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**Edexcel GCE**

**Biology**  
**Advanced**  
**Unit 6B: Practical Biology and Investigative Skills**

Friday 14 January 2011 – Afternoon <b>Time: 1 hour 30 minutes</b>	Paper Reference <b>6BI08/01</b>
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<b>You must have:</b> Ruler, Calculator, HB Pencil	Total Marks
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### 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.*

### 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.

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### Answer ALL questions

1 Agar plates spread with a suitable culture of bacteria can be used to test the effectiveness of different antibiotics.

(a) Describe how to investigate the effect of different types of antibiotic (the independent variable) on bacteria. Include details of a suitable **dependent** variable and how it can be measured.

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(b) (i) State **two** variables, other than the dependent and independent variable, which could affect the investigation.

(2)

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2 .....



(ii) Suggest how **one** of the variables you have stated in (b)(i) could be controlled.

(1)

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(c) Give **two** ways in which this investigation should be carried out safely.

(2)

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(d) To treat a bacterial infection, an antibiotic must be effective against the bacteria. Suggest **one** other factor that may need to be considered by a doctor when prescribing an antibiotic to treat a patient with a bacterial infection.

(1)

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**(Total for Question 1 = 12 marks)**



2 Rennin is an enzyme, found in the stomach of mammals, that can form solid clots in milk. Rennin is often used in the first stage of cheese production.

A student was interested in discovering which conditions would be ideal for making cheese. She wanted to determine which concentration of rennin was likely to give her suitable rates of clotting of milk.

She prepared the following test tubes:

- Fourteen test tubes with 5 cm<sup>3</sup> milk
- Twelve test tubes, each containing 5 cm<sup>3</sup> of different concentrations of rennin
- Two test tubes with 5 cm<sup>3</sup> distilled water

She placed these test tubes in a water bath at 30°C and left them for 10 minutes. The content of each test tube containing milk was added to a test tube containing either rennin or distilled water. These were mixed and returned to the water bath. The time taken for the milk to clot (thicken) was recorded.

A copy of the student's raw results are below.

3% rennin	30 sec, 20 sec;	2% rennin	45 sec, 40 sec;
1.5% rennin	1min, 1min 30 sec;	1% rennin	1min 30 sec, 1min 30 sec;
0.5% rennin	3min 30 sec, 3min;	0.2% rennin	7min, 7min 30 sec;
Distilled water did not clot.			

(a) Explain why the test tubes containing milk, rennin and distilled water were left in the water bath for 10 minutes before they were mixed.

(1)

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(b) Convert the times recorded into the SI units of seconds and prepare a suitable table to display these raw results and each of the following.

- (i) The mean time for clotting for each concentration of rennin.
- (ii) The mean rate of milk clotting, calculated using the equation below

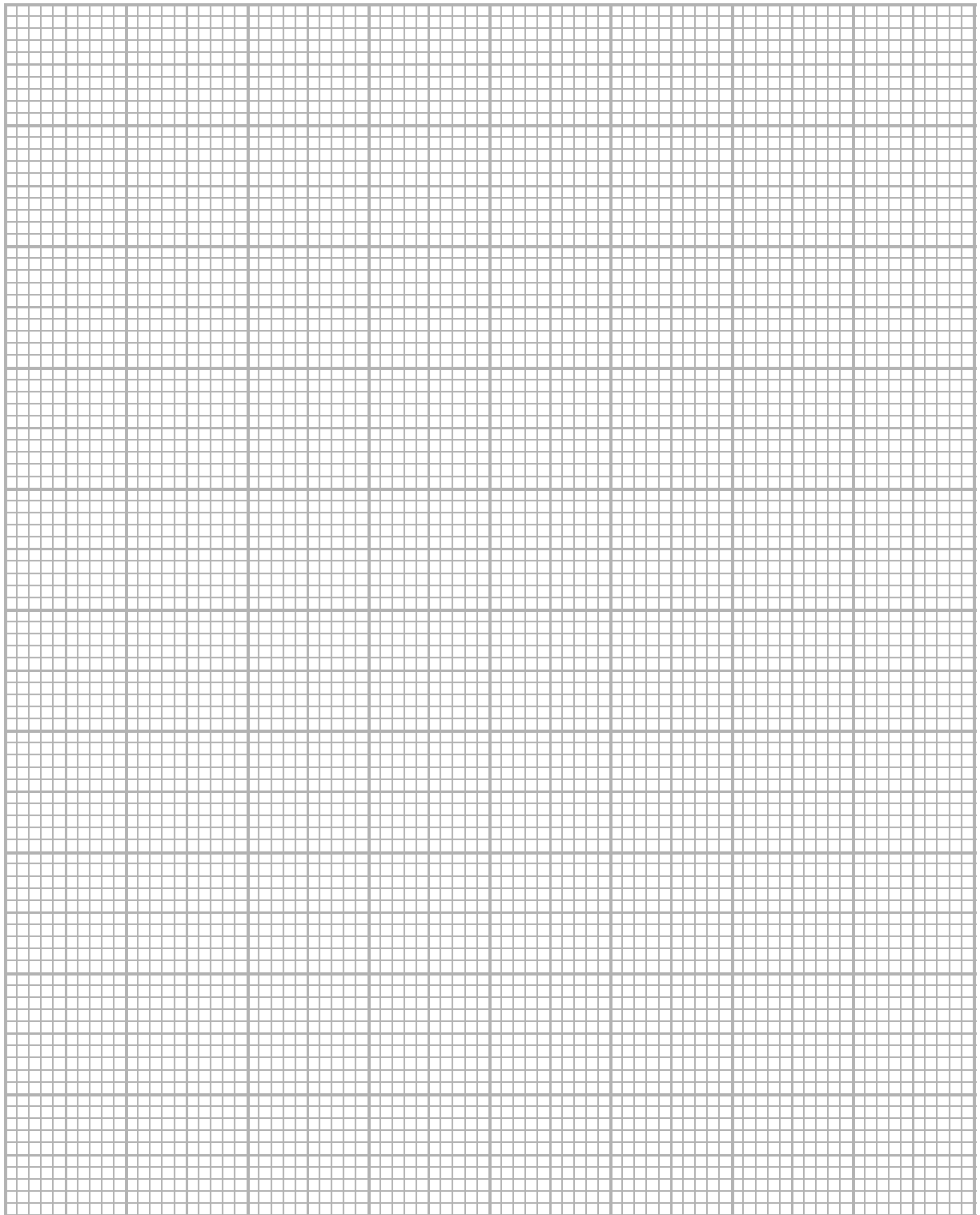
$$\frac{1}{\text{mean time for milk to clot / seconds}} = \text{mean rate of clotting / s}^{-1}$$

(5)



(c) Show the effect of changing the rennin concentration on the mean rate of milk clotting, in a suitable graphical form.

(3)



(d) Identify an anomalous result in the data for the different rennin concentrations. (2)

Give **one** reason for your answer.

(e) The student applied a Spearman rank correlation to explore the relationship between the rate of clotting and the rennin concentration. From her calculation, she obtained a Spearman rank correlation of 1.0.

Table of significance levels for Spearman rank correlation.

<b>Significance level (p)</b>	0.20	0.10	0.05	0.01	0.001
<b>Critical value of <i>r</i></b>	0.55	0.67	0.76	0.88	0.95

What conclusion can be drawn from this investigation? Use the information in the table to explain your answer. (2)



(f) Give an explanation for the relationship between rennin concentration and the rate of clotting of milk.

(2)

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**(Total for Question 2 = 15 marks)**





3 The intensity of shade cast by the canopy of trees, in a woodland environment, may influence the distribution of plants growing on the floor of the woodland.

A student observed that there were more primrose plants growing in some areas of the woodland.

He formed the hypothesis that the abundance of primrose plants would increase with an increase in light intensity.



Plan an investigation to test this hypothesis.

Your answer should give details under the following headings.

(a) An outline of a suitable sampling technique for this investigation and whether there are any safety and ethical issues you would need to consider.

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

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

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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.

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**(Total for Question 3 = 23 marks)**

**TOTAL FOR PAPER = 50 MARKS**



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