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Examiners' Report
Principal Examiner Feedback

Summer 2024

Pearson Edexcel International GCSE
In Human Biology (4HB1) Paper 02

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Publications Code 4HB1_02_2406_ER

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General Comments

Examiners made comments about the impressive knowledge and understanding shown by many of the candidates. The effort by both the centres and candidates in preparation for this summer examination is quite evident in the quality of the responses. Mathematical skills were generally very good with many students demonstrating that they could complete multistep calculations which was a requirement for two of the three mathematics questions in this paper. There are a number of experiments that are embedded in the Human Biology specification and students are expected to have covered these throughout the duration of the course. It is understandable that some centres do not have the equipment to carry out all of them. It is nonetheless important for students to be familiar with them. A possible solution would be to use online resources which can include simulations. Some students were able to apply their knowledge and understanding of biology to analyse and evaluate data and information from unfamiliar contexts and experiments, the evidence from weaker responses would suggest that more practice is required in this area.

Question 1

For part(a) most were getting this right, but some did not read the question carefully and were giving examples, such as AIDS being caused by HIV rather than the type of pathogen. Furthermore a significant number stated that cholera was caused by a virus. Most were also getting (b) correct, but a few named the virus as the cause of gonorrhoea and some selected contaminated water as the mode of transmission.

Candidates that scored both marks for c(i) described an overall drop and some further description such as a steep drop after 1990 or fluctuations in the graph. Some candidates struggled to describe the trends in the graph in simple terms with the outcome often being correct information embedded within convoluted sentences.

c(ii) Quite a lot were spot on with this one, but some got the marks due to the tolerance allowed. Some were outside the tolerance but could still sometimes achieve 1 mark for error carried forward. A minority of candidates did not read the answer line and so did not give the answer per 100.000.

Question 2

Many candidates named the cytoplasm and nucleus as places in a cell the RNA can be found. Ribosomes or rough endoplasmic reticulum were accepted as alternative to cytoplasm.

Part (a)(ii) A generally very well answered question in which candidates showed good recall of at least two of the key differences between RNA and DNA. Some only referred to the bases by their single letter (U or T) and so failed to secure mp2.

There were some vague answers to do with long and short strands or where each substance is found. Thiamine was not accepted as a difference between the two as it has a separate biological function.

Many found (a)(iii) very difficult. Bases, codons and amino acids were commonly given as the answers which were clearly incorrect.

Many candidates scored full marks for (b). They understood that mutations can change bases in DNA consequently changing the amino acids and hence the protein. A few also went on to explain how protein function is affected. Some candidate missed MP2 because they said that a different amino acid is formed, whilst other did not mention that the protein was the final product. Product was not credited as it was in the stem of the question. Some vaguely mentioned that a mutation caused changes in the characteristics or phenotypes.

Question 3

Many scored 2 marks for (a) frequently mentioning smoking and a correct disease. However, many did not read the question carefully as the question asked about a factor other than alcohol or diet; a significant number of students wrote a dietary factor. It was difficult to award mp2 when drugs were given for mp1 as what was said was often very vague.

(b) A high proportion of candidates scored full marks on this question, they included the role of the liver in the production of bile but some failed to mention that liver damage is likely to reduce (or stop) production of bile and so failed to score this mark. There were often with a very good description of emulsification included. However, some candidates, while mentioning 'emulsification', described it as the breakdown of fats into fatty acids and

glycerol and so did not gain this mark. There were very few references to lower lipase activity.

For C, many got the idea of blurred vision, and some could explain why it occurred.

A small number got the mark for explaining that due to the cloudiness of the lens, less light reached the retina. Some said that less light entered the eye rather than less light reaching the retina. Other answers were far too vague to be credited.

Most scored a mark for (d). Cerebrum and cerebellum were common answers.

For part (e) MP4 and MP5 were commonly awarded. Not many stated reduced release of neurotransmitters or diffusion across the synapse.

Many responses scored nothing as they were making the link to hormones and depression.

Lots of mention of slurred speech and slow nervous system in answers that were not credited.

Increased heart rate, increased breathing rate and pupil dilation were common answers in part(f) However, there were a number of answers that spoke about 'getting the body ready for fight or flight' without any further detail.

Question 4

The majority scored full marks for (a)(i) though some were left blank by a few candidates while others confused bronchus and alveolus.

Relatively few candidates scored all four potential marks for (a)(ii.) Many alveoli/large surface area of alveoli(mp1) and short diffusion distance due to alveoli and capillaries (mp2) were frequently included in answers. Fewer candidates correctly identified the "moist" nature of the gas exchange surface (mp3) and even fewer adequately accurately identified the "network of capillaries" involved (mp4). Some answers were too vague to be credited, for example, a good blood supply should have been qualified by a network of capillaries.

Very few students scored the maximum of 4 marks for (b)(i). Some scored marks for mentioning inhaling and exhaling normally into the mouthpiece, while others described a pen on a rotating drum, and a few knew how to measure the tidal volume from the chart obtained. Some mistakenly

suggested how vital capacity can be measured. It was quite clear that many candidates were unfamiliar with the spirometer or indeed how to use it. Quite a few described a peak flow meter instead and some mentioned limewater, neither of which were credited.

For (b)(ii) A large proportion of candidates scored both marks on this question either by initially calculating the reduction in vital capacity caused by severe asthma and separately subtracting this from the value of 4600cm^3 or by calculating the final value by multiplying by '0.7'/'70%' to find the answer of 3220cm^3 . The most common error here was forgetting to calculate the difference between the vital capacity for a healthy person and the reduction due to asthma.

Question 5

(a)(ii) was well answered with many candidates gaining both marks for mentioning the use of sterile equipment and minimising the time that the lid is removed during the inoculating process. However, some candidates were too vague and included answers such as the use of gloves and goggles neither of which were credited.

Nearly all students scored both marks for (a)(iii), but a small number mentioned P.

Many candidates were credited with 4 marks for (a)(iv), by explaining that mutations in the bacterial population results in those bacterial cells surviving and reproducing and passing on the advantageous allele. Very few mentioned an increase in allele frequency in the bacterial population. The most common error amongst candidates on this question is the perception that mutations happen in response to the presence of the antibiotic.

Only a small proportion of candidates gained both marks on this question (b) Some students used the term decay or decompose which was too close to the terms in the stem of the question. Many were vague and mentioned feeding. A few did not understand the question and wrote about the use of microbes in industry. Also, that "fertilise" or produce "fertilisers" are not specific enough given that the most common use of fertilisers in agriculture are 'artificial fertilisers' which are not formed by the action of decomposers.

Question 6

There were varied responses to part(a) with some good answers scoring full marks. Some stated that they will change light intensity without going on to describe how this could be achieved. Some stated size of pupil rather than diameter and others did not state a practical way of measuring the diameter, for example, using a ruler or taking a photo from which the diameter can be measured. The principle of waiting for the pupil size to adjust was included in only a small proportion of responses (MP2)

Many candidates achieved full marks for the calculation in (b). Some candidates failed to achieve full marks because they did not convert cm to mm or did not divide the diameter by 2 to obtain radius to substitute into the area formula. Common error here was using the bright light diameter or trying to rearrange the area formula. Some candidates were confused by the information the information given by bright light and tried to use this for their calculation in dim light.

Many candidates scored full marks for c(i) but a few got the contraction and relaxation of the radial and circular muscular muscle the wrong way around. Some confused ciliary for circular muscle.

c(ii) Most scored one mark for realising that the action outlined in c(ii) ensured that more light entered the eye, but fewer mentioned that this resulted in clearer vision.

Question 7

Many candidates scored well on part(a), gaining all four marks. A typical answer included "reduced blood flow" (mp1) to "heart muscle" (mp2) so less "oxygen and glucose" (mp3) are delivered to the tissues which results in "reduced aerobic respiration" (mp4). Many responses went on to include "heart attack" (mp5). Some candidates repeated heart disease which was in the stem of the question were not credited. Other candidates were not precise enough about the significance of reduced blood flow to the heart muscle and were a bit vague.

Many candidates correctly manipulated the information presented in the stem of the question (b)(i) to calculate the final answer of 1.135 million more obese women than men in the UK. However, other candidates found the multiple steps needed to correctly answer this question challenging and others chose to

round their answers and, in so doing, lost accuracy and so failed to gain full marks.

(b)(ii) Most students described BMI for (b)(ii) and whilst they mentioned that there was a need to measure mass and height, many failed to state the correct calculation was mass divided by height². Many failed to either state the correct figure for obesity or using the data from a relevant graph or chart.

Some candidate scored full marks in © for explain that beta blocker binds to the receptors (MP1) therefore preventing neurotransmitters from binding (MP2) and the consequence on heart rate or blood pressure (MP3). Many candidates lost credit for failing to mention “receptors”, in their response and simply stated the heart muscle. Others failed to complete their answer by mentioning the effect of this action on heart rate or blood pressure and so failed to secure mp3.

Question 8

Many candidates score MP1- the presence of a dominant allele for (a)(iii) to explain why carriers do not have the disease, MP2 was well described by those who secured the mark, but many failed to gain the mark by saying that the effects of the recessive allele were ‘not expressed’ which was insufficient to gain the mark.

A significant number of students scored 4 marks for (a)(iv). Some candidate failed to state the genotypes of the parents so missing out on MP1, while others to link the correct offspring genotype with the child inheriting cystic fibrosis. A minority of candidates showed the cross as being sex-linked or codominant and, by so doing, did not secure any marks on this question.

A small number of candidates secured 3 marks for part(b).

Some. students mentioned restriction enzymes, but many went on to discuss plasmids rather than a virus vector. Most used the term gene rather than allele. Many answers were quite superficial talking about the need to make mucus without providing a description on how this can be done Quite a few answers were talking about genetic counselling and a few students provided some detail on the use of stem cells. It was quite clear that candidates were unaware of this procedure.

