

Thursday 24 January 2013 – Morning

**GCSE GATEWAY SCIENCE
SCIENCE B**

B711/01 Science modules B1, C1, P1 (Foundation Tier)

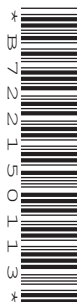
Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour 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 **20** pages. Any blank pages are indicated.

2

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

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

3

Answer **all** the questions.**SECTION A – Module B1**

1 This question is about drugs.

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

Draw straight lines from the **drug** to its **effect on the body**.

drug	effect on the body
depressant	block nerve impulses
hallucinogen	distorts what is seen and heard
pain killer	slows down brain activity

[2]

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

(i) Explain how alcohol will affect James **and** his driving.

.....

.....

..... [2]

(ii) 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]

[Total: 6]

Turn over

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) Kerry and Abbas write down some conclusions about their data.

Put a tick (✓) next to each of the **two** conclusions that best match their data.

Colin's reactions improved with practice.

☐

The males have faster reactions than the females.

☐

Reactions slow down as you get older.

☐

Younger people can follow instruction better.

☐

Ewan plays a lot of computer games.

☐

[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) Some people inherit genetic disorders.

Which of these genetic disorders is most likely to be a problem in this investigation?

Put a tick (✓) next to the **best** answer.

cystic fibrosis

☐

colour blindness

☐

sickle cell anaemia

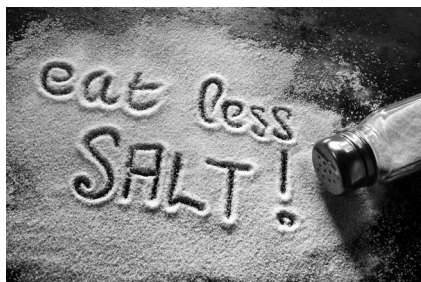
☐

[1]

[Total: 6]

3 Gemma finds out about problems caused by different diets.

Read the information that Gemma finds out about diets with high salt levels.



Many people are concerned about the amount of salt in their diet. Salt contains the element sodium. There are limits to the amount of sodium you should eat each day.

The table shows the suggested values for daily sodium intake.

minimum amount of sodium the body needs each day	500 mg
maximum daily intake for a healthy adult under 50	2300 mg
maximum daily intake for a healthy adult over 50	1500 mg

The average daily intake of sodium for people in America is 3400 mg.

Some people are concerned that this amount of sodium could lead to health problems.

Use the data and your scientific knowledge to explain if people should be concerned.



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

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..... [6]

[Total: 6]

4 Read the information about some diseases.

Disease	Type of pathogen that causes disease	How the pathogen gets into body	Some countries where the disease occurs
diphtheria	bacteria	through the nose	Brazil South Africa India
malaria	protozoa	when an infected mosquito bites you	China Kenya Gambia
cholera	bacteria	drinking contaminated water	Kenya India Vietnam
typhoid	bacteria	drinking contaminated water	Kenya India Vietnam
yellow fever	virus	when an infected mosquito bites you	Brazil Kenya Gambia

Use the information in the table to answer these questions.

- (a) Mucus on the lining of your airways can help prevent disease.

Write down the name of the disease that this mucus could help prevent.

..... [1]

- (b) Sally is going on holiday to Brazil.

Which **two** diseases should she be vaccinated against?

..... and [1]

- (c) Use the table to write about the similarities and differences between malaria and yellow fever.

.....

.....

.....

..... [2]

8

(d) When a pathogen enters the body the immune system can destroy the pathogen.

Describe how the immune system can destroy pathogens.

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..... [3]

[Total: 7]

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 **most** resistant to fading from exposure to light and high temperatures?
Choose from **A**, **B**, **C** or **D**.

answer [1]

- (ii) Which pigment is thermochromic?
Choose from **A**, **B**, **C** or **D**.

answer [1]

- (b) Paints also contain a **binding medium** and a **solvent**.

What are the jobs of the binding medium and of the solvent?

.....

 [2]

- (c) David paints his steel bike.

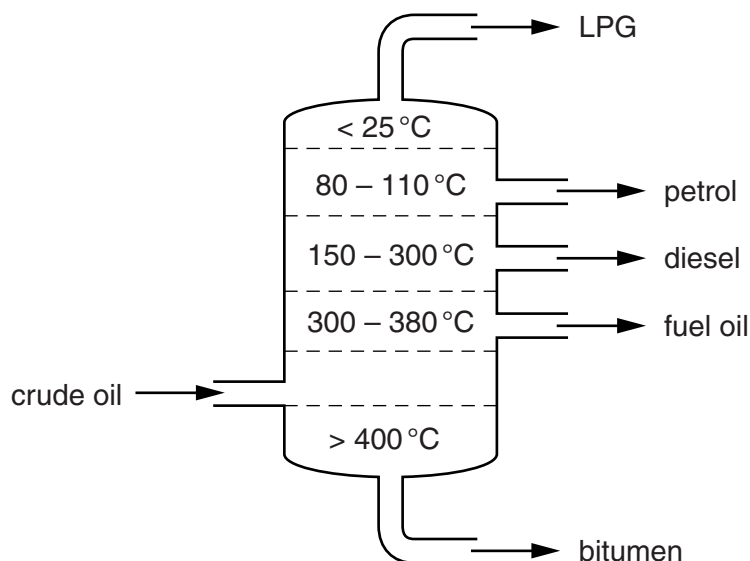
Explain why David paints his bike.

.....
 [2]

[Total: 6]

- 6 Look at the diagram of a fractionating column.

It shows the temperatures inside the column and some of the fractions made.



- (a) Write down the name of **one other** fraction obtained from crude oil.

..... [1]

- (b) Look at the table. It shows some carbon compounds and their boiling points.

Compound	Boiling point in °C	Fraction
butane	0	
heptane	99	petrol
eicosane	344	
dodecane	216	

Complete the table to show which fraction each compound belongs to.

One has been done for you.

[2]

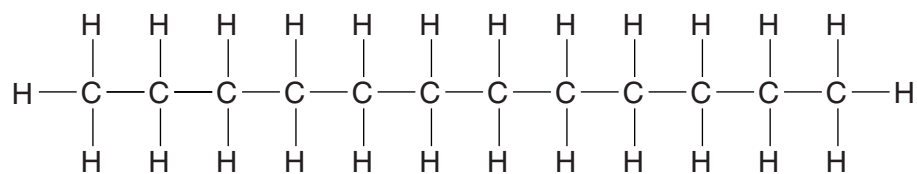
- (c) Crude oil is a **non-renewable** fuel.

What is meant by a non-renewable fuel?

.....

..... [2]

(d) Look at the displayed formula of dodecane.



Complete the sentences.

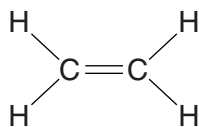
The number of **elements** in dodecane is

The total number of **atoms** in one molecule of dodecane is [2]

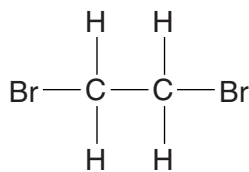
[Total: 7]

12

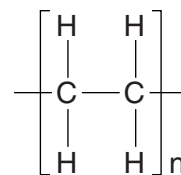
- 7 Look at the displayed formulas of ethene and two compounds that can be made from ethene.



ethene



compound A



compound B

Write about the **types** of compound shown and describe how ethene can be changed into 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) Which gas could be carbon monoxide?

answer [1]

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

Does the evidence support this?

Explain your answer.

.....

 [3]

- (c) Cars are fitted with catalytic converters.

What is the job of a catalytic converter?

..... [1]

- (d) Methane burns in oxygen.

Carbon dioxide and water are made.

Write a **word** equation for this reaction.

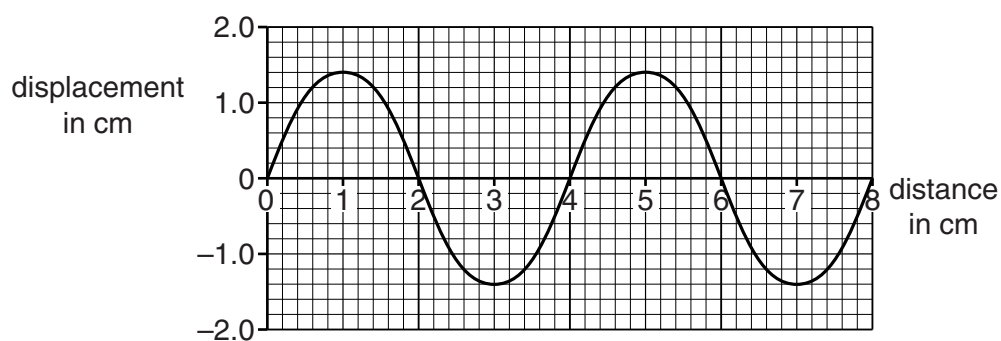
..... [1]

[Total: 6]

SECTION C – Module P1

9 This question is about waves.

Look at the diagram of a wave.



(a) (i) What is the amplitude of the wave?

answer cm [1]

(ii) What is the wavelength of the wave?

answer cm [1]

(b) The wave has a frequency of 600 Hz.

Calculate the speed of the wave in cm/s.

.....

answer cm/s [2]

[Total: 4]

15

- 10 (a) Some parts of the world have earthquakes.

Write down the name of the equipment used to detect earthquakes.

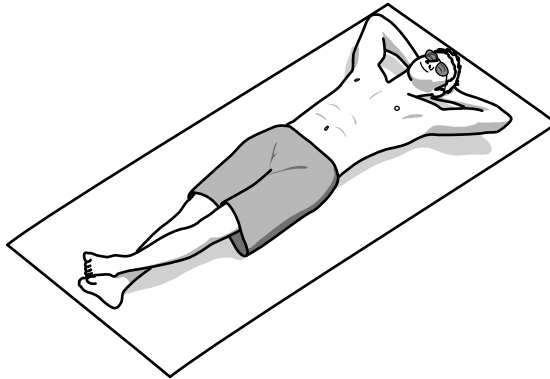
..... [1]

- (b) Earthquakes produce shock waves that pass through the Earth.

Write about the effects of these shock waves.

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

- (c) Mark likes to sunbathe.



In the UK, he can stay in the sun for 60 minutes before he burns.

In Mexico, where it is hotter, he can stay in the sun for only 20 minutes before he burns.

Suggest things he could do to safely stay out in the sun in Mexico.

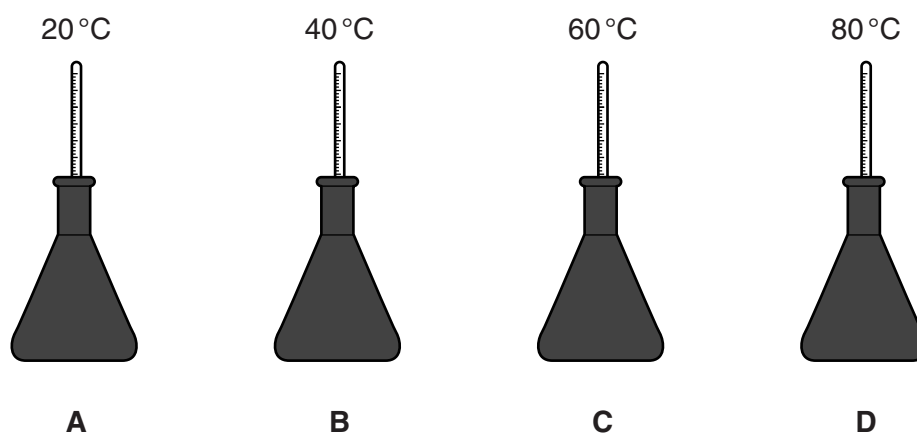
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..... [2]

[Total: 5]

- 11 Nadine is performing experiments about infrared radiation.

Look at the diagram of the equipment she uses.

It shows four identical flasks full of water at **different** temperatures.



The flasks are all painted with the same black paint.

- (a) Which flask gives out the most infrared radiation?

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

answer [1]

- (b) Nadine then uses four identical flasks of **different** colours.

Each of the coloured flasks contains water at 60 °C.

The list shows the colours of the flasks.

Put a tick (✓) in the box next to the flask which cools down the quickest.

flask colour

dull black

☐

shiny black

☐

silver

☐

white

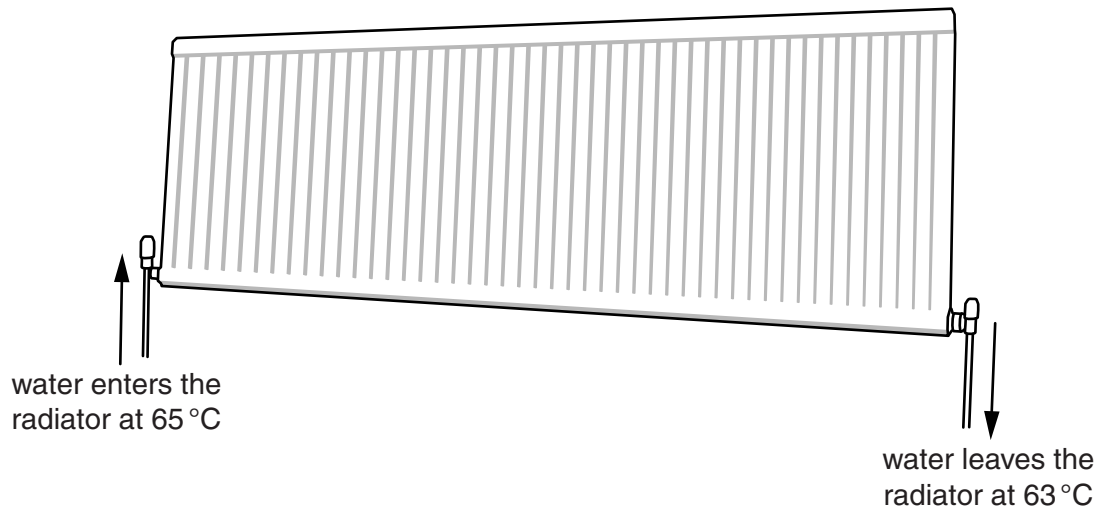
☐

[1]

[Total: 2]

- 13** Finn's living room is heated by a radiator.

Look at the diagram.



Water enters the radiator at 65°C and leaves at a temperature of 63°C .

2 kg of water flows through the radiator each second.

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

- (a)** Calculate the amount of heat energy given out by 2 kg of water as it passes through the radiator.

.....

.....

.....

answer J [2]

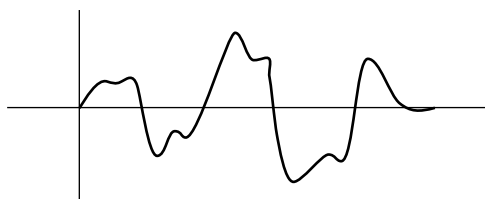
- (b)** How could he increase the amount of heat energy given out?

..... [1]

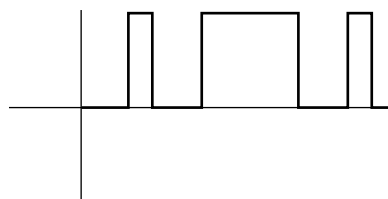
[Total: 3]

14 Television remote controls use digital infrared signals to change channels.

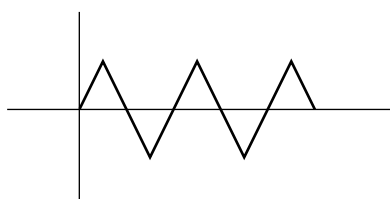
(a) Which one of the diagrams shows a digital signal?



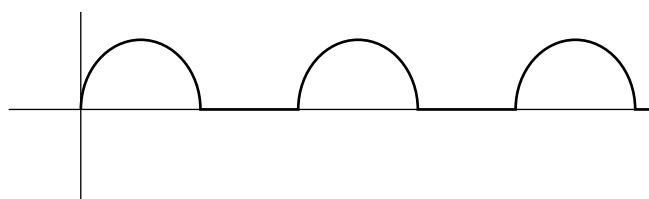
A



B



C



D

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

answer [1]

(b) Write about other uses of infrared radiation.

.....

.....

.....

..... [2]

[Total: 3]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	Key										3	4	5	6	7	0
		relative atomic mass atomic symbol name atomic (proton) number															
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	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	128 Te tellurium 52	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						

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.