Please write clearly in block capitals.

Centre number   Candidate number
Surname
Forename(s)
Candidate signature

Tuesday 17 May 2016  Afternoon  Time allowed: 1 hour

Materials
For this paper you must have:
• a ruler
You may use a calculator.

Instructions
• Use black ink or black ball-point pen.
• Fill in the boxes at the top of this page.
• Answer all questions.
• You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
• Do all rough work in this book. Cross through any work you do not want to be marked.

Information
• The marks for questions are shown in brackets.
• The maximum mark for this paper is 60.
• You are expected to use a calculator where appropriate.
• You are reminded of the need for good English and clear presentation in your answers.
• Question 8 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
• In all calculations, show clearly how you work out your answer.
1 Figure 1 shows the water balance for a person on a cold day.

The numbers show the volume of water, in cm$^3$, the person’s body gained and lost.

Figure 1

Water gained by the body

- Food 600
- Drinking
- Respiration 400

Water lost from the body

- Urine 1500
- Respiration 400
- Breathing 400
- Faeces 100
- From the skin 400

1 (a) (i) How much water was lost from the body on the cold day? 

[1 mark]

Draw a ring around the correct answer.

1800 cm$^3$  2400 cm$^3$  3300 cm$^3$

1 (a) (ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance? 

[2 marks]

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Volume of water = ____________ cm$^3$
1 (b) (i) Name the process by which water is lost from the skin. [1 mark]

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1 (b) (ii) Why does the body need to lose water from the skin? [1 mark]

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1 (c) The next day was a hot day. The person gained the same volume of water and did the same activities.

1 (c) (i) What effect did the increase in temperature have on the volume of water the person lost? [1 mark]

Tick (✓) one box.

Less water was lost through the skin. 

More water was lost through the skin. 

More water was lost in faeces.

1 (c) (ii) What effect would the increase in temperature have on the volume of urine the person lost? [1 mark]

Draw a ring around the correct answer.

decrease increase no change

Turn over for the next question
Car drivers need quick reactions to avoid accidents.

A student uses a computer program to measure reaction time. The computer screen shows a traffic light on red. The traffic light then changes to green.

**Figure 2** shows the change the person sees on the computer screen.

![Figure 2](image)

When the traffic light changes to green the person has to click the computer mouse as quickly as possible. The computer program works out the time taken to react to the light changing colour.

2 (a) Special cells detect the change in colour.

2 (a) (i) What word is used to describe special cells that detect a change in the environment? **[1 mark]**

Draw a ring around the correct answer.

- receptor cells
- reflex cells
- stimulus cells

2 (a) (ii) Where in the body are the special cells that detect the change in colour of the traffic lights? **[1 mark]**

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2 (b) The student used the computer program on one computer to measure the reaction times of people of different ages.

2 (b) (i) Give one variable the student should control so that a fair comparison can be made between the people of different ages. **[1 mark]**

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Turn over ➤
2 (b) (ii) The student did each measurement three times to calculate a mean value. Table 1 shows the results.

Table 1

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Mean reaction time in milliseconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>242</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>221</td>
</tr>
<tr>
<td>60</td>
<td>258</td>
</tr>
<tr>
<td>75</td>
<td>364</td>
</tr>
<tr>
<td>90</td>
<td>526</td>
</tr>
</tbody>
</table>

The reaction times for the 30-year-old person were 192, 174 and 180 milliseconds.

Calculate the mean reaction time of the 30-year-old person.

[1 mark]

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Mean reaction time = _____________________ milliseconds

2 (b) (iii) Which one of the following is an advantage of repeating each test three times and not doing the test just once?

[1 mark]

Tick (✔) one box.

Any anomalies can be identified.  
The results will be more precise.  
There will be no errors.
2 (b) (iv) Some people think that old people should not be allowed to drive a car.

Why is it more dangerous for old people to drive cars?

Use information from Table 1 to support your answer. [2 marks]

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3  Figure 3 shows how energy and biomass pass along a food chain.

**Figure 3**

Parsley  →  Swallowtail caterpillar  →  Blue tit  →  Hawk

3 (a)  The parsley shown in Figure 3 carries out photosynthesis. Why is photosynthesis important in the food chain?

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3 (b)  Which diagram shows the pyramid of biomass for the food chain in Figure 3?  

Tick (✓) one box.
3 (c) **Figure 4** shows the ways a swallowtail caterpillar transfers 20 J of energy from food.

![Figure 4](image)

What percentage of the energy in the caterpillar's food is used for growth? [2 marks]

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Percentage = _____________

3 (d) The organisms in the food chain are adapted for survival.

3 (d) (i) **Figure 5** shows a swallowtail caterpillar seen from the back.

![Figure 5](image)

Suggest how the swallowtail caterpillar shown in **Figure 5** is adapted to reduce the chance of being eaten by blue tits. [2 marks]

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Turn over
Figure 6 shows a hawk.

Suggest two ways that the hawk is adapted to catch and kill blue tits. [2 marks]

1. 

2. 
4 Hormones are involved in controlling the menstrual cycle and fertility.

4 (a) (i) Use the correct answer from the box to complete the sentence. [1 mark]

| auxin | follicle stimulating hormone (FSH) | thalidomide |

A hormone produced by the pituitary gland is __________________________. 

4 (a) (ii) Use the correct answer from the box to complete the sentence. [1 mark]

| luteinising hormone (LH) | oestrogen | statin |

A hormone produced by the ovaries is __________________________. 

4 (b) (i) Why are fertility drugs given to some women? [1 mark]

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4 (b) (ii) A doctor injects fertility drugs into a woman. After the injection, the hormones travel to the woman’s ovaries.

How do the hormones travel to the ovaries? [1 mark]

Draw a ring around the correct answer.

through the bloodstream  through the neurones  through the skin

4 (c) Which two hormones are used in contraceptive pills? [2 marks]

Tick (✓) two boxes.

FSH  oestrogen

LH  progesterone

Turn over
5 Pathogens are microorganisms that cause infectious diseases.

5 (a) Figure 7 shows the percentage of children under 5 years old who died from infectious diseases, in the UK, in four different years.

![Figure 7](image)

5 (a) (i) In the 1840s Dr Semmelweis introduced a new idea into hospitals. What was this idea?

Tick (✓) one box.

- hand-washing
- immunisation
- painkillers

5 (a) (ii) Between 1750 and 1850 vaccinations were also developed. What is in a vaccine?

Tick (✓) one box.

- large amounts of dead pathogens
- large amounts of live pathogens
- small amounts of dead pathogens
5 (a) (iii) The advances in medicine had an effect on death rate.

Describe the effect these advances had between 1750 and 1850.

To gain full marks you should include data from Figure 7. [2 marks]

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5 (b) Antibiotics were developed in the 1940s. Antibiotics kill bacteria.

5 (b) (i) Which one of the following is an antibiotic? [1 mark]

Draw a ring around the correct answer.

cholesterol                  penicillin                  thalidomide

5 (b) (ii) The use of antibiotics has not reduced the death rate due to all diseases to zero.

Suggest two reasons why. [2 marks]

1 __________________________________________

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2 __________________________________________

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5 (c) In school laboratories, bacteria should be grown at a maximum temperature of 25 °C.

Give one reason why companies testing new antibiotics grow bacteria at 37 °C. [1 mark]

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Darwin’s theory of natural selection states that all living things have evolved from simple life forms.

6 (a) Use the correct answer from the box to complete the sentence.  

[1 mark]

three billion  three million  three thousand

Darwin’s theory states that life began on Earth ________________________ years ago.

6 (b) Life evolved due to changes in genes. Changes in genes cause variation.

Complete the sentences.  

[2 marks]

Changes in genes are called ________________________ .

Individuals with characteristics most suited to the environment are more likely to survive and ________________________ .
Nicotine and alcohol are drugs that affect the brain.

What is the correct description of both nicotine and alcohol? [1 mark]

Tick (✓) one box.

illegal, medical drugs

illegal, recreational drugs

legal, medical drugs

legal, recreational drugs

Why do people find it difficult to stop smoking? [1 mark]

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A drug company has developed a new drug which helps people to stop smoking. The new drug prevents the feeling of pleasure caused by nicotine in the smoke.

The new drug is now being tested on rats which have been given a lot of alcohol to drink. The company wants to find out if the drug can help people to stop drinking alcohol.

It is important that the tests on rats are done by an independent company. [1 mark]

What is meant by an independent company?
7 (b) (ii) Why is it important that the tests are done by an independent company?

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[1 mark]

7 (b) (iii) Some scientists believe that the part of the brain sensitive to alcohol is the same as the part of the brain sensitive to nicotine.

Explain why the new drug might be useful for treating people who find it difficult to stop drinking alcohol.

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[2 marks]

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Question 7 continues on the next page
Figure 8 shows the results of a survey into the different types of alcoholic drinks consumed by one hundred 15-year-old boys and one hundred 15-year-old girls in the UK.

**Figure 8**

![Bar chart showing the percentage of 15-year-olds who consumed each type of alcoholic drink, categorized by gender.](chart)

**Key**
- **Boys**
- **Girls**

**Type of alcoholic drink**
- Beer, lager, cider
- Spirits
- Alcopops
- Wine

**Percentage of 15-year-olds who consumed the drink**
- 0%
- 20%
- 40%
- 60%
- 80%
- 100%

7 (c) (i) Describe the differences between the **types** of alcoholic drink consumed by boys and by girls.

Use **only** information from **Figure 8**.

[2 marks]

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7 (c) (ii) A newspaper headline stated:

**“All boys drink alcohol”**

Use information from part (c) and **Figure 8** to give **one** reason why the newspaper headline may **not** be correct.

[1 mark]

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In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Mineral ions are an important component of a healthy diet.

Describe how the other components of the diet are important in keeping us healthy.

In your answer you should refer to:
• the different components
• why we need each component.

[6 marks]
Students investigated decomposition.

The students:
- put some decaying grass cuttings into a vacuum flask
- put a carbon dioxide sensor and a temperature sensor in the flask
- attached the sensors to a data logger
- closed the flask with cotton wool.

A vacuum flask was used to reduce the loss of thermal energy.

Figure 9 shows the investigation.

9 (a) Give one advantage of using a temperature sensor attached to a data logger instead of a thermometer.

[1 mark]
9 (b) Figure 10 shows the results from the data logger for carbon dioxide concentration in the flask for the next 25 days.

Figure 10

9 (b) (i) Why did the concentration of carbon dioxide in the flask increase? [3 marks]

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9 (b) (ii) Suggest what has happened in the flask to cause the carbon dioxide concentration to level off after 20 days. [1 mark]

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END OF QUESTIONS
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