
APPLIED GENERAL **APPLIED SCIENCE**

ASC4 The Human Body
Report on the Examination

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General

In this report, the performance of students in this series is summarised in a way that is as helpful as possible to teachers preparing future cohorts.

Although students continue to face disruption due to COVID, it was very encouraging to see a larger entry for this component this series compared to January 2021. Overall, the mean on the paper had increased slightly, by 1.5 marks. It was clear, as with last series' exam, that the best students had managed to prepare well in the circumstances for this examination and were able to attain high marks.

However, there were many aspects of the paper which proved to be very challenging for the majority of students. For example, interpreting and applying understanding to unfamiliar contexts, such as bone structure, the role of hydrochloric acid in digestion, and co-transport and its effect on preventing dehydration.

Presentation was generally good with handwriting being legible and it was clear that the space provided for answering questions was sufficient for the vast majority of students (there were very few students who utilised the additional pages at the end of the question paper). It was also clear that students had sufficient time to complete the paper. All questions were attempted by the vast majority of students.

In a number of questions, students had used blank space to sketch small diagrams to help them work out answers and often this led to greater clarity in the responses.

Question 1

- 1.1 This question discriminated well, with over half of the students correct giving the role of iron ions in the formation of haemoglobin or in the transport of oxygen. References to the formation of myoglobin were not seen.
- 1.2 Over 60% of the students gained full marks by identifying two symptoms of iron deficiency and another third gained one mark. The most commonly seen correct answers were tiredness or fatigue, pale complexion or dizziness. All other correct options were seen in student's responses. Those students who did not gain full credit often referred to unspecified weakness or named the condition as anaemia without giving the symptoms.
- 1.3 The vast majority of students gained full or partial credit in this question. A wide range of correct answers were given, with red meat, spinach and iron supplements being the most frequently seen correct answers. Answers that did not gain credit were often too vague, such as leafy green vegetables or answers which are high in other nutrients such as eggs for Vitamin D and milk for calcium.

Question 2

- 2.1 All students attempted this question and the vast majority gained full credit for two functions of the skeleton. All answers on the mark scheme were seen but the most commonly given answers were movement and support.

- 2.2** This question was answered much better than in previous series, with over 60% of students gaining both mark and a further third gaining one mark. It was much rarer to see the pelvis given as part of the axial skeleton, as has been common previously. The ribs or skull were often quoted as correct components of the axial skeleton and a wide range of correct bones were seen for the appendicular, including femur, humerus, ulna and pelvis. A significant minority did state limbs without making clear it is the bones of the limbs. In some cases, students gave lists of bones and on occasion this was problematic as they listed correct and incorrect examples.
- 2.3** Over half of the students correctly identified the ligament as the part of a joint that holds the bones in place. The most common incorrect answer was tendon.
- 2.4** This question discriminated well with an even distribution of students gaining 1, 2 or 3 marks. A notable misconception was that hinge joints can only move up to 90° in one plane. Generally, students did not select 'sliding motion in three planes'.
- 2.5** Approximately 90% of the students correctly selected the function of the synovial fluid.
- 2.6** This question proved to be demanding for students with only a quarter gaining credit. In some answers students used the term 'more gaps' when describing bone B, implying some confusion that the term 'more' is synonymous with 'bigger' or 'larger'. However, in this case 'more gaps' is incorrect in comparison to bone A. Some students gave the idea that bone B is more porous, but it was very rare for students to give the common features of both bones.
- 2.7** Two thirds of students correctly described the risk for a person with osteoporosis. Students that did not gain credit, often described the bone as being weaker or damaged without going on to describe the risk of this.
- 2.8** Most students gained at least one mark for suggesting how to prevent osteoporosis developing. However, students' answers were at times too vague to gain credit. The most common correct answers referred to exercise or increasing calcium intake. Some students gave examples of specific foods that would increase calcium intake. It was much rarer to see answers referring to vitamin D intake.

Question 3

- 3.1** Two thirds of students gained full credit for selecting descriptions of chemical digestion and mechanical digestion, with a further 20% gaining one mark. The most commonly seen misconception was that chemical digestion involves condensation reactions.
- 3.2** This question discriminated well with approximately 20% of the students gaining all four marks and only 7% gaining 0 marks. The most commonly seen correct responses gave the correct group of enzymes and where absorption of the digested food occurs. Errors were most commonly seen in the sites of production, with the liver stated.
- 3.3** Only approximately 25% of the students gained credit in this question for describing the effect of hydrochloric acid on pH, thus creating the optimum conditions for enzymes to work. Many students wrote in terms of hydrochloric acid killing pathogens or emulsifying fats.

- 3.4** The vast majority of students correctly selected the gall bladder as the location of bile storage.
- 3.5** Approximately two thirds of the students correctly identified fats.
- 3.6** Three quarters of the students correctly gave the large intestine as the part of the digestive system that absorbs water. The most commonly seen incorrect answers were small intestine followed by the liver.
- 3.7** This question was marked with an error carried forward from the previous question part, meaning students who gave the incorrect organ could still gain credit for correctly labelling that organ in this question. Over 90% of students correctly labelled the organ they named in the previous question.
- 3.8** This question was demanding and was aimed at the higher end of the attainment range. Approximately 30% of the students gained one or two marks, most commonly for identifying the co-transport of sodium ions and glucose. Those answers that did not gain credit, often discussed the glucose in terms of giving a person energy.

Question 4

- 4.1** Most students correctly selected the part of the brain that controls breathing rate and heart rate. The most commonly selected incorrect answer was the cerebral cortex.
- 4.2** This question discriminated well, and students had to apply their knowledge of the brain to describe the function of each part within the given scenario. The most common correct answers related to the role of the cerebellum in controlling movement. Students often failed to clearly describe the role of the occipital lobe in *processing* the visual information.
- 4.3** Most students were able to correctly describe the difference between the somatic and the autonomic nervous system and answers were often supported by well-chosen examples for each. A significant minority demonstrated some confusion with this and the sympathetic / parasympathetic nervous system.
- 4.4** Just over half of the students correctly described the role of the sympathetic and parasympathetic nervous system. In a minority of answers, students simply gave an example of the action of the sympathetic and parasympathetic nervous system which was insufficient to gain credit.
- 4.5** Approximately 40% of the students correctly described the effect of the parasympathetic nervous system on the digestive system.
- 4.6** Students seemed to find describing the effect of the sympathetic nervous system on the pupils of the eyes easier than describing the effects in the previous question, with over three quarters correctly stating that they dilate or get larger. Only a small minority described pupil constriction.
- 4.7** Almost two thirds of all students gained partial credit in this question, which relied on interpretation of an image, with the most common correct answers relating to the reduced

areas of living tissue. Some students went on to identify the temporal lobe as being affected and linking this to its role in memory.

Question 5

- 5.1** Over two thirds of all students gained full or partial credit in this question. Students needed to select appropriate features of fast-twitch muscle fibres that would support the conclusion posed in the question. For this reason, references to fatiguing quickly or functioning for short periods of time were insufficient. However, many students gave one or both of these in their list of features. All possible correct answers were seen in student's responses, but anaerobic respiration and store of creatine phosphate were seen more frequently.
- 5.2** This question proved relatively challenging with only one third of students correctly naming the sarcomere as the area between two z lines.
- 5.3** Well over half of the students could correctly name the filaments attached at the Z line. Some students simply stated 'thin filaments', but given the nature of the diagram, this was insufficient.
- 5.4** Over three quarters of students gained some marks in this question with just over a quarter gaining full credit. The most common error was to divide the change in length by the length of the sarcomere in the relaxed myofibril. Some students calculated the length of the contracted myofibril as a percentage of the relaxed myofibril.
- 5.5** The final question on the paper was demanding and discriminated well, with approximately 60% gaining some credit. A quarter of all students gained 3 or 4 marks and some excellent answers were seen. Misconceptions or errors seen included the following:
- calcium ions binding with tropomyosin
 - troponin moving and unblocking the binding sites
 - myosin attaching to actin, without referring to the heads
 - actin pulling myosin along the actin
 - actin and myosin being pulled closer together.
- 5.6** The vast majority of the students found this question very demanding and only just over 20% gained credit. Some students who identified active transport went on to give the direction of movement incorrectly, i.e., into the sarcoplasm or out of the sarcoplasmic reticulum. Occasional references to endoplasmic reticulum 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.