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General Certificate of Education

Applied Science 8771/3/6/9

Examiners' Report

2006 examination – June series

- Advanced Subsidiary

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GCE Applied Science – AS Units

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Unit SC02 – Energy Transfer Systems

General Comments

Despite the fact that this paper was equivalent to the January paper in terms of accessibility and complexity of questions, it appears to have been tackled more effectively by candidates across the range of abilities. This being the case, the paper seems to have produced more marks in the higher range, i.e. 36 – 56. There was a good spread of marks, ranging from 2 to 67 out of the 80 available.

On the whole most candidates appeared to do better with the biology questions than the physics questions in this combined examination. This was particularly evident with the less able candidates. The more able candidates demonstrated a balanced understanding of energy transfer in the two different areas of expertise.

Question 1

(a) Mostly correctly answered.

(b) Most answers gave the correct range of 60 – 80, although some candidates failed to provide a range, giving only, for example '60'.

(c)(i) Mostly answered correctly.

(ii) Mostly both systolic and diastolic values were correctly given, although many answers were spelt incorrectly. Where the correct phonetic spelling was given a mark was awarded.

(d) The less able candidates mostly gained 2 of the available 3 marks. However, some candidates failed to read the question properly and gave an answer which did not include any reference to the role of the nervous system in increasing heart rate.

Question 2

(a)(i) Only the more able candidates gained both of the available marks. Most answers mentioned the 'maximum amount of air taken in (or breathed out)', without realising that both the air taken in and breathed out were necessary when measuring vital capacity, these answers therefore gained only one of the two marks.

(ii) 'Spirometer' was mostly correctly given for the equipment used to measure vital capacity, although sphygmomanometer tended to be given by the less able candidates.

(iii) The value for vital capacity was mostly correctly given.

(iv) Tidal (volume or capacity) was given correctly in most instances.

(b)(i) Chemoreceptor was correctly given by the more able candidates, while various terms, such as 'carbon dioxide receptors', were incorrectly provided by the less able candidates.

(ii) Mostly correct location given for the position of chemoreceptors in the body.

(c)(i) The majority of answers were incorrect, referring to 'the maximum amount of air that can be breathed out' with no reference to the rate at which air was expelled.

(ii) Nearly all answers were correct, with candidates realising that the peak expiratory flow rate of the athlete was higher than the normal rate. This showed that most candidates had correctly learned the normal range of values.

(iii) Most answers gave 'asthma' as a reason for a fall in peak expiratory flow rate, while others referred, also correctly, to improper functioning of the lungs.

(iv) Less able candidates gained mostly 2 of the 4 available marks, usually for stating that there was increased oxygen consumption by the muscles. The more able candidates, however, tended to provide a more detailed answer which included reference to a rise in carbon dioxide levels in the blood being detected by chemoreceptors, with a subsequent response by the respiratory centre.

(d)(i) Most points were correctly plotted on the graph, with even scales and correct labelling of axes.

(ii) Most answers mentioned that the peak expiratory flow rate was higher in the evening than the morning, while the more able candidates also recognised that the difference between the morning and evening readings was the same each day.

Question 3

(a) Mostly correct deduction of the wavelength and frequency readings from the graph.

(b)(i) Mostly correct examples were given for the use of ultrasound in diagnosis.

(ii) Mostly correct explanations were given to accompany the example given in part (b)(i).

(c)(i) Only the more able candidates gave valid examples for where ultrasound is not suitable for diagnosis.

(ii) When a correct example was given in part (c)(i), this was often accompanied by a correct explanation.

(d) Most answers gained only one of the possible three marks for stating that the use of radioactive tracers might cause injury to the patient. Perhaps, surprisingly, very few candidates expressed any concern for testing animals and failed to give this as an ethical issue.

Question 4

(a) Most candidates correctly answered this section of the question.

(b)(i) Mostly correct values were given for the maximum kinetic energy.

(ii) Well answered by the more able candidates who provided the correct answers with the appropriate units. The less able candidates still managed to mostly gain two of the possible compensation marks.

(c) Mostly correct reasons were given for why the rocket is likely to return to the ground with a slower maximum velocity.

(d) Many answers mentioned the fact that energy was absorbed, that the stopping time was increased, and that there was less force. Very few referred to a change in shape of the crumple zone or the fact that the momentum changes more slowly. No answers mentioned 'ductile' or 'bendable' in terms of the crumple zone.

(e) The less able candidates tended to refer to using seat belts or air bags to protect the camera, while the more able candidates gave correct examples such as attaching a parachute which would slow the rocket down.

Question 5

(a) Mostly very well answered with many candidates gaining all 6 marks.

(b) The better answers referred correctly to the fact that hair or feathers trap air which acts as an insulator, while very few mentioned that small pockets of air prevent convection. The majority of answers incorrectly made reference to hair trapping heat.

(c)(i) Generally only one out of the possible 2 marks were awarded here, usually for the first mark point, namely, that thicker blocks of snow mean that heat has further to travel. Most candidates appeared to have a poor understanding of how thick blocks of snow could help to maintain a warm environment for the explorer to shelter in.

(ii) More candidates than in the January exam realised that 'hot air' rises, while the less able candidates failed to gain marks by talking about 'heat' rising.

(d)(i) Most candidates gave 3 correct ways in which the body reacts when exposed to cold surroundings.

(ii) Most candidates gave 3 correct ways in which the body reacts when exposed to hot surroundings.

(e) Mostly candidates correctly realised that a silver blanket reflects heat back to the body.

Question 6

(a) Mostly 2 of the 3 possible marks were gained here, with some candidates giving the same answer for two energy sources even though the question specifically asked for a different advantage for each.

(b) Mostly correct alternative ways were given for how electricity could be generated, with an accompanying correct explanation for why this method is not used on a large scale.

(c) Poorly answered with only very occasional reference to the fact that efficiency means how much of the total input energy is converted into 'useful' energy, which was crucial for the award of the mark.

(d) Only the more able candidates provided a correct calculation and they often failed to give the correct units, thus failing to gain the second mark.

Unit SC05 – Energy Transfer Systems

General Comments

On the whole candidates were able to complete the paper in the time allowed. In general candidates were able to pick up marks from all questions set against the four different types of materials identified in the specification. The mathematical questions, of which there were two, were answered reasonably well. Less able candidates picked up marks mainly from the AO1 criteria from questions across the paper with more able candidates picking up marks from the AO1, AO2 and some of the AO3 criteria questions. There was a clear difference in demonstration of knowledge with more able candidates making relevant links between the science and understanding of how material behaved and the less able unable to make this link. It would appear that greater preparation on the structure of each of the four materials identified in the specification and general terms associated with these materials would be a useful starting point for the teaching and delivery of this unit.

Question 1

(a)(i) Most candidates gained 2 out of the available 3 marks, with marks failing to be obtained for not mentioning how the sample is secured.

(ii) Often poorly answered with many candidates giving inappropriate answers. There was also some confusion with the use of stress and strain as answers.

(iii) Most candidates were able to gain both available marks by identifying 'repeat' and identical conditions.

(b) Most candidates were able to gain both marks by identifying changes in the shape.

(c)(i) Generally a poor understanding shown of stress-strain curves. Only the breaking point was identified by the majority of candidates. More able candidates were able to identify more points on the curve than the less able candidates but very few showed full understanding.

(ii) Most candidates were able to pick up 1 out of the 2 available marks by identifying the return to the original shape.

(iii) The more able candidates were able to identify the elastic behaviour.

Question 2

(a)(i) Most candidates were correct in identifying annealing.

(ii) Most candidates were able to pick up 1 or 2 out of the 3 available marks for identifying heat and cooling.

(b)(i) Candidates showed a poor understanding of the term ductile.

(ii) Poor answers for part (b)(i) showed very little knowledge of understanding manufacturers requirements. Some candidates gained marks for identifying 'ease of shaping'.

(iii) Very few candidates gained more than 1 out of the 3 available marks. Candidates showed a lack of understanding towards the structure (micro) of the material.

(c)(i) Most candidates were able to identify a suitable coating.

(ii) Most candidates were able to identify a particular resistance.

(iii) Often poorly answered with a large number of candidates confused by the question and unable to identify a particular reduction in properties.

(d)(i) Most candidates scored poorly in this section with a lack of understanding of the manufacturing process.

(ii) More able candidates were able to gain marks with appropriate answers/sensible solutions to the questions posed.

Question 3

(a) Most candidates were able to identify the structure as 'amorphous'.

(b)(i) Almost all candidates were able to answer with 'covalent'.

(ii) Often poorly answered with a lack of understanding of the high melting point of glass.

(c) Generally well answered with many candidates gaining 2 out of the 3 available marks. Some candidates failed to gain marks for the incorrect use of units.

(d)(i) Often poorly answered with candidates appearing to be confused over what mechanical and physical properties were.

(ii) The majority of correct answers identified glass as being brittle (mechanical property) and transparent (physical property).

(e) This section of the question was well answered with candidates able to describe or show illustrations that the crack was widening leading to failure of the glass.

(f)(i) Many candidates failed to identify the heat treatment process and in some cases there were incorrect references made to chemical toughening.

(ii) Most candidates were unable to be specific about the heating conditions (high) and cooling (rapid). Only the more able candidates gained marks here.

(iii) Very few candidates scored full marks with the majority picking up 1 or 2 of the 3 available marks for identifying toughness and glass failing in a safe manner.

Question 4

(a)(i) This part of the question was answered well.

(ii) Often candidate responses were about how the strength and performance would improve and not the bonding/adhesion/protection of the fibre/resin.

(b) Most candidates were able to identify suitable properties from the text.

(c)(i) Very few candidates were able to identify the correct stresses.

(ii) Again, very few candidates were able to identify the correct stresses.

(d) In general only the more able candidates gained marks in this section of the question.

(e) This section of the question was well answered with many candidates gaining both available marks.

(f)(i) Often the responses referred to the correct answer which was Rod B.

(ii) In general this section was answered well with those able to show comparison picking up marks. Only the more able candidates scored full marks. Those candidates failing to gain full marks were unable make comparisons between the rods or their properties.

Question 5

(a)(i) Most candidates were able to identify the correct answer polymer.

(ii) Most candidates failed to identify the molecules as being 'long'.

(b)(i) Generally well answered with most candidates picking up 1 of the 2 available marks.

(ii) Candidates were able to pick up 1 of the 2 available marks for identifying other suitable properties – however too many candidates made references to strong and not strength.

(c)(i) Most candidates were able to successfully identify a type of plastic.

(ii) Answered well by most candidates.

(d)(i) Generally a poor response to this part of the question. Very few candidates identified the direction of draw.

(ii) Very poorly answered with a lack of understanding of thermoplastics and thermosetting polymers at a molecular level.

(e)(i) Most candidates showed some understanding of the terms 'stress and strain'

(ii) Generally well answered with many candidates gaining 2 of the 3 available marks. Some candidates failed to gain marks through the incorrect use of units.

Principal Moderator's Report

General Comments

The award has started well with many centres producing coursework of a commendable standard in both content and presentation, making use of novel approaches to meet unit requirements. Centre administration overall has been good.

A minority of centres have failed to realise that Units 1, 3, 4 and 6 are targeted at AS level. Some centres have set assignments that are insufficiently challenging for candidates – sometimes below their capabilities – thus restricting marks from the higher mark bands because they find difficulty producing coursework content to match their requirements. Some centres have set assignments that are too challenging and candidates struggled with the complexity; here, the less able candidates found analysis and drawing conclusions difficult.

There were a number of examples where it was evident that the tutors/assessors had not read (or understood) unit specifications properly. It is absolutely essential that tutors/assessors read the unit specification very carefully and also the assessment grids before commencing teaching any unit. They should also make candidates fully aware of their task. In order to have access to the highest marks available for units, it is essential that candidates cover the unit specification fully.

Colleagues are encouraged to make full use of the guidance available. AQA has produced a teacher's guide to support this specification which is a source of information, guidance and advice. Each centre also has a coursework adviser allocated to them who is only an e-mail or telephone call away for speedy advice.

The AS award builds on the work candidates may have done at GCSE level – or other prior learning – and candidates will be at different levels of capability and knowledge; centres should look to extend student knowledge, capabilities and interests and, using the school and local facilities, take this to an AS standard. Whilst this is an AS award, and candidates need to be challenged and moved on in their learning. If the step is too great, or if the assignments set involve work which is practically or conceptually very difficult, then candidates learning and, as a result, understanding, will be made more difficult. This affects the access candidates have to the higher marks because they are struggling with the complexity of the task. There is a balance to be struck between being sufficiently challenging to be interesting and move candidates on, and too challenging, putting barriers in the way of progress. Many centres get this right by knowing their candidates well, understanding what the specification requires and carefully providing appropriate assignments.

It is very important that centres guide candidates on coursework construction yet still leave opportunity for student flair and individuality. Monitoring coursework during its production to see how it is developing is essential. Some candidates produced unreasonably large pieces of coursework running to over 300 pages. These are really too large and represent an unreasonable amount of candidate effort. It also shows some lack of skill on the part of the candidate in selecting appropriate material to include and inappropriate guidance by the centre in allowing the student to produce so much work. At the other end of the scale some candidates submitted work of only a few pages which is insufficient to cover the requirements of a unit.

Whilst guidance is important, too much guidance – exemplified by all candidates doing the same activity, obtaining the same results and doing the same calculations – suggests over prescription.

At the other end of the range, allowing candidates to show autonomy in their working does not mean leaving them to do it alone. There is a middle way – helping candidates where they need help, and allowing them freedom, whilst monitoring their work, to allow them to gain the higher marks.

It is imperative that centres make it very clear to candidates that the incorporation of text downloaded from the Internet into coursework is plagiarism and will not be tolerated. Coursework is intended to be candidates' own original work. The assembly of coursework by simply downloading material and cutting and pasting it together is not acceptable. It is expected that candidates will use the Internet but what they should do is use it as a resource from which they construct their own coursework by reading, understanding and re-working what they have found to suit their purpose. Candidates may find it helpful to download and use in their coursework sets of data, photographs, diagrams and other similar items to support their work and this is not a problem. It is the unedited use of downloaded text in coursework, credited as student work, which is unacceptable. If centres fail to identify this during monitoring and final assessment, their entry could possibly be referred to AQA malpractice who will take appropriate action.

Administratively most centres managed to send mark sheets off (or sets of work if 10 candidates or fewer) in good time. However some centres were very late, making life more difficult for everyone – including themselves. A number of centres forgot to include Centre Declaration Sheets and a significant minority forgot to send Candidate Record Forms signed by the candidate: some of these also had the candidate name or number missing, which again makes identifying work more difficult – both are needed for checking. Despite the request not to send ring binders, some centres still did this, making for very bulky packages and more difficult handling. Plastic wallets are slippery and removing and replacing material is time consuming and frustrating. The best way to submit work is to use double or single treasury tags. Centres may choose to keep work-in-progress in any way they find most appropriate.

Unit 1 – Investigating Science at Work

Many centres completed this unit well, carrying out a survey and choosing one organisation to study in depth. Some produced very high quality coursework and centres had clearly established good working relationships with companies. Some centres had the foresight to consider aspects of work for unit 3 at the same time and had gathered useful evidence of the application of analytical techniques in the workplace.

The summary of local organisations is intended to motivate candidates to find out what organisations there are in the area local to the centre that use science. Part of this section is about using a range of research methods. There is no need to include in this section extensive company details – just a brief outline with name, address, type of service/product, nature of science used, company size – just sufficient to know where it is and what goes on there. Some candidates tabulated this information, others made well laid out lists. Some included local area maps and put the companies on it. These were all appropriate. Some centres included far too many companies, some simply used pages of web-site information, and some included

companies very well out of their home region – with no explanation why. Some centres sent questionnaires out to local companies.

The principal moderator has concerns over the use of questionnaires with companies. If several candidates from a centre each send a range of companies questionnaires these companies may become irritated by the repeated contacts and this could spoil what could be a fruitful working relationship. Some of the letters and questionnaires seen were of a poor standard and create a poor impression of the work of the centre and lack of initiative from candidates who could have sourced the information easily elsewhere without troubling the company. There is a role for questionnaires; this may be to prime an organisation before a visit so that they can prepare answers to the questions that are going to be asked or to make sure that when on a visit, the information that is required is obtained.

Having completed a summary of organisations, some centres went on to study more than one organisation – showing a misunderstanding of the unit requirements and causing candidates to misdirect their efforts and limit access to higher mark bands because an organisation was not studied in sufficient depth. Centres are guided to read the Assessment Objectives and mark band criteria and in turn to guide candidates to address each of the areas detailed. The more that are completed and the higher the level of treatment of each, the higher the mark the candidate should be awarded. Assessors should ask, "Is there something about…...", "How good is it?" for each of the statements in the mark band. If something is missing, the coursework should be referred back to the candidate for re-working. Last minute assessment makes referral problematic and could limit candidates' marks.

Where there is # in the assessment grid, this is a request to assessors to indicate student's capability for independent working – these comments could be written on the Candidate Record Form or included in the body of the coursework.

Unit 3 – Finding out about Substances

Most centres made good efforts with this unit. Centres are reminded of the need to tackle 5 pieces of work, the 4 analyses and the enthalpy of combustion activity. A number of centres did not attempt 5 activities and this automatically reduced the marks available for candidates. A number of centres guided candidates to carry out more than 5 activities. Whilst this may be interesting and teachers may wish to include extra activities as a part of their teaching programme – if they have time – they are not a requirement of the unit and may very well detract from student effort in the required areas. Centres should read the unit and its assessment requirements carefully and guide candidates to study these to an appropriate depth – remembering it is an AS unit. Candidates stand a better chance of gaining higher marks by covering the unit requirements fully, rather than by going outside the unit requirements with work which cannot be given credit.

Ideally, for each analysis, candidates should initially learn procedures and then use them for another purpose. Simply carrying out the analyses on known substances to see what the result is, is only half of the idea. Candidates should then go on to identify unknowns as appropriate. Candidates should consider where different types of analysis are appropriate and where their results have limitations – such as in inorganic analysis, maybe flame tests, or carbonate tests with acid, which only shows what is there, not how much of it there is. They should also find out where these tests are put to use in the work-place.

As mentioned in Unit 1 some centres sensibly linked aspects of these two units together, learning about techniques in Unit 3 and seeing them in action in Unit 1, putting the learning in the context of the working environment.

Some centres approached this work through the context of a burglary where evidence had to be collected and samples identified or muddled compounds that needed identifying. An approach which researched the composition of eggs was interesting but it led to the use of back-titrations and complex inorganic analysis which was too involved for the candidates to successfully analyse.

Some centres carried out too many chromatography analyses and others failed to make adequate conclusions from colorimetry work.

Most centres carried out enthalpy of combustion investigations but some limited this to the use of practically obtained data to calculate the energy yield per gram or mole of fuel. To gain the highest marks it is expected that candidates will calculate the theoretical energy yield using bond energy values and relate this to their own values obtained practically. Candidates should also indicate or show that they have taken care to obtain precise and reliable results. Some centres misinterpreted the unit requirements and carried out work on the enthalpy of neutralisation which limited candidates' marks. Some included neutralisation and work on exothermic and endothermic reactions in addition to that on enthalpy of combustion. Centres may wish to teach additional content but should remember that its inclusion in the coursework is not necessary and in fact leads moderators to question centres understanding of the unit and creates additional unnecessary work for candidates. This may well reduce marks since it detracts from the work they should be covering.

In the analysis of substances, and where calculations are carried out, it would be very helpful if assessors could indicate that the analysis findings and calculations are correct. Moderators do not know what should have been identified.

The evaluation of work was found to be weak across a broad range of centres and frequently limited marks. At AS level, evaluations, particularly of quantitative experiments, should include a consideration of the tolerance limits of readings – possibly percentage errors – and, where possible, a comparison of experimental and theoretical results

Unit 4 – Food Science and Technology

This unit has 2 parts, the generation of a design brief for a product and the production and testing of the product. Many candidates carried out this unit well but there were several areas where centres have not fully understood the unit requirements.

AO1 is essentially about the identification of a group of individuals with some sort of dietary need – it may be specialised or it may just be a well balanced diet. The aim is to show an awareness of general or specific dietary needs and design a product to meet this need bearing in mind the fact that the product is likely to deteriorate once made.

In many cases, the design brief or product specification was hidden amongst an extensive piece of work about diet. It would be a good idea if candidates included a clear summary which sets out what the candidate was going to make, who it was for, what particular features it should have

and how it is planned to package and keep it in good condition. This may not necessarily come at the start since candidates may wish to explore ideas and information before deciding what to do. Once the product is determined then research into ingredients, methods of manufacture and its preparation would follow.

Most candidates made their product and used photographic evidence of the stages of production and the final outcome, which provided good evidence of what had been done. Some candidates' selected inappropriate products such as an instant protein powder supplement drink. It was difficult to meet some of the unit requirements with such a product. Some worked as groups on product design which is acceptable, but the individual contributions should be made very clear so that credit goes to the appropriate person.

Most centres carried out tests on food materials. Unfortunately many centres appear to have carried out class practicals on food items, some of which had no link with the products some candidates had made; this makes access to marks for carrying out tests on the product impossible. Centres are advised to consider guidance given to candidates about how to test their product, as a whole, or its components. This is the area where precise and reliable data can be obtained and calculations carried out. Serial dilutions, colony counts, turbidity or other tests which generate data would be appropriate covering both decay and preservation. Many observations made were low level such as the product had dried out, or there was green mould on the banana, but not on the peanut.

It should be noted that sensory testing, whilst clearly sensible for a food product, is not part of the specification and, as this is the case, candidates work in this area should not form a significant component of the study.

Some candidates made very good efforts with labelling and packaging, giving good detail of the legal requirements, following this with current examples then going on to design their own label for their product and some even made a mock-up package.

Most tackled costing but many of these were at a simplistic level. Centres devoting considerable time to business strategies in this section have missed the main direction of the unit. The idea is for candidates to be aware of the cost of ingredients, manufacture, packaging and other on-costs involved in the production of food items and make a sensible attempt at a cost and sale price for their product.

Most centres included work on government agencies such as the Ministry of Agriculture, Fisheries and Food and the Food Standards Agency but the tests they carry out and how this could impact on their product was much less well covered.

Unit 6 – Synthesising Organic Compounds

Many candidates gave a reasonably good coverage of organic compounds and functional groups – some were exceptionally good. But there were a number of centres where the work was sketchy and incomplete relative to what is expected at AS level. Common areas of weakness included types of reaction and shapes of organic molecules. The identification of the reaction types required in the specification could be made more clear.

Unfortunately, some candidates appeared to make use of downloaded text. The use of downloaded images of compounds is acceptable, especially if these are annotated and referred to in written work. Sections of directly imported text are not acceptable. Some centres made use of heavily prompted work-sheets for this section, where candidates simply had to fill in blanks. Others just provided a collection of class notes apparently copied from the board. These approaches limit the candidates' opportunity for autonomous working and hence limit marks available.

Most candidates explained isomerism well, but a significant number did not, providing just an outline or statement of the types of isomerism with the obvious omission of examples and explanations. Few candidates made clear links between their products and spectroscopic techniques. Some centres completely omitted work on spectroscopy – removing the opportunity for marks in this area. Other centres limited the study of spectroscopic techniques to a level where candidates could not access the higher marks.

Candidates are required to produce two organic compounds – to prepare more is not necessary and places additional pressure on candidates. Centres should note that one solid and one liquid product are needed ideally to fully meet the criteria of the specification. Each preparation should be well documented and very few candidates provided any evidence that they had researched a method of preparation for the compounds they made.

Candidates did not always produce balanced equations for their reactions or clearly explain what type of reaction was taking place. Many tried to purify their products, notably the solid products, but evidence of the purification of liquids was sparse, with many centres quoting yields of crude product and distillation ranges. In a significant number of cases, it was difficult to find the yields and boiling or melting points because of poorly displayed results: these values were frequently hidden in a page of text or used in calculations without being clearly recorded first. A significant number of candidates successfully calculated yields and found melting and boiling points, although the latter were often merely distillation ranges from the preparation stage and not precise boiling point measurements. It would be very helpful if centre assessors could mark calculations as correct or incorrect.

Centres are reminded that there is no requirement in this unit for the production of biochemical compounds, the use of a bioreactor or any work on enzymes.

Mark Ranges and Award of Grades

Unit	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
SC01: Investigating Science at Work	60	60	27.6	13.2
SC02: Energy Transfer Systems	80	80	33.9	11.2
SC03: Finding out about Substances	60	60	30.7	11.6
SC04: Food Science and Technology	60	60	28.8	12.5
SC05: Choosing and Using Materials	80	80	31.2	9.1
SC06: Synthesising Organic Compounds	60	60	29.4	12.6

SC01 – Investigating Science at Work (1597 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	60	47	41	35	29	24
Uniform Boundary Mark	100	80	70	60	50	40

SC02 – Energy Transfer Systems (1538 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	80	56	50	44	38	33
Uniform Boundary Mark	100	80	70	60	50	40

SC03 – Finding out about Substances (1597 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	60	47	40	34	28	22
Uniform Boundary Mark	100	80	70	60	50	40

SC04 – Food Science and Technology (613 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	60	45	39	34	29	24
Uniform Boundary Mark	100	80	70	60	50	40

SC05 – Choosing and Using Materials (750 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	80	48	44	40	36	33
Uniform Boundary Mark	100	80	70	60	50	40

SC06 – Synthesising Organic Compounds (577 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	60	47	41	35	29	24
Uniform Boundary Mark	100	80	70	60	50	40

Advanced Subsidiary (Single) award

Provisional statistics for the award (773 candidates)

	A	B	C	D	E	U
Cumulative %	2.3	8.8	23.5	44.1	65.2	100.0

Advanced Subsidiary (Double) award

Provisional statistics for the award (421 candidates)

	AA	AB	BB	BC	CC	CD	DD	DE	EE	U
Cumulative %	1.2	2.9	6.9	11.9	18.1	27.3	38.7	49.4	60.6	100.0

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidate lie in range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).

Uniform Mark: a score on a standard scale which indicates a candidate's performance. The lowest uniform mark for grade A* is always 90% of the maximum uniform mark for the unit, similarly grade A is 80%, grade B is 70%, grade C is 60%, grade D is 50%, grade E is 40%, grade F is 30% and grade G is 20%. A candidate's total scaled mark for each unit is converted to a uniform mark and, when subject grades are awarded in 2004, the uniform marks for the units will be added in order to determine the candidate's overall grade.