

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Report on the Units

June 2009

J641/MS/R/09

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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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Chief Examiner's Report

Ofqual produced a public report on GCSE Sciences in March 2009: 'Findings from the Monitoring of the new GCSE Science Specifications: 2007 and 2008'. This report (page 25) makes reference to an agreement between Ofqual and the Awarding Bodies 'to ensure that grade boundaries are set appropriately'. Part of this agreement required all the awarding committees to work towards a new national standard for this summer's series. This has had an impact on both the examined units and the coursework components awarded this summer, and has resulted in higher thresholds than might have been expected for a number of the key grade boundaries, across the Gateway Science and 21st Century Science suites of specifications.

This sessions examination papers followed a similar pattern to previous years with B624 attracting the higher number of entries in the June session. Entries for both B623 and B624 were slightly lower than last year and it may be that some centres are entering more candidates for the separate science examinations.

The papers all produced a good spread of marks and when distributions were plotted they formed bell shaped graphs. There were, however, differences between performances on the individual sections of papers. For example candidates found the biology section of B623 quite challenging whereas the physics section of B624 proved more difficult.

The Principal Examiner's reports which follow will indicate weaknesses and strengths on particular questions and part questions. It is worth noting the following general comments:

- candidates need to make sure that they provide comparative answers when required
- the accuracy shown in writing balanced symbol equations is improving but some candidates are still losing marks due to careless writing of lower and upper case letters or subscripts
- it is pleasing to note that many candidates are now scoring well on questions involving calculations but there still appear to be cases where the lack of a calculator is costing candidates marks.

B623/01 Foundation Tier

General Comments

The cohort included a significant proportion of candidates who were retaking this component. The average mark for this examination paper was 28, and the marks achieved by candidates covered the range from 0 to 52. Centres had good entry policy in terms of the Tier of entry. Only a very small proportion of candidates would have been better suited to the Higher Tier examination paper.

All three sections of the examination paper differentiated well and allowed candidates to demonstrate their knowledge and understanding of GCSE Additional Science. Candidates found Section C much more accessible than Sections A and B.

There was no evidence that candidates ran out of time and questions left blank by candidates reflected a lack of knowledge or understanding rather than a shortage of time.

Comments on Individual Questions

SECTION A – MODULE B3

Question 1

This question focussed on plant roots and was extremely demanding as shown by the responses by candidates.

In (a) only a very small proportion of the candidates were able to label part **A** as a vacuole and to write an acceptable function of a vacuole. In (i) candidates often labelled **A** as a chloroplast or cytoplasm. A significant proportion of candidates did not attempt (a) (ii).

In (b) candidates only needed to define diffusion in terms of the movement of anything (particles, molecules, compounds, substances or a named substance) from a high concentration to a low concentration.

Question (c) focussed on geotropism but many candidates did not recognise this and sometimes chose their answers from the labels on the diagram.

Question 2

Only an extremely small proportion of the candidates in (a) were able to describe an adaptation of an egg cell. Common misconceptions included that the egg was large so it was easy to find. Another common misconception was to refer to the egg having a cell wall. Rather more candidates could describe an adaptation of a sperm. Most candidates described the tail and how it helped the sperm to swim.

In (b) a small proportion of the candidates could recall that meiosis was the cell division that could make egg and sperm cells. Two common incorrect responses were mitosis and fertilisation. A significant proportion of candidates did not attempt this question.

Candidates found (c) much less demanding than the rest of question 2 and often were able to recognise oxygen as the substance that crosses the placenta into the foetus and carbon dioxide that leaves the foetus.

Question 3

This question focussed on the heart and pulse rate.

In (a) almost all the candidates could recognise that the pulse rate increases.

Although many candidates could calculate the pulse rate in (b) (i) as 90 beats per minute a small proportion of candidates used data from the table to deduce the pulse rate. As a result an error carried forward was used in (ii) for candidates that did not get 90 beats per minute.

One mark in (c) was given for the idea that the heart pumps blood and the other mark was for stating one correct fact about the left or right side of the heart. Candidates were often confused about where the blood was pumped to and the second mark was often not awarded.

Question 4

This question was about growing carrots using selective breeding and genetic engineering. This was the least demanding question in Section A.

Most candidates were able to select the correct characteristic in (a) but had much greater difficulty with part (b). The technique of selective breeding was not well known and candidates were not sufficiently precise with their use of language. Candidates often poorly expressed that the carrots with the selected characteristic must be bred with each other. A significant proportion of candidates gave answers that related to cloning or genetic engineering.

In (c) candidates were often able to select one of the two correct terms.

SECTION B – MODULE C3

Question 5

This question focussed on the Periodic Table. Candidates found this section demanding but more accessible than Section A.

In (a) most candidates could use the Periodic Table to identify sodium as the element with atomic number of 11.

Candidates often chose elements from Period 3 or Period 4 rather than nitrogen, oxygen or neon in (b) and only an extremely small proportion of the candidates got the answer correct.

In (c) some candidates chose oxygen but many others chose other elements including carbon which was not on the list of elements.

The knowledge that potassium compounds give a lilac colour in the flame test was well known in (d)

Question 6

This question focussed on the decomposition of copper carbonate.

In (a) only a small proportion of candidates could write the word equation and a common misconception was to include oxygen as one of the reactants. A small proportion of candidates wrote symbol equations but often they wrote incorrect formulae so were not given credit.

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In (b) candidates often described decomposition as the breakdown of a substance but a common misconception was to state that decomposition meant rotting. A significant proportion of candidates did not attempt this question.

In (c) the effect of carbon dioxide on limewater was well known.

Question 7

This question was about the properties of metals and superconductors.

Many candidates stated that iron was strong and/or malleable in (a) and were able to choose the correct property of metals as good conductors of electricity in (b).

Candidates found (c) very difficult. In (i) only a small proportion of candidates could select the correct response. Very few candidates recognised that the magnet was an electromagnet in (ii). A common incorrect answer was a super-magnet. The advantages of superconductors in (iii) were not well known. Candidates rarely mentioned that electrical energy would be transmitted with very little energy loss. Common misconceptions included that electricity would move faster or that the train could move very fast. A significant proportion of candidates did not attempt (c) (ii) and (iii).

Question 8

This question focussed on electronic structure and the uses of halogens.

In (a) many candidates realised that the electrical charge on an electron was negative.

In (b) candidates often gave imprecise answers and did not refer to the number of electrons in the outer shell but stated that the electronic structures were similar. Many candidates did not attempt this question.

In (c) the uses of chlorine was much better known than those of iodine however significant numbers of candidates did not attempt the questions. The most common use given for chlorine was to sterilise swimming pools. Candidates need to be reminded not to use germs but rather bacteria, microbes or micro-organisms.

Question 9

This question focussed on the electrolysis of aqueous sodium chloride and the chemical test for hydrogen.

Many candidates were able to recognise a cation in (a).

In (b) a significant proportion of candidates were able to state that each sodium atom loses one electron to make a sodium ion.

The chemical test for hydrogen in (c) was known by a small proportion of the candidates and there was some confusion with the test for oxygen. A small proportion of candidates mentioned the use of a splint without stating that the splint had to be alight. A surprisingly large proportion of candidates did not attempt this question.

SECTION C – MODULE P3

Section C was the least demanding of the three sections. Questions 10 and 11 were the most accessible in Section C.

Question 10

This question was about car safety.

In (a) many candidates could state another safety feature of a car. Typically candidates stated seat belts or crumple zones.

A common answer in (b) was to refer to the use of hand-free mobile phones but this was not given credit because the use of a mobile phone will reduce driver concentration. Acceptable features included cruise control and paddle shift controls.

Question 11

This question was about kinetic and potential energy.

In (a) many candidates chose Jupiter but others chose Pluto instead. The other planets were not effective distracters.

In (b) only a very small proportion of candidates stated that the bar could be lifted higher. Using a heavier bar or a longer bar was also acceptable because of the context of the question.

Most candidates were able to correctly fill in the table in (c) even though this was a common question.

Question 12

This question focussed on the motion of different vehicles.

In (a) most candidates could get one mark by placing one tick in the correct box.

Only a very small proportion of candidates could answer question (b) and a significant proportion did not attempt the question. A common misconception was to reduce air resistance or drag.

Question 13

This question was about work done and power while a car is driving up a hill.

Many candidates in (a) (i) were able to use the equation work done = force x distance to show that the work done was 28000 J. In (ii) candidates were often able to calculate the power of the engine as 3500 W. Many candidates did not write the equation they had selected from page 2 of the examination paper and just quoted the answer or $28000 \div 8000$. A significant proportion of candidates did not attempt either (i) or (ii).

In (b) candidates often realised that the speed of a car can be calculated from the distance travelled and the time taken but were confused by the context of the question. Candidates that stated that the speed can be calculated from the distance and the time whether this was written in (i) and/or (ii) were awarded full marks. Only a very small number of candidates realised the importance of the lines on the road in (i) and often candidates gave common sense rather than scientific answers. Benefit of doubt was given to candidates that used the idea of how long since this could refer to either time or distance.

Question 14

This question was about distance-time and speed-time graphs.

In (a) (i) many candidates could get at least one mark but only a very small proportion of the candidates got both marks. All of the incorrect letters proved to be effective distracters. In (ii) and (iii) roughly half of the candidates were able to get the correct answers.

Candidates often gave imprecise answers in (b) for the meaning of braking distance. Candidates often defined braking time rather than distance and also included the thinking distance in their definition.

B623/02 Higher Tier

General Comments

The paper performed well with all marks being achieved from the maximum of 60 to a minimum of 0.

The mean for the paper was 30.1 and the standard deviation 10.8.

There was a slight reduction in the number of candidates entering this paper suggesting that some of the most able candidates have moved to separate sciences.

In general centres should be congratulated on preparing candidates effectively for this paper and entering them for the correct tier.

Comments on Individual Questions

SECTION A – MODULE B3

Question 1

In part (a) candidates were asked to name one part of *this* cell, i.e. a root cell, not found in animal cells. The majority gave a correct answer, the most common being cell wall. A significant minority gave the incorrect answer chloroplast or got the cells mixed up and gave the answer cell membrane.

In part (b) three quarters of the candidates gave a correct definition for diffusion. Part (c) proved more difficult with about 20% of the candidates answering this question correctly. The first missing word was geotropic. Examiners were instructed not to accept geotropism although slight spelling mistakes were accepted. Many candidates identified gravity as the second answer but struggled to give the correct answer auxin for the third gap.

Question 2

The majority of candidates were able to identify the cell division as meiosis in part (a) (i) and most of these correctly described how it differed from the division making body cells in (a) (ii).

Part (b) proved more difficult with less than half scoring any marks on this question. Those candidates who knew this topic usually scored both marks one for the DNA unzipping and the other for complementary bases joining. The main incorrect answers either had a description of mitosis or candidates thought that the chromosomes unzipped. If candidates relied on diagrams alone it was necessary for them to be fully labelled to score full marks (see mark scheme).

Question 3

In part (a) (i) candidates were expected to give any two of the following three: choose the largest carrots (1) cross breed or cross pollinate (1) select the largest offspring for further crosses (1). Whilst the majority of candidates selected the largest carrots, considerably fewer scored on their second part. Common misconceptions were to take cuttings or to extract the DNA or genes from the large carrots and insert it into others. In (ii) about 30% of candidates were able to correctly identify problems. The most common correct answer was to reduce the gene pool.

Part (b) produced few correct answers. The majority of candidates mistakenly thought that beta-carotene was vitamin A or that carrots contained vitamin A and this was transferred to rice. Examiners were looking for one of the following ideas: that the rice would contain beta-carotene (1), beta-carotene can be converted into vitamin A (1), or that people can get their vitamin A by eating this rice (1).

Question 4

In part (a) examiners were looking for the idea that arteries have to cope with high pressure. The most common misunderstanding was that arteries pump blood. In part (b) there were few correct answers. Examiners were looking for the idea that the blood is at low pressure and the blood will flow easier.

Question 5

In part (a) examiners were looking for a description of the information in the chart, the time (for the reaction) decreases and then increases. If figures were used they had to be correct, so a common answer, decreases to pH7 and then increases would be marked wrong. Some candidates wrote that the rate of reaction decreased and then increased which was also incorrect.

In part (b), the majority of candidates correctly identified 6 as the optimum pH.

Part (c) was an A/A* question and as expected only the most able candidates correctly answered this question. The marking points were: the enzyme denatured, it changed shape, substrate no longer fits the enzyme and that it was the active site of the enzyme that changed shape. Candidates could score their marks from a labelled diagram (see mark scheme).

SECTION B – MODULE C3

Question 6

In part (a) the majority of candidates correctly identified the elements in both parts.

In part (b) less than a third of candidates could correctly give the relative mass and charge of a neutron.

Question 7

In part (a) candidates generally gave a correct word equation. Common errors were to add heat/energy as one of the reactants. In a significant number of cases, oxygen was also added as a reactant.

Part (b) was the worst answered question on the paper. Candidates did not read the question carefully and often gave a property of the transition metal (e.g. conducts electricity, lustrous) rather than the compound – even though this word was emboldened. Examiners were looking for answers of coloured or used as a catalyst.

Question 8

In part (a) about half the candidates scored by stating that the superconductor had little or no resistance. Of those failing to score, many stated that no energy was lost as heat which was not credited as it did not correctly answer the question but was a consequence of it having no resistance.

In part (b) (i) surprisingly few candidates were able to identify the type of magnet as an electromagnet. Higher level answers, beyond the scope of this specification such as Meissner effect magnet were accepted. In part (ii) most candidates gave a disadvantage as having to be cooled to very low temperatures but few were able to give an advantage of loss free transmission of power or superfast circuits. The majority just repeated the statement that they had zero resistance.

Question 9

In part (a) candidates usually stated that they had the same number of electrons in the outer shell. Some candidates thought that the shells contained atoms or protons which were marked incorrect. It was pleasing to see the majority of candidates draw accurate and clear dot and cross diagrams in part (b). Candidates usually stated that the two atoms had different numbers of neutrons or different relative atomic masses. The question as a whole performed well and produced a good mark distribution.

Question 10

Part (a) proved difficult with less than 10% scoring. Examiners were looking for the statement "ions move". Whilst a variety of formulae and symbols were acceptable for the word ions, it had to be clear that they were moving and if specific ions were mentioned they had to go the correct way (sodium ions moving to the anode would not score). Part (b) was usually correct and in part (c) most candidates were able to construct and balance the ionic equation correctly.

Question 11

Both parts proved equally difficult with about a quarter of candidates answering the questions correctly i.e. (a) D, (b) C. Being an objective question all answers were given but the most popular incorrect answer was to reverse the correct answers i.e. (a) C and (b) D.

SECTION C – MODULE P3

Question 12

In part (a) the vast majority of candidates correctly identified Jupiter as the planet with the greatest gravitational potential energy.

In part (b) again the majority correctly identified the changes in PE and KE along the roller coaster ride.

In part (c) (i) whilst the majority of candidates scored 1 mark for stating that the terminal velocity occurred when the forces on the ball were balanced, few scored the second mark for stating that the air resistance (drag) increased with speed. In (ii) few were able to relate the loss of GPE at the terminal speed to doing work against air resistance or being transferred to heat energy.

Question 13

In part (a) candidates were asked to explain how the air bag reduced the forces in a collision. Few addressed the points given in the question and gave vague incorrect answers about the air bag absorbing some of the force leaving less for the driver. Examiners were looking for any two points relating to the driver not the car: it increased the stopping time (1), decreased the acceleration (1), hence as $F=ma$ the force is less (1), or increased the stopping distance (1), so force is less as work = force x distance (1).

In part (b) the question was straight forward and most candidates stated the driver would be more comfortable or could reach the pedals both of which were acceptable answers.

In parts (c) and (d) most candidates were able to identify a factor that increased thinking distance and a similar number were able to identify a factor that increased braking distance. Candidates should be instructed to give specific examples for these rather than general terms. Whereas increased speed would be correct for both answers, speed on its own would be incorrect as a reduced speed would reduce these distances. For part (d) most answers that failed to score were: weather conditions, or condition of brakes or tyres.

Question 14

In part (a) (i) most candidates were able to show that the work done was 28000J.

In part (a) (ii) the majority of candidates successfully calculated the power as 3500W.

In part (b) (i) only the most able candidates were able to explain why the fuel consumption was higher than expected. In the best answer seen, the candidate had continued the lower part of the graph as a straight line and stated that the force had increased faster than expected and as such more work was needed, using more fuel. The most common correct answers stated that the force goes up much faster at higher speed.

In Part (b) (ii) the question was set using Penny's car so as to rule out any answers that involved a different car, for example engine size. Surprisingly few candidates were able to answer this question correctly as there were a wide array of acceptable answers (see mark scheme).

In part (c) the majority of candidates scored at least 1 on this part. Examiners were looking for ideas that : the car does not pollute on its own (1), it needs recharging (1), making electricity at power stations pollutes (1) or an explanation of no pollution if electricity from, say, wind power is used to recharge.

Question 15

This type of quantitative question was new and produced good differentiation. Candidates needed two correct answers for 1 mark and all correct for 2 marks.

B624/01 Foundation Tier

General Comments

This 60 mark foundation paper had a mean of 29, gave a good range of marks and on balance offered appropriate challenge across the grade range. The highest score for this paper was 59 marks. The paper allowed candidates to show what they could do. The whole paper was also able to reliably discriminate across the ability range at grading. There was no evidence of candidates running out of time and most candidates answered the great majority of questions. No response questions were more often seen from weaker candidates on Section C. This may have been as it was to the end of the paper. Another possibility is that they found this section more challenging.

Most candidates had a good idea about each topic being questioned but were unable to express the answers in clear scientific terms. Where marks were lost this was generally resulting from vague answers rather than incorrect ones. Examples include items such as 'seeing babies' and 'kidney stones' when explaining the use of ultrasound in hospitals.

The performance on calculation questions improved further this year with even weaker candidates generally getting them correct.

The paper covered a large range of items from modules B4, C4, and P4. The majority of candidates seemed to have covered most of the specification and attempted all the questions. Only the weaker candidates generally gave much in the way of no responses.

Comments on Individual Questions|

SECTION A – MODULE B4

Question 1

- (a) (i) About 1/3rd of candidates could correctly name another group of decomposers as the answer. Fungi [1] or named fungi were acceptable. Worms was a common misconception as were other creatures from the compost bin.
- (ii) The rest of part (a) was answered more successfully by up to 2/3rd of candidates. In this part most mentioned 'not enough oxygen' or 'presence of salt' [1]. There were some errors with 'Too wet' [0] but too cold gained [1].
- (b) Most knew that **leaves** [1] contained the most chloroplasts where **photosynthesis** [1] took place and that the energy from this came from **sunlight** [1].

Question 2

- (a) Over 90% got the line diagram correct on what the parts of a plant do.
- (b) Only a quarter chose **phloem** as the correct answer. A common incorrect answer was xylem.

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- (c) About half the responses were correct with greenhouse producing warmer conditions being the most common correct answer. Marks were also available for the control of conditions such as 'controlling humidity' [1]. Many thought mistakenly that greenhouses magnified the sunlight [1].
- (d) (i) Only a small proportion of candidates knew this as a pyramid of numbers [1]. Some answers fell short with 'pyramid' [0] or 'pyramids of biomass' [0]. Common incorrect responses were 'food chain' and 'food web' [0].
(ii) Only a third of candidates correctly chose 'biological control' from the options. Pesticide control was a distracter which attracted many.

Question 3

- (a) 'Fertiliser' was correctly selected by most candidates.
- (b) (i) About a quarter could name a correct mineral such as phosphates / potassium / magnesium [1]. Also acceptable but rarely seen was sodium / iron / manganese / zinc / sulphate. Phosphorous and water were common errors here.
(ii) Again about a third gave correct answers here with yellowing of the leaves [1]. Common incorrect responses were discoloured, brown, withered or dried.
(iii) Most candidates gained 1 mark here with a quarter gaining both. It was a question that discriminated well. Leaves were broader to 'catch more light' was often seen [1]. The explanations for thinner leaves was less well answered and rarely related to gas exchange.

Question 4

- (a) About half gave correct answers.
- (b) This 3 mark extended writing question on watering plants was attempted by nearly all candidates. It was a common question and it discriminated well. Most got the idea of the water being absorbed or taken in [1] by the roots [1]. Few mentioned root hairs [1] but many described water going up the stem [1].

SECTION B – MODULE C4

Question 5

- (a) Generally well done. Sometimes 'phosphates' lost a mark.
- (b) (i) Many were incorrect on this common question with 'sulphuric, hydrochloric, nitrate' acids frequently seen. Only 15% got the correct answer as nitric [1].
(ii) About a quarter correctly calculated the relative formula mass as 80 [1].

Question 6

- (a) About a quarter got full marks on this question about cleaning. The detergent mark was the one most likely to be incorrect.
- (b) This was well answered with most marks given for 'shrinking' or 'saving energy'. Many also said 'damage to clothes/ clothes fade/ or specific damage to environment.' There was little reference to de-naturing.
- (c) In explaining 'dry cleaning' the temptation to put 'not wet' [0] was too much for many. Some wrote of using steam or going to the cleaners. About a third of the candidates gave correct answers which showed that water was NOT used [1].

Question 7

- (a) Very well answered.
- (b) Many answers struggled for clear expression here. The idea of run off [1] was seen in about 1/3rd of answers. Some other suggestions were 'tidal movement, animals carrying, crawling, fishing or dumping' [0].
- (c) Only a fifth of candidates correctly chose 'white' [1] from the list.
- (d) About three quarters gave the correct word equation:
sodium chloride + silver nitrate → sodium nitrate + silver chloride (1)

Question 8

- (a) This part proved challenging for most. Few could name ammonia as the compound [1] with a total of 4 atoms [1]. Part (ii) showed better answers with a half naming the symbol ⇌ as reversible [1].
- (b) Well answered by the great majority.
- (c) Well answered, many scored 2 marks. Most common responses were for 'labour' and 'raw materials'.

SECTION C – MODULE P4

Question 9

- (a) Only a few of the stronger candidates got this correct. Many answers such as 'high frequency, sound, gamma, beta, etc' were often seen.
- (b) This uses of ultrasound question was better answered with 'scanning pregnant mums' [1] or 'breaking kidney stones' often seen. Poorer answers such as 'looking at babies' were still common as they have been in previous sessions. X-rays [0] was also common too.

Question 10

- (a) Very few could name uranium as the nuclear fuel.
- (b) This also proved challenging with few realising the reaction in a bomb was uncontrolled [1] or faster [1].

Question 11

- (a) About 1/8th of answers gave radiographer [1].
- (b) This was better answered with cancer treatment a popular correct answer. Wrong answers were often confused with ultrasound.
- (c) Over half of the candidates could correctly name the nucleus [1].

Question 12

- (a) Many scored 2 for 'positive and negative'. A common error for the first answer was either 'conductor' or 'metals'.
- (b) There were many correct responses re: 'spark, fire, explosion'. Common errors were 'shocking people' or 'affecting the planes instruments'.
- (c) This was a common question involving extended writing. Some of the answers were not very clear. The idea of 'shock' was not always linked to 'heart'. 'Current or charge' was often not linked to 'passing into body'. The third mark was available for the safety idea mostly gained for 'asking people to stand back'.

Question 13

- (a) Many and varied answers were seen about what a fuse is for but few were correct. For example, 'make drier work', 'to pass electric through' was commonly seen. Simple answers referring to safety scored [1]. Better answers were seen and rewarded, such as it 'prevents electrical fires' [1] or 'when the current is too large the fuse melts' [1].
- (b) (i) Quite well done. The most common error was 'green and yellow'.
(ii) Less well done, the common error being 'negative' or 'earth'.
- (c) This was very poorly answered. Only a handful of candidates scored this mark. Most wrote about it being 'double insulated' or 'earth not needed' or 'hot air coming out'. There were also more 'No Responses' here too.
- (d) This was a well answered resistance calculation.

B624/02 Higher Tier

General Comments:

This paper produced a good spread of marks, with the whole mark range being accessed.

The lack of legibility and poor literacy skills worried a number of examiners. In addition, candidates did not always adhere to the strict conventions for the acceptable writing of formulae. Variations by the same candidate even on the same line did cause unnecessary loss of marks.

Candidates did not show any problems with time management and usually the majority of questions had been attempted.

Comments on individual questions:

SECTION A – MODULE B4

Question 1

- (a) The majority of candidates were scoring 2 marks for an acceptable reference to 'too much salt' and 'a lack of oxygen'. A few mentioned the low temperature as a factor.
- (b) (i) A mixed response; moderately few achieved a mark for identifying the correct step.
(ii) Generally poorly answered. Only the best candidates were getting the mark for 'nitrogen-fixing bacteria' and hardly any were mentioning 'lightning'. The most common error was 'nitrifying bacteria'.
- (c) Many candidates scored with 'palisade cells'.

Question 2

- (a) Generally well answered. The most common error was to circle 'xylem'.
- (b) (i) Surprisingly few candidates got this correct with many answering biomass pyramids or food chain responses.
(ii) A mixed response to this question. Some candidates didn't go far enough to gain credit; i.e. answers were vague, such as 'more environmentally friendly/cheaper', which were the most frequent non-scoring responses. Only the better candidates were able to give the specifics to gain credit. Scoring marks were usually for references to 'not harming the plant' and being 'species specific'.

Question 3

- (a) (i) Usually well answered. A significant number of candidates referred to 'discoloured' or 'shrivelled' leaves.
(ii) Generally well answered, though a minority tried to concoct a magnesium compound here.

- (b) (i) The vast majority scored this mark for correctly reading the graph.
- (ii) Surprisingly well answered. Most candidates gained at least 1 of the 2 marks and a significant number successfully differentiated between minerals for less traps and energy for more. Marks were often lost where candidates did not seem to appreciate that they were asked for a comment on 'too many' and 'too few' traps. This was an error in reading/comprehension or in not stipulating which condition they were referring to.
- (iii) Well answered for the first part, where 'larger surface area' was an almost universal response. The second part on 'diffusion pathways' was less well answered.

Question 4

- (a) Moderately well answered for the first mark, which was usually 'flaccid' or 'turgid'. Relatively few candidates achieved a second mark, which when scored was a reference to 'turgor pressure'. The usual common error of referring to plants and not cells lost the marks.
- (b) A surprising majority of candidates did not seem to understand this concept of the most dehydrating conditions.

SECTION B – MODULE C4

Question 5

- (a) (i) A significant number of candidates were unable to name the correct acid. Hydrochloric acid featured regularly or a nitrate or ammonium compound.
- (ii) Generally well answered.
- (b) Most candidates scored the first 2 marking points but typically, answers included reference to plants/algae using up all the oxygen. Even so, many candidates did score 3 marks here, even if there was an element of confusion over what caused the oxygen depletion.

Question 6

- (a) Generally well answered, with references to reduced energy usage being the norm. There were also many responses to greater damage to clothes at the higher temperature.
- (b) Generally well answered.
- (c) (i) A significant minority thought no liquid was involved or were unclear about 'without water'.
- (ii) Generally well answered. Candidates opted usually for the damage that was avoided by using the dry cleaning process.

Question 7

- (a) (i) Many candidates did not gain credit as they only referred to solids being removed and not the idea of settling.

- (ii) The removal/killing of bacteria/microbes was well understood.
- (b) Well answered, though candidates who had not understood 'run-off' in the earlier question usually failed to score here either.
- (c) Almost universally answered correctly.
- (d) Generally well answered, though see earlier reference to problems with writing equations and formulae according to recognised conventions.

Question 8

- (a) The vast majority answered correctly here.
- (b) (i) Moderately well answered, though many candidates came up with all sorts of numbers, either counting atoms or making some other calculation.
 - (ii) Generally well answered, though several candidates were calculating 80/64.

SECTION C – MODULE P4

Question 9

- (a) Generally well answered.
- (b) Poorly answered on the whole. Many made no reference to electrons or their movement. There were many responses with 'positive and negative charges'. A noticeable minority referred to positive electrons. Several thought there was some transfer onto the ruler to make it positive.
- (c) Often candidates managed to speak about a 'shock to the heart' amidst some fairly bizarre techniques or understanding about what was happening. The majority made reference to non-participating medical staff being told to 'stand clear'. A few candidates had the doctor rubbing the paddles together to form a static charge.

Question 10

- (a) A number of candidates simply repeated the question and didn't give any sort of explanation of double insulation. Others answered clearly, usually with reference to the insulating material of the casing.
- (b) Incorrect answers were very rare.

Question 11

- (a) Poorly answered. Not many candidates used 'reflected' in their answer; many used 'bounced back' or even deflected/refracted. Only rarely was the second mark credited. A suitably challenging question.
- (b) Only moderately understood. The most common correct answer made reference to X-rays only being suitable for showing bony structures. Some simply made comment about the health dangers, despite being asked to give some other response.

Question 12

- (a)** The majority were unable to answer this correctly and quite often made comment about what happened in the body when someone was X-rayed.
- (b)** There were few correct answers. Most referred to health or concentration. Some clearly understood the issue and answered unequivocally; others waffled. Part (ii) was answered better, but many referred to killing all the tumour, mopping up outlying cancer cells and did not appreciate the welfare and reducing exposure to the healthy cells.

Question 13

- (a) & (b)** Generally poorly answered.
- (c)** Generally well answered, usually with some reference to rocks/soil and sun/cosmic rays. Common errors were microwaves and radio waves.
- (d)** Generally well answered.

B626 Report on Gateway Additional Science Skills Assessment

A General Comments

In this, the second year of this unit, the majority of centres coped well with the assessment tasks and applied the marking criteria accurately. There were however, some problems and a significant number of centres had to have their marks scaled, a few by a large amount. Other than over-generous marking, which is covered under the headings of the different components, the following caused problems in some centres.

- A mistaken choice of task. This occurred when a centre chose a task from modules 5 and 6 of a subject for use in Additional Science. These modules are not part of Additional Science and so this choice is forbidden. More seriously a few centres submitted a task for the wrong subject when entering for a separate science subject. This is the same as trying to use a result in a Biology examination to gain marks in Physics.
- Lack of internal moderation. If one teacher marks more generously than the others, it can result in the work of the whole centre being scaled down even those candidates whose work was correctly marked.
- Lack of annotation. Whilst annotation of students work is not compulsory, it is easier for a moderator to support a centres decision if the centre points out what the candidate has written which deserves that mark. This is particularly important if the decision is a borderline one.

B Administration

The paper work from most centres was in order and created no problems. There were, however, some centres where things did not go smoothly. These were the things which caused problems on more than one occasion.

- A missing candidate record sheet meaning that the mark for Practical Skills was unclear.
- Wrong addition of the marks for the three components, leading to a CW amend form being needed.
- Different marks entered on the candidates work and on the MS1 form with the same result.
- A copy of the MS1 form which was so faint as to be illegible.
- A missing centre authentication form. The lack of this form can result in results being withheld.

These problems delay the process of moderation and communication with centres was sometimes very difficult with many requests being needed to acquire the correct paperwork. It is a good idea if centres include, with their sample an Email address which enables the person responsible for the assessment to be contacted.

Supervision of Candidates

There is no need for close supervision for the gathering of information for the Research Study. Indeed this research may be done at home if desired. Nor is there any need for supervision of the collection of data for the Data Task, other than the normal precautions during practical work.

The supervised sessions, however, do have to be supervised. Whilst examination conditions are not necessary the supervising teacher must be confident that the work is the candidates' own to enable the Centre Authentication form to be signed.

The work does not have to be completed in one hour and, if necessary, it can be completed over two sessions. If work is completed over two sessions then work should be collected in and reissued for the second session. The work should not be marked or assessed in any way between sessions nor should candidates be given any other assistance.

Redrafting of work is forbidden and inappropriate assistance can be considered malpractice.

C Research Studies

It was good to see a wide range of Research Studies being used this year. Centres took advantage of the different studies available in each subject area.

The marking of these studies was usually reasonably accurate and nearly always within tolerance. Where there was generosity it was usually in the assessment of quality A.

This year the great majority of candidates produced their studies by answering the five questions separately. This is a more reliable way of ensuring that all the salient points are covered than answering the whole study in essay format.

Quality A: Collecting Information

It is important to remember that the sources used by candidates must be referenced in or at the end of the Study. Even an excellent piece of work answering all the questions in great detail can only score a maximum of 2 marks for this quality if no sources are referenced.

Sometimes marks of 6 were given by centres which presumably knew that their candidates had accessed suitable sources. However, if there is no evidence there can be no credit.

This was the least accurately marked of the four qualities even though it is the easiest to get right.

If sources are given in full in a bibliography at the end, then 4 marks can be scored provided it is clear that they have been used. If it is indicated, within each question, where the information came from then 6 marks can be scored. If sources are only linked to questions not to the information given then 5 marks is appropriate.

Quality B: Interpreting Information

The interpretation of the science involved in the study is key to this quality. Understanding is key to interpretation. It was noticeable, this year that many candidates were quoting from websites which effectively gave the answer to some of the more straightforward questions.

If the quote is directly relevant to the question, some understanding is implied and a mark of 4 would be a fair judgement. However, to gain a higher mark it must be clear that the student fully understands what they are writing. This would be demonstrated if the candidate were writing in their own words or if they added some relevant comment to a given quote from a website. It was sometimes the case that candidates were given marks of 5 or 6 for answers which were demonstrably copied directly from websites.

It should be noted that, where not all questions have been answered or where questions have only been partially answered, marks of 5 and 6 are unlikely to be appropriate.

Quality C: Developing and using Scientific Ideas

Here we are looking for the ability of the candidate to go further than the requirements of the specification. It may be that some discussion of a current scientific debate is required or an explanation of a scientific idea at a greater depth than that required by the specification. Whatever is required, the response must fully answer the questions posed.

As above the student must demonstrate an understanding of the points being made. Quotes from or lists derived from sources are never worth the higher marks, scoring 4 at most. There was again a tendency in some centres to give high marks for quotes from websites which seemed to answer the question concerned but which didn't demonstrate the student's understanding of the points being made.

Quality D: Quality of Written Communication

As last year centres usually marked this reasonably accurately.

Where adjustment to marks was necessary, it was usually because the teacher marking the work had mistakenly credited the student with marks for the English copied from a source. When this language was compared to the students own English in different questions there was a clear mismatch.

Credit should only be given for the students own use of English. Where the work is almost entirely copied from the internet and other sources it is difficult to justify a mark of more than 2.

D Data Tasks

It was again good to see a wider range of Data Tasks used though not as wide a range as was the case with the Research Studies. The 'old favourites' such as Bouncing Balls still appeared regularly.

Where scaling was necessary it was usually because of over-marking of the Qualities assessed in the Data Task. In the case of large scalings this was almost universally the case. The Qualities which caused the greatest difficulties were Qualities B and C and to a lesser extent Quality E, though all Qualities were over-marked on occasion.

Quality A: Interpreting the Data

The graph should be the easiest thing to score marks on. In the majority of cases it was but in some centres the marks given were too high.

The main areas where candidates lost marks were:

- not drawing a suitable 'best fit' line (or curve)
- drawing a graph which was too small
- drawing a graph with axes the wrong way round
- plotting points inaccurately
- joining a graph to the origin where inappropriate.

Marks lower than 4 were rare but centres are reminded that; a best fit straight line should have an equal number of points on each side unless anomalies are being excluded; a graph should occupy at least half of an A4 grid; the controlled variable should always be on the 'x' axis; points should be plotted accurately; and it is not always appropriate to draw a graph going through the origin (it is sometimes actually wrong).

There were cases where the raw data was not included with the work. This meant that plotting could not be checked and limited the mark available.

Quality B: Analysis of the Data

Missing data was sometimes a problem with this skill too. The most usual 'processing' used to gain two marks is the averaging of three attempts at each value. If the data are not included then this mark can sometimes not be achieved. This means that, even with a complete description of the trends the maximum mark available is 3.

Marks of 4 were frequently gained in this skill but, equally, marks higher than 4 were often given without justification. Additional processing which leads nowhere should not be given credit, nor should the spotting of an anomaly where a point does not lie on a smooth curve.

The additional processing which is done needs to show something which is not immediately obvious from the raw data or it needs to show that what seems to be reliable data is in fact invalid in some way.

It was clear that some centres gave their candidates ideas as to what additional processing could be done. In most cases the candidates did not understand why they were doing it and made no use of the information which they could have obtained. They were, however, sometimes given credit for 'following instructions'.

This is a high order skill designed to discriminate between candidates of high ability. A candidate should see the opportunity for additional processing for themselves without assistance from the teacher. In good centres more able candidates succeeded in gaining 5 or 6 marks with no outside assistance.

Quality C: Evaluation of the Data

There are two strands to this Quality, the data and the experimental procedure. The attention of centres is drawn to the title and the word DATA which appears in it. Analysis of the data obtained should be the main aim of the candidate. If the reliability of data is not addressed then the maximum mark achievable is 3, no matter how thorough the treatment of weaknesses in the method.

It is not sufficient to say 'we used the fall back data and that must be reliable because it was provided by OCR (it is not even accurate to say that, as unreliable results are always built in to the fall back data). It is equally not sufficient to say we used a computer simulation and computers do not make mistakes.

A more common error was to say that the data must be reliable because we did three repeats and doing five would make it more reliable. Repeats may make the average more reliable, they do not make the raw data more reliable. Many candidates stated that their data was reliable when more than one values was clearly divergent. It was often the case that marks of 5 or 6 given by the centre had to be reduced to 3 or even 2.

Reliability of data is most easily addressed by comparing the results gained in the three repeats required in most data tasks. Where only one value is taken, proximity to a best fit line is an alternative. The data themselves must be discussed to gain marks of above 3.

Validity must be discussed to gain marks higher than 4. To be valid, data must first be reliable. If the data is reliable but does not give an expected conclusion then it is not valid. For example, a best fit line may not go through the origin as expected or a value calculated from the data may not agree with a known value. If data is not valid it must be due either to the method/apparatus or to 'operator error'. This gives the candidate the opportunity to discuss the procedure part of the task.

Quality D: Justifying a Conclusion

This was, in general, marked more accurately than the previous two Qualities though there were exceptions. A conclusion of sorts has been given in the form of the pattern described in Quality B. This quality involves justifying that conclusion.

Where candidates were marked too generously it was usually because they had written about the theory involved in the phenomenon observed but had not explicitly linked what they had written to the data which they had obtained. An examination of the criteria will reveal that, at each level, the word DATA is included. If neither the data themselves nor the pattern described in Quality B are referred to in this answer, then it is difficult to award high marks even if the science used is of high quality.

The problem seems to be that candidates learn the theory necessary before embarking on the Task and then regurgitate it (with greater or lesser accuracy) in answer to question 4. If it is correct, the centre awards it 6 marks even if no reference whatsoever is made to the data or to the pattern observed in the investigation.

To gain marks at the highest level in this skill it is necessary that the science used is correct, fully understood and explains the data obtained in the experiment completely.

Quality E: Planning further Work

The plan must be sufficiently detailed to allow another person to carry out the intended experiment. In all cases it is possible to use the investigation already carried out as a basis for the plan. It is, then, often not necessary to describe all the apparatus needed. What must be included is:

- the variables which to keep constant and which to vary
- how to ensure that variables are kept constant
- the range of values to be used for the controlled variable.

Only if there is sufficient detail in the method given, can marks in excess of 3 be obtained. Marks higher than 4 are achieved by considering the importance of the new information which would be obtained. There is usually a question to lead candidates in the right direction.

Where this skill was generously marked it was either because the method proposed did not give sufficient detail of the variables and their control or because the method wouldn't work.

E Practical Skills:

This is a mark given by the centre as a summary of the practical skills demonstrated by each candidate over the period of the course.

The intention is to gain a general impression rather than to have a snapshot of the skills on a particular occasion.

Many centres had a good range of marks but it was surprising to see how many centres had a complete cohort all scoring six marks.

F Separate Sciences

The problems and successes noticed in work submitted for the separate sciences were the same as for Additional Science in both Research Studies and Data Tasks.

The overall scores tended to be higher because, in general, candidates were of higher ability.

The tasks used were, in the main, those from modules 3 and 4 of each science but it was pleasing to note that some of the tasks from modules 5 and 6 were beginning to be used.

Many of these skills exercises provide interesting ways of delivering and enhancing the separate science units. I hope to see them used more next year.

G Other Matters

Centres are thanked for the diligent work which the vast majority put into the assessment of the work of their candidates. Where this is done moderators can support the decisions made by centres and the process runs smoothly

Where it is necessary to adjust the marks of a centre the work is looked at by at least two moderators.

If the adjustment is large it is looked at by at least three including the Principal Moderator.

Further guidance on assessment of skills can be found in the Additional Science Support Booklet which was sent to all centres and which is also available on Interchange and at www.gcse-science.com.

Next year a series of training courses will take place in different parts of the country details of these has been sent to centres and is also available on www.ocr.org.uk.

Centres can be part of a cluster. Cluster co-ordinators conduct meetings where centres can exchange ideas and experiences as well as receiving training.

Grade Boundaries

Grade	A*	A	B	C	D	E	F
Mark/60	54	49	43	38	32	26	20

Grade Thresholds

General Certificate of Secondary Education
Additional Science B (Specification Code J641)
June 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B623/01	Raw	60	-	-	-	33	27	22	17	12	0
	UMS	69	-	-	-	60	50	40	30	20	0
B623/02	Raw	60	46	38	28	19	15	13	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B624/01	Raw	60	-	-	-	35	29	23	18	13	0
	UMS	69	-	-	-	60	50	40	30	20	0
B624/02	Raw	60	49	41	31	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B626/01	Raw	60	54	49	43	38	32	26	20	14	0
	UMS	100	90	80	70	60	50	40	30	20	0

B626 - The grade thresholds have been decided on the basis of the work that was presented for award in June 2009. The threshold marks will not necessarily be the same in subsequent awards.

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J641	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J641	4.1	16.8	38.8	66.9	83.7	92.5	97.0	99.0	100.0	58845

59231 candidates were entered for aggregation this series

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

Statistics are correct at the time of publication.

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