

Examiners' Report March 2008

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

Overall it was encouraging to see candidates being able to recount many scientific principles including the theory of natural selection and the interpretation of food webs. Data handling is still being carried out well and the candidates ability to interpret graphs is continuing to improve. Disappointing over the whole paper is candidates inability to deal with the mathematical element when it comes to calculations or simple percentages.

Foundation

Classification questions are continuing to cause candidates many problems with only 14% of candidates able to identify chordata as the phylum to which birds belong. There are some problems with the genetics questions where only 28% of candidates were able to recognise that a gene is a unit of inheritance. The process of cloning now appears to be better understood with 43% of candidates able to recognise that genetically independent hydra reproduce asexually, and that this is a form of cloning. Overall sexual reproduction seems to be well understood, although only 56% of candidates could correctly identify the male sex cell in animals as a sperm.

Higher

The common questions for both foundation and higher candidates worked well where the graph interpretation and data analysis was good. Data on pollution and the great bird watch well answered however only 40% of higher tier candidates were able to correctly calculate a simple percentage.

Genetic modification and the use of enzymes in this process seems to have been misunderstood with a significant percentage believing that hormones were used to insert genes or to cut them out. The understanding of the 'How Science Works' type of questions especially relating to experimental data is improving especially the method of planning the experiment with 61% of candidates able to identify the best method of carrying out a drug trial and 62% able to identify the reasons for trialling the drugs. The actual interpretation of the experiment is still an area for improvement with only 30% of candidates able to successfully identify the control in an experiment. Other areas of How Science Works especially with regards to the ethics of experimentation are improving steadily as candidates are recognising this style of question better.

Science 5006

Biology 5026

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

This question paper was well accessed by a majority of candidates at both foundation and higher level. The data interpretation continues to be answered well although once again mathematical manipulation is proving to be a problem.

Foundation

It was pleasing to note that 86% of the candidates were able to successfully identify paracetamol as a painkiller, however only 44% of candidates were able to successfully identify the fact that a virus causes the common cold. The use of the white blood cells in the immune system is still proving to be a problem with only 60% of candidates able to identify that white blood cells are the part of the blood that fight infection. Experimental data was well handled although calculating an average was only understood by 49% of the candidates. The use of drugs and their effects is understood well, although only 48% of candidates knew that paracetamol in large doses was harmful to the liver. Another area where there are problems is in understanding the control of glucose levels in the blood with only 30% of candidates able to identify that insulin is a hormone. On the crossover questions candidates did well on understanding the problems associated with alcohol and cigarettes and the unborn child. It was disappointing to note that candidates still cannot distinguish that vertical contact is the passing of an infection from mother to baby in the womb with only 16% of foundation candidates answering this question correctly.

Higher

The problems associated with smoking and alcohol especially relating to a pregnant woman are well understood and the data interpretation relating to these questions was well understood although only 52% of candidates were aware that there are other substances in tobacco which are more harmful than nicotine. Once again there are problems with the understanding of the eye with only 42% of candidates able to identify the iris reflex and 46% which understood accommodation as the change in the shape of the lens in the eye. It was very pleasing to note that 83% of candidates were able to recognise the synapse but only 26% of the candidates knew that the messages were passed across the synapse by neurotransmitters with 62% believing that it was electrical impulses. Reaction times once again are a problem with candidates confusing an increase and decrease in reaction times. Sedatives slow down reaction so therefore they increase the reaction time. The understanding of the menstrual cycle and the hormones involved needs to be improved and for the A/A* questions they need to know this information in depth including those hormones involved in IVF treatment such as LH and FSH. Finally the mathematical element of the paper was once again poorly accessed with many candidates unable to do a simple graph based calculation which resulted in only 22% of the candidates getting this question correct.

Science 5007

Chemistry 5035

C1a- Patterns in properties/ Making changes

Foundation

Only 52% of candidates were able to correctly identify a reaction that gives out heat as exothermic with 27% choosing physical. Flame colours were poorly known with only 36% correctly identifying the colour of a flame produced by sodium. 28% chose red and 31% blue. Only 58% could identify the position of sodium in the periodic table with 27% choosing the position where chlorine is. Only 42% knew that cooking involves chemical reactions and produces new products with 47% thinking that the reaction was physical. Only 41% of candidates knew that iron is extracted from its ore using carbon with 25% believing that it is found uncombined and 28% that it is extracted using copper. Only 36% of candidates knew the colour of the precipitate produce when sodium hydroxide solution reacts with a solution containing an iron(II) salt. 26% chose blue, 20% white and 18% yellow. Only 29% of candidates recognised that the reaction between calcium carbonate and hydrochloric acid involves neutralisation with 37% believing that thermal decomposition is involved. Only 16% of candidates could correctly identify one of the halogens at room temperature as a grey solid with the other three answers all being more popular than the correct answer. Only 33% knew that the symbol for potassium is K.

Higher

As would be expected higher tier candidates performed better than foundation candidates on questions 17 to 24 but some of the weaknesses indicated above were still present with only 26% of candidates being able to correctly identify one of the halogens at room temperature as a grey solid.

In question 25 only 37% could identify calcium as the metal with compounds that produces flame colours with 36% choosing magnesium. In question 27 54% knew that the reaction of iron(III) oxide with carbon to produce iron is reduction but 28% believed it is thermal decomposition. Counting of periods was poor in question 28 with 34% choosing the transition metal in period 5 instead of the one in period 4. Whilst 45% of candidates recognised the oxidising agent hazard symbol and knew that this would help other substances to burn, 41% thought that it was the flammable symbol. It is recognised that candidates have difficulty with equations but it was not expected that in question 30, 22% would choose the option involving ammonia as NH_4 . Knowledge of the density of ammonia was poor. 77% knew that ammonia is soluble in water and turns moist red litmus paper blue but only 51% knew that it is less dense than air. Knowledge of the uses of ammonia was also poor with only 29% knowing that ammonia is used to produce nitric acid but not soap. This is an example of How Science Works to benefit society. Only 52% of candidates knew that potassium sulphate contains the elements potassium, sulphur and oxygen. 40% of candidates believed that a solution of potassium iodide would produce a blue precipitate with sodium hydroxide solution. Only 15% of candidates knew that sodium oxide, hydroxide and carbonate will all react with dilute hydrochloric acid to form sodium chloride. 57% of candidates thought that the modern periodic table lists elements in order of increasing mass number.

Science 5008

Chemistry 5036

Paper C1b Topics 7 and 8

Foundation

The first eight 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 new materials specified in this unit. A surprisingly large number mistakenly think that the formula for carbon monoxide is CO_2 and only 47% knew that petrol was obtained from crude oil by fractional distillation. The danger of drinking too many alcoholic drinks is well understood. The advantages of using bio-fuels instead of petrol caused confusion. Only 38% of candidates realised that an emulsion is a mixture of two liquids.

Questions 17 and 18 showed that the knowledge and understanding of issues concerned with nanoscience is variable. Only 27% of candidates realised that nanoparticles are less than 100nm in diameter and 34% of candidates thought that sunscreens containing nanoparticles neither absorb nor reflect UV radiation.

Questions 21 to 24 involving the interpretation of graphical information were well answered.

Higher

The first 10 questions showed a good knowledge and understanding with the exception of the behaviour of the shape memory alloy.

Many candidates did not understand the order of the fractions obtained from the fractional distillation of crude oil. Only 37% of candidates successfully compared the viscosity and ease of ignition of diesel to kerosene.

Questions 30,32 and 38 involving the understanding of balanced chemical equations were good discriminators. 53% of candidates failed to recognise the properties of gasohol.

Information regarding carbon monoxide caused a significant number of candidates problems. Only 43% of candidates correctly identified the formation of carbon monoxide by the incomplete combustion of any fuel containing carbon.

Candidates confused the use of the term 'particulates', with regards to the combustion of fuels, with particles.

Candidates generally performed well with questions 39 and 40 involving the interpretation of data.

Science 5009

Physics 5045

Paper P1a 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. In 8 out of the first 16 questions over 50% of candidates opted for the correct response.

Candidates seem secure on some aspects of efficiency but only 24% knew that efficiency is not measured in volts, joules or watts.

Over half of candidates could identify a graph of a.c. but less than 40% could identify sources of d.c. as a battery and a solar cell.

Candidates were very successful in analysing the data about rechargeable batteries but found some of the questions about household insulation difficult.

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

In 4 of the 8 questions over 60% of foundation candidates chose the correct option.

In 7 of the 8 questions over 60% of higher candidates chose the correct option.

Candidates showed that they had been well prepared to explain the effect of increased resistance on current, and were comfortable with energy changes and environmental aspects of renewable energy. The only area for concern was the high percentage of foundation and higher tier students (over 60%) who did not know how the resistance of an LDR is affected by intensity of light falling on the LDR .

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 9 out of the 16 questions and 60% or more in 7 of these questions.

Candidates displayed a very good understanding of medical uses of electricity and in particular to analysing claims in newspaper advertisements.

Less than 40 % of higher tier candidates could calculate the resistance from the graph in question 29 and less than 40% of candidates knew that a straight line I/V graph indicated constant resistance. However, questions 31 and 32 were answered well. Almost 60% knew that the resistance of a resistor increases when its temperature increases.

Despite its regular appearance in this and other series of tests the advantages and disadvantages of RCCB's compared to fuses still causes confusion amongst candidates.

About 60% of candidates knew that current in a component is measured by connecting an ammeter in series with the component but, less than 35% correctly answered the question on the cost of electrical energy.

Teachers are reminded that past papers are available on the Edexcel website. This gives opportunities to encourage self-study by students or as class homework exercises with problem questions discussed in a subsequent lesson.

Science 5010

Physics 5046

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

Foundation tier

One question which tested application of knowledge and other aspects of How Science Works involved the measurement of wavelength. A section of a rule was supplied. 46% selected the correct response but all three distractors attracted large numbers of candidates.

A majority of candidates thought that sending men to the Moon was 'not a helpful way of trying to detect aliens'. They failed to realise that it is the reception of radio signals which is important rather than their emission. As many as 25% thought that scientists have proved the existence of aliens and only 8% that they must exist because they appear on TV. This then left 72% who knew that both statements were false.

Overlap questions

High percentages of correct scores were recorded by both foundation and higher candidates for items testing the type of radiation detected by Police in the dark and how this is produced. That this was scanning by emission was slightly less well understood (38%F and 60%H).

The identification of a digital signal still causes problems (34%F and 62%H).

Again, quite high scores were obtained for items about Newton's 2nd and 3rd laws but only 37% at F worked out that the 1 kg mass would weigh more on Earth than Uranus (89%H) while 44% thought it would weigh more on Mars than Jupiter.

Higher tier

Identifying the combination of planets orbiting a star as most like the Solar System was answered correctly by 73% although 16% of these higher students thought it was most like a galaxy and as many as 95% were able to compare the relative numbers of orbits. 74% were able to work out the conditions least like the Goldilocks zone. A disappointingly small number correctly identified both the smallest and largest distances between two planets whose orbital radius were given. 28% thought they were always the same distance (150 million km) apart.

It was surprising to note that only 39% realised that both transverse and longitudinal seismic waves would be detected after a route through the mantle only.

It was pleasing to observe the greater awareness of red shift that candidates exhibited by their responses. There was an apparent discrepancy, however, between answers selected for the final two items. Only 34% chose the word version in Q39 'longer wavelengths have a larger red shift' while 64% identified the proportionality variation of amount of red shift and wavelength as a graph in item 40.

The statistics showed that there was little, if any, time pressure for students to complete this paper.

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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				16	13	10	8

5006/5026	Max mark	A*	A	B	C	D	E	F	G
	H	24	17	15	13	11	8	6	
	F	24				17	14	12	10

5007/5035	Max mark	A*	A	B	C	D	E	F	G
	H	24	15	13	11	9	6	4	
	F	24				15	13	11	9

5008/5036	Max mark	A*	A	B	C	D	E	F	G
	H	24	19	17	15	13	8	5	
	F	24				18	15	12	9

5009/5045	Max mark	A*	A	B	C	D	E	F	G
	H	24	18	16	14	12	9	7	
	F	24				15	12	9	7

5010/5046	Max mark	A*	A	B	C	D	E	F	G
	H	24	19	17	15	13	10	8	
	F	24				16	13	11	9

Uniform Mark Grade Boundaries - All Units

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

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

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