Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6435486969

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1 **(a)** Some students wanted to determine the reaction time of a sample of people aged from 5–80 years.

The students found three different methods of testing reaction time, as described in Fig. 1.1.

Method 1: Ruler test	Method 2: Computer click timer	Method 3: Light board test
• The subject rests their elbow on a table so that their wrist extends over the side. • The assessor holds the ruler vertically in the air between the thumb and first finger of the subject. • The zero mark on the ruler is lined up with the first finger of the subject. The ruler is released without warning. • As soon as the subject sees the ruler fall, they catch it as quickly as possible. • The distance the ruler falls is recorded in metres.	• The subject looks at a computer screen and clicks a **start** button on the screen and waits for the background colour to change. • As soon as the background colour changes the subject clicks a **stop** button on the screen. • The reaction time, in seconds, appears on the screen.	• The subject stands in front of a board with buttons arranged in a pattern. The buttons light up randomly. • As soon as a button lights up the subject presses the button to turn it off. • As soon as a button is pressed another button lights up. • The number of lights turned off in a set time is recorded.

Fig. 1.1

(i) The students decided that Method 2 was the most suitable to use for testing subjects aged from 5–80 years.

Suggest **two** reasons why Method 2 is the most suitable.

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..... [2]

(ii) State the independent variable **and** the dependent variable in Method 2.

independent variable .....

.....

dependent variable .....

.....
[2]

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(iii) Describe how the students could investigate the reaction time of a sample of people aged from 5–80 years, using Method 2.

Your description should be set out in a logical order and be detailed enough to let another person follow it.

Details of Method 2, as described on page 2, are **not** required.

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(b) The students found some results on the internet for a reaction time test, as shown in Fig. 1.2.

The error bars show ± 1 standard deviation (*s*).

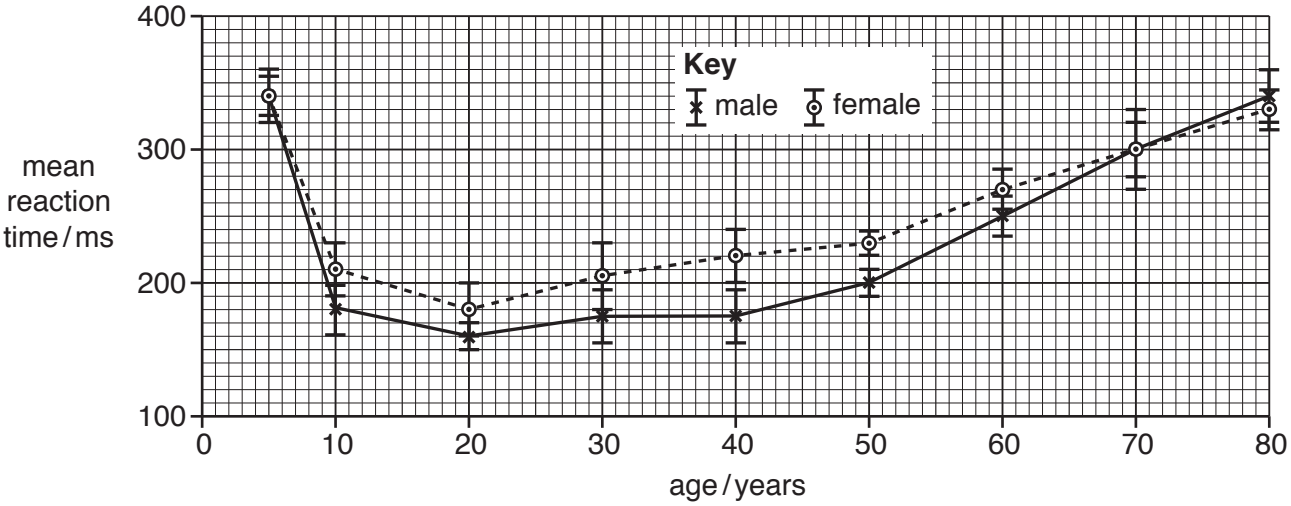


Fig. 1.2

(i) The percentage change in mean reaction time for males between the ages of 5 years and 10 years is 47%.

Calculate the percentage change in mean reaction time for **females** between the ages of 5 years and 10 years. Show your working and give your answer to the nearest whole number.

.....% [2]

(ii) State **two** conclusions about the trends shown by the results in Fig. 1.2.

1 .....

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2 .....

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[2]

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(iii) State a suitable statistical test that the students could use to find out if the difference in reaction times between males and females of the same age was significant.

Give a reason for your answer.

name of test .....

reason .....

.....

.....

[2]

(iv) Suggest a null hypothesis for the test that you have chosen in **(iii)**.

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..... [1]

[Total: 17]

2 Sperm production in humans is controlled by the hormones FSH and LH. These hormones are released from the pituitary gland in males to maintain a constant concentration in the blood.

Research has shown that sperm production in humans has decreased during the last 75 years. This research has highlighted concern about the fertility of future generations.

(a) Assessments of fertility are carried out on diluted semen samples. The samples are checked for number of sperm per mm^3, motility and abnormal structure.

Fig. 2.1 shows sperm in one part of a haemocytometer grid used for counting sperm. The microscope illumination causes the sperm heads to fluoresce.

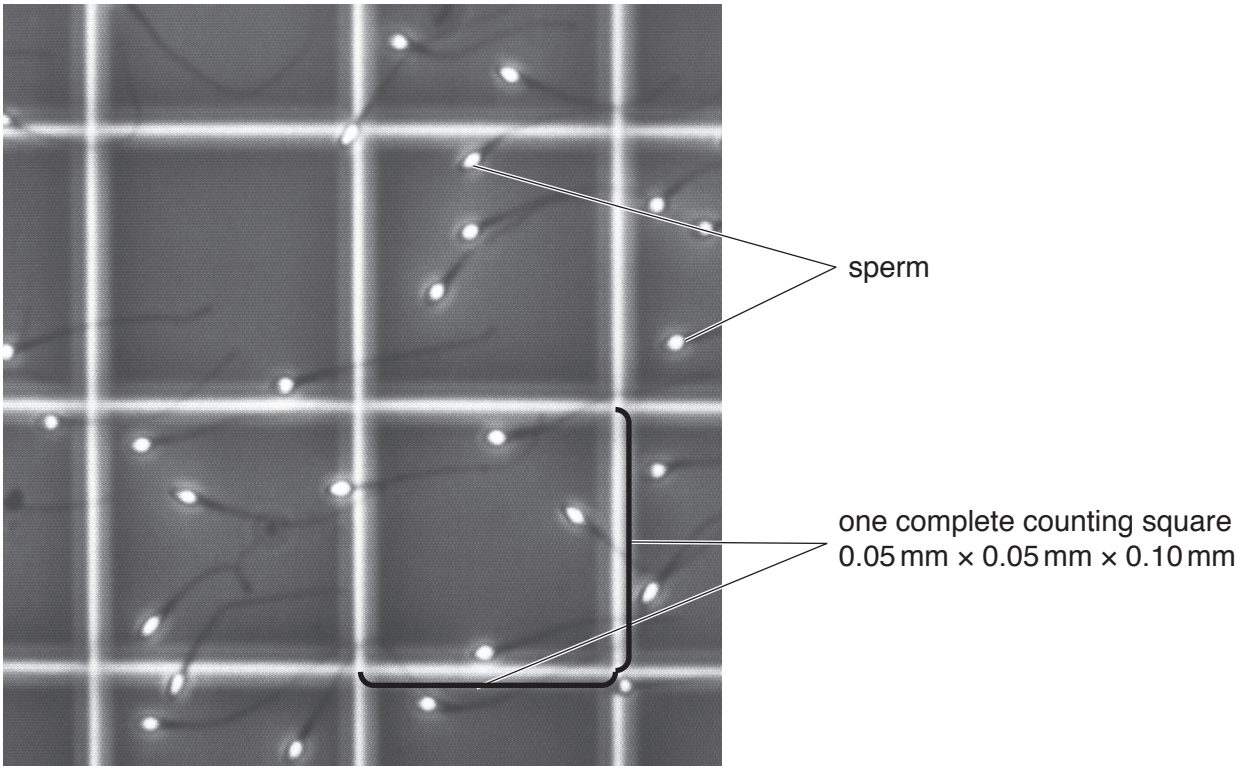


Fig. 2.1

The semen sample shown in Fig. 2.1 was diluted by a factor of 100.

(i) Describe a method by which the number of sperm present in this **diluted** sample could be estimated.

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..... [2]

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(ii) Describe how you could estimate the number of sperm per mm^3 in the original, **undiluted** semen sample.

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..... [3]

(iii) Suggest why this method of counting sperm may not represent the actual number of sperm in the original, **undiluted** semen.

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..... [2]

(b) Hormone imbalances can result in reduced sperm production and immobile sperm, leading to infertility.

A study was carried out on 120 men with different causes of infertility.

All the subjects were non-smokers, did not drink alcohol and did not take any medication for 6 months before the study.

The concentrations of the hormones FSH and LH were measured in each man.

Semen samples were collected and tested within 2 hours of collection. The number of sperm per mm^3 were estimated and the motility of the sperm assessed.

(i) Identify **two** variables that **have been** standardised in this study.

1 .....

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2 .....

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[2]

Fig. 2.2 shows the concentration of FSH and LH in four test groups. In one test group, the men are fertile and in the other three groups, the men show different types of infertility.

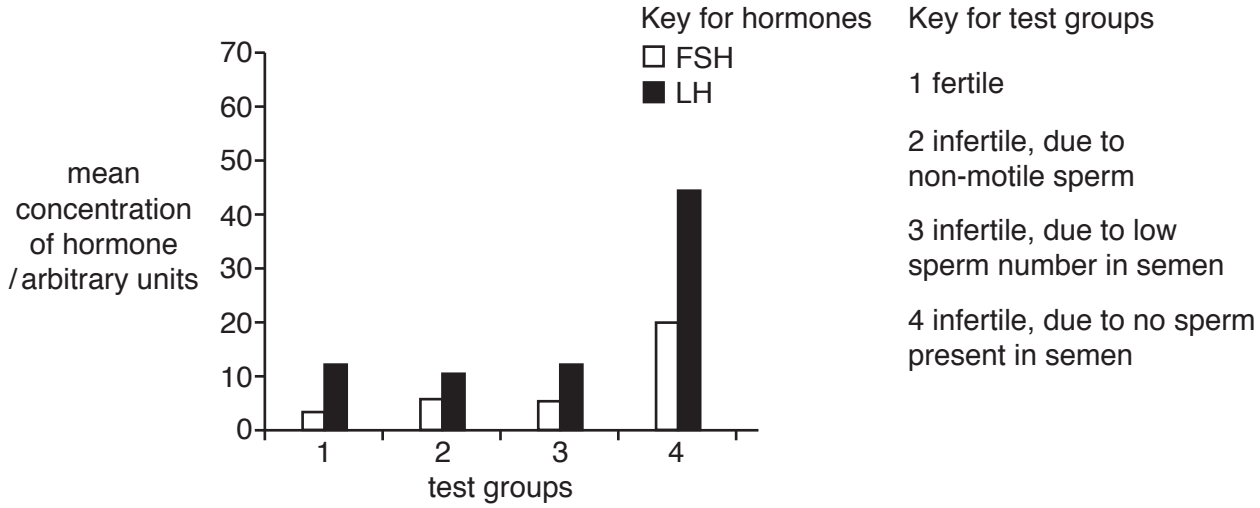


Fig. 2.2

(ii) State the reason for including the hormone concentrations of fertile men in Fig. 2.2.

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..... [1]

(iii) State **one** conclusion about the effect of FSH and LH on infertility in men that is consistent with the results of this investigation.

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..... [1]

(c) Semen samples may also be tested for viability of sperm. Viability is the proportion of live sperm present in semen samples.
Viability of sperm can be tested using a chemical which stains living cells a different colour to dead cells.

Suggest a method, using this stain and a haemocytometer, that could be used to test the viability of sperm in a semen sample.

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..... [2]

[Total: 13]

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