

Tuesday 12 June 2012 – Morning

**GCSE 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)

Duration: 1 hour



Candidate forename		Candidate surname	
Centre number		Candidate number	

MODIFIED LANGUAGE

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.
- 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).
- Do **not** write in the bar codes.

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.

EQUATIONS

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

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

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

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

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Question 1 begins on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

Section A – Module B1

- 1 Mary, Tom and Peter are investigating reaction times.

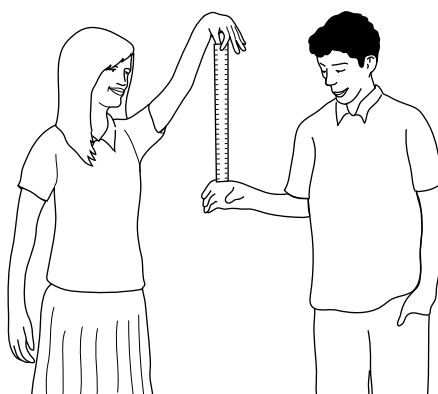
Mary holds a ruler so the 0 cm mark is level with the top of Tom's hand.

Mary lets go of the ruler and Tom catches it as quickly as he can.

Mary writes down the number on the ruler showing above Tom's hand.

She tests Tom four more times. Then Peter and Mary are tested.

They are short of time, so Peter and Mary are only tested four times.



The table shows their results.

The shorter the drop distance, the faster the reaction.

pupil	drop distance in cm				
	1 st attempt	2 nd attempt	3 rd attempt	4 th attempt	5 th attempt
Tom	4	17	12	6	11
Peter	13	3	14	2	no result
Mary	6	7	18	5	no result

- (a) Who has the shortest average drop distance?

Use calculations to work out your answer. Show your working.

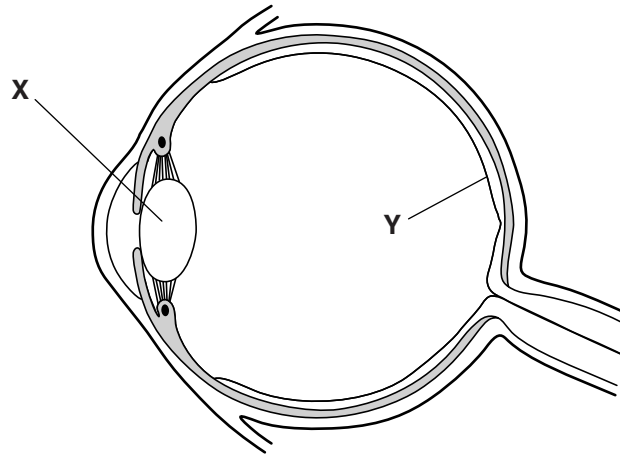
.....

answer

[3]

- (b) The eye is involved in this reaction.

Look at the diagram of the eye.



- (i) Write down the name of part **X**. [1]
- (ii) Write down the name of part **Y**. [1]
- (c) When catching the ruler, what is the **effector**?
..... [1]
- (d) Catching the ruler is **not** an example of a **reflex**.

Explain why.

.....

..... [1]

[Total: 7]

- 2 Many human babies are fed on breast milk.

Look at this list of some of the substances in breast milk.

antibodies

carbohydrates

fats

minerals

proteins

vitamins

water

- (a) One substance that is part of the balanced diet of an older child is missing from this list.

- (i) Write down the name of this substance.

..... [1]

- (ii) Suggest why this substance is **not** in breast milk.

.....

..... [1]

- (b) Breast milk contains antibodies.

The antibodies protect the baby from pathogens.

- (i) What type of immunity do the antibodies give the baby?

Draw a ring around the correct answer.

active

aerobic

antibiotic

chemical

passive

[1]

- (ii) Explain the reason for your answer.

.....

..... [1]

- (iii) As a baby grows it develops other ways to protect its body from pathogens.

Describe how the digestive system protects the body from pathogens.

.....

.....

.....

..... [3]

- (c) When a baby feeds from its mother, the milk is at the correct temperature.

Suggest what the temperature of the milk is when a baby feeds from its mother.

..... °C [1]

[Total: 8]

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3 Jane is a cigarette smoker.

(a) Cigarette smoke contains nicotine.

Nicotine causes **addiction**.

What is meant by addiction?

.....
 [1]

(b) Cigarette smoke also contains carbon monoxide.

Carbon monoxide causes Jane's blood to carry less oxygen than a non-smoker.

(i) How would you expect this to affect Jane's heart rate?

Choose from

decrease

increase

no effect

..... [1]

(ii) Explain your answer.

.....
 [1]

(c) Cigarette smoke also contains tar.

Tar can cause lung cancer.

It does this by causing changes in the chemical that genes are made of.

(i) What chemical are genes made of?

..... [1]

(ii) What are changes to genes called?

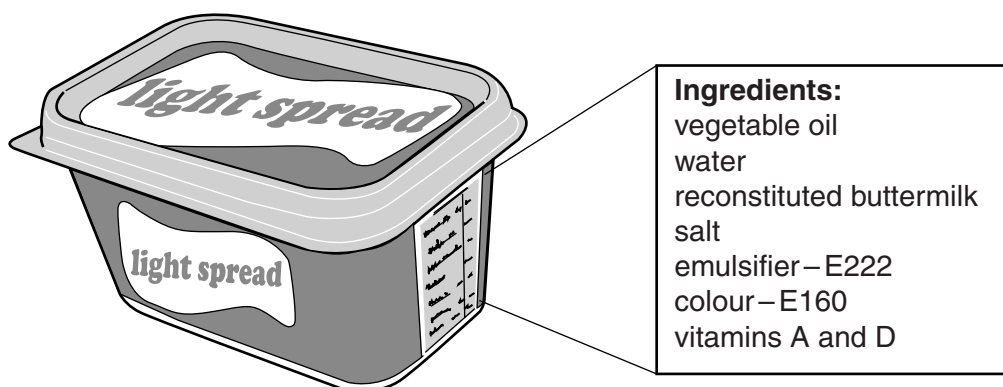
..... [1]

[Total: 5]

Section B – Module C1

4 Processed food contains food additives.

Look at the ingredients in the tub of margarine.



(a) The sentences give some information about the ingredients in the margarine.

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

The ingredient present in the largest amount is vegetable oil.

☐

The ingredient present in the smallest amount is E160.

☐

The margarine contains less salt than vitamins.

☐

The margarine contains more E160 than E222.

☐

The margarine contains more water than salt.

☐

[1]

(b) (i) The margarine contains an **emulsifier**.

What is the job of the emulsifier?

.....

..... [1]

- (ii) Look at the diagram. It shows a molecule of an emulsifier.



Complete the missing label on the diagram.

[1]

- (c) Margarine is used in making cakes.

Tricalcium phosphate is an additive found in some cake mixes.

It has the formula $\text{Ca}_3(\text{PO}_4)_2$.

How many **atoms** are in the formula $\text{Ca}_3(\text{PO}_4)_2$?

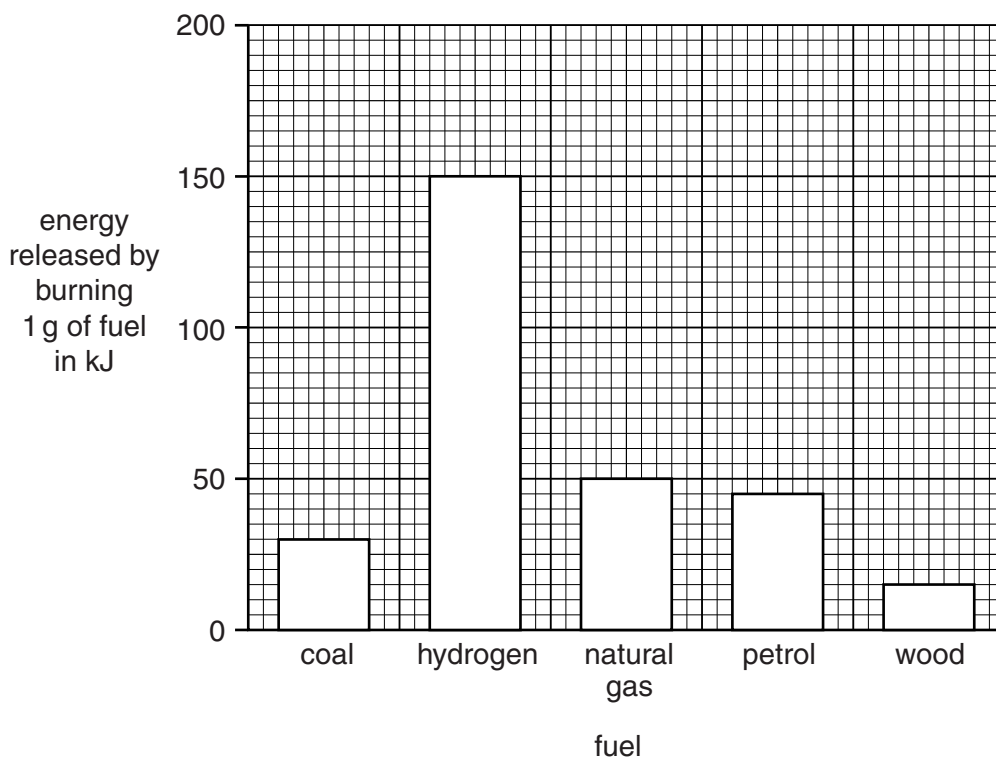
answer [1]

[Total: 4]

5 This question is about fuels.

(a) Look at the bar chart.

It shows the energy released, in kJ, by burning 1 g of five different fuels.



(i) How much energy is released by burning 1 g of natural gas?

answer kJ [1]

(ii) Calculate the mass of **coal** that will release the same amount of energy as 1 g of hydrogen.

.....

.....

answer g [1]

(b) A gas in the air is needed for the burning of coal.

Write down the **name** of this gas.

..... [1]

(c) Petrol is a **hydrocarbon**.

Write down the names of the two **elements** chemically combined in a hydrocarbon.

..... and [1]

- (d) The Tornado steam locomotive was built in 2008.

It was the first steam locomotive to be built in the UK for 50 years.



60163 TORNADO

New Steam for the Main Line

The owners had to choose a fuel for the locomotive.

Write down **two** factors they had to think about.

.....

.....

..... [2]

[Total: 6]

14
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6 This question is about crude oil.

The hydrocarbons in crude oil can be separated into useful products called fractions.

fraction	boiling temperature in °C	number of carbon atoms in hydrocarbon molecule	relative % in crude oil	relative % demand
LPG	less than 40	1 – 3	10	20
petrol	40 – 200	4 – 12	10	25
paraffin	200 – 250	12 – 16	15	23
heating oil	250 – 300	15 – 18	20	20
fuel oil	300 – 360	19+	45	12

(a) What is the name of the process used to separate crude oil into useful products?

..... [1]

(b) Suggest why petrol costs more than fuel oil.

Use information from the table to help you.

.....
 [1]

(c) Another process that happens in an oil refinery is **cracking**.

Write about cracking.

Your answer should include

- the conditions needed for cracking
- why cracking is a useful reaction.

Use information from the table to help you.

.....

 [2]

[Total: 4]

7 Nick plays golf.

Nick has bought a new golf jacket. His new jacket is made of GORE-TEX® fabric.



(a) GORE-TEX® fabric is **breathable**.

Write down one **advantage** of breathable clothing.

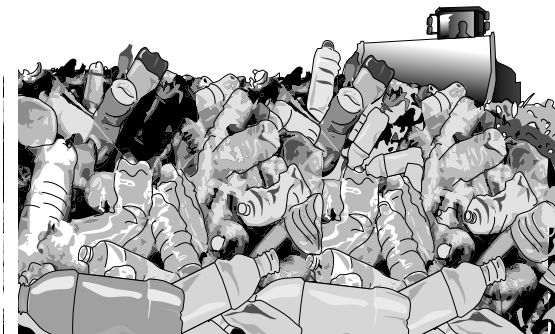
..... [1]

(b) GORE-TEX® fabric is made from polymers.

Polymers make plastics.

Read the article about plastics.

The Problem with Plastic Waste



The UK produces about 3 million tonnes of plastics from crude oil every year.

Most of the litter found on UK beaches is plastic waste.

80% of the plastics made end up in landfill sites.

- (i) Plastic waste needs to be removed from beaches.

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

It decomposes to make smelly gases.

☐

It is flammable producing toxic fumes.

☐

It is non-biodegradable so litters the beach.

☐

[1]

- (ii) 80% of the plastics made end up in landfill sites.

This is a problem because landfill sites get filled up very quickly.

Write down two **other** ways that waste plastics can be disposed of.

1

2 [2]

- (c) (i) Polymers are made when many small molecules join together.

What are these small molecules called?

Choose from this list.

alkanes

carbohydrates

monomers

proteins

answer [1]

- (ii) Poly(propene) is the polymer made when many propene molecules join together.

Write down the name of the polymer made when many **ethene** molecules join together.

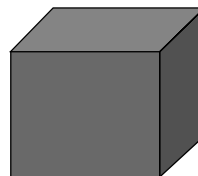
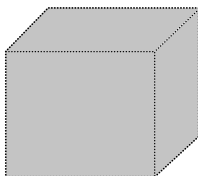
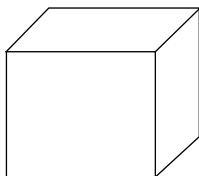
..... [1]

[Total: 6]

Section C – Module P1

- 8 (a) Fiona has three different 10cm^3 cubes at room temperature.

She heats them with a Bunsen burner.



She supplies the **same** amount of energy to each cube.

The temperature rise is **different** for each cube.

Write down two reasons why the **increase in temperature** is different.

- 1
- 2
- [2]

- (b) Fiona heats a **liquid** for 12 minutes.

Look at the table of her results.

time in minutes	temperature of liquid in $^{\circ}\text{C}$
0	20
2	28
4	34
6	41
8	52
10	52
12	52

What happens to the temperature of the liquid after 8 minutes?

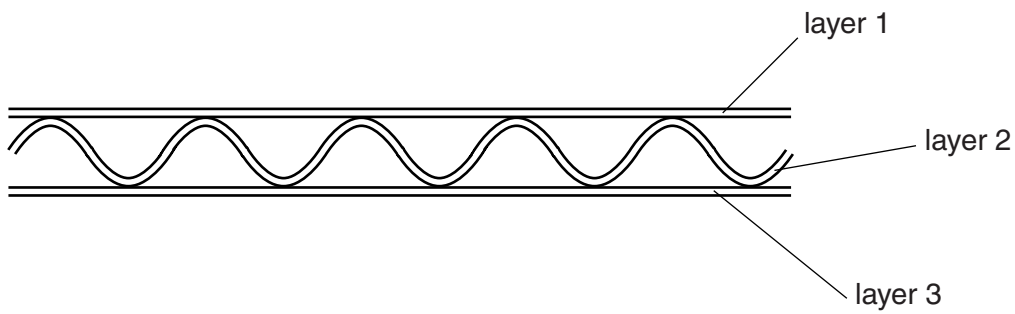
.....

Explain why this happens.

..... [1]

[Total: 3]

- 9 (a) Corrugated cardboard is made up of 3 layers of thick paper.



It is a good insulator.

Write down **one** reason why corrugated cardboard is a good insulator.

.....
 [1]

- (b) Goran has a new gas central heating boiler.

In one day he uses 7.2 MJ (7 200 000 J) of energy.

6.5 MJ (6 500 000 J) is **usefully** used to heat the water.

The rest of the energy is **wasted** as hot gases.

Calculate the **efficiency** of the boiler.

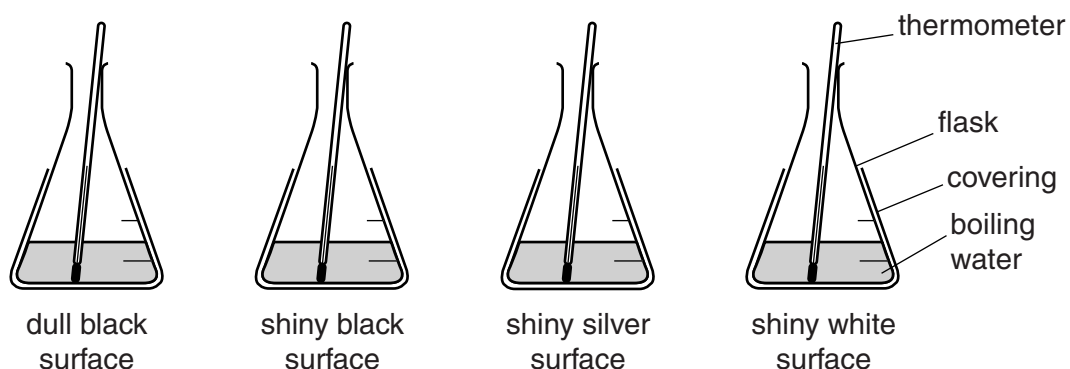
The equations on page 2 may help you.

.....

answer [2]

[Total: 3]

10 (a) Look at the diagrams of the flasks. They are covered in different materials.



All the flasks are identical in size and contain the same volume of boiling water.

Which flask cools the quickest?

Choose from

dull black shiny black shiny silver shiny white

answer [1]

(b) **Infrared** radiation and **microwave** radiation are both part of the electromagnetic spectrum.

They are both used for **cooking**.

(i) Write down one **other** use for infrared radiation.

..... [1]

(ii) Write down one **other** use for microwave radiation.

..... [1]

(c) **Infrared** radiation and **microwave** radiation heat food in different ways.

Write about these differences.

infrared radiation

.....

.....

microwave radiation

.....

..... [3]

[Total: 6]

- 11 (a) There are two types of signal used to transmit data.

One type is analogue.

Write down the name of the **other** type of signal.

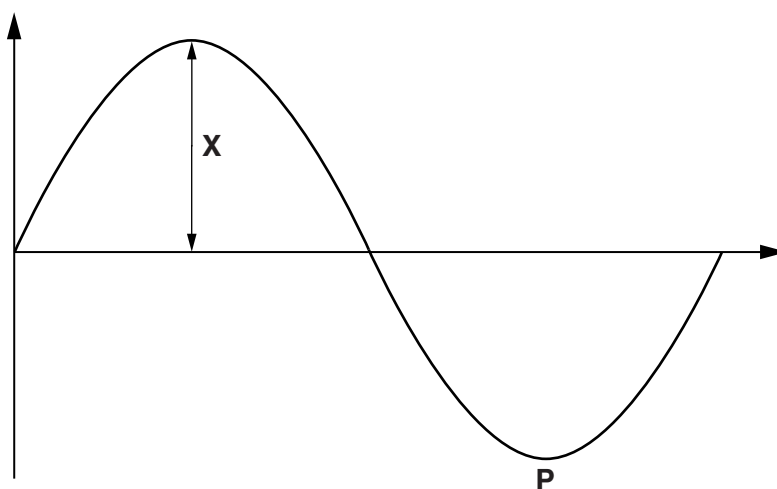
..... [1]

- (b) What is an **analogue** signal?

.....

..... [1]

- (c) Look at the diagram of a transverse wave and the list of features of the wave.



amplitude

crest

frequency

trough

wavelength

- (i) What does the distance **X** show?

Choose the correct answer from the list.

answer [1]

- (ii) What does the point **P** show?

Choose the correct answer from the list.

answer [1]

[Total: 4]

12 Staying out in the sun gives you a suntan.

It can also cause skin cancer.

- (a) Write down the name of the radiation from the Sun that gives you a suntan.

..... [1]

- (b) Helen wants a suntan. She does not want to burn her skin or get skin cancer.

What can she do to **reduce** the risk of damage to her skin?

.....

..... [1]

- (c) The temperature of the Earth is increasing.

Scientists suggest that this is caused by an increase in the amount of carbon dioxide in the atmosphere.

Write down two **different** causes for the increase in carbon dioxide in the atmosphere.

1

2 [2]

[Total:4]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0
7 Li lithium 3	9 Be beryllium 4	<div>Key</div> <div>relative atomic mass atomic symbol name atomic (proton) number</div>					4 He helium 2
23 Na sodium 11	24 Mg magnesium 12	11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
39 K potassium 19	40 Ca calcium 20	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
85 Rb rubidium 37	88 Sr strontium 38	56 Fe iron 26	55 Mn manganese 25	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	84 Kr krypton 36
133 Cs caesium 55	137 Ba barium 56	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	54 Mn manganese 25	86 Xe xenon 54
[223] Fr francium 87	[226] Ra radium 88	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	98 Tc technetium 43	[222] Rn radon 86
<div>Elements with atomic numbers 112-116 have been reported but not fully authenticated</div>							
<div>Elements with atomic numbers 112-116 have been reported but not fully authenticated</div>							

* 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.