

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



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.

2

EQUATIONS

energy = mass $\times$ specific heat capacity $\times$ temperature change

energy = mass $\times$ specific latent heat

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

wave speed = frequency $\times$ wavelength

power = voltage $\times$ current

energy supplied = power $\times$ time

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

distance = average speed $\times$ time

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

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

force = mass $\times$ acceleration

weight = mass $\times$ gravitational field strength

work done = force $\times$ distance

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

power = force $\times$ speed

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

momentum = mass $\times$ velocity

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

GPE = mgh

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

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

3

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 a single 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) To test their reactions the individuals use their eyes to see the colour change.

Which part of the eye detects the colour change?

..... [1]

5

(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]

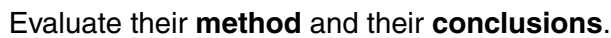
(iii) His mother's genotype is Bb.

What is Ewan's genotype?

..... [1]

[Total: 8]

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



[6]

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7

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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 within the town.

Explain why this could help.

.....

.....

..... [2]

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

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

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

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.....

.....

..... [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 a baby's bath.

Which pigment should the toy contain?

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]

11

- (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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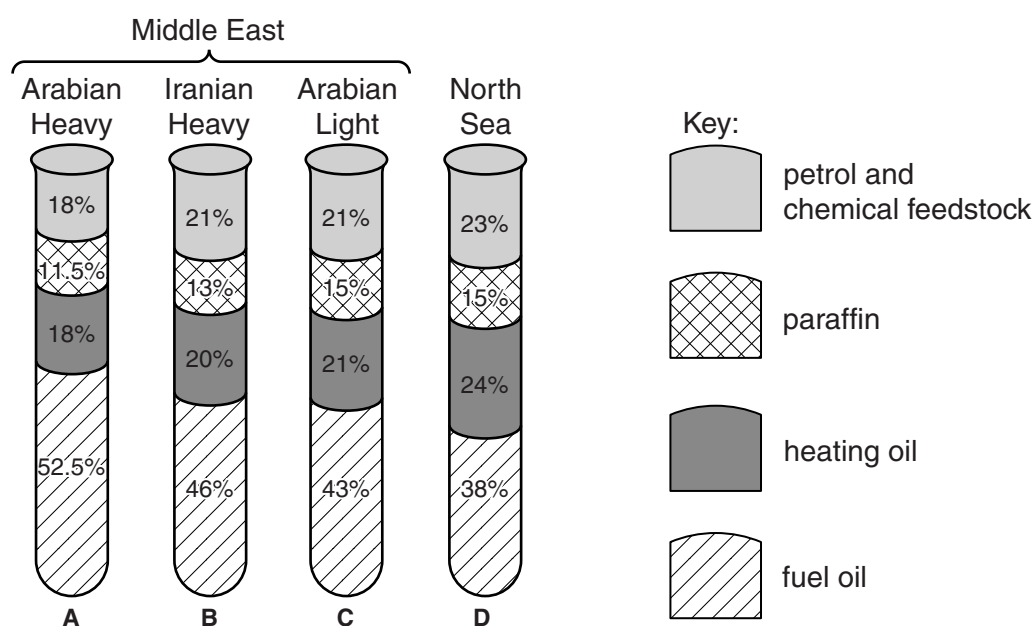
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..... [2]

[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 obtaining North Sea crude oil is beneficial to the UK.

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..... [3]

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

Explain how an oil refinery manager overcomes this problem.

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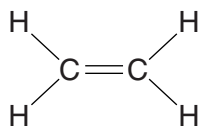
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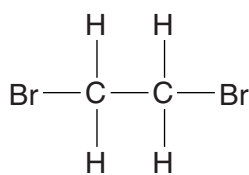
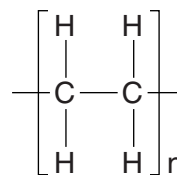
[Total: 6]

13

- 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 support this?

Explain your answer.

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..... [3]

- (b) Cars are fitted with catalytic converters in order 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.

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..... [2]

[Total: 7]

SECTION C – Module P1

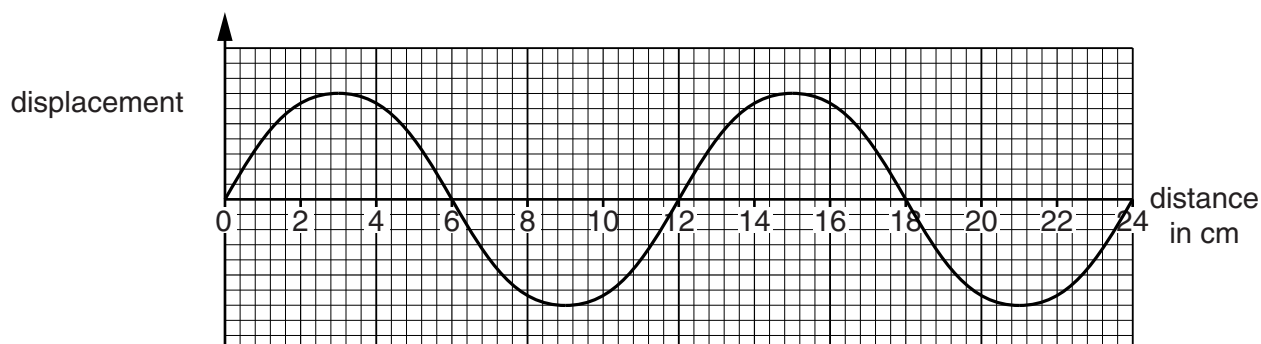
9 This question is about waves.

(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.

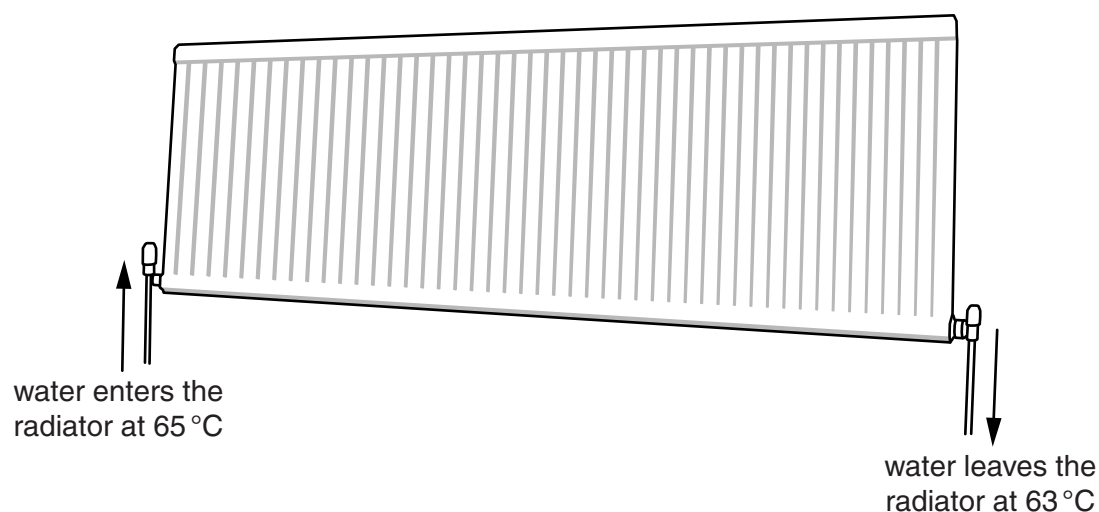
Calculate the frequency of this wave.

.....

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 thinks about 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?

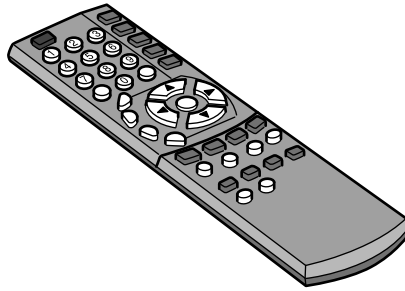
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..... [1]

[Total: 4]

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.

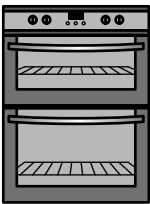
Explain how.

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..... [2]

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

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

Explain how a potato is cooked in both ovens and why the microwave oven cooks the potato quicker.

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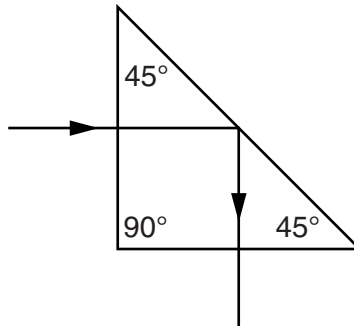
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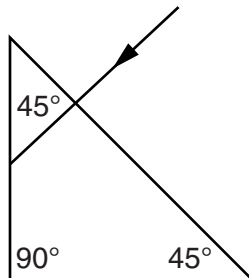
(c) Mary investigates how light passes through a prism.

She does two experiments.

Look at the result of her first experiment.



Complete the path of the light in her second experiment.



[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.

☐

S-waves are longitudinal.

☐

P-waves travel faster than S-waves.

☐

S-waves and P-waves travel at the same speed.

☐

P-waves travel slower than S-waves.

☐

S-waves can travel through all parts of the Earth.

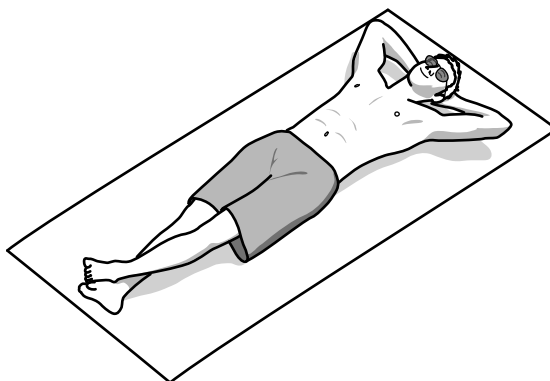
☐

P-waves can travel through all parts of the Earth.

☐

[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]

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The Periodic Table of the Elements

1	2	1Hhydrogen1										3	4	5	6	7	0
		Key															
		relative atomic mass atomic symbol name atomic (proton) number															
7	9											11	12	14	16	19	20
Li lithium 3	Be beryllium 4											B boron 5	C carbon 6	N nitrogen 7	O oxygen 8	F fluorine 9	Ne neon 10
23	24											27	28	31	32	35.5	40
Na sodium 11	Mg magnesium 12											Al aluminium 13	Si silicon 14	P phosphorus 15	S sulfur 16	Cl chlorine 17	Ar argon 18
39	40											70	73	75	79	80	84
K potassium 19	Ca calcium 20											Ga gallium 31	Ge germanium 32	As arsenic 33	Se selenium 34	Br bromine 35	Kr krypton 36
85	88											115	119	122	128	127	131
Rb rubidium 37	Sr strontium 38											In indium 49	Sn tin 50	Sb antimony 51	Te tellurium 52	I iodine 53	Xe xenon 54
133	137											204	207	209	[209]	[210]	[222]
Cs caesium 55	Ba barium 56											Tl thallium 81	Pb lead 82	Bi bismuth 83	Po polonium 84	At astatine 85	Rn radon 86
[223]	[226]											Elements with atomic numbers 112-116 have been reported but not fully authenticated					
Fr francium 87	Ra radium 88																

* 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.