



## **General Certificate of Secondary Education**

# **Human Physiology and Health 3417/H**

## **Report on the Examination**

*2007 examination - June series*

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# Human Physiology and Health

## Higher Tier

### General

As in last years paper, candidates performed better on the standard demand questions than the higher demand questions. Some sections of the higher demand questions were frequently left blank. Most candidates were able to accurately read information from graphs, for example question 8(a) and question 9. Some candidates found it quite challenging to produce a coherent account for question 1(c).

It was again evident that candidates find difficulty in answering questions on certain topics. As in previous years, answers to questions on kidney function, temperature regulation, blood sugar regulation and reproductive cycles tended to gain low marks.

Quality of language was often poor. As noted in previous reports, candidates still refer to “it”, “them” and “they” without making it clear to what they are referring. Spelling of common English words as well as scientific terms was frequently poor. It is particularly important that candidates are able to spell scientific terms with similar spelling but different meanings, for example glycogen and glucagon and glucose.

The marks for questions of written communication were allocated to question 1 and question 12. Most candidates achieved the mark for question 1, but far fewer for question 12. As in past examinations, this is mostly a consequence of inaccurate use of terminology.

### Question 1 (*Standard Demand*)

In part (a) most candidates gained at least three of the four marks in this section. The only common errors in part (i) were arithmetic, so that 20 or 10 million were stated. In part (ii) almost all candidates gained at least one mark. Accurate readings of the figures were less common.

In part (b) only better candidates showed an understanding of resistance. Most candidates referred to immunity rather than resistance and although most realised that these bacteria were able to survive, very few gave a clear explanation as to why the population increased. Poor use of language, such as bacteria grew or increased, was common.

Candidates’ answers in part (c) were very variable, although most candidates gained at least four of the seven marks. The majority correctly identified Fleming, but poorer answers confused Jenner and Fleming. Most candidates were aware of the original observations, although there were a number of confused answers where the bacteria and mould were reversed. Very few mentioned the name of the organism, *Penicillium*, or the use of broth testing on bacteria. Many answers extended beyond the original discovery and described the first use of penicillin.

### Question 2 (*Standard Demand*)

Part (a) overall was well answered. Some candidates confused continuous and discontinuous variation. A surprising number stated that age was a discontinuous variable.

Most candidates gave a correct answer for part (b). However there was a large minority who did not seem to know how to complete the diagram and used the symbols M and F to represent male and female.

### Question 3 (*Standard Demand*)

In part (a) most candidates correctly identified B and D. E was often misidentified as the pulmonary vein or the aorta.

The majority of candidates gained two or three marks for part (b). Answers were often very confused. Many candidates described a complete circulation and did not offer any explanation as to how the blood was moved. The role of heart muscle and valves was often omitted. Very

few candidates named valves. Those who did often confused the sequence in which they opened and closed.

The answers to part (c) were almost universally correct.

#### **Question 4 (Standard Demand)**

Most candidates gave a correct answer for part (a)(i). On part (ii) many candidates confused the stimulus with the receptor, so pain or touch were common incorrect answers. Most candidates gave a correct answer for part (iii). The most common error was to state 'a nerve'. For part (iv) most candidates gave a correct answer. The most common error was to give the general answer of 'an effector'.

In part (b) most candidates identified A and B correctly. The most common errors were to reverse the two types of neurone or use the term nerve instead of neurone.

In part (c) most candidates drew arrows in the correct direction, but often omitted the relay neurone.

Part (d)(i) was almost always correctly answered. Surprisingly few candidates could give two feasible suggestions for part (ii). Most tended to give examples of the same idea, that reaction time increased with age. Better answers referred to failing eyesight, changes in muscle power or arthritis.

#### **Question 5 (Standard Demand)**

Overall this question was well answered.

In part (a) most candidates gained all three marks.

For part (b) most candidates answered correctly. There were some good explanations in terms of kinetic theory of the effects of low temperature on enzymes. Poorer answers tended to refer only to the optimum temperature without explaining the effect of either high temperature or low temperature on the activity of enzymes.

In part (c) most candidates gave a correct answer. The most frequent was pH. Poorer answers stated temperature.

#### **Question 6 (Standard Demand)**

Parts (a) and (b) were correctly answered by most candidates. Very few failed to multiply their graph reading by five.

Part (c) was also answered correctly by most candidates, although poorer answers tended to refer to weight rather than mass.

Answers to part (d) were poor overall. Although there were some good answers, most candidates tended to give a long list of the components of cigarette smoke and generalise that these were responsible for poor development, rather than growth of the baby. Better answers were able to link carbon monoxide to haemoglobin and reduced oxygen supply, but relatively few candidates developed their answer to explain the consequential effect on respiration and energy supply for growth. A common error was to state that tar blocks the blood supply to the placenta.

#### **Question 7 (High Demand)**

In part (a)(i) almost all candidates gave correct answers. The only common error was to give an answer to part (ii) in part (i). For part (ii) most candidates gave a correct answer. Poorer answers referred to killing microorganisms. Answers to part (iii) were varied and tended to be more related to the catastrophe 'power failure' idea. Better answers referred either to possible infection or damage to blood cells.

In part (b) most candidates showed an understanding of rejection, but answers were often too imprecise. Some reference to either antibodies or antigens was expected.

Most candidates gave a correct answer to parts (c)(i) and (c)(ii). In part (c)(iii) there was tendency for candidates to repeat their answer to either (b) or (c)(i).

### Question 8 (*High Demand*)

In part (a) candidates tended to either give correct answers to all parts of the section or randomly put the name of both organs and hormones. Answers to parts (a)(i) and (ii) were more often correct than to part (a)(iii). The most common error was to confuse the role of oestrogen in egg maturation with that of luteinising hormone in egg release. A minority described the role of oestrogen and luteinising hormone during puberty.

Answers to part (b) were poor overall. Candidates did not seem to have read the information carefully enough and only better answers referred to possible roles of oxytocin during childbirth. Common incorrect suggestions were 'shrinking the uterus after birth' and 'expelling the placenta after birth'. The majority made a plausible suggestion linking oxytocin and milk.

In part (c)(i) most candidates gave a correct figure, but then often failed to state that there was an increase. Most candidates gave correct answers to part (c)(ii), although poorer answers gave examples of methods already in the bar chart. The most common of these were 'the pill' and female condoms.

### Question 9 (*High Demand*)

Overall this question was poorly answered.

Most candidates answered part (a) correctly. For part (ii) the majority of candidates struggled to make any valid answer statement. There was a great deal of confusion about the role of DNA in protein synthesis. Blank spaces were quite common. Most answers tended to describe a version of base pairing with varying degrees of accuracy. Better answers referred to a code, but rarely linked this to an amino acid sequence.

For part (b)(i) the answers of most candidates indicated considerable misunderstanding of sex linkage. Common misconceptions were that the colour blindness allele is carried by the Y chromosome and that the colour blindness is caused by a missing gene. The use of the terms gene and allele was frequently incorrect. There was also some confusion between chromosomes and genes; for example, "the colour blindness chromosome dominates the gene for normal vision". For part (i) only a minority of candidates actually showed sex linked inheritance correctly. Common errors were to show the presence of alleles on the Y chromosome, or more commonly to omit the sex chromosomes entirely. Answers that used R and r correctly gained full marks, but the vast majority of candidates showed a monohybrid cross. A maximum of two marks was allowed for correct outcomes of these crosses. Few candidates actually achieved this as parental generation and gametes were omitted. Candidates who identified phenotypes tended to list these separately rather than link them to the correct genotypes.

### Question 10 (*High Demand*)

Most candidates gave a correct answer to parts (a)(i) and (a)(ii). While most candidates knew in part (iii) that glucose increased, many did not gain credit as they did not refer to **blood** glucose. In part (iv) the majority of answers were restricted to the conversion of glucose to glycogen. A few better answers mentioned respiration or cell uptake, but rarely all three.

In part (b) there were some excellent accounts of the regulation of glucose, including the accurate spelling of glucagons, glycogen and glucose. It was essential that these were correctly identified, but in many cases candidates were clearly unsure and so hybridised words, in particular glucagon and glycogen as *glucogen* and *glycagon*. A common misconception was that the hypothalamus monitors blood glucose concentration. Poorer answers confused the role of the liver and pancreas.

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**Question 11 (High Demand)**

For part (a) there were a few excellent, clear explanations. For the majority, however, as in previous papers, the same misunderstandings about kidney function were evident. Candidates still confuse more reabsorption and absorption and appear to believe that urine is secreted from the blood into the kidney. For example many answers referred to: 'waste filtered', 'glucose filtered back to the blood' and 'diffusion into Bowman's capsule'. Poorer answers also showed the common confusion between urea and urine.

Most candidates gave a correct answer to part (b)(i). In part (ii) many candidates' answers were too vague. The most common answer was brain. In part (iii) many candidates failed to realise that an answer related to the graph was expected. Those candidates who did use the graph usually gained at least one mark for describing the fall in the rate of filtrate flow. Better answers also made a relevant comment about the size the fall, but very few made a correct reading from the graph. It was more common to make estimates, for example, about an hour, 14 to less than 1. Most candidates gained at least two marks for part (iv). Poorer answers showed the same misconceptions about kidney function as in part (a) and so referred to the kidney 'letting out' less or more water.

In part (c) most candidates gained one mark for a correct reference to the blood. The transfer between blood and the endocrine gland or target organ was less well known.

**Question 12 (High Demand)**

Most candidates gave a correct answer for part (a), although the spelling of hypothalamus was more often incorrect than correct. The most common spelling was hyperthalamus.

Answers to part (b) showed the same pattern as noted in previous years. Candidates have a good understanding of temperature regulation, but often fail to gain credit by imprecise statements. Some reference to increased heat loss is expected, rather than the more usual 'heat is lost'. The term vasodilation was often used, but was rarely explained clearly. Better answers referred to the role of arterioles, but most candidates referred to capillaries or the skin becoming red without any reference to increased blood flow. Answers about the mechanisms of heat loss often lacked sufficient detail, for example, references to evaporation failed to mention that the heat source is the skin. A more common imprecise answer was 'it cools the skin or body'. Poorer answers still refer to capillaries 'rising up' to the skin surface.

**Mark Ranges and Award of Grades**

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.

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## 3417 Centre – Assessed Component

### General

Centres tended to be rather generous in the awarding of marks, but often just within tolerance which meant that marks were left unchanged by the moderator. Skill areas A, F and I caused the greatest concern regarding the agreement of marks. It was easier to agree marks when scripts had been carefully annotated as this helped the moderator to fully appreciate why the marks had been awarded. There were a few instances of inappropriate investigations, including surveys of the price of organic food, and those which were considered dangerous in terms of health and safety. Centres are once again reminded that a coursework booklet is available every autumn which gives examples of good practice, advice on marking, administration and appropriate titles for the communication section.

### Administration

- a) Centres must arrange for the work or centre mark form (if more than 20 candidates) to be with the moderator by the 5<sup>th</sup> of May and it should be sent by first class post. Some larger centres took too long to send work to the moderator after the sample had been requested.
- b) A Centre Declaration Sheet must be included within the package, duly signed by the appropriate staff.
- c) Full annotation with regard to skill D is required before marks can be awarded; much time was spent trying to contact teachers in order to verify the marks.
- d) Both teacher and candidate are required to sign the Candidate Record Form. Marks can no longer be accepted if there is no candidate signature.

### Choice of Investigations

There was the usual range of investigations including Osmosis, Catalase, Exercise, Cooling Curves and Energy Content of Foods, with most centres choosing to complete just one investigation in which to cover skills A to H.

- a) Osmosis – A good choice for acquiring a full range of quantitative data and in fact most centres chose this as their main investigation. The major drawback with this experiment was the inability of candidates to process the data in such a way that the change in mass or length was presented as a % change to allow for accurate comparisons when different start mass/length had been used. Some degree of help would be acceptable here in terms of how to calculate % change to ensure the correct data is used in the construction of a line graph.
- b) Exercise – A disappointing choice of variables with many candidates choosing a range that was very limited. There were very few who collected recovery rate as an indication of fitness levels with most choosing to take pulse rates simply before and after exercise. Other candidates tried to make this investigation far too complex by comparing individuals of different ages, sex, fitness levels, smokers etc. Analysing the data obtained here was virtually impossible and the results were somewhat questionable in terms of reliability with so many variables.

### Moderation

- a) Internal Standardisation – there were a number of instances where internal standardisation had not taken place or was ineffective and this meant that some candidates were penalised due to one group being generously marked. It was sometimes necessary to request further samples and treat the individual groups separately to prevent penalisation of correctly marked samples.

b) Complete Investigations – there are still some candidates who fail to submit a mark that has come from a complete investigation (where there is evidence that skills B, E, F and G have been attempted). The centre should penalise by deducting one mark from the candidates' total.

c) Degree of Help – It is evident from the planning section that many candidates receive far too much help. There are too many candidates who produce plans which are very similar to others in their group. Teachers should emphasise the need for individual work and should not accept work that is dubious in its origin. Plans were obviously heavily teacher led and did not allow for individuality, especially when considering the range to be used.

## **Group 1 – Planning**

### **Skill area A**

Generally this skill is too generously marked with full marks being given for little information that actually informs the plan. Often marks were allocated for a candidate simply going through the motions of carrying out a pilot with no meaningful improvements being made upon the original method. This was particularly evident when pilot results showed the wrong trend, for example, the gaining of mass in potatoes soaked in hypertonic sugar solution. These results were often not even referred to, going unnoticed, and with no modifications being made upon the original pilot.

### **Skill area B**

Plans were clearly laid out with all the necessary information, but there were many instances where fair test factors were implied within the plan rather than explicitly explained for full marks. Generally candidates were unable to show a clear enough understanding of the variables for the higher mark. Only one plan is necessary, some candidates wasted a lot of time and effort in writing out anything up to four plans for the same experiment and moderators were left wondering which to mark for skill B.

### **Skill area C**

Most candidates appreciated the need to collect quantitative data and with a range that covers at least five measurements. Planning to repeat was more often than not included, but there were few who showed an understanding as to why this was important. It must be clear what the range is going to be from the plan, it can not be assumed from the equipment list that a range of five is going to be used simply because five chips of potato and five test tubes are listed. Candidates should clearly stipulate the range, for example 0%, 10%, 20%, 40% and 60%.

## **Group 2 – Implementing**

### **Skill area D**

Marks cannot be accepted for this skill without evidence in the form of annotation from the teacher. A number of Centres had to be contacted in order to rectify this. Distance Learners had their marks adjusted to take the absence of skill D into consideration.

### **Skill area E**

Skill A cannot be remarked for skill E, results should be obtained from the main investigation. Most candidates collected a sufficient range with repeats. Many made use of class results for the collection of repeats, which was acceptable if the candidate made it clear which were their *own* results. It should be noted that candidates need to collect results over the full range for themselves. Some classes were poorly organised such that each candidate collected results for only one of the parameters and repeated these. These instances did not qualify for the collection of sufficient raw data as they relied too heavily on class results. Candidates should be able to state a trend from their own results and be able to back this up with the use of repeats from the class.

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Presentation of results in a fully headed table was rare; some tables were meaningless with headings and titles missing. Averages are useful and often necessary for the plotting of an appropriate graph, but are not necessary for the awarding of marks in skill E. This is for raw data only. Some candidates failed to show raw data and only listed averages or pulse rate per minute when the results were collected over 15 seconds.

### **Group 3 – Analysing, Drawing Conclusions and Evaluating**

#### **Skill area F**

A number of errors were common within this skill which prevented the awarding of full marks. For example, the use of non-linear scales, the choice of difficult to plot scales and hence inaccurate plotting. Teachers must check plots for accuracy before awarding full marks; inaccurate plotting reduces the mark to one. It would be advisable to encourage candidates to produce one graph that compares all the results rather than 4 or 5 on separate pages. Computer generated graphs are still causing problems with the lack of marked points, no grids and inadequate scaling.

#### **Skill area G**

There was little analysis or use of the graph for determining the trend, this was not helped when lots of graphs were produced. Most candidates stated a simple trend and tried to relate this to HPH, but there were few who managed a fully detailed conclusion with enough HPH for full marks.

#### **Skill area H**

This skill area differentiates between a grade C and grade A candidate. Candidates should be reminded to comment on any anomalies that are apparent and that personal failings cannot be given credit. The marking of this skill varied; some centres giving high marks for weak evaluations and others awarding low marks when worthy comments of an evaluative kind had been made.

### **Group 4 – Communicating**

#### **Skill area I**

There were a number of candidates who included an exhaustive list of references with some in excess of 12, but little use of citing within the text made decisions regarding selectivity very difficult and almost impossible. There are still some centres who think that three internet sites is a good range; this was not considered worthy of more than one mark. References must be listed clearly enough for retrieval by a second person. There were a large number of candidates who failed to do this, for example simply putting 'Google' was not accepted. Moderators found it very helpful when candidates cited the references used within the text and judging the level of selectivity was much easier in these cases.

#### **Skill area J**

Lots of excellent examples were witnessed here which were often closely marked to the criteria. Centres that set a question for candidates to answer generally achieved higher marks than those who gave a free choice in terms of topic titles; these candidates were often unable to present a balanced argument which addressed the moral, ethical, social and economical aspects. Introductions to an investigation cannot be awarded marks for this skill area, there were a number of centres who wrongly awarded marks for descriptions about how the heart functions, the effect of caffeine on reaction rates, the concepts of Osmosis and diffusion etc. These should have been included as part of a relevant investigation in skill G and not part of the communications section.