GCSE

Additional Science (Route 2)

AS2FP

Report on the Examination

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General comments

Examiners continue to be concerned about a number of features that would enhance the marks students achieve but which would require very little additional effort on their part. These include: making sure that the correct number of boxes is ticked or words circled in multiple-choice type questions; avoiding leaving answer spaces blank; and using rulers and calculators in appropriate places.

Students should also be reminded that simply copying out the information in the question is unlikely to gain marks and that they must 'add value' to what is given. In some questions this may involve as little as making comparisons, using terms such as 'greater' or 'less than'.

Examiners also noted the number of students whose writing was so poor that it was difficult to interpret. Simply, if the writing cannot be read, despite the best attempts of several examiners, then no marks can be awarded. Schools are reminded that there is a full range of access arrangements for students that they can apply for, such as scribes or the use of a word processor.

It was evident that some students had started the examination well, but, as the questions became more demanding, had lost impetus.

Students should be reminded that they should answer in the spaces provided. These spaces are considered more than enough to accommodate an answer, even if half of it is crossed out and replaced. However, should more space be needed, students should use additional pages and not continue answers into the margins.

Question 1

(a) The great majority of students identified the correct two statements. Surprisingly, over a hundred students failed to follow the instruction to 'tick two boxes', offering only one or three of the alternatives.

(b)(i) Nearly all students were able to offer an acceptable definition of 'extinct', the most common suggestions being that the species 'no longer existed' or had 'all died out'. The small number of students who did not gain this mark often left their answers short by suggesting only that 'the animal is dead'.

(b)(ii) Most students continued their good start to the paper by clear reference to fossil evidence. Examiners reported very few students describing fossils or their formation without also using the specific term, 'fossil'.

(b)(iii) Although well over half of the students gained the mark here, this part of the question was more demanding. All of the alternatives are reasons for extinction; however, it was important that students read the question carefully enough and recognised the key issue that 'trilobites became extinct over a very short time period'. This would eliminate the first two alternatives as likely answers. Examiners suspected that students who did not read this vital information carefully enough would have been tempted to tick the first box as a cause of extinction. Further evidence for this comes from this first alternative being the more often selected distracter. Students should be reminded of the need to read all the information carefully and, in questions such as this, to consider all of the alternatives before making their choice.

Question 2

(a)(i) Most students were aware that body cells contain 'two' sets of chromosomes. The more commonly selected distracter was 'one', as some students possibly confused body cells with gametes.

(a)(ii) 'Mitosis' was correctly selected by a very large proportion of students, with 'fertilisation' proving to be the more popular of the distracters.

(b)(i) Although most students appeared to recognise that cell division of body cells results in the formation of two cells, very few students appeared aware that during this cell division, the daughter cells have the same number of chromosomes as the parent cell. Hence a very high proportion of students incorrectly chose the second alternative.

(b)(ii) Many students appeared to be unsure as to why more cells might be needed by the body. There were many references to 'energy' and 'fighting off infections', rather than to those points shown in the mark scheme: for 'growth', 'repair' or 'replacement'. The examiners allowed specific examples or descriptions of these three ideas, but not the suggestion that cells were being repaired or that cells were growing.

(c)(i) Most students correctly selected 'stem cells' here, although 'body cells' was by no means an unpopular distracter.

(c)(ii) A considerable proportion of students did no more than repeat the information in the question, that these cells can be used to 'repair damage'. The examiners were looking for specific examples of this, such as the 'growth of new organs' or 'repair / replacement of extensive skin damage'. A small but significant number of students suggested that stem cells could be used to grow completely new legs or arms. Very few seemed to realise that stem cells are able to differentiate to form other / specific types of cells.

(d)(i) Those students who gained both marks usually did so by referring to 'fertilisation' and to 'gametes / egg + sperm'. Those who fell short of this first idea often got no further than the 'meeting', rather than 'fusing / combining', of the gametes. Weaker responses included reference to 'intercourse'.

(d)(ii) Only the very least successful students failed to identify that identical twins will have the 'same DNA as each other'.

Question 3

(a) Many students coped well with this data and made good attempts to answer the question. Most of these recognised that training for short distances 'increases the number / percentage of fast-twitch fibres' whilst training for long distances 'decreases' this. Alternatively, students attempted to respond to the first statement by describing the general pattern of numbers / percentage of fast-twitch fibres in muscles of the different athletes. Each of these routes could gain two of the three marks; however, the most successful students tackled both statements. Less successful students often became confused about the information and described athletes as 'having twitches'. It was sometimes unclear which of the two statements a student was referring to, as an answer such as 'short distance runners have more fast-twitch fibres' did not make it clear whether the student was comparing this with before training or with long distance runners, the first of these comparisons

being worth one mark and the second being worth two marks. In cases such as this students did often amplify their ideas later in the answer, although examiners gave the benefit of doubt.

(b) Many students achieved one of the two marks here, referring either to '400(m)' or giving a suitable explanation. However, other students only suggested 'short distance'. Language skills sometimes proved a difficulty, with some students struggling to explain that 50% was closest to the 52% shown on the graph for the 400m runner. Examiners accepted the correct distance given in the explanation, provided it had not been contradicted previously by 'long distance'.

Question 4

(a)(i) Less than a quarter of the students identified the correct answer, 'hydrogen ion'. This was particularly surprising to examiners who might have expected the reverse. The most commonly selected response by far was 'sulfate ion'.

(a)(ii) This part of the question was answered much better than part (a)(i), with a high proportion of students demonstrating evidence that they knew the pH scale sufficiently well. However, a considerable number still reversed the scale, offering '4', but perhaps more surprising was the fifteen percent of students who selected '7', which examiners thought would have been readily recognised as being neutral.

(a)(iii) Three-quarters of students knew that the reaction could be described as 'neutralisation'.

(b) Most students gave correct responses in terms of reactants or products being 'harmful' or chlorine being 'poisonous'. Others gave answers in terms of protection from the chemicals. Incomplete answers which did not gain credit gave statements such as chemicals 'affecting' the body without qualification, or made references to the suit burning or 'protecting the fire-fighters from being burnt'.

(c) A very high proportion of students knew that 'chlorine' is a product of the electrolysis of sodium chloride; however, only around half the students knew that 'sodium hydroxide' is also produced, with almost as many selecting 'sodium'.

Question 5

(a) A little more than three-quarters of all students knew that reactions that give out heat are 'exothermic' reactions. Most of those who made the wrong selection chose 'endothermic'.

(b)(i) Most students were able to interpret the information given in the table regarding the two types of hand warmer. The advantages were usually given as the reusable being cheaper or reaching a higher temperature. In some cases, just 'reusable' was given as a response without students realising the need to add value and give an answer such as 'it could be used again'.

For the disadvantages, 'staying warm for less time' was usually given. The second disadvantage proved to be harder to obtain, with many students stating that it was 'too hot and would burn the hand'. Students tended not to appreciate that having to place the warmer in boiling water to reuse was a disadvantage. Few students gave responses in terms of the costs to reverse the reaction.

(b)(ii) Many students were able to link the reaction being slow to the hand warmer 'staying warm for 10 hours' or the 'reaction lasting 10 hours'.

Question 6

(a)(i) 'Precipitation' was not well known by students as the type of reaction which would make an insoluble salt from two soluble salts. The most commonly selected answer was 'electrolysis'.

(a)(ii) However, in this part of the question, 'filtration' was much better known as a means of separating an insoluble substance from a solution, with over half the students selecting the correct answer. 'Distillation' proved to be the more popular of the two distracters.

(b) Approximately half of the students correctly chose both of the required salts, 'silver nitrate' and 'sodium bromide'. A significant number suggested 'silver bromide' as one of their answers, which was of course not accepted. Many students appeared unaware that in order to make a bromide, it would be necessary to start with a bromide salt and that, if a silver salt is needed then one of the reactants must contain silver.

Question 7

(a) Most answers spoke in terms of sodium ions having 'a positive charge', often then amplified by 'opposites attract'. Some negated their answer by mention of 'positive electrons' or 'positive electrodes' being attracted. Others gave a description of the process occurring at the electrode without realising that the question had asked *why* the sodium ions were attracted. Others merely stated that sodium was produced without saying why this was at the negative electrode.

(b)(i) Somewhat less than half of the students knew that 'sodium chloride' was the electrolyte, 'chlorine' proving to be a very strong distracter.

(b)(ii) 'NaCl(l)' was correctly selected by over half of the students; however, many were unsure of the state symbols, suggesting that molten sodium chloride would be a solid or a gas.

(c) Students were able to link the inability to produce sodium before 1800 to batteries not being available until 1800. Incomplete responses simply stated that sodium was not discovered until 1807.

Question 8

(a) A good number of students gained full marks for this question and half of the students attained at least two out three marks. The common distracter was 'an atom has electrons surrounded by a positively charged mass', perhaps the reason being that they were looking at the plum pudding model as well as the nuclear model when selecting answers. There were quite a few students who ticked more than three boxes, or only ticked one.

(b)(i) This question was answered well. The majority of students selected the correct response 'six'. Those who did not gain the mark usually suggested 'twelve'.

(b)(ii) Despite the information given in the previous question, the students often failed to recognise that the proton number does not change for an element. The most popular distracter was '8', the number of neutrons; perhaps the students thought that two consecutive questions with the same answer was some kind of trick question. The answer of '14', the mass number, was as popular as the correct answer.

Question 9

(a) This question was answered well. Most students knew that 'gravity' or 'gravitational force' was responsible for pulling dust and particles together, although some believed that 'fusion' was responsible.

(b) Over three quarters of the students answered this correctly. 'Fission' was the most commonly selected distracter.

(c)(i) A high proportion of the students gained full marks here. Those who lost marks knew that the correct first stage was the 'protostar', but then mixed up the other stages.

(c)(ii) This question was answered quite well, with over half the students gaining full marks. Both age and brightness of a star were popular distracters for the determination of a star's life cycle. Examiners were pleased that a very high number of students knew that the forces were balanced in the main sequence period of a star's life cycle.

Question 10

(a) Only half the students wrote 'gamma' (or the accepted beta) as the source of radiation from Tc-99. Popular incorrect answers were 'alpha' and 'X-rays'.

(b)(i) This question was answered very well. Those who did lose marks either wrote 'zero' for the number of atoms at the start, or thought that the atoms increase with time.

(b)(ii) This question was answered well with the majority of students gaining full marks. If the answer value was incorrect, students could still gain one mark if they had shown on the graph or otherwise that they had found the time at '800' and the time at '400'. However, some students did not read the time correctly, often because they used a free-hand line drawn on their graph. A few students added the two times together instead of subtracting them.

(c)(i) The majority of students knew that radiation can increase the chance of cancer, or that it causes mutation or cell damage. Incorrect answers often referred to poisoning or symptoms of radiation sickness.

(c)(ii) Half of the students gained a mark on this question, usually by making reference to the fact that radiation cannot pass through the lead or that it offers some protection for the nurse. Many of those who failed to score misunderstood what the lead was there for and thought it was to stop the Tc-99 from escaping or to stop the spread of germs, infection or bacteria. Some believed it would stop any reactions from occurring.

(c)(iii) This was poorly answered, with many thinking that the nurse was at a higher risk due to the handling / preparing this particular syringe, and some thought that radiation would get onto the nurse's skin when it leaked. Only a few commented on the idea of 'greater exposure' or 'dealing with radiation more often'.

Question 11

(a) Most students gained this mark by referring to the 'amount / volume / mass' of egg white, or to the idea that repeating the investigation would improve it. Few students suggested that keeping the

tubes at the 'same temperature' would be useful, whilst the other points shown on the mark scheme were very rarely given.

(b)(i) This question required students to think through the information provided and link it to their knowledge of conditions in different parts of the digestive system. Relatively few students gained both marks, although close to half of the students gained one of them. The most common error was to give the correct parts of the digestive system but in reverse order, which gained no credit, whilst others failed to qualify 'intestine' with 'small'. In correct answers, reference to both 'pancreas' and 'small intestine' were seen frequently. The least successful students often offered a list of body parts for examiners to choose from and inevitably fell foul of the 'list rule' of marking.

(b)(ii) A little over a quarter of students gained this mark, referring to acidic conditions in the stomach. It was not uncommon for students to get part (b)(i) incorrect but be sufficiently vague here as to gain the mark; however, specific incorrect statements such as 'the small intestine has acidic conditions' were not accepted, as information to the contrary is expected knowledge on the specification.

(c) A disappointing proportion of students appeared to have no idea whatsoever what enzymes were, despite the previous parts of the question; a high proportion also failed to offer any thoughts at all. On the other hand, some students displayed excellent knowledge of the uses of enzymes in the home or in industry. Almost all correct answers were restricted to the examples given in the specification, referring to 'baby food', '(biological) washing powders' and 'slimming products'. Those students who had not revised this part of the specification often described a whole range of wildly speculative roles for enzymes, including 'making concrete', 'growing fish' and even 'making microwave ovens'.

Those students who restricted their answers to the role of enzymes in digestion could gain no more than four marks.

As this question assessed students' Quality of Written Communication, this was also taken into account when awarding marks.

Question 12

(a)(i) Students were often unsure of the correct name of calcium chloride, offering a range of suggestions, including 'calcium chlorine'. Other suggestions included 'water', which was ignored if given along with the correct response. Some, presumably confused by the state symbols, attempted 'calcium carbonate' as the solution. Many students also offered chemicals which had no link whatsoever to the reaction shown.

(a)(ii) Students were more confident here, with over half being able to identify the more familiar 'carbon dioxide' as a gas.

(b) Many students did not read the question carefully enough and answered in terms of volume rather than rate. Those who did give rate answers often started by stating that the rate 'increased at the beginning'. The end of the reaction was often described as a 'plateau' or due to a 'limiting factor'. There were many examples of inclusion of data, but these were not always linked to the effect on the rate. Good answers referring to volume were, however, awarded two marks. Examiners often had difficulty disentangling answers that appeared to refer to both volume and rate. Less successful students seemed unaware of the difference between the two ideas, or that a graph line that slopes like this one indicates a declining rate of reaction.

(c)(i) Students often realised that the line would be steeper due to the higher temperature and correctly drew the line to the left of the printed line. However, few appreciated that the volume of gas collected would be the same and few lines levelled off at 80cm^3. Most of the curves drawn finished at a higher volume, with just a few finishing below 80cm^3. Examiners allowed a little tolerance on this final volume to take account of weaker drawing skills or the need to show the added line.

(c)(ii) Despite the instruction to refer to particles, many students failed to mention particles at any point in their answer and instead gave a description of the temperature increase 'increasing the rate of reaction'. Marks were obtained usually either by stating that the particles would have 'more energy' or would 'move faster'. Incomplete answers often referred to particles 'moving more', without it being clear whether this was a speed or a distance. Incorrect responses included particles 'expanding', getting 'hotter' or 'bigger'. Few answers referred to collisions, with even fewer students giving complete answers relating to an increased collision rate, usually just stating that there were 'more collisions' or that the particles 'collide faster'. The most successful answers usually spoke in terms of 'more energy' and particles 'moving faster'. Very few answers included ideas about more frequent collisions, with many who went down this route stopping short with 'more collisions', when there would be the same number of collisions, hence producing the same volume of gas.

Question 13

(a)(i) This was well answered, with students either stating that plastic is an 'insulator' or 'does not conduct electricity'. Some did say 'it is a poor conductor' which was not worth a mark. There were a few who wrote 'plastic is a good conductor'.

(a)(ii) Given that students are expected to know the names of the three wires, and that they were also given the names in the diagram, it was surprising that so many students gained no marks on this question. However, over half of the students got both of the cable names correct and if they did lose a mark it was mainly due to writing the earth wire as one of the wires.

(b)(i) There were four marks on offer for this question and three of them could have been achieved even if students selected the wrong cable, so long as the physics was correct. It was a shame to see so many blank spaces. However, for those students who did attempt the question, many of them recognised that a flexible cable is required, but only around of half of these went on to explain that it was needed for movement of the lawnmower to secure one mark. A good number of students correctly calculated the power of the lawnmower using the information in the question and therefore were awarded two marks straight away. The most common choice of cable was cable number one, as students failed to recognise that only a two-core cable is needed as the lawn mower is double insulated. Instead, they incorrectly believed that because a three-pin plug was being used, a three-core cable would be the best, or that an earth wire was needed for 'extra protection'.

(b)(ii) The examiners were hoping that the picture would have helped the students to explain the action of the RCCB, which is knowledge direct from the specification. Unfortunately, many students had no idea how they worked and confused the action with a fuse, which lost them all the marks. There were a number of students who wrote vague answers but managed to get across the idea of 'breaking the circuit' and so were awarded a mark.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator www.aqa.org.uk/umsconversion