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General Certificate of Education (A-level)
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Human Biology HBIO4

(Specification 2405)

Unit 4: Bodies and Cells In and Out of Control

Report on the Examination

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General Comments

Excellent answers to all of the questions were seen but it appears that even the best students were unable to produce all of these. The result was that no students obtained marks right at the top of the raw-mark range. The distribution of the actual mark range was wide.

A disappointing aspect of the performance of many students was seen in questions requiring factual recall of what would usually be considered traditional A level topics. This was seen in parts of questions 1, 3, 5, 7, 8 and 10. Many students also displayed weaknesses in questions involving topics that were new with this specification; notably involving genetic engineering and perception.

Students should be encouraged to make use of information given in the stem of a question as this is provided specifically for their guidance. Time would be well spent in assimilating the information provided, and in making sure it is well understood, *before* attempting to answer any questions based upon it. There were a number of questions where students attempted to use learnt answers that did not fit the context.

Students should also be encouraged to use appropriate, subject-specific, scientific terminology wherever possible in order to avoid ambiguity in their answers.

Question 1

The general level of response in this question was somewhat disappointing.

(a) There were some good, clear answers to this question. Most students knew that sodium and potassium ions are involved in maintaining a resting potential but many got the distribution and movement of these ions the wrong way round. There was also considerable confusion between channels and 'pumps' and their roles. Some students described the events during generation of an action potential. Fewer than half the students scored both marks and over a quarter scored zero.

(b) This part was better answered and about a third of students scored all four marks.

Question 2

This question was poorly answered by most students, they did not know what the terms specified meant and could not name the methods required. This was particularly notable in 2(b)(ii) and 2(c)(ii) where over eighty percent of students failed to gain the marks.

Question 3

(a) About forty percent of students obtained all three marks but over twenty five percent scored 0 or 1. In many cases, students failed to score full marks because of poor expression or use of terminology. A number of students incorrectly referred to 'active sites' on actin or myosin.

(b) The best answers answered the question as set and used the diagram as instructed. These answers noted that myosin heads pointed out from both ends of the thick myosin filament. They went on to point out that this would cause the actin filaments to move towards the centre, pulling the Z lines to which they are attached. Quite a large number of students wrote 'stock' answers about interactions between actin and myosin and scored one or two marks.

Question 4

(a) Only fourteen percent of students obtained all four marks here and nearly forty percent scored zero. Many of the answers that failed to score were 'stock' answers about human blood groups and their inheritance. The question was actually about the relationships between base sequences on DNA, codons on mRNA, amino acid sequences in proteins and tertiary structure and active sites of enzymes. Even amongst those who took the correct direction, there were large numbers who did not know or understand these fundamental relationships. Some referred to amino acids sequences in DNA, or DNA 'making' amino acids.

(b) This was the best answered question on the paper. Over seventy percent of students obtained four marks. In general, the students who obtained fewer marks did not use the symbols they were instructed to use and got very confused.

Question 5

(a) Just over thirty percent of students scored three marks and a similar percentage score one or zero. There was considerable confusion about where light is refracted in the eye. There was also confusion about the roles of ciliary muscles and the ligaments attached to the lens. Quite a large number wrote about the lens 'contracting and relaxing'. A notable number wrote 'stock' answers about the roles of rods and cones.

(b) Over sixty percent of students scored one or two marks here. It was pleasing to see that many understood that the brain 'made up the line' from past experience or the surrounding visual field.

(c) Many students noted that the blind spot in one eye is covered by the visual field of the other eye. Many noted that the brain would receive information about the gap from the other eye. The best answers put both ideas together.

Question 6

(a) Epigenetic imprinting was a new topic introduced in this specification. Nearly sixty percent of students failed to score. Many resorted to answers involving mutations, sex chromosomes or recessive alleles. There were good answers that focused on an inherited change in the expression of a gene, without a change in DNA base sequences.

(b) It was pleasing to see that this was well answered by most students.

(c) There was roughly a normal distribution of marks here. Most noted that boys with the condition tended to have higher concentrations of ghrelin. After that, it depended on the extent to which they used and cited the data when looking at exceptions to the stated relationship.

Question 7

(a) About forty percent scored two marks here and nearly a quarter failed to score. The mark scheme only required an understanding that hormones are released into the blood and that it takes a (relatively) long time for the blood to carry the hormone around the body to the target.

(b) Elements of the answer to this question proved inaccessible to many students. Most students did not understand that stress is perceived by the brain, on the basis of information received from sense organs. In essence, they did not appreciate the link between the nervous system and hormonal system mediated through the hypothalamus-pituitary axis. There were a few excellent answers from students who did understand this link.

Many students picked up the story from the release of ACTH in response to stress and scored three marks, sometimes even four. Quite a large number ignored the information given and wrote about 'flight or fight', the sympathetic nervous system and noradrenaline. There were many students who expressed the reverse of the actual situation, with the body getting stressed and this resulting in the person feeling worried. These students usually failed to score.

(c) Those who made some attempt to use the information in (b) usually scored one or two marks here.

Question 8

(a) Only around twenty percent of students scored both marks here. Some wrote about the role of FSH but not in the context of IVF. The result was that they didn't write about either overcoming a deficit in the woman, or causing several follicles to ripen. A disconcerting number wrote about follicles being released, or removed, and these being fertilised by sperm. Many gave wrong functions for FSH.

(b) This question was answered well by most students and just over forty percent obtained all three marks. It was pleasing to note that most students knew what LH does. Those students who got less than three usually failed to give the whole story; levonorgestrel prevents the peak in LH, so ovulation doesn't occur and there is no egg to be fertilised.

(c) Over eighty percent of students obtained one or two marks here. Most wrote about how an IUD did not prevent fertilisation and the worry that many women have that the fertilised egg marks the start of a life. The commonest error was to state that an IUD prevents a fertilised follicle from implanting.

Question 9

(a) There was considerable confusion in the minds of most students. The majority defined cancer as a tumour, in the sense that it was described as uncontrolled cell division. Relatively few seemed to understand that cancer is linked to metastasis, or spread to other parts of the body. Many gave essentially the same answer to (i) and (ii).

(b) This question produced many good, clear answers that used the correct terminology. Where students failed to score it was usually due to poor language skills and terminology; for example, describing mdm and p53 as having the same shape, rather than complementary shapes.

(c) This question produced a normal distribution of marks, with just over ten percent obtaining all the marks and just under ten percent obtaining none. The key to students' success lay in their ability to put together all the information given. Some seemed to focus either on the flow chart, or on the information with the graph but not both.

Question 10

(a) This question has been asked many times before and yet only thirty percent obtained all three marks. Thirty six percent of students failed to score. Many wrote that insulin converts glucose to glycogen and some even identified insulin as an enzyme. These students then often wrote that insulin removes the glycogen from the blood.

(b) Very few students obtained all three marks, though many obtained two. A fundamental problem appeared to be that students do not appreciate the link between a high energy intake through the diet and obesity, or to recognise that fat and sugar in the diet are sources of energy. Many also appear to be unaware of links between increased exercise, increased respiration and a higher energy demand which work against obesity.

(c) About half of students recognised that a questionnaire is subjective, or that people may not choose to give accurate information.

(d) This question produced the full range of marks and nearly sixty percent obtained two or three marks. Only a small percentage obtained all five marks. This was because so few students made any correct use of the probability values in the table. About half of those who did attempt to use these values stated that only the decrease in alcohol was significant, because the probability value at 0.43 was greater than 0.05.

(e) There were some good, rational answers to this question. These usually revolved around the idea that, although one group was given less advice, they were given advice they could follow if they wished. The study did not actually do them any harm. Very many answers ignored the fact that volunteers were used for this study and

suggested that obese people were being bullied and discriminated against. No credit was given for this approach.

(f) This question produced a normal distribution of marks. It tested the ability of students to pick out trends in the data relating to blood glucose and insulin. Some students focused on one or the other and thus scored fewer marks. Some students gave 'stock' answers about the signs and symptoms of diabetes.

(g) This question was intended as an opportunity for students to relate the results to the methodology of the study. In essence, it was a How Science Works question; the command word 'evaluate' should have been a clue to students in this respect. In practice many obtained one or two marks for describing the differences in the risk of developing diabetes. Relatively few considered the lack of statistics, the fact that this was only one study, that only ran for six years and had no control group with no risk factors for diabetes. Quite a large number thought that 870 people was a small sample size for a single study.

(h) In their answers many students wrote about the test, rather than what it was intended to test about the device. Perhaps not surprisingly, there was considerable confusion about accuracy, giving a true reading, and reliability in the sense of repeatability. Some very good answers were seen.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website.