OCR

Friday 6 June 2014 – Afternoon

LEVEL 1 CAMBRIDGE NATIONAL IN SCIENCE

R072/01 How scientific ideas have developed

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

OCR supplied materials:
- Insert (R072/01/I – inserted)

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

Duration: 1 hour

R072/01

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found inside this document.
- 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

- 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 **60**.
- Your quality of written communication is assessed in questions marked with a pencil (✎).
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question refers to the article, **Reaction Times** in the Insert.

(a) (i) Which of the following correctly describes a reflex reaction?

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

A reflex reaction …

has no stimulus. ☐

happens when a person is sleeping. ☐

happens without the person thinking. ☐

is usually very slow. ☐

[1]

(ii) The patellar reflex (knee-jerk) has several stages.

These are listed below, but not in the correct order.

A	Hammer stretches the tendon
B	Motor nerve carries message to muscle
C	Muscle contracts, moving the lower leg
D	Patient sits with the leg relaxed
E	Sensory nerve carries message to spinal cord

Put the steps into the right order. The first and last have been done for you.

D				**C**

[1]

(b) (i) Zak has found a website on which he can measure his reaction time.
He has to click a key when a red box on the screen is replaced by a green one.

Which is the best description of the type of reaction time that he is testing?

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

Choice reaction time ☐

Complex reaction time ☐

Recognition reaction time ☐

Reflex reaction time ☐

Simple reaction time ☐

[1]

(ii) The website says that the average reaction time for this test is 215 ms.
Zak's first two attempts take 210 ms each.
After five attempts his mean time is 220 ms.

Zak claims that his reaction times are very good.

Explain whether Zak is justified when he claims to have very good reactions.

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

(iii) How can Zak get more evidence for his claim that his reaction times are very good?

.....

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

(c) Look at **Graph 1** in the article.

Which **one** of these conclusions can be drawn from this graph?

Put a tick (✓) next to the correct answer.

Women react faster than men. ☐

Women reacted faster to an auditory stimulus than to a visual one. ☐

Men reacted faster to a visual stimulus than to an auditory one. ☐

There was no difference between reactions of men and women. ☐

There was no difference between reactions to auditory and visual stimuli. ☐

[1]

(d) Look at the data in **Table 2** in the article.
Which of these people is likely to have the slowest reactions?

Put a (ring) around the best answer.

12 years **16 years** **24 years** **32 years** **48 years**

[1]

(e) Look at **Table 3** and **Graph 2** in the article.

(i) Why was **Group A** included in the investigation?

.....

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

(ii) Use the data to explain why car drivers with 80 mg/100 ml alcohol in their blood should not drive.

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

(f) **(i)** Look at **Table 1** (reproduced from the article).

	Distance before the ruler was caught in cm				
Ali	25	30	30	25	25
Charlie	45	40	40	35	40
Phil	92.1	81.3	44.5	43.2	36.4

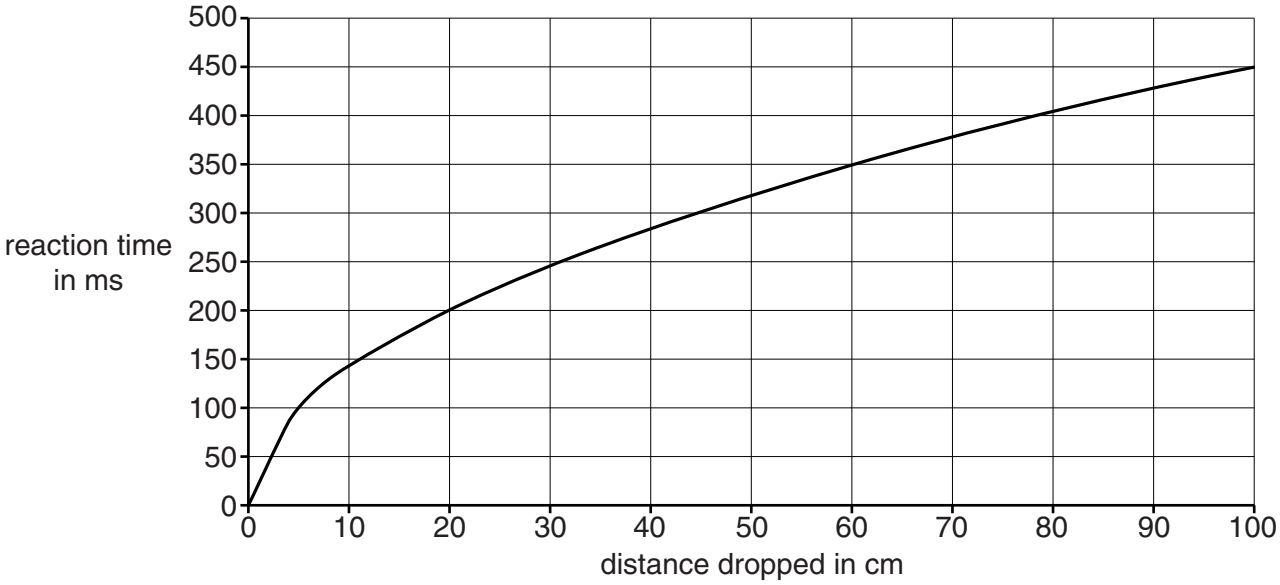
Table 1

What is the **mean** distance that the ruler fell before Charlie caught it?

Show your working.

..... cm **[2]**

This graph shows the relationship between the distance the ruler drops and reaction time.



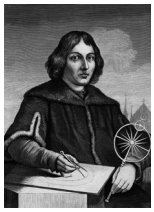
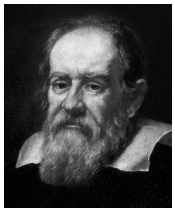
(ii) Use this graph to find Charlie's mean reaction time.

..... ms **[1]**

[Total: 15]

2 Human understanding of the universe has changed over the last 4000 years.

(a) For each theory, put a tick (✓) in the column for **each** of the people who believed this. Each row may have one or more than one tick.

Theory	Ancient Greeks 	Copernicus 	Galileo 	Newton 	Hubble 
Earth is the centre of the Universe (Geocentric)					
Earth orbits the Sun (Heliocentric)					
Gravity attracts the Earth to the Sun					
The Universe is expanding					

[4]

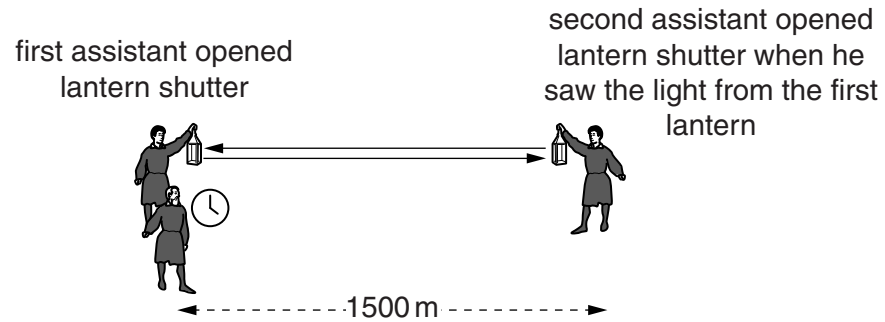
(b) Which inventions have produced much more detailed information about the Universe? Put ticks (✓) next to the **two** best answers.

- Microwave ovens ☐
- Telescopes ☐
- Smartphones ☐
- Wi-fi networks ☐
- Satellites ☐

[2]

(c) Galileo tried to work out how fast light travels.

He had two assistants standing on hills.
The first person shone a lantern towards the second.
As soon as the second person saw the light he shone his own lantern.



Galileo measured the time between the opening of the first lantern shutter and observation of light from the second lantern.

(i) Why does this experiment **not** give a good value for the speed of light?

.....

.....

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

About 50 years later, a Danish astronomer made an estimate of the speed of light.
He measured the time for light from the planet Jupiter to reach the Earth.
The time varied by up to 22 minutes depending on where Jupiter was in its orbit.
His estimate for the speed of light was too low.

(ii) Suggest why the value was too low.

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

(iii) What is the modern accepted value for the speed of light in a vacuum?

Put a (ring) around the correct value.

300 km/s **3000 km/s** **30 000 km/s** **300 000 km/s** **3 000 000 km/s**

[1]

(d) Many years later, James Clerk Maxwell suggested that there were many different types of electromagnetic radiation. He knew about light but predicted the existence of radio waves. Twenty years after this, Heinrich Hertz demonstrated that radio waves existed.

Why could Hertz achieve something that Maxwell did not manage?

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

(e) Put ticks (✓) next to **two** features of electromagnetic waves.

Electromagnetic waves …

travel in straight lines.	☐
cannot travel through a vacuum.	☐
cannot be reflected.	☐
can carry data.	☐
all have the same wavelength.	☐

[2]

[Total: 15]

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Question 3 begins on page 10

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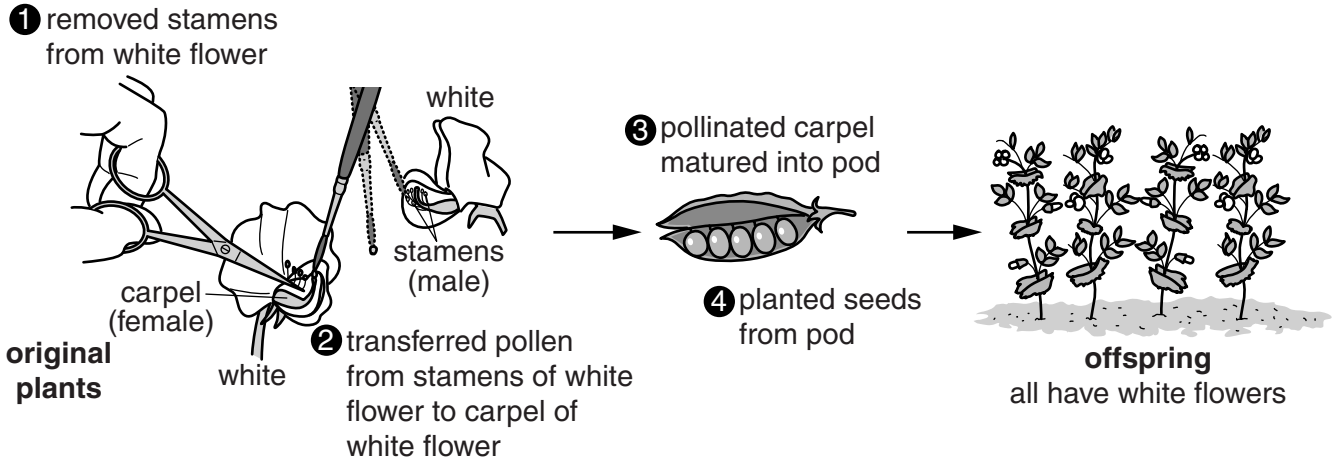
3 Gregor Mendel studied the characteristics of pea plants.

Some of his pea plants had white flowers and some had purple flowers.

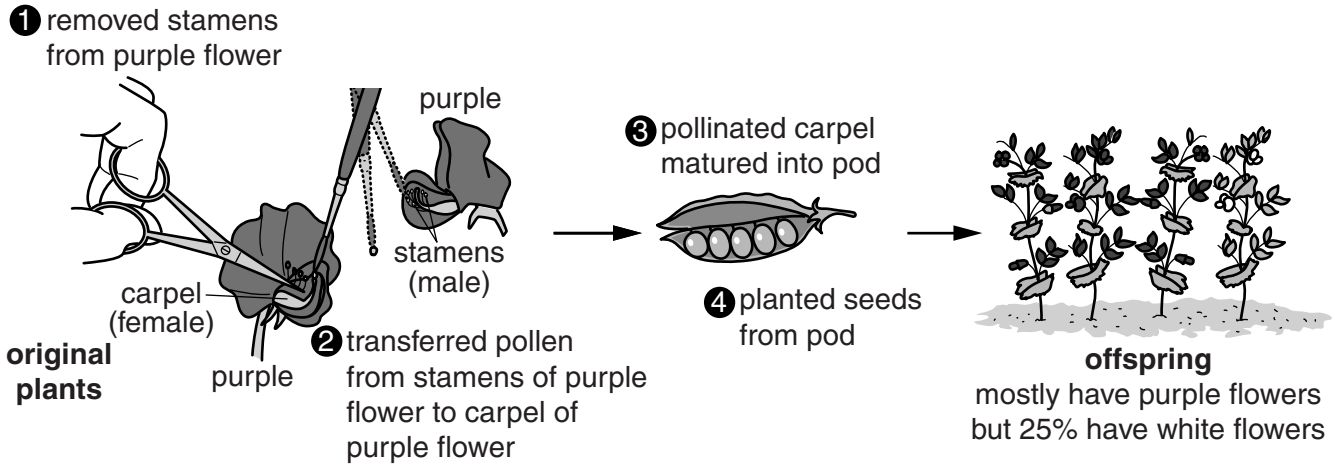
Experiment 1

When he took pollen from a white flower and used it to fertilise another white flower, the seeds always grew into plants with white flowers.



Experiment 2

When he took pollen from a purple flower and used it to fertilise another purple flower, most of the seeds grew into plants with purple flowers but 25% of the seeds grew into plants with white flowers.



(a) Explain how the flower colours can be passed from the original plant to the offspring and why different coloured flowers were produced in Experiment 2.

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

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..... **[6]**

(b) Mendel did many such experiments. He published the results in 1866.
Why is it important that his results were published?

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

So that people know how to grow white flowers.	☐
So that people could repeat his experiments.	☐
So that other people could check his results.	☐
So that his name became well known.	☐
So that he would win a Nobel Prize.	☐
So that he could make more money.	☐

[2]

(c) Mendel worked mainly by himself.
What advantages would there have been to working as a part of a team?

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

[Total: 10]

4 The amount of carbon dioxide (CO_2) in the atmosphere has changed over the last 50 years.

Year	1960	1970	1980	1990	2000	2010
Atmospheric carbon dioxide in parts per million (ppm)	316	325	338	354	369	388

(a) Describe the trend in the concentration of carbon dioxide.

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

(b) Suggest **two** human activities which may have contributed to this change.

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

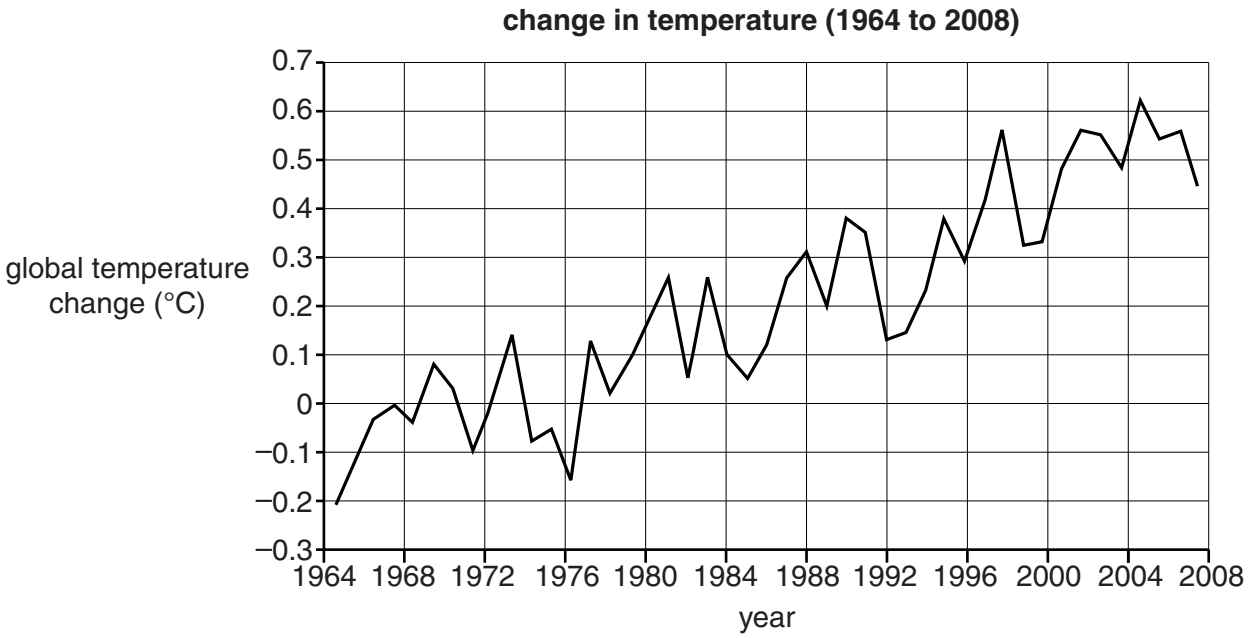
(c) (i) Which of these is the best estimate of the percentage change in the carbon dioxide level from 1960 to 2010?

Put a (ring) around the best answer.

5% **11%** **23%** **72%** **81%**

[1]

(ii) During this time, the global temperatures have also changed.



Put a tick (✓) next to the best description of the temperature changes.

The global temperature …

stays the same. ☐

increases every year. ☐

has increased over 40 years. ☐

never decreases. ☐

[1]

Some people believe that the carbon dioxide (CO_2) in the air has caused the change in global temperature over time.

(d) Explain how the carbon dioxide in the air can affect the global temperature.
Suggest how this might affect the Earth.

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

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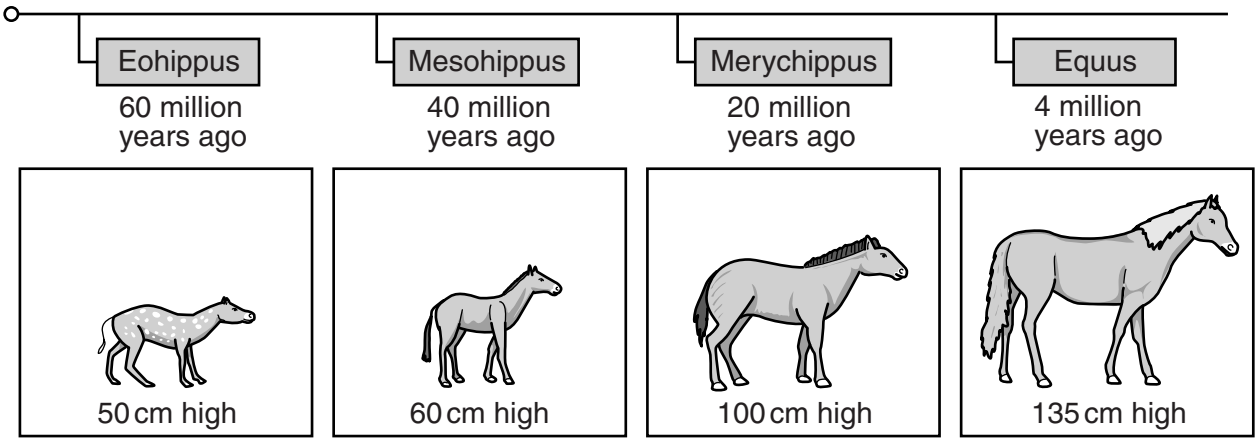
..... **[6]**

[Total: 12]

5 The horse has evolved over many years.



(a) How can a modern scientist know what Eohippus looked like?

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

(b) Explain how the scientist can estimate the age of each ancestor of the modern horse.

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

(c) Modern racehorses have been bred from Equus.
Explain how a racehorse breeder would breed a successful racehorse.

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

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..... **[4]**

[Total: 8]

END OF QUESTION PAPER

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