

Monday 10 June 2013 – Afternoon

**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 **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

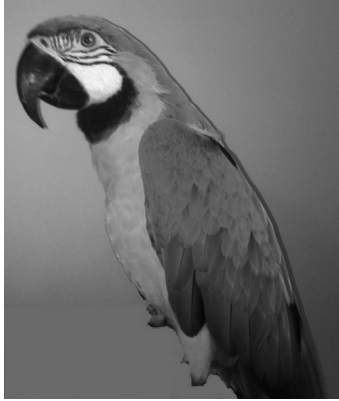
$$mgh = \frac{1}{2}mv^2$$

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

Answer **all** the questions.

SECTION A – Module B1

1 Look at the picture of a macaw.



There are 70 chromosomes in each body cell of a macaw.

(a) How many chromosomes are in a **sperm** cell of a macaw?

..... [1]

(b) Macaws can be bred in captivity.

There are **no visible differences** that identify male and female macaws.

Breeders often test the DNA of their macaws before they use them for breeding.

Suggest why they are tested.

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

(c) The natural environment for a macaw is the top of trees in tropical rainforests.

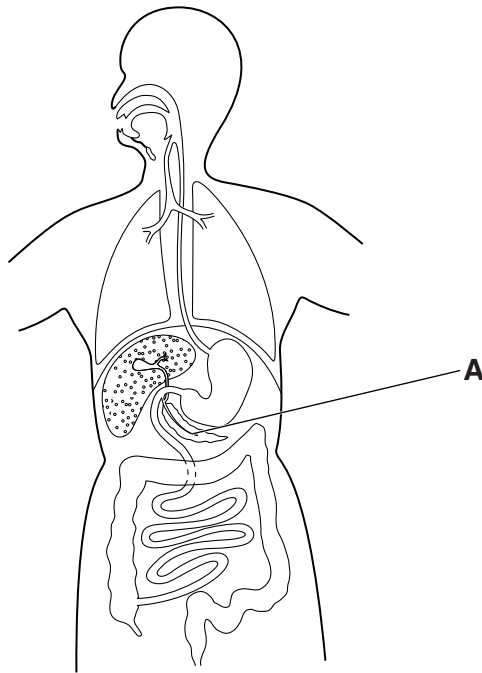
Explain why the position of the eyes on the head of a macaw would be an advantage in its natural environment.

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

[Total: 5]

2 This question is about diabetes.

(a) Look at the diagram.



What is the name of part **A**?

Choose your answer from the list.

liver

lung

oesophagus

pancreas

stomach

answer [1]

(c) Diabetes can affect the retina.

The retina is part of the eye.

Describe the job of the retina.

.....

.....

..... [2]

[Total: 9]

3 Alex is a marathon runner preparing for a race.

Diet specialists recommend that he uses a **high energy** diet during the month before his race.



(a) Look at the diets.

| Diet A | |
|--------------|----|
| food group | % |
| carbohydrate | 60 |
| protein | 20 |
| fat | 10 |
| fibre | 10 |

| Diet B | |
|--------------|----|
| food group | % |
| carbohydrate | 70 |
| protein | 15 |
| fat | 10 |
| fibre | 5 |

| Diet C | |
|--------------|----|
| food group | % |
| carbohydrate | 65 |
| protein | 15 |
| fat | 10 |
| fibre | 10 |

Which diet should Alex use during the month before his race?

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

diet [1]

(b) Alex can improve his fitness by training.

A person's maximum heart rate in beats per minute, can be calculated by subtracting their age from 220.

Alex is 26 years old.

(i) What is Alex's maximum heart rate?

.....beats per minute [1]

(ii) During training Alex's heart rate varies between 126 and 146 beats per minute.

126 beats per minute is 65% of his maximum heart rate.

Calculate what percentage 146 beats per minute is of his maximum heart rate.

answer % [2]

(iii) During training, Alex should keep his heart rate between 70% and 80% of his maximum heart rate. This will improve his fitness.

Use your answer from **part (ii)** to evaluate whether Alex's training will improve his fitness.

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

[Total: 6]

4 Nicola is a pharmacist.

She is asked to recommend a treatment for a disease called athlete's foot.

Athlete's foot causes skin to crack and flake.

Nicola advises that there are two drug treatments, but one of them needs a prescription.

(a) What type of pathogen causes athlete's foot?

..... [1]

(b) Explain why some drugs need a prescription.

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

(c) It is important to repair the damaged skin as quickly as possible.

One reason is to reduce the pain and discomfort.

Suggest and explain **one other** reason.

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

[Total: 5]

SECTION B – Module C1

5 Many foods contain food additives.

(a) Draw **four** straight lines to match the type of **food additive** with its **job**.

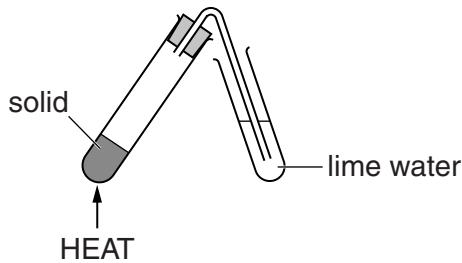
| food additive | job |
|------------------|--|
| antioxidant | improves the colour of a food |
| emulsifier | makes a food taste better |
| flavour enhancer | stops foods reacting with oxygen |
| food colour | helps to stop oil and water separating in a food |

[2]

(b) Baking powder helps to make a cake rise when it is baked in an oven.

Oscar heats a sample of baking powder for five minutes.

Look at the apparatus he uses.



The baking powder does not change colour while it is heated.

Oscar sees bubbles in the lime water.

The lime water turns milky during the heating.

How can you tell that heating baking powder is a chemical change?

.....

.....

..... [2]

[Total: 4]

6 The air may contain different pollutants.

Look at the table.

It shows the relative concentration of pollutants found in the air in two places.

| Pollutant | Molecular formula | Relative concentration in the air | |
|------------------------|-------------------|-----------------------------------|----------------|
| | | in a city centre | near a volcano |
| carbon monoxide | CO | 0.3 | 0.01 |
| hydrogen sulfide | H ₂ S | 0.01 | 210 |
| nitrogen dioxide | NO ₂ | 1.5 | 0.1 |
| sulfur dioxide | SO ₂ | 200 | 1500 |
| trichlorofluoromethane | CFC ₁₃ | 0.01 | 0.005 |

(a) Write down the names of **two** of the pollutants that have molecules with only **three** atoms.

..... and [1]

(b) The concentration of air pollutants in a city centre is different from that near a volcano.

(i) There is a **higher** concentration of carbon monoxide in a city centre than near a volcano. Suggest why.

..... [1]

(ii) Describe **two other** differences in the concentrations of air pollutants.

.....

 [2]

(c) Some scientists think that volcanic eruptions cause acid rain.

What evidence is there in the table of data to support this idea?

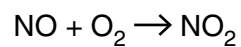
.....

 [2]

(d) Nitrogen monoxide, NO, reacts with oxygen, O₂.

Nitrogen dioxide, NO₂, is made.

Look at the symbol equation for this reaction. It is not balanced.



Construct the **balanced symbol** equation for this reaction.

..... [1]

[Total: 7]

Question 7 begins on page 12

8 Chemists are developing polymers that are

- biodegradable
- soluble in water.

(a) Suggest **advantages** of polymers that are biodegradable.

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

(b) These chemists publish their results using books, the internet and conferences.

Why is it important that these chemists publish their results?

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

(c) Polymers are large molecules made from many small molecules called monomers.

A polymer is made from the monomer chloroethene.

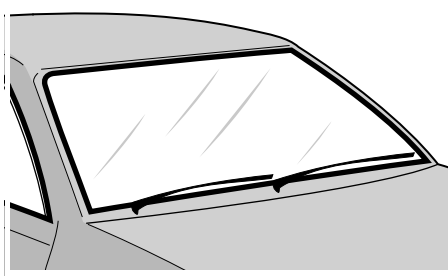
What is the name of this polymer?

..... [1]

(d) Look at the table. It shows the properties of some polymers.

| Polymer | Colour | Hardness (1 = Soft, 10 = Hard) | Biodegradable |
|---------|------------|--------------------------------------|---------------|
| A | white | 10 | yes |
| B | black | 1 | no |
| C | colourless | 9 | no |
| D | colourless | 1 | yes |

The windscreen of a car is made from a polymer.



Which polymer is best to use for a car windscreen?

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

polymer [1]

[Total: 6]

9 Stowmarket Synthetics make a perfume.



The perfume must have certain properties.

One of these properties is that the perfume should not dissolve in water.

Write about some of the **other** properties that a perfume must have.

.....

.....

.....

..... [2]

[Total: 2]

SECTION C – Module P1

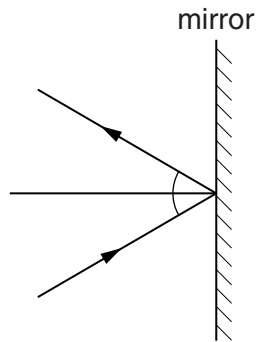
10 This question is about light.

(a) (i) Light can change direction when it passes from one medium into another.

What is the **name** of this effect?

..... [1]

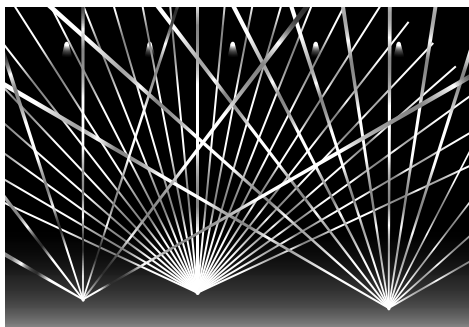
(ii) What is happening to the ray of light in this diagram?



..... [1]

(b) Light can be produced by lasers.

Look at the picture of a laser light show.



Each laser produces a narrow beam of light of a single colour.

Describe how the properties of light produced by lasers allows them to be used for laser light shows.

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

(c) In the past, Morse code was used for communication.

Look at the table showing part of the Morse code.

| | | | |
|---|------|---|----------|
| A | ·— | 1 | ·— — — — |
| B | —··· | 2 | ·· — — — |
| C | —·—· | 3 | ··· — — |
| D | —·· | 4 | ···· — |
| E | · | 5 | ····· |
| F | ··—· | 6 | —···· |

(i) Morse code is a **digital** code.

Describe how **light** is used to send a Morse code message.

.....

.....

.....

..... [2]

(ii) Morse code can be sent by using light signals through the air.

It can also be sent using electricity in wires.

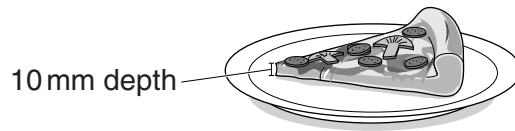
Give **one advantage** of using light rather than using electricity.

.....

..... [1]

[Total: 7]

11 Gino wants to heat a thin slice of pizza.

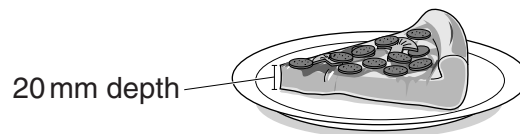


thin pizza slice

Look at the information about the two different methods of heating the **thin** pizza slice.

| Method of heating | How a pizza slice is heated | Distance waves can penetrate into a pizza slice in mm | Time to heat the thin pizza slice in minutes |
|---------------------------|------------------------------------|---|--|
| oven using infrared waves | heats the top surface of the pizza | <1 | 5 |
| oven using microwaves | heats water and fat in the pizza | >7 | 1.5 |

Gino also wants to heat a thicker slice of pizza.

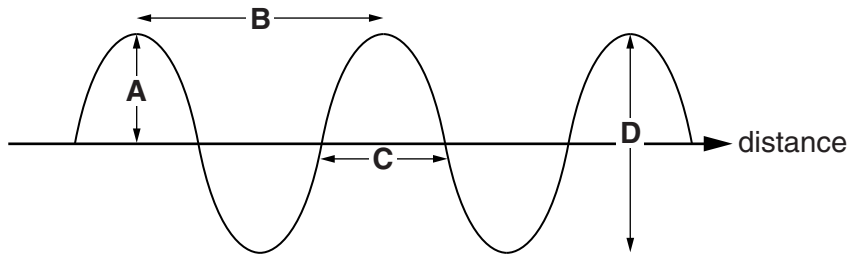


thick pizza slice

The **thick** pizza contains a greater percentage (%) of **water and fat**.

12 This question is about waves.

(a) Look at the diagram of a transverse wave.

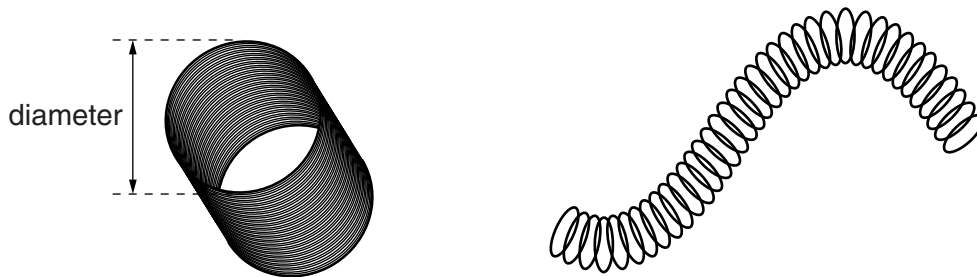


Complete the sentence.

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

The wavelength is represented by letter [1]

(b) Kathy and Jonathan use springs to make transverse waves.



They collect data about springs with different diameters.

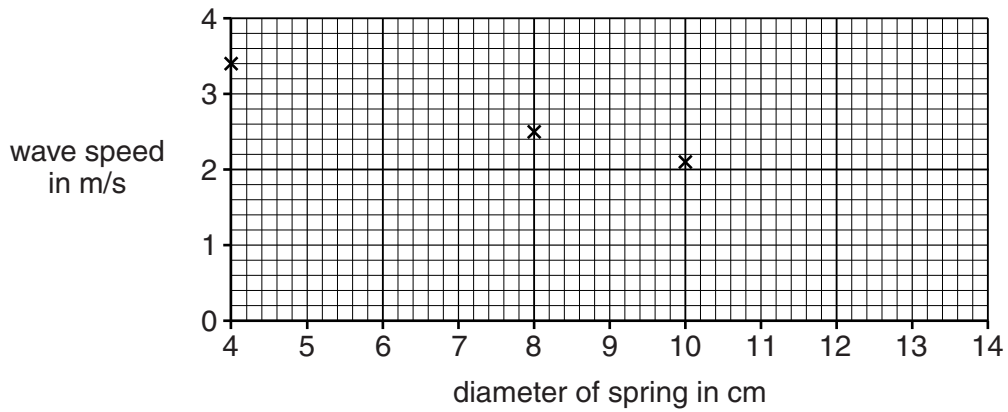
| Diameter of spring in cm | Wavelength in m | Frequency in Hz | Wave speed in m/s |
|--------------------------|-----------------|-----------------|-------------------|
| 4 | 1.68 | 2.0 | 3.36 |
| 6 | 1.42 | 2.0 | |
| 8 | 1.26 | 2.0 | 2.52 |
| 10 | 1.05 | 2.0 | 2.10 |

Calculate the **wave speed** of the spring with a diameter of 6 cm.

.....

wave speed = m/s [2]

(c) Kathy plots a graph using the data.



Using the graph:

(i) Look at the wave speed you calculated in part (b).
 Plot the wave speed for a **6 cm** diameter spring using the letter **X**. [1]

(ii) Describe the relationship between the diameter of the spring and the wave speed.

 [1]

(iii) Find the **wave speed** of a spring with a diameter of 12 cm.
 wave speed = m/s [1]

[Total: 6]

13 Some waves are harmful to humans.

(a) The Sun emits harmful electromagnetic waves.

What type of electromagnetic waves causes sunburn?

Choose your answer from the list.

radio

ultraviolet

visible light

X-ray

answer [1]

(b) Sunscreens can reduce the risk of sunburn.

A scientist collects evidence about a new sunscreen.

The scientist carries out four tests.

| Test | Time taken for skin to burn in minutes | |
|------|--|------------------------|
| | Without sunscreen | With the new sunscreen |
| A | 30 | 90 |
| B | 40 | 120 |
| C | 10 | 30 |
| D | 20 | 60 |

The scientist makes the conclusion that the new sunscreen works.

Explain how the conclusion is based on the scientific evidence in the table.

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

(c) Earthquakes produce shock waves.

These shock waves can cause a tsunami.

Describe how earthquakes are **detected** and **recorded** and how this information can be **used** to reduce harm to humans from a tsunami.

.....

.....

.....

.....

.....

..... [3]

[Total: 6]

END OF QUESTION PAPER



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