THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

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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. | **Duration:** 1 hour 15 minutes |
| A calculator may be used for this paper. | |

OCR supplied materials:
None

Other materials required:
* Pencil
* Ruler (cm/mm)

B71102

| 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.

Turn over

2
EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

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

distance = average speed × time

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

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

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

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

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

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]

Turn over

4

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					
			Attempt 1	Attempt 2	Attempt 3	Attempt 4	Attempt 5	Mean
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]**

(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]

Turn over

6

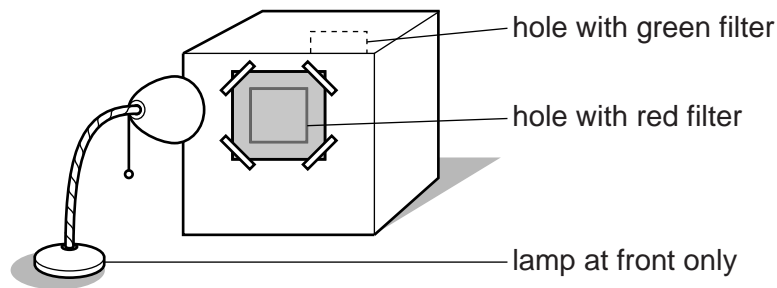3   Fritz and Carol are investigating the growth of plants.

They put a plant in a box with 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.

hole with green filter

hole with red filter

lamp at front only

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.

....

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....

....

....

.... **[6]**

[Total: 6]

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]**

9

(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.

   ....

   ....

   ....

   .... **[2]**

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

   ....

   ....

   .... **[2]**

   [Total: 6]

Turn over

10

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]**

(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.

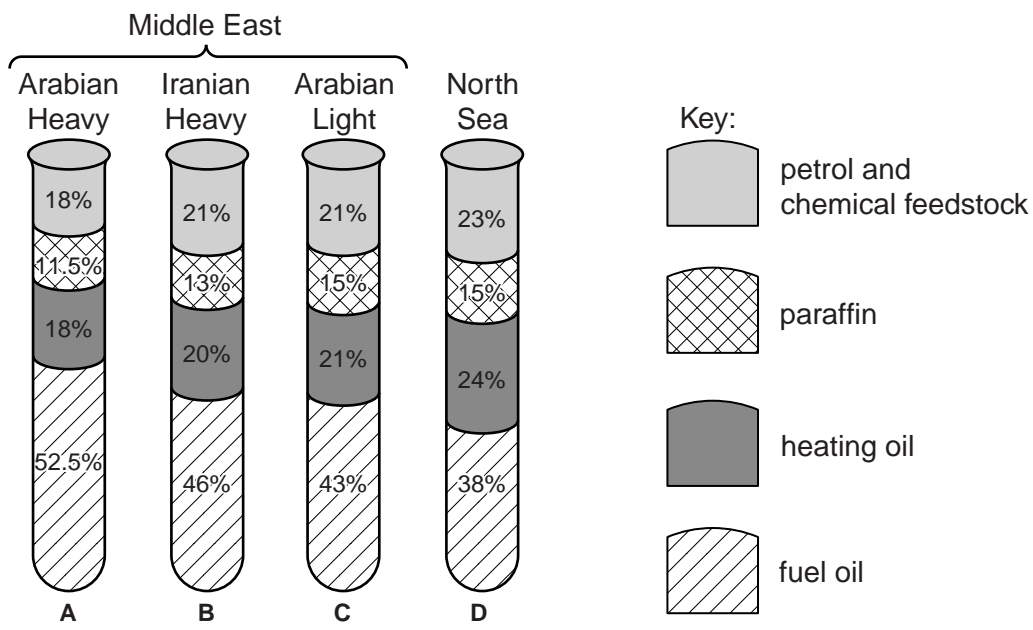Explain why people have these different views.

....

....

....

.... **[2]**

[Total: 6]

Turn over

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

Middle East

Arabian Heavy | Iranian Heavy | Arabian Light | North Sea

Key:

petrol and chemical feedstock

paraffin

heating oil

fuel oil

A: 18%, 11.5%, 18%, 52.5%
B: 21%, 13%, 20%, 46%
C: 21%, 15%, 21%, 43%
D: 23%, 15%, 24%, 38%

A   **B**   **C**   **D**

(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.

....

....

....

.... **[3]**

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

Explain how an oil refinery manager overcomes this problem.

....

....

.... **[2]**

[Total: 6]

14

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.

....

....

....

.... **[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, N_2, are made.

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

.... **[2]**

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

Explain why.

....

....

.... **[2]**
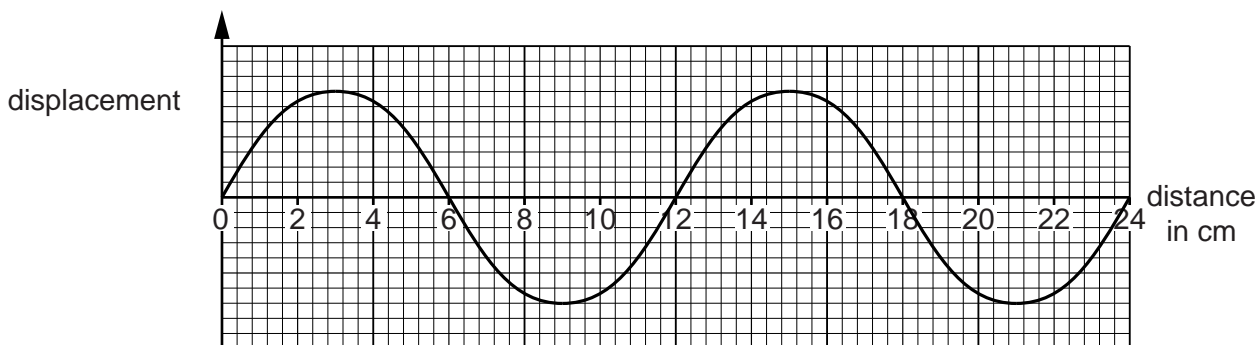
[Total: 7]

15

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]

Turn over

16

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

water enters the
radiator at 65 °C

water leaves the
radiator at 63 °C

(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 J/kg °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?

....

.... **[1]**

[Total: 4]

11 Oliver wants to reduce energy loss from his house.

He decides to put insulation in his loft.

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

Better insulators have lower U-values.

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

Oliver thinks that doubling the thickness of insulation in his loft should halve his heating bills.

Describe how the loft insulation reduces energy loss and suggest reasons why Oliver's heating bills are **not** halved.

✎ *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 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.

....

....

....

....

.... **[3]**

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

She does two experiments.

Look at the result of her first experiment.

45°

90°   45°

Complete the path of the light in her second experiment.

45°

90°   45°

[2]

[Total: 7]

Turn over

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]

END OF QUESTION PAPER

21

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22

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The Periodic Table of the Elements

Key

relative atomic mass	
atomic symbol	
name	
atomic (proton) number	

Example:
1
H
hydrogen
1

1	2											3	4	5	6	7	0
																	4 **He** helium 2
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

* 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.

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