Version 1

General Certificate of Education (A-level)
June 2011

Human Biology HBI3T

(Specification 2405)

Unit 3: Investigative and Practical Skills

Report on the Examination

Further copies of this Report on the Examination are available from: aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX.

General comments

The general standard of marking of ISAs has continued to improve this year. It was clear that the great majority of teachers had read the Marking Guidelines carefully and applied them diligently. Most teachers marked in red, placing one tick per mark awarded at appropriate places on the scripts, and recorded subtotals in the margins. It is important to follow these conventions. Not only does it assist the work of the moderator, it greatly reduces the chance of errors in totalling candidates' marks. Such errors were much more commonly seen in samples from centres where ticks were used inconsistently or not at all, or where subtotals were not recorded.

In a minority of centres, Marking Guidelines were not adhered to closely. Some teachers appeared not to distinguish between a solidus (/) and a semicolon. The former indicates two responses that are alternatives for which only one mark is available; the second separates different marking points. Marking conventions and the mechanics of marking are detailed in the section entitled "Guidance for teachers marking Human Biology ISAs" which prefaces each set of Marking Guidelines. All teachers would be well advised to ensure that they are familiar with this guidance before beginning to mark ISAs.

In a few centres, a number of points not in the Marking Guidelines were credited – often annotated as "valid". These points were often disallowed on moderation. Credit should be given for alternative wordings having the same meaning as points in the Marking Guidelines; points not within the Marking Guidelines should not be given.

Many teachers used annotation in their marking. These annotations were of considerable assistance in moderation, especially in the case of marginal points.

It was clear that internal moderation had taken place in a number of centres with larger numbers of candidates. An internal moderation process should be carried out whenever more than one person is involved in the assessment. The board's moderators welcome evidence of effective internal moderation.

Administrative procedures were followed correctly by most centres. The most frequent deficiency was absence of Head of Centre signature from the Centre Declaration Sheet, necessitating return of the sheet to the centre.

In most centres, each candidate's table, graph and Written Test were stapled so that, in effect, there was a single document for each candidate. This is preferable to putting the work of each individual into separate plastic pockets or to leaving sheets loose; both of these latter practices can add considerably to the time taken to moderate the work.

Of the two options available, Q (Whether lower arm length can be used to predict the height of a person) was twice as popular as P (The effect of amylase concentration on the digestion of starch). A number of centres appear to have given their candidates the opportunity to attempt both options, submitting the better mark.

Stage 1

The great majority of raw data tables were satisfactory. Nearly all candidates provided a full description of both variables, either in the title, or in the column headings. The most common error was in option Q, where some candidates described the independent variable as "length of arm" rather than "length of lower arm". Centres were wrong to credit this. The independent variable was nearly always in the first column. A few candidates had a first column with a number to identify the person measured, or the agar plate. In such cases, the first column should have been ignored and the mark awarded if the second column contained

the independent variable. Most candidates stated units appropriately in headings of the columns. There were very few instances of units being stated in the body of the table.

Stage 2

Calculation of means (option P) was generally carried out correctly.

The proportion of candidates producing a good standard of graph work has continued to improve year on year. Most graphs had the independent variable on the x axis and the dependent variable on the y axis, with appropriate scales, labels and units. In option P, points were generally plotted clearly and often joined by ruled lines. This is preferable to freehand curves or supposed "lines of best fit" that do not pass through all of the points. Unjustifiable extrapolation beyond the range of the data was occasionally seen. In option Q, where plotting the data was expected to produce a scattergram, no line was needed. The most common error was the use of a non-linear scale. This was usually on the x axis and more frequently seen in option P.

It was pleasing to see evidence of checking the accuracy of plotting in most centres' marking. Moderation of graphs was greatly assisted by centres that indicated the points for which marks had been awarded by a row or column of ticks (and crosses where appropriate).

HBI3T/P11 The effect of amylase concentration on the rate of digestion of starch

Question 1

Most candidates identified the well with distilled water as a control and explained its purpose.

Question 2

Identification of anomalies and calculation of a mean were frequently given in answers.

Question 3

Many candidates appeared to have had difficulty in expressing the idea of the need to ensure that volume does not vary.

Question 4

Prevention of evaporation and of contamination were both frequently stated by candidates. Some answers were expressed badly or indicated misconceptions such as 'to prevent amylase evaporating'.

Question 5

Answers indicated that many candidates had observed or appreciated that not all clear areas would be perfect circles.

Question 6

The reaction between iodine and starch was very widely known. The diffusion of amylase into the agar and the breakdown of starch by amylase were generally understood.

Question 7

Most candidates cited faster breakdown of starch resulting from more enzyme substrate complexes but few explanations included concentration gradients or speed of diffusion.

Question 8

In part (a), few candidates suggested the use of squared paper to measure area. Most suggested calculation and the formula was very widely known. However, many candidates suggested measuring radius rather than diameter, which would be difficult to do accurately. Few mentioned subtracting the area of the well. There were few correct answers to part (b).

Question 9

Many candidates were able to use the data in the table to compare digestion rates correctly. The first two marking points were seen more frequently than the third. Some centres awarded the first marking point for answers that referred only to potato starch or glycogen. The underlining of and in the Marking Guidelines indicated that reference to both was required for the mark.

Question 10

In (a), the effect of temperature on enzyme activity was known and explained well by the great majority of candidates. Most candidates were familiar with the use of thermostatically controlled water baths to keep temperature constant (part(b)). In part (c), concentration or volume of substrate and enzyme solutions were frequently identified as factors that should be kept constant. Some candidates failed to gain marks or were erroneously awarded marks by their centre for stating “amount”, rather than volume or concentration. The source or type of polysaccharide was not often mentioned.

Question 11

In (a), most candidates noted that the graph showed that each amylase had a different optimum pH. Fewer identified the different maximum rates of reaction. Some candidates did not express this second point clearly. Many answers to (b) explained differences in structure in terms of amino acid sequences and tertiary structure. Some markers did not appreciate that the solidus (/) indicated alternatives and gave two marks for this single marking point. Around half of the answers referred to different DNA or RNA.

Question 12

Very few candidates were able to carry out the calculation correctly.

Question 13

In part (a), less than half of the candidates recognised the significance of standard deviations not overlapping. In part (b), surprisingly few demonstrated an understanding of the importance of using matched groups.

Question 14

Around half of the candidates knew of the blocking of the pancreatic duct in cystic fibrosis; a similar number recognised the potential advantage of greater digestion of starch by salivary amylase in people with cystic fibrosis.

HBI3T/Q11 Investigation into whether length of the lower arm can be used to predict the height of a person

Question 1

About one half of the answers demonstrated an understanding of the term “dependent variable”.

Question 2

Many candidates gained full marks by recognising valid sources of error. However, some centres wrongly credited sources of error that had been specifically excluded in the method; for example, measuring height of subjects with their shoes on, or measuring lower arm to the end of the fingernails.

Question 3

Most candidates gave two sensible suggestions for factors that might affect the relationship between height and length of the lower arm. The term “gender” was widely used where the biologically more appropriate term “sex” would have been preferred.

Question 5

Most candidates scored the mark by reference to accuracy.

Question 6

A majority of candidates gained the mark, with both possible answers being equally common.

Question 7

‘Scattergram’ and ‘positive correlation’ were widely known. In contrast, part (c) was not answered well by many candidates. Perhaps because of the generally poor quality of response, a number of centres marked this item generously. In part (d), there were many poorly expressed answers. Many candidates gave the first marking point, but the width of shoulders and lack of bench or table were not often given.

Question 8

A significant minority of candidates were unable to calculate the ratio of 1:4 correctly. Some calculated it correctly and then expressed it as 1 in 4 or 1:3, suggesting a fundamental lack of understanding of ratios. Some candidates expressed the answer as 4:1 despite being prompted in the answer line to give the ratio as femur length : height. Disappointingly, a number of markers gave full marks for the reversed ratio.

Question 9

Most candidates recognised that *Australopithecus* was shorter than *Homo* but few commented on the change in height with time. Many candidates realised that the height of *Australopithecus* had been estimated by multiplying femur length by 4. In part (c), small sample size was identified by a majority of candidates, but the other possible reasons for unreliability were each identified by relatively few candidates.

Question 10

Often the natures of range and standard deviation were not clearly understood, or were poorly expressed. A number of centres marked this item too generously, giving both marks for imprecise answers.

Question 11

In part (a), many candidates gained marks for the surface area to volume ratio and heat conservation, or the fat and insulation alternatives. Few answered in terms of muscle. In (b), it was usual to score one mark for recognising that the heaviest mean body size was at the lowest altitude but few answers considered the standard deviations, or compared the difference between means at 2500m and 3500m with that between means at 2500m and 100m in order to gain the second mark. In (c), the mark was usually scored, with diet or genetic differences being the common answers.

Question 12

In part (a), many candidates identified two or three creditworthy points in their descriptions of the data. Responses in part (b) showed that it was widely understood that correlation does not prove causation.

UMS conversion calculator www.aqa.org.uk/umsconversion