

Examiners' Report Summer 2007

GCSE

GCSE Science (2101) Units 5005-5010

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Paper B1a (5005) Environment / Genes

Overall candidates accessed this paper well and many of the subjects indicate good understanding of many of the topic areas. Topics where candidates scored well were food chains and webs and sexual reproduction. Candidates are becoming much better at accessing graph interpretation type questions especially in the higher tier.

Foundation tier

For the foundation tier, candidates had problems with external sexual reproduction where 41% of candidates believe this is asexual reproduction. Natural selection was poorly understood with only 28% of candidates able to identify that the increase in rat population was due to natural selection, 29% of them believing they were genetically modified.

For the cross over questions pyramids of biomass are once again an issue, with only 35% of foundation tier candidates gaining the correct answer and only 44% of higher tier. Many candidates are still confusing a pyramid of biomass with a pyramid of numbers. Classification once again is poorly understood with candidates attaining less than 50% at both foundation and higher tier when asked to identify kingdom and species for the peppered moth.

Higher tier

At higher tier a worrying 75% of candidates believed that humans evolved from monkeys rather than that they both had a common ancestor and 55% of candidates believed that scientists at the time of Darwin's book disagreed with his observations. Genetic modification is also poorly understood with 43% of candidates believing that pollination is involved in the production of GM plants. The use of punnet squares and identification of blood groups was well understood with over 60% of candidates gaining the correct answer on these questions.

Paper B1b (5006) Electrical and Chemical Signals / Use, Misuse and Abuse

Candidates accessed this paper well with marked improvements in graph interpretation and the use of experimental technique style questions although mathematical calculation type questions still cause problems.

Foundation tier

At foundation tier, problems were seen in understanding voluntary and involuntary response with only 46% of candidates getting the correct response. Disappointing response on how glucose is carried around the body with only 21% of candidates answering 'in the plasma' correctly.

Standard demand questions saw big differences between the foundation tier candidates and higher tier candidates. When questioned about pathogens only 25% of foundation tier candidates and 55% of higher tier candidates correctly identified them as disease causing organisms. There still seems to be a problem in the understanding of vehicle borne organisms which is where an organism is carried to the sufferer in something such as food.

Higher tier

Higher tier candidates had difficulties with mathematical calculations with 26% of candidates able to multiply 600 by 12. General understanding of the menstrual cycle is limited with understanding of the role of oestrogen and progesterone and their effect on the gonadotrophins LH and FSH being poorly understood. This is essential knowledge to understand how hormones are used as contraceptives or infertility treatments. Finally candidates appear to only be reading the first part of the answer in the last questions, it is important they do not just read the first part which may be correct and not the second part of the answer which is wrong.

Paper C1a (5007) Patterns in Properties / Making Changes

Foundation tier

In November 88% of candidates were able to correctly identify the symbol for an atom of helium but this time in a very similar question only 58% could correctly identify the symbol for an atom of chlorine with 27% choosing CL. The position of chlorine in the periodic table was also not well known with 30% of candidates believing that it is in group 1. Only 42% of candidates knew the test for chlorine with 33% believing that it turns limewater cloudy. 43% of candidates knew, or could recognise from the formula, that ammonia is a compound with many believing that it was a mixture or an element. Only 45% knew that the reaction between an acid and an alkali was an example of neutralisation. The reaction of potassium with water was not well known with only 32% knowing that a lilac flame is produced. The word equation for the reaction was also poorly answered with 36% thinking that oxygen is an additional reactant and that the products are potassium oxide and hydrogen.

Only 39% of candidates knew that a reaction which gives out heat is exothermic.

The first three questions on metals produced good answers from both tiers. Many foundation tier candidates did not know the position of the transition metals in the periodic table with 42% suggesting that iron is in group 4. Higher tier candidates showed better knowledge but 33% failed to count the periods correctly choosing D rather than C. In Q23 knowledge that the reaction of zinc oxide with carbon to produce zinc is reduction and in Q24, that reactivity is linked to method of extraction, were both poorer than expected.

Higher tier

The higher tier candidates performed better than foundation candidates on questions 17 to 24 but the weaknesses indicated above were present.

In Q26 there was confusion between sodium carbonate and sodium hydrogen carbonate with 52% choosing sodium carbonate. In Q29 48% correctly identified the position of an inert element as being in group 0 but 38% believed it was in the position of hydrogen. Knowledge that the boiling points of the halogens increased with increase in atomic number was very weak with 28% believing that it was the chemical reactivity that increased. The displacement reactions of halogens were not well known with only 31% correctly identifying that bromine would react with sodium iodide solution. An equal percentage believed that bromine would react with sodium chloride solution. Only 27% could correctly identify the equation for the reaction of sodium with water with 32% believing NaO is a product of the reaction.

Only 27% realised that the production of carbon from sugar is an example of dehydration. Most of the questions on salts produced poor responses. 38% gave a correct answer to Q35 but 34% believed that you could mix solutions of copper chloride and potassium nitrate and form crystals from the solution. Only 14% knew that oxides, hydroxides and carbonates all react with acids to produce salts. 29% of candidates knew that insoluble salts are prepared by mixing two solutions but only 16% could correctly identify how to obtain a pure dry sample of the salt. In Q39 only 18% gave the correct answer with 41% believing that both statements were correct.

Paper C1b (5008) There's one Earth / Designer Products

Foundation tier

The first 16 questions were generally well answered and all areas of the specification were accessible. There was some evidence to suggest that a more careful reading of the questions would be beneficial.

Candidates understand recycling issues but a surprisingly large number mistakenly think that most plastics are biodegradable. The advantages and disadvantages of biofuels are not well understood. Only 46% of candidates realised that the production of biofuels from plants uses large areas of land.

The effects of drinking too much alcohol are unsurprisingly well known. However, only 50% of candidates correctly described spoiling of wine by oxygen. Questions involving application and interpretation of data were well answered.

Questions 17 to 24 showed that knowledge and understanding of issues concerned with complete and incomplete combustion was not good.. Only 13% of candidates realised that incomplete combustion of propane produces carbon with most giving carbon dioxide or sulphur dioxide.

Higher tier

The first 8 questions showed a good knowledge and understanding .The questions involving the understanding of balanced chemical equations were good discriminators. 36% of candidates failed to recognise that hydrogen is not a product of the complete combustion of propane. Information regarding the fractions obtained from crude oil caused a significant number of candidates problems. Only 24% of candidates correctly identified the fractions obtained at different points on a fractionating column. Only 57% of candidates understand the uses of bitumen.

A significant number of candidates struggled to correctly interpret information given on synthetic materials. 36% of candidates incorrectly identified ice hockey sticks as a likely use for Thinsulate.

Candidates struggled with the questions on 'Fuels for the future', especially the idea that DME forms no solid residue when burnt. Despite being given the equation showing carbon dioxide and water as the only products only 30% gave the correct response.

Paper P1a (5009) Producing and Measuring Electricity / You're in Charge

Foundation tier

Overall the performance of candidates in the first sixteen questions showed that they had been well prepared with over 50% of candidates opting for the correct response in 9 out of the first 10 questions and for 6 out of those questions the correct option was chosen by over 60% of candidates.

Candidates seem secure on some aspects of renewable energy but only 25% correctly identified a solar cell as a source of electric current and 46% of candidates thought that solar cells supply energy 24 hours a day.

Candidates' understanding of batteries was very patchy and only 20% recognised that current is measured using an ammeter in series with a component.

Questions about investigating current flow in a wire were generally answered very well with candidates displaying a sound understanding of accuracy and interpretation of results.

The common questions differentiated well between foundation and higher tier students and all discriminated well between less able and more able candidates.

Candidates showed that they had been well prepared to explain the effect of increased resistance on current, choice of sensors and calculating electrical power. Candidates performed well on most of the other common questions but only 23% of foundation tier candidates (56% of higher) understood the use of a control in an investigation. Similarly only 32% of foundation (64% of higher) candidates could interpret the data supplied to identify which type of insulation is best at reducing energy losses.

Higher tier

Candidates once again showed that they had been well prepared for the examination with over 50% of candidates identifying the correct response in 12 out of the 16 questions and 60% or more in 8 of these questions.

Candidates displayed a very good understanding of environmental and social impacts of renewable energies such as wind power and solar power. However, almost 33% of candidates thought that solar cells would only be widely used when their efficiency was almost 100%.

Candidates also showed a good understanding about investigating current/voltage relationships in a filament lamp.

Candidates struggled with questions on output voltage of batteries and predicting how long a battery was able to last when supplying a current.

Paper P1b (5010) Now You See it, Now You Don't / Space and its Mysteries

Foundation tier

Performance across all areas of the specification was patchy. For example, when considering uses of the different parts of the electromagnetic spectrum, while 75% knew that a sun tan was due to ultraviolet waves as many as 56% thought a toaster uses microwaves to change bread into toast. In a similar vein, 56% correctly identified the orbit of a comet but only 31% recognised that an asteroid also orbited a star. 25% thought the comet orbited a planet while 38% thought that an asteroid did. It was pleasing to see that 85% were happy with the idea of uncertainty about the existence of aliens with small, equal numbers making each of the three incorrect, definite statements. Only 50% identified the sound waves from a siren as longitudinal - as many as 22% thought they were ultrasonic.

All of the common questions were efficient at differentiating between foundation and higher tier candidates. All four of the questions about the constellation Orion worked very well.

This difference in performance between the two levels was typical of the overlap items and once again shows that students responded to the good advice of teachers as to the level they should attempt.

Higher tier

Many of these questions were well answered. Some, however, gave cause for concern. Ideas of reliability and validity were not well understood. As many as 69% considered the internet to be reliable, even though it gave rise to such diverse values for the distance between Earth and Rigel. The extremely low value for a correct multiple choice answer showed that only 6% really understood the meaning of validity as the idea that the test/experiment is measuring what it is meant to be measuring. In this case, the test is about the ability of sun-block to protect against skin cancer. The sunscreen is thus designed to block against ultraviolet light, so testing with infrared radiation is not valid (X-rays, gamma rays or radio etc. would also be unsuitable.).

Candidates did not appear to be pressed for time on the higher paper as the last three items about earthquakes were correctly answered by quite high percentages of candidates. This was most encouraging since there were several application items on the paper for which students had to do some original (to them) thinking. In particular, as many as 53% of candidates correctly used the given guidance to calculate the magnitude of an earthquake on the Richter scale. It is most important to note and to tell candidates that just because the question mentions this scale, they do **not** have to remember anything about it. They will always be supplied with sufficient information to successfully answer application items of this sort. What they need is practice in applying knowledge - not just learning a few facts.

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Raw Mark Grade Boundaries for GCSE Science Unit Tests

| | | | | | | | | | |
|------|----------|----|----|----|----|----|----|---|---|
| 5005 | Max mark | A* | A | B | C | D | E | F | G |
| H | 24 | 17 | 16 | 14 | 13 | 10 | 8 | | |
| F | 24 | | | | 17 | 14 | 11 | 9 | 7 |

| | | | | | | | | | |
|------|----------|----|----|----|----|----|----|----|---|
| 5006 | Max mark | A* | A | B | C | D | E | F | G |
| H | 24 | 18 | 17 | 15 | 14 | 11 | 9 | | |
| F | 24 | | | | 18 | 15 | 12 | 10 | 8 |

| | | | | | | | | | |
|------|----------|----|----|----|----|----|----|---|---|
| 5007 | Max mark | A* | A | B | C | D | E | F | G |
| H | 24 | 14 | 13 | 11 | 9 | 7 | 6 | | |
| F | 24 | | | | 16 | 13 | 11 | 9 | 7 |

| | | | | | | | | | |
|------|----------|----|----|----|----|----|----|---|---|
| 5008 | Max mark | A* | A | B | C | D | E | F | G |
| H | 24 | 16 | 15 | 13 | 11 | 7 | 5 | | |
| F | 24 | | | | 17 | 14 | 11 | 9 | 7 |

| | | | | | | | | | |
|------|----------|----|----|----|----|----|---|---|---|
| 5009 | Max mark | A* | A | B | C | D | E | F | G |
| H | 24 | 18 | 17 | 15 | 13 | 10 | 8 | | |
| F | 24 | | | | 15 | 12 | 9 | 7 | 5 |

| | | | | | | | | | |
|------|----------|----|----|----|----|----|----|---|---|
| 5010 | Max mark | A* | A | B | C | D | E | F | G |
| H | 24 | 13 | 12 | 10 | 9 | 7 | 6 | | |
| F | 24 | | | | 14 | 12 | 10 | 8 | 6 |

Uniform Mark Grade Boundaries - All Units

| | | | | | | | | | |
|---|---------|----|----|----|----|----|----|----|---|
| | Max UMS | A* | A | B | C | D | E | F | G |
| H | 40 | 36 | 32 | 28 | 24 | 20 | 18 | | |
| F | 27 | | | | 24 | 20 | 16 | 12 | 8 |

Note: On higher tier papers, the "allowed" grade E is calculated as half a grade width

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