OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science B

Gateway Science Suite

General Certificate of Secondary Education **J641**

Examiners' Reports

June 2011

J641/R/11

Oxford Cambridge and RSA Examinations

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification 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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Additional Science B (Gateway)(J641)

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Chief Examiner's Report

This series examination papers followed a similar pattern to previous years with B624 attracting the higher number of entries in the June series. Entries for B623 in June have remained fairly constant but there has been a continued fall in entries for B624 in June. This fits with an increase in entries for these papers in the January series.
The papers all produced a good spread of marks and when distributions were plotted they formed bell shaped graphs. The mean marks for the B623 papers were in line with previous series' but in the B624 papers, slight decreases in mean marks were seen. There were small differences between performances on the individual sections of papers but less so than in previous series'.

The Principal Examiners' 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 continues to improve
- it is pleasing to note that many candidates are now scoring well on questions involving calculations. These skills will be thoroughly tested in the papers covering the new specifications and so it is good to see that teachers are emphasising these areas.

B623/01 Foundation Tier

The average mark for this examination was 30.5, and the marks achieved by candidates covered the range form 0 to 54. Centres demonstrated good entry policy in terms of the tier of entry and 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. Three questions were often unanswered. In section A Question 3(b)(i) candidates failed to mention plasma, in Section B Question 7(b)(i) candidates failed to mention alkali metals and in Question 8(a) candidates did not write the chemical formula $CuCO_3$.

Candidates coped well with the calculation questions in section C. There was no evidence that candidates ran out of time and the questions left blank by the candidates reflected a lack of knowledge or understanding rather than a shortage of time. Answers were usually well expressed and legible.

Question 1

This question used the context of a sheep farm to examine aspects of selective breeding, cloning and genetic engineering.

Almost all candidates obtained both marks for (a) with a few only gaining one mark because just one box had been ticked.

All candidates found (b) challenging. In (b)(i) only a small proportion of candidates could explain why the lambs could not be a clone of their parents. Many candidates did not mention genes or DNA or the involvement of two parents. Very few candidates gave correct answers to (b)(ii) as they did not state that lambs could be clones of each other and this occurs by being identical twins rather than just twins. Typical answers were very vague and often referred to all animals being unique, having their own genes and so not being clones of each other.

In (c)(i) only a small proportion of candidates could recall the scientific term as being genetic engineering or genetic modification. The most common incorrect responses involved cloning and selective breeding. In (c)(ii) only the most able candidates could suggest one advantage of improving sheep by transferring genes compared with selective breeding. Faster was the most common correct answer.

Question 2

This question focused on the phases of growth and sexual reproduction leading to growth by cell division and cell differentiation. Part (a) was common with the Higher Tier examination.

In (a) most candidates were able to identify the three month periods when the mass increased the most and the least. The most common incorrect response was in identifying periods greater than three months.

Most candidates identified infancy as the phase of growth being referred to in the question in part (b). The most popular incorrect answer was childhood.

Almost all candidates obtained at least one mark for (c), with sexual reproduction being the most common answer for the first sentence. A much smaller proportion of the candidates referred to differentiation or specialisation for the answer to the third sentence. Typical answers for this sentence were mitosis and division.

Question 3

This question was about the digestion of starch to glucose by the enzyme amylase and the absorption and transport of glucose in the body. Parts (a), (b)(i), (b)(ii) and (c)(i) were common with the Higher Tier examination.

In (a) about half the candidates gave the correct answer as being 55oC with 80oC being a common incorrect answer.

In (b)(i) few candidates correctly gave the answer as diffusion. Common incorrect answers to the process were digestion and respiration. Candidates gave vague answers to part (b)(ii) and often failed to appreciate the need to break down the large insoluble starch molecules before they could be absorbed. Many candidates thought that starch would make the blood thick or that the process would be a little slower. In (b)(iii) the majority of candidates thought that the stomach or large intestine absorbed glucose into the blood rather than the correct answer of the (small) intestine.

In (c)(i) most candidates could not identify the part of the blood that transports glucose as being plasma. The majority thought it was red blood cells. In part (ii) many candidates were able to get at least one mark for the heart pumping blood. Fewer candidates gained the marks for explaining where each side of the heart moves blood to. Many candidates thought the left side of the heart pumped blood to the lungs and the right side pumped blood to the body. Other candidates thought the left side of the heart pumped blood to the veins and the right side pumped blood to the arteries.

Question 4

This question focused on the Periodic Table with parts (c) and (d) common with the Higher Tier examination.

In (a) candidates often gave the incorrect answer to the symbols in the same period as being Be and Sr or F and I. Many candidates correctly gave F as the answer to (b) with Be being a common incorrect answer. Candidates found (c) more difficult and often gave the incorrect answers Au and Fr. In (d) about half the candidates gave the correct answer with the most common incorrect answer or F.

Question 5

This question focused on the structure and properties of metals. Parts (a)(i) and (a)(ii) were common with the Higher Tier examination.

In part (a)(i), many candidates correctly identified iron as being a poor electrical conductor. A number of candidates did not gain the mark as they listed all the properties of iron from the information in the table. A few candidates just wrote that iron was a good conductor without mentioning it was a good electrical conductor. In part (a)(ii), most candidates did not correctly identify 'lower density than iron' as being the reason aluminium is used for overhead cables. Candidates again listed all the properties of aluminium from the table or thought that a low melting point was important for overhead cables.

In part (b) almost all candidates gained one mark for superconductors in the third sentence. Many candidates gained a second mark for regular in the first sentence. A number of candidates gave the answer ionic instead of metallic in the second sentence.

Question 6

This question was about atomic structure and involved candidates writing answers to four questions into a crossword puzzle. Two of the marks were common with the Higher Tier examination.

Most candidates gained three marks for this question with proton or negative being the answers often omitted.

Question 7

This question focused on Group 1 metals, the alkali metals, including flame test colours and the need to store them under oil.

In part (a) most candidates gained at least one mark for either lithium or potassium. Copper was a common incorrect answer.

Very few candidates gained the mark in part (b)(i). The most common incorrect answers were alkalis and pathogens. In part (b)(ii), half the candidates gained one mark for explaining that Group 1 elements need to be stored in oil because they react with water. Fewer candidates explained that they also react with air.

Question 8

This question was about reactants and the number of atoms in a formula.

The majority of candidates wrote the whole equation as the answer to part (a) and could not identify the reactant in the reaction. In part (b) candidates usually gave the incorrect answers of 3 or 8.

Question 9

This question used the context of a parachutist to assess forces, speeds and measurement of speed.

In part (a)(i), most candidates correctly identified the downward force as being gravity although a few did mention gravitational potential energy. In part (a)(ii) most candidates also correctly stated that speed would increase.

In part (b)(i), fewer than half the candidates correctly identified the upward force as drag or air resistance. The most common incorrect answer was upthrust. A number of candidates confused force with energy and gave answers about kinetic energy and potential energy. The majority of candidates gained two marks for the question about the measurements needed to calculate speed. Some candidates only mentioned the instruments required and failed to write about the measurements being made. A smaller number included speed in their answers as one of the measurements needed to be made.

Question 10

This question focused on the speed, acceleration and driving force of a car during part of a race. Part (b) was common with the Higher Tier examination.

Most candidates correctly identified the parts of the graph showing constant speed in part (a)(i) and the car speeding up in part (a)(ii).

Only a small proportion of candidates could correctly complete the sentence in part (b)(i) about acceleration. Most candidates wrote that acceleration is the 'force' or 'time' in speed per unit

'm/s'. In part (b)(ii) many candidates could calculate the driving force as 6000 (N). Candidates rarely quoted the equation they had selected from the formula list and a few squared the 5 m/s2 showing they had misunderstood the units of acceleration. In part (b)(iii) many candidates could also calculate the work done by the car's engine as 1600000 (J). Again candidates rarely quoted the equation they had selected. A few candidates only gained one mark because they wrote the incorrect number of zeros on the answer line although the 8000 x 200 was correct.

Question 11

This question was focused on hybrid cars and asked candidates to use information in a table to suggest how cars can be made more efficient.

Most candidates were able to get at least one mark which was usually for stating that a hybrid car was the more efficient. Candidate's answers were often confused. Many just explained what the table showed without explaining which combination of hybrid, non hybrid, petrol, diesel, small engine size and large engine size car would be the more efficient. Some candidates did not understand the fuel consumption units of kilometres travelled per litre of fuel and thought that the lower the number in the table the more efficient the car.

Question 12

This question focused on energy including gravitational potential energy, kinetic energy and absorption of energy during a crash. Part (b) was common with the Higher Tier examination.

In part (a)(i), most candidates gained the mark for stating that the car had less mass. Slightly fewer candidates gained the mark for part (a)(ii) as they just repeated the information form the diagram stating that the car was a four wheel drive SUV rather than mentioning it had a greater mass. A number of candidates thought it had more potential energy because it was taller. Most candidates gave joule as the unit for energy in part (iii). A number of candidates gave the incorrect answer of newton.

Very few candidates gave the correct answer of increase by 4 in part (b). The majority of candidates wrote the KE on the car increases, doubles or changes.

Most candidates gained the mark for energy being absorbed in a crash in part (c).

B623/02 Higher Tier

The performance by candidates produced the usual wide spread of marks. It may have been that a few candidates would have been better served by a foundation tier entry. At the other end of the distribution, there were some excellent scripts.

Candidates are making improvements in some areas. Numerical questions were very well answered and more care is being taken over the writing of symbol equations, although the inclusion of an electron did cause great difficulties. The role of cryolite in the extraction of aluminium is still poorly understood.

Q1a: Some candidates gave 6 month ranges. Most candidates were not troubled by this question.
Q1b: A few candidates only commented about mass and therefore didn't score. The majority scored a mark for the idea of monitoring development/growth.
Q1c: Most answers in part (i) offered either meiosis or mitosis in about equal proportions. Many answers to part (ii) were correct.

Q2a: Part (i) was generally well answered but a small number of candidates offered 80°C. In part (ii), many candidates scored two marks for identifying the start of denaturing or the change in shape of the active site. A significant number of candidates scored three.
Q2b: Most answers to part (i) were correct. Part (ii) was also answered well.
Q2c: Candidates again answered this question well. A significant number of answers gave "cell wall" references that didn't score. Some offered villi for one answer and large surface area for the other and so hit the same marking point.
Q2d Fewer candidates gave the correct answer of plasma than gave either white or red blood cells.

Q3a: In part (i), there were a surprising number of candidates who gave ideas about "Breeding two animals from the same species" (or in some cases different species). The mention of increased mutations lost the mark for many candidates in part (ii). The idea of genetic diseases/problems being more likely was not well communicated at all.
Q3b: Many answers referred to fertilisation and leaving embryos in Petri dishes, in part (i). There were a significant number of good answers though. The answers to part (ii) were generally poor. Many candidates thought the question was to do with selecting characteristics/copying the parents.
Q3c: A number of candidates missed the mark in part (i) because they omitted that the elephant egg cell should be enucleated. A significant numbers of poor answers were given to part (ii), often to do with carrying oxygen and only containing haemoglobin.
Question No.
Q4: Many candidates scored all three marks with a small number offering 'F' for part (b) as well as or rather than (c).

Q5a: Part (i) was well answered by many candidates although a number did lose the mark by offering a list of properties. Some candidates wrote about conductivity in part (ii) but on the whole most answered well.
Q5b. Some candidates used the words "little or no resistance" in part (i) and gained the mark. There were a number of poor answers to do with speed of conduction etc. Part (ii) was reasonably well answered, even by some candidates who failed to score in 5b(i).

Q6: This question was usually well answered. The most common mistakes were 3 across and 4 down.

Q7a: Many candidates are still losing marks for implying that the cryolite lowers melting point of aluminium although the energy mark was scored by most. The identification of products was weaker, with other products such as hydrogen being named.
Q7b: Very few candidates gained 2 marks here, some scored 1 as candidates found the balancing very difficult.
Q7c: The majority of candidates gained 1 mark for one pair of shared electrons. There were many good diagrams for 2 marks although some didn't add the second hydrogen atom.

Q8a: A significant number of candidates could not use the squeaky pop to identify hydrogen.
Q8b: Examiners saw many good answers here. Those candidates who didn't score generally offered simplistic answers such as "because it's lower down the group".

Q9a Both parts (i) and (ii) provided no major issues for most candidates. Part (iii) was also well understood by most candidates.
Q9b Most candidates answered correctly. Some candidates did not score because their answers were not comparative, for example, long rather than longer.

Q10a In part (i) many candidates answered 600 and scored zero. Part (ii) was generally well answered. In part (iii) candidates typically did not offer the 'slopes upwards/slopes downwards' part of the answer even though they knew that the second slope was steeper, thus not scoring the mark.
Q10b: Most candidates new the first word in part (i). Many candidates wrote "squared" or "distance" for the second word so losing the mark. Part (ii) and part (iii) were answered successfully by most candidates.

Q11a: Few candidates scored 3 marks. Many candidates scored 1 mark for the driving style and some candidates scored 2 marks for also including a correct reference to GPE. Fewer candidates understood the work done/energy transfer aspect of the question.
Q11b: A pleasing number of candidates know this now, although many still answered "increases" or "doubles"

Q12: More candidates scored the first mark than the second, including misplacing the answer "turning" in many cases.

B624/01 Foundation Tier

General Comments

Candidates performed well in the paper. Centres had clearly done a thorough job of preparing their candidates for the examination. As in previous examinations candidates performed reasonably well in the questions involving calculations. There was no evidence of shortage of time with this paper and no rubric problems. The questions were clear and there was no evidence that candidates did not understand what was required of them.

Comments on Individual Questions

SECTION A – Module B4

1a A very high level of success in part (i). 'Stem' was the incorrect answer when the mark was not gained. In part (ii), most candidates referred to 'looking dry' or 'yellowed' and did not gain the mark. Candidates who gained the mark often wrote 'floppy' or 'drooped', rather than the expected answer of wilted. There was a wider spread of responses in part (iii) but a higher number gained the mark than in part (ii). Most candidates that were correct answered with 'amount of (Sun)light or wind'. Errors included unspecified references to weather or pests, either insects or animals.

1b Very few answered 'chlorophyll', chloroplasts being the usual correct answer. Incorrect answers included 'nucleus', 'veins', 'cell membrane' some even repeated 'the leaves' from the question.

1c Whilst the majority of candidates gained the mark some opted for 'growup' or 'growcrop' in part (i). Similarly, a high number of correct choices were seen in part (ii), with '3' the most common incorrect selection. Most candidates gained the mark in part (iii). When it was not awarded the answer was usually constructed around the idea of keeping the pests away or just getting rid of the pests.

1d In part (i), the idea of reducing or stopping rotting / decay was not fully appreciated by some candidates, although most gained the mark. Often the answer was merely 'keeps it fresh or stops it going off'. Whilst these types of statements are true they do not explain why. Part (ii) was answered better, canning or chilling being regular answers.

2a Answers to part (i) were usually correct. The second box (not enough oxygen for photosynthesis) was the popular incorrect choice. In part (ii), the better candidates recalled the term hydroponics but it was not widely known. Answers such as: 'water growing', 'hydro growing', 'biological method' or 'mineral growing', did not gain credit. Part (iii) was answered much better than the previous part. 'Too cold' and 'no oxygen' were frequent responses. 'Not enough oxygen', which did not gain credit, weakened some potentially good responses. Many candidates correctly gave 'nitrates' in part (iv). Other candidates answered 'water', 'carbon dioxide' and 'roots' (presumably a carry-over from the first question).

2b Candidates regularly referred to highest yield and the low percentage of cucumbers that could be eaten. Answers that often threatened more marks fell short because the answer did not stress highest / most and neglected to reinforce their conclusions with reference to actual data in the table.

3a Candidates often correctly chose one biomass source alongside an incorrect choice. Uranium often appeared with water alternatively sometimes one of the correct answers was given with one of these energy sources.

3b Whilst the concepts in (b) were difficult and aimed at higher grades it was anticipated that the diagram would help the candidates. In this context, of a power station many candidates could not explain what partially permeable meant or pick out the correct description of how osmosis acted in the power station water tank.

SECTION B – Module C4

4a Burette was not well recalled in part (i). 'Test tube' and 'funnel' frequently appeared in answers to the question. Part (ii) was well answered. Candidates were good at identifying the type of solution from the pH value and a high proportion gained both marks. Usually, the error when both marks were not gained was to reverse alkali and acid.

4b The most common response was to wrongly carry over a piece of information in part (a)(i) and insert 'alkali' into the incomplete word equation but 'salt' was recalled regularly.

4c Usually candidates cope well with calculations but this was not the case with the percentage yield calculation in part (i). The errors were varied:

- using the wrong quotient
- subtraction of 4.2 from 4.8
- 8.8 – 4.2 = 0.6
- 0.6 x 100 = 60 (%)
- simply expressing 4.8 or 4.2 as a %.

In part (ii), some candidates correctly stated that some was lost due to evaporation or some was left behind in the apparatus but many only had the idea that 'predictions are never right'.

4d Most candidates appreciated the reason for using fertiliser and gained this mark, usually for the idea of faster growth or bigger yield. Unspecified references of 'grow' or 'better' were not enough to gain credit.

5a Many candidates did not recall the terms batch and continuous. The word 'process' in the answer lines often led them to write 'Haber' as one of the answers.

5b This was a very well answered question. If candidates did not gain full marks this was generally due to an omission (i.e. not including three discrete points) rather than obviously incorrect statements.

6a This question was also very well answered. Most candidates made two or three correct links. 'Water' linked to 'helps water to drain off the dishes' or 'detergent ' linked to 'softens hard water' were the most common errors made.

6b The answer required was fertilisers rather than the mechanism of how the fertilisers actually made their way into the drinking water.

6c The selection of the correct water sample was required rather than a description of solutions or precipitates in parts (i) and (ii). The results of testing with silver nitrate and barium chloride were not well understood by the candidates, in part (iii). Many answers only repeated information in the table with 'solution' appearing frequently.

SECTION C – Module P4

7a Most candidates correctly identified which situation would result in a shock. Most incorrect choices were the balloon near the wall situation.

7b Candidates had experience of the electrostatic effect in the question and gave good descriptions of what would happen, most candidates were awarded the mark.

7c The electron was sometimes identified although there was some confusion between positive charges and the terms 'electric' and 'static' appeared in answers.

8 The best answers were in a logical sequence; the name of the equipment used / paddles charged / shock given / safety precaution(s), often more than three marking points being addressed. Incomplete descriptions were the main reason for scores less than 3 but most candidates gained full or partial credit in this question.

9a Candidates were usually able to explain one way of changing the current. Changing the position of the ammeter was an incorrect response occasionally given as an answer.

9b Candidates could usually display their ability to do reasonably straightforward calculations like the current calculation in this question and gained both marks. Incorrect division sometimes resulted in only one mark being awarded.

10 The uses of ultrasound were recalled to a good degree, a relatively small number of answers failed to gain some credit. X-rays or merely 'looking at the baby' or 'looking at broken bones' appeared in some answers.

11a Usually candidates gained the mark with a response about treating or diagnosing cancer. There was occasionally some confusion with X-rays and ultrasound from the previous question.

11b Most candidates knew the name for the part of the atom which emits gamma rays. Centre, middle or alpha/beta were wrong answers that were given.

11c In part (i), smoke alarms was the most frequent response, better candidates did answer with: 'smoke detectors'. There was no obvious trend with incorrect responses. The idea of putting the material into a nuclear reactor was expected in part (ii) but many candidates answered in terms of making the nucleus unstable, charging or exposing to, alpha, beta, gamma or nuclear radiation.

12a Most candidates gained at least partial credit with a high number scoring two or three marks. Incorrect ideas were usually a named fossil fuel in the first response, water vapour in the second and energy in the last response.

12b Candidates were able to identify the new measurement in part (ii) much more readily than what the scientist was measuring in part (i). Often the answers were given in reverse of the correct ones (i.e. D / C).

B624/02 Higher Tier

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates, producing a good distribution of marks covering almost the whole mark range available. The paper gave candidates the opportunity to show what they know, understand and can do and there was real stretch and challenge at grades A and A*. All candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions.
The quality of candidates' spelling, punctuation and grammar was generally good. However, there were a few cases where deciphering a candidate's writing posed a serious difficulty.

Question 1

(a) The majority of candidates were able to correctly identify respiration.

(b) Many candidates found the word hydroponics difficult to recall in part (i), hydrophonic being a popular alternative. In part (ii) only the more able candidates clearly understood that the minerals and disease could be controlled. Many thought it just meant there would be minerals available and no diseases.

(c) Many candidates failed to identify the cell walls, many incorrectly answered stem or root.

(d) Many candidates missed the idea that three marks were available for this question as they only provided one advantage and one disadvantage. Lower ability candidates also failed to make the comparisons needed for the mark. They simply stated the yield was high not higher.

Question 2

(a) Very few candidates understood that alcohol is made by the process of fermentation in part (i). Many incorrectly referred to burning confusing the idea of how biomass is used to generate electricity. In part (ii), many candidates incorrectly believe that burning biomass does not release carbon dioxide.

(b) Over half the candidates were able to explain partially-permeable in part (i). There was some confusion with many candidates referring to quantity rather than the type of molecule. In part (ii), many candidates incorrectly thought water moved from a concentrated salt solution to a dilute salt solution.

Question 3

(a) The majority of candidates correctly identified chlorophyll.

(b) In part (i) most candidates gained at least one mark, normally for mentioning palisade. About half the candidates correctly referred to photosynthesis or chloroplast in part (ii). However many candidates incorrectly answered in terms of gas exchange.

(c) Only the more able candidates managed to identify the bacteria in part (i). In part (ii), few correct answers were seen. This was because candidates failed to mention bacteria in their answer. Most candidates scored at least one mark in part (iii) but there was no clear pattern to which part they got right.

Question 4

(a) Most candidates were able to identify salt as the answer.

(b) This question discriminated well with most correct answers seen where candidates scored higher total marks.

(c) Although many correct answers were seen a common error included using the equation upside down to give an answer of 114%.

(d) Candidates lost this mark because they either forgot water or added carbon dioxide.

(e) Over half the candidates correctly answered carbon dioxide.

(f) Very few candidates were able to calculate 30 tonnes as the answer. In many cases their working out was too confusing to identify any calculation marks. The most common single mark was awarded for calculating 60 as the relative formula mass of urea.

Question 5

(a) Few candidates were able to describe how to extract the chemicals from plants. There was a clear distinction between the minority of candidates who had obviously extracted chlorophyll from a green plant in the lab and scored 3/3, and those who had no idea. Many scored the crush /grind mark but then struggled. There was much confusion with water purification: sedimentation, chlorination etc, and adding a solution instead of a solvent.

(b) Most candidates recognised the need for testing. Incorrect answers included the idea of expensive or rare raw materials, which is not part of the development process.

Question 6

(a) Many candidates lost this mark because they only mentioned the process not the source. Eutrophication and run off being examples.

(b) Candidates struggled with the tests for different ions. Very few candidates answered part (iii) correctly and many missed it out completely. Part (iv) answered better with most candidates gaining both marks. Some candidates still lose marks for changing the formula of NaCl to Na_2Cl or by not using subscript.

Question 7

(a) Over half the candidates correctly gave electron as the answer.

(b) Most candidates scored at least one mark, normally for the safety idea of standing clear. There was some confusion over the use of the term electricity. Some candidates referred to electricity through the body not charge.

Question 8

Candidates of all abilities were able to use the equation to calculate the resistance correctly.

Question 9

(a) Many candidates lost the second mark because they used the term 'bounces off' instead of reflected.

(b) Candidates who got this wrong did so because they made vague statements about less harmful or safer. Candidates should be encouraged to refer to cells not being damaged by ultrasound.

Question 10

(a) Only the more able students were able to describe half-life in part (i). A common error was to answer in terms of single atoms, for example, "time taken for half an atom or nucleus to decay". In part (ii), many candidates simply multiplied 160 by 2. Very few were able to give the correct answer of 640.

(b) Few candidates showed an understanding of the concept of using radioactivity to date rock. Many confused the idea with radiocarbon-dating.

Question 11

(a) Many candidates scored at least one mark, normally for 'heats' and 'steam'. A common error was to mix up turbine and generator.

(b) Very few candidates understood how the metals became radioactive. Many made vague comments about types of radiation but there was little mention of neutrons.

B626 (Incorporating separate Biology B636, Chemistry B646 and Physics B656)

General Comments

It is pleasing to note in this, the penultimate report on this specification, that the majority of centres applied the criteria sufficiently accurately as to make any scaling of their marks unnecessary.

Those centres are thanked for their attention to detail and their compliance with the administrative procedures.

There were, however, a significant number of centres where problems still arose and it is to those centres that the following remarks are chiefly directed.

Centres are reminded that it is the job of a moderator to support the decisions of the teachers in a centre wherever possible. Annotation of the work in the sample submitted, to show where and why marks were awarded, greatly facilitates this process. Too often it is not clear to a moderator on what basis a particular mark is decided upon.

Administration

Most centres coped well with the change to the system of sampling. It is hoped that next year the process will run more smoothly for all centres.

Whilst moderators no longer need the MS1 sheets in order to select a sample it is still helpful if these sheets are sent to the moderator either early or with the sample of work (see comments in the section on internal moderation). Along with the MS1 sheets it is essential that the Centre authentication sheet (CCS160) is included. If this sheet is not supplied then marks for the skills assessment have to be withheld.

Each sample of work should have the Skills Assessment Record sheet attached to the front. This is the only way a moderator has of knowing the mark awarded for Practical Skills.

There were too many cases where the marks on the record sheet had been wrongly totalled or where the mark had been wrongly transferred from this sheet to the MS1 mark sheet. Errors like this delay the process of moderation and cause additional work for both the moderator and the centre.

Supervision of candidates

Centres are reminded that, although close supervision is not necessary in the research phase of the Research Study or during the practical part of the Data Task, it is obligatory for the sessions where the written work is done.

Centres have to fill in a Centre Authentication Form. By completing this form a centre certifies that candidates have been supervised as instructed in the board's regulations and that they are satisfied that the work is the candidates' own.

There has been more than one occasion, this year, where two identical pieces of work have been present in the sample requested. There were also a good number of cases where different pieces of work had similarities which seemed to go beyond what could have occurred by coincidence.

Where this occurs and plagiarism has clearly taken place, neither candidate's work will be credited.

If candidates are supervised properly, according to the board's regulations, this should not occur. Please note:

- Candidates are NOT allowed access to the internet during either of the supervised sessions.
- Candidates may not bring any electronic media into a supervised session.
- In the Research Study session candidates may have access to their rough notes and print outs of their research but nothing else.
- In the Data Task session candidates should have access only to their results and the instruction and question sheet for the task.
- Redrafting (producing a second version of the work after teacher correction) is strictly prohibited.

Comments on the assessment of the different qualities

Research Studies

The Research Study assesses the candidate's ability to research a topic and to use the results of that research to answer the questions posed.

Candidates should not be taught the information needed to complete the task. This obviates the need for research and results in very similar answers from all candidates. Marks are rarely very good and candidates frequently do poorly by miss-remembering what they have been taught.

Candidates should write answers to each question separately not write an essay on the whole topic. Candidates following this structure are likely to answer each question thoroughly.

High marks cannot be scored if questions are answered incompletely.

Quality A: Collecting information

There are two common errors in assigning marks for this quality.

Sometimes a candidate is given zero marks because they have given no references. Wrong! They can have two marks if it is clear from their answers that they have done some research.

Sometimes a candidate is given six marks because they have a large number of fully referenced sources in their bibliography. Wrong! This is only worth four marks. For higher marks the sources must be referenced in the text of the study. If sources are linked to the questions five marks are available, if they are linked to items of information within the answers six marks can be awarded.

In summary, it is not necessary to have a long list of sources to gain high marks but it must be clear how the sources have been used.

Quality B: Interpreting information

The key word for this quality is 'information'. Some Research Studies involve the drawing of graphs or other interpretation of data. Doing this, even when correct, does not merit 6 marks.

It is the information in the candidate's research which must be interpreted. Their understanding of the information discovered must be clear from their answers to the questions. Higher marks will be gained from the understanding (interpretation) shown in answers to the later, more open ended questions.

Good answers to early questions followed by poor answers to later questions do not deserve six marks.

Answers copied from internet sites are worth some credit and can be given a maximum of four marks if they are relevant and answer the question completely and appropriately. However, for six marks candidates must demonstrate their understanding by use of their own words.

Quality C: Developing and using scientific ideas

The 'scientific ideas' involved here depend on the topic of the study. Topics are either an extension of an idea which is part of the specification or from an area outside the specification with clear links to science taught in the course.

Whichever is the case, more is expected than a reiteration of what has been taught. There should be evidence that some research has been done and the results should be correctly applied to answer the questions posed. Wrong answers should not be given credit.

It is chiefly in this quality that candidates who have been taught the necessary information usually fail to perform as well as they should.

As in quality B, credit (up to a maximum of four) can be given for text copied from sources, as long as it is relevant and fully answers the question.

Quality D: Quality of written communication

The criteria for this quality are reasonably clear and centres usually get the level about right. However, it should be noted that the consistent and correct use of scientific and technical vocabulary is more important than minor grammatical errors. A perfect piece of English with few if any examples of appropriate vocabulary is worth four. Whereas, a piece of work which is clearly science with appropriate vocabulary, is worth six even if there is the occasional spelling mistake.

Candidates are often given too much credit for the words which originate from a website. Only their own words can be given credit in quality D.

Data Tasks

It is intended that candidates actually carry out the investigation described. Fallback data is provided for candidates who have been absent for the practical session, or whose results make it difficult to detect patterns and so come to a valid conclusion.

Candidates who use fallback data for the second of these reasons should also include their own results. They should use their own results for answering Q3 (evaluation) but the fall back data for their other answers.

All candidates should include a table of results, even if they are using the fallback data. Moderators need to see evidence of the 'simple processing' (usually averaging) before they can give marks for quality B. They also need to check the accuracy of the plotting in the graph.

If a candidate does not perform the investigation they are disadvantaged, especially in answering questions 3 and 5 (skills C and E)

Quality A: Interpreting the Data

Candidates' graph drawing skills are generally quite good and marks of less than four for this skill are rare. Where marks are low it is usually due to small, poorly drawn graphs, inaccurately

plotted points and wrongly scaled axes. Any two or more of these factors is likely to result in a lower mark.

Candidates were sometimes given six marks for graphs which were not of sufficient quality. The graph line should be well drawn and not too thick. It should be drawn with a ruler if straight or be smooth if a curve. Graphs should be accurately plotted and on axes with sensible scales. The scale should allow the graph (not just the grid) to occupy at least half of the available A4 space.

A best fit line should ignore 'outliers' but should then have an approximately equal number of points on each side of the line. A best fit line does not always have to go through the origin, indeed sometimes it should not.

Quality B: Analysis of the Data

Most candidates managed to score four marks for this quality but 'real' marks higher than this were rare. Simple processing (eg averaging) and a description of the observed trend are all that is required for 4 marks and this was usually accomplished. Thankfully the use of an unqualified 'positive correlation' was not frequently seen (it is certainly not worth any credit).

Gaining higher marks proved difficult. A significant number of centres attempted to provide guidance to their candidates on what 'additional processing' to attempt but, in addition to being too much help, this rarely resulted in any additional marks as candidates didn't understand why they were doing the required task and so did not use the results. Simply spotting an anomaly will not do. Both the additional information and the detected anomalies must depend on the processing which has taken place. Simply spotting a point which is off the line or a measurement which is an outlier will not do as it can be seen from the raw data and/or the graph.

The most fertile area towards which candidates can be directed is showing whether their data is or is not valid. No guidance on how to approach this should be given. This is a high order skill which is designed to discriminate between the most able candidates.

Quality C: Evaluation of the Data

There are two strands to this skill and where candidates concentrated on only one aspect they were often marked overly generously. Since the assessment criteria are hierarchical the maximum mark is two where only one strand is addressed.

Candidates should discuss the methods used and how it relates to the reliability of the data. The reliability of the data is most easily accessed by considering the consistency of repeat values or, in the few tasks where there are no repeats, the proximity of points to the best fit line.

Candidates scoring 4 marks were not uncommon though 3 was sometimes more appropriate. To gain higher marks the validity of the data needs to be discussed. The concept rather than the word is important. Does the data from the experiment correctly represent what should have been obtained? The most straightforward way to approach this is to compare two data sets (another candidate's data is likely to provide a better comparison than the fall back data) or to use the graph to work out a quantity for which the value is known (this is only possible in some of the tasks).

Quality D: Justifying a conclusion

A significant number of candidates wrote a conclusion which, whilst it contained some science, was not directly related to the data obtained. Even for two marks it is necessary to relate the conclusion to the data.

The difficulty arises where the candidates have, understandably, been taught the necessary theory before the task is attempted. Weaker candidates then regurgitate this information with sometimes less than perfect recall and omit any mention of the data obtained in the experiment.

To score well in this quality the link to the data needs to be plain and the explanation needs to use appropriate and correct science which is clearly understood.

Having said that, most centres marked this quality with reasonable accuracy.

Quality E: Planning further work

Candidates in some centres clearly paid more attention to the criteria than to the question posed. These candidates (sometimes a whole centre) suggested further work which bore no relation to the problem posed in question 5. Such answers deserve no credit as the question has not been answered.

Some candidates gave a good answer to the second part of question 5 but, since their plan was insufficiently detailed, could score no more than three marks.

A detailed plan does not have to be pages long. It is intended that the investigation which they have just completed should be use as a basis. It is, therefore, not necessary to give great detail. 'The investigation just completed was repeated but…' is an acceptable way to start. After the 'but' should come;

- A description of the variables, which to control which to vary and which to measure.
- An account of how the variables are to be held constant and controlled.
- A range of values for the controlled variable.

This amount of detail would allow a third part to perform the intended investigation.

The most frequently omitted part of this description is the range of values to use. This omission limits the mark for quality E to three.

Internal Moderation

It is a requirement of the board that internal moderation of the work in a centre should take place. This is necessary unless all of the work is assessed by the same teacher.

Moderators have to judge whether the centre as a whole is marking to the same standard as other centres. A moderator is not permitted to change the rank order of the candidates in the centre. This means that if standards vary across different groups and if scaling of marks is required, unfairness to candidates can arise. Candidates who were marked generously will benefit as their marks will be reduced by a smaller margin than is appropriate, however candidates who were marked accurately will have their marks reduced to below what they deserve.

Where the problem is serious a centre will be asked to remark the work of all candidates and to resubmit their marks for moderation.

If MS1 sheets are sent which include the set of each candidate this can ease the problem. If only one teacher's marking is out of tolerance then the centre can be requested to remark the work of just that teacher. This reduces the workload of the centre and maintains fairness for the candidates.

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.

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