OCR
RECOGNISING ACHIEVEMENT

GCE

Applied Science

Advanced GCE **A2 H575/H775**

Advanced Subsidiary GCE **AS H175/H375**

Report on the Units

June 2007

H175/H375/MS/R/07

Oxford Cambridge and RSA Examinations

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

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GCE Applied Science, G622 Monitoring the Activity of the Human Body (Written Examination)

General Comments

All questions were attempted by the majority of the candidates. Where answers were inappropriate this was often due to failure to respond the key words in the stems of questions such as 'How', 'State' or 'Explain'. Those questions requiring mathematical interpretation were generally not well answered. Time does not appear to have been an issue in terms of completing the paper.

Comments on Individual Questions

1 **(a)** Well answered. Many scored full marks here. Weaker candidates confused the trace with that from a spirometer.

(b) Many candidates earned the full 3 marks. Some gained 'Error Carried Forward' marks for the correct method after a wrong estimation for the time for one heart beat. The commonest error was simply to multiply the time for one beat by 60.

(c) This mark was not often awarded – either the value was imprecise or a result of a misinterpretation of what constitutes a complete heart beat.

(d) Generally well answered for citing differences, but fewer candidates followed the clear instruction to 'use data values', losing half of the available marks. Many candidates clearly understood what phases of the heart's activity the ECG trace represented, for example, gaining credit by referring to 'ventricular contraction' rather than QRS complex.

(e) **(i)** Generally well answered, albeit with a range of acceptable phonetic alternatives.

(ii) Less well answered with the commonest incorrect response being 'heart attack'.

2 **(a)** **(i)** Poorly answered. Candidates found difficulty measuring values from the trace. Inappropriate units were often seen.

(ii) Inappropriate units often used.

(iii) Candidates should use values stated in the specification. Many did not. Single values or a correct range were accepted for both of the values asked for.

(iv) A sizeable minority of candidates thought that the breathing rate at the low end of the normal range and or the high end of the TV range was an indication of poor health, citing asthma as a possible cause.

(b) Generally well answered, although weaker candidates simply described the path taken by inhaled air, and a small minority stated that inhalation of air caused the diaphragm to move down and the ribs and sternum to move up and out.

(c) **(i)** Answered correctly by the majority of the candidates.

(ii) Well answered with the majority gaining full marks for accurate observations.

(iii) Well answered.

(c) **(iv)** Generally well answered but some candidates assumed that both values would change in the same way.

(d) Disappointing. Many candidates clearly confused the spirometer with the peak flow meter but some of the marking points were still accessible where appropriate, eg maximum breaths in and out, sterile mouthpieces etc.

3 **(a)** Candidates often failed to give all of the substrates or products, but were more successful in remembering the number of ATP molecules produced. This information is examined frequently but despite this fact, very few obtained full marks here.

(b) Candidates found 'composition of blood' the most difficult to respond to. Common inappropriate responses included 'thicker', 'faster' and 'less composed'. Candidates tended to over generalise. The six marks available were rarely awarded.

(c) **(i)** Well answered. Many candidates however, used the 'steroids' of common parlance rather than the desired 'anabolic steroids'.

(ii) Very well answered. Some candidates referred to gas chromatography and ELISA tests rather than picking up on the information in the stem relating to blood tests.

4 **(a)** Misunderstanding of the question resulted in this being poorly answered. Many answers described quality of the image produced rather than both methods using X-rays to generate images.

(b) Similar comment to 4a appropriate here too.

(c) **(i)** Well answered.

(ii) Well answered.

(d) Most candidates gained both marks.

(e) First row completed successfully but second row less so.

(f) Few candidates gained 3 marks. Few could pose the question as to who should or would get them and then pursue the argument.

5 **(a)** **(i)** Very poorly answered. The vast majority interpreted the question as 'under what circumstances' is blood pressure increased rather than what generates the pressure increase. Very few understood the idea of compression of the blood resulting from ventricular muscle contraction.

(ii) Well answered.

(b) **(i)** Most candidates gained this mark.

(ii) Some candidates demonstrated a very sound understanding of this area of the specification. Others described the cardiac cycle effectively but made no attempt to follow the instruction in the stem of the question. The question clearly stated that candidates should target their answers '....at points A-E during the cardiac cycle'. General descriptions were not credited. Few included

blood pressure and time values in their answer. Overall an understanding of pressure change and the opening and closing of valves is generally poor. For some candidates the QCA marks were the only marks awarded in this subsection.

(c) **(i)** Very poorly answered. Many gave the positions of ‘pulses’ in the body.

(ii) Poorly answered. Phonetic versions of the medulla oblongata were accepted.

(iii) This proved to be too demanding for the majority of the candidature. There was poor understanding of sympathetic response and vasoconstriction. Most candidates described blood flow rather than blood pressure. Few answered by discussing what caused the increase in blood pressure and how the brain controlled the process.

GCE Applied Science, Cells and Molecules G623 (Written Examination)

General Comments

G623/01 Plan: The majority of the candidates investigated the effect of temperature on the population growth of a culture of a Cyanobacterium or a member of the Chlorophyta. Most candidates investigated population growth in two main ways: total counts using a haemocytometer or % transmission/absorbance readings using a colorimeter.

Centres are asked to ensure that candidates read the instruction brief carefully to avoid misinterpretation. Some candidates used yeast as their chosen organism – some the bacterium Vibrio cholerae.

Whilst the planning exercise is an open book examination, there was some evidence of student collusion during the completion of this task. This is not acceptable practice.

The downloading of plans from the internet is not an acceptable practice and particularly obvious where the organisms or techniques involved are inappropriate, or where there is marked difference in the vocabulary, grammar, punctuation and language skills in general in different parts of the plan and when students in the same Centre and different Centres present the same 'identical' plan as 'their own work'.

Centres are asked to remind candidates of the content of the 'Notice to Candidate' and their signed declaration on page 2 of the Paper G623/PLAN.

G623/02 Test: All questions had been attempted suggesting that there was adequate time to answer the paper. There was a feeling in the examining team that the quality of written work was lower this session compared to the January cohort. Many scripts were difficult to read in terms of poor handwriting and flow.

Comments on Individual Questions

G623/01 Plan

The following summarises the major comments regarding the marking point criteria.

A This needed to be a working document relevant to the intended practical work. An appreciation of electrical (microscope, water baths, colorimeter), glassware and biological hazards which are of medium or low risk is required.

B Prediction needed to relate to the effect of temperature changes to population growth.

C This requires justification of a prediction using existing knowledge of enzymes/photosynthesis and information on the accompanying OCR resource sheet. Some candidates also used population growth temperature data obtained from secondary sources.

D,E,F,G Many candidates did not consider preliminary work. Those that did assumed that observations from previous investigations using yeast and haemocytometers were acceptable here. In many cases, preliminary work was not justified or related to the main method of the investigation. Preliminary work must inform the main method in future.

H,I Many candidates listed at least two secondary sources. Candidates must ensure that full reference details are given and they must state how these sources have helped in the investigation. Whilst details of algal images often added to the presentation, the sources of these which were cited often did not inform the planning process.

J,K Many candidates achieved marking point J. However lack of detail in the method or confusion of techniques within a single method meant that many of them did not achieve K.

L,M Candidates need to give qualified names and quantities for M. Many failed to list algal supplies and thermometers as essential items. They must also ensure that the correct name for equipment is given eg calorimeter was often used instead of colorimeter.

N Candidates need to appreciate the importance of repeats.

O,P The majority of candidates stated between 3 and 4 temperature values to be investigated. Whilst the range stated did relate to the information in the insert and/or their prediction, a minimum of 5 values should be considered in future.

Q,R Whilst many candidates stated a minimum of 2 controlled variables, very few explained how these variables were to be controlled.

S Many candidates planned to tabulate their data in suitable format. However, units of measurement must always be included in the headers.

T Many candidates planned to display their results graphically. Some went as far as to calculate population growth from calibration curves (if using a colorimeter). Candidates must ensure that graph axes are appropriate and fully labelled with units.

U Mean number of cells or population density using the haemocytometer were the most common calculations seen in scripts.

V A small number of students only, indicated possible conclusions graphically. Many highlighted the optimum temperature which would result in the maximum growth in population.

W Some candidates were able to recognise one possible source of error in their equipment. Two are need to award his marking point. Many candidates however highlighted individual technical failures/errors which could not be credited.

X Many of the more able candidates were able to suggest at least one possible method to improve the accuracy or validity of their data. Many had difficulty obtaining this mark.

Y Very few candidates were not awarded this marking point.

G623/02 Test

1 **(a)** **(i)** Majority of candidates plotted the points accurately and could draw a line of best fit with a ruler.

(ii) Majority of candidates were able to correctly read from the graph a value of 0.35 or error carried forward value.

(iii) This section was not answered well. More able candidates could identify osmosis as the process and could link this to movement or diffusion of water so that water potentials were in equilibrium. Very few mentioned the role of the selectively permeable membrane or could give an accurate definition of water potential. Many candidates described 'the movement from a high concentration to a low concentration' without commenting on what was moving.

(iv) Few candidates realised that the value of a change in mass was a means of overcoming differences in sample masses at the start.

(b) **(i)** Extremely low number of candidates could offer 'hydrolase' as a response here.

(ii) Only the more able candidates recognised this as a condensation reaction.

(iii) Knowledge of 'Key Stage 3' food tests is still remarkably poor. Confusion still exists between the Benedict's test and Biuret test.

2 **(a)** The majority of candidates attempted the first three sections of the table and achieved some marks. Many however did not have a clue about the sections on maximum magnification and resolution, although many recognised that an EM has a higher resolution than a LM. However, the numbers which were given often bore little relationship to the magnitude of the resolving power of each microscope.

(b) Many candidates who clearly had been taught this area attempted the question and could achieve at least one mark for each of the three organelles. However, in some Centres, there was evidence that students either had not covered this section of the specification at all or clearly had done no revision on it.

3 **(a)** Many candidates achieved 2 of the 4 marks for the scale value and the distance between the arrows. However, many students could not proceed with the ratio calculation to give a correct answer in μm.

(b) Many candidates gained at least 1 mark here. Some failed to note that the haemocytometer counts dead and live cells.

(c) Whilst many candidates had clearly learnt about the Coulter counter since its appearance on a previous paper and hence achieved at least 1 of the technical marks, very few really understood this question. Only a very small number of candidates could link the perfusion system data and knowledge of the Coulter counter to gain the full 3 marks.

4 The majority of candidates made a good attempt at this question. The mark scheme was sufficiently 'open-ended' to allow any relevant and sensible statements linked to moral and or ethical issues. The allowance of 1 error in each of spelling, punctuation and grammar meant that many candidates gained the QWC marks even when the subject content was poor.

Principal Moderator's Report
GCE Applied Science AS Portfolio Units

General Comments

In this session the majority of centres have implemented and delivered the requirements of this vocational course in such a way that candidates have produced portfolio work which includes a great deal of interesting, relevant and up to date science. Centres that have adopted a vocational approach and have encouraged visits and practicals which link with local scientific organisations should be commended. The numbers of candidates taking this qualification this session has increased. As a consequence there were a number of new centres as well as existing centres. A number of centres are now accredited, in that OCR considers that their candidates are completing work to the appropriate standard, these centres do not need to send a sample of their candidates' work unless requested by OCR. Accreditation runs for three years.

This type of assessment is new to a large number of centres and it is notable that many centres have applied the assessment criteria very accurately and have assessed their candidates' work at the correct level.
The portfolio units available for this session were as follows:

- Unit 1 Science at Work
- Unit 2 Analysis at Work
- Unit 5 Chemicals for a Purpose
- Unit 6 Forensic Evidence
- Unit 7 Physics of Sport

The majority of centres were very responsive in returning scripts for moderation and where there was low entry it was appreciated that centres sent all scripts directly to the moderator. This saved time and led to an efficient moderation exchange. As a result of the completion deadline in May, candidates had less time available to finish their portfolio work. Nonetheless, most centres succeeded in completing their portfolio's on time. One suggestion to help ease this problem in year 2 is to start the A2 year as soon as possible following the examination period.

Work from many centres was well organised and the comments on the URS forms firmly supported the moderation. Work clearly annotated with the assessment criteria codes helped moderators to locate particular documents. Appropriate page numbers on portfolios is also really appreciated. Some candidates produced many pages of up to date detailed science, which showed their enthusiasm in the subject area studied. It would be useful, however, if task sheets set to candidates were included with their work, as it is quite difficult to moderate work when it is not known what the candidates were initially given.

It was good to see evidence of individual research by candidates as well as research from visits. Many centres had also linked science to local organisations. Some high quality, interesting and up-to-date science was seen and where centres had given candidates clear, well structured assignments linked to the assessment criteria, the work produced reflected the standard required for an AS level qualification. The inclusion of risk assessments with practical work should be normal practice; most centres now are encouraging candidates to complete and use these with their work.

The work now completed is generally at AS level and clearly shows candidates have increased their science skills and knowledge. Marks for some Centres were adjusted in order to bring them in line with national standards, these tended to be at the higher mark bands. Centres need to be aware that work completed for the higher level assessment criteria needs to be at A/B AS standard, a statement or a mention of the assessment requirement is insufficient at this level.

High level evidence produced by candidates needs to show thorough and detailed research, which has been suitably selected and records of practical work which are both accurate and precise, with suitable processing and interpretation.

Work selected for moderation reflected coverage of all the Units offered by this AS specification. A range of marks was seen. Centres need to provide Candidates with more guidance and support in the use and selection of research material obtained from the internet.

To support Centres a list of suitable practical activities that have been implemented successfully is attached in appendix 1.

Unit 1 Science at Work

AO1
Some excellent surveys were seen which demonstrated sound research skills with the production of a wide range of interesting up to date science. Candidates gaining high marks demonstrated that they had the ability to be both selective and concise in presenting the required information. Centres should note however that the survey requires evidence of information on the products made or service offered, the type of work and the science involved as well as details regarding health and safety, these are not expected to be lengthy reports. The survey exercise was included to encourage candidates to find out about the range of science involvement in many well known organisations eg supermarkets, hairdressers, food manufactures/bakeries etc. It was good to see that many centres had encouraged visits, which included trips to local breweries, power stations, hospitals, nursing homes, opticians and fitness centres. On the other hand, those candidates who had used the Internet for their research tended to use large companies eg Astra Zeneca, Biffa, Shell Coke Cola, Wrigleys, Glaxo Smith Kline, BUPA, Warburtons.

Mark band 3 work should show evidence that a range of sources had been used, indicated within a bibliography. ‘Google’/’the internet’ is insufficient. Information on websites, books used, visits, any speakers etc., should all be included. Candidates should be encouraged to use their own words when ever possible and cut and paste information is not worthy of mark band 3. If fewer than five surveys are included in the portfolio, then credit should still be given for those organizations that were surveyed. The mark allocated then needs to be averaged. Centres need to credit work completed. Where candidates have worked together to research their organisations evidence of individual summaries should be presented.

AO1b
Most candidates are now using one of the five organisations surveyed as a base for their in-depth study. Candidates need to be guided to focus their work on the guidelines given in the specification. In addition to the work completed in the survey, the report should include a more detailed study of what is produced or provided, the number of people and range of staff employed (this was often omitted), their roles and responsibilities, the qualifications of the scientifically qualified staff and a discussion of the science involved. Health and safety work should also be linked to the work in their chosen organisation especially for candidates aiming for higher mark bands. It is advisable to guide candidates in their choice for the in-depth study to ensure they are able to include suitable science. Good science work was seen from human physiology - fitness centres/physiotherapists, imaging techniques - hospitals, growth/GM crops - farms animal behaviour - zoos, lens/eye - opticians etc.

For mark band 3 the additional guidelines indicate a comprehensive study is required and information should be selected and clearly and logically presented. Candidates who simply included large quantities of research from the internet, which displayed little evidence of editing

or selection, should not be awarded higher grade criteria. Some evaluation and justification of the use of the material also needs to be included for the higher mark bands. Comments on the validity of the sources used must be included if mark band 3 is to be reached.

AO1c
To achieve MB3 for A01c candidates need to have knowledge of the Health and Safety laws detailed in the G620 specifications and how organizations comply with them. There were still some candidates who did not mention laws and regulations by name. A great deal of informative work was gathered from candidates who had interviewed staff or visited organizations. Several letters and emails written by candidates to arrange visits or speakers were seen.

AO2a
Some excellent work was seen for this strand. Candidates had carefully researched information on waste management energy control effects on community of their organization. Candidates that had studied drug manufacturers and the impact of their products on society produced some exceptionally good reports which encompassed the requirements of the specification.
This section was sometimes completed as part of the in depth study or as a separate task. Either method is fine, however it is useful to identify on the IURS form where this can be located. The work for this strand in the majority of scripts seen was included as part of the in-depth study.

AO2b
Several Centres tended to award mark band 3 for this strand when candidates had only completed one set of calculations. The appropriate degree of accuracy was often not given in answers; significant figures need to be considered and where appropriate units also need to be given. For the higher marks candidates should aim to produce a range of techniques, averages are not sufficient for mark band 3. Rearrangement of equations followed by substitution and calculation of an answer, percentage increase calculations are considered complex calculations (2 steps).

It should be noted that mathematical guidelines of straightforward and complex calculations are given in the appendix of the specification.

AO3a
Many centres now are encouraging candidates to complete a wide range of interesting practical work. Biological practicals included food testing, physiological measurements, microbiology, dissection, enzyme investigations. Chemical practicals included preparations of a range of organic compounds, aspirin, quantitative and qualitative analysis linked to water pollution/food industry/forensic investigative work. Physics practicals included material testing/electrical investigation momentum and motion. Most of the work seen was targeted at the correct level and practicals are now being chosen which have a vocational link. This is good to see. Risk assessments are now being included with the work but these should be working documents not something which is written up after the practical work has been completed. Several centres tended to use one of the two practicals for this unit in both unit 1 & 2. This is acceptable however photocopies should be included, a reference in Unit 2 is insufficient for the moderation process.

AO3b
It should be noted that AO3b is assessed for recording only. Mark band 2 needs to include all relevant observations and measurements. If a practical is chosen eg an organic preparation, candidates need to ensure that they record relevant observations as well as the final yield and/ or melting point. Candidates should also be encouraged to present results in suitable tables and include correct significant figures for numerical recordings. Detailed descriptions are required for qualitative recording – ‘nothing’ is insufficient for mark band 2. Where candidates have done microscope work the drawings should be suitably detailed and labeled with information on magnification. Mark band 3 needs to include appropriate precision for observations and measurements.

AO3c
Work for this strand should show suitable processing with interpretation even for mark band 1. It is also important to clearly show the method of processing of the results for higher mark bands and in addition evaluation of accuracy of apparatus and method is needed if mark band 3 is to be accessed. Processing skills in graphs and calculations were clearly evident in work seen, however interpretation of results should include reasons.

Unit 2 Analysis at Work

Again some high quality work was produced from candidates, with many achieving 40+ marks. Reports were well written and suitable research and practical work had been completed. Centres who had guided their candidates to use organisations with energy policies that were easily accessible within their web sites produced good researched reports, covering the requirements of AO2. Candidates who chose organizations that focused on environmental policies had difficulties in accessing all the mark bands. There were many candidates who failed to complete this strand. It is hoped that the assessment criteria for this unit will be reviewed, to make it much more accessible to candidates.

AO1a AO1b AO1c
The work produced on energy policies was wide ranging. An excellent source of energy policies can be found from the web sites of universities and many high street stores including Sainsbury's and Tesco. These sites provided well structured information which could be used to cover the assessment criteria. Candidates who had visited organizations or used their own establishment were again able to obtain the appropriate information for their reports. Oil companies and large international companies were not always the best to choose as the language used on the web site was high level and complex. There was some generous marking for this strand.

Work for AO1b on energy efficiency still needs to include information on the measures put in place by companies and colleges/universities in order to become efficient. A definition of energy efficiency was often seen without any reference to anything else. Centres should focus on Section 2.2.5 Efficiency in the specification and link it to the requirements of AO1b.

For AO1c the environmental impact was considered and candidates found information easily to support this, although economic impacts were not always covered in such detail. The environmental issues are very topical and consequently candidates produced work which reflected their interest in this topic area, which was good to see. A lot of information was seen on the impact of fossil fuel on the environment, however, care needs to be taken that candidates do not just cut and paste irrelevant information into their reports.

Although this important and topical issue has been difficult to cover by many Centres, there is evidence of a much higher level of work in this area this session.

AO2
Work for this strand has shown an improvement this session, although several candidates are not completing both sections. The assessment criterion requires candidates to show forms of energy transfer involved in the generation of electricity and data on different fuels**.** It is important that candidates describe the different types of energy transfers that might be present in the generation of electricity. Energy transfers need to be detailed and using suitable terms eg gravitational potential energy rather that just potential energy, several diagrams and flow charts were seen on the production of electricity but it is essential that energy transfers are included in order to fulfill the criteria. Many centres accessed costs of a range of fuels coal, gas, nuclear, it would be good to include UK costs rather than those from the USA. A vague mention of heat from a fuel is insufficient.

More relevant data is now being seen but candidates need to make a comparison of the relative benefits and problems of large scale and small scale electrical generation, not just give basic information Candidates should research data and costs of renewable and non renewable fuels. Accuracy and correct solutions are needed to fulfill the mathematical requirements of mark band 3.

Some centres again produced excellent work sheets to support the work for AO2 and these did include suitable references to researched data. A range of calculations was seen, complex can be considered to be multistage, if centres are still finding difficulties with this it is advisable to refer to the appendix of mathematical requirements in the specification. Accuracy and correct solutions are needed to fulfill the requirements of mark band 3. Work on comparing the benefits and problems of large and small-scale electrical generation was evident in a lot of the work moderated, but for mark bands 2 and 3 some reference to quantitative information is required.

AO3

A wide range of practical work was seen which reflected all the mark bands, and many centres used the examples which were given in the teachers' guide. To support Centres a list of suitable practical activities that have been implemented successfully is attached in appendix 1. The inclusion of risk assessments is needed for all practicals completed. It is recommended that centres provide appropriate proformas for risk assessments and candidates working at mark band 3 should not be including just generic hazards and their associated risks. Risk assessments need to be suitably detailed and include specific hazards and risk related to the experiment being completed, information on the concentration of the chemical used and its associated hazards should be focused upon at this level.

Practical reports and experimental work carried out covered all mark bands but work for mark band 3 needs to be suitably detailed, with evidence of vocational links and supported by confirmation from the assessor that risk assessments have been produced and drawn upon and that equipment has been safely used. Results need to be suitably presented, processed and interpreted. Data needs to be recorded to an appropriate precision including correct significant figures where appropriate. For titration readings volumes should be recorded to the nearest $0.05cm^3$. Suitable evaluation is required and this needs to focus on the method and outcomes of the specific experimental work completed, not just a generic statement of the success of the work. Candidates need to comment on the strengths and weaknesses of a procedure, including accuracy, precision and sensitivity of equipment and reagent. They also should include any practical difficulties associated with a particular procedure and suggestions for improvement should be explained. Sources of error should not be those produced as a result of carelessness by the candidate.

Centres need to be aware that the requirements of the practical work in this unit include two physical analyses both chromatography and colorimetry, some centres only completed one of these experimental procedures but marked this out of 8. Good practice was seen where practical work had a vocational link. It is hoped that centres in the future will link the work to a suitable vocational context.

The requirements of the assessment criteria for each practical include production of a suitable report. This does not necessarily mean the rewriting of the method, a reference to the standard procedure followed is sufficient. Inclusion of risk assessments is important as well as a record of relevant observations and/or measurements made. Work for all levels should also show some processing and interpretation of results.

Unit 5 Chemicals for a Purpose

This AS level unit is an optional part of the double award and it is hoped that this unit will offer candidates the opportunity to extend their chemistry knowledge and study the properties and actions of examples of chemical products used in consumer goods. There is a lot of guidance given in the specification under 5.4 Guidance for Teachers and in Guidance on Delivery. This section gives additional guidance for each section of What You Need to Learn from the specification with examples of compounds, processes, catalysts and practical work. Centres are advised to use this when preparing for this unit.

AO1
Centres where candidates had focused on four examples of chemical compounds (two organic and two inorganic) and had extracted researched work and displayed it clearly tended to score high marks for AO1 and AO1b. Care however needs to be taken to ensure candidates do not just cut and paste the information researched. Presentation for this strand can be in any type of format. Candidates produced a range of posters, presentations and leaflets to display this information Guidance needs to be given to the candidates in their choice of examples to ensure that they can continue through AO1, for example, candidates need to choose compounds which will allow them to link properties to uses and structures. Examples of compounds chosen include sodium chloride, silver chloride, sodium carbonate, calcium carbonate, calcium oxide, ammonia, water, sulphuric acid, hydrochloric acid, nitric acid. The organic compounds were more wide-ranging, some examples included ethene, ethanol, methanal, polyethene, and nylon. Some centres had encouraged candidates to do a lot of research into detergents

Centres again should note that AO1c also requires that one of the examples should be either a polymer or a detergent. The requirement for this strand is that the chemistry of the example chosen is researched and studied, so it is important that the polymer chosen has suitable reactions that candidates can understand. It is hoped that for higher mark bands evidence will be shown of understanding the chemistry of the chemical chosen. AO1c should be one of the compounds identified in AO1a. Candidates work needs to show fully explained reactions with appropriate scientific terminology and balanced equations.

AO2
A range of both organic and inorganic industrial processes were included eg Haber process, Contact Process, fractional distillation/cracking, reforming, preparation of ethanol. Some presentation work was seen which clearly demonstrated understanding which was supported by comments from those listening. Work on catalysis was suitably discussed; however advantages and disadvantages of the processes were not given enough detail for mark band 2 or 3. Again it is suggested that centres refer to the teacher's guidance given in the specification.

AO3
It was expected that candidates should carry out research in to workable methods for preparations, prepare a sample of a chemical on a laboratory scale and carry out some tests to determine its purity with records of all observations, weighings, melting points etc., Risk assessments need to be included for all mark bands. Aspirin was generally the compound chosen. Candidates need to check that all observations and results are recorded and diagrams are drawn wherever possible, even diagrams from higher level candidates could be better. In AO3a the candidate should research the method themselves if high mark bands are to be achieved and evidence of selectivity should be shown. Results need to include the yield and for AO3b mark band 2 the yield should be calculated correctly and mark band 3 how the theoretical yield is calculated needs to be included to reflect suitable knowledge at this level. For AO3b candidates need to record all mass results to the same number of decimal places for mark band 3.

Results need to include the yield and for AO3b mark band 2 the yield should be calculated correctly and mark band 3 how the theoretical yield is calculated needs to be included to reflect suitable knowledge at this level. For AO3b candidates need to record all mass results to the same number of decimal places for mark band 3. AO3c needs to show an awareness that the yield can be increased by changing conditions just for mark band 1. This strand was generally not well done and candidates need to work on improvements for this section.

Unit 6 Forensic Science

This continues to be a popular unit, and work seen included good research on recording and collection of evidence, methods of analysis and information on the strengths and limitations of types of forensic evidence. Work also included ethical issues in forensic science.

AO1

Centres whose candidates used scenarios to assess AO1a again produced some good evidence on the need to record and preserve a crime scene. Many candidates completed reports focused on the required topics given in the specification and these were also satisfactorily assessed. Candidates gave interesting and informative work on methods of recording the crime scene through the use of photography, video methods and sketches. Centres need to note the mark allocation for this section AO1b (12 marks) and consequently allocate an appropriate time to candidates to work on this section. Again where work for AO1b was linked with AO3a this seemed to work well. Candidates are producing some good discussion work for AO1c. On ethical issues in forensic science however, some centres are not appreciating that for mark band 3, work should show a range of relevant information on ethical issues in forensic work and an understanding of the need for an ethical code for forensic scientists more evidence of this was seen this session. This should include relevant points from the current legal framework. Mainly candidates still just discussed the reasons for and against taking DNA samples and keeping this information on a database.

AO2

The O J Simpson case or the Australian dingo case provides many opportunities to consider the validity of the evidence presented and to come to a conclusion of probable guilt. Candidates are now giving reports which include how forensic scientists ensured that the quality of evidence was objective, the strengths and weaknesses of the analytical techniques w used in the chosen case and an interpretation of the probability of guilt.

Calculations on forensic data were difficult to find, however a range of Rf values MB1, refractive index calculations MB2 and for higher mark bands several centres produced data sheets of qualitative data which had been collected and set appropriate problems based on this. This was similar to work given in the teacher's guide.

AO3

Candidates have the opportunity in this strand to carry out a wide range of methods of forensic analyses. Selected evidence is now being seen in each of the four areas. Candidates need to cover a range of the methods of analysis listed in the specification. Some interesting scenarios were set up and again, as the specification becomes more established, it is hoped that the sharing of good practice will lead to useful ideas and resources being available. Popular experimental work included work on fingerprinting and taking footprints, measuring and using photographs of tyre prints, microscopic techniques looking at different types of hair, fibres, finger/toe nails, use of artificial blood for testing and analysis, chemical tests both inorganic and organic analysis of unknown substances, eg fertilizers, copper sulphate, calcium carbonate, sugar and use of artificial urine samples. Chromatographic work was seen on inks, dyes and amino acids, with the use of IR spectroscopy for identification. Refractive Index of glass was also seen from many centres. As well as carrying out this work candidates needed to record their forensic observations or measurements and the data needed to be displayed in a range of ways

for mark band 2 and above. For mark band 3 candidates needed to process and interpret their results and again centres using a case study or a set-up crime scene could access the higher mark bands as there was opportunity to discuss the significance of the results found.

Unit 7 The Physics of Sport

This AS level unit is another optional unit of the double award .Candidates who scored high marks have produced clear, precise leaflets which included good science linked to the chosen sport. Work seen reflected interest and understanding in the topic studied with candidates also showing good IT skills used in the presentation of the work.

AO1
Candidates were not expected to produce lengthy reports for this unit, but to extract the relevant information and present it in the form of a leaflet, the topics related to measurement, seeing, movement, choice of ball material, equipment and techniques in sport. Many candidates are now extracting suitable material from internet sites and presenting it suitably, high marks were not awarded to candidates who just 'cut and pasted' information. For mark band 3 it was hoped that, although the assessment criteria stated demonstrate a comprehensive and detailed knowledge and understanding, this would be still shown in leaflet form, with evidence of suitable selection of the correct material. Selecting the appropriate information necessary to adhere to this format demonstrates a higher level skill.

The assessment criteria clearly states that five different quantities needed to be considered for the measurement leaflet and both units and devices for measuring these are needed. Some weaker candidates just recorded a number of SI units which is insufficient evidence for Mark Band 1. Some very detailed work on the structure of the eye was seen but a link to the chosen sport is needed, some good work was seen which linked to winter sporting activities skiing, snowboarding etc. Football, tennis, surfing and snowboarding were popular sports chosen for the movement leaflet and again mark band 1 candidates just gave evidence of musculo-skeletal systems with no particular link to the chosen sport. It was expected that centres could generate data from practical work covered in this section to fulfill the requirements of AO2b. Centres should refer to Section 7.2.2 'Physics of the Body'.

Choice of ball material and equipment in sport produced a wide range of interesting work. Much evidence was seen of how research into materials and new technology has developed over the years and is responsible for the high quality sporting equipment we use today. Evidence was needed from both these topic areas for AO2a and candidates were expected to give reasons for selection of a particular material for its chosen use. For mark band 3 some reasoning behind their choice was necessary, just simple statements were in sufficient for higher mark bands. It was hoped that work on sports techniques would allow candidates opportunity to complete practical work on momentum, this was seen in several centres and candidates used results and data collected to support mathematical evidence for AO2b. This was good to see.

Centres need to be aware that 19 marks are focused on the practical requirements for this unit and consequently the time spent on practical work should be allocated accordingly. The practical activity could be an additional piece of work and although it should relate to the work covered in the leaflets candidates can produce a separate piece of evidence to cover AO3. Evidence of planning the investigation tended to be weak and just focus on one experiment, for mark bands 2 and 3 a range of techniques need to be included in the work presented and a range of tests carried out with evidence of the need to repeat. Risk assessments were not always included and interpretation of the data collected in many cases only reflective of mark band 1.

Appendix 1
Organic preparations
Aspirin
Iodoform
Ethanol
Biological Practicals
Dissection
Microorganisms – aseptic techniques/monitoring bacteriological growth/effectiveness of antibiotics
Microscopy work preparation of slides/haemocytometer
Physiological monitoring
Physics
Material testing/car bumpers/surf boards
Electrical testing
Optical properties investigation
Colorimetry
% manganese in a paper clip
% copper in solutions
Chromatography
Aspirin
Anadin/paracetamol
Thin layer chromatography (TLC plates used) – the analgesics problem

Qualitative Chemical Analysis
Investigative work on unknowns, which are linked to forensic investigations
mummion (practical taken from teacher's guide)
Analysis of water samples – pollution analysis. Quantitative analysis examples included food
Quantitative Analysis
Volumetric analysis,
vinegar,
Potassium manganate VII – iron tablets
Bleach determination of active ingredient

GCE Applied Science, Sampling, Testing and Processing G628 (Written Examination)

General Comments
This was the second time that this paper has been set and the number of candidates taking the examination was around 450, almost twice as many as in January 2007.

The specification content for this module is broadly similar to module 7446 in the AVCE (Science) and there was evidence of candidates preparing for this examination by using the previous 7446 material as well as the sample material provided by OCR and the previous paper for this module.

The total for the paper was 90 and, as in January 2007, there were many papers that showed a score of between 30 and 50. Fewer candidates scored in the fifties and sixties but sadly, there were a number of candidates who only scored marks here and there and whose total was consequently very low.

In January 2007 the report commented that 'a number of the candidates with low scores, produced papers showing that they had not really used the case study material adequately in their preparation'. This comment can be repeated for this paper too, as very often answers were given that had little relevance to the case study material and more reference to this would have gained them marks.

Question 3, which was not based on case study material, was by far the weakest in terms of candidates' responses. Many candidates could not apply their knowledge to unfamiliar situations that had a vocational slant.

In previous examinations comment has been made about two main weaknesses with a number of candidates' responses, and the same can be said of this paper too. Many candidates did not read the questions carefully enough and answered what they thought the questions were asking. This is an A2 paper and the question stems often reflect the higher level of understanding required. All too often the answer given, although in itself expressing correct science, did not answer the question posed.

The inability of a number of candidates to handle simple mathematics is worrying. Very many candidates cannot calculate percentages or change the subject of equations, and some are still unable to calculate a mean. Sometimes answers were provided that were quite unrealisitic, such as the length of a musical pipe being 385 000 metres or a bamboo plant having a circumference of over a hundred metres. Candidates are urged to look at their answers and consider if their response is a sensible one.

There was little evidence that the paper was too long. Gaps in question 3 were more likely to indicate an inability to answer rather than a shortage of time.

On balance, the examiners felt that this second paper had worked well and they were pleased to read a number of quality papers where candidates had prepared themselves well and were able to demonstrate their knowledge and understanding and apply it, as well as a being able to suggest modifications to given procedures.

Comments on Individual Questions

1 This question was based on the article 'The manufacture and uses of cement products'.

(a) A wrong answer was seldom seen.

(b) Nearly all candidates realised the need for homogeneity in the cement and why it was therefore important to analyse several samples from the same batch of cement.

(c) **(i)** Many candidates wrote that the cement samples should be stored at room temperature and did not state the need for dry conditions to prevent premature reaction with moisture.

(ii) There were a number a number of acceptable answers here; the commonest response was 'date' or mention of a hazard.

(d) The question asked **why** flame emission spectroscopy was the preferred technique for the analysis of the cement for calcium. Few gave the main reason – accuracy. 'Easy' and 'quick' were accepted as poorer correct answers.

(e) **(i)** Many candidates were able to complete the table but fewer could give their answers to two decimal places as required.

(ii) A mean value was given by most candidates.

(iii) The correct value was usually for the concentration of calcium in mg dm^{-3}.

(iv) Very few realised that it was necessary to take the answer from part (iii) and multiply it by 100.

(v) Calculating percentages remains a mystery to many, and two marks were often lost here. It was also necessary to change mg into g but few candidates realised this.

(f) **(i)** This question was generally correct.

(ii) Many candidates were unaware that the washing of a precipitate is to remove **soluble** impurities.

(iii) Nearly all candidates realised the need to dry solids to constant mass and to remove all traces of water, but it was seldom that the response was unambiguous.

(iv) The response to this was very disappointing. Candidates are clearly not able to use weighings given in a table and then to turn the data into percentages.

(g) **(i)** Most candidates gained the two allocated marks here.

(ii) Sound answers were given here. Nearly all candidates gave sensible answers about the need for the concrete to be in the form of fine particles.

(h) **(i)** Many candidates were unable to devise an experiment to measure the setting time for a cement/water mixture. Some neglected to mention that water was needed or forgot to mention the need for timing. The response to this type of question always seems disappointing but is an essential part of this unit.

(ii) Relatively few candidates could give sound ideas about an extension to the setting experiment in part (i).

(i) Those who had worked on the case study in detail were able to give a reasoned response here. Too often, however, it seemed like guesswork.

(j) There were some good tables drawn which gained both marks. Sometimes the percentage was not mentioned and lost credit. A few candidates persisted in giving a % sign after each number.

k The answers were often poorly expressed. The examiners were looking for 'less energy needed' and something about the safety hazards of the process – the answer was given in the case study, but was seldom clearly stated.

(l) Many candidates could not interpret the y axis of the graph. This showed the % breakdown in acid conditions. A large number thought that this meant **stability** in acid conditions. Some weaker candidates thought that cement decomposed the acid or that the cement contained the acid.

(m) There were a number of acceptable answers but it was unusual for candidates to gain both marks.

2 This question was based on the article 'Bamboo – an essential plant for life'.

(a) Surprisingly, relative few stated that bamboo grew very quickly and, as a consequence, large quantities of fertiliser were needed.

(b) **(i)** Many candidates were able to obtain three or four marks for stating some variables that needed to be kept constant, so that the results were scientifically meaningful.

(ii) The examiners expected height, width or number of leaves etc. It was unusual for a candidate to gain both marks.

(iii) 'The name of the fertiliser' was a correct response, given by nearly all candidates.

(iv) This proved more challenging – the tests had been done under one set of conditions with one variety of bamboo. Few candidates mentioned other varieties or different climatic conditions making a difference.

(c) **(i)** The answer, 18 m, was gained by nearly all candidates.

(ii) If the observer takes readings further from the bamboo plant, then the angle will be smaller and any errors relatively greater. This was seldom appreciated by the candidates.

(d) This was a challenging question and only a few found that the plants were 0.5 m apart. However, most candidates made a start and gained some credit.

(e) **(i)** The word 'systemic' was in the article. Those who had researched the meanings of the scientific words in the article found this easy. For those who had not (a sizeable number apparently), unacceptable and often meaningless responses were seen.

(ii) For those who gained credit in (i), this was easy.

(iii) There was an encouraging response to this question with many gaining at least two of the three marks.

(f) Candidates were asked to be imaginative here. Most resorted to killing the bamboo, which was not in the spirit of the question.

(g) Candidates were well aware of the need to find the risks of using this substance.

(h) Many candidates stated (correctly) that the length of the pole was important. Fewer considered the width or the number of nodes, although nodes were mentioned in the stem of the question.

(i) **(i)** Many students had clearly not read this part of the article, where it stated that most of the silica was in the outer stem.

(ii) Only the better candidates stated that it may contain something else other than potassium carbonate. Some said that potassium and carbon were present as elements, not as a compound.

(j) **(i)** The length of the pipe was accepted as values from 58 to 59 cm. Some candidates gave unrealistic answers such as 385 000 cm or even 0.385 cm. I wonder if they have seen musicians playing instruments of these sizes?

(ii) Most candidates realised that if the pipe was shorter then the frequency was higher.

3 **(a)** Surprisingly few suggested the use of a sieve or similar. The spelling of ‘sieve’ left much to be desired.

(b) **(i)** **‘**Wearing protective gloves’ or ‘use a fume cupboard’ were the usual correct responses.

(ii) It was surprising how few students could state that oil was less dense than water or even that it was ‘lighter’ – which was accepted as a weaker response.

(iii) It appeared that few candidates had seen or used a separating funnel. Other acceptable methods including siphoning, using a dropping pipette or a burette. Sadly, some candidates used filter paper and assumed that the oil would collect in the paper and the water would go through.

(c) The use of a mechanical press etc. was not often given.

(d) **(i)** Very few candidates could give a reasoned response here. Most candidates resorted to turning the gas down. Better responses included the use of anti-bumping granules or the use of a reflux condenser.

(ii) Few scripts were seen where the candidate stated that the reaction would be slower or even not work.

(e) **(i)** The meaning of the word ‘precipitated’ remained a mystery to many.

(ii) Few candidates mentioned the use of an indicator, which the examiners thought was the obvious answer.

(f) **(i)** Most candidates mentioned the better control given by electrical heating or the danger of fire from gas heating, but both were not often seen.

(ii) Surprisingly, few mentioned that vapour was being turned into liquid.

(iii) A drain tap is to run off liquids – few gave this answer.

(iv) Economically, it would be costly to remove flowers from the extracted oil. Very few gave a logical answer here.

(g) Candidates gave sound responses for the factors that should be considered when selecting a dye for the soap.

(h) If the soap is cut into shavings, then water will be lost more quickly, it was unusual to award a correct mark here.

GCE Applied Science, Working Waves G635 (Written Examination)

General Comments

The performance of many candidates was disappointing. In general traditional parts of the specification attracted better responses than did applications of waves. Several instances are noted below where candidates might have scored more by careful reading of the questions.

Comments on Individual Questions

1 **(a)(b)** The majority of candidates answered correctly, but a significant minority chose 'sound' in answer to (b).

(c) Most candidates scored at least 2 or 3 marks. Some misinterpreted the question and compared properties in a vacuum with other media but in these cases most of the science was erroneous. The weakest candidates simply defined the quantities.

(i) Around half recognised that radio waves penetrated matter more readily than light waves but a very significant proportion argued that since light had the higher frequency and energy, light would penetrate matter more readily than radio waves.

(ii) Many correct answers. Common incorrect answers stated either:
that glass or water can be penetrated by light - ignoring the fact that they are also penetrated by radio waves OR that metals are penetrated by radio waves.

(e) **(i)** The great majority of candidates constructed sentences using terms used with reference to electromagnetic waves and/or electrical signals, but few could describe how the energy conversion takes place. Some failed to distinguish between the actions of a receiving and a transmitting aerial.

(ii) All answers here were weak although the great majority of candidates provided a response that involved some scientific ideas. Many did not recognise this as an application of polarisation. The most common error was to describe diffraction around hills. Some confusion with attenuation was common, as was a description of oscillating electrical and magnetic fields. There was evidence of misconceptions about aerials attracting the radio waves and about whether shorter waves could reach the aerial. Some confused the orientation of the rods/direction of polarisation with the direction of the transmitting station/direction of propagation. Others confused this with other parts of the specification and gave answers including broadband and satellites.

2 **(a)** Most scored 1 mark for recognising that humans emit radiation, but it was rare that two were earned.

(b) Most candidates were well prepared for calculations but very many were unable to deal with standard notation and so lost a mark. The majority gave the correct unit. The most common unit error was m/s. Some inserted numbers in the unit line.

(c) Most candidates were able to give a creditworthy description. Some misinterpreted this question and explained the principles of the endoscope rather than explain how it assists the rescuers. A significant number thought that a there was a miniature camera at the end of the endoscope.

(d) **(i)** A large minority measured the critical angle correctly, and almost as many measured the angle between the incident and reflected ray, ie double the critical angle. Of those who had drawn a normal, almost all measured the critical angle correctly.

(ii) Very few candidates followed the instruction to use Figs 2.1 to 2.4 as the basis of their explanation and instead structured their answer around the roles of the core and the cladding in a step index fibre. Most candidates had some idea of TIR, but the phrasing used to describe its relation to the critical angle was often very weak.

(iii) Only a minority of candidates showed refraction of the ray as it enters the fibre. Most scored the second mark.

(iv) This section was aimed at the better candidates and required application of knowledge to an aspect of an experiment similar to one they are expected to have carried out. There were few correct answers. Most thought that there should be no reflection at this point.

3 **(a)** **(i)** Many good answers. A minority described the injection of contrast medium. Others suggested the injection was intended to sedate the patient, or to protect her from the effects of the radiation.

(ii) Most candidates managed to score some marks. The question discriminated well between the weaker and more able candidates. The former often stated factors but did not attempt to explain them. Some candidates confused diagnosis and therapy, or thought that the Gamma camera emits radiation.

(b)(c) There were very few good diagrams to show a gamma camera collimator, but lots of diagrams to show the production of X rays or the action of a fluorescing screen.

A proper understanding of the principles of the gamma camera requires some knowledge of its components and their functions. Without this, the principles can only be covered at a superficial level. The generally poor performance on this section is one factor contributing to disappointing overall marks and, on this occasion, has been taken into account in setting grade boundaries for this unit. It is anticipated that centres will cover this topic in more detail in the future. The medical physics textbooks listed in section 16.3.3 provide useful source material for teachers.

(d) **(i)** The majority of candidates demonstrated some understanding of radiation protection issues and most scored at least one mark.

(ii) More candidates were able to describe the causes of biological half life than were able to name it.

4 **(a) (b)** Many good responses. A small majority showed variation on amplitude and a large minority provided a diagram that could be taken as a full modulation cycle. One most common answer was to draw unmodulated waves of different frequencies for (a) and (b). However some sketches were of poor quality such that their intended meaning was unclear.

(c) Only the best candidates understood why FM is better. Those who did attempt a correct explanation generally gained one or two marks, and this small group included some excellent responses.

(d) Most candidates gave correct answers. A small minority drew discontinuous levels or a straight line others drew bar charts.

(e) Only a minority were able to explain that degraded digital signals can be restored.

(f) Many candidates simply restated the information in the question.

(g) Most candidates were able to state the advantages of broadband, mostly based on the phrasing associated with advertising broadband connections rather than seeking to explain the technology. Relatively few answers showed any appreciation of the role of frequencies in the transmissions.

(h) A small majority answered correctly.

5 **(a)** Although not well done overall, this question discriminated effectively between those who were well prepared for the topic and those who had little or no familiarity with it. The responses suggested that candidates had been made aware of these terms but struggled to recall their meanings. Many answers appeared to have been constructed by rephrasing the words on the card.

(b) The majority of candidates identified 2-way simultaneous transmission and “1-way-at-a time” transmission. A smaller but significant proportion recognised that in theses applications this was due to whether 1 or 2 frequencies were available.

Principal Moderator's Report
GCE Applied Science A2 Portfolio Units

General Comments

This is the first June assessment session for this A2 qualification. All Units were assessed by centres, the most popular tended to be Unit 14 and Unit 15. A good standard of work was seen in a high percentage of the work moderated, which was a credit to the candidates taking this qualification.

- Unit 8 Investigating the Scientist's Work
- Unit 10 Synthesising Organic Chemicals
- Unit 11 Materials for a Purpose
- Unit 12 Electrons in Action
- Unit 13 The Mind and the Brain
- Unit 14 Ecology and Managing the Environment
- Unit 15 Applications of Biotechnology

Work from most centres was well organised and clearly annotated with the assessment criteria codes, and indicated that staff and candidates were experienced in portfolio assessment, following on from AS in previous sessions. In many cases centres used their own assessment forms which were good to see, however it is important that centres record both the centre and candidate number and complete the URS form with the total marks for the Unit when sending work to the moderator. Centres are again asked to include the tasks sheets given to the candidates as this helps to support the moderation process. Where there was low entry it was appreciated when centres sent all scripts directly to the moderator; this saved time and led to an efficient moderation exchange.

In the majority of centres candidates' work was at an acceptable standard for A2 level. Limited scaling of centres did occur but this was where the work submitted was not at an appropriate level for the A2 requirements of the assessment criteria. The majority of the scaling occurred where candidates had not completed the required standard of work at mark band 3. Work at this level is at A/B standard of A2 and reports, evaluations and justifications should reflect a high standard of language and scientific understanding.

Unit 8 Investigating the Scientists' Work

This is a mandatory unit and forms part of the synoptic assessment for both the single and double A level qualification.

Centres had tried very hard to ensure that the investigative work seen by the candidates related to a vocational context, the range of activities was very similar to the work seen in January and included a range of chemical, biological and physical investigations eg organic preparations related to drug manufacture, rates of reaction linked to catalysis, inorganic analysis both qualitative and quantitative linked to food, forensic and environmental. Investigations on vitamin C and iron content of foods linking to the biological and chemical theory and vocational context were a common choice. Investigative work focused on micro organisms, health, fitness, and psychological effects were also common choices. Several candidates produced work which extended practical work used in units managing the environment, applications of biotechnology and properties of materials, work at high levels was often seen. Candidates can base their experimental investigative work on any topic, however in order for the assessment criteria to be covered candidates need to build on the skills and knowledge from the AS qualification.

It is important that centres cover the requirements for AO1 strand by including a full holistic plan, which is not just the aims of a series of experiments but includes a detailed log of the full investigation. The plan should not be 'written up 'after the work has been completed. AO1b should also include research on the chosen topic and suitable health and safety guidelines. It is hoped that this unit will test both organisational skills as well as the use of experimental techniques. Centres are advised to look at the exemplar work on the OCR Website Applied Science A2 if they are unsure of the requirements. AO1 should include evidence of both scientific principles and details of a range of experimental techniques. Some candidates tended to be quite repetitive in their chosen experimental work. A variety of different techniques is preferred.

Risk assessments need to be included with all experimental work to fulfil the health and safety requirements. For mark band 2, AO1b needs to show evidence of a range of relevant research with information on why this has been chosen, with statements to support its validity. Mark band 3 needs to also include constraints that the candidates are working to with suitable contingency plans.

Centres need to ensure that when the investigative work has been decided upon candidates will be able to gather sufficient data to cover the requirements of AO2. Not only data for calculations but also there needs to be a suitable vocational link. Candidates should not just be doing volumetric analysis or physical testing in isolation.

It is useful if Centres can include with this unit evidence that candidates had actually carried out the practical work and evidence that they had completed or used risk assessments. A statement written on the candidates' work is sufficient or alternatively a certificate of completion of practical. A write up of the method etc. is not evidence that the candidates have completed the practical requirements.

Again evaluation was quite weak and Centres need to work on this strand with their candidates.

Unit 10 Synthesising Organic Chemicals

The requirements of the assessment criteria meant that AO1 was only allocated 10 marks. The specification coverage for 10.2.1 and 10.2.2 was quite extensive, however where centres had given candidates guidance, work was of a much higher standard than where candidates were expected to do their own research on all the requirements of the specification. Worksheets and focused information on functional groups and types of chemical reactions are sufficient to cover the requirements for AO1. Candidates need to check work is accurate, the correct numbers of bonds are drawn around carbon atoms and equations balance, a lot of errors were seen in this section of the work. Where candidates had summarized the different drug types and the principles of the drug action good knowledge and understanding was displayed. Some very good work was seen for this section.

Work produced on the manufacture of ethanol and aspirin allowed candidates to gain full coverage of AO2. A great deal of interesting material was seen on costs and benefits to individuals, particularly related to different drugs. Calculations tended to relate to calculations of yields and profits for manufacturing organic chemicals.

A good range of organic preparations were seen, in addition to aspirin, paracetamol, iodoform, bromobutane, ethanol were commonly completed. Centres however need to take care that work is more detailed for AO3d and AO3e. Conclusions were not sufficiently detailed and evaluations for mark band 3 needed to consider the accuracy, errors, variables, sample size prepared, number of steps and also improvements should be both suggested and explained wherever possible. A statement of an alternative technique is insufficient for mark band 3.

Unit 11 Materials for a Purpose

Some high quality and interesting work was produced for this unit. Most of the work seen for AO1 reflected mark band 2. Mark band 3 work in addition to more than 2 examples, needs to show evidence that candidates have not just extracted data/facts directly from web sites but have related the various structures to the physical properties not just statements of each. Some good posters were seen. Case studies were variable and where candidates had chosen a specific purpose for their chosen material and used published data with a clear justification of their choice of materials, higher marks could be achieved. Some candidates, however, just cut and pasted data which did not link to the specific use of the material. Hopefully this will improve as candidates become more selective in their use of the internet. Calculations were easy to cover and a good range was seen however accuracy and significant figures need to be watched. Some candidates were still not labeling axes accurately or choosing suitable scales for their graphs.

A wide range of practical work was covered for this unit, which allowed candidates to complete practical work at a range of levels. Risk assessments need to be completed for all experiments, these in many cases were very brief and tended to be generic, more care is needed. Results need to be set out clearly with significant figures, accuracy and the need to repeat considered. Mark band 3 work needs to relate to the requirements of the assessment criteria and be of a suitable high level in both language and presentation. For AO3a main points to watch are correct calculations of gradients, and comments on why results obtained from samples differ. AO3b some good work was seen for this strand however for mark band 3 assessment of the impact testing machine compared with industrial standards is needed. AO3c the evaluations of whether the treatments have produced the expected results were rather weak – a higher level of discussion is needed for mark band 3. The results for AO3d should again be accurate and precise with the correct significant figures stated, and again evaluation of results need to be made at a suitable high level, this means the inclusion of errors with reasons, reliable and unreliable results, possibly a comment on validity suitable improvements where required.

Unit 12 Electrons in Action

Although this had a limited entry work much of the work seen was of good quality and showed a good understanding of the requirements of the specifications. The introduction of the redox series through a series of displacement experiments followed by half equations and then links to electrode potential led candidates through the understanding needed for this topic area. Mark band 3 work however for AO1b needs to show more selection and interpretation of material, a lot of basic cut and paste work was seen here.

AO2a mark band 3 work needs to compare the commercial cells chosen and include both an explanation of the information researched. Work seen tended to be mark band 2. AO2b calculations of EMF of cells were of suitable quality but again accuracy and significant figures need to be watched.

Practical work needs to include suitably detailed risk assessments linked to specific experiments and not generic statements of chemicals used. Concentrations of solutions need to be included and related to the hazard and risk. Again mark band 3 work needs to reflect the criteria in both coverage and standard at a high level. Explanation of any practical techniques that will improve results need to be suitably detailed not just a statement of an alternative technique. Results again need to be accurate and precise and data needs to be displayed in a range of ways. AO3c mark band 3 needs to include interpretation of results with detailed conclusions and a high level evaluation which includes errors, information of whether evidence collected is valid or reliable, if suitable number of results have been taken.

Unit 13 The Mind and the Brain

Candidates' had completed a great deal of interesting work for this unit. The fact sheets ranged from information needed for the Health Service to just basic information extracted from the internet. It is hoped that candidates will extract and select the required information on stress and its related illness and find out facts about the brain rather than cut and paste.

AO2a again allowed candidates to research the clinical methods of studying the brain and interesting work was seen. Work for mark band 3 was quite difficult to reach and limited work was seen on explanations of how methods are used in an experimental setting. Diagnosis of brain diseases was adequately covered by several candidates however the use of these methods for confirmation of hypotheses regarding normal brain function was rarely covered.

AO2b moral and ethical implications of brain research needs to show evidence of suitable discussion by the candidates; care also needs to be taken that candidates check that they cover the requirements of the AO2 mark band 2 & 3 for this strand. Mark band 3 particularly has a number of criteria that needs to be covered for 4/5 marks. Generally centres had no problems in gaining data but again mark band 3 work needs to show full explanation of the rationale behind the test and the result gained in addition to completing the statistical calculations,

Experimental work on a cognitive function generally was suitably covered and assessed. AO3e however for mark bands 2 & 3 needs to care needs to be taken to ensure the requirements of the criteria are suitably covered.

Unit 14 Ecology and Managing the Environment

Work again for this session showed that candidates' had completed a wide variety of fieldwork, visits and research. Huge quantities of work had been completed by many candidates. Several candidates produced high quality work which reflected suitable coverage of Mark band 3 requirements and this was good to see.

For AO1 the best work was seen where candidates had been suitably guided to extract the relevant information to show relationships between the organisms, their physical environment and each other in ecological succession. Although many candidates produced good evidence which illustrated research on the effect of agricultural practice, human habitation and greenhouse gas production on ecosystems and biodiversity several candidates did not cover all the required topics. Mark band 3 does require reasons for choice of resources to be included.

It needs to be noted however that for mark band 3 evaluative work and justification on the choice of material needs to be included. The weakest strand for this unit was again AO2a the scientific, moral and ethical reasons for preserving ecosystems and species diversity. Candidates again produced information related to, eg Wildlife Preservation Work, RSPB and good work was seen where candidates had had visiting speakers, been out to visits and had gathered their information by questioning staff involved in projects involved in methods used to manage ecosystems and preserve species diversity. Candidates however must include data/information which related to the success of a project managing one ecosystem.

Calculations were usually linked to data gathered from practical work carried out and again Centres need to ensure that if they are going to use this suitable opportunities are given for candidates to collect quantitative data.

Practical activities included work from field trips to practicals based at candidates' schools and colleges, a wide range of experimental techniques were seen which were often well documented and recorded. Candidates need to ensure risk assessments are detailed and include any chemicals used. These need to be working documents rather than generic additions to a report. Candidates who are aiming for higher mark band 3 must ensure that they cover a range of

appropriate techniques and suitable repeats are completed where necessary. Data collected needs to be appropriately precise and displayed in a range of suitable ways. For AO3d mark band 3 interpretations need to show a high level of detail and conclusions need to be related to data collected and the occurrence and distribution of species within the ecosystem studied.

Unit 15 Applications of Biotechnology

In centres where candidates had been suitably guided on the science of genetic engineering and the use of recombinant DNA technology, good high quality work which showed understanding was produced. High marks were gained where candidates had clearly structured their research work, showed the relevant understanding of these topics and given evidence of the use of a range of sources.

AO2a produced a wide range of interesting case studies of where recombinant DNA technology had been used in solving problems associated with food production by crop plants, care again is needed to ensure work is not cut and pasted. For mark band 2 evidence of evaluation of at least two specific examples of the technology is needed and mark band 3 was quite difficult to achieve, the assessment criteria needs to be carefully followed.

AO2b tended to be difficult achieve, the mathematical requirements seen were generally reflective of mark band 1, financial data was often given but limited or no calculations included. Centres are asked to refer to the Appendix on Mathematical Requirements in the specifications.

Again in order to reach the higher mark bands for AO2c for mark band 2, candidates need to summarize moral ethical and environmental issues concerning the use of recombinant DNA technology in the production of GM plants with an explanation of two types of controls placed on scientists that work in this field. Mark band 3 however needs a more detailed report with additional explanations and evaluative work on the two types of controls placed on scientists and how effective they are.

A lot of good practical work was seen, simple bioreactors were produced and immobilised enzymes were used and produced. The planning of the practical work, however, needs to be clearer and indicate the full intention of investigation. It was good to see preliminary work from candidates and in some scripts good research work on enzyme activity was included. Evidence of good displays of results need to be included for AO3c. Conclusions and interpretation of results were often quite basic. Care needs to be taken to ensure for the higher mark bands the assessment criteria is covered. Candidates need to ensure they spend the appropriate time on AO3c and AO3d to ensure sufficient coverage for the requirements of the assessment criteria. For AO3d level 3 candidates need to check the industrial links are made and care needs to be taken to cover all parts of this strand.

Advanced GCE Applied Science AS (H175, H375) and
GCE Applied Science A2 (H575, H775)
June 2007 Assessment Session

Portfolio Unit Threshold Marks (AS)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G620	Raw	50	40	35	30	25	21	0	1518
	UMS	100	80	70	60	50	40	0	
G621	Raw	50	40	35	30	25	21	0	1640
	UMS	100	80	70	60	50	40	0	
G624	Raw	50	40	35	30	25	21	0	289
	UMS	100	80	70	60	50	40	0	
G625	Raw	50	40	35	30	25	21	0	250
	UMS	100	80	70	60	50	40	0	
G626	Raw	50	40	35	30	25	21	0	393
	UMS	100	80	70	60	50	40	0	

Examined Unit Threshold Marks (AS)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G622	Raw	90	66	57	48	39	31	0	1629
	UMS	100	80	70	60	50	40	0	
G623	Raw	90	66	57	48	40	32	0	573
	UMS	100	80	70	60	50	40	0	

Portfolio Unit Threshold Marks (A2)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G627	Raw	50	40	35	30	25	20	0	648
	UMS	100	80	70	60	50	40	0	
G629	Raw	50	41	36	31	26	22	0	304
	UMS	100	80	70	60	50	40	0	
G630	Raw	50	40	35	30	25	21	0	122
	UMS	100	80	70	60	50	40	0	
G631	Raw	50	40	35	30	25	20	0	97
	UMS	100	80	70	60	50	40	0	
G632	Raw	50	40	35	30	25	20	0	117
	UMS	100	80	70	60	50	40	0	
G633	Raw	50	40	35	30	26	22	0	272
	UMS	100	80	70	60	50	40	0	
G634	Raw	50	40	35	30	25	20	0	299
	UMS	100	80	70	60	50	40	0	

Examined Unit Threshold Marks (A2)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G628	Raw	90	61	55	49	43	38	0	412
	UMS	100	80	70	60	50	40	0	
G635	Raw	90	55	48	41	34	27	0	452
	UMS	100	80	70	60	50	40	0	

Specification Aggregation Results

Uniform marks correspond to overall grades as follows.
Advanced Subsidiary GCE (H175):

Overall Grade	A	B	C	D	E
UMS (max 300)	240	210	180	150	120

Advanced Subsidiary GCE (Double Award) (H375):

Overall Grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
UMS (max 600)	480	450	420	390	360	330	300	270	240

Advanced GCE (Single Award) (H575)

Overall Grade	A	B	C	D	E
UMS (max 600)	480	420	360	300	240

Advanced GCE (Double Award) (H775)

Overall Grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
UMS (max 1200)	960	900	840	780	720	660	600	540	480

Cumulative Percentage in Grade

Advanced Subsidiary GCE (Single Award) (H175):

A	B	C	D	E	U
1.5	9.0	26.7	54.1	78.1	100.0
There were 946 candidates aggregating in June 2007.					

Advanced Subsidiary GCE (Double Award) (H375):

AA	AB	BB	BC	CC	CD	DD	DE	EE	U
0.0	2.0	4.9	10.4	21.8	33.2	49.2	61.6	78.5	100.0
There were 346 candidates aggregating in June 2007.									

Advanced GCE (Single Award) (H575):

A	B	C	D	E	U
0.8	8.8	28.0	62.9	89.3	100.0
There were 375 candidates aggregating in June 2007.					

Advanced GCE (Double Award) (H775):

AA	AB	BB	BC	CC	CD	DD	DE	EE	U
0.0	0.8	4.7	10.1	20.6	37.4	58.8	76.3	91.8	100.0
There were 277 candidates aggregating in June 2007.									

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication.

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