



**General Certificate of Secondary Education
March 2012**

**Science B
(Specification 4500)**

SCB1HP

Unit 1: My World

Report on the Examination

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GCSE Science B

SCB1HP

General Comments

A number of candidates had been inappropriately entered for this tier. Centres should consider carefully whether candidates with poor writing and comprehension skills are suitable for the Higher Tier paper. The importance of practicing writing continuous prose responses to scientific questions is essential and re-writing of the question should be discouraged. Imprecise use of language often meant that candidates could not be awarded marks. Responses often demonstrated poor use of scientific terminology, which resulted in marks not being awarded. A significant minority of candidates did not read the questions carefully or follow instructions correctly. Instances will be apparent in the detailed report below. A significant number of candidates were unfamiliar with the elements and compounds listed in Appendix E of the specification.

Question 1 (Standard demand)

- (a) Three marks were rarely awarded as very few candidates knew that the function of thick fur was to trap a layer of air. Most knew that fur reduced heat loss from the body and so had an insulating effect. Too many candidates deviated into descriptions of camouflage and surface area / volume ratio.
- (b) Whilst the correct answer of animal B was frequently chosen, confusion exists between surface area / volume ratio and surface area. Consequently the explanation for animal B being most able to survive cold conditions tended to refer to its small surface area reducing heat loss, and so could not gain full marks. A considerable number chose animal C, the argument often being that it was bigger and so could survive the cold. A small minority chose animal A in the belief, like Goldilocks, that it was neither too large nor too small but just right.
- (c) 'Extremophiles' was quite well known, although the spelling was rather variable. 'Volcanic' was not so well answered, with 'air' or 'hot air' being a typical answer.

Question 2 ((a), (b) Standard demand / (c) High demand)

- (a) It was obvious that most candidates had seen at least one test for a gas. However, the majority could not identify the test for carbon dioxide. The 'squeaky pop' test for hydrogen was a common answer, presumably because the test was the most memorable. The test for oxygen was also popular, as was attempting to grow a plant in the gas.
- (b) (i) Most candidates seemed to have focussed on the word 'plugged' in the question stem and so ignored 'loosely'. Consequently, most of the answers described how the flask was sealed to prevent gas escaping. Of the few who gained a mark for this question, most described how gas could escape the flask. A small minority came up with the actual reason for the loose plug: to prevent liquid escaping.

- (b) (ii) A smooth curved line passing through the points was required to gain the mark. Unfortunately most candidates chose to draw a straight line. Of those who attempted a curve, some were poorly executed, with multiple lines or a thick line.
- (b) (iii) The question required use of the graph and so the candidates who ignored that instruction and described the reaction between calcium carbonate and acid were unlikely to gain credit. Also, those candidates who attempted to draw a straight line made it difficult for themselves as the fact that the reaction was slowing down was not so obvious. Any reasonable time after 7 minutes would gain the first mark. Too many candidates seemed to think that one could not be sure of the time when the reaction stopped because the reaction might change suddenly or because of 'anomalies' in the results.
- (b) (iv) Most candidates knew that a gas was released in the reaction but could not go on to explain why this causes a change in mass. A common misconception is that gas weighs little or nothing at all, and so the mere production of gas would lead to a reduction in mass. It is clear that many candidates had seen this reaction as they knew that the pieces of calcium carbonate dissolved in the acid. However this often led to the conclusion that the disappearance of the calcium carbonate led to a reduction in mass. Several candidates penalised themselves by not actually pointing out that the mass decreased.
- (c) (i) A minority of candidates could produce a correctly balanced symbol equation. However, most could not. A substantial number merely put the names of the chemicals into the equation. Others confused the symbol for calcium with that for carbon, copper, cobalt or chlorine. Little effort was made to balance the equation. The symbols for the products were better known than the reactant.
- (c) (ii) Very few candidates gave the correct answer of 2.8g. Most made the first subtraction and gave the answer as 2.2g, ignoring the fact that there were two marks for the answer and a simple subtraction would hardly be worth two marks.
- (c) (iii) Not well known.

Question 3 (Standard demand)

To answer this question it was necessary to provide a logical narrative beginning with carbon dioxide in the atmosphere and ending with the formation of limestone. Initially, the carbon dioxide could dissolve in the ocean or could be taken up by aquatic plants photosynthesising. Thereafter, it was necessary to include the uptake of carbon by marine animals in order to make bones and shells with calcium carbonate. When these animals died, they would sink to the bottom of the ocean to form the sediment. Over millions of years, pressure would compress this sediment to create limestone.

Most candidates could include information in their account that was not provided in the diagram.

The link between dead marine organisms and limestone was well known, as was the relationship between the uptake of carbon dioxide and photosynthesis. However, only the most able could provide the link from

carbon in plants to carbon in animals and also that the carbon was needed to create shells and bones. That pressure was necessary to create limestone was fairly well known, although there was a tendency to stray on occasions into fossil fuel formation. Also, many candidates failed to point out that the timescale involves millions of years.

In general, despite the lack of factual information, the level of communication was good, with very few incoherent answers. Having said that, many candidates would gain a higher mark on this type of question by planning their answer beforehand. In too many cases, a candidate had to resort to arrows and asterisks to include a point which should have been described earlier.

Question 4 (Standard demand)

- (a) The concept of Red Shift is not fully understood. The correct answer should have been that the light from galaxy K was less red shifted than that of galaxy L (or the reverse argument for galaxy L). That this shift refers to the absorption lines in the light spectrum from the galaxy is implied but did not have to be stated. Those candidates who described the light from galaxy L as being 'redder' or 'more red' have missed the point. The second mark, which was gained more often, was for pointing out that galaxy K was moving more slowly than L (or the converse). Some candidates lost the mark by not addressing the question and just pointing out that more distant galaxies moved faster without reference to K or L.
- (b) The idea that the universe began as a single point which then expanded was generally known, although the means of describing it were often confused and tended on occasion to stray into descriptions of the formation of planets.
- (c) Most candidates gained this mark, although the usual route was via variations on the 'gaining of more knowledge about the universe'.

Question 5 ((a), (b(iii)) Standard demand / (b(i), (ii), (c) High demand)

- (a) Almost all candidates could recognise the pattern in the graph. Unfortunately, many lost the first mark by failing to appreciate that the temperatures were all negative numbers and so the larger the number, the lower the temperature. The second mark, for pointing out that the graph was not linear, was gained by very few.
- (b) (i) Most gave the correct answer of 18.
- (b) (ii) There were many correct diagrams, although those candidates who had arranged the electrons in a symmetrical pattern made marking the question much simpler than those who scattered the electrons randomly about the shell. Allowance was made for any error in part (b)(i).
- (b) (iii) Several candidates misread the graph and so answers of -205° and -215° were given. Others forgot the minus sign and so lost the mark. Some gave temperatures which were considerably different from -210°C , presumably because they had decided that the atomic number of argon was not 18, despite the fact that it had been given in the question.
- (c) (i) There were no issues with this question.

- (c) (ii) Very few candidates knew that the air has to be dry, otherwise any water would freeze at the low temperatures.
- (c) (iii) This was not attempted by a number of candidates. Many candidates knew that fractional distillation was used in some way but then became fixated on a description of that process and so did not answer the question. The mixture needed to be heated slowly rather than being boiled, until the boiling point of argon was reached, at which point the argon would become a gas and could be collected. There was some confusion as to what happens to the Argon at its boiling point, with terms like 'condensed' and 'liquefied' being used on occasions.
- (c) (iv) There was some confusion between uses of argon and uses of other noble gases. Argon is not used in neon lamps. Similarly, 'filament lamps' gained the mark, but 'lamp filaments' did not.
- (d) The majority of candidates did not appear to be familiar with the terms 'molecule' and 'atom'. Most of the answers were concerned with how oxygen and nitrogen did not fit the pattern rather than why. Those candidates who recognised that the number of atoms was a factor would often suggest that oxygen and nitrogen are compounds while the other gases are elements.

Question 6 ((a) Standard demand / (b) High demand)

- (a) 'Natural Selection' was well known, although 'evolution' and 'adaptation' were often seen.
- (b) It was obvious that most candidates were aware of the processes of natural selection. However, the answers were often confused. Many candidates have difficulty in transferring their knowledge of natural selection to a novel situation and gave a generic account of selection which could not gain full marks. Far too many answers took the Lamarckism route with the animals stretching their necks over generations. It should also be pointed out that species do not evolve because they see a need.

Question 7 (High demand)

- (a) Most candidates could name at least one of the three gases, but not many could name all three. Nitrogen and argon were common incorrect answers.
- (b) (i) The formula of methane is not well known. 'Me' or 'MH4' were popular answers.
- (b) (ii) A substantial number of candidates recognised that methanogens could not have survived in an atmosphere containing oxygen. Some stated that the early atmosphere contained little oxygen but did not gain the mark because they did not go on to explain the significance of this in terms of methanogen survival. A common error was to suggest that the methanogens created the methane in the atmosphere.

Question 8 (High demand)

- (a) It was apparent that most candidates did not fully understand the meaning of the word 'biomass' as their answers referred to the decomposition of dead organic matter or the combustion of fossil fuels. Respiration was often introduced almost as an afterthought. That the process produced carbon dioxide which is a greenhouse gas was well known.
- (b) Although most of the candidates had some understanding of the processes involved in maintaining the temperature of the Earth's atmosphere, their answers lacked the detail necessary for a question at this level. Consequently, only the most able could gain any credit. Phrases such as 'heat bounces off the Earth' or 'heat gets trapped by greenhouse gases' are insufficient. Some candidates knew that short wave infra-red radiation from the sun passes through the atmosphere to reach the Earth's surface and is then radiated back as long wave radiation which is absorbed by the greenhouse gases. However, they could not go on to describe how the greenhouse gases then re-emit this radiation. According to far too many candidates, the ozone layer is still involved.

Mark Ranges and Award of Grades

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