

Biology

Dealing with data



Answer questions 1-9 on paper

Drawing tables

The conventions for drawing a table are :

- A full grid drawn with lines separating both the rows and the columns.
- The first column contains the independent variable.
- The second column contains the dependent variable. There might be more than one column if the experiment has been repeated.
- The headings to the columns must be descriptive and contain the unit. The unit and title are separated by a solidus ie /

Example

Temperature / ^o C	Time taken for eggs to hatch /h
5	230
10	90
11	70
13	50

Question 1

Catalase is an enzyme. It breaks down hydrogen peroxide to produce water and oxygen. In an investigation, the volume of oxygen produced in one minute was measured when different concentrations of hydrogen peroxide were added to a fixed amount of catalase. The results were put in a table.

Draw the table headings for this experiment on a piece of paper. (3)

Dealing with data in tables

Get into the habit of reading all the data **before** you read the questions.
Write your answers to the following questions **on paper**

Question 2

Scientists carried out a survey of some upland streams in different parts of the UK.
Some of the results are shown in the table.

Stream	pH of pond water	Number of animal species	Number of plant species
1	4.0	5	4
2	7.1	22	19
3	4.4	11	6
4	6.5	20	13
5	5.7	16	9

Describe the relationship between the pH of the streams and the number of plant species. (1)

How could the layout of this table be improved? (1)

Question 3

An investigation was carried out to determine the effect of an increase in environmental temperature on oxygen consumption in a mammal. The table shows the results of this investigation.

Environmental temperature /°C	Oxygen consumption /arbitrary units
5	36
10	30
15	24
20	15
25	10
30	10
35	10

Describe the effect of an increase in environmental temperature on oxygen consumption in this mammal. (2)

Question 4

The effect of carbon dioxide concentration on lung ventilation was investigated. The table shows the results.

	Concentration of carbon dioxide of air breathed in /%					
	0.04	0.80	1.50	3.00	5.50	6.00
Mean volume of one breath/cm	670	740	800	1250	1850	2100
Mean number of breaths per minute	14	14	15	15	16	27

Describe the effect of increasing carbon dioxide concentration on the rate of breathing. (2)

Question 5

In the USA, members of the public found many frogs with deformed legs. A team of scientists measured many different factors and then analysed their results. They found a relationship between the percentage of frogs with deformed legs and the mean number of parasitic worms found in the frogs.

The group of scientists chose six ponds to investigate. All the ponds contained parasitic worms. Three of the ponds were close to fields and received agricultural run-off from these fields. The other three ponds did not receive agricultural run-off.

The scientists built two cages in each of the six ponds.

One cage in each pond allowed parasitic worms to enter and one cage did not.

The scientists put frogs that are not infected with parasitic worms into all twelve cages.

The table shows the results of this investigation.

	Percentage of frogs with deformed limbs					
	Ponds with agricultural run-off			Ponds with no agricultural run-off		
Pond number	1	2	3	4	5	6
Cage with mean mesh diameter of 500 μ m	22	27	24	3	4	7
Cage with mean mesh diameter of 75 μ m	0	0	0	0	0	0

One of the boxes in the table has been shaded. Describe the information given in the shaded box. (2)

Different types of averages

The mean

The sum of the observations divided by the number of observations.

The median

This is the **middle number or value** when all the values have been ranked.

Where there is an even number of values, the median is calculated as the mean on the two middle values.

The mode

This is the **most common** number or value in a set of observations.

The range

This gives a measure of how spread out the data is.

Give the smallest and largest value. Do not subtract them to find the range.

Question 6

3.6, 3.8, 4.0, 4.1, 4.2, 4.2, 4.2, 4.3, 4.3, 4.4, 4.4, 4.4, 4.4, 4.6

Find the mean of the above numbers

What is the median of the above set of numbers?

What is the mode for this set of numbers?

What is the range for this set of numbers?.

Question 7

1, 1, 2, 2, 3, 4, 5, 5, 5, 5, 6, 7, 7, 7, 8, 9, 9, 10, 11

Find the mean of the above numbers

What is the median of the above set of numbers?

What is the mode for this set of numbers?

What is the range for this set of numbers?

Question 8 Measuring fish

Sample	Fish length /cm				
	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5
A	45	57	39	72	51
B	45.0	57.0	39.0	72.0	51.0

Calculate the mean fish length for fish in sample A and B. Think about how many decimal places are appropriate.

Question 9 Diameter of a sample of seeds

The measurements for a sample of seeds are 12.5, 14.0, 11.5, 11.0 and 9.5 mm

What is the mean diameter for these seeds

Give the range for these seed diameters

Question Body 9 Temperatures

The body temperature of six people are shown below.

36.7°C, 37.2°C, 36.5°C, 36.2°C, 39.9°C, 36.5°C

Give the range for these temperatures?

What is the mode of these temperatures?

Find the mean of these temperatures

Identifying anomalous results

Anomalies (outliers) should be identified and excluded from the calculations. The mathematical detail involved in identifying anomalies goes beyond A level Biology.

For experiments a simple check list is this:

- Was the suspected anomaly recorded in error?
- Was the suspected anomaly recorded in different conditions to the other values?

If yes, the anomaly should be omitted from the data.

If spotted at the time of the experiment you should consider repeating the test.