Preparing for 'AS' Biology

Welcome to the beginning of your 'AS' Biology course

In this course you will use various skills which include comprehension, graphing, analysing and evaluating. In completing the activities in this booklet you will be revising these skill areas. You will need to bring your work to your first Biology lesson.

In addition effective revision is essential for achieving success in Biology and there is a glossary of terms you will need to learn for a quick test in your first few Biology lessons. These terms are part of developing your understanding of analysing, interpreting and evaluating and the 'AS' Biology examinations will assess this component. Maths skills build on Higher tier GCSE maths (grade 6 and above) and represent 10% of Biology 'AS' level.

We look forward to meeting you in September.

Enjoy the rest of your holiday.

Name: _____

Calculating Means and Rates of Reaction, Changing Data from One form to Another, Explaining my Results:

The data shows the time it took the enzyme amylase to break down starch in solutions of different pH.

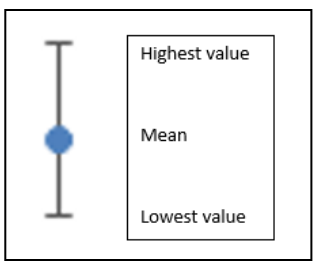
pH	Time (min)	Time (min)	Time (min)	Mean time (min)
5.0	6.0	6.0	6.5	
5.5	4.5	4.5	4.5	
6.0	3.0	2.0	2.5	
6.5	2.0	2.5	2.0	
7.0	1.2	1.0	1.2	
7.5	1.2	1.2	1.2	
8.0	3.0	3.5	3.5	

1. Calculate the mean time at each pH
2. What is the independent variable?
3. What is the dependent variable?
4. Calculate the rate of reaction at each pH (rate = 1/time) so 1÷time

pH	Rate ( )	Rate ( )	Rate ( )	Mean Rate ( )
5.0				
5.5				
6.0				
6.5				
7.0				
7.5				
8.0				

Write your answers on the next page.

5. When plotting a graph which variable goes on which axis?
6. When is it appropriate to plot a bar chart?
7. When is it appropriate to plot a line graph?
8. Plot a graph to show the rate of reaction at the different pH values
9. Show the range/error bars (see diagram)
10. Describe the graph.
11. Explain the graph.
12. How confident are you in your conclusion based on the spread of your data and why?



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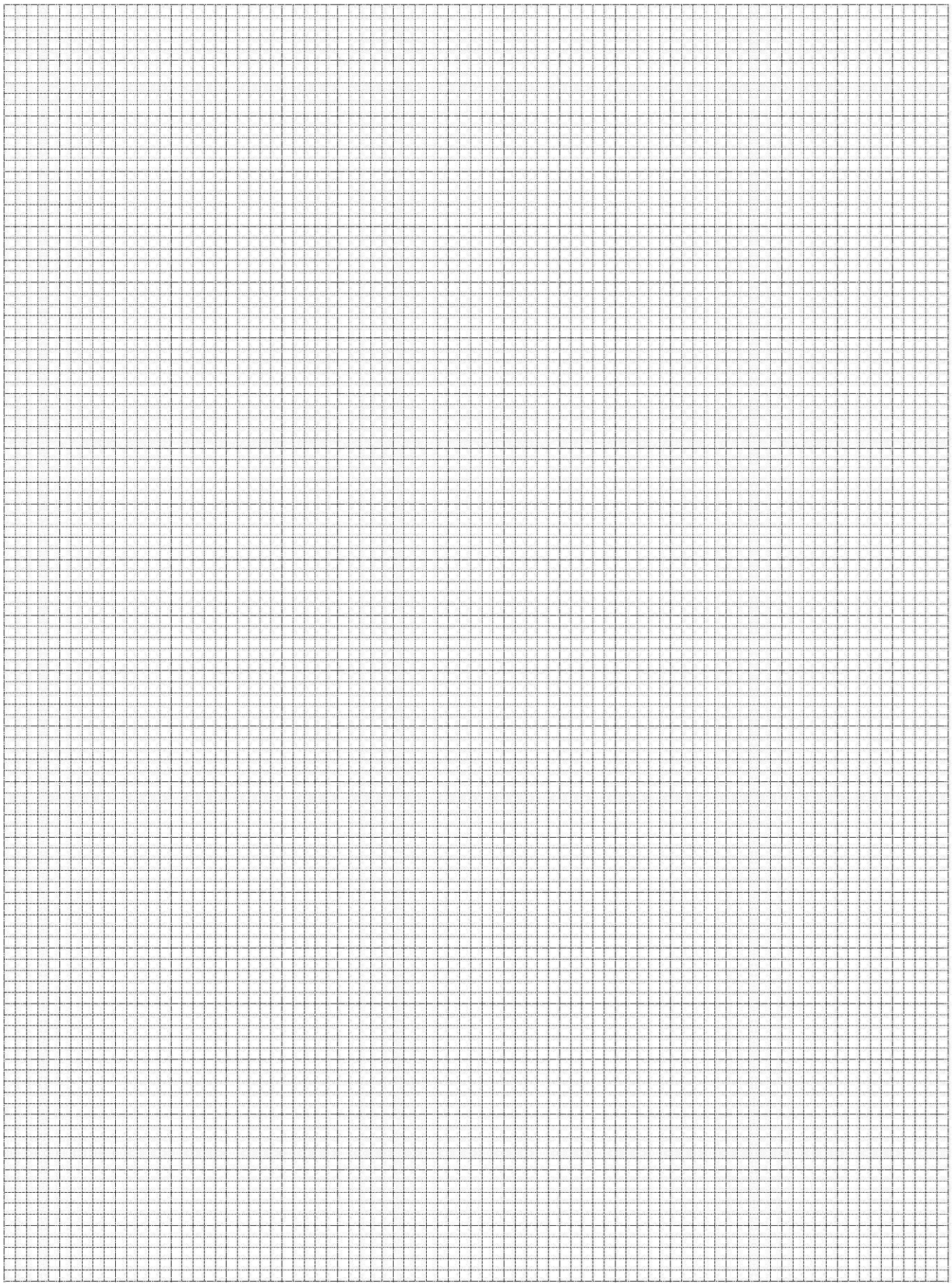
You may use this if you wish



Answers:

5.

6.

7

10.

11

12

Data analysis and evaluation skills and the use of controls):

To continue developing your skills from GCSE you need to answer questions 1 to 6 based initially on GCSE knowledge then the sources provided.

You need to learn the 'Glossary of Terms' and you will be tested on these terms in your first Biology lesson.

Controlling mosquitoes

The question follows the style of the *How Science Works* question in BIOL2. It is intended to be used in conjunction with the accompanying PowerPoint presentation and should help students to develop a strategy for answering such questions.

Suggested marking guidelines are enclosed on a separate sheet. These guidelines could either be used by the teacher in marking the exercise, or should be sufficiently clear to students to allow them to mark their own work.

Mosquitoes are insects. Many female mosquitoes feed on human blood. They are attracted to humans and land on exposed skin. They then pierce the host's skin and suck their blood.

Traps can be used to catch and kill mosquitoes. Australian scientists compared two mosquito traps to see which was more efficient at catching mosquitoes.

1 Both of these traps used heat and carbon dioxide to attract mosquitoes.
Explain how each of these might attract a mosquito to a human.

1 (a) Heat

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(*1 mark*)

1 (b) Carbon dioxide

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(*2 marks*)

The scientists moved the traps randomly between 12 different sites over 12 nights. Each night the traps were at a different site. They switched the traps on 1 hour before sunset. They switched the traps off 1 hour after sunrise. After they had switched the traps off they examined the mosquitoes they had caught. Their results are shown in the table.

	Trap **A**	Trap **B**
Mean number of mosquitos trapped per night (±standard deviation)	3707 (±604)	2037 (± 480)
Total number of species of mosquito trapped	17	18
Percentage of mosquitos able to transmit Ross River fever from one person to another	47	43

Ross River fever is a disease caused by a virus. Mosquitos can transmit Ross River fever from one person to another. Suggest how.

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(*2 marks*)

3 The total number of mosquitoes caught in trap A was 444 90.
Calculate the total number of mosquitoes caught in trap **A** that were able to transmit Ross River fever. Show your working.

Answer .....

(*2 marks*)

4 An Australian company owns a large outdoor site where its employees work at night. The company wants to protect its employees from mosquitoes. Evaluate the data in the table and suggest which trap it would be better to use.

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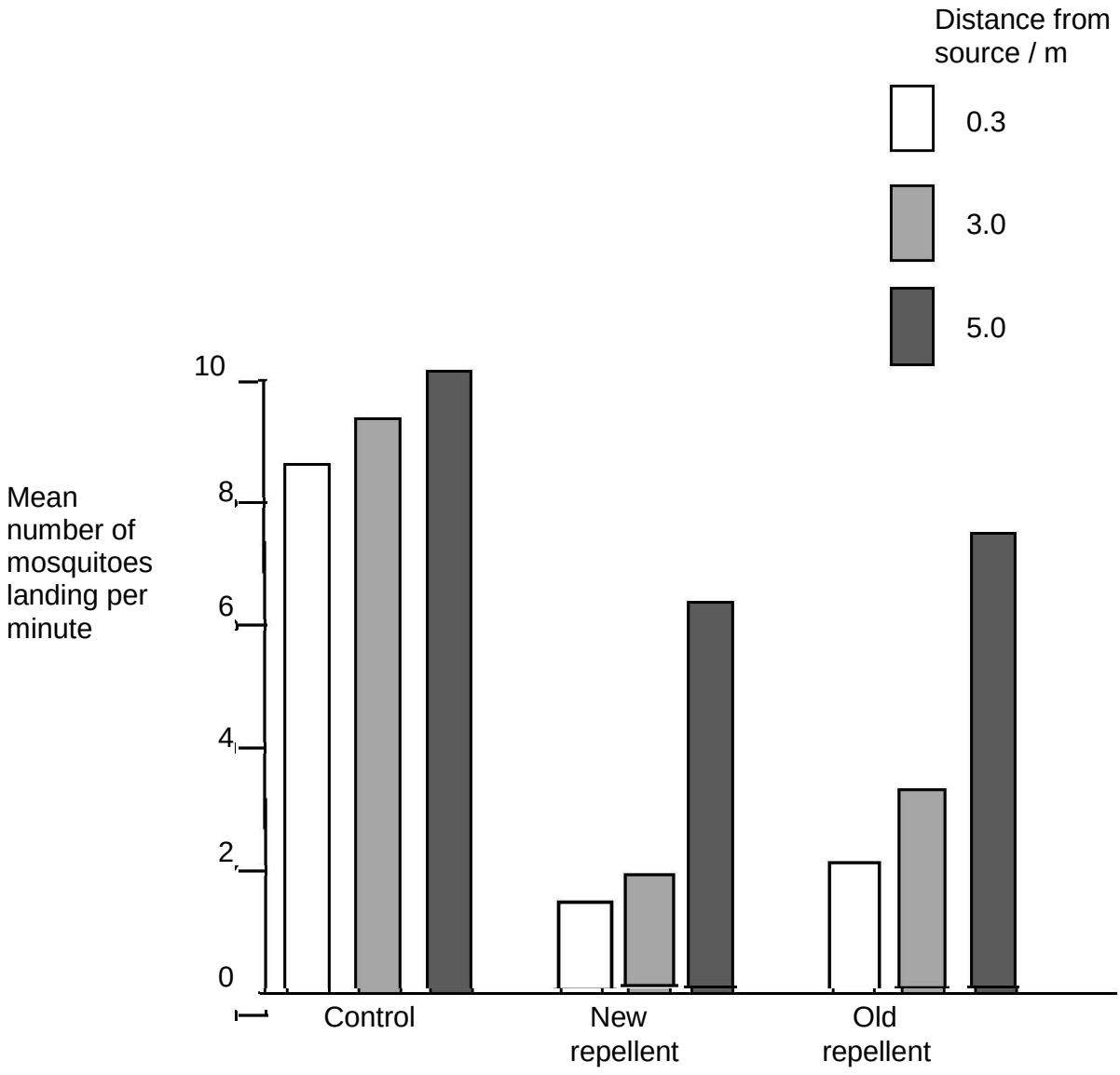
(*3 marks*)

A mosquito repellent is a substance that keeps mosquitoes away. Another group of scientists investigated how distance from a source of mosquito repellent affected the number of mosquitoes landing on a person's arm.

- The scientists placed the mosquito repellent at the centre of a large greenhouse.
- They released approximately 750 adult female mosquitoes into the greenhouse.
- Volunteers then entered the greenhouse. The volunteers wore protective clothing and counted the number of mosquitoes landing on an exposed forearm in a series of 1 minute periods.
- They did this at different points at one of three distances from the source of the repellent.

The graph shows the mean number of landings at different distances from the source of the repellent. It also shows the effect of using new repellent and old repellent. The old repellent had been opened 10 weeks earlier.



5 In this investigation there was a control experiment.

5 (a) Suggest how this control experiment should have been set up.

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(*1 mark*)

5 (b) The results of the control experiment are important in interpreting the results of this investigation. Explain why.

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(*2 marks*)

6 A student read about this investigation. She thought that it might be useful to use the repellent outside at a party she was organising. Explain why the results of this investigation might **not** apply to using the repellent outside.

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(*2 marks*)

Glossary of Terms

Accuracy

A measurement result is considered accurate if it is judged to be close to the true value.

Calibration

Marking a scale on a measuring instrument.

This involves establishing the relationship between indications of a measuring instrument and standard or reference quantity values, which must be applied.

For example, placing a thermometer in melting ice to see whether it reads 0^0C, in order to check if it has been calibrated correctly.

Data

Information, either qualitative or quantitative, that have been collected.

Errors

See also uncertainties.

measurement error

The difference between a measured value and the true value.

anomalies

These are values in a set of results which are judged not to be part of the variation caused by random uncertainty.

random error

These cause readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next.

Random errors are present when any measurement is made, and cannot be corrected. The effect of random errors can be reduced by making more measurements and calculating a new mean.

systematic error

These cause readings to differ from the true value by a consistent amount each time a measurement is made.

Sources of systematic error can include the environment, methods of observation or instruments used.

Systematic errors cannot be dealt with by simple repeats. If a systematic error is suspected, the data collection should be repeated using a different technique or a different set of equipment, and the results compared.

zero error
Any indication that a measuring system gives a false reading when the true value of a measured quantity is zero, eg the needle on an ammeter failing to return to zero when no current flows.

A zero error may result in a systematic uncertainty.

Evidence
Data that have been shown to be valid.

Fair test
A fair test is one in which only the independent variable has been allowed to affect the dependent variable.

Hypothesis
A proposal intended to explain certain facts or observations.

Interval
The quantity between readings eg a set of 11 readings equally spaced over a distance of 1 metre would give an interval of 10 centimetres.

Precision
Precise measurements are ones in which there is very little spread about the mean value.

Precision depends only on the extent of random errors – it gives no indication of how close results are to the true value.

Prediction
A prediction is a statement suggesting what will happen in the future, based on observation, experience or a hypothesis.

Range
The maximum and minimum values of the independent or dependent variables;

For example a range of distances may be quoted as either:

'From 10cm to 50 cm' or

'From 50 cm to 10 cm'

Repeatable
A measurement is repeatable if the original experimenter repeats the investigation using same method and equipment and obtains the same results.

Reproducible
A measurement is reproducible if the investigation is repeated by another person, or by using different equipment or techniques, and the same results are obtained.

Resolution
This is the smallest change in the quantity being measured (input) of a measuring instrument that gives a perceptible change in the reading.

Sketch graph
A line graph, not necessarily on a grid, that shows the general shape of the relationship between two variables. It will not have any points plotted and although the axes should be labelled they may not be scaled.

True value
This is the value that would be obtained in an ideal measurement.

Uncertainty
The interval within which the true value can be expected to lie, with a given level of confidence or probability eg "the temperature is 20 °C ± 2 °C, at a level of confidence of 95 %".

Validity
Suitability of the investigative procedure to answer the question being asked. For example, an investigation to find out if the rate of a chemical reaction depended upon the concentration of one of the reactants would not be a valid procedure if the temperature of the reactants was not controlled.

Valid conclusion
A conclusion supported by valid data, obtained from an appropriate experimental design and based on sound reasoning.

Variables
These are physical, chemical or biological quantities or characteristics.

categoric variables
Categoric variables have values that are labels eg names of plants or types of material or reading at week 1, reading at week 2 etc.

continuous variables
Continuous variables can have values (called a quantity) that can be given a magnitude either by counting (as in the case of the number of shrimp) or by measurement (eg light intensity, flow rate etc).

control variables
A control variable is one which may, in addition to the independent variable, affect the outcome of the investigation and therefore has to be kept constant or at least monitored.

dependent variables
The dependent variable is the variable of which the value is measured for each and every change in the independent variable.

independent variables
The independent variable is the variable for which values are changed or selected by the investigator.

nominal variables
A nominal variable is a type of categoric variable where there is no ordering of categories (eg red flowers, pink flowers, blue flowers)