

Monday 9 January 2017 – Morning

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



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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.
- Do **not** write in the barcodes.

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 case study 'The Story of DNA'.

(a) Miescher extracted proteins and nuclein from white blood cells.

Table 1 shows the elements in proteins and in nuclein.

Use **Table 1** to answer these questions.

(i) Name **one** element which is in proteins but **not** in nuclein.

..... [1]

(ii) Name **one** element which is in nuclein but **not** in proteins.

..... [1]

(iii) Name **two** elements which are in both proteins **and** nuclein.

..... [1]

(b) Look at **Fig. 1**.

Complete this table to show the number of each type of atom in cytosine.

	Number of each type of atom	
	Thymine (T)	Cytosine (C)
Carbon	5	4
Hydrogen	6	
Oxygen	2	
Nitrogen	2	

[1]

(c) (i) Look at Chargaff's data in **Table 2**.

Which species has the lowest percentage of adenine?

..... [1]

(ii) Pairs of bases have similar percentages to each other in a species.

Which bases are pairs?

..... and

..... and

[2]

(iii) Why were earlier scientists unable to make the same measurements as Chargaff?

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

(iv) Why did Chargaff do his tests on many different species?

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

(d) (i) Franklin investigated the structure of DNA by collecting evidence from DNA crystals.

Describe the technique she used.

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

(ii) Franklin did not publish her results immediately.

Suggest reasons why she did not publish immediately.

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

(e) The code for making proteins is in the DNA structure.

Which part of DNA makes the code for protein?

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

- bases
- backbone
- helix
- sugar
- phosphate

[1]

[Total: 15]

2 Andy is watching a game of football on a cold day.

(a) He starts to shiver.



The following statements explain why Andy shivers but they are **not** in the correct order.

A	Andy's brain sends an electrical signal to effectors.
B	A sensor detects that the blood temperature is below 37°C.
C	The body temperature increases.
D	Electricity makes muscles tighten and relax very quickly.
E	Cold air makes Andy's skin start to cool down.

(i) Put the statements in the correct order. Two have been done for you.

E				C
----------	--	--	--	----------

[2]

(ii) Shivering is an example of a **negative feedback system**.

Which statement explains why?

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

Shivering makes the body temperature go back to normal.

Shivering makes the body temperature negative.

Shivering makes the body temperature lower.

Shivering makes the body temperature change faster.

[1]

(b) Andy's friend Bob is playing in the football game.



Bob's trainer wants to monitor Bob's body temperature during the game.

The trainer gives Bob an electronic wristband temperature monitor.

(i) Suggest why using an electronic wristband is a better method than using a thermometer to monitor body temperature during the game.

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

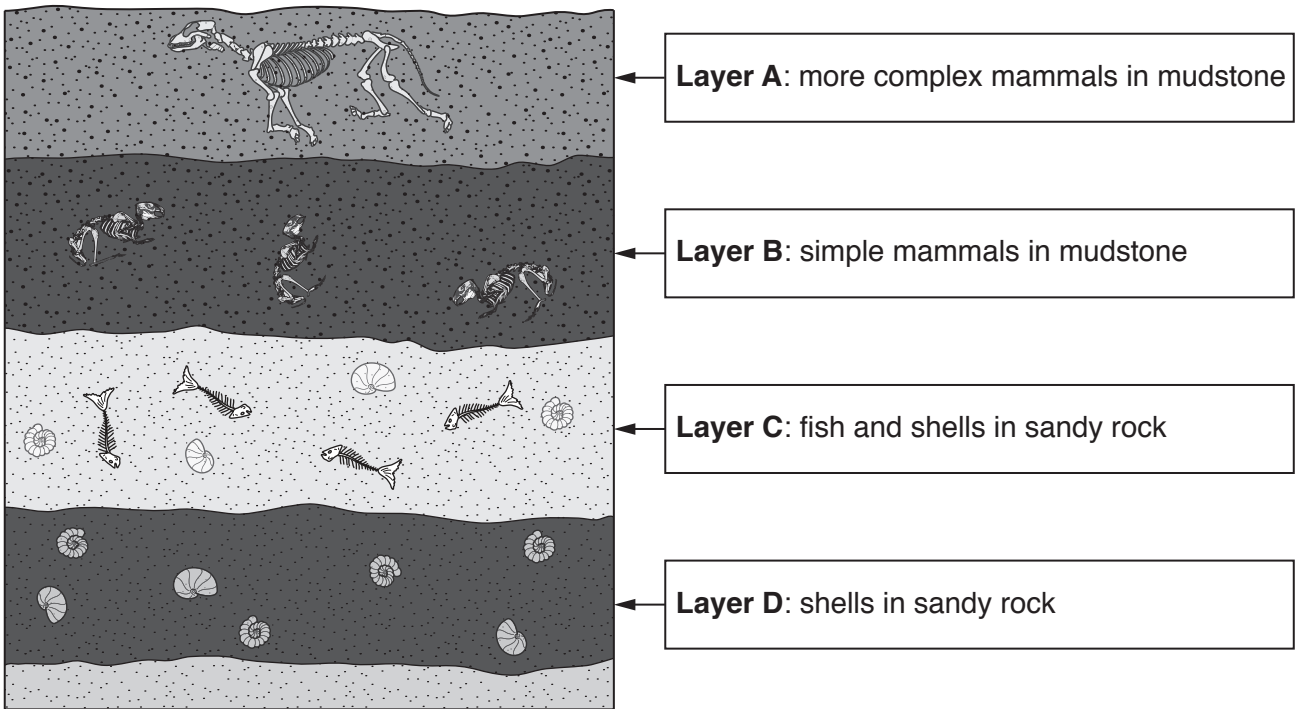
(ii) During the game, Bob's body gets hot.

Explain **one** way that Bob's body can cool him down when he gets hot.

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

[Total: 7]

3 Scientists find evidence for evolution from the fossils in layers of rocks.



(a) Which rock layer (A, B, C or D) is the oldest? Explain your answer.

Oldest layer:

Explanation:

..... [2]

- 4 (a) Infra-red, microwaves, radio waves and visible light are all waves in the electromagnetic spectrum.

Put these waves in order of increasing wavelength.

Infra-red has been done for you.

Use these words: **microwaves**, **radio waves** and **visible light**.

	<i>Infra-red</i>		
--	------------------	--	--

Shortest wavelength \longrightarrow Longest wavelength

[2]

- (b) Different detectors detect different types of electromagnetic waves .

Draw one straight line from each **detector** to the correct **electromagnetic wave**.

detector

electromagnetic wave

human eye

infra-red

aerial in a mobile phone

microwaves

receiver for 'over the horizon' communication

radio waves

visible light

[3]

[Total: 5]

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5 The early Greek model of the Universe is shown in **Fig. 1**.

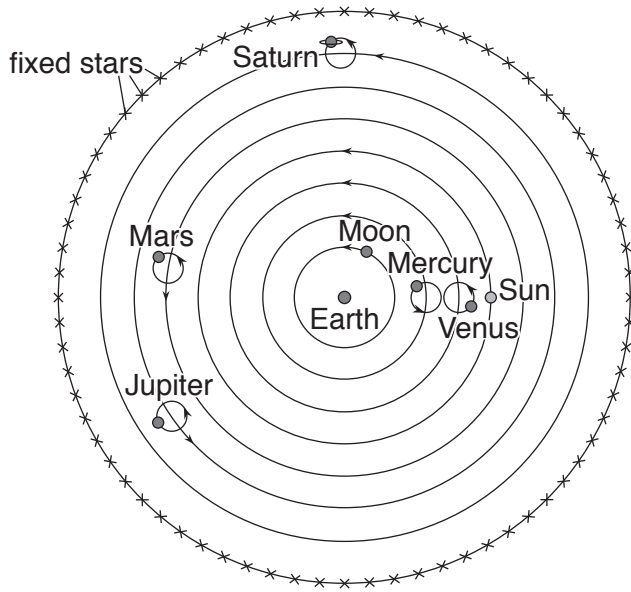


Fig. 1: Early Greek Model

Later, Copernicus introduced a new model which arranged the Earth, the Sun and the planets differently, as shown in **Fig. 2**.

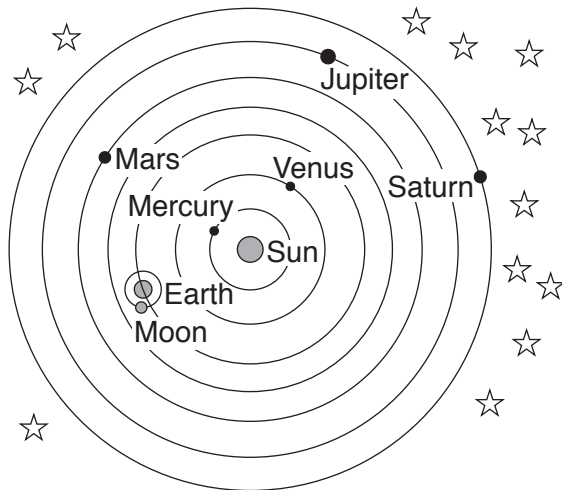


Fig. 2: The Copernicus model

6 In the early 20th century, Alfred Wegener developed the theory of continental drift to describe how the continents have moved.

(a) What evidence did Wegener use to support his theory?

Put ticks (✓) in the **two** boxes next to the correct answers.

The Earth's climate changes.

The continents fit together like a jigsaw.

Birds migrate from continent to continent.

The same fossils are found on different continents.

The Universe is expanding.

[2]

(b) When Wegener published his theory, geologists did not accept it.

One reason was that they could not measure the movement of the continents.

(i) Suggest a reason why it was not possible to measure the movement of the continents.

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

(ii) Give one **other** reason why geologists did not accept Wegener's theory.

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

(c) Years later, Arthur Holmes supported Wegener's theory.

He introduced the idea that convection currents in the Earth's mantle cause the continents to move.

(i) Where is the mantle?

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

at the centre of the Earth

between the centre of the Earth and the crust

on the outside of the Earth

along the edges of the tectonic plates

[1]

(ii) Many years later it was discovered that the Atlantic Ocean between Britain and America is getting wider.

This is due to sea floor spreading.

Explain how convection currents in the mantle cause sea floor spreading.

You may draw a labelled diagram as part of your answer.

.....

.....

..... [3]

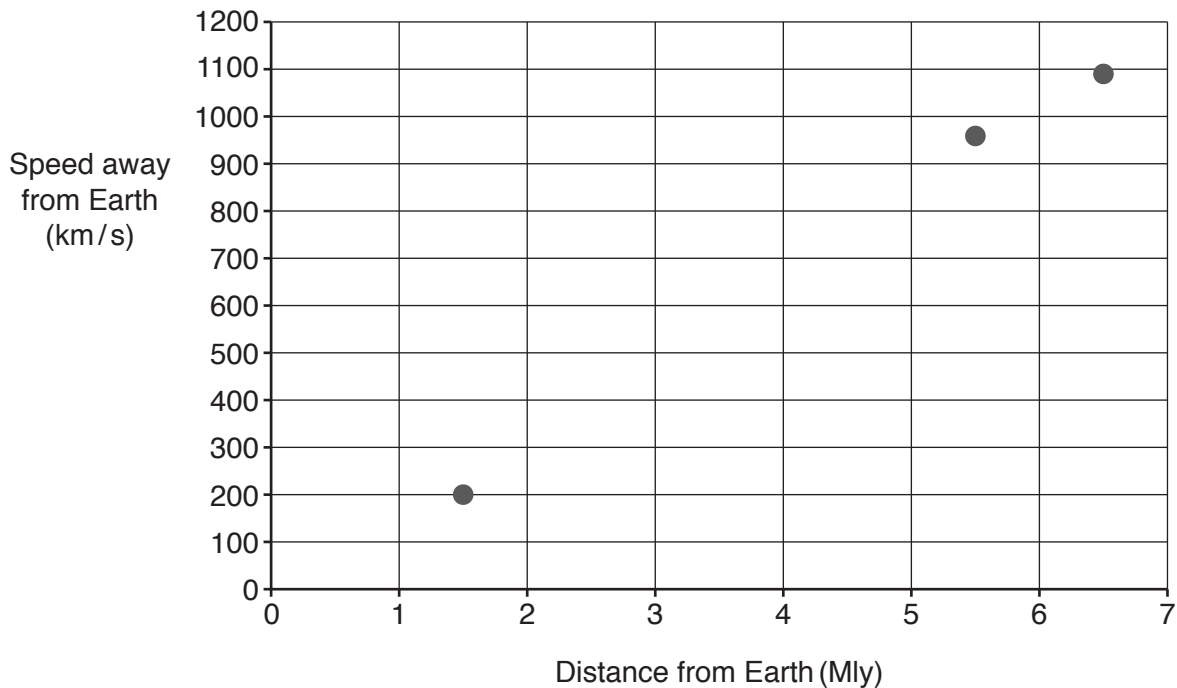
[Total: 8]

7 The astronomer Edwin Hubble measured the distance of some galaxies and their speed away from the Earth.

Here are some of his results.

Galaxy	Distance from Earth (Mly)	Speed away from Earth (km/s)
A	1.5	200
B	3.0	500
C	5.5	960
D	6.5	1090

(a) This is the scatter graph drawn from this data. Three of the points have been plotted.



(i) Plot the point for **galaxy B** on the graph. [1]

(ii) Hubble concluded that there was a positive correlation between the distance and the speed of galaxies.

How does the graph show a positive correlation?

.....
 [1]

(iii) Use the graph to estimate the speed of a galaxy that is 4.0 Mly from the Earth.

speed = km/s [1]

(b) Hubble collected his data in the 1920s.

Scientists can now collect data about many more galaxies.

(i) Why are scientists able to collect data about many more galaxies?

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

(ii) Hubble’s results led to the idea that the Universe is expanding.

How do Hubble’s results support the idea that the Universe is expanding?

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

(iii) Hubble’s results give evidence for a theory to explain how the Universe began.

What is the theory about the beginning of the Universe?

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

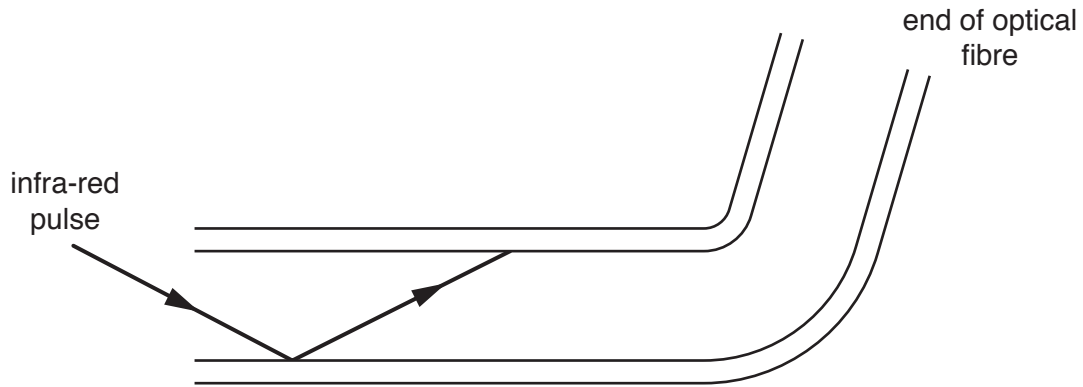
- binomial
- big bang
- evolution
- particulate

[1]

[Total: 6]

8 Some houses are connected to the internet by optical fibres.

Infra-red pulses are sent along the optical fibres.



The diagram shows an infra-red pulse entering a short piece of optical fibre.

- (a) Complete the diagram above by drawing the path of the pulse until it reaches the end of the optical fibre. [3]
- (b) An infra-red pulse takes 0.5 milliseconds to travel along an optical fibre which is 100 km long.

How long does it take a pulse to travel along a 300 km optical fibre?

Show your working.

length of time to travel 300 km = milliseconds [2]

[Total: 5]

END OF QUESTION PAPER

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