

Thursday 12 January 2012 – 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	
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Centre number						Candidate number				
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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

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

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

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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 The table shows information about the alcohol in different brands of beer.

brand	volume of beer in can or bottle in ml	units of alcohol in can or bottle
A	440	1.8
B	330	1.6
C	440	1.5
D	275	1.0
E	330	1.7

1 unit = 10ml of pure alcohol

1 unit is also the amount of alcohol that the average adult can drink and remove from their blood in one hour.

(a) How many ml of alcohol are in one can of **brand A**?

answer ml [1]

(b) (i) If an average adult drinks one can of **brand C**, how many **minutes** will it take to remove all the alcohol from the blood?

answer min [1]

(ii) Billy drinks a can of **brand C**.

It takes 120 minutes for all the alcohol to be removed from his blood.

This is different from the time it takes an average adult.

Explain why it is different.

.....
 [1]

(c) Billy drinks 100ml of each brand on different days, one brand per day.

Which brand will take longest to be removed from his blood?

You **must** show your working.

answer

[2]

(d) Billy is more likely to have an accident while driving if there is alcohol in his blood.

This is because alcohol is a depressant.

Depressants slow down the transmission of nerve impulses.

Explain how depressants slow down the transmission of nerve impulses.

.....

.....

.....

..... [2]

[Total: 7]

2 John and Steve are trying to stay fit and healthy.

They eat balanced diets and enjoy playing football.



(a) Regular exercise and eating a balanced diet help reduce high blood pressure.

(i) Write down **one other** way to reduce high blood pressure.

..... [1]

(ii) John and Steve both eat balanced diets, but they do **not** eat exactly the same foods.

Write down and explain **one** medical reason why balanced diets may not all be the same.

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

(b) When they play football, John and Steve sweat.

Explain how sweating works and why it is necessary.

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

(c) John has a bath after his game.

He puts his foot in the bath but quickly pulls it out because the water is too hot.

This is an example of a spinal reflex action.

(i) In this reflex action, what is the receptor?

..... [1]

(ii) In this reflex action, what is the effector?

..... [1]

[Total: 7]

3 Sam's baby is due to have an MMR (measles, mumps and rubella) vaccine.

(a) Explain how vaccination (immunisation) works.

.....
.....
.....
.....
.....
..... [3]

(b) Sam is worried because she has heard that there may be some risks associated with vaccination.

Doctors know about these risks, but usually recommend that babies are vaccinated. Why?
.....
..... [1]

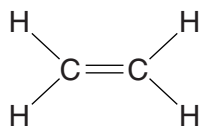
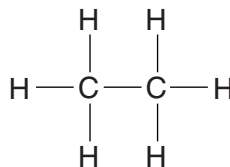
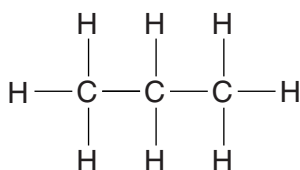
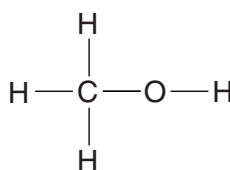
(c) Measles, mumps and rubella can **not** be treated with antibiotics.

Suggest why.
..... [1]

[Total: 5]

Section B – Module C1

5 Look at the displayed formulas of some carbon compounds.

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

(a) Which compound will decolourise bromine water?

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

answer

[1]

(b) What is the molecular formula of compound **C**?

..... [1]

(c) Compound **A** is ethene.

Draw the displayed formula of the polymer poly(ethene).

[1]

(d) Compound **C** is a **saturated** hydrocarbon.

What is meant by saturated?

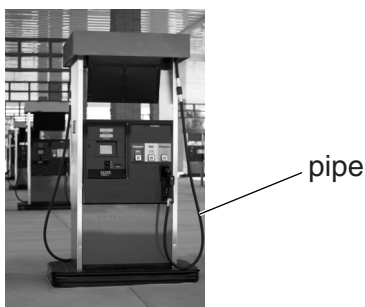
..... [1]

[Total: 4]

6 (a) Look at the table. It shows some information about polymers.

polymer	melting point in °C	solubility in water	solubility in petrol	is it biodegradable?
A	80	slightly soluble	insoluble	yes
B	90	slightly soluble	soluble	no
C	120	insoluble	insoluble	yes
D	95	insoluble	soluble	no

(i) None of these polymers would be suitable for making the pipe on a petrol pump.



Explain why.

.....

 [2]

(ii) Which property, not in the table, would be necessary for the polymer used to make this pipe?

..... [1]

(b) GORE-TEX® fabric is used to make outdoor clothing.

GORE-TEX® fabric is made with nylon laminated with a PTFE membrane.

The PTFE has small holes in it.

GORE-TEX® fabric is waterproof but **also** breathable.

Explain why.

.....

 [2]

[Total: 5]

11
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Question 7 begins on page 12.

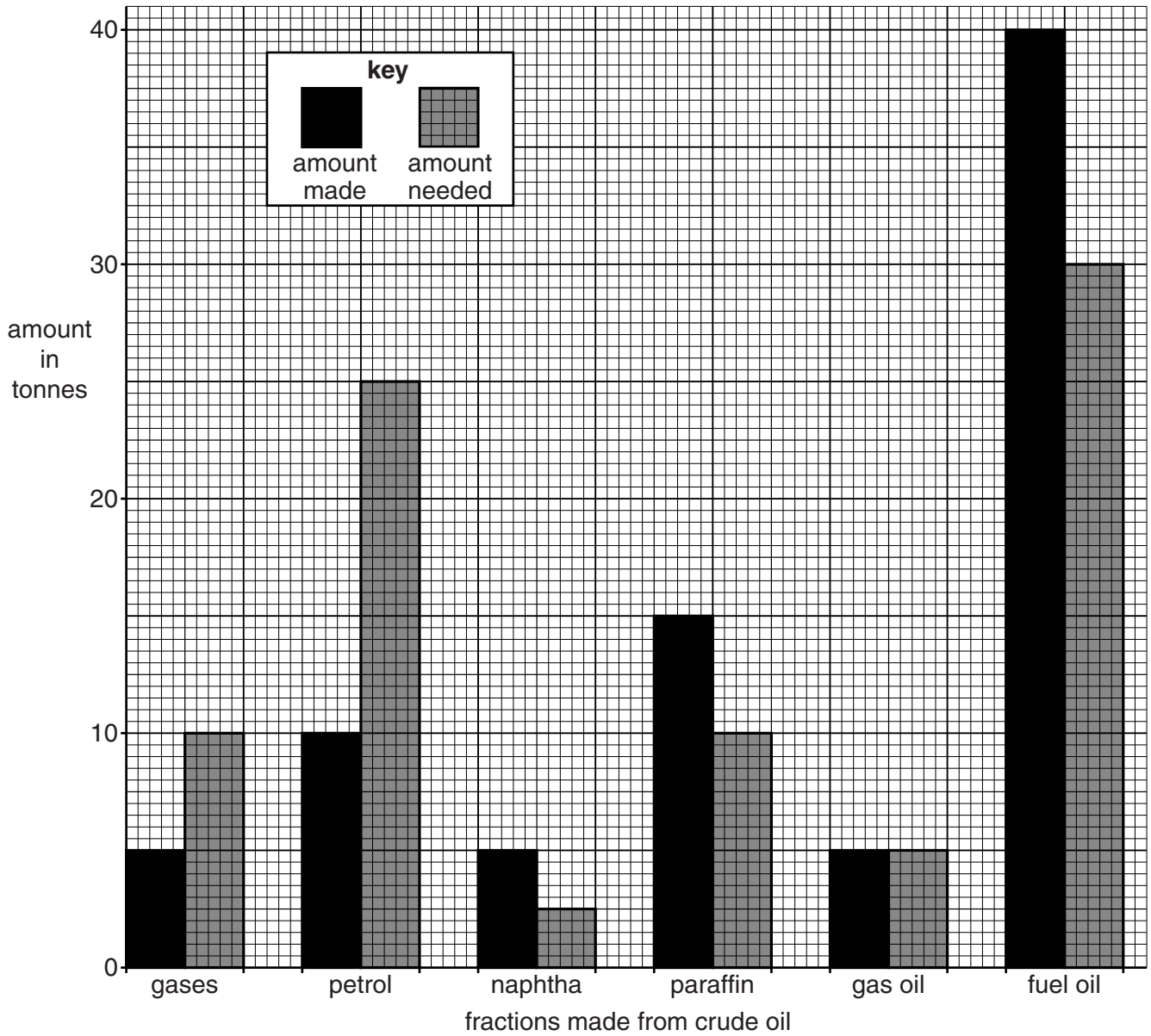
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7 Oil refineries separate crude oil into useful fractions.

They do this by fractional distillation.

The bar chart shows the amount of some fractions **made** from 100 tonnes of crude oil.

It also shows the amount of these fractions **needed** for everyday uses.



(a) Look at the amount made and the amount needed for each fraction in the bar chart.

What problems does this give the manager of an oil refinery?

Explain how cracking overcomes these problems. Include an equation for cracking.



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

..... [6]

(b) The UK economy needs large amounts of crude oil from overseas.

The need to import crude oil raises political issues.

Write about these **political** issues.

..... [2]

[Total: 8]

8 Look at the table. It shows information about some fuels.

fuel	energy value in kilojoules per kg	availability	cost in £ per kg	state at room temperature	estimated years of supply left	pollution
A	4800	good	1.30	liquid	20	makes carbon dioxide and some sulfur dioxide
B	4960	limited	0.80	liquid	12	makes carbon dioxide
C	8950	good	0.33	solid	50	makes carbon dioxide and large amounts of sulfur dioxide
D	3700	good	1.30	gas	8	makes carbon dioxide

(a) A new power station plans to use fuel C.

Explain the advantages and disadvantages of this choice.

.....

.....

.....

..... [3]

(b) Methane, CH₄, is a fuel.

Methane burns in oxygen, O₂.

Carbon dioxide and water are made.

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

..... [2]

[Total: 5]

9 Chemical changes happen when potatoes and meat are cooked.

(a) The protein molecules change shape when meat is cooked.

What is the name of this process?

..... [1]

(b) Potato is easier to digest when it is cooked.

Explain why.

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

[Total: 3]

Section C – Module P1

10 The Sun is giving out all types of electromagnetic radiation.

The ozone layer absorbs some of this radiation.

(a) Which type of radiation does the ozone layer absorb?

..... [1]

(b) Scientists have discovered a hole in the ozone layer over Antarctica.

What has caused this hole in the ozone layer?

.....
..... [1]

(c) Look at the following information.

- Exposure to sunlight can cause skin cancer.
- To reduce this effect children are often covered in high SPF sunscreen.
- Rickets is a disease caused by a lack of vitamin D.
- Sunlight is used to make vitamin D.

Reduction in the number of skin cancer cases is an advantage of using high SPF sunscreen.

Use the information to suggest one possible **disadvantage** of using high SPF sunscreen.

.....
..... [1]

[Total: 3]

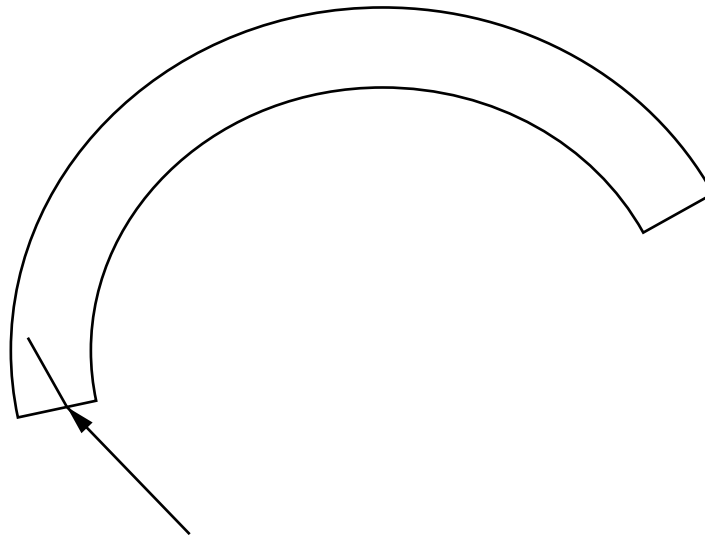
11 (a) Lasers produce an **intense** beam of light which is coherent.

Explain what is meant by intense **and** coherent.

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

(b) Many telephone companies use optical fibres to carry signals over large distances.

Look at the enlarged diagram of an optical fibre.



Continue the ray to show its path along the fibre from one end to the other.

[2]

(c) Some people think the use of mobile phones is safe.

Others think mobile phones may be harmful to health.



Write about one of the possible health risks from using mobile phones and suggest how this risk can be reduced.

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

[Total: 6]
Turn over

13 (a) Neil notices that when ice melts, the temperature does not change.

Explain why.

.....
..... [1]

(b) Neil is holding a party. He wants to make sure he has enough ice to cool all the drinks.

He investigates how much ice is needed to cool a glass of orange juice.

He adds ice to cool the orange juice from 20°C to 5°C.

temperature of the ice	0°C
original temperature of the orange juice	20°C
mass of orange juice	0.4 kg
specific heat capacity of orange juice	4100 J/kg °C
specific latent heat of water	330 000 J/kg

(i) Calculate the amount of energy transferred from the drink.

.....
.....
.....
answer J [2]

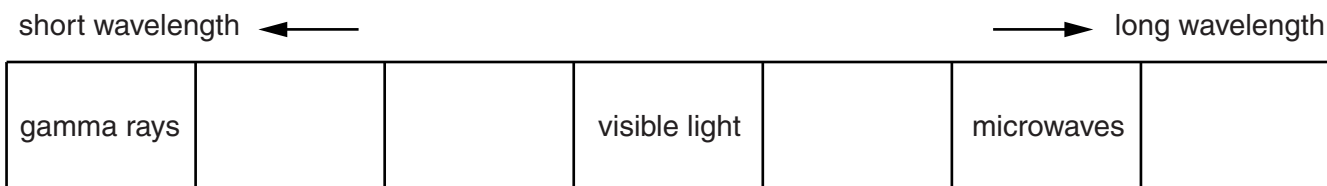
(ii) What mass of ice would need to melt to transfer this amount of energy?

.....
.....
.....
answer kg [2]

[Total: 5]

14 This question is about waves.

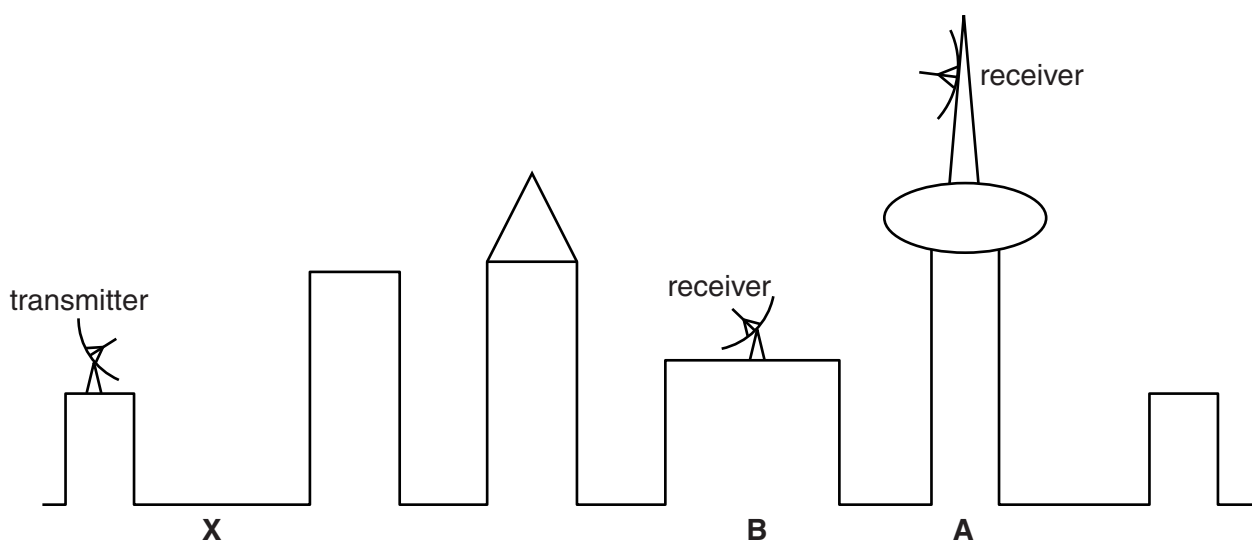
(a) The table shows part of the electromagnetic spectrum.



Complete the table by filling in the **other** types of electromagnetic wave. [2]

(b) The diagram shows part of the skyline of a city.

The transmitter transmits both microwaves and radio waves to the city.



(i) Microwave signals can be received at the top of building **A**, but not at the top of building **B**.

However, radio waves can be received at the top of both buildings **A** and **B**.

Explain why.

.....

.....

..... [2]

- (ii) City planners are thinking of putting another building, as tall as building **A**, at position **X**.

This could affect radio communications throughout the city.

Describe the effect and suggest a possible solution.

.....

.....

..... [1]

[Total: 5]

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	11 Na sodium 11	12 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18								
	19 K potassium 19	20 Ca calcium 20	23 Sc scandium 21	24 Ti titanium 22	25 V vanadium 23	26 Cr chromium 24	27 Mn manganese 25	28 Fe iron 26	29 Co cobalt 27	30 Ni nickel 28	31 Cu copper 29	32 Zn zinc 30	33 Ga gallium 31	34 Ge germanium 32	35 As arsenic 33	36 Se selenium 34	37 Br bromine 35	38 Kr krypton 36
	39 Rb rubidium 37	40 Sr strontium 38	45 Y yttrium 39	48 Zr zirconium 40	51 Nb niobium 41	52 Mo molybdenum 42	55 Tc technetium 43	56 Ru ruthenium 44	59 Rh rhodium 45	65 Pd palladium 46	63.5 Ag silver 47	70 Cd cadmium 48	73 In indium 49	75 Sn tin 50	77 Sb antimony 51	79 Te tellurium 52	80 I iodine 53	84 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						

1	H	1
	hydrogen	

relative atomic mass
atomic symbol
name
atomic (proton) number

* 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.