OCR
RECOGNISING ACHIEVEMENT

GCE

Applied Science

Advanced GCE **A2 H575/H775**

Advanced Subsidiary GCE **AS H175/H375**

Report on the Units

June 2008

H175/H375/MS/R/08

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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.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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G620, G621, G624, G625, G626: AS Portfolio Units

General Comments

The majority of Centres have implemented and delivered the requirements of this advanced Applied Science course enabling their candidates to produce a range of portfolio work which is interesting, relevant and up-to-date. This is the third June assessment session and the numbers of Centres involved is steadily increasing. It is hoped that this qualification will give young people the opportunity to gain scientific knowledge and understanding, and learn a range of practical skills including research skills which will support their continuing studies or careers. Many Centres are now accredited and consequently much of their work was not seen during this session. Where Centres are accredited, OCR considers that their candidates are completing work to the appropriate standard. Sampling, however, does take place over both the January and June sessions and OCR will contact Centres if they are required to send samples of their candidates' work for moderation. Accreditation runs for three years and separate accreditation is given for AS and A2. Centres that have adopted a vocational approach and have encouraged visits and practicals which link with local scientific organisations should be commended.

It is good to report that many Centres have applied the assessment criteria very accurately and have assessed their candidates' work to the correct level. For the majority of Centres, candidates' work was at an acceptable standard for AS level. Where scaling of candidates' work occurred, this was mainly at the higher mark bands.
All the AS portfolio units offered were seen and moderated this session. These include:

- **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**

It was a credit to the Centres in that they were very responsive in returning scripts for moderation. 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.

It is important that Centres return the Centre Authentication Form with the candidates' work as this is now a requirement of QCA. It helps the moderation process if work from Centres is organised and presented using treasury tags which allows moderators to easily read the work. Centres are also encouraged to write comments and page references on the URS forms, to support the moderation process.

It is appreciated when Centres include the tasks sheets set for the portfolio work; this helps to support the moderation process, as it is often quite difficult to see how much support candidates have been given if guidelines have not been included.

Work selected for moderation reflected coverage of all the units offered by this AS specification. A range of marks were seen. Candidates' use and selection of research material obtained from the internet showed a noticeable improvement. Candidates should be encouraged to use their own words whenever possible and to include suitable references of the website used.

Centres should support good practice by encouraging candidates to include risk assessments with all practical work. In many cases more guidance is needed to ensure these are suitably detailed and not generic - they should be used as working documents.

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

Unit 1 Science at Work

This is a mandatory unit and is completed by all candidates taking both the AS single award and the AS double award. Some excellent surveys were seen which demonstrated sound research skills with the production of a wide range of interesting and up-to-date science. Candidates gaining higher marks demonstrated that they had the ability to be both selective and concise in presenting the required information.

Candidates need to ensure each survey includes:

- the products made or services offered
- the type of work that takes place
- an identification of the science involved*
- the inclusion of information on Health & Safety**

***more guidance is needed to ensure this is covered, many candidates are just including a superficial statement, or just cutting and pasting work taken from the organisations' website which shows no understanding.*

*** constraints and guidance used in the organisation are useful for the survey and can also support the assessment for AO1c. Candidates however need to refer to the names of the actual regulations and laws. There were some omissions here.*

The text in the survey should use candidates' own words. Information cut and pasted from Internet sites is insufficient. Excessive detail is not required for the surveys, this work is intended to be an overview of science in the work place. If fewer than five surveys are included in the portfolio then credit needs to be given to those organisations that were surveyed. The mark allocated needs to be averaged. Where candidates have completed group work, information about the independent work carried out by candidates needs to be indicated.

The survey exercise was included to encourage candidates to find out about the range of science involvement in many organisations e.g. hospitals, opticians, dentists, health clubs, garages, building companies, engineering works, educational establishments, all the utilities etc. and it was good to see that candidates had visited zoos, local breweries, power stations, medical centres , opticians and fitness centres. Alternatively, those candidates who had used the Internet for their research tended to use large companies e.g. Astra Zeneca, Biffa, GlaxoSmithKline, BUPA.

The majority of candidates are now focusing on one of the organisations studied in the survey for their in-depth study. They need to ensure that the following guidance is used:

- explanation of what is produced or details of the service offered
- information about the organisation including the number and range of staff employed *
- further details on the scientific job roles specifically related to the chosen organisation
- some explanation and detail of the science involved in the organisation
- any further specific detail on research, quality control
- details and specific links of the Health and Safety laws and regulations used is important here for AO1c

* *careers information can be used here.*

For mark band 3, the additional guidelines indicate a comprehensive study is required and information should be selected from a range of sources and be clearly and logically presented. It is good practice to include the resources used as a bibliography and this should be encouraged.

Comments on the validity of the sources used must be included if mark band 3 is to be reached. There was minimal evidence of evaluation and justification of the research material. However, some excellent work was seen with precise, informative research.

For AO1c, even for mark band 1, candidates need to show awareness and a basic knowledge of Health and Safety laws and regulations. Higher marks can be obtained where candidates link Health and Safety with their surveys and also make suitable links in their main study. Contributions to this strand can come from evidence included throughout the unit.

Where candidates have been given structured guidance to demonstrate the impact of an organisation on society, higher marks were gained. Candidates need to include appropriate information from the following guidelines:

- the contribution to the economy and management of costs
- details on waste management and environmental issues
- ICT uses -where appropriate
- details on the effect on the community (employment/transport) and the environment
- energy requirements
- benefits to the society

In the majority of scripts seen, the work for this strand was included as part of the in-depth study. It would however be useful for moderators if an indication was given on the URS form of where this evidence could be located within the unit.

It should be noted that mathematical guidelines of straightforward and complex calculations are given in the appendix of the specification. A wide range of suitable calculations were seen linked to practical work offered. Calculations submitted tended to be assessed correctly at mark band 1 and 2. For mark band 3, work should be correct and answers given to the appropriate degree of accuracy with correct significant figures. Candidates are now submitting a range of calculations rather than just one example and evidence of additional tasks to cover a range of mathematical work was also seen to support mark band 3.

It was noticeable this session that candidates are linking their practical tasks to a vocational context, this is good to see. For this unit they are including suitably detailed risk assessments and many assessors are now clearly giving evidence that candidates had completed their practical activities. Accuracy of recording still needs to be watched. The recording of titration results should be at least one decimal place and set out in a suitable format. All measurements need to show the required precision and include the relevant units. Omission of units in tables and on axes of graphs was still widespread. Generally work seen is now being assessed appropriately for processing with interpretation, even for mark band 1. Candidates are now showing the methods of processing of their results for higher mark bands and in some cases, evaluation of the accuracy of apparatus and method is being included for mark band 3.

Unit 2 Analysis at Work

A range of energy policies were seen and the correct range of practical exercises was generally submitted. Some high quality work was produced from candidates, with many achieving 40+ mark.

It is now good to see that the majority of Centres are now guiding their candidates to complete work on energy rather than environmental policies. It is difficult in some cases to extract the energy related information from organisations 'energy/environmental information, but where selection occurred, candidates gained higher marks. Airlines, Sainsbury's, Tesco, colleges and universities and many local authorities have suitable information on energy and environmental work.

Work for AO1b on energy efficiency is improving, but there are still omissions in what measures need to be put in to place by companies in order to become efficient. More candidates are now including definitions of energy efficiency and are focusing on Section 2.2.5 in the specifications and linking it to the requirements of AO1b.

Environmental issues continue to be very topical and good research has been seen. Candidates need to ensure that they extract relevant information and relate it to their chosen organisation. This topical issue is now being covered in a lot more depth and at a higher level than in previous sessions.

Energy transfers involved in the generation of electricity are now being included and where work is brief it is being assessed accordingly. More relevant data is now being seen and candidates are now making a comparison of the relative benefits and problems of large scale and small scale electrical generation. Accuracy and correct solutions are needed to fulfil the mathematical requirements of mark band 3, this still needs to be worked on by candidates.

Suitable practical work is being included by most Centres but risk assessments still need to be more detailed and be used as working documents. Two physical analyses are required to include both chromatography and colorimetry. The qualitative chemical analysis can include investigative work on unknowns, forensic investigation, mummion, water or pollution analysis. The quantitative analysis examples can include analysis of water, vinegar, iron tablets, bleach, ear drops, metallic solutions etc.. Good practise was seen where practical work had a vocational link and again this was evident.

Reports do not necessarily need a rewrite of experimental methods but care needs to be taken that suitable detail is given on recording and processing of results. Care however is also needed in the accuracy of calibration graphs for colorimetry, several errors were seen here.

Work seen generally reflected mark bands 1 and 2 but it still needs to be noted that work for mark band 3 needs to be suitably detailed, with evidence of vocational links and evidence from the assessor that risk assessments have been produced, used and equipment has been used safely.

Suitable evaluation is required and this needs to be focused on the method and outcomes of the specific experimental work completed, not just a generic statement of the success of the work. Care needs to be taken that the level of this work reflects mark band 3. Centres need to check work is accurate and is clearly and logically presented.

Unit 5 Chemicals for a Purpose

This AS level unit is an optional part of the double award and offers candidates the opportunity to extend their chemistry knowledge in both organic and inorganic chemistry. Numbers of candidates studying this unit have increased but many simple errors in equations and basic chemical knowledge are still apparent. Candidates again need to be steered away from cutting and pasting from websites; a lot of this was particularly seen in this unit. There is guidance given in the specification under 5.4 Guidance for Teachers and in Guidance on delivery.

Candidates are now choosing four compounds: two organic and two inorganic. Although candidates still need guidance to choose compounds which will allow them to find information on both uses and properties of these compounds. Examples of compounds used included: sodium chloride, silver chloride, sodium carbonate, calcium carbonate, calcium oxide, ammonia, ammonium salts, water and inorganic acids. The organic compounds were wider ranging e.g. ethene, ethanol, methanal, polyethene, and nylon. Some Centres had encouraged candidates to do a lot of research into detergents. It should also be noted that for the chosen compound for AO1c, details are needed on how the structure and chemistry relates to its use. Candidates produced a range of posters, presentations and leaflets to display this information.

For AO2a popular industrial processes included the Haber Process, the Contact Process, fractional distillation/cracking and reforming. Two industrial processes are needed with conditions, raw materials and uses of the products. Candidates need to take more care when writing balanced chemical equations, as several inaccuracies were seen.

Candidates generally gave clear and detailed work on catalysis, but more detail is needed on advantages and disadvantages of the processes for mark band 2 or 3. Again it is suggested that Centres refer to the teachers' guidance given in the specification.

Although aspirin was popular, preparations of paracetamol, iodoform, esters, haloalkanes and carboxylic acids were seen. Care still needs to be taken to make sure that sufficient detail is given to the requirements of the assessment criteria to ensure suitable evidence is produced enabling higher mark bands to be reached. Please can candidates be encouraged to draw diagrams to scale – more care is needed in this area.

For AO3b mark band 2, both observations and measurements are needed and the yield should be calculated. To support mark band 3, the candidates need to show how the theoretical yield is calculated to reflect suitable knowledge at this level and they also need to record all mass results to the same number of decimal places. 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

The work moderated for this unit was generally assessed appropriately and the task sheets seen logically covered the requirements of the specification. Candidates showed enthusiasm in this topic which was reflected in the range and quality of the work seen.

Candidates submitted interesting and informative work on methods of recording the crime scene through the use of photography, video and sketches. Centres whose candidates used scenarios to assess AO1a produced some good evidence on the need to record and preserve a crime scene. Higher marks were achieved where candidates completed reports, in their own words, which focused on the required topics given in the specification.

Many candidates linked work for section AO1b with the practical AO3. Where this is done please ensure the work reflects the appropriate time allocation as 12 + 19 marks are allocated. Where AO1b work was completed with AO3a it seemed to link together well. Candidates are producing some good discussion work for AO1c. Work on ethics was varied in detail, but generally candidates were not gaining the higher mark bands. Some Centres are still 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. This should include relevant points from the current legal framework. The O. J .Simpson case or the Australian dingo case are still popular and give the opportunity to consider the validity of the evidence presented and to come to a conclusion of probable guilt. Candidates are now giving reports which address the requirements of the assessment criteria.

A range of calculations on forensic data is now being seen e.g. Rf values in chromatography for mark band 1, refractive index of glass samples for mark band 2 and for the higher mark bands, a range of calculations using qualitative data, similar to those shown in the teachers' guide.

Experimental work for visual and biological areas included analyzing fingerprints, taking footprints, measuring and using photographs, microscopic techniques and analysis of artificial blood. Chemical analysis included both organic and inorganic tasks. Chromatography was used for the analysis of inks, dyes, amino acids and lipsticks. Interpretation of IR spectra was commonly seen for the identification of unknown samples. Refractive Index of glass was seen from most Centres for physical analysis. Candidates need to ensure detailed processing and interpretation of their results for mark band 3. In addition, candidates are expected to record their forensic observations and measurements and display their data in a range of ways.

Unit 7 The Physics of Sport

This continues to be a popular unit and work seen showed candidates' enthusiasm in the physics of sport. Some Centres included a wide range of practical work linked to the appropriate topics to support understanding which was good to see. Candidates need to ensure they link their enthusiasm for sport to the physics knowledge required.

Many excellent leaflets were seen and Centres are generally supporting candidates in using their own words rather than cutting and pasting from the Internet, however, still more work is needed to support this. More evidence is now being seen on the linking of scientific knowledge to the chosen sport or equipment to support the higher mark bands. Cricket, golf, tennis, snooker, swimming and skiing are some of the most popular sports chosen.

Care needs to be taken to ensure work on the choice of ball material and equipment in sport is candidates' own words wherever possible. Research into materials and how new technology has improved performance was commonly seen. Where candidates gave evidence and reasons for selection of a particular material for its chosen use, mark band 3 was appropriately given.

Evidence was seen of practical activities based on movement which generated data covering AO2 and AO3. Centres should refer to Section 7.2.2 Physics of the Body. Work on sports techniques also allowed candidates the opportunity to carry out practicals on momentum. Candidates used the data collected to support mathematical evidence for AO2b.

It again should be noted that 19 marks are focused on the practical requirements for this unit and consequently the time spent on practical work should be allocated accordingly. Evidence of planning and a range of techniques should be evident. Risk assessments should be included to support safe working. Candidates need to work on the interpretation of data and drawing conclusions. Discussion of the significance of their findings is rarely seen for mark band 3.

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/parecetamol
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

G622: Monitoring the activity of the human body

General Comments

The majority of candidates completed the whole paper

Comments on Individual Questions

1 (a) Answered very well.

(b) Most candidates obtained 1 mark. Few candidates gave cartilage or explained its role.

(c) Many answers gave respiration rather than diffusion.

(d) A lot of answers explained pressure and volume changes rather than describing the muscle actions bringing these about.

2 (a) This was well answered.

(b) The majority gained high marks.

(c) (i) Many confused the role of red and white blood cells.

(ii) This was generally well done.

(d) (i) Few gained full marks as they failed to link increased red blood cells with carrying more oxygen and therefore enhanced aerobic respiration and production of more A.T.P. for exercise.

(ii) Many thought steroids were recreational.

(iii) This was not well known as drug names.

(iv) Very weak answers. Few mentioned 2 samples.

3 (a) This was well done. Candidates now use data well.

(b) Most candidates described changes rather than explained.

(c) The majority gained 1 mark.

(d) (i) The role of the peak-flow was poorly understood.

(ii) There were too many unspecific answers.

(iii) Few gave correct units.

4 (a) Most candidates did this well.

(b) A lot of candidates gained credit for pumping action of the heart on blood but failed to link to respiration and removal of waste products.

5 (a) (i) Candidates missed X-rays – harmful or ionising radiation and ultrasound was relatively cheap.

(ii) (1) Contrast media was unknown to many although some knew barium meal.

(ii) (2) The point was to obtain a clear/accurate image.

(ii) (3) Answered well.

(ii) (4) Many thought it could lead to catastrophic events like ripping out pacemakers.

(b) Many confused answers. After the X-rays few looked at it from point of view of both the doctor and patient.

G623: Cells and Molecules

General Comments

G623/01 Planning exercise

A range of different methods to estimate the relative sugar content of Merlot and Syrah grapes were seen in this task e.g. hydrometry, Brix scale analysis, semi quantitative analysis using a colorimeter with Benedict's reagent, quantitative analysis using Lane and Eynon titrations, and Rubelein titrations. Centres are asked to ensure that candidates read the instruction brief carefully to avoid misinterpretation i.e. to ensure that a **comparative** analysis of the two types of grape is included in the plan. It is suggested that centres provide students with an optional self assessment tick sheet to ensure that they address all the marking points in their plans before final submission.

It was disappointing to note that in some centres there was clear evidence of copying amongst candidates.

G623/02 Test

Each of the questions and the paper as a whole achieved good differentiation between candidates. There was no evidence of candidates failing to complete the paper due to lack of time. There were no common misinterpretations of the rubric.

Comments on Individual Questions

G623/01 Planning exercise

A Many were unrelated to the investigation. Simple reference to 'spillage' or 'coats on the floor'. This evidence needs to be a working document relevant to the intended practical work. An appreciation of electrical (blender/colorimeter); glassware; sharps; relevant chemical hazards need to be recognised. Level of risk and control measures need to be addressed.

B Prediction needs to be comparative and relating to the sugar content in the two tissues. Many students just linked colorimetric observations to glucose concentration. Candidates often referred to all grapes with no specific reference to merlot/syrah.

C Justification often omitted. Justification of prediction should make use of secondary sources and information on the accompanying OCR resource sheet.

D - G Preliminary work was often confused with the actual investigation (or omitted altogether). Many candidates still did not consider preliminary work. Where preliminary work was included it was not justified or related to the main method of the investigation in some cases.

H / I Many candidates listed at least two secondary sources. However, candidates must ensure that full reference details are given and they must state how these sources have helped in the investigation.

J / K Many students achieved marking points J and K. Many candidates wrote in some detail regarding their chosen method to enable reasonable degrees of accuracy and reliability.

L / M Students need to give a comprehensive list of equipment for M with qualified names and quantities. Students in some centres failed to list the source material whilst others used inappropriate source material i.e. grapefruit; limes; lemons. Many failed to include 'numbers', 'sizes' and in some cases essential items such as Benedict's reagent.

N Students need to appreciate the importance of repeats and the need for experimental data to be comparative. This criterion was met by most of the more able candidates.

O / P Whilst the majority referred to both merlot and syrah grapes the need for comparison was rarely stated. Some candidates failed to gain credit here because they used inappropriate source material such as 'green and black grapes'.

Q / R Whilst many students stated a minimum of 3 variables as dependent, independent and controlled variables, very few students explained how these variables were to be controlled.

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

T Many students planned to display their results graphically as calibration curves for known glucose concentrations.

U Mean % absorbance/transmission values were the most common calculations seen in scripts. Some candidates were awarded U for their use of estimating glucose concentrations from calibration curves.

V Few students addressed possible conclusions. Those that did failed to link possible conclusions to confirm or reject their prediction.

W Sources of error were often too vague and few gave two valid examples. Some students were able to recognise one possible source of error. Two are needed to award this marking point.

X Many candidates were able to suggest at least one possible method to improve the validity of their data (usually by suggesting an alternative method). However, students need to distinguish the difference between the terms accuracy and validity to enable suitable improvements to be suggested.

Y Awarded to the vast majority of candidates.

G623/02 Test

1 (a) Many candidates could access this question. Most candidates could describe the process of making a temporary slide for two marks although their use of appropriate equipment terminology was lacking. 2 marks often gained for 'use of iodine or stain' and 'cover slip'. References to the need for thin sections and the exclusion of air bubbles were less common.

(b) (i) Chloroplast and nucleus were generally well known with mitochondrion a common error for A.

(ii) The idea of a clearer image was recognised by the majority of candidates but was linked to greater resolution only by the better candidates. Higher magnification was often included but the 'explanation' mark was rarely gained.

2 (a) Very few candidates scored more than 2 or 3 of the 5 available marks - a very small minority associated condensation reactions with all 3 groups.

(b) (i) Very poorly answered. Correct structures for glycerol and fatty acids were extremely rare. Very few students could draw these diagrams. Few candidates attempted this section.

(ii) More able candidates were able to compare saturated and unsaturated fats re C-C/C=C bonds. Some candidates appreciated that polyunsaturated fats carried more than 1 double bond.

(c) (i) Generally well answered with most candidates scoring 2 of the 3 marks available.

(ii) Few candidates answered in sufficient detail to gain more than one mark, usually for making reference to 'DNA controlling genetic expression'. Control of cell activity and protein synthesis were occasionally included but other details were extremely rare.

(d) A significant number of candidates labelled the diagram accurately and many others gained 2 or 3 of the available marks. Glycoprotein was the best known of the labels and most confusion arose between glycolipid and phospholipid.

3 (a) (i) (ii) Most candidates experienced great difficulty in both parts of this question. Both the description in (i) and the explanation in (ii) normally lacked the clarity and detail to gain marks. Choice of magnification and adjustment of slide were the commonest correct responses in (i).References to calibration of the epg in (ii) were very uncommon.

(b) (i) It was pleasing to note that many candidates knew how a Coulter counter can be used to determine the number of yeast cells. Many were awarded 2/3 marks in this section. The majority of students achieved 1 or 2 QWC marks. Weaker candidates confused the Coulter counter with a haemocytometer.

(ii) Majority of candidates could give one advantage of a Coulter Counter although increased accuracy was a common misunderstanding.

4 (a) Many candidates were awarded 2 marks for clinical symptoms of HC.

(b) Many students appreciated the need to look for abnormal cells. Neoplastic cells/CINs were unused marking points. One or two candidates referred to HPV particles.

(c) Many students could list 2 ethical problems although care needs to be taken to provide ethical issues which are relevant from the doctors' perspective.

G627, G629, G630, G631, G632, G633, G634: A2 Portfolio Units

General Comments

This is the second June assessment session for this A2 qualification. All units were assessed by Centres; the most popular optional units were Unit 10, Unit 14 and Unit 15. A good standard was seen in a high percentage of the work moderated, which was a credit to the candidates taking this qualification. It was felt that Centres now have a good understanding of the assessment criteria and most of the work seen was well organised and indicated that staff and candidates were experienced in portfolio assessment, following on from AS in previous sessions. Candidates' portfolio work at this level showed a marked improvement in research skills, evidence of independent working and more selective use of the Internet. The range of work seen reflected good vocational links in many up-to-date topics. The following units were assessed this session:

- 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

Centres are again asked to include the tasks sheets given to the candidates as this helps to support the moderation process. Centres which gave candidates structured assignments focusing on the requirements of the assessment objectives allowed them to produce logical and relevant work which gave access to higher mark bands.

Where there were less than ten candidates in the group it was appreciated when Centres sent all their scripts directly to the moderator; this saved time and led to an efficient moderation exchange. It also supports the moderation if Centres can indicate the assessment code e.g. AO1 (a) on the candidates' work.

Candidates' work was at an acceptable standard for A2 level for the majority of centres and only limited scaling was necessary. 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 grade at 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. The topics chosen for the investigative work need to build on knowledge and understanding studied at AS. Where this was apparent, excellent investigations were seen with practical skills based at the correct level and supported by suitable research of the related scientific requirements. It was pleasing where candidates showed both independent research and practical skills. 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.

The majority of investigative work seen was related to vocational contexts, the activities included a range of chemical, biological and physical investigations. Examples included: organic preparations related to drug manufacture and aspirin, rates of reaction linked to catalysis, inorganic analysis both qualitative and quantitative linked to food, forensic and environmental. Investigations on vitamin C, calcium and iron content of foods linking to both biological and chemical theory were very popular. Biological investigative work focused on micro organisms, yeast /sugar /fermentation, health, fitness, and psychological effects again were commonly seen, however, care is needed if these areas are chosen to ensure work reflects A level standard. A range of different techniques need to be included. Work which extended practicals from units 11, 13 and 14, often led to work at high levels.

In order to cover the requirements for AO1 a full plan is required 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. More candidates are now completing holistic plans however more specific detail is still needed to reflect mark band 3 requirements and specific monitoring is required, rather than generic statements.

Investigations which gave clear aims and objectives for AO1 allowed higher marks to be achieved as a discussion of how the investigation achieved its aims and objectives was more easily completed. Evidence of both scientific principles and details of a range of experimental techniques also needs to be present. Some candidates still tended to be quite repetitive in their chosen experimental work and did not develop their skills. Risk assessments need to be included with all experimental work to fulfil the health and safety requirements.

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. Evidence for 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. They should not just be doing volumetric analysis or physical testing in isolation. Centres are encouraged to include evidence that candidates had actually carried out the practical work with further evidence that they had completed and 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. The report does not necessarily need the candidates to include write ups of methods. A standard procedure which was used can be attached. The report needs to show the outcomes of the investigation with suitable evidence of an understanding of the scientific concepts involved. Evaluations need to focus on the whole investigation not just single experimental tasks. Evaluation was frequently quite weak and Centres must work on this section with their candidates.

Unit 10 Synthesising Organic Chemicals

This unit was the most popular of the optional units and work moderated indicated that candidates are now acquiring better research skills and are showing the ability to select suitable and relevant material. A variety of different practical skills are being assessed, showing competence in organic preparative work and purification and recrystallisation techniques.

Work seen for AO1 was focused on the requirements of the specification and the accuracy in the chemistry knowledge was much improved from AS. Candidates gaining higher marks for AO1a gave good summaries of classification and identification of functional groups with evidence of understanding of different types of isomerism. The importance of isomerism linked to specific examples is needed to secure mark band 3. Candidates' only gaining lower marks still need to check work is accurate, the correct numbers of bonds are drawn around carbon atoms and equations balance. Errors were again seen in this section of the work.

Candidates seem now to be showing suitable understanding of the detail needed for AO1b, with less and less copied information now being included. Suitably selected and accurate information is required for mark band 3. Tests however are still being supplied as evidence for knowledge and understanding and although this is a method of assessing knowledge perhaps providing a worksheet for candidates to complete would be more appropriate for this type of qualification.

Some excellent work has been seen for AO1c. Good practice is shown where candidates complete work in table form: suggested headings could be Type of drug/How it is used/example/importance in health care /further information. More detailed information however on therapeutic effects and usage is needed to support mark band 3.

For AO2, a wider range of organic compounds are now being seen from different drugs, alcohols, and various polymers. AO2b needs to focus on costs and benefits to individuals, companies and society associated with the manufacture of the organic compound. Data from chemical and pharmaceutical companies provided a range of evidence for this strand, although for mark band 3, candidates need to ensure that as well as descriptive work, some explanation and evaluative work is included. 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.

Preparations of aspirin, ethanoic acid, iodoform (triiodomethane), bromobutane, ethyl ethanoate and paracetamol were seen. Candidates need to take care that for mark band 3, risk assessments are accurate and sufficiently detailed. Risk assessments tended to be mark band 2 rather than mark band 3. Candidates need to be guided to ensure they record suitable observations and measurements for both their preparations. The processing of results must be completed accurately and show some understanding at all mark bands. Evidence on calculations of theoretical yield is also needed. Conclusions were not sufficiently detailed and evaluations for mark band 3 need to look at the accuracy, errors, variables, sample size prepared and reaction routes. 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

This unit had limited entry, however some high quality and interesting work was produced. Most of the work seen for AO1 reflected mark band 2. Candidates need to ensure that understanding is shown, as there was a lot of cutting and pasting for this part of the unit. Candidates need to be encouraged to use their own words. In addition to more than 2 examples, evidence to support mark band 3 needs to show that candidates have not just extracted data and facts directly from web sites but have related the information to the physical properties. Where candidates had completed posters, more independent work and understanding was seen.

Common case studies included materials for furniture, kitchens, floors and sporting equipment 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. 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 labelling 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, in many cases these 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. In 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 and possibly a comment on validity suitable improvements where required.

Unit 12 Electrons in Action

This unit also had limited entry and work was of variable quality. Higher level work showed a good understanding of the specifications requirements and candidates had been given clear assessment tasks which guided them through the requirements. The introduction of the redox series through a series of displacement experiments followed by half equations which then links to electrode potential gave candidates the understanding needed for this topic. 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 needs to compare the commercial cells chosen and include an explanation of the information researched. Work seen tended to be mark band 2. In AO2b, calculations of the EMF of cells were of suitable quality but again accuracy and significant figures need to be watched.

AO3 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 and information of whether evidence collected is valid or reliable and if a suitable number of results have been taken.

Unit 13 The Mind and the Brain

This unit was very popular this session and candidates' had completed a great deal of interesting and topical work. Work seen for AO1 showed that candidates are now learning how to use the internet and are showing selection and use of suitable material. Care needs to be taken to ensure that the work is presented as fact sheets and not reports. Candidates are now extracting and selecting the required information on stress and its related illness and are including facts about the brain.

For AO2a, structure and function of the brain was well done and some good work was seen on the description of behavioural and cognitive effects associated with damage and how the brain deals with it. There were some good illustrations. Work seen for this session included good mark band 3 work supported by details of the sources used to support the research. AO2b moral and ethical implications of brain research still needs to show evidence of suitable discussion by the candidates; although some good arguments were given from some candidates and some work on ethics of future technologies was included. AO2c does ask for a fact sheet detailing statistical evidence; however work from practical investigations can be used here. Candidates are using a wide range of statistical testing on their results but additional information is still needed to ensure the higher mark bands.

Experimental work on a cognitive function was generally suitably covered and assessed. 26 marks are available for this section and therefore candidates need to spend the appropriate time in their experimental work. Reports should be written as a scientific document and not use 'I did this, I did that etc.'. Reports which were well organized and included side headings reflected the higher mark bands. Care needs to be taken that for AO3e, mark bands 2 and 3 suitably cover the assessment criteria.

Unit 14 Ecology and Managing the Environment

Several candidates produced high quality research and practical work showing knowledge and understanding which reflected suitable coverage of mark band 3 requirements. Candidates' work indicated interest and enthusiasm in this topic area. Huge quantities of work had been completed by many candidates. Centres which gave candidates structured assignments focused on the requirements of the assessment objectives allowing them to produce logical and relevant work which gave access to these high mark bands.

AO1 work is showing suitable selection from researched material and work which indicates candidates are understanding ecological succession and the effects of change on ecosystems and biodiversity. Some good poster work was seen, allowing mark band 3 to be reached. 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. Care needs to ensure that candidates cover all the required topics: effect of agricultural practice, human habitation and greenhouse gas production on ecosystems and biodiversity. Mark band 3 does require reasons for choice of resources to be included. AO1b research on the effect of agricultural practice, human habitation and greenhouse gas production on ecosystems and biodiversity was also extensive where candidates had been given the appropriate guidelines and support. 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, for example, Wildlife Preservation Work or the RSPB. 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 involving 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. Information on the methods used was often included but the data relating to the success of the project often omitted. Calculations were usually linked to data gathered from practical work carried out. Centres need however to ensure that if they are going to use this, suitable opportunities are given for candidates to collect quantitative data. Some good statistical analysis was seen in this section.

Practical work was wide ranging and included investigative work based around candidates' school or college or field trip work. A range of experimental techniques were seen and it was good to see photographic evidence of work carried out. Centres need to ensure suitable opportunities are given for candidates to collect quantitative data. Risk assessments generally for this session seemed to be suitably detailed and did include the risk out in the field as well as back in the lab. 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.

The displaying of data for AO3c needs to show a range of different ways for mark band 2. Kite diagrams were often seen to support data display. 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

This is another popular unit, however, care needs to be taken to ensure candidates are including work in the leaflets which they understand. They should be encouraged to use their own words wherever possible. Booklets produced for AO1 showed a variety of information on the science of genetic engineering and the use of recombinant DNA technology however quantity does not automatically mean high marks, work for the higher mark bands should show suitable selection and use of the researched information. 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.

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 the 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 still tended to be difficult to achieve, the mathematical requirements seen were generally reflective of mark band 1, financial data was often given but limited or no calculations included. More data was seen in this session with detailed information on costs of GM crops/seed costs as well as growing costs etc. Percentage and increase percentage work was popular. 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.

Perhaps the word ‘fermenter’ is one with which centres are more familiar, however a lot of good practical work was seen, with simple bioreactors/fermenters produced and used. Planning of the practical work needs to be clearer, more detailed and should indicate the full intention of the investigation. It was good to see preliminary work from candidates and good research work on enzyme activity was often 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 the assessment criteria is covered for the higher mark bands. 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 that industrial links are made and care needs to be taken to cover all parts of this strand.

G628: Sampling, testing and processing

General comments

This was the second time that this paper has been set in the summer and the number of candidates taking the examination was around 560, which is around 40% greater than in the previous summer.

There was continuing evidence of revision from past papers and the specimen materials provided by OCR.

The total for the paper was 90 and, as in June 2007, there were many papers that showed a score of between 30 and 50. The number of candidates whose scores were between 50 and 75 continues to rise slowly but there are still too many candidates whose total is 20 or less.

In previous reports comment has been made that a number of candidates had not really used the case studies in the way in which they were intended. The examiners felt this to be less true in this paper. However, some easy marks were still lost when credit could have been gained by looking at the provided case study material during the examination.

As in previous examinations, the final question – which was not based on case study material - was easily the weakest in terms of candidates' responses. Again, many candidates could not apply their knowledge to unfamiliar situations that had a vocational slant.

The examiners considered that the results showed that candidates are relatively weak in the development of experiments to test the points outlined in the question. This is not an easy area to prepare for, apart from looking at past questions and the responses expected in reply. Time for a unit is limited and the examiners suspect that practical work may be one of the first areas to suffer. A wider practical knowledge would have helped candidates in designing experiments to suit new situations.

In previous papers the examiners have noted that some of the responses indicated that the candidates had not really read the question thoroughly. However, there was less evidence for this in the present paper

A number of candidates fail to handle simple mathematics in a competent way. Many candidates still cannot calculate percentages or change the subject of equations. Some answers continue to be unrealistic, such as the efficiency of a power station to remove sulphur dioxide from the flue gases. Some gave well over 100% as their response to this question. As on previous occasions, candidates need to consider if their response is a sensible answer.

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

Comments on Individual Questions

1 This question was based on the article 'Acid rain – a soluble problem?'

(a) (i) Some candidates gave a general answer about pollution, this did not gain credit.

(ii) The need for a comparison to be made between samples was generally understood.

(iii) Most candidates gained credit for suggesting the wearing of gloves as a protection against biological toxins in the water.

(iv) The commonest acceptable suggestions here were 'slipping' or 'drowning'. A number of other sensible answers also gained credit but it was difficult for some candidates to suggest two valid suggestions.

(v) The examiners were looking for a suitable method that was safe and that used appropriate equipment. Some candidates scored all three marks but it was more common to award two marks, as many candidates did not give much detail in their responses.

(vi) Most candidates suggested that two samples were collected because one may have become contaminated. Some suggested that this gave a more accurate result; this needed more qualification to gain credit.

(vii) Nearly all candidates gained the two marks for correctly labelling the sample.

(viii) The need for cleanliness was well recognised.

(ix) It was pleasing to see that many candidates realised the meaning of $\pm$ 5% and gave the correct answer of 4.75.

(b) Few candidates could give adequate explanation as to why the pH changed in winter.
The question asked about pH but many candidates thought that increased pH meant increased acidity.

(c) Two acceptable reasons to be considered when choosing an alternative method to a pH meter were often seen.

(d) Many candidates could change the subject of the formula and correctly obtain 12.5 mg dm^{-3}.

(e) (i) Effectiveness and availability were often given but a third correct answer was seldom seen.

(ii) Mass of the liming agent and the volume of water were the commonest valid answers.

(iii) In general this was poorly done, despite a generous range of possible answers. A number of candidates thought that calcium hydroxide was a liquid and used a titration method. This could gain credit if correctly described.

(iv) The sum was often correctly done but the unit given was sometimes incorrect.

(f) (i) The correct answer was 217600 tonnes but this was seldom seen. Some gave a correct answer in grams!

(ii) Even when allowing for error carried forward, a correct answer was seldom seen.

2. This question was based on the article 'Nickel – the devil's copper'

(a) Most candidates used the article and stated that a magnet was necessary.

(b) The answer 'dermatitis' was in the article. Not all candidates realised this.

(c) The question asked candidates to present the data as a flow chart. There were three marks for this and most candidates gained at least one mark. A few either did not read the question carefully enough or did not know the meaning of a 'flow chart'.

(d) (i) Although the numerical answer was often correct, the units for density were often wrong.

(ii) Many candidates found it hard to describe why the large number of decimal places given were not valid. The examiners felt the candidate knew what he or she was trying to say but they could not express themselves clearly enough on paper.

(iii) Very few candidates realised the problem of accurately measuring small quantities.

(e) Most candidates realised that carbon monoxide / nickel tetracarbonyl were very toxic.
Very few appreciated the need to circulate the carbon monoxide for further use.

(f) The answer, 1200 g, was frequently seen but not everybody then divided this value by 80 to obtain the correct answer to (ii).

(g) (i) Nearly all candidates knew how to increase the rate of a chemical reaction.

(ii) The need to note down modifications was well known.

(iii) Many candidates correctly divided the mass of nickel by 2 to obtain the mass in 500 cm^3 of the solution.

(iv) This too, was generally correct and followed on naturally from (iii).

(v) Although many candidates realised that the coin was only composed of nickel and copper, few went on to say that you could take one percentage from 100 to find the other percentage. Some assumed that it was composed of 25% nickel and 75% copper, but the question did not ask this.

(h) It was disappointing to see so many candidates who could not read the graph correctly.

(i) This question asked candidates to design an experiment. Many candidates gained some credit but it was rare to see a drawing and description that was completely correct and well documented.

3. (a) (i) The need to produce a larger surface area was often given.

(ii) Candidates were used to the need for a risk assessment before starting work.

(b) (i) Candidates were required to mention both wool and cotton but this was not always done.

(ii) 'Use a different mordant' was the commonest acceptable response.

(iii) Most candidates gained both marks here.

(iv) The need for washing was usually stated but fewer then stated that the rinse water needed to be colourless.

(v) There was a wide range of acceptable answers here and many candidates gained full credit.

(vi) Full marks were often scored here too, when candidates were asked to consider the difference in colour obtained when dyeing different batches.

(vii) Although a number of answers were acceptable it was seldom that a candidate could gain more than two marks. The examiners felt that the answers were too restrictive and they should have been more imaginative.

(c) (i) Surprisingly, relatively few candidates realised that the masses required had not been given.

(ii) The examiners found the responses to this question very disappointing. The question stated that alcohol was flammable but many candidates simply heated the beaker containing an alcoholic solution directly, using a naked flame. The question also stated that most of the alcohol should be evaporated but nearly all candidates simply boiled the solution dry.

(iii) Relatively few realised that the formation of the yellow precipitate would stop when no more berberine was present.

(d) (i) Most candidates gained one of the marks for stating that some berberine was lost during filtration.

(ii) A number of candidates realised that impurities would give the apparent high result.

(iii) This question was simply about percentages but presented in a table form. Sadly, very few could cope with this alternative presentation of results.

(e) (i) Very few candidates could use the information given to work out the percentage of berberine from the integration trace on the chromatogram.

(ii) The chromatograms showed the presence of two impurities. Few candidates used this information in their answer.

G635: Working Waves

General comments

Although many candidates attempted most sections of all the questions, most were insufficiently prepared in one or more area of the specification. Most candidates showed at least a basic familiarity with each topic, but very few demonstrated a sufficient command at A2 level to score full marks on any question.

Comments on Individual Questions

1 (a) (i) Most candidates identified one or two of the four possible answers. Safe and remote were the most common correct answers. Incorrect answers explained aspects of how IR cameras work rather than giving advantages.

(ii) A small majority gave an answer close to body temperature.

(iii) Many candidates gave sensible ranges for the higher temperature. Fewer answered within the accepted range for the lower value with a few suggesting values close to absolute zero. Most recognised that the temperature range is related to the temperature of the objects they are looking at, but disappointingly few recognised the need to differentiate between the subject and the surroundings.

(b) Many correct answers. The most common error was to assume that the device merely had to withstand the high temperature, rather than to measure it.

(c) Most candidates correctly drew curves above and below the curve given. Few scored full marks by correctly showing the shift of the peak wavelength, often both were skewed to the right. A number gave the graph for the wall as a straight line parallel to the wavelength axis.

(d) Most knew formula and could work out a frequency but often with the wrong wavelength. A significant number gave unit as hz. Other common errors included picking the wrong wavelength, transposition errors, difficulties with powers of ten, failing to give the answer to 2 significant figures, confusing significant figures with decimal places or rounding down rather than up and using incorrect units.

(e) Many candidates gave the same wavelength for ultraviolet light as they had used for infrared light in part (d). Many had not learnt that the velocity in air of different parts of the electromagnetic spectrum is the same or very similar.

(f) Many correct answers. A number thought that uv is reflected, but this was condoned on this occasion as the candidates had demonstrated that they knew that the radiation was not transmitted. Others stated that glass does transmit uv or that it has a different refractive index for uv

2 (a) (i) Often the cladding was omitted or incorrect. Some confused the cladding with the protective sheath. Others apparently guessed, with answers such as ‘copper wire’.

(ii) Most candidates scored some marks by demonstrating an appreciation of repeated reflections at the core/cladding interface. Many correctly drew the path of ray C. Fewer showed any refraction or understanding of what happens to rays incident at less than the critical angle.

(iii) Most of those who had correctly drawn the paths of B and C through the fibre gave correct answers here. A significant number referred to time rather than distance.

(b) Many candidates had not learned about the distinction between monomode and multimode. About half got the idea of signals arriving together, but found this difficult to express.

(c) (i) Many candidates had not learned about the distinction between step index and graded index. Answers relating to the difference between coherent and incoherent bundles were not uncommon. Less than half mentioned refractive index. A significant number described a fibre with core and cladding.

(ii) Very few candidates described what happened to the path of light as the ray progressed along the fibre – most repeated an explanation of monomode fibres.

(d) Many candidates recognised this as a question about the electromagnetic spectrum and gave good answers accordingly. A number answered transverse and longitudinal.

3 (a) Although some candidates realised that one of the given channels is used for the telephone and the other for data, few identified which was which.

(b) A reasonable proportion of candidates could describe digital but had more difficulty with analogue. A common QWC error is writing “whereas” as two words.

(c) Most candidates scored at least one mark.

(d) This question effectively differentiated between those who were well prepared for the examination and others. More than half could name the process (equal numbers suggesting ADC and pulse code modulation); the description often got ¾ marks, samples, binary, 1 & 0’s.

(e) Many students struggled to find an example despite the fact that many may have used their mobile phone or ipod to convert a digital signal into an analogue sound, minutes before entering the exam room!

4 (a) Most candidates identified the factors of distance and obstruction. 'Numbers of other users' was suggested by some, but was not accepted as it would only apply at certain times.

(b) Most candidates suggested a number of appropriate factors. The most popular answer was number of users. Many candidates referred to other networks.

(c) Over half the candidates recognised that a cell was a geographical segment. Substantial minorities thought it was a component of their phone or the base station/aerial, in particular, some confused the term with the cell in a battery. To score full marks candidate were also expected to suggest the size of the cell and the location of the mast within the cell. These marks were each only scored by a minority and fewer still identified both points.

(d) Disappointingly few candidates realised that the advantage of cells is re-use of frequencies. These tended to be clustered in individual centres suggesting possibly variations in depth of teaching.

(e) This was well answered. A number of those who did not know the term full duplex made sensible attempts (e.g. duplex or simplex) which enabled them to score 'error carried forward' marks in part (ii).

5 (a) (i) Many correct answers. Incorrect responses either got the answer the wrong way round or did not indicate whether they were referring to narrow or wide beams.

(ii) Disappointing response. The majority of candidates simply stated that one or more components absorbed X-rays. Some confused the image intensifying screen with a grid to improve quality.

(b) (i) Many incorrect responses were about X-rays indicating that they did not realise that the tracer is a radioactive source.

(ii) About half the candidates discussed radiation and harm to the baby but a significant number thought the process involved X-rays.

(iii) Some identified the short/6 hour half life, but otherwise, poor responses suggested that radioactive tracers had not been understood in any depth.

(c) (i) A majority of correct answers, but a substantial minority thought that the barium is radioactive.

(ii) Most candidates scored at least one mark, but a significant number thought that the endoscope was better because of the barium emitting X-rays.

Grade Thresholds

Advanced GCE Applied Science AS (H175, H375) and
GCE Applied Science A2 (H575, H775)
June 2008 Assessment Session

Portfolio Unit Threshold Marks (AS)

Unit		Maximum Mark	a	b	c	d	e	u	Total nos of cands
G620	Raw	50	42	37	32	27	22	0	1578
	UMS	100	80	70	60	50	40	0	
G621	Raw	50	42	37	32	27	22	0	1769
	UMS	100	80	70	60	50	40	0	
G624	Raw	50	42	37	32	27	22	0	345
	UMS	100	80	70	60	50	40	0	
G625	Raw	50	40	35	30	25	21	0	248
	UMS	100	80	70	60	50	40	0	
G626	Raw	50	42	37	32	27	23	0	405
	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	69	62	55	48	42	0	1754
	UMS	100	80	70	60	50	40	0	
G623	Raw	90	72	63	55	47	39	0	592
	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	42	37	32	27	23	0	827
	UMS	100	80	70	60	50	40	0	
G629	Raw	50	42	37	32	27	23	0	368
	UMS	100	80	70	60	50	40	0	
G630	Raw	50	42	37	32	27	22	0	132
	UMS	100	80	70	60	50	40	0	
G631	Raw	50	42	37	32	28	24	0	97
	UMS	100	80	70	60	50	40	0	
G632	Raw	50	43	38	33	28	23	0	239
	UMS	100	80	70	60	50	40	0	
G633	Raw	50	42	37	32	28	24	0	339
	UMS	100	80	70	60	50	40	0	
G634	Raw	50	42	37	32	27	22	0	383
	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	44	39	0	568
	UMS	100	80	70	60	50	40	0	
G635	Raw	90	63	55	47	40	33	0	539
	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
1.8	9.2	29.8	55.6	78.1	100.00
There were 1017 candidates aggregating in June 2008.					

Advanced Subsidiary GCE (Double Award) (H375):

AA	AB	BB	BC	CC	CD	DD	DE	EE	U
0.3	1.9	3.3	11.2	21.8	36.2	48.0	67.6	79.0	100.0
There were 394 candidates aggregating in June 2008.									

Advanced GCE (Single Award) (H575):

A	B	C	D	E	U
1.4	11.3	29.5	66.6	93.4	100.0
There were 537 candidates aggregating in June 2008.					

Advanced GCE (Double Award) (H775):

AA	AB	BB	BC	CC	CD	DD	DE	EE	U
1.2	2.3	5.8	16.1	27.8	44.7	63.2	78.7	90.9	100.0
There were 360 candidates aggregating in June 2008.									

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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