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Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Biology

Advanced

Unit 6: Practical Biology and Investigative Skills

Friday 13 May 2016 – Morning

Time: 1 hour 30 minutes

Paper Reference

WBI06/01

You must have:

Ruler, Calculator, HB Pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- Any blank pages are indicated.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

- 1 The photograph below shows an adult male frilled lizard (*Chlamydosaurus kingii*).



Magnification $\times 0.1$

Male frilled lizards display their frill to attract females. A successful male may mate with many females.

The female lays fertilised eggs in a nest on the ground and lightly covers them with soil.

Young lizards hatch from the eggs after an incubation period of approximately two months.

The temperature of the nest is usually between 20 °C and 40 °C.

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- (a) In many species of lizard, the gender (sex) of the offspring is influenced by the temperature at which the eggs are incubated.

Describe an experiment that could be carried out to investigate the effect of temperature on the gender of the frilled lizard offspring.

You should include details of how **two** relevant variables are controlled.

(5)

- (b) Suggest **one** possible source of random error in this experiment.

(1)



(c) Describe **two** ways to ensure the wellbeing of the lizards in this experiment.

(2)

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(d) The results of a similar experiment are shown in the table below.

Temperature of eggs	Gender of offspring
low	females only
middle	males and females
high	females only

- (i) The managers of a nature reserve would like to increase the population of frilled lizards in the reserve. They plan to incubate the lizard eggs at temperatures that will produce more females than males.

Suggest possible advantages and disadvantages of this plan.

(3)

Advantages

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Disadvantages

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- (ii) To produce more female offspring, the eggs could be incubated at either a high or a low temperature. The reserve managers chose a high temperature because this causes the young lizards to hatch more quickly.

Explain why a high incubation temperature might cause the young lizards to hatch more quickly.

(2)

(Total for Question 1 = 13 marks)



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- 2 A student read that an increase in cases of type II diabetes may be linked to an increase in the amount of sugar in people's diets. The article suggested that even healthy foods, such as modern apples, contain more sugar than traditional apples.

The student investigated the sugar content of modern and traditional varieties of apple.

Modern apple varieties include: Cox, Braeburn and Gala.

Traditional apple varieties include: Egremont Russet, Adams' Pearmain and Lord Lambourne.

The student bought modern apple varieties from a supermarket and traditional apple varieties from a farm.

He crushed a 100 g sample from each apple and measured the total sugar content of each sample.

His results are given below.

Cox 12.7 g	Adams' Pearmain 11.4 g
Braeburn 13.5 g	Lord Lambourne 12.6 g
Egremont Russet 12.2 g	Cox 11.9 g
Lord Lambourne 13.3 g	Braeburn 13.2 g
Gala 15.7 g	Egremont Russet 11.7 g
Lord Lambourne 13.2 g	Gala 14.8 g
Adams' Pearmain 12.9 g	Braeburn 12.6 g
Gala 14.6 g	Cox 12.3 g
Egremont Russet 12.4 g	Adams' Pearmain 12.1 g

- (a) Write a suitable null hypothesis for this investigation.

(2)

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(b) Calculate the mean sugar content for the modern apples and for the traditional apples.
Prepare a suitable table to display the **raw data** and the **two** calculated **means**.
(3)



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Question 2 continues on the next page



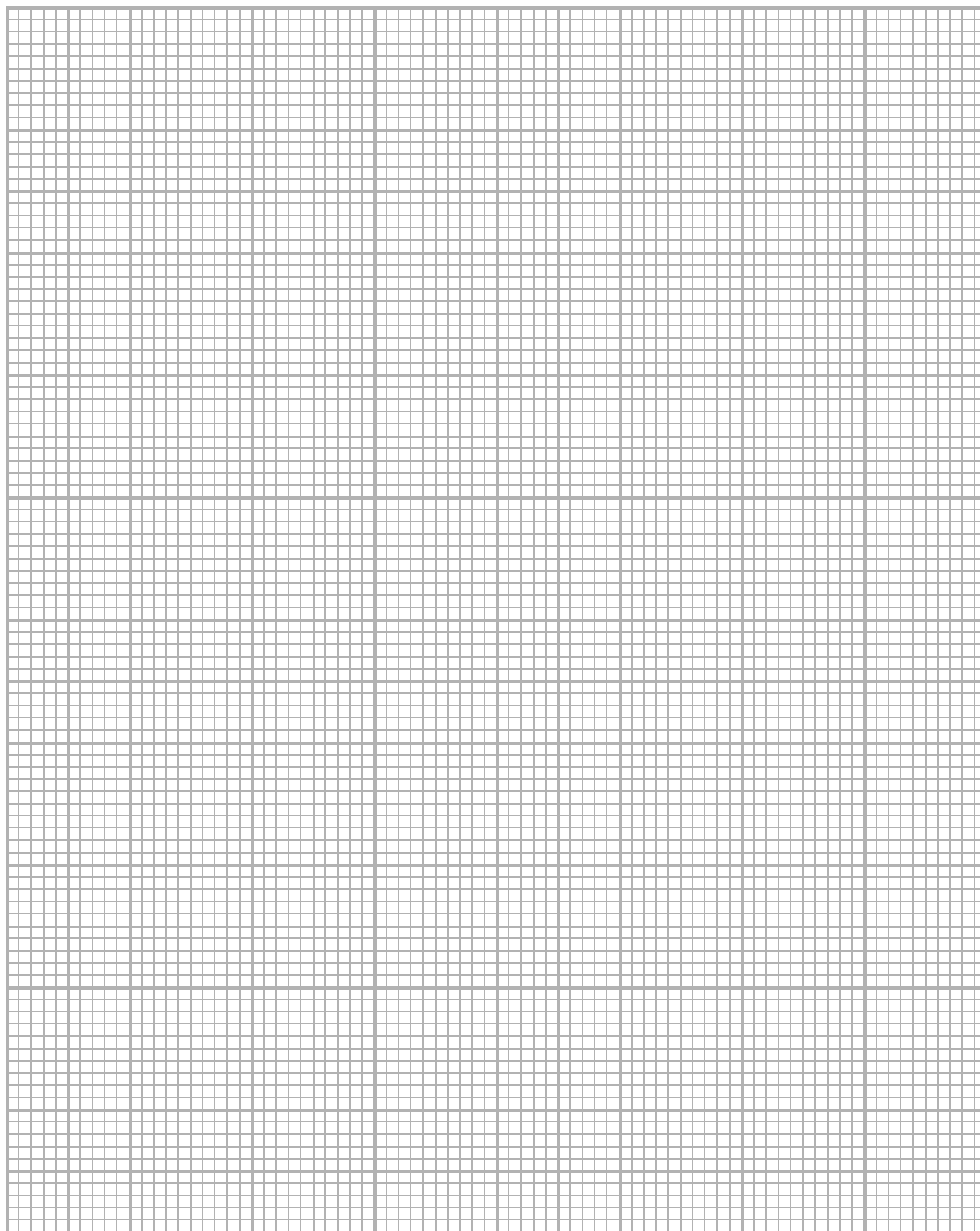
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- (c) On the graph paper below, draw a suitable graph to show the mean sugar content of modern apples and traditional apples. Include an indication of the variability of the data.

(3)



(d) The student applied a statistical test to his data. He calculated a value of 2.196.

The table below shows some critical values for this test.

The number of degrees of freedom is calculated using the following formula:

$$\text{degrees of freedom} = (n_1 + n_2) - 2$$

where n_1 and n_2 represent the sizes of the groups being compared.

Degrees of freedom	Level of significance			
	0.20	0.10	0.05	0.01
6	1.440	1.943	2.447	3.707
7	1.415	1.895	2.365	3.499
8	1.397	1.860	2.306	3.355
9	1.383	1.833	2.262	3.250
10	1.372	1.812	2.228	3.169
11	1.363	1.796	2.201	3.106
12	1.356	1.782	2.179	3.055
13	1.350	1.771	2.160	3.012
14	1.345	1.761	2.145	2.977
15	1.341	1.753	2.131	2.947
16	1.337	1.746	2.120	2.921
17	1.333	1.740	2.110	2.898
18	1.330	1.734	2.101	2.878
19	1.328	1.729	2.093	2.861
20	1.325	1.725	2.086	2.845



What conclusion can be drawn from this investigation?
Use your graph and the information in this table to explain your answer.

(4)

(e) Suggest why it may **not** be reasonable to draw valid conclusions from this investigation.

(3)

(Total for Question 2 = 15 marks)



- 3 Vital capacity (VC) is one measure of lung capacity. VC is the volume of air that can be exhaled if a person breathes out as fully as they can, after inhaling as deeply as they can.

Some athletes try to increase their VC as part of their training programme, because they believe it will help to improve their performance.

A yoga teacher promotes a yoga class designed specifically for athletes. The advertising leaflet reads:

Improve lung function without high-impact exercise that can damage joints and cause fatigue. Yoga focuses on deep breathing and mindfulness alongside strength and flexibility, which can help to give you that competitive edge. Increase your vital capacity and oxygen uptake – and feel better too! Sessions available every day: join us as often as possible for maximum benefits.

Plan an investigation to determine whether frequency of participation in yoga classes is linked to an increase in vital capacity.

Your answer should give details under the following headings.

- (a) A consideration of whether there are any safety or ethical issues you would need to take into account.

(2)

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- (b) Suggestions for preliminary practical work that you might undertake to ensure your proposed method would provide meaningful data.

(3)

- (c) A detailed method, including an explanation of how important variables are to be controlled or monitored.

(10)

[2 marks are available in this section for the quality of written communication.]



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(d) A clear explanation of how your data are to be recorded, presented and analysed in order to draw conclusions from your investigation.

(4)

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(e) The limitations of your proposed method.

(3)

(Total for Question 3 = 22 marks)

TOTAL FOR PAPER = 50 MARKS

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