GCSE
Additional Science (combined)

AS2FP

Report on the Examination

4409

June 2015

Version: 1.0

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General

A considerable number of students had very poor handwriting. Examiners cannot award marks if they are unable to decipher key words in the student's answer, such students disadvantage themselves considerably. Where a student's writing is poor, Centres may use scribes and it would be helpful to students if this was done so that their true ability in science is assessed. In addition students should be advised to use a black pen that delivers a dark black colour, rather than shades of grey which some have. This will also help examiners to read what the student has written.
Students need to think about their responses to multiple choice questions before ticking or ringing an answer. This would avoid the messy alterations and crossing out, where it was not always possible to tell what the student's final response was.
Students should also consider the need to plan their answers to longer questions before they begin to write. This was a particular issue in question 11(c) where long and rambling responses often repeated the same idea several times. Sufficient space is provided for students to write very full answers on the printed lines. Only on rare occasions should it be necessary for students to extend their answer to additional paper. In such cases, students should be reminded to carefully number their continuations; some such continuations bore no indication of the question number they related to, leaving examiners to make their 'best guess'.

Question 1 – Low Demand

(a) Whilst many students appeared to have some understanding of what 'inherit' means, many had difficulty in expressing their ideas. The examiners were looking for the idea of something genetic being passed on from parents. Many students missed the first point as they only referred to 'something' being passed on (often lapsing into material goods) or referred to named characteristics such as 'hair or eye colour', or even just 'eyes'. In addition there was often the indication that the genes might be inherited from a wider range of the family circle, including siblings, or just being 'passed on' without reference from or to whom.

(b) Most students knew that cystic fibrosis results in 'damaged cell membranes'. The most commonly selected distractor was 'having extra fingers or toes'.

(c)(i) Students may have been able to recall some of the necessary information or may have worked it out from diagram. Whichever route was used, the majority of students gained both marks here, with almost all students gaining at least one mark. The most commonly selected incorrect answer was that the 'next child will definitely have cystic fibrosis', implying that some students believe in predestination of genetic characteristics rather than them being inherited randomly.

(c)(ii) Most students correctly identified 'embryo screening', with 'embryo division' being by far the most popular of the incorrect responses.

(c)(iii) Those students who offered acceptable ideas usually went along the route of the process being 'unethical' or 'immoral'. It should be noted that 'being against religion' or 'playing God' is insufficient in this type of question, although being against religious *views* or *beliefs* will gain credit. Very few students thought that the process might lead to the embryo being harmed, although some did suggest that this may lead to the possibility of abortion.

Question 2 – Low Demand

(a)(i) This was answered correctly by the majority of students. Of those who did not gain credit, many appeared to believe that dinosaurs would be heavy enough to make impressions in solid rock.

(a)(ii) Students found this question more difficult and not many students suggested that few such fossils were ever formed or that of those that were formed, many will have been destroyed. Students who went down this last route often suggested that the footprints had been 'eroded', which was acceptable.

(b) Most students could offer at least one suggestion, most notably asteroid collisions with the Earth or other catastrophic events, however the examiners felt that 'flooding' was insufficient in this case. Many suggested a lack of food or (new) predators, although references to 'disease' were relatively infrequent. The examiners reported no cases of students suggesting that extinction could be caused by the 'cyclical nature of speciation'.

(c)(i) The examiners thought that identifying the number of peaks above 7.5 (million species) would be straightforward. However the majority of students found it anything but, with over a tenth of students offering no response – perhaps some of these had not noticed this question, towards the bottom of the page. Of those who offered an incorrect suggestion, it was clear that some had counted all the peaks shown on the graph, without reference to the criterion for 'mass extinction'.

(c)(ii) Thinking their way through the time line described in the question proved difficult for many students. Some worked out the year that the data would suggest '50 000 015' and were credited, although some attempted this and made critical errors, whereas others omitted the 'million' and only gave answers such as '2065'. A number of students could not offer any suggestion.

(c)(iii) Those students who looked carefully at the graph and recognised the irregularity of the pattern or described the irregularities gained this mark. Others correctly described our inability to predict the future. Again, many students could offer no suggestions.

Question 3 – Low Demand

(a)(i) Most students incorrectly believed that plants respire 'only in the daytime', with only about a third of students gaining the mark here.

(a)(ii) The vast majority of students however, knew that animals respire 'all of the time'.

(b) Again, most students knew that most of the reactions involved in respiration occur in the 'mitochondria', with the two distractors being almost equally popular amongst those who did not.

(c)(i) Students needed to think carefully about what goes on during exercise, relate this to the graph and then determine the time that the exercise might have lasted for. Relatively few arrived at the correct answer, '6 minutes', that is from the start of the exercise until the heart rate began to fall. The most popular answer was '11 minutes' from the start of the exercise until the heart rate had fallen back to its original level, as students presumably believed that heart rate falls during exercise.

(c)(ii) Most students could come up with at least one way that breathing changes during exercise. It should not have been difficult for students to imagine themselves doing an exercise and then think about how their breathing might change during it. In order to gain both marks, it was necessary to refer to both depth and rate of breathing, however students often gave vague terms such as 'more' breathing which could equally apply to both depth and rate and consequently could not be credited as well as either of the more precise terms.

(c)(iii) The examiners were pleased to see that the alternative source of energy, through 'anaerobic' respiration was widely known, although a high number of students made no attempt to answer this question.

Question 4 – Low Demand

(a) Only about a third of students knew that electrolysis produced sodium hydroxide. Those who gave the incorrect answer chose the distractors roughly equally.

(b)(i) More students chose the incorrect 'Na^+', than the correct answer.

(b)(ii) A little under half of students knew the pH value of sodium hydroxide was '13', although almost as many believed it to be '7'.

Question 5 – Low Demand

(a)(i) This was well answered with the majority of students being able to complete the equation from the given data.
Although a word equation was asked for, correct symbols and formulae were accepted, though few managed to correctly give 'O_2'. It will be worth emphasising to students that they need to read the question carefully before starting their response; it is easier to obtain marks through using names of chemicals rather than the symbols and formulae.
Some students added an extra product such as 'power' or 'heat', neither of which was accepted.

(a)(ii) Most students realised the role of a catalyst in increasing the rate of reaction.

(b)(i) Few students were able to correctly name the gas in the froth as 'oxygen' despite having been told earlier in the question that oxygen was produced. 'Hydrogen', 'oxide', 'manganese' and 'carbon dioxide' were common incorrect responses.

(b)(ii) Most students were able to correctly describe an 'increase' in temperature as a consequence of an exothermic reaction.

(c) This question was well attempted but few students were able to suggest why the method was an improvement. Many answers related to the method being more accurate or having better equipment. Students also wrote in loose terms rather than using technical terminology, many referred to being able to measure the amount; however the amount of froth could also be measured so this was insufficient. Few had read the information in the question well enough to appreciate that more measurements were made. Others mentioned the use of measuring cylinder but were not able to explain why this was an advantage. The mark most often gained was for the idea of gas not escaping.

(d)(i) Most students were able to interpret the graph to gain at least one mark on this question, with Z being most often linked to the last description.

(d)(ii) A significant number of students did not attempt this question but most of those who did were able to correctly read the total volume of gas produced.

Question 6 – Low Demand

(a) Very few students gained any marks here. There were many confused answers showing little understanding of the process. Few were able to use the information to realise that the temperature required to melt the mixture was lowered. Even fewer were then able to state that this saved energy or had cost implications.
There were so many incorrect responses that it was difficult to see a pattern, but answers often related to the mixture being molten so that ions can move or that cryolite was acting as a catalyst. Others thought it was to do with the rate of the reaction.

(b) Very few students were able to give two ways in which energy is used in the process. Reference to the need for 'heat' energy was the most common method of obtaining the mark with 'electrical energy' being seen much less often.
Incorrect responses often related to energy but in the wrong direction ie being produced or 'heat' given off from mixture.

(c)(i) Just over half the students gained one mark usually by stating that 'opposites attract'. Few stated that aluminium ions are positive, although the insufficient 'aluminium is positive' was seen quite often when describing charge. Again students often did not describe clearly what they were referring to using 'they' and 'it' which examiners treated as 'aluminium ions' and 'the negative electrode', respectively, in terms of the phrasing in the question.
Many students confused the terms 'ions', 'electrodes' and 'electrons'.

(c)(ii) Again, students need to be encouraged to carefully read the question as information to help them was given in the stem. There were few very good answers, with carbon being the positive electrode the most common mark gained. Many students referred to opposites attracting or 'positive and negative electrodes attracting' one another. Others stated that carbon and oxygen 'mixed' to make carbon dioxide rather than them 'reacting' together.

Question 7 – Low Demand

(a)(i) Most students gained both marks for this part, the structure of the atom was well known.

(a)(ii) Less than half the students correctly identified 'neutron' and some responded with 'electron', which is surprising when considering the high percentage of correct responses to part (a)(i).

(b) Most students gained this mark.

Question 8 – Low Demand

(a)(i) The great majority of students correctly identified the time scale here.

(a)(ii) Just over half gained both marks here; only a small proportion failed to gain either mark. 'Supernova' was the most common incorrect inclusion.

(b) Most students attempted this question but only about a third gained the mark. Many of the incorrect responses refer to the 'Big Bang' or to Earth having been a star / supernova. Some only re-wrote information from the stem of the textbook statement.

(c) Only a very small proportion of students gained both marks. Of those who gained marks, most referred to 'extending scientific knowledge', in one of several ways. Some thought the purpose was to 'produce water', whereas others used catch-alls such as 'cure cancer'. Many gave answers rephrasing the process given in the stem without adding to it.

Question 9 – Low Demand

(a) This was generally very well done. A few converse relationships were given which were acceptable. Incorrect answers often referred to time rather than paper thickness increasing.

(b)(i) This was well done by those who attempted it with a third of the students gaining all three marks. A few students referred to the 'thickness of the paper', rather than simply describing the data from the graph. Some lost marks by vague descriptions which did not quote values for time or counts.

(b)(ii) Students needed to read the question carefully to gain this mark. The word 'between' in the question was highlighted to draw students' attention to the horizontal part of the graph; however many missed this and selected the first distractor.

(c) About half scored the mark here, with most of those who did not choosing the first distractor.

(d) The importance of the highlighted word 'near' in the question was commonly ignored, with very few students realising that the proximity of the radioactive source would *increase* the chances of any effect. Thus, those who gained a mark, almost always did so for reference to 'cancer'. There were many misconceptions about the nature of radioactivity, with suggestions that it might 'affect hearing' or might 'drop onto someone and injure them' or simply 'kill you' (instantly).

(e) The majority of students gained marks here. Some students only gave one response, possibly because the instructions had not been read carefully enough.

Question 10 – Standard Demand

(a) A high number of students made no attempt to answer this question. In addition there were many suggestions, such as 'starch' which showed little understanding of the process of digestion. Despite this, about a quarter of students gave the correct answer 'amino acids'.

(b)(i) The examiners were pleased with the number of students who recognised that putting the two tubes into the water bath for ten minutes would allow them to 'reach the same temperature', before they were mixed.

(b)(ii) The diagrams show that in step 4 of the investigation there is 10 cm^3 of solid egg white and in step 5 there is 7 cm^3. The examiners believed that identifying this and determining the difference in volumes should be reasonably straightforward. However, only a little over a quarter of students could complete the necessary steps.

(c)(i) Many students realised that an increase of temperature had resulted in an increase in the digestion of the egg white, and gained the first mark. The second mark required some mathematical skills to recognise that the volume digested was doubling for every 10 ^oC rise in temperature. Some students fell short of this only suggesting that the volume 'doubles' without reference as to the conditions under which it doubles, so were only awarded the first mark for an implication of an increase.

(c)(ii) Students often took the wrong route in this question, misunderstanding what was required to improve accuracy, suggesting that simple repetition of the investigation would do this. Those who realised that the temperature interval needed to be reduced usually only gained the first mark as they did not specify any part of the particular range of temperatures over which this would determine a more accurate value.

(c)(iii) Many students realised that the error with the statement was in the word 'killed' as referred to enzymes, often suggesting that 'enzymes are not living'. However some of these were unable to suggest an alternative term such as 'destroyed' or possibly 'denatured' (although this term is not expected knowledge, many students used it). Many of the students who did not gain marks here believed that the error in the quotation was the temperature, and suggested that some different temperature might kill the enzyme.

Question 11 – Standard Demand

(a) Just over a third of students gave the correct response, 'base', although almost as many offered 'alkali'.

(b) Over a third of all students did not attempt this question. Of those that did there was little understanding of what 'state symbols' are.
Even with the prompt that was given in the question of '(aq)' few state symbols were seen. There were a variety of approaches eg '4 4 2', '+ + -' etc. Some just wrote (aq) for all the answers or wrote 'magnesium oxide', 'solid' or 'gas' in the bracket.
When correct state symbols were used, relatively few students were able to successfully allocate the correct state symbol to the relevant substance.

(c) The question asked students to describe how they would prepare crystals of magnesium sulfate. Examples of equipment that could be used were given in addition to indications as to what was required in their response.
Six marks were only awarded if the method would produce magnesium sulfate crystals rather than magnesium powder.
Students who gave labelled diagrams could gain credit for the diagrams but 6 marks would not be awarded to a student who just included the diagram, it is expected that some prose would also be seen.

There was clear evidence that many students had not experienced this practical work. The spatula was often used to pick up the crystals or add solution. Students often thought the filter paper was to filter out the magnesium sulfate crystals. Names of equipment were often not known, with descriptions such as 'ceramic bowl' for the evaporating basin, 'spoon' for spatula and there were several references to a 'torch'.
Many students gave good descriptions of the mixing process, but few went on to add excess magnesium oxide, though the absence of this was not penalised.
For the filtration process sometimes 'sieve' was used, but was not credited. A significant number clearly did not read the question and thought that the crystals would be in the residue rather than the solution that was the filtrate.
To obtain crystals from the filtrate, students often stated that they would evaporate all the water. As this would produce powder rather than crystals a maximum of 5 marks could be obtained in this case.
Some included phrases such as 'harden into' crystals in their response. There were some good responses seen but few could manage to describe all the stages.
Some started well but were then not sure what to do once sulfuric acid and magnesium oxide were added together, they often just evaporated the solution straight away without filtering.
Occasionally students didn't mix sulfuric acid and magnesium oxide or used the wrong chemicals but did gain credit for the filtration and crystallisation stages. Others often used the wrong equipment, eg mixing in a measuring cylinder.
Colours given in the response were ignored as students are likely to have prepared copper sulfate from copper oxide and sulfuric acid which is a very similar reaction and students aren't expected to know the colours of magnesium sulfate solution and crystals.

Question 12 – Standard Demand

(a)(i) Only around half of the students gave 'live' here, with most of the rest suggesting 'earth'..

(a)(ii) Very few responses referred to 'double insulation'. Most of those who gained the mark were for wood not conducting. Many said that the (earth) wire just wasn't needed and several referred to the plug case rather than the lamp.

(a)(iii) This part was generally well answered but with more responses of 'doesn't conduct' than 'insulator'. A number of students thought plastic was a conductor. Some responses indicated some understanding but used vague or incorrect terms. Some did mention other properties of plastics which were ignored.

(a)(iv) Little understanding was shown, with suggestions about 'battery life'. There was also a lot of confusion between power, voltage and electricity. Many merely amplified 3A to 3 amps/amperes or listed the different fuse sizes available. Of the creditworthy responses referring to the effect on the fuse, the term 'blow' was used more often than 'melt'. Many confused the terms 'current', 'charge', 'power' and 'voltage' using them incorrectly.

(b) Most incorrect responses focused on the power rating of the bulb, some cross-referenced to the idea of blowing a fuse if a bulb larger than this were used. Many merely wrote out the label in longhand. There were very few correct references to 'frequency' in the sample. There were many incorrect attempts at defining a.c, including 'alternate' and 'alternative' current.

(c) Many students did not attempt this part. Of those who did, some divided rather than multiplied. It is a matter of concern that some students stated that they did not have a calculator.

(d) A significant number of students selected C having misunderstood what was meant by the 'input'. Many who chose A did not go on to make the necessary comparison of both input and output.

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