

Thursday 24 January 2013 – Morning

**GCSE GATEWAY SCIENCE
SCIENCE B**

B711/02 Science modules B1, C1, P1 (Higher Tier)

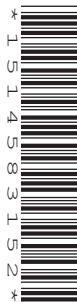
Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour 15 minutes
MODIFIED LANGUAGE



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.
- 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

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- 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 **75**.
- This document consists of **24** pages. Any blank pages are indicated.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

efficiency = $\frac{\text{useful energy output (} \times 100\% \text{)}}{\text{total energy input}}$

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

average speed = $\frac{\text{distance}}{\text{time}}$

distance = average speed × time

$$s = \frac{(u + v)}{2} \times t$$

acceleration = $\frac{\text{change in speed}}{\text{time taken}}$

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

power = $\frac{\text{work done}}{\text{time}}$

power = force × speed

$$\text{KE} = \frac{1}{2}mv^2$$

momentum = mass × velocity

force = $\frac{\text{change in momentum}}{\text{time}}$

GPE = mgh

$$mgh = \frac{1}{2}mv^2$$

resistance = $\frac{\text{voltage}}{\text{current}}$

Answer **all** the questions.

SECTION A – Module B1

1 This question is about drugs.

(a) Different types of drugs have different effects on the body.

Draw a straight line from each **drug** to its **category**.

drug	category
LSD	depressant
temazepam	hallucinogen
aspirin	pain killer

[1]

(b) James has drunk a pint and a half of beer and one gin and tonic.

People who drink more than four units of alcohol are likely to be over the legal limit for driving.

Look at the table.

Drink	Amount	Units of alcohol
beer	one pint	2.3
gin and tonic	one measure	1.0
lager	one pint	3.4
wine	one glass	3.0
vodka	one measure	1.0

Can James legally drive?

Explain your answer.

.....
 [2]

(c) Describe how alcohol damages the liver.

.....

 [2]

[Total: 5]

2 Kerry and Abbas investigate the nervous system.

They ask people to test their reactions using a computer game.

The game uses a square that changes colour.

It times how long it takes someone to react to the change.

The table shows the results.

Name	Sex	Age in years	Time taken to react in seconds					Mean
			Attempt 1	Attempt 2	Attempt 3	Attempt 4	Attempt 5	
Colin	male	16	0.28	0.34	0.33	0.33	0.40	0.34
Diane	female	55	0.39	0.45	0.44	0.40	1.43	0.62
Ewan	male	14	0.31	0.28	0.24	0.30	0.33	0.29
Freda	female	72	0.53	0.48	0.54	0.48	0.53	0.51
Tom	male	12	0.26	0.29	0.30	0.30	0.27	0.28

- (a) Look at Diane's results. One of her results is inaccurate.

This has made her mean too high.

Calculate the mean for Diane **without** the inaccurate result.

mean = seconds [2]

- (b) Describe the patterns in their results.

.....

 [2]

- (c) The people in the test use their eyes to see the colour change.

Which part of the eye detects the colour change?

..... [1]

(d) Ewan has blue eyes.

The alleles for blue eyes are recessive.

His parents both have brown eyes.

(i) Explain what is meant by recessive.

..... [1]

(ii) What is an allele?

..... [1]

(iii) His mother's genotype is Bb.

What is Ewan's genotype?

..... [1]

[Total: 8]

3 Fritz and Carol are investigating the growth of plants.

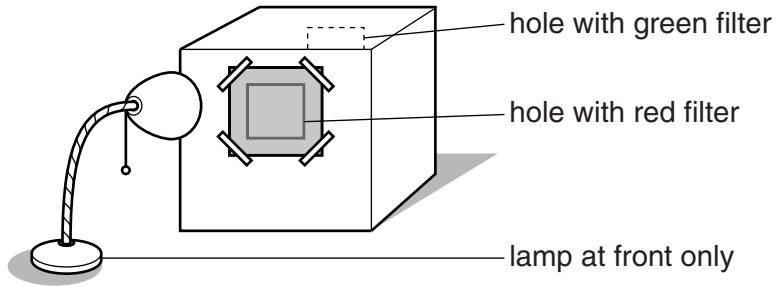
They put a plant in a box. The box has a hole in each end.

The box has a filter that lets only red light into one hole.

It has another filter that lets only green light into the other hole.

They put a lamp in front of the red filter.

Light can only get into the box through the two holes.



After five days the top of the plant is pointing towards the red filter.

Fritz concludes that red light has a greater effect on auxin than green light.

Carol concludes that the plant bends towards the greater light intensity.

Evaluate their **method** and their **conclusions**.



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

[6]

[Total: 6]

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Question 4 begins on page 8

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4 Read the information about some diseases.

Disease	Type of pathogen that causes the disease	How the pathogen gets into body	Some countries where the disease occurs
diphtheria	bacteria	through the nose	Brazil South Africa India
malaria	protozoa	by the mosquito acting as a vector	China Kenya Gambia
cholera	bacteria	drinking contaminated water	Kenya India Vietnam
typhoid	bacteria	drinking contaminated water	Kenya India Vietnam
yellow fever	virus	by the mosquito acting as a vector	Brazil Kenya Gambia

Use the information in the table and your scientific knowledge to answer these questions.

(a) A town in Kenya is trying to reduce the numbers of people infected with yellow fever.

They start by reducing the amount of stagnant water in the town.

Explain why this could help reduce the yellow fever.

.....

.....

..... [2]

(b) Sally is going on holiday to Brazil. Sally has two different vaccinations before she goes.

- (i)** One vaccination gives Sally active immunity to yellow fever. The second vaccination gives passive immunity to diphtheria.

Explain how Sally's immunity to yellow fever and diphtheria will be different.

.....

.....

.....

..... [2]

- (ii)** Explain the process of immunisation to provide active immunity.

.....

.....

..... [2]

[Total: 6]

SECTION B – Module C1

- 5 This question is about pigments in paints.

Pigments give paints their colour.

Look at the table. It shows information about some pigments used in paints.

Pigment	Colour	Effect of increasing the temperature	Effect of light	Type of paint made
A	blue	no change	no change	oil based
B	yellow	no change	colour fades	emulsion
C	red	changes to yellow	colour fades	oil based
D	green	colour fades	absorbs light and later gives off light	emulsion

- (a) (i) Which pigment is phosphorescent?

Choose from **A**, **B**, **C** or **D**.

answer [1]

- (ii) A toy tests the temperature of water in a baby's bath.

Which pigment should be used in the toy?

Choose from **A**, **B**, **C** or **D**.

answer [1]

- (b) There are two types of paint:

- emulsion paints
- oil based paints.

Explain how **each** type of paint dries.

.....

.....

.....

..... [2]

- (c) Some pigments are used to make nail varnish.

In some countries these nail varnishes are tested using animals.

Some people think we should test cosmetics on animals.

Other people think we should **not** test cosmetics on animals.

Explain why people have these different views.

.....

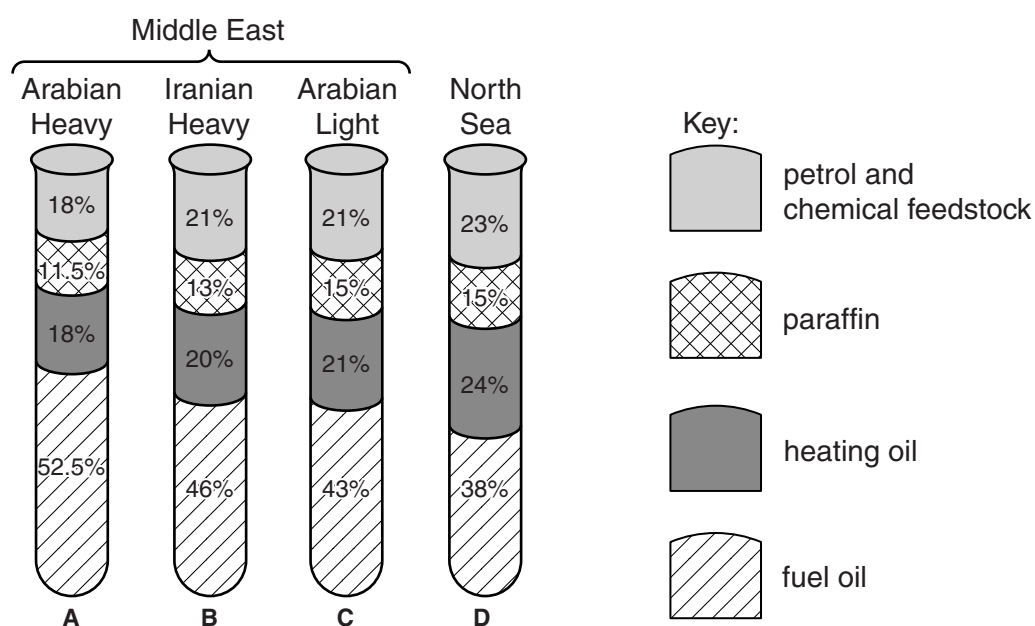
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..... [2]

[Total: 6]

6 Look at the data about crude oils **A**, **B**, **C** and **D** from different parts of the world.



(a) (i) Which crude oil would be the best one to use to make fuel oil?

Choose from **A**, **B**, **C** or **D**.

answer [1]

(ii) Suggest why North Sea crude oil is important to the UK.

.....

.....

.....

..... [3]

(b) All four crude oil samples contain more fuel oil than is needed.

Explain how an oil refinery manager solves this problem.

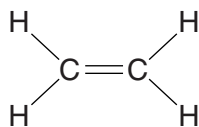
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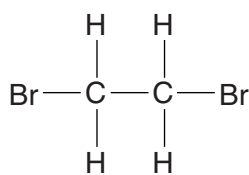
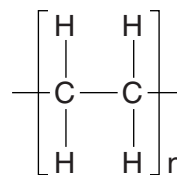
..... [2]

[Total: 6]

- 7 Look at the displayed formulas of ethene and two compounds that can be made from ethene.



ethene

compound **A**compound **B**

Write about the **types** of compound shown and explain the reactions where ethene is changed into compound **A** and compound **B**.



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

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..... [6]

[Total: 6]

- 8 Look at the table. It shows information about gases which pollute the air.

Pollutant gas	Solubility in water	pH of solution	Effect on marble statues	Effect on steel	Effect on humans
A	very soluble	8	none	none	none
B	insoluble	not applicable	none	none	poisonous
C	very soluble	3	reacts slowly	increases rusting	causes coughing
D	very soluble	4	reacts slowly	increases rusting	causes coughing and photochemical smog

- (a) Karen thinks that pollutant gases **A**, **C** and **D** all cause acid rain.

Does the evidence in the table support this?

Explain your answer.

.....

.....

.....

..... [3]

- (b) Cars are fitted with catalytic converters to remove carbon monoxide.

Carbon monoxide, CO, reacts with nitrogen monoxide, NO.

Carbon dioxide and nitrogen, N₂, are made.

Write a **balanced symbol** equation for this reaction.

..... [2]

- (c) It is important that air pollution is controlled.

Explain why.

.....

.....

..... [2]

[Total: 7]

SECTION C – Module P1

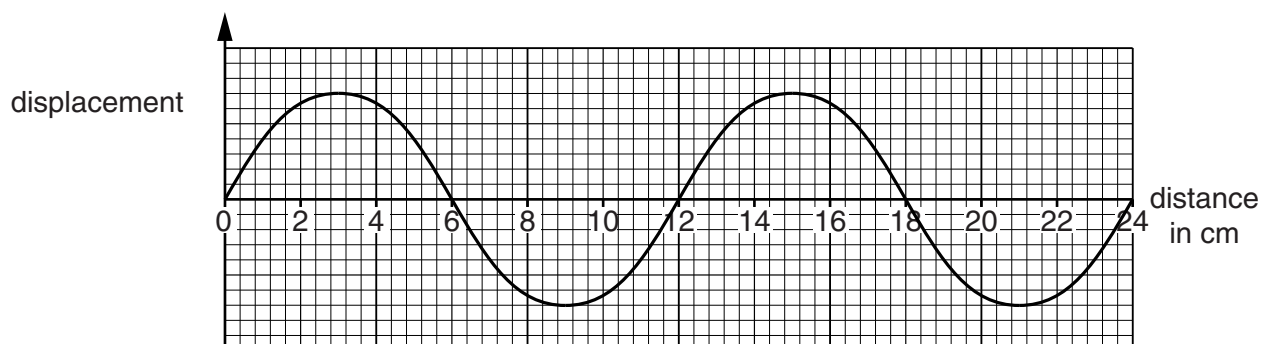
9 This question is about waves.

(a) A loudspeaker gives out a sound of frequency 80 Hz.

What does 80 Hz mean?

..... [1]

(b) Look at the diagram of a water wave.



(i) What is the wavelength of this wave?

answer cm [1]

(ii) The speed of this water wave is 20 cm/s.

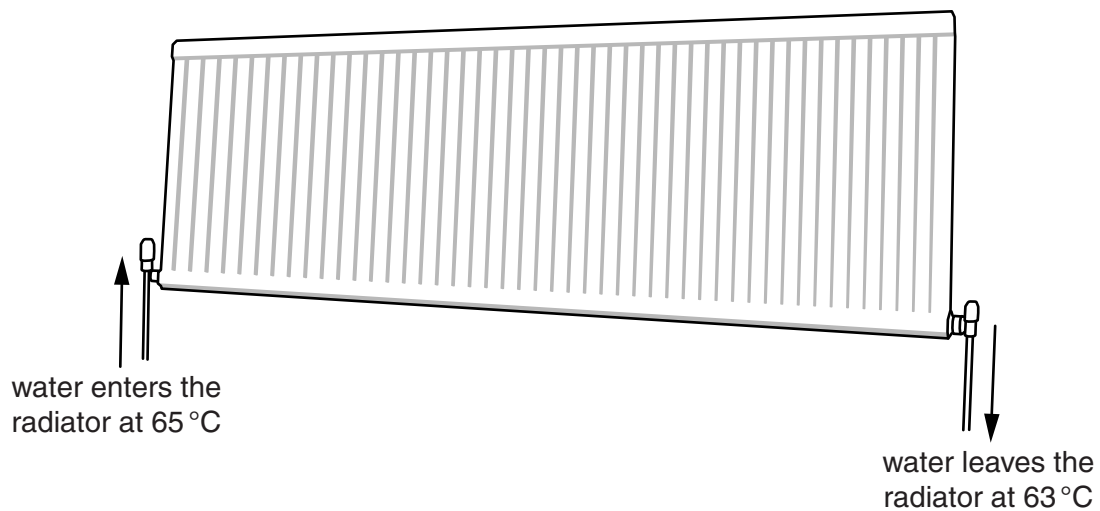
Calculate the frequency of this wave.

.....

answer Hz [2]

[Total: 4]

- 10 Laura's living room is heated by a radiator.



- (a) The water enters the radiator at 65°C and leaves the radiator at 63°C .

The radiator gives out 2000 J of heat each second.

The specific heat capacity of water is $4200\text{ J/kg}^{\circ}\text{C}$.

Calculate the mass of water flowing through the radiator each second.

Give your answer to **two** decimal places.

.....

.....

.....

answer kg [3]

- (b) Laura's friend has an identical radiator that uses oil instead of water.

Oil has a lower specific heat capacity than water.

How can this radiator give out the same amount of energy as Laura's radiator?

.....

..... [1]

[Total: 4]

He knows that the U-value of the **insulation and the ceiling taken together** is a measure of the rate of energy loss.

Look at the information in the table.

Thickness of insulation in mm	U-value of insulation and ceiling	Saving in energy bills each year in £
0	2.30	0
100	0.40	40
200	0.20	57
400	0.10	70

Describe how the loft insulation reduces energy loss and suggest reasons why Oliver does not save half his energy bill.



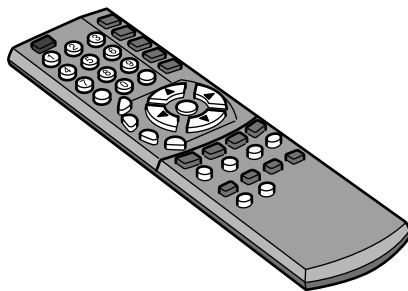
The quality of written communication will be assessed in your answer to this question.

[6]

[Total: 6]

12 This question is about electromagnetic radiation.

(a) An infrared remote control can be used to control a television.



The **signal** from a remote control can change the channel on a television.


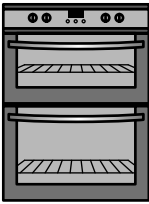
Explain how.

.....

.....

..... [2]

(b) Look at the information about cooking same-sized potatoes in two different ovens.

Type of oven	Type of radiation	Cooking time for a potato in minutes
 microwave	microwaves	12
 conventional oven	infrared	60

Explain how a potato is cooked in each oven and why the potato in the microwave oven cooks more quickly than the potato in the conventional oven.

.....

.....

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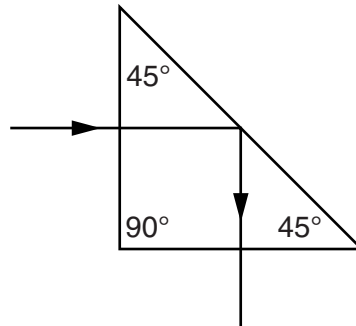
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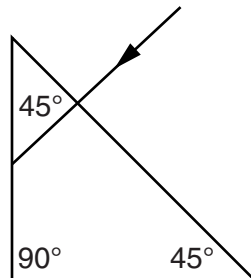
(c) Mary investigates how light passes through a prism.

She does two experiments.

Look at the result of her first experiment.



Complete the path of the light in her second experiment below.



[2]

[Total: 7]

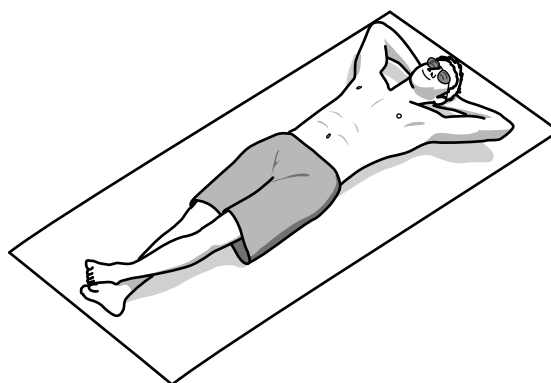
- 13 (a) When an earthquake happens, S-waves and P-waves are produced.

Put ticks (✓) in the boxes next to **all** the **correct** statements.

- | | |
|--|--------------------------|
| P-waves are longitudinal. | <input type="checkbox"/> |
| S-waves are longitudinal. | <input type="checkbox"/> |
| P-waves travel faster than S-waves. | <input type="checkbox"/> |
| S-waves and P-waves travel at the same speed. | <input type="checkbox"/> |
| P-waves travel slower than S-waves. | <input type="checkbox"/> |
| S-waves can travel through all parts of the Earth. | <input type="checkbox"/> |
| P-waves can travel through all parts of the Earth. | <input type="checkbox"/> |

[2]

(b)



On a sunny day, Mark can stay in the sun for 20 minutes before he gets sunburnt.

He wants to sunbathe for 3 hours.

What is the **lowest** level of sun protection that he should use?

Choose from: 5 15 20 30 50

answer [1]

- (c) People with darker skin have a lower risk of developing skin cancer from sunbathing.

Suggest a reason why.

.....
 [1]

[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> <div>1 H hydrogen 1</div> <div> <div>relative atomic mass</div> <div>atomic symbol</div> <div>name</div> <div>atomic (proton) number</div> </div> </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	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
133 Cs caesium 55	137 Ba barium 56	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
[223] Fr francium 87	[226] Ra radium 88	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	[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							
<div> <div>63.5 Cu copper 29</div> <div>59 Ni nickel 28</div> <div>59 Co cobalt 27</div> <div>56 Fe iron 26</div> <div>55 Mn manganese 25</div> <div>52 Cr chromium 24</div> <div>51 V vanadium 23</div> <div>48 Ti titanium 22</div> <div>45 Sc scandium 21</div> </div> <div> <div>108 Ag silver 47</div> <div>106 Pd palladium 46</div> <div>103 Rh rhodium 45</div> <div>101 Ru ruthenium 44</div> <div>[98] Tc technetium 43</div> <div>96 Mo molybdenum 42</div> <div>93 Nb niobium 41</div> <div>91 Zr zirconium 40</div> <div>89 Y yttrium 39</div> </div> <div> <div>197 Au gold 79</div> <div>195 Pt platinum 78</div> <div>192 Ir iridium 77</div> <div>190 Os osmium 76</div> <div>186 Re rhenium 75</div> <div>184 W tungsten 74</div> <div>181 Ta tantalum 73</div> <div>178 Hf hafnium 72</div> <div>139 La* lanthanum 57</div> </div> <div> <div>[272] Rg roentgenium 111</div> <div>[271] Ds darmstadtium 110</div> <div>[268] Mt meitnerium 109</div> <div>[277] Hs hassium 108</div> <div>[264] Bh bohrium 107</div> <div>[266] Sg seaborgium 106</div> <div>[262] Db dubnium 105</div> <div>[261] Rf rutherfordium 104</div> <div>[227] Ac* actinium 89</div> </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.