.

Nicotine is one substance in cigarette smoke that is linked to heart disease.

Write down **one other** substance in cigarette smoke that is linked to heart disease.

..... [1]

(ii) Look at the list of drug types.

**depressant**

**hallucinogen**

**painkiller**

**performance enhancer**

**stimulant**

What type of drug is nicotine?

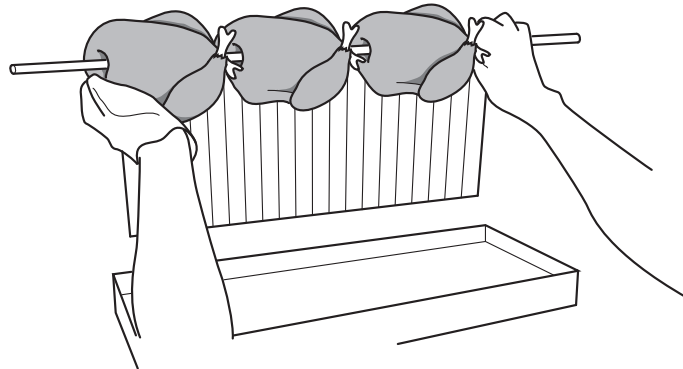
Choose your answer from the list.

..... [1]

[Total: 6]

Section B – Module C1

5 Trevor is cooking some chickens.



He roasts the chickens in an oven.

(a) Write down two **other** ways Trevor could cook the chickens.

1 .....

2 ..... [2]

(b) (i) Cooking chickens is a chemical change.

Explain why.

..... [1]

(ii) Trevor takes the chickens out of the oven.

Write about **one other** way the chickens have changed during cooking.

..... [1]

[Total: 4]



6 Crude oil is a fossil fuel.

Crude oil is a mixture of hydrocarbons.

(a) What is a **hydrocarbon**?

..... [1]

(b) Petrol can be made from crude oil by fractional distillation.

Write down the names of **two** other fuels that can be made from crude oil.

Choose from the list.

**coal**

**coke**

**diesel**

**propane**

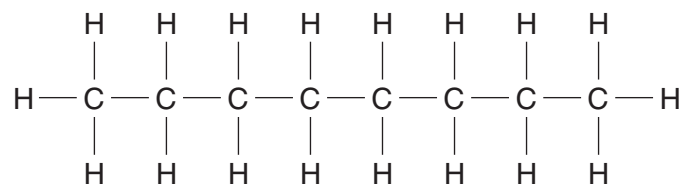
**wood**

1 .....

2 ..... [2]

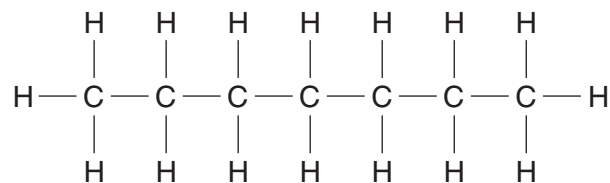
(c) Two of the hydrocarbons found in petrol are called heptane and octane.

(i) Look at the displayed formula for **octane**.



What is the total number of **atoms** in one molecule of octane?..... [1]

(ii) Look at the displayed formula for **heptane**.



Heptane has the molecular formula  $\text{C}_7\text{H}_{16}$ .

What is the molecular formula for **octane**? ..... [1]

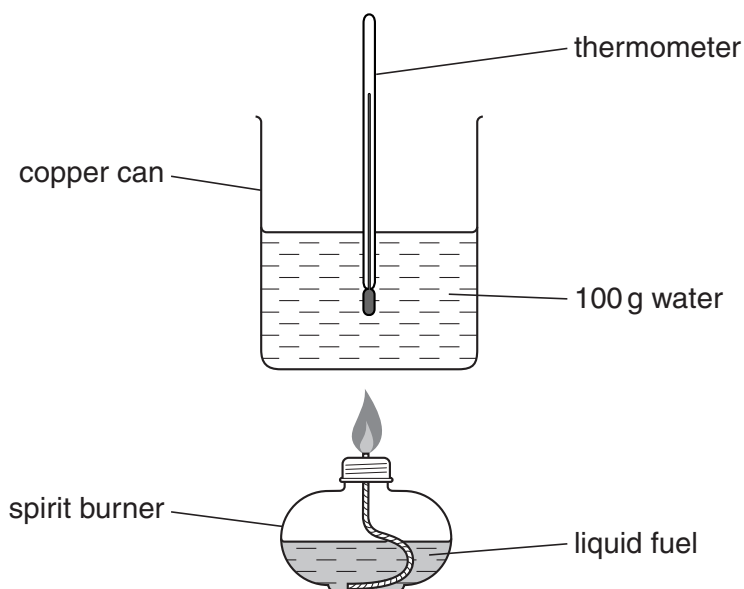
[Total: 5]

7 Steve and Sarah investigate some fuels.

They want to find out which fuel gives off most energy.

They test four liquid fuels.

Look at the diagram. It shows the apparatus they use.



They burn 1.0g of fuel each time.

Look at the table.

The table shows their results.

fuel	temperature at start in °C	temperature at end in °C
ethanol	20	37
methanol	18	28
paraffin	20	35
petroleum spirit	18	42

(a) Which fuel transfers the **most** energy to the water?

.....

Explain how you know.

.....

..... [2]

(b) Paraffin contains hydrocarbons.

(i) When complete combustion of paraffin happens, two substances are made.

Write down the name of **one** of these substances.

..... [1]

(ii) Steve and Sarah watch the paraffin burn in the spirit burner.

They notice that it burns with a very sooty, yellow flame.

Suggest why.

..... [1]

[Total: 4]

8 This question is about polymers.

(a) Poly(ethene) is a polymer.

Polymers make plastics.

Write down **one** use for plastics made from poly(ethene).

..... [1]

(b) Poly(ethene) is **non-biodegradable**.

What is meant by non-biodegradable?

.....  
..... [1]

(c) Poly(chloroethene) is a polymer.

The plastic from this polymer is used to make water pipes.



One property of poly(chloroethene) is that it is easy to shape.

Write about **other** properties of poly(chloroethene) that make it suitable for making water pipes.

.....  
.....  
..... [2]

[Total: 4]

- 9 Sam has bought a new bottle of perfume.



- (a) One of these chemicals gives this perfume its smell.

Which one?

Choose from the list.

**acid**

**ester**

**salt**

**water**

..... [1]

- (b) A perfume must have several properties.

One of these properties is that it must not react with water.

Write down one **other** property that a perfume must have.

..... [1]

- (c) Sam's perfume was tested before the company was allowed to sell it.

Write down **one** reason why.

..... [1]

**[Total: 3]**

Section C – Module P1

10 The diagrams show the polar ice cap today and how it may look in 200 years time.



The polar ice cap becomes **much** smaller.

This could happen due to **global warming**.

(a) Write down **two** things that may **increase** global warming.

- 1 .....
- 2 ..... [2]

(b) Erupting volcanoes can cause the Earth's temperature to **fall**.

Explain how.

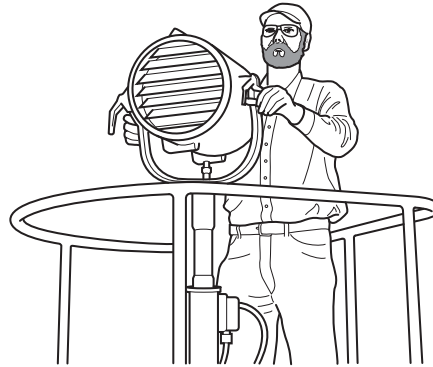
- .....
- .....
- ..... [2]

[Total: 4]

11 Many years ago it was difficult to send messages long distances.

A runner had to carry a written message.

The use of flashing light signals greatly improved this.



(a) How is sending messages using flashing lights better than using a runner?

.....  
 ..... [1]

(b) Messages sent this way use a series of flashing lights.

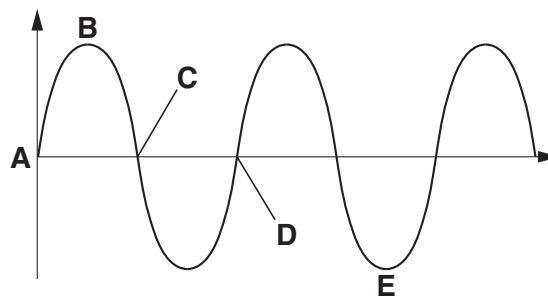
This is a type of code.

What is the **name** of this code?

..... [1]

(c) A light wave is a **transverse** wave.

Look at the diagram.



(i) Which letter shows a **crest**?

answer ..... [1]

(ii) The **wavelength** is the distance between letter ..... and letter ..... [1]

[Total: 4]

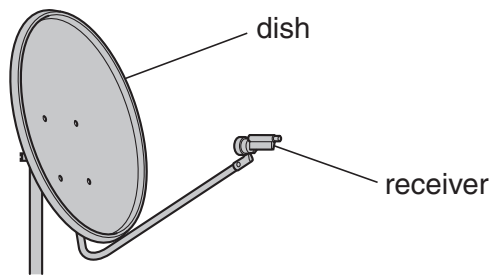
Turn over

16  
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12 The diagram shows a satellite receiver dish.



Satellite dishes use wireless technology.

(a) What type of radiation does wireless technology use?

..... [1]

(b) What happens to the signals when they reach the dish?

..... [1]

(c) Two types of signal are used to transmit information.

One type is **digital**.

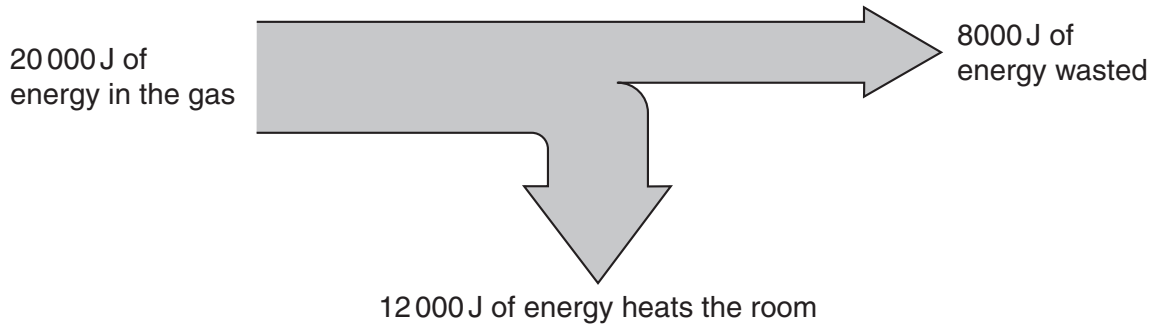
Write down the name of the other type of signal.

..... [1]

[Total: 3]

13 Asif has a gas fire that heats the living room of his house.

The diagram shows how much of the energy in the gas actually heats the room.



(a) Calculate the efficiency of the gas fire.

The equations on page two may help you.

.....

.....

answer .....

[2]

(b) Asif wants to make his house more energy efficient.

He makes improvements to his house.

Draw a straight line from each **improvement** to its correct **explanation**.

<b>improvement</b>	<b>explanation</b>
put shiny foil behind radiators	it is a poor conductor
put fibreglass in the loft space	it stops cold air entering
fit draught-proofing around windows and doors	it reflects heat energy (infrared)

[2]

(c) Asif insulates his loft. It costs £240.

This reduces his energy bill by £80 every year.

Calculate the payback time for his loft insulation.

.....  
.....

answer ..... years

[1]

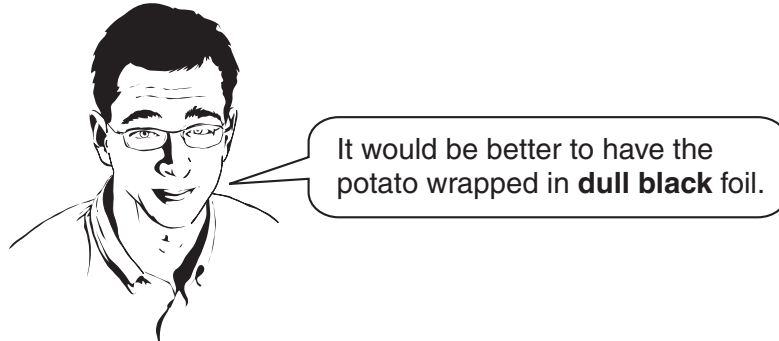
[Total: 5]

14 (a) Molly wants to bake a potato in an oven.

The oven emits infrared radiation that cooks the potato.

She thinks that wrapping the potato in **shiny** foil will heat it quicker.

Liam does not agree.



Liam is correct.

Put ticks (✓) in the boxes next to the **two** correct sentences that explain why.

Dull black foil keeps the heat in better.

Dull black foil reflects the radiation better.

Dull black foil absorbs the radiation better.

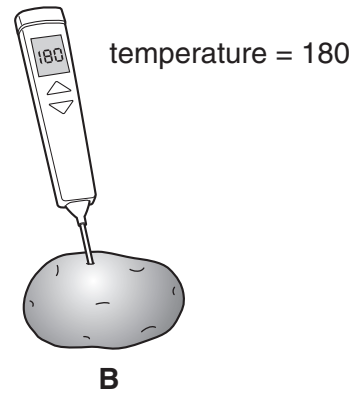
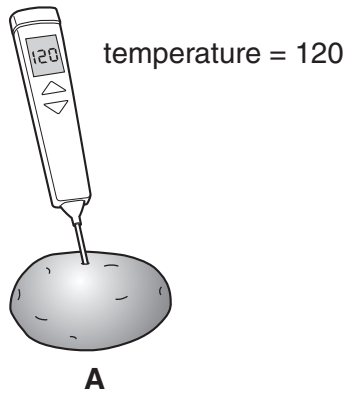
Shiny foil reflects more radiation away.

[2]

(b) Molly cooks two potatoes.

The potatoes are the same **size** and **mass**.

She measures the temperature of both potatoes.



(i) Distance is measured in metres (m).

What is temperature measured in?

Choose from

- A      J      °C      N      W**

answer .....

[1]

(ii) Molly leaves the potatoes to stand for ten minutes.

She measures the temperatures again.

Look at her results.

	at the start	after 10 minutes	drop in temperature
temperature of potato <b>A</b>	120	70	50
temperature of potato <b>B</b>	180	80	100

The temperature of potato **B** dropped the most.

Potato **B** cooled faster than potato **A**.

Why?

.....  
 ..... [1]

[Total: 4]

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# The Periodic Table of the Elements

	1	2	3										4	5	6	7	8	9	10																
	<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: auto;">                     1 H hydrogen 1                 </div>																						<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: auto;">                     4 He helium 2                 </div>												
7											Li lithium 3	9	Be beryllium 4											11	12	13	14	15	16	17	18	19	20		
23	Na sodium 11	24	Mg magnesium 12											27	28	29	30	31	32	33	34	35	36	37	38										
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	70	Ga gallium 31	73	Ge germanium 32	75	As arsenic 33	79	Se selenium 34	80	Br bromine 35	84	Kr krypton 36
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	115	In indium 49	119	Sn tin 50	122	Sb antimony 51	127	I iodine 53	131	Xe xenon 54		
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	204	Tl thallium 81	207	Pb lead 82	209	Bi bismuth 83	[209]	Po polonium 84	[210]	At astatine 85	[222]	Rn radon 86
[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	Elements with atomic numbers 112-116 have been reported but not fully authenticated													

\* 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.