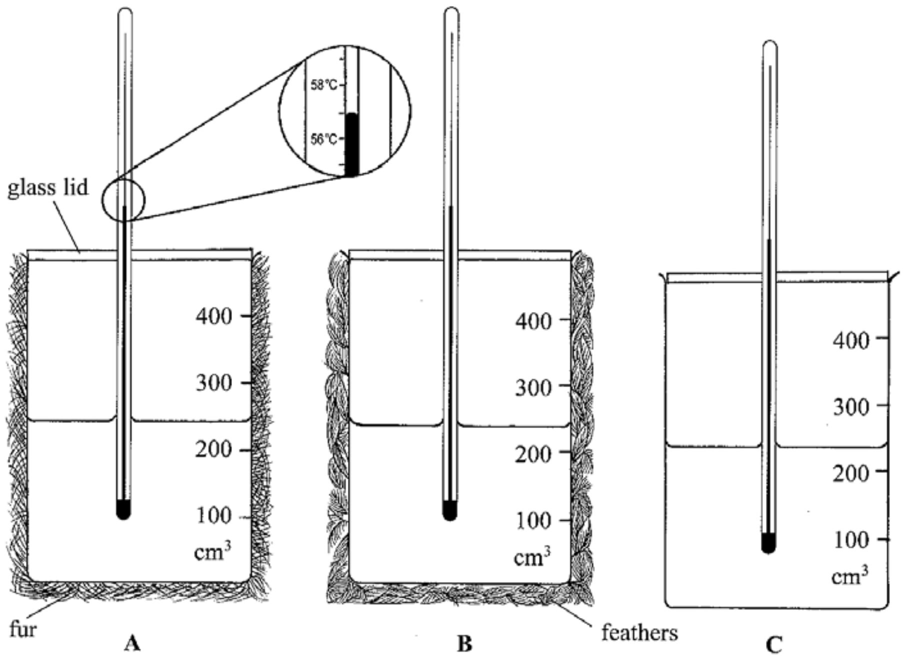
Paper 3

Question1, sample 1

Leave blank

1. A student wanted to study loss of heat from organisms. He used beakers filled with hot water as models of organisms. The diagram shows the apparatus he used.



(a) Look at the thermometer in beaker **A**.

(i) What unit is used to measure temperature?

Celsius

(1) 1

(ii) Write down the temperature of the water in beaker **A**.

57°C

(1) 1

(b) Look carefully at the water level in beaker **C**.

Write down the volume of water and give the units.

~~250~~ 240 cm³

(2) 2

(c) Which beaker do you think would lose heat most quickly? Give a reason for your answer.

beaker C, ~~too~~ because it contain no isolater that prevents escaping of heat

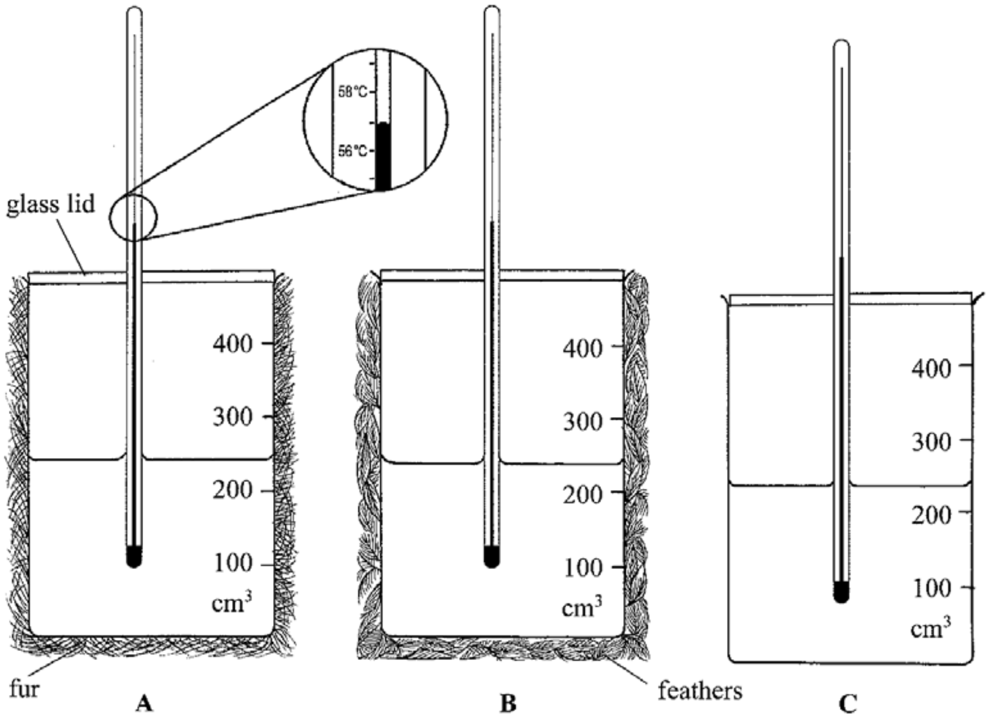
(2) 2

(Total 6 marks) Q1 6

Question 1, sample 2

Leave blank

1. A student wanted to study loss of heat from organisms. He used beakers filled with hot water as models of organisms. The diagram shows the apparatus he used.



(a) Look at the thermometer in beaker **A**.

(i) What unit is used to measure temperature?

Thermometer 0

(1)

(ii) Write down the temperature of the water in beaker **A**.

57°c ✓ 1

(1)

(b) Look carefully at the water level in beaker **C**.

Write down the volume of water and give the units.

250 cm³ ✓ 1

(2)

(c) Which beaker do you think would lose heat most quickly? Give a reason for your answer.

Beakker C ✓ 2

There is no material to keep it from loosing heat hence there will be no stopping of ~~loosing~~ loss of heat. So the most heat loss will occur at Beaker C ✓

(2)

(Total 6 marks)

Q1. 4

Question 1 (out of 6)

This question was an easy introduction to the paper. It provided an opportunity for all levels of candidates to obtain marks for simple observation, measuring and recognition of appropriate units. The final part of the question expected candidates to predict and explain the outcome of heat loss from the beaker lacking in insulation.

Sample 1 (score 6) **A* standard**
All marks were awarded and answers were clear and concise.

Sample 2 (score 4) **B/C standard**
Part (a) (i) had not been read carefully and the term thermometer was therefore erroneous. In part (b) the reading of 250 was incorrect. Examiners are given a range of acceptable answers for this type of question but, in this case, 250 fell outside the accepted range.

Question 2, sample 1

Leave blank

2. The five steps listed below describe how to test a food sample for a simple sugar (reducing sugar). benedicts

The steps are in the correct order.

1. Crush food sample in some water, using a pestle and mortar.
2. Put crushed food sample in a test tube and add reagent A.
3. Place the test tube in a water bath at 70 °C.
4. Leave for 2 minutes.
5. Look to see if there is a colour change.

(a) (i) Why is the food sample crushed in step 1?

To increase its surface area and make it softer for testing ✓ 1

(1)

(ii) What is the name of reagent A added in step 2?

Hydrochloric acid

(1)

(iii) In step 3 the test tube is heated. Why is a water bath used rather than heating the test tube directly with a Bunsen burner?

In order to keep the temperature constant and not raise it quickly to obtain the correct results. ✓ 1

(1)

(iv) Suggest why step 4 is needed.

In order to cool down. ✗

(1)

(b) Two food samples were tested. Complete the table below to show the colours you would expect.

Colour of reagent A at start	Colour of reagent A at end	
blue ✓	food sample containing glucose	brick red ✓
blue	food sample containing protein	Colourless ✗

(3) 2

(Total 7 marks)

Q2 4

Question 2 (out of 7)

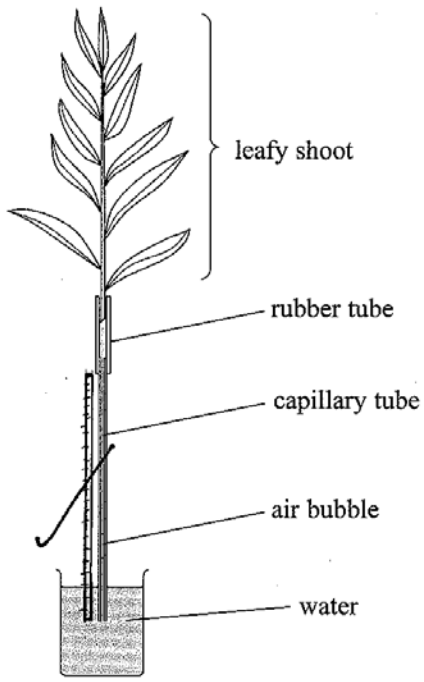
This question gave candidates the opportunity to demonstrate their understanding of the methods used in a simple food test. An element of recall is needed together with some clear thinking about the reason for carrying out certain procedures.

Sample 1 (score 4) **B/C standard**
The need to increase the surface area of the food sample was clearly understood, as was the need to adopt a safe procedure for heating the contents of the test tube. However, this candidate could not recall that Benedict's solution is used to test for reducing sugars or that time is needed to allow the colour change to take place. In (b), the colour blue was required.

Question 3, sample 1

Leave blank

3. A student set up apparatus to investigate the rate of transpiration from a leafy shoot. A diagram of the apparatus is shown below.



(a) Name **one** piece of the apparatus that contains water.

beaker

(1) 1

(b) Where on the apparatus is it important to have an air tight seal?

So as not to block xylem by air

(1) 0

(c) To measure the rate of transpiration the student also used a ruler and a stopclock.

(i) Draw a ruler on the diagram to show where it should be placed.

(1) 1

(ii) In what unit would the student measure the rate of transpiration?

Cm/minute

(1) 1

Q3 3

(Total 4 marks)

Question 3 (out of 4)

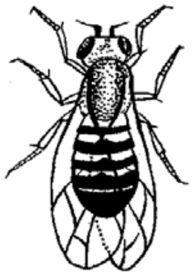
This question showed a simple photometer and candidates were asked about its set up and use. Most were able to state where water would be during the experiment and to identify where a water tight seal was needed. Although most candidates could show where a ruler should be placed to measure water loss, some candidates failed to overlap the ruler scale with the air bubble. The weakest responses placed the ruler at right angles away from the apparatus, as used in experiments on the effect of light intensity on the rate of photosynthesis.

Sample 1 (score 3) **A/B standard**
The ruler clearly overlaps the air bubble, the beaker does contain water and the units would allow the rate to be calculated as they show a time unit together with a volume unit. The answer to part (b) would suggest that the question had been misunderstood, or had been read too quickly.

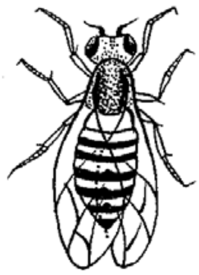
Question 4, sample 1

Leave blank

4. The fruit fly is an organism used in studies of inheritance. Male and female fruit flies look different. You can see these differences in the diagram.



male fly



female fly

One mutant strain has very small wings. These are known as vestigial wings.

female fly with small (vestigial) wings

A biology teacher set up a cross between male fruit flies with normal wings and female fruit flies with small (vestigial) wings.

The offspring are shown on page 7.

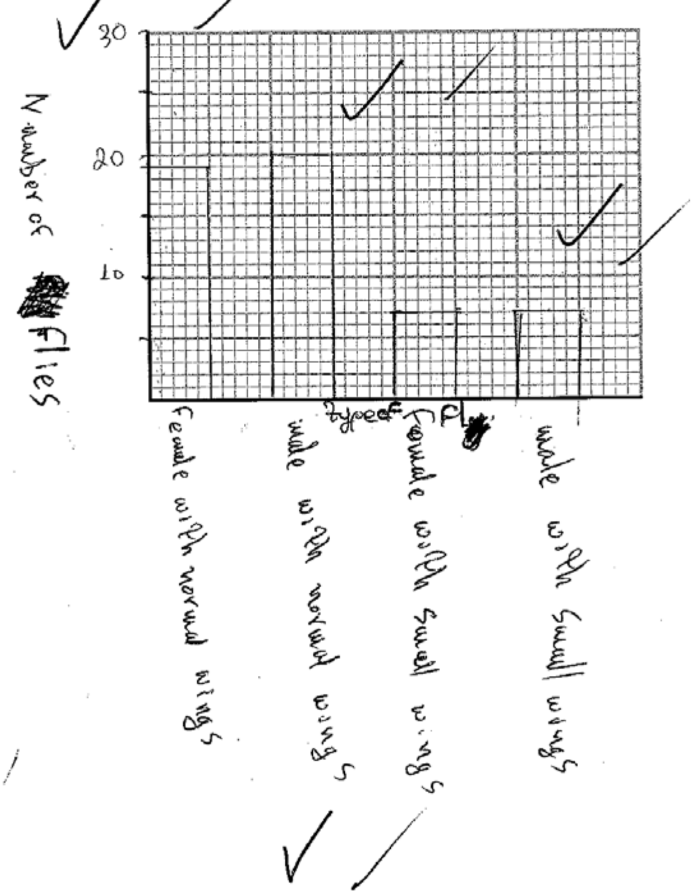
Leave blank

(a) (i) Count the number of male and female flies with small wings and put the tally and the total in the table below. The flies with normal wings have been done for you.

Type of fly	Tally	Total
female with normal wings	///// ///// ///// ////	19
male with normal wings	///// ///// ///// /////	20
female with small wings	///// //	7
male with small wings	///// //	7

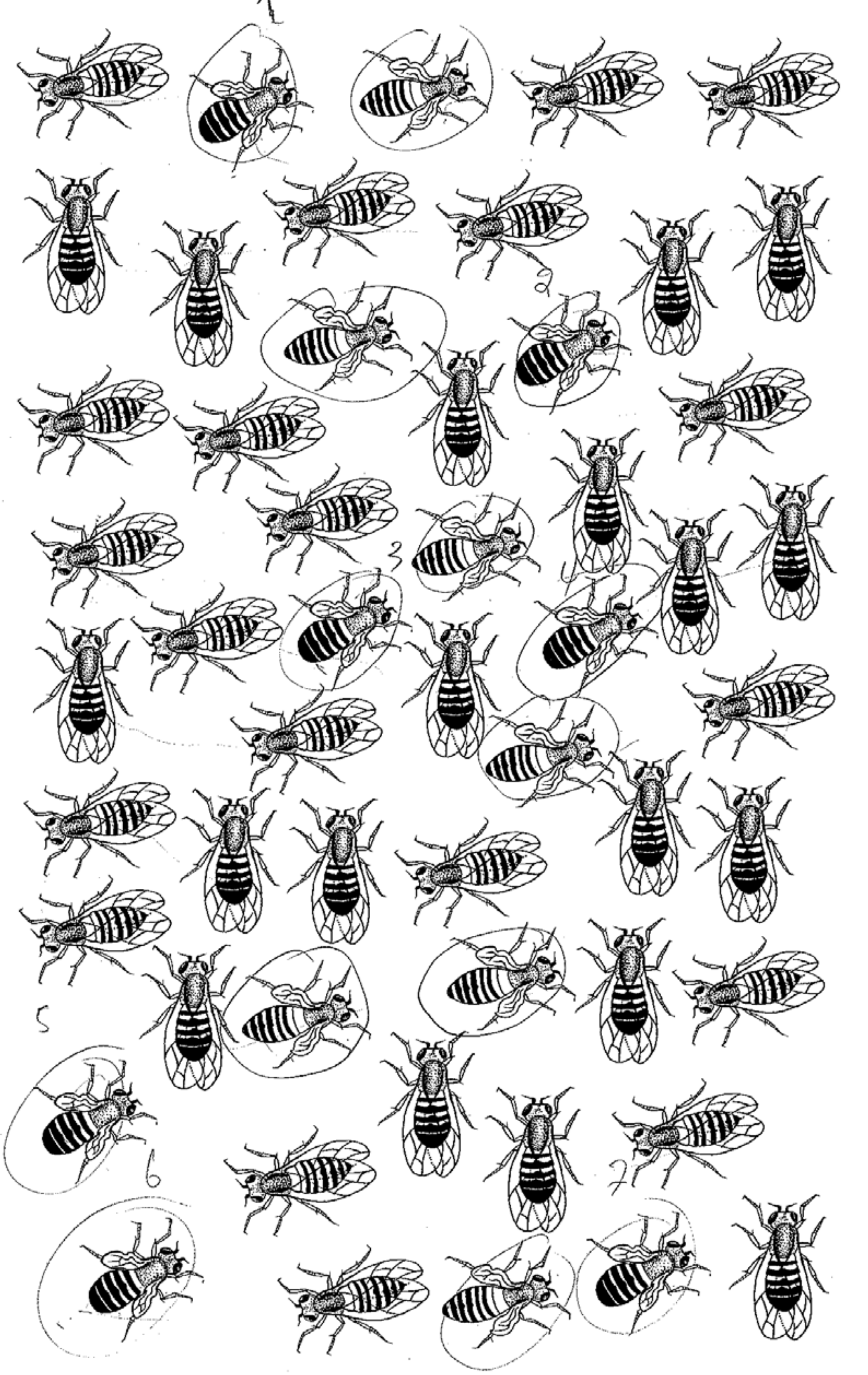
(4)

(ii) Plot a bar chart of the four types of flies produced.



(4)

Leave blank



Leave blank

(b) (i) Use the information from the table in part (a) to work out the total number of each of the following.

The total number of male flies is 27

The total number of female flies is 26

The total number of normal winged flies is 39

The total number of small winged flies is 14

(4)

4 4

(ii) Describe **one** pattern that you can see in these results.

The pattern is that most of the flies both male and females are normal wing.

(2)

1 1

Q4

(Total 14 marks)

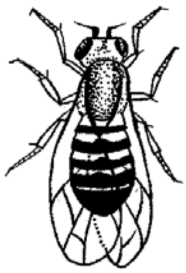
13

13

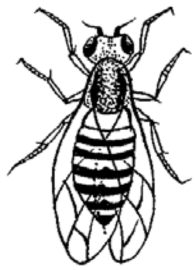
Question 4, sample 2

Leave blank

4. The fruit fly is an organism used in studies of inheritance. Male and female fruit flies look different. You can see these differences in the diagram.



male fly



female fly

One mutant strain has very small wings. These are known as vestigial wings.

female fly with small (vestigial) wings

A biology teacher set up a cross between male fruit flies with normal wings and female fruit flies with small (vestigial) wings.

The offspring are shown on page 7.

Leave blank

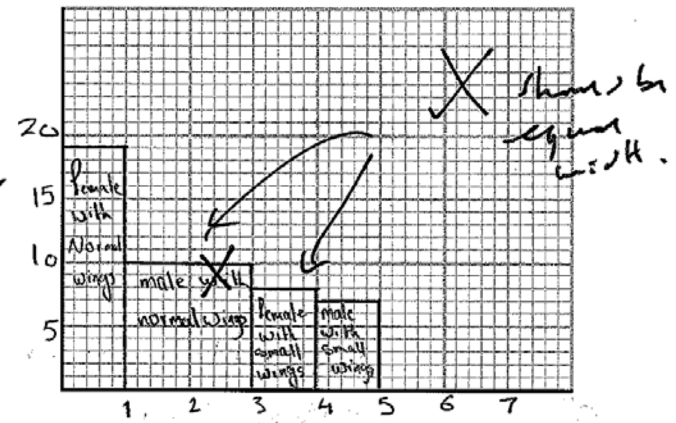
(a) (i) Count the number of male and female flies with small wings and put the tally and the total in the table below. The flies with normal wings have been done for you.

Type of fly	Tally	Total
female with normal wings	///// ///// ///// ////	19
male with normal wings	///// ///// ///// /////	20
female with small wings	/////////	8
male with small wings	///////	7

(4)

3

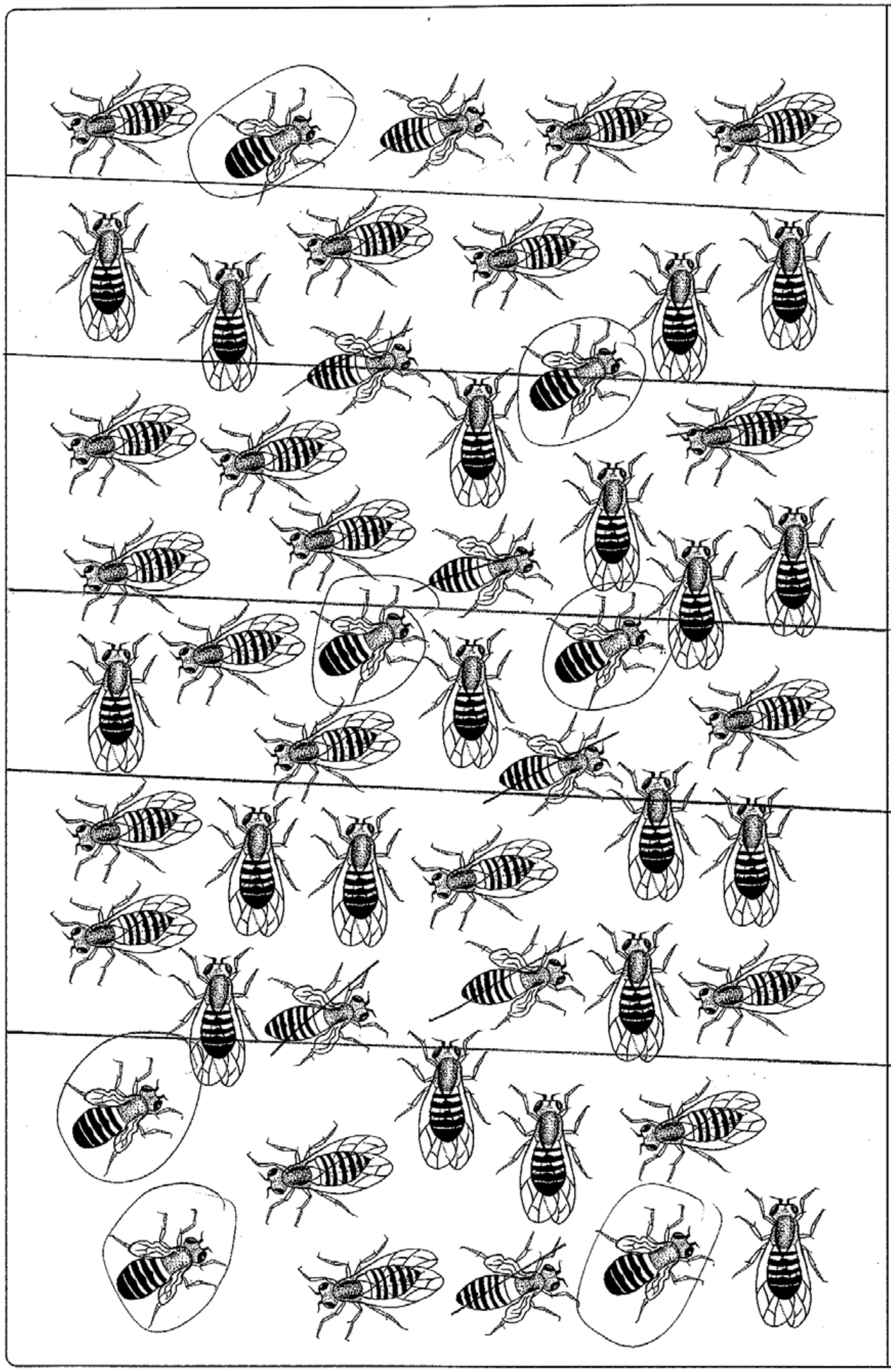
(ii) Plot a bar chart of the four types of flies produced.



(4)

2

Leave blank



Leave blank

(b) (i) Use the information from the table in part (a) to work out the total number of each of the following.

The total number of male flies is ....27....

The total number of female flies is ....27....

The total number of normal winged flies is ....39....

The total number of small winged flies is ....15....

(4) 4

(ii) Describe **one** pattern that you can see in these results.

....Count the number of each type of flies....

(2) 0

Q4

(Total 14 marks) 9

Question 4 (out of 14)

This question enabled candidates to demonstrate their abilities in observing, data handling and analysis. They were required to classify and count the offspring from a Drosophila cross, produce a tally chart and use it to draw a bar chart. Those candidates who miscounted were allowed credit for their subsequent bar charts, thus ensuring that the marks for each component of the question were independent. Candidates were also asked to describe a pattern seen in the results and full credit could have been gained from a description of the sex ratio or the 3:1 ratio observed in the offspring.

Sample 1 (score 13) **A*/A standard**
All answers were correct up until part (b) (ii), where insufficient detail was given to warrant both marks. With reference to the graph, a bar chart had been drawn with correctly labelled axes and all the bars were at the correct heights.

Sample 2 (score 9) **C standard**
This paper is useful to show how the idea of transfer error works. In (a) (i) the tally of 8 is incorrect but this did not prevent the candidate from gaining a mark for totalling the tally as 8. Similarly, in the graph the height of 8 was credited, and this transfer error continued to be credited in part (b) (i). The graph lost two marks because of the unequal widths of bars and lack of information about what the numbers mean on the vertical axis. The numbers on the horizontal axis constitute an error. This candidate was unable to describe an acceptable pattern that is seen in the results.

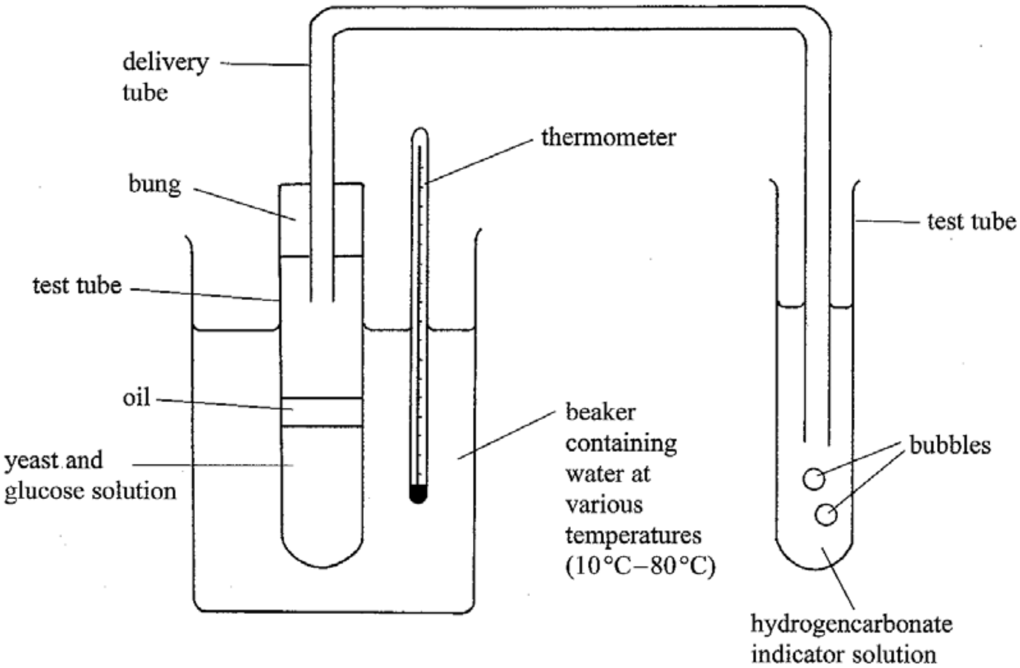
Question 5, sample 1

Leave blank

5. David carried out an investigation into the effect of temperature on anaerobic respiration in yeast. The only factor that he changed was the temperature of the reaction mixture. He was careful to control all other key factors that might affect the rate of respiration in yeast.

David predicted that the rate of respiration in yeast would increase as the temperature increased.

The apparatus he used is shown in the diagram.



David counted the bubbles of carbon dioxide being given off in one minute as the yeast respired.
He did this three times for each temperature he used.

(a) Why did David put oil on the surface of the yeast and glucose solution?

To exlude any oxygen interfering with the yeast and glucose solution **(1)**

1

(b) State **one** key factor that David should control and suggest how he might do this.

Factor The temperature

How controlled Use a thermometer in order to be aware of any temperature changes **(2)**

0

QUESTION 5 CONTINUES OVERLEAF

Leave blank

(c) David put his results into a table.

Temperature in °C	Number of bubbles of carbon dioxide released in one minute			
	First count	Second count	Third count	Average
10	10	10	9	9.7
20	21	22	20	21.0
30	40	38	41	39.7
40	55	54	53	54.0
50	60	65	64	63.0
60	54	52	30	45.3
70	31	30	29	30.0
80	0	0	0	0.0

1

(i) Calculate the average number of bubbles released in one minute at 40 °C. Write your answer in the empty box in the results table.

(1)

(ii) Using the results in the table, describe the effect of increasing the temperature on the rate of respiration in yeast.

As the temperature increase from 10°C to 50°C the rate of respiration in yeast increases. However from 60°C to 80°C the rate of respiration in yeast starts to fall.

(more CO_2 bubbles are released per minute).

(2) 2 2

(iii) David had predicted that the rate of respiration in yeast would increase as the temperature increased. To what extent do his results support this prediction?

David predicted that up to a point because as we can see the rate of respiration in the yeast decrease from 60°C to 80°C, so too high temperatures do not favour the rate of respiration of yeast.

(2) 2 2

Leave blank

(iv) Using your biological knowledge, explain the average result at 80 °C.

As we can see in the average result at 80C no bubbles are released at any count. That shows that respiration doesn't take place at the high temperature of 80C°. **(2)** 1

(d) Identify **one** anomalous (unexpected) result in David's table.

The third count in 60C which was smaller compared to the first and second count. **(1)** 1

(e) (i) Suggest **one** way that this experiment could be modified to improve the reliability or accuracy of the results. Explain how your modification could improve the results.

Modification Test for CO_2 which is produced during respiration in yeast (fermentation).

Explanation use the same solution of yeast and glucose and put lime water on the second test tube to test for the production of CO_2. **(2)** 0

(CO_2 turns lime water milky).

(ii) Suggest a further experiment David could carry out and explain how it would provide more information on the effect of temperature on respiration in yeast.

David could carry out this experiment by using a lamp or a bunser burner flame to explain the effect of temperature on respiration in yeast. **(2)** 0

Q5 8

(Total 15 marks)

TURN OVER FOR QUESTION 6

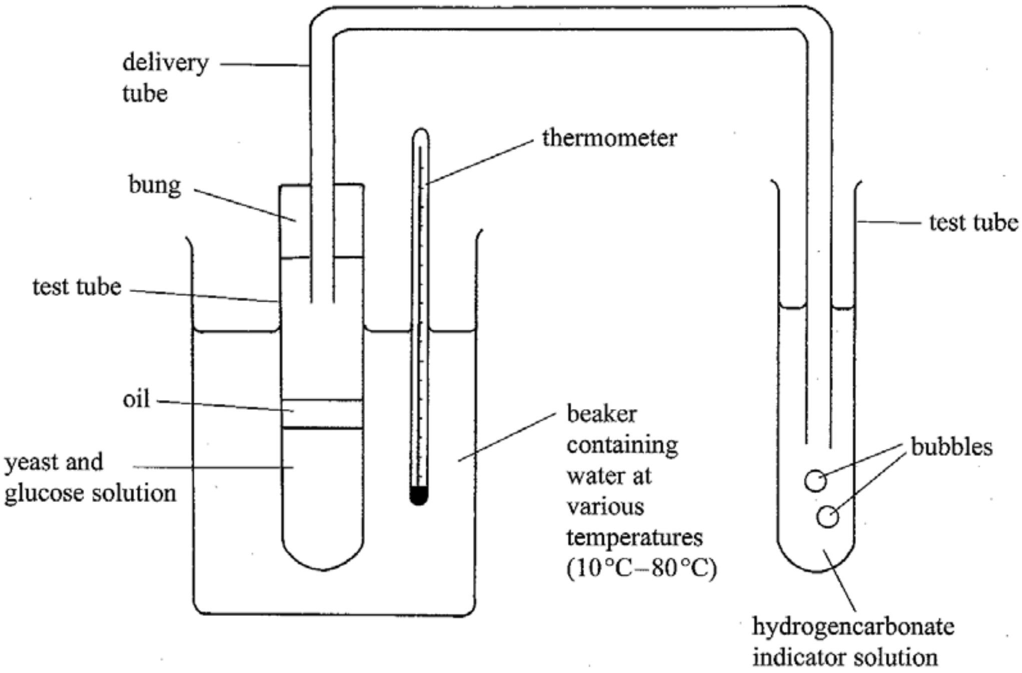
Question 5, sample 2

Leave blank

5. David carried out an investigation into the effect of temperature on anaerobic respiration in yeast. The only factor that he changed was the temperature of the reaction mixture. He was careful to control all other key factors that might affect the rate of respiration in yeast.

David predicted that the rate of respiration in yeast would increase as the temperature increased.

The apparatus he used is shown in the diagram.



David counted the bubbles of carbon dioxide being given off in one minute as the yeast respired.
He did this three times for each temperature he used.

(a) Why did David put oil on the surface of the yeast and glucose solution?

To prevent the entry of any gases. ? ✓ / A. **(1)** 1

(b) State **one** key factor that David should control and suggest how he might do this.

Factor Oxygen

How controlled he had ~~to~~ put oil and a bung 0

(2)

QUESTION 5 CONTINUES OVERLEAF

Leave blank

(c) David put his results into a table.

Temperature in °C	Number of bubbles of carbon dioxide released in one minute			
	First count	Second count	Third count	Average
10	10	10	9	9.7
20	21	22	20	21.0
30	40	38	41	39.7
40	55	54	53	54 ✓
50	60	65	64	63.0
60	54	52	30	45.3
70	31	30	29	30.0
80	0	0	0	0.0

(i) Calculate the average number of bubbles released in one minute at 40 °C. Write your answer in the empty box in the results table.

(1)

(ii) Using the results in the table, describe the effect of increasing the temperature on the rate of respiration in yeast.

increasing the temprefure increases the rate of realising bubles but until 60 °C the bubles starts to decrease ✓

(2) 1

(iii) David had predicted that the rate of respiration in yeast would increase as the temperature increased. To what extent do his results support this prediction?

the results doesnt support his prediction because on 60°C all ~~but~~ no. ~~#~~ of bubles starts to decrease ✓

(2) 1

Leave blank

(iv) Using your biological knowledge, explain the average result at 80 °C.

at 80°C all enzymes are denatured
so ~~no~~ 0 bubles are released so
The average of all the three
Counts is (0)

(2) 1

(d) Identify **one** anomalous (unexpected) result in David's table.

at 10°c at third count, bubles shouldnt
decrease

(1) 0

(e) (i) Suggest **one** way that this experiment could be modified to improve the reliability or accuracy of the results. Explain how your modification could improve the results.

Modification use a graduated gas jar

Explanation ~~to show~~ so as to show the
amount of bubles clearly instead of counting
them

(2) 1

(ii) Suggest a further experiment David could carry out and explain how it would provide more information on the effect of temperature on respiration in yeast.

Put a certain amount of yeast and glucose
in a Conical Flask a close in carefully
to prevent oxidation of ethanol then
heat the mixture, the more you heat
the more bubles are released until
enzymes are denatured

(2) 0

(Total 15 marks)

Q5 5

TURN OVER FOR QUESTION 6

Question 5 (out of 15)

This question described the sort of investigation a candidate might carry out. Many candidates were able to recognise the role of oil in keeping the conditions anaerobic. However, a significant number could not correctly identify a key factor that needed to be controlled. A factor such as glucose concentration was anticipated, which could be controlled by carefully measuring and using the same volume and mass for each temperature. Candidates were usually able to calculate an average based on raw data. To gain full credit when describing results candidates were expected to describe the increase in respiration with temperature up to 50 ^{o}C and the decline after this temperature. The best candidates were able to explain how high temperatures denature enzymes by changing the shape of the active site, and that this would lead to little respiration. Almost all candidates were able to identify the anomalous result at 60 ^{o}C.

Candidates had most difficulty in suggesting one way that the reliability or accuracy of the experiment could have been improved and to explain how it would improve the experiment. To improve accuracy, the gas could have been collected in a gas syringe or an inverted measuring cylinder. This could be explained by describing how counting bubbles is inaccurate because bubbles have different volumes. To improve reliability, candidates could have suggested taking more readings at each temperature. This could be explained by describing how more readings increases confidence in the average result, reducing the effect of any atypical or anomalous result.

Finally, candidates are asked to suggest a further experiment that would provide more information on the effect of temperature on respiration. Some of the best responses described how the study could be extended by examining more temperatures either side of 50 ^{o}C to discover the optimum more precisely.

Sample 1 (score 8) **C/D standard**
A good start but temperature is not an acceptable factor that should be controlled. This factor is varied in this experiment. The correct average was calculated and acceptable answers were given to describe the results and to comment on their relationship to the prediction. It is always a good idea to quote figures in support of answers to these types of question. The biological knowledge expected in (c) (iv) was not present other than appreciating that there would be less respiration. The reason why is missing from this answer. Identification of the anomalous result was correct but, possibly because the terms reliability and accuracy are poorly understood, the answers to (e) (i) and (ii) gain no credit.

Sample 2 (score 5) **D/E standard**
Gases was generously accepted in (a). The answer to (b) suggested that this candidate had an unclear understanding of the biology involved. In (c) (ii), a mark was lost by stating 60^{o}C rather than 50^{o}C. The mark awarded was for appreciating an increase followed by a decrease. In (iii), two ideas were expected: firstly, the idea of some support as there is an increase; and, secondly, the idea that there is a lack of support since there is a decrease after 50^{o}C. This candidate gets a mark for the latter idea. In (iv), credit is given for appreciating that enzymes would be denatured but the fact that no bubbles would be produced is not deemed to be as good an explanation as there being less respiration. Candidates are encouraged in ‘explain’ questions to use their relevant biological knowledge. The anomalous result was not identified and although an acceptable modification was given, the explanation of ‘amount’ was not clear enough for reward.

Question 6, sample 1

Leave blank

6. Describe how you could compare the population size of a plant growing in two different places. One place is on the side of a hill and the other place is on a piece of flat ground.

experemental: throw a quadrat in the hill randomly and then count the ~~no~~ number of ~~pa~~ plants in the quadrats including the edges, ~~then~~ ~~go~~ repeat the same steps in flat ground

~~rel~~ reliability: ~~reep~~ repeat the steps 5 times and then take the average

4

Q6 4

(Total 4 marks)

TOTAL FOR PAPER: 50 MARKS

Question 6, sample 2

Leave blank

6. Describe how you could compare the population size of a plant growing in two different places. One place is on the side of a hill and the other place is on a piece of flat ground.

It is impossible to go on counting the plants and get the perfect value. Hence, we have to estimate. We measure a metre square of the land on a flat ground and see how many plants are there in the metre square. Hence multiply the value in higher term of kilometers to get the estimated value of plants on a piece of flat ground. Then you find out the surface Area of the sloping area of the triangular hill and use the same method to calculate the estimated value and we compare each other looking at the estimated values of plants over a piece of surface area. per plants growing.

Q6 4

(Total 4 marks)

TOTAL FOR PAPER: 50 MARKS

END

Question 6 (out of 6)

This question asked candidates to describe how they could compare population sizes on flat and sloping ground. Many candidates did not describe an experiment at all, but stated the different factors found on flat and sloping ground. There were some excellent accounts describing how quadrants could be used to count the number of plants in a specific area and then repeating this to scale up the results to estimate the population size. This exercise should be repeated on both the flat and sloping ground.

Sample 1 (score 4) **A* standard**
All the elements needed to provide a full answer are present and they are stated in a pleasingly concise, erudite manner.

Sample 2 (score 4) **A*/A standard**
All the elements needed to score full marks are evident but the candidate overwrites the answer. The first sentence, for example, is unnecessary.

For more information on Edexcel International, please contact our International Customer Services on +44 (0) 190 884 7750 or visit www.edexcel.org.uk/international

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: 190 High Holborn, London WC1V 7BH, UK

edexcel INTERNATIONAL