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Examiners' Report

Principal Examiner Feedback

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In Human Biology (4HB1)

Paper 01R

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### Question 1

**(a)** From the vast majority of responses, it was made clear that candidates understood the main role of red blood cells. 'Transport of oxygen' was seen often although it was not always the case that the destination i.e. to body cells was given.

**(c)(i)** There were several responses from candidates that just counted the number of cells rather than give a ratio of red to white blood cells although most students gained full marks for their answer to this question. In some cases, candidates determined the ratio correctly but then represented this on the answer line in the wrong way i.e. white cells to red which is not what the question asked.

**(c)(ii)** As in previous examination series, some candidates continue to use inappropriate terms to describe defence against disease. There were many responses that made use of terminology such as 'fight' or 'kill' disease which is scientifically incorrect. It appears that students remain confused and unable to distinguish between disease and pathogen and it may be an idea to clarify that it is the pathogen that is destroyed rather than the disease. For this reason, marking point 2 was not often awarded. Many marks were awarded for responses that included that the number of white blood cells increase (marking point 1) and production of antibodies (marking point 3).

### Question 2

**(a)(i)** Well done to the vast majority of candidates that were able to label the ciliated cell correctly. In a minority of cases label lines did not extend clearly to the intended structures and this cost marks.

**(b)(ii)** Some responses lacked detail about cilia but gave details about infections caused by the build-up of mucus. These responses did not make any connection to the cilia which implied that candidates lost focus of the expectations of the question. More able candidates were able to score at least one mark for describing the effect of cigarette smoke on the ciliated cell but still many were unable to gain the full two marks as they lost sight of the information that the question had given.

### Question 3

**(a)(ii)** Responses included various details that gave advantages of magnifying cells and more often than not the information given was correct. Most answers stated that (organelles) could be seen more clearly and in many cases named organelles were mentioned. A well answered question.

**(a)(iii)** There were many good attempts at answering this question although not all responses were to the point. Some mentioned the names of various stains without actually stating that the stain needed to be applied to the specimen and this left room for doubt in awarding marks. In the majority of cases however, candidates were able to state why the cell sample could not be seen and included details that met the marking criteria.

**(b)(ii)** Candidates have been well prepared in answering this type of mathematical question. Using the information given in the question most were able to carry out the conversion from millimetres to micrometres. It was only students working at lower levels that found this a challenge.

### Question 4

**(b)(i)** Marks were lost where candidates failed to label axes correctly although bars were generally well drawn. Some candidates fail to understand that the column headings from the table displaying the data are what should be used as axes labels.

**(b)(ii)** Many candidates failed to clarify whether they were talking about 2010 or 2013 and therefore failed to gain marks. There were, however, a good number of responses that identified a factor to give a reason for the difference in the number of cases of kwashiorkor between the years stated in the question. A significant number of students were able to include relevant details such as 'more protein in diet in 2013' which awarded them the mark.

**(b)(iii)** Candidates have been well taught in percentage calculations. Most were able to use the data supplied to arrive at the correct answer. Those that missed marks either interpreted graphical data incorrectly or were unable to manipulate an equation to arrive at the correct answer.

### Question 5

**(a)(ii)** Some really good answers here that show many candidates are aware of the role of iron in the diet and in pregnancy. Many candidates scored total marks for their responses although there were some answers that failed to include marking point 4 – that iron was needed (indirectly) for the growth of the fetus.

**(b)(i)** There were numerous responses that failed to make reference to time which cost marks. This limited several responses to 3 out of the 4 marks allocated for this question. This aside, candidates seem well conversed with this practical activity and were able to include most marking points in their responses to gain full marks.

**(b)(ii)** There were some really good suggestions on how the apparatus could be changed to improve the accuracy of the results in the investigation shown. Most of these gained credit. Many responses include 'add a lid' or made reference to preventing heat loss in some other way. Other suggestions included using polystyrene in place of a copper cup which implied understanding of heat loss through conduction. Any reference to stirring was infrequently seen suggesting that candidates are less familiar with the need for heat distribution to improve the accuracy of the results.

### Question 6

**(a)(i)** Another mathematical question that was well answered by candidates of all abilities. Students were well able to use the information from the pie chart to calculate the time spent by the cell shown in mitosis.

**(a)(ii)** Too many candidates appeared unaware of the events taking place at each stage of the cell cycle. Marks were lost for a significant number of responses that gave a description of mitosis or that mentioned DNA replication. The most commonly awarded mark was marking point 3 where a fair number of students identified that protein synthesis was a process that took place in the G1 phase. Where candidates did discuss each growth phase separately, they inevitably provided details for G2 that failed to gain any marks. There is strong evidence to suggest here that candidates are unable to distinguish between the events that take place in each stage of the cell cycle.

**(a)(iii)** Candidates lost marks for vague responses that simply stated, 'same as the parent'. More able students were more prescriptive and were able to clearly describe the genetic features of the cells produced by mitosis.

**(a)(iv)** The table provided structure for candidates to present their answer to this question and consequently it was generally well answered. Most students were able to give correct details of the events taking place in each stage of mitosis so full marks were gained for many responses. Some candidates mistook telophase for cytokinesis which cost marks.

**(b)** This proved to be a challenge for many students who appeared unfamiliar with the role of DNA polymerase. There seemed to be confusion between adding nucleotides to an existing template strand and joining new nucleotides together laterally. Many responses focussed on base pairing rules – not the objective of the question and therefore failed to gain any credit.

### **Question 7**

**(a)** There were many thoughtlessly drawn diagrams that indicated candidates were not so familiar with the changes that take place in the blood vessels on a hot day. Too many diagrams required too much interpretation to award marks which simply meant marks were lost. A large number of diagrams did not draw any difference between the capillaries and the shunt vessel although with greater thought and application of biological knowledge marks could have been awarded.

**(b)** There were some good responses that included details of vasodilation and how this increased the loss of heat from the body although typical errors in understanding were evident in answers that stated 'blood vessels move closer to the skin surface'. Some candidates gave irrelevant information about sweating and the role of the hair erector muscles in maintaining body temperature. A good number of candidates used the term 'radiation' to describe how heat was transferred from the body. This was awarded a mark. There were many responses that didn't consider the role of the shunt vessel which meant marks were limited to 3 for this question. Responses failed to consider the impact/diameter of vessels closer to the surface of the skin and explanations were too vague to award marks.

**(c)** More able candidates scored well here giving details that, for most of the time, covered all marking points. Where full marks were not obtained the hypothalamus was often omitted meaning that marking point one was less often awarded.

### **Question 8**

**(a)(i)** Generally answered well with only a few candidates losing marks by giving the incorrect direction of flow.

**(a)(ii)** It was clear that a good number of candidates understood that a faulty allele was inherited from each parent and this credited many responses with at least one mark. Where full marks were not obtained this was for lack of clarity and structure in responses that failed to give the correct genotypes of the parents.

**(a)(iii)** It was clear that the majority of candidates were unaware of the role of endoplasmic reticulum although many made the effort to provide an answer to this question. Few students mentioned that the protein would not be transported and/or that the protein would not be modified or would have an incorrect shape. There were a significant number that were under the impression that the endoplasmic reticulum was involved in protein synthesis in some way. It was very rare to award the full two marks for responses to this question with most students failing to gain any credit or, at best, one mark although this was infrequently seen.

**(a)(iv)** More able candidates gained full marks for this question although there is clearly some confusion with students working at grades 5 and below into what constitutes a nucleotide. Candidates should be able to relate that a codon is equivalent to 3 bases and that this is equivalent to one amino acid.

**(a)(v)** Candidates were quite happy to list the components of a nucleotide rather than describe the structure which cost marks for many answers. Although recognising the sugar, base and phosphate

was awarded one mark only these responses did not fully answer the question. Few candidates provided clearly labelled diagrams and more often than not these gained full marks. The diagrams were well drawn and labelled correctly.

**(b)** Most candidates scored well on this although those that failed to gain full marks tended to omit marking point 3 in their response – many stated that phenylalanine was missing from the *gene* rather than the *protein*. Despite this, students were able to use the diagram well to conclude that the mutation was caused by a deletion, specifically TTT that gained many candidates two out of the three marks available.

### Question 9

**(a)(i)** A good number of candidates were able to score one mark for subtracting 4000 from 23500 although less realised that to gain further credit the score derived needed to be divided by 4000 and then multiplied by 100 to achieve a percentage. Consequently many students failed to achieve full marks for calculations that sometimes lacked clarity in the figures given in answers. Some workings out were difficult to follow.

**(a)(ii)** Candidates were evidently unsure of using the graph to arrive at a correct response to this question. Many were unable to associate the data given with scientific understanding to elucidate a response that gained credit. Students of all abilities failed to recognise that other factors could contribute to kidney disease although in few responses named factors were mentioned, mostly scoring one mark. Very few answers identified genetic predisposition as a creditable mark. In general, candidates seemed to be unable to link the information given in the graph to other circumstances that could have influenced the prevalence of kidney disease.

**(b)** Many candidates drew clear diagrams and labelled them correctly although some carelessly drawn label lines to the structures lost marks in some cases. These label lines inevitably did not extend to the structures they were indicating. A fair number of candidates labelled the collecting duct as the proximal convoluted tubule and others labelled the distal tubule.

**(c)** Applying scientific understanding of the working of the kidney to the effect of glyphosphate on its function proved a challenge to students. Candidates generally failed to apply their knowledge of kidney function to the context of the question which, in many cases, threw them. All that was needed here was a clear understanding of the role of the kidneys but many marks were lost in responses that neglected to include details on how this chemical used on weeds affected ultrafiltration and the subsequent consequences on the function of the kidney.

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