

Examiners' Report November 2007

GCSE 360Science

GCSE

GCSE Science (2101)

GCSE Biology (2105)

GCSE Chemistry (2107)

GCSE Physics (2109)

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Science 5005

Biology 5025

Paper B1a Environment / Genes

Generally this paper was well accessed by foundation and higher tier candidates alike. Candidates are starting to show a greater understanding of the topics especially the genes section. Interpretation of data remains a very well understood section especially for the higher tier candidates. How science works appears to be more understood in this paper than in previous ones where, in particular, ethics questions have been very well answered.

Classification is once again a problem area for candidates, with only 42% of foundation tier candidates able to identify that differences between individuals are known as variations, and only 58% able to identify omnivores as plant and animal eaters. It was pleasing to note that 77% of candidates were aware that primates belong to the class mammals. Food chains questions were not as well answered in this paper with only 60% of foundation tier candidates able to identify that producers were at the start of a food chain. Once again there is a lack of understanding of pyramids of biomass and pyramids of number, with only 47% of foundation tier candidates recognising that a pyramid of biomass is pyramid shaped. Natural selection was clearly not understood, with only 25% of candidates able to identify that the development of long necks in giraffes was an example of natural selection. Cell division questions were well accessed, but candidates are still confused with regards to the hierarchy of DNA, genes and chromosomes, with only 23% of foundation and 30% of higher tier candidates able to identify that genes are made of DNA.

At higher tier the understanding of the cloning process is not good, with only 29% of candidates able to recognise that the nucleus to make a cloned animal comes from the original animal and not the surrogate. The way in which energy is lost in food chains is still a problem for candidates, in particular the fact that much energy is used in respiration in animals and in keeping warm whereas plants do not have to use as much energy in this way. Once again selective breeding and genetic modification are confused, with candidates interchanging the two in various questions. On a positive note, however, the process of gene therapy is being understood to a much greater degree than in previous papers, although the ability to complete genetic diagrams to work out subsequent generations is still a problem, with only 32% of candidates able to identify the numbers of heterozygous offspring there are.

Science 5006

Biology 5026

Paper B1b Electrical and Chemical Signals / Use, Misuse and Abuse

This paper was reasonably well accessed, with both foundation and higher tier candidates able to gain significant marks on graph and data interpretation, and with candidates showing significant understanding of the blood and the role of the immune system. Areas which candidates accessed less well were those of blood sugar regulation, the nervous system and the role of female sex hormones.

Foundation candidates found questions on TB difficult, with only 53% of candidates able to identify that it is caused by a bacterium and only 66% able to identify an X ray of the lung. Although the role of blood was generally well understood the role of platelets in blood clotting caused a problem, with 43% of candidates believing that white blood cells caused blood clotting. The iris reflex was a problem for candidates, with only 34% of candidates able to recognise that the iris reflex is as a result of the eyes response to light, and only 44% of candidates able to recognise the role of this in protecting the retina from too much light. Disappointingly, as questions related to drugs abuse are usually well answered, 76% of foundation candidates and 79% of higher tier candidates wrongly believed that the problem with cannabis is addition rather than possible psychosis. Once again questions related to drug trials cause problems, with only 45% of foundation candidates and 56% of higher tier candidates able to identify the benefit of using a placebo in a drug trial. Although a creditable 57% of foundation and 82% of higher tier candidates recognised that people with diabetes do not make enough of the hormone insulin, the remainder of this section was poorly answered.

Higher tier candidates were clear about the basics of the nervous system but only 29% of candidates were able to correctly identify that epilepsy, strokes and brain tumours have a similar impact on the nervous system as Parkinson's disease. 41% of candidates were able to identify the myelin sheath as an insulator of electrical signals passing along the neurone, with 31% incorrectly believing it to prevent bacterial infection. The role of oestrogen and progesterone in the menstrual cycle and in birth control was misinterpreted, with only 19% of candidates able to recognise that if progesterone levels remain high then menstruation will not take place. Graph interpretation on the role of FSH, LH, oestrogen and progesterone was less well answered than other graph interpretation, although 51% of candidates recognised from the graphs that ovulation occurred on day 14 as a result of high levels of FSH and LH.

Science 5007

Chemistry 5035

Paper C1a Patterns in Properties / Making Changes

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 and can explain the uses of the substances specified in this unit. A surprisingly large number mistakenly think that the fizz in lemonade is caused by citric acid and 35% thought that sugar is an artificial sweetener. The periodic table is well understood. Only 11% of candidates realised that the collection of hydrogen gas was over water. Hazard labels are well recognised.

Questions involving practical qualitative analysis are not well answered. Guesses are evident at flame test colorations and the colours of precipitates obtained with aqueous sodium hydroxide and metal cations are not known.

Questions 17 to 24 showed that the knowledge and understanding of issues concerned with types of reactions and atomic structure is variable. Only 38% of candidates realised that the addition of potassium to water is an exothermic reaction and 35% of candidates thought that the nucleus of an atom consists of electrons and protons.

Higher tier

The first 8 questions showed a good knowledge and understanding with the exception of the flame colour of sodium. The questions involving the understanding of balanced chemical equations were good discriminators. 57% of candidates failed to recognise the properties of carbon dioxide. Information regarding the halogens caused a significant number of candidates problems. Only 39% of candidates correctly identified the variation in the physical states and boiling points of the halogens.

Only 33% of candidates understand the nature of the reactions between halogens and solutions of halides.

Apart from the first question, candidates performed well with the questions on 'Ores'. Most candidates did not understand that magnesium and iron(III) oxide would react. A pleasing number of candidates successfully deduced the values of w, x and y to balance the equation.

Science 5008

Chemistry 5036

Paper C1b There's one Earth / Designer Products

Foundation tier

In questions 1 to 6 candidates showed a good knowledge of the uses of materials, but 34% of candidates thought that the coloured spot on some frying pans would burn at 60 °C. Questions on the environment were also generally well answered, but 28% of candidates thought that newspapers are non-biodegradable, and a further 20% believed that newspapers are made from non-renewable resources.

Knowledge of the gases in air was slightly weaker, with 28% of candidates suggesting that the percentage of oxygen in the atmosphere is 78%. Only 9% of candidates knew that, since the formation of the Earth, the percentage of oxygen has increased from 0%. 34% of candidates believed that nitrogen is needed for food to decay, and 52% that spots on packaging that change colour make the packaging microbe resistant. Knowledge of ethanol was again weak, with the usual confusion being shown between fermentation and distillation, and 24% of candidates thinking that the gas produced during fermentation of sugar is methane. In question 20 most candidates failed to consider the volumes in the different glasses and suggested that the whisky glass contained the most ethanol. Only 36% knew that ethanol is a bio-fuel because it is made from living things, with 25% believing that it is non-renewable and 21% that it produces no pollution. 22% of candidates believed that ethanol produces a solid residue during burning. Only 37% of candidates could correctly identify the advantage of bio-butanol compared to bio-ethanol, with 28% suggesting that the advantage was that it is produced from renewable resources and 23% that it can be used instead of petrol.

Higher tier

As would be expected higher tier candidates performed better than foundation candidates on questions 17 to 24, but 16 % believed that distillation is used to make wine and, in question 20, 65% of candidates suggested that the whisky glass contained the most ethanol. Only 53% of candidates knew that sodium hydroxide can be obtained from both sea water and rock salt. Generally, candidates performed well on the sections on nanotechnology but there was some confusion between hydrophilic and hydrophobic. The crude oil questions proved difficult for many candidates, with 34% of candidates not knowing that the crude oil is vaporised before it enters the fractionating column, and only 37% identifying the correct comparison in question 32. In question 33, 40% of candidates did not consider the size of molecules in petrol, and chose A. 35% of candidates believed that producing ethanol from sugar does not release carbon dioxide into the atmosphere, and 27% that burning bio-diesel does not release carbon dioxide into the atmosphere. Only 39% could identify the hydrocarbon in question 35, with 25% choosing C_8H_{16} and 25% choosing $C_{16}H_{36}$. In question 36, equations for the incomplete combustion of methane were not well known, with only 33% choosing the correct combination. 26% chose 1 only, suggesting that they were not familiar with carbon as a product of incomplete combustion. 39% chose an option including equation 2, which showed hydrogen as a product. In question 38, 55% of candidates believed that waste products are not released into the atmosphere when hydrogen is used as a fuel.

Science 5009

Physics 5045

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

Foundation tier

In general, some of the scores on this paper were disappointing. Several of the items testing how science works, such as identifying advantages/disadvantages and the impact of 'modern' technology on a locality, were quite well answered. Those items which tested the science behind these ideas were not.

For the application item about the new(ish) type of torch, as many as 65% successfully identified part X as a magnet. Unfortunately, exactly the same percentage (though not necessarily the same students) then answered the next item by thinking that the current in the coil of wire was caused by the movement of **positive** electrons. This resulted in only 18% correctly choosing negative electrons and 17% who showed no understanding by choosing magnetic poles. It is not surprising then that, in another item, 67% chose an upward direction for the charge movement in the wire next to the positive terminal of the battery.

Interpreting graphs caused considerable difficulty. More than half of the candidates thought that voltage steadily increased to a maximum between when you pick the torch up and when you switch it on. A scale which increased by 0.2 for a small square was little understood although the qualitative aspects of it being an alternating voltage, not needing an earth wire because of the low voltage and also the effect of an increase in speed produced considerably higher scores.

Higher tier

Performance by higher tier candidates on the overlap questions was much more encouraging. Clearly, students, under their teachers' guidance, are choosing the correct tier.

Direct reading from graphs was well done but students did not fully understand the step nature of some scientific discoveries and also experienced some difficulty dealing with negative temperatures.

Candidates at this level are quite happy with using equations, either in the form they are given, or when they need to change the subject of the equation. Care should be taken with units, however, as some, even of the highest scoring students, miss the k for example in kW.

The majority of students successfully identified the incorrect statement about given data.

Science 5010

Physics 5046

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

Foundation tier

Overall the questions were well answered and most areas of the specification were accessed by the majority of candidates. Indicators show that candidates found the paper slightly easier than previous papers for this unit.

Candidates seemed well prepared on uses and dangers of electromagnetic radiation, but only 22% knew that they all have the same speed in a vacuum.

Most candidates knew there is little gravity in space, but only half chose gravity as the force which pulls dust and gas together in the formation of a star.

Just over 50% of candidates could put common stellar objects in order of size.

The common questions differentiated well between foundation and higher tier students.

A disappointing percentage of pupils thought that either light or infrared was a longitudinal wave.

Candidates were well prepared for questions on the Big Bang, and searching for extraterrestrial life.

Higher tier

Candidates have significant misconceptions about the relative speed of digital and analogue signals.

Candidates were well prepared to answer questions on wave characteristics, but almost half of candidates forgot to halve the distance travelled in an echo calculation.

Many candidates showed a good understanding of gravitational field strength, but almost 70% were unsure about evidence supporting the Big Bang theory.

The last few questions discriminated well and higher ability candidates showed good understanding of questions ranging from black holes to the Earth's interior.

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Raw Mark Grade Boundaries for GCSE Science Unit Tests

5005/5025	Max mark	A*	A	B	C	D	E	F	G
H	24	19	17	15	13	10	8		
F	24				15	12	10	8	6

5006/5026	Max mark	A*	A	B	C	D	E	F	G
H	24	17	15	13	12	9	7		
F	24				16	13	10	8	6

5007/5035	Max mark	A*	A	B	C	D	E	F	G
H	24	18	15	12	10	7	5		
F	24				13	11	9	7	5

5008/5036	Max mark	A*	A	B	C	D	E	F	G
H	24	18	16	14	12	8	6		
F	24				17	14	11	9	7

5009/5045	Max mark	A*	A	B	C	D	E	F	G
H	24	16	14	12	11	8	6		
F	24				13	10	8	6	4

5010/5046	Max mark	A*	A	B	C	D	E	F	G
H	24	17	15	13	11	9	8		
F	24				17	14	11	9	7

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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