



**General Certificate of Education**

**Human Biology 1406**

**HBI3T      Investigative and Practical Skills  
Assessment**

**Report on the Examination**

*2009 examination - June series*

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## **General**

The introduction of a new specification always brings change but the move to ISAs as a method of assessing A-level practical work followed the pattern already established by AQA at GSCE. This meant that many centres already had experience of carrying out a prescribed investigation and assessing their candidates' work by following Marking Guidelines. The AS ISAs provided a choice of two investigations; these will be replaced by two new AS ISAs next year.

Both the current ISAs were attempted in roughly equal numbers. Some centres clearly chose one ISA and every candidate carried out that investigation. Other centres appear to have found the time to do both, and then selected the best mark. Some centres used the help offered by the Assessment Advisers. Others would have benefited from using this service, as practical problems relating to equipment, concentrations, timings etc could have been resolved at an early stage.

The standard of assessment varied greatly between centres. In the best instances, the accuracy of marking was comparable to that expected of standardised examiners marking a written paper. At the other end of the spectrum, there were centres that appeared to have ignored the Marking Guidelines, and to have credited anything that was more or less biologically correct, irrespective of its relevance to the question.

## **Stage 1**

Many candidates produced excellent tables showing their raw data. Descriptions of both variables were detailed and had clear titles. A few relied on the title of the table to make their variables explicit, which was acceptable. The vast majority correctly placed their independent variable in the first column. Those who did not replaced it with 'trial' numbers. Some candidates recorded the units within the column. In a few cases this had been given credit when it should not have been. It was clear that some candidates were uncertain over the units of time; they confused minutes and seconds with minutes and decimal parts of a minute.

Candidates at some centres appeared not to have been given enough time to complete sufficient repeats, covering a wide enough range of the independent variable. There is no time limit on the practical part of the ISA and candidates may carry out extra trials on subsequent occasions.

Some centres failed to provide candidates with solutions which enabled them to collect data within a reasonable amount of time. Trials are carried out when the tests are set to check that the timings and concentrations given lead to a successful outcome. Any concerns of this nature should be discussed with an Assessment Adviser. Details are available from the AQA Offices, Manchester.

In some centres, all the tables were very similar in layout. Rehearsing Stage 1 is not acceptable.

All centres attached the table to the ISA. Some chose to make an A4 booklet of Stages 1 and 2 which kept all the work together.

**Stage 2**

Most candidates were able to calculate the means of their raw data, although some were uncertain how many decimal places were appropriate.

Some centres were uncertain what additional calculations to carry out. Others used rates, either of increase in heart rate from resting rate (Option P) or of digestion of starch (Option Q). Standard deviations were calculated, these are acceptable even though the specification does not require it. Unfortunately, a few centres chose to calculate the rate of recovery. The collection of data in order to do this was outside the framework of the investigation. It was surprising that, despite there being more than one option for an additional calculation, in most centres all the candidates did the same calculation. Such a strategy should not be discussed in advance. If no calculation was carried out, no mark should be awarded. Centres who awarded marks in these circumstances risked taking the marks out of tolerance.

Many candidates produced excellent graphs showing the mean data, and others showed data which had been processed further. Some candidates chose to carry out additional calculations, and then plotted their mean results. This was acceptable but surprising.

Almost all candidates correctly put the independent variable on the x-axis and the dependent variable on the y-axis.

Many candidates selected suitable scales in terms of the size of the graph. Some used non-linear scales. This was most frequent on the x-axis, and usually involved a gap which was too large or too small at the start. Very few graphs were drawn on computers.

The labels on the axes varied in quality. Those candidates who chose to plot mean data generally produced more appropriate labels. Some neglected to add the label 'heart rate' or 'beats per minute'; both were needed. Labels showing variables and units of rates were often inaccurate.

Generally, the points were plotted accurately, and most centres checked this aspect carefully. Line graphs were drawn as points joined by straight lines, or lines of best fit; both were acceptable. A few candidates produced graphs that were families of lines; they had not placed one variable on each axis. Most were neatly presented and easy to read.

One centre solved the problem of recording the allocation of marks for the graph by printing a sticky label with all the marking points, and ticking or crossing next to them. This made the task of moderating the graph very straightforward.

**ISA P: The effect of exercise on pulse rate****Question 1**

Most candidates knew that it was important to let the pulse rate return to its resting rate before attempting the next trial. Some chose to use the term 'normal' but this was not acceptable as it could refer to a normal exercising, resting, or sleeping rate. Only the best explained how an investigator would know that resting rate had been achieved and so enough time had passed.

**Question 2**

It was easy to see a pattern in the data, and most candidates described it. Some centres had trained their candidates to quote figures when describing a pattern, these candidates scored best. The terms 'outliers' and 'anomalies' were acceptable in the correct context. A number of centres wrongly credited answers along the lines of, 'Because I can work out an average'.

**Question 3**

Candidates struggled to explain what they meant by these two terms, and the weakest used the term they were trying to explain in their explanation. Some are happy to monitor temperature by measuring it only once; this was not acceptable.

**Question 4**

The answers to the problem of the length of time used to take the pulse were very varied. Many candidates appreciated that it would slow down over time. It was good to see comments relating to the multiplication of errors when shorter times are chosen.

**Question 5**

Most candidates offered 'stroke volume', fewer suggested multiplying this by 'heart rate', and some were unable to explain the relationship between the two terms. It was marked well.

**Question 6**

A wide variety of answers was offered, embracing many different aspects of physiology. Fully correct answers were only offered by the best candidates. Some markers had chosen alternative answers to credit; these were not acceptable during moderation as, generally, they did not answer the specific question.

**Question 7**

This question had frequently been rewarded too generously when markers ignored the need to comment on the levelling off at a particular time. About half the candidates noticed the drop but failed to add the description of the rest of the line.

**Question 8**

Candidates were generally able to describe the data but tended to consider either the response to exercise, or the resting pulse rate. Very few explanations were offered.

**Question 9**

Answers about calculating a mean had frequently been credited regardless of whether any reference was made to the reliability of that mean. Many candidates did not make that point. Candidates should be made more aware about the use of extra data for carrying out statistical calculations.

**Question 10**

There was a good range of credit-worthy answers but some markers had credited 'to take continuous data' which was not in the Marking Guidelines and was in the stem of the question. As there was no requirement to collect data during the exercise, it was of no advantage to collect data at that time. Apart from these answers, most candidates were able to offer at least one acceptable advantage.

**Question 11**

Candidates were quite likely to quote figures in their answers. Most were able to see the differences in rate between the two groups but few referred to the fact that the rate levelled off after it had risen.

**Question 12**

'For comparison' was frequently and confidently both offered and credited.

**Question 13**

Very few candidates had accurate ideas about definitions of these terms, and often mixed range with standard deviation. Very few looked at the data in the table and made comparative comments between the two groups.

**Question 14**

Most candidates know that athletes develop stronger hearts. Some went on to link this idea to having a larger stroke volume. Very few linked these features to being able to have a lower heart rate. Weaker candidates directed all their comments to the athlete rather than to the heart.

**Question 15**

Calculations of percentage remain a challenge for many candidates.

**Question 16**

There were many generalised answers to this question, and no references to reliability.

**Question 17**

This was the most frequently over-marked question of the ISAs this year. Most candidates picked out two or three facts from the table and quoted them almost verbatim. No additional information was offered. This had been credited by many markers who failed to appreciate that whole statements from the Marking Guidelines had to be in the answers for marks to be awarded. Aerobic respiration, ATP production, the need for energy by muscles, and the diffusion of oxygen were rarely mentioned by candidates.

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**ISA Q: The effect of temperature on the rate of the reaction catalysed by amylase****Question 1**

This question was generally well answered and well marked.

**Question 2**

Most candidates recognised the need to maintain a constant temperature. The equilibration of the solutions was an acceptable alternative.

**Question 3**

Most candidates recognised that time was needed for equilibration.

**Question 4**

The water bath was needed to avoid fluctuations in room temperature; relatively few candidates appreciated this. If no water bath is available, monitoring of room temperature should involve several temperature measurements; a minimum of two was acceptable.

**Question 5**

Many suggested looking for a red-brown colour, or the lack of black. Some incorrect colours had been credited. The term 'clear' is not a generic answer for any colour. Rarely was it suggested that comparison should be made with some kind of standard, such as a solution of iodine.

**Question 6**

This question was answered and marked in varying ways. There was an expectation of a graph to be plotted for this specific task. Many suggested drawing a line of best fit, and this was recognised in the marking. The final mark was for extrapolation and instructions as to how to read off the time. These should be clear enough to carry out. Too much credit had been given to answers with no reference to extrapolation.

**Question 7**

There was generally a good understanding of how to make up solutions of this type. Those who answered incorrectly were generally out by a factor of ten.

**Question 8**

Some confusion appeared to exist in the minds of candidates and markers over the distinction between a control and the use of a controlling variable. Descriptions of the latter were not considered creditworthy. Answers referring to reliability were not acceptable.

**Question 9**

There were many unhelpful suggestions regarding the ease of reading the graph. Those who knew the correct answer used the descriptive terms with confidence.

**Question 10**

This question was answered very vaguely by many candidates, who failed to recognise that the variability was about the mean. Suggestions about the range were inappropriate.

**Question 11**

As a standard answer has appeared for similar questions on previous theory papers, this was generally well answered and accurately marked. There appears to be a growing trend for candidates to describe an enzyme 'denaturing' rather than 'being denatured'. Both were credited this time.

**Question 12**

Answers of testing 'at a range of different temperatures' were regarded by some markers as the same as the answer 'at lower temperatures' that was given in the Marking Guidelines. This was not supported during moderation as testing at higher temperatures would not provide more useful results. Many candidates had little idea of suitable suggestions to make. Sometimes the same answer was phrased in two different ways and given two marks. Candidates should be trained to be more specific with regard to 'volume' or 'mass', and not to refer to 'amounts'.

**Question 13**

This question challenged many candidates who did not appreciate the need for a mass and a volume. Most frequently, one or the other was offered. Mmol was accepted this year, but centres are asked to use SI units in future.

**Question 14**

Many candidates filled all the space in writing their answers but most wrote vaguely around the subject. Some recognised the difference in concentration in the table, but failed to explain how those differences were achieved. Only the best were able to explain how the higher concentrations ended up in the blood of pancreatitis sufferers.

**Question 15**

A large number of candidates offered 'no bias' as a suitable explanation. Weaker candidates only suggested 'fair test' and, regrettably, this had been deemed acceptable by some markers.

**Question 16**

Credit had frequently been given when answers made no reference to the mean. Correct answers also needed to refer to the increased concentration of amylase in the blood.

**Question 17**

Most candidates appeared to be unfamiliar with the use of isotonic solutions. A small number of the best candidates mentioned the idea of osmosis, but most were unable to apply theoretical ideas to a practical situation. Weaker candidates suggested that the saline solution moved by osmosis.

**Question 18**

Generally, this question was well answered. A small number found reading the figures from the graph difficult.

**Question 19**

Most candidates missed the point of this question. They appreciated that means could be compared, but not that size might affect reliability.



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**Question 20**

With the increased use of 'How Science Works' in schools and colleges it was disappointing that so few candidates were able to comment on the various pieces of information that would have been useful, such as sample size, levels of disease, or side effects. Good answers including these points were very rare. Similarly, only a minority of candidates described data from the table; candidates seemed surprisingly unaccustomed to reading error bars and quoting data in a HSW context.

**Question 21**

Most candidates were able to recognise that a damaged pancreas will produce less enzyme.

**Question 22**

This question was also well answered, with most candidates reading the graph and making correct comparative conclusions between the two drugs.

Overall, candidates had acquired many of the skills that previous candidates had demonstrated in their traditional coursework. It was disappointing to see that some of the weaknesses in techniques shown in the past are still present.

'How Science Works' encourages candidates to work with data. Some centres had clearly worked hard at this aspect of the specification, and their students were confident and competent in reading graphs and tables. They could calculate percentages, describe trends, and make suitable comments on reliability. They were able to assess critically the methods of collecting data in terms of sample size.

***The mechanics of marking***

Many teachers marked in red. Those who chose green, black, blue or lead pencil made it more difficult to see their marks.

The principle of using one tick to reward one correct answer in the Marking Guidelines and, hence, one tick representing one mark, was widely disregarded. Sometimes two ticks were used for one mark, and other times one tick was used for two marks. Even this unhelpful pattern was not applied consistently within centres.

The total number of ticks should match the mark total in the margin. Many scripts had nothing in the margin, and a few had no sub-totals for each section. The habit of ringing the maximum number of marks as printed on the script was unhelpful, and made it more difficult to check totals.

Many markers did not use crosses against incorrect answers, some put a total of zero in the margin, and others left the answer with no evidence that it had been read or marked. Some markers wrote very helpful annotations near marginal points - these were always much appreciated, and would be welcome in future marking.

Some centres decided to add the term 'valid' as an annotation when they wanted to reward an answer that was not in the Marking Guidelines. Although this drew attention to a decision which had been taken, it tended to be used liberally and erroneously by some centres.

Some centres had clearly gone to a lot of trouble to carry out internal standardisation, and to show evidence that they had done so on some scripts. This was not the case in all centres, and

when some scripts were marked much too leniently and others were marked too severely there was a risk that regression would be unfair to some candidates. In the worst cases of this nature, centres had all their scripts collected and inspected by the moderator.

Many centres had been very careful in the completion of the front of the ISA script. All centre and candidate numbers were shown in the relevant boxes. The candidate had signed the work, and so had the teacher. Other centres were much more casual. A few centres submitted scripts that included no candidate numbers; these had to be ascertained by the moderator from the Centre Mark Sheet.

The Candidate Record Forms were generally completed efficiently. A few centres failed to appreciate that information regarding the type of ISA, the PSA marks and the overall total should be supplied on the back of the form.