

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Report on the Units

June 2008

J641/MS/R/08

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

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B623/01 Foundation Tier

General Comments

The level of difficulty was **appropriate** for the ability range of the candidates.

Candidates performed to a satisfactory standard throughout the paper. Levels of performance in the three sections were comparable with candidates gaining a good spread of marks across the paper. Most candidates attempted all the paper and there was no indication of candidates not reaching the end in the time allowed.

The majority of candidates were able to display a good level of knowledge and understanding. However, candidates still find some areas of the specification difficult such as superconductors and electrolysis.

Comments on Individual Questions

Section A (Module B3)

Question 1

(a) A number of candidates failed to attempt **(a)(i)**. Candidates should be encouraged to read all parts of a question even when there is no answer line. In part **(ii)** many candidates of all abilities still seem to think that animal cells have cell walls. Candidates lost a mark in part **(iii)** because they did not make it clear that the sperm enters the egg. The sperm and egg meet was a common answer gaining only one mark.

(b) Most candidates were able to plot the points, however more care is needed with drawing the line. Rubbed out lines were often difficult to distinguish from the actual line.

Question 2

(a) Very few candidates gained both marks on this question. The most common incorrect answers were veins and arteries.

(b) The majority of candidates knew the heart pumps blood but very few knew the name of the valve. In part **(iii)** only the more able candidates understood the role of valves. Most candidates incorrectly assumed the heart would slow down.

Question 3

(a) Part **(i)** was normally answered correctly. However, very few candidates knew about diffusion, instead they seemed to think the process was photosynthesis or respiration.

(b) Only high ability candidates understood how plants reproduce using runners. Most candidates seemed to think asexual reproduction involved the fruit. In part **(ii)** candidates failed to make a comparison. They said it would take time to grow instead of taking longer.

(c) The more able candidates knew about fruit ripening in part **(i)**. In part **(ii)** the most common incorrect answer was minerals.

Section B (Module C3)

Question 4

The majority of candidates correctly identified gold and bromine in parts **(a)** and **(b)**. However, some candidates did not choose from the list and identified other elements in group 7.

In part **(c)** a large proportion of candidates identified copper and carbon but missed out oxygen. Very few candidates knew the flame test for sodium in part **(d)**. Candidates were more likely to understand the term group than period in parts **(e)** and **(f)**.

Question 5

(a) Only the more able candidates were able to identify bauxite as aluminium ore.

(b) In the main candidates found this question difficult. Very few candidates knew that aluminium was produced at the cathode in part **(ii)** and only the minority of candidates understood that the carbon electrode reacted with oxygen.

Question 6

(a) Most candidates could identify one property of metals. Although some did repeat the stem by saying it conducted electricity. A number of candidates only listed one property and could not be given a second mark.

(b) This was answered better by the more able candidates. A number of less able candidates named a metal Zne could use instead of its property.

(c) Candidates still think superconductors are fast conductors. Very few understand that they have very little resistance.

Question 7

Most candidates realised there were three oxygen atoms but only the more able candidates identified three elements.

Question 8

(a) Approximately 50% of the candidates incorrectly thought copper was light green.

(b) Many candidates tended to just describe setting up the apparatus in the diagram, they did not identify solution X as limewater. In part **(ii)** many candidates lost the mark because they included heat in the equation, e.g. copper carbonate + heat.

Question 9

(a) Many candidates read this as name two fossil fuels, giving answers such as coal and gas.

(b) The incorrect answer tended to be C because it was the lowest number.

(c) Most candidates knew electric cars used batteries.

Section C (Module P3)

Question 10

The incorrect answer to part **(a)** tended to be fiesta, although most candidates did correctly identify the punto. More candidates were correct with their answer to part **(c)** than part **(b)**.

Question 11

This whole question was successfully answered by the majority of candidates. However, the most common error was answer of Ford in part **(b)**.

Question 12

(a) A number of candidates tried to multiply the two numbers instead of simply add them together.

(b) Candidates have difficulty defining thinking distance without using the word think. They should be encouraged to answer this question in terms of the distance the car travels while the driver reacts. In part **(ii)** some candidates lost a mark because alcohol and drugs were the same marking point. Also they tended to say speed and not higher speed.

(c) Again candidates lost the mark because they tended to say speed and not higher speed.

Question 13

(a) In part **(i)** few candidates identified the force as weight however they gained the mark for because they mentioned gravity. Only the more able candidates realised it was air resistance.

(b) The majority of candidates incorrectly thought there was no gravity on the moon. Very few mentioned no atmosphere.

B623/02 Higher Tier

General Comments

This was the second session in which a large number of candidates sat this component. The cohort included a significant proportion of candidates who were retaking the component. The average mark for this examination paper was 34, and the marks achieved by candidates covered the entire range from 0 to 60. A small but significant number of candidates obtained marks which suggested they would have been better suited to the Foundation Tier examination paper rather than the Higher Tier.

All sections of the examination papers differentiated well and allowed candidates to demonstrate their knowledge and understanding of GCSE Additional Science.

Candidates found Section C more accessible than Sections A and B.

Comments on Individual Questions

Section A (Module B3)

Question 1

This question focussed on growth and was the least demanding question in Section A.

(a) Most candidates were able to plot the last four points although a very small number of candidates did not attempt to plot the points. A significant proportion of candidates plotted a dot to dot graph but most drew a curve of best fit. In part **(ii)** the majority of candidates recognised that the quickest growth rate occurred in the first three months.

(b) Almost all the candidates were able to give a common sense answer most of which were included on the mark scheme.

(c) Although most candidates recognised mitosis a small proportion chose meiosis. In part **(ii)** many candidates were able to recall the name mitochondria, but some candidates gave the names of other organelles such as chloroplasts.

Question 2

This question focussed on the heart.

(a) The semi-lunar valve was not well known by candidates. Bicuspid or tricuspid were often written by candidates.

(b) Many candidates were able to recall that valves stop backflow in the veins but less referred to the blood pressure in the veins being less than in the artery.

(c) Often candidates were not able to express themselves adequately to be awarded a mark. Other candidates did not explain in sufficient detail for example stating that the heart was working harder rather than explaining why. Common misconceptions were that the blood would pool or clot.

(d) Many candidates were able to refer to either the long waiting list or the problems of rejection of heart transplants.

Question 3

This question was about growing strawberries.

- (a)** Only a small proportion of candidates referred to diffusion. Common errors were photosynthesis, respiration or osmosis.
- (b)** The question focussed on absorption of carbon dioxide into leaves but many candidates focussed on photosynthesis instead. The most common response was to refer to the leaves being thin and having a large surface area. Often candidates incorrectly qualified thin by reference to thin cell walls. Only a small proportion of candidates referred to the presence of lots of stomata.
- (c)** Although the mark scheme only required mention of genetic modification or genetic engineering very few candidates actually used these terms. Common misconceptions involved the use of cross pollination or selective breeding. A significant proportion of candidates did not attempt this question.

Question 4

This question on DNA was the most demanding question in Section A.

- (a)** Although many candidates could recall the C-G and A-T base pairing other candidates included random letters.
- (b)** This question was extremely demanding and only a small proportion of candidates was able to get maximum marks. Answers needed to be precise and avoid ambiguities for example DNA unzips has a particular meaning that is not the same as DNA splits in half. Very few candidates referred to complementary bases and often base pairs were confused with amino acids or proteins.
- (c)** Candidates found this question even more demanding than part (b) and a significant proportion of candidates did not attempt it. Many candidates repeated the information given in the stem of the question by referring to proteins rather than amino acids.

Section B (Module C3)

Question 5

This question involved selecting the most appropriate element from the provided list. Only a small proportion of candidates selected elements that were not in the provided list.

- (a)** Although many candidates selected neon a common distracter was oxygen.
- (b)** Many candidates selected one of the elements from the fourth period but a significant proportion chose carbon.
- (c)** Although many candidates selected carbon a common distracter was oxygen.

Question 6

This question about aluminium was the most demanding question in the whole examination paper.

- (a)** Many candidates stated that aluminium was formed at the cathode but other candidates gave gases such as hydrogen or carbon dioxide.

- (b) Only a small proportion of candidates referred to a reaction between carbon and oxygen, some candidates suggested that the carbon was worn away by heat.
- (c) Many candidates realised that electricity was expensive. References to mining the ore were only given credit if they specifically referred to aluminium ore.
- (d) Only an extremely small proportion of candidates could construct the equation for the reaction at the anode. A common misconception was to add the electrons to the oxide ion. A significant proportion of the candidates left this part question blank.

Question 7

This question was about metals and superconductors.

- (a) Many candidates realised that metals have delocalised electrons. Any answer that indicated an electron that could move was awarded both marks for this question.
- (b) The most common response was that a metal needed to be a good thermal conductor but candidates also referred to high melting points and non-toxic. Both of these were given credit.
- (c) Knowledge of superconductors is new to the GCSE Additional Science specification and this was reflected with the poor quality of some of the answers. Common misconceptions in part (i) included that electricity would flow forever, the electricity would flow faster and it would never stop conducting electricity. Very few candidates referred to the manufacture of electromagnets or of efficient electrical power transmission. In part (ii) very few candidates referred to the problem that superconductors can only be used at very low temperatures.

Question 8

This question involved the interpretation of formulae and was the least demanding in Section B.

- (a) Most candidates deduced there were two oxygen atoms in the formula.
- (b) Most candidates deduced there were five atoms in the formula. A very small proportion of candidates worked out the relative formula mass instead of quoting the number of atoms.

Question 9

This question was about transition elements.

- (a) Most candidates could recall the correct colours for copper and for iron(II) compounds.
- (b) Many candidates were able to write the word equation. A small proportion of candidates included heat in the equation; these candidates were not awarded a mark. Heat under or over the arrow however was allowed.

Question 10

This question was about ionic and covalent bonding.

- (a) Even though this question was targeting the highest grades at GCSE a significant number of candidates were able to draw a correct dot and cross diagram. A common misconception was to draw the electron transferred from sodium to chlorine in both the sodium and chloride ions outer shell. Other candidates drew a covalent dot and cross diagram.

(b) Covalent bonding was well known by many candidates.

Section C (Module P3)

Question 11

This question was about powering cars.

- (a) Most candidates were able to calculate that the car would need 9 litres of fuel.
- (b) In part (i) most candidates realised that electric cars need to be recharged and in part (ii) that to generate the electricity would involve burning fossil fuels and that this would give atmospheric pollution.

Question 12

This question about distance-time graphs was the least demanding of the whole examination paper.

- (a) Most of the candidates chose the Corsa.
- (b) Most candidates were able to select the correct equation and obtained the answer of 330 km.

Question 13

This question was about force and motion.

- (a) A significant proportion of the candidates gave factors that affected thinking distance rather than ones which increased thinking distance. These factors were not given credit. The most common responses were use of drugs, alcohol and distractions. In part (ii) some candidates gave factors that affected braking distance, for example speed rather than greater speed. Common correct responses included icy or wet roads. Imprecise responses such as poor weather conditions were not given credit.
- (b) Most candidates were able to select the correct equation from page 2 and could calculate the work done as 50 000 J.

Question 14

This question about the physics of car crashes was the most demanding question in Section C.

- (a) Candidates found this question very demanding and often repeated some of the information in the question. The best answers used $F=ma$ to explain qualitatively how crumple zones reduce the force acting on a passenger. Credit was also given for lower level answers in which candidates referred to a change of shape of the crumple zone and energy being absorbed. Common misconceptions included absorbing impact or absorbing the force.
- (b) Parts (i) and (ii) were marked together but only a very small proportion of the candidates were able to be awarded full marks. Good answers used the data to state that as speed doubles the braking distance quadruples and then explained that braking distance is proportional to the kinetic energy. Some candidates gave the relationship between speed and kinetic energy and did not refer to braking distance. A significant proportion of candidates left part (ii) blank.

Question 15

(a) In part **(i)** most candidates realised that the drag force increases. In part **(ii)** most candidates could explain that the forces were balanced.

(b) Part **(i)** was the most demanding part question. Candidates did not appreciate that the question referred to what was happening at terminal speed and so they often stated that potential energy was converted into kinetic energy. In part **(ii)** most candidates recognised that the kinetic energy remains constant.

B624/01 Foundation Tier

General Comments:

This was a good paper with a high accessibility containing some useful discriminating questions at the key grade boundaries of C and F. The mean mark was above 50% and so students felt a sense of productive achievement after having sat the paper. There were many opportunities for candidates to demonstrate what they have understood and learned during their course. Also there was no evidence of candidates running out of time. Weaker candidates generally were responsible for NR (no response) answers and these were often in extended writing questions.

The paper was accessible and gave a wide range of marks which gave a good distribution. There were very few papers, though, with scores above 50. This is often as strong C candidates will often be doing Higher Tier. There were some marking points that were very challenging to get on this tier. These were mainly the questions that were common with the higher paper. The common questions targeted at grades C and D were worth a total of 18 marks out of 60.

Comments on Individual Questions

Section A (Module B4)

Question 1

This was a good starter question about plant parts and their functions with more than half of the candidates scoring both marks here.

(a) Many candidates scored both marks for reproduction linked to part A (flower) and part D (roots) for anchorage. Common incorrect answers were B (stem) for reproduction.

(b) This question asked for the job of chloroplasts. It was generally answered well by more able foundation candidates. Examiners were seeking to award marks for absorbing light energy or making sugar, food or carbohydrate. Also allowable were 'joins water and carbon dioxide' but this was extremely rare, also acceptable were 'containing chlorophyll' or 'transferring energy'. We did not accept attracting sunlight which was given reasonably often.

(c) In describing water movement through the plant most referred to the idea of absorbed by the root and then transport up the stem. It was answered well by many.

Question 2

(a) This question on nitrate deficiency discriminated well. Good answers referred to poor growth (shorter) and yellowing of the leaves. Loss of colour was allowed but change in colour was not. Many unfortunately referred to wilting or drooping. Others mentioned an affect on the fruit which was ignored. Also ignored were: thinner stems, roots or shoots, slow(er) growth, wilting / drooping. We did allow smaller / stunted / shorter (plants) / shorter stems/ smaller leaves / fewer cells.

(b). Most could identify phosphorous or potassium as another element on the bag. Some wrote nitrogen (again) and others merely offered 'Camfert' (trade name) as an element. The question, though, was answered correctly by the great majority.

(c) About half the candidates could work out from 3% of 1 000g that the mass was 30g.

(d) Relatively few knew that nitrates are used by plants to make protein. Also acceptable but rarely seen on this tier was amino acids or enzymes.

(e) Most candidates scored [1] on this rather than [2] or [0]. There were some good suggestions for preserving tomatoes. Refrigeration, cooling or freezing commonly scored 1 mark. Also acceptable were drying or dehydrating, adding vinegar and cooking (eg make pickle / chutney / ketchup), or canning / bottling. Also allowable were using a controlled atmosphere (eg air tight container / oxygen removed). Some were concise with 'keep them cool and dry' which was awarded 2 marks.

Question 3

(a)(i) There were virtually no correct answers on what is meant by biomass. A mark was available for **mass** (kg, g or even weight) of living organism(s) / cells / living thing(s). Many were confused but some wrote of the amount rather than the mass.

(a)(ii) Most referred to light but in this food chain **Sun** or **sunlight** gained the mark. It was answered well by the great majority.

(b)(i) Most correctly sketched the pyramid of numbers on the grid.

(b)(ii) The pyramid of biomass was rarely correct on this tier.

(c) This question discriminated well. A few referred to excretion or movement for 1 mark. Also allowable answers were heat / movement / egestion / waste / respiration / excretion / death / eaten by another animal not in food chain / not all parts eaten. Many answers referred to merely the idea of eating which was not awarded a mark.

Question 4

This question was about crop spraying.

(a) This was very well answered. Most candidates gained 2 marks for correctly joining up the chemical to its job.

(b) **Biological** control was rarely seen. But it was common to see natural and organic as answers which were not credit worthy.

Section B (Module C4)

Question 5

The first question on section B was quite well answered.

(a) Most could line up the solutions to their pH.

(b) Most knew that the pH **increased** when the alkali was added. Many referred to the idea of neutralisation but others again referred to the pH increasing. Occasionally alkali has higher pH than acid gained the 2nd mark. A score of [1] on this 2 mark question was a common pattern.

Question 6

(a) Most could indicate a source of costs for making medicine. Many gave (cost of) raw materials or chemicals. Others referred to staff, transport or research costs.

(b) This 3 mark extended writing question on plant extraction was a common question aimed at grade C. On this tier only small numbers gained more than 1 mark. It discriminated well at the grade C boundary with most of these gaining 2 marks. Marks were available for cutting or crushing the plant (often seen). Less common was a reference to adding a solvent or named solvent (to dissolve the chemical). It was very rare to see any valid separation idea such as chromatography / distillation. Boiling in water, however gained 2 (for breakdown idea and solvent idea).

(c) Most correctly chose batch as the process.

Question 7

(a) Most picked the RAM of magnesium from the periodic table as 24.

(b) Rather fewer could calculate the relative molecular mass as 74. 57 was a common incorrect answer.

(c)(i) Very few got the correct total mass of 50g.

(c)(ii) Most correctly picked the mass as **increasing**.

Question 8

This question on drinking water and pollution was quite well answered.

(a) Most could name a water source from one of the following: lakes / aquifers / springs / reservoirs / dam / wells / rain / sea / ocean, loch / (the) cut / canal / streams / delta / pond / bore holes.

(b) Examiners were seeking to award marks for human pollutants. Oil was often given as also was sewage, both were awarded 1 mark.

(c) Many were vague (or at least not scientific) in explaining chlorination as killing germs or cleaning water. Sterilising, killing bacteria or microbes (1) were seen less often.

(d)(i) Some chose 'white' as the correct precipitate.

(d)(ii) Most could do the word equation correctly. When it was wrong it was due to missed arrows or addition signs. Occasionally reactants and products were incorrect, unfinished or mixed up.

Question 9

(a) About 80% correctly chose cutting tools for diamond. Jewellery was a common wrong answer (worthy but not on the list).

(b) About 60% chose fertilisers for ammonia. Car batteries and cleaning clothes was a common wrong answer here.

Section C (Module P4)

Question 10

Section C started with an electrostatics question.

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(a) Only about 20% stated a correct use of electrostatics. Most of these referred to photocopiers or PC printers as an example of a use of static electricity. Again, as in previous sessions, it was common to see 'sticking balloons to your head' as a use.

(b) This 3 mark extended writing question on electrostatic repulsion was a common question aimed at grade C. It discriminated well at the grade C boundary. On this tier 25% gained more than 2 marks. Marks were available for charging the rods (often seen for 1 mark). Some were more correctly specific in saying that both rods were charged the same (for 2 marks), either both positive or both negative. Good answers went on also to say that like charges repel for the 3rd mark. Electron or charge movement was also seen and rewarded. But many vaguely wrote of the static moving or the strips getting static electricity. Others failed to tackle the science at all and merely repeated the question by saying the strips moved apart.

Question 11

This question was about current electricity in the home.

(a) Most drew a complete workable circuit for 1 mark. Those that fell short of the mark left obvious gaps, had two cells opposing each other or drew the wrong symbol in such as a capacitor instead of a cell. Short circuits deemed the circuit unworkable so scored [0].

(b)(i) Better candidates knew that F (variable resistor) changed the current.

(b)(ii) This was a grade D/C calculation question that most students got correct. Encouragingly many grade E and F candidates also calculated this correctly. Candidates seem to be doing increasingly better in calculations. Common mistakes were to do the incorrect division, multiply $3 \times 0.5 = 1.5$ or to add $3 + 0.5 = 3.5$.

(c) Some candidates could choose earth as the correct wire to prevent the toaster becoming live.

(d) Many also chose Tammy as having the correct statement. Chris's controlling current idea was a popular incorrect answer.

Question 12

(a) There were some good answers linking the wave's features to its correct description. Amplitude and frequency were the most likely correct responses. The reward for correct answers was as follows: one correct = 1, two correct = 2 and three or four correct = 3. Sometimes more than one line was drawn from or to a box and this was judged as incorrect (for that box only).

(b) Half the candidates could refer to a correct use of ultrasound (in hospitals). Scanning (unborn) babies or breaking kidney stones were frequent correct answers.

Question 13

(a) This question had few correct answers. Acceptable answers included emissions or decays but these were rarely seen. Also we allowed waves / particles / gamma / alpha / beta / ionisations.

(b) About 40% knew the nucleus was the source of radioactivity.

(c) About 50% knew that alpha sources were used in smoke alarms.

Report on the Units taken in June 2008

(d)(i) About 80% knew that gamma sources were used in cancer treatment. As alpha is also used in localised cancer treatment as an implant it was also allowed as an acceptable answer.

(d)(ii) This was a challenging question but some astute and able students did use the correct idea. Most incorrectly thought that there were, in this case, dangers from a source that was too strong. In fact in time the source would become less radioactive and so may not treat the cancer properly.

(e) The uncontrolled chain reaction was not well answered. Some said merely an explosion. A few correctly referred to a nuclear bomb or nuclear explosion. Also allowable was a named nuclear event such as Chernobyl, Hiroshima, Nagasaki or 3 mile island. About 20% of candidates scored the mark here.

B624/02 Higher Tier

General Comments:

The paper produced a mean mark of 31.6 and gave candidates the opportunity to show what they know understand and can do. The full range of marks was seen and a wide standard deviation of 11.1 was achieved. About 2000 candidates scored less than 15 marks and would have been better served by entry to the foundation tier. Assistant examiners and team leaders thought that the level of difficulty of the paper was appropriate. Most candidates could access the paper with very few questions omitted. There was no evidence of lack of time. It was noticeable that, for a significant number of candidates, the B4 section scored lower in comparison to the overall mark gained across the whole paper. Questions involving 2 or more marks were suitably differentiated for A grade candidates.

The paper differentiated well with 37 marks required for grade A and 17 for grade C

Comments on Individual Questions

Section A (Module B4)

Question 1

The majority of candidates scored 2 marks in part **(a)** usually for 'stunted growth' and 'yellow leaves'. Wrong answers included 'wilting', 'small plants', 'lack of growth' or 'no growth'.

In part **(b)(i)** up to 50% of candidates were correct in giving 'protein' or 'amino acid', but regular incorrect answers were growth and nitrogen. Far fewer gained a mark in part **(ii)** for 'chlorophyll', but would have done so if 'chloroplasts' and 'photosynthesis' had been acceptable.

The majority of candidates scored 1 or 2 marks in part **(c)**. Most understood that vinegar is acidic and this kills or inhibits microbes. A few gained the second mark for a comment about enzymes being denatured. Many non-scoring answers referred to stopping rotting or decay or references to preventing oxidation. .

In part **(d)(i)** a significant minority scored with 'hydroponics' and its more popular but allowed variant 'hydrophonics', but many had no idea and were simply guessing with a wide choice of incorrect responses. Part **(ii)** was generally poorly answered with the lack of root support gaining the most marks. The idea of 'controlling fertilisers' etc was not understood and the most common answers not gaining marks referred to 'recycling nutrients', being able to grow plants anywhere irrespective of soil conditions and plants not getting the 'natural' nutrients of the soil.

Question 2

In part **(a)(i)** the majority of candidates were able to draw the bars accurately to scale, though the scanning of 'pencil' bars was often very indistinct and candidates were frequently sloppy in drawing freehand without rulers, creating very wavy lines. Candidates were far less certain in part **(ii)**. The majority scoring simply drew a mark worthy pyramid, while others demonstrated instantly they were wrong with incorrect drawings or incorrect labelling. Those who attempted a verbal description only often failed to give enough detail, saying 'it will be a normal pyramid shape' without stating which way up.

Candidates scored very well in part **(b)**. The most usual answers were 'heat', 'movement', and 'faeces'.

As expected, only the most discriminating and able candidates scored well on part **(c)** involving the nitrogen cycle. The most common single mark gained was for accurately giving the role of nitrogen-fixing bacteria. All but the most able candidates scored zero, usually commenting on the bacteria not the nitrogen.

Question 3

Part **(a)(i)** was well answered. Most understood xylem carried water (and minerals), though a small minority thought it carried 'food' or 'sugars' and lost the mark. In part **(ii)** most candidates gave a mark-worthy response with 'tubes', 'hollow' or 'dead cells'.

In part **(b)(i)** most candidates scored 1 mark for recognising the significance of 'air spaces', though a number were clearly referring to 'stomata' when they used the term 'holes'. Many also scored a second mark for 'diffusion' or 'large surface area', but far fewer than for the first mark. Despite the many ways candidates could score in part **(ii)**, it was relatively poorly done. The demand for 'structure and reason' to score the mark eluded most and far too many are still talking about 'catching or attracting light', rather than 'absorption of light'.

Section B (Module C4)

Question 4

The majority of candidates were able to score in part **(a)** with correct references to 'neutralisation'. Weaker candidates made vague references to pH numbers with no comparison and failed to score.

In part **(b)** the majority of candidates correctly stated 'calcium nitrate' and scored 1 mark.

In part **(c)(i)** the majority of candidates correctly gave 'base', while 'allotrope' was the most frequent incorrect response. In part **(ii)**, many candidates scored 2 marks for a correctly balanced equation, with others often scoring 1 mark. 'Water' was missed out on occasions and incorrect use of upper and lower case symbols also lost marks.

Question 5

Very few candidates scored 3 marks in part **(a)**, although almost all gave some form of 'crushing', 'grinding up' or 'cutting up' for the first mark. If candidates scored 2 marks it was usually for describing or drawing about chromatography as well, but only a tiny minority spoke about a 'solvent' for the 3rd mark.

In part **(b)**, many candidates scored a mark about the role of R & D in the high cost of new medicines, but others wrongly thought it was sufficient to say that 'R & D cost a lot' without giving a reason why. Correct answers often referred to labour costs, repeat tests and long testing periods.

Question 6

The majority of candidates scored the mark for a correct calculation in part **(a)**.

In part **(b)** many candidates produced endless lines of calculations, but less than half achieved the full 2 marks for a correct final answer. Many more had '100' and '111' embedded somewhere in the figures, so scoring 1 mark for correctly calculating the relative formula masses required. Others had the correct final figures '555', but with the decimal point wrongly placed.

Question 7

In part **(a)**, as candidates were required to stipulate 'solid' in the answer or a named solid, like 'dirt', 'stone' etc, a number failed to score this mark. Most considered that 'filtering out (large) particles' was sufficient. The majority of candidates gave a correct description of the purpose of chlorination.

In part **(b)**, a good number of candidates understood that distillation of seawater involves a large energy commitment, but many just spoke of heating or energy costing a lot without indicating the amount of energy. Many wrote about the cost of the apparatus, the corrosive aspects of seawater or 'transport costs'.

In part **(c)** the vast majority were scoring with a correct word equation, though a number tried to write a symbol equation, almost always failing to write the formula of the nitrates correctly.

Question 8

The majority of candidates scored 1 mark in part **(a)** for correctly stating that diamond was 'lustrous' or 'attractive'.

In part **(b)**, candidates either knew clearly why diamond is a non-conductor or simply wrote something non-descript about its structure and that electrons or current 'couldn't get through'.

Part **(c)** was well answered by most candidates recognising that graphite is a good electrical conductor.

In part **(d)** most knew that nanotubes could be used as 'industrial catalysts', though the other given answers to choose from appeared regularly, particularly 'pencil leads', presumably a confusion with graphite.

Section C (Module P4)

Question 9

Most candidates understood that static electricity is dangerous where flammable materials are present in part **(a)(i)**. Several wrote about defibrillators in hospital and inevitably went on to give wrong answers for part **(ii)** as well. Others were writing wrongly about 'current electricity' flowing in wires. Where candidates scored correctly in part (i), the majority went on to write correctly about 'earthing' in part (ii).

The fact that polythene strips must be repelling due to like charges was well understood in part **(b)**. A level of response mark scheme was employed with reference to charges scoring 1 mark, reference to like charges scoring 2 marks and like charges repel scoring 3 marks.

In part **(c)(i)**, a number of candidates achieved the mark for why paint particles carry the same charge, though too many read on to part **(ii)** first and simply referred to them being attracted to the oppositely charged car body. Others wrote here and for the following two questions that 'it gave an even finish'. Part **(d)** scored well.

Question 10

In part **(a)**, the majority of candidates correctly identified the variable resistor, though many gave the letter for the resistor or one of the other options.

In part **(b)** most gained 2 marks for the calculation of resistance, although some set out the calculation correctly for 1 mark, only to divide 3 by 0.5 and give 1.5 as the answer.

Question 11

Many scored correctly in identifying that alpha particles cannot escape through the skin in part **(a)(i)**. The commonest error was simply to talk about the damage that these particles can cause. In part **(ii)**, most understood that a radioactive tracer is 'ingested' or 'injected', though several had the radiation being fired into the body one way or another! In part **(iii)**, few scored a mark as to how radiation is picked up outside the body. Most had some sort of device, usually a computer, an ultrasound or X-rays registering radiation in a completely undefined manner.

In part **(b)**, better candidates understood exactly how X-rays are generated and scored 2 marks. A few more did not designate the electrons as 'fast moving' or 'high energy'. The majority of candidates interpreted this question as to how an X-ray image is taken of hard and soft body tissues.

Question 12

Perhaps 50% of candidates scored at least 1 mark for showing '4 half lives' in one way or another in part **(a)**, but fewer went on to successfully calculate the count rate after 2 hours. '192,000' was a common incorrect answer, once again with many improbable calculations shown.

In part **(b)**, a significant minority scored 2 marks for '(boron) rods absorbing neutrons'. A few scored 1 mark for mentioning rods, while most simply referred to 'good monitoring', 'lead-lined containers' or 'using water to cool down excessive reactions' and failed to score.

B626 Report on Gateway Additional Science Skills Assessment

A General Comments

This was the first year in which Research Study, Data Task and Practical Skills were assessed. Similar but not identical skills have been assessed in the past; which both helped and hindered the adoption of the new mode of skills assessment.

In the Research Study candidates were, overall, better at producing Research than was the case when Science in the News was first introduced last year. Experience with last year's tasks clearly helped with this skill. The questions, which focussed skills on a particular area, also helped. On the down side some centres emphasised the similarities at the expense of the differences.

The Research Study involves the answering of five questions after researching to find the information necessary. Below are listed some of the ways centres deviated from this.

- Writing the answers as a continuous piece of prose rather than as five answers.
- Assessing the reliability and validity of sources (this is not necessary although it's a good habit).
- Treating the exercise as a Science in the News task on the topic of the study, ignoring the questions.

In the Data Task, centres already had experience of some of the skills involved from 'POAE' in years gone by. This meant that Quality A and Quality D were quite well done. The Data Task, however, concentrates much more on the data and less on the process of acquiring it. Below are listed some of the common ways in which candidates lost marks.

- Not doing any further processing in addition to the averages.
- Failing to talk about the reliability and validity of the data.
- Concentrating too much on the weaknesses of the method and ways to improve it.
- Putting insufficient detail into the method for Quality E.
- Disregarding the variable identified in Q5.

Candidates were entered for Skills Assessment 2 (Research Study, Data Task and Practical Skills) for Additional Science and separate Biology, Chemistry and Physics. The table summarises the number of candidates in each specification.

Specification	Subject	Number of centres	Number of candidates
B626	Additional Science	573	63150
B636	Biology	102	2922
B646	Chemistry	97	3598
B656	Physics	109	3565

B Administration

In Science Skills, when the sample of work is sent to the moderator, it has to be sent with the record of Can-Do tasks completed. This record gives a breakdown of how the total mark was arrived at.

For Additional Science there is a cover sheet on which the three marks which make up the Additional Science Skills Assessment should be recorded.

Most centres attached this sheet to the work (though there were still some arithmetical errors). A significant number of centres, however, failed to attach this sheet. This meant that the only way a moderator could know the Practical Skills mark was to subtract the marks from Research Study and Data Task from the total mark. This sometimes gave a total greater than six and made it necessary for the centre to complete a form adjusting the marks appropriately. Centres are requested to ensure that this cover sheet is attached to the scripts requested in future.

Selecting the Correct Task

Only Research Studies and Data Tasks linked to modules 3 and 4 of each subject can be used for skills assessment in Additional Science (B626).

There were a few instances where centres had used tasks linked with module 5 or 6 of a science to assess skills in Additional Science. This is not permitted. The tasks linked with modules 5 or 6 are only appropriate for the separate sciences. In 2008 candidates who had been assessed on inappropriate work were not penalised. This concession will not automatically be available in 2009.

Supervision of Candidates

There is no need for close supervision of 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. Restrictions for each type of skills assessment are given below.

Research Study

Supervision should be sufficient to allow staff to sign the centre declaration form, stating that the study produced is the candidate's own work, with confidence.

Candidates should not bring into the supervised session any electronic media nor should they have access to the internet or their own areas on the school network. This is to avoid candidates simply copying and pasting work already completed at home (possibly with the help of others).

Candidates should not be allowed simply to copy out a piece of work previously produced. This practice has been used, this year, by a small number of centres.

If candidates word process their study, any direct quotes from books or web sites should be in a different font to make it clear which is the candidate's own work. Quotes should also be identified as such in hand written studies.

Data Task

The same rules regarding level of supervision apply to Data Tasks as apply to Research Studies.

Candidates should not have access to the internet or to textbooks. All that is allowed in the supervised session is as follows.

- The original instruction sheet for the experiment.
- The candidate's own results and any other data set which is to be used.
- The questions to be answered.
- A periodic table and physics formulae sheet if applicable.

This is the same as would be allowed in a written examination.

Annotation

Annotation of scripts submitted for moderation is helpful to both the moderator and the candidate.

It is the job of a moderator, not to mark the work, but to support the decisions made by the centre wherever possible. It is much easier for a moderator to do this if reasons why a certain mark has been given are noted on the work itself.

This is useful particularly where intermediate marks (1, 3 or 5) are given. Brief written comments are more useful than notes like B4 or C5 written in the margin. These brief written notes can be at the point where marks are awarded or separately at the end.

There is no necessity to annotate all scripts, just those which are sent for moderation. It is easier for the Moderator to support the decisions of the centre if the centre explains why the marks were given.

Other Matters

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.ocr.org.uk.

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.

The coursework consultancy service allows centres to send three pieces of marked skills assessment of each type to be checked by a senior moderator. The moderator will send a report providing feedback on the marking. It is rare for a centre which has used this service to have their marks adjusted. Photocopied marked work should be sent to the science team at OCR in Cambridge.

C Research Studies

Many centres had candidates who scored well in this part of the skills assessment. Where candidates did less well it was because:

- they did not give full URLs for their sources.
- they did not refer to their sources within the answers to the questions.
- they answered the questions in insufficient detail.
- they relied too much on quoting sections of web sites or textbooks.

Unlike Science in the News Tasks, where the research is 'open ended', Research Studies have questions which must be answered. These questions are not for guidance, they require answers. It is best if the candidates give numbered responses to the numbered questions. If they are written as essays, it is easy for a candidate to miss something essential. It also makes the study less easy to mark and to moderate.

These are Research Studies and research does need to be done. In some cases, it is possible to answer the questions set without doing a great deal of research. The answers given in these cases are unlikely to be good enough to achieve higher marks, something beyond or in greater detail than the content of the specification is required.

Candidates who were 'over-prepared' for the study tended to do less research and to score lower marks.

Quality A (Collecting Information)

This has to do with the research part of the study. The questions guide the candidate as to what research needs to be carried out. Since the topics of the studies lie outside the content of the specification, some research is always necessary.

Two marks can be gained without any sources being given as long as it is clear, from the answers, that some research has been done.

To gain four marks sources must be given and must be given in full. For an internet site this means the full URL for the page(s) used. A moderator needs to be able to check the source should this prove necessary. At least two sources should be given. It should be clear that the sources have been used in the study.

To gain six marks for this skill the sources must be referenced within the text of the study so that it is clear where the information used came from. These references need to appear in the answers to all five questions.

Quality B (Interpreting Information)

In many Research Studies there is some simple interpretation involved in the first two questions. Correct interpretation here can give marks at a low level but is not sufficient to achieve a mark of six. Higher marks can only be achieved by the use of scientific explanation in answer to the later, more open ended, questions.

To achieve the higher marks the science used must be correct and it must be understood by the candidate. It is not sufficient to include only a quote, or a paraphrase, of the web site, however relevant to the answer it may be. A candidate needs to show understanding either by adding content of their own or by internalising the information and writing in their own words.

Maximum marks were sometimes given for quotes from sources which were not entirely relevant to the question asked. The maximum mark available for a relevant quote from a web site would be four.

For six marks the science used must be correct, relevant and written at a level which clearly shows that the candidate understands what is being written.

Evidence for this skill could be found in the answers to any of the questions but full marks would not be available if only some of the questions were answered.

Quality C (Developing and Using Scientific Ideas)

This skill links with the topic of the study. Answers to one or more of the questions will involve the application of the science in the study to either issues of current importance, everyday applications, development of ideas and theories or theoretical explanation of facts.

The quality and completeness of the answers provided here is the discriminating factor which decides on the level of the marks given. It is unlikely that an adequate answer can be found in a book or on the internet. An individual answer written in a way which demonstrates the candidate understands the issues involved and in which the candidate makes relevant and, where appropriate, original comments is required for 6 marks.

Quality D (Quality of Written Communication)

Centres usually had few problems assessing this skill but there are dangers.

Credit has, on a significant number of occasions, been given for the quality of the English in passages copied from the internet. In these cases the quality of the English in the more open ended questions later in the study does not match up. It is the candidate's own work which should be used to decide the level awarded.

Competent use of English is not sufficient for the higher marks. There must be significant and correct use of scientific and technical vocabulary.

In centres with many very good candidates, weaker candidates are sometimes under-marked because they do not measure up to the high standards exhibited by the majority. To a very limited extent the same problem is observed in centres with a large number of weaker candidates.

It is important to mark according to the criteria not comparatively within the centre.

D Data Tasks

Data Tasks consist of a practical task and five questions, each linked to one of the skills being assessed.

Since the completion of the practical task is not assessed, it can be adapted to suit the facilities at the centre. However, care must be taken to ensure that the variables measured and controlled are the same and that the adapted method generates data which allows the five questions to be answered.

It is recommended that the questions be answered in the order given in the task and that care be taken that the answers given fulfil the criteria for assessment. This is particularly important in Quality E where a significant number of centres treated it as merely a way of suggesting further

work. Although questions are linked to skills, marks for each skill can be scored in other questions.

Many centres opted to use only the fall-back data. This was done for a variety of reasons. Sometimes it was because the results obtained by the students were not good enough to provide a reliable conclusion, sometimes it was to make the whole exercise more straightforward.

It is definitely to the candidate's advantage to have their own results in addition to the fall back data. Alternatively, a set generated by the teacher or a set generated by the class as a whole could be used.

If their own data were insufficient leading to the use of the fall-back data, it is still a good idea to include the candidates own data to enable a better evaluation of the data for Quality C.

Quality A (Interpreting the Data)

Candidates usually scored well in this quality with many scoring full marks and few less than four. Where marks were lost it was usually due to errors in plotting, too small a graph or, most frequently, an inappropriate line.

It was pleasing to note that, other than where appropriate, 'dot to dot' graphs were rare. It was sometimes the case that 'best fit' straight lines were drawn where a curve was clearly more appropriate and 'best fit' straight lines were sometimes just straight lines paying little regard to the position of the points.

Marks are given for an appropriate means of displaying the data. This is nearly always a graph. Graphs should have correctly labelled axes with the controlled variable on the 'x' axis and the dependant variable on the 'y' axis. The graph (not just the axes) should occupy at least half of an A4 sheet. Plotting should be accurate to half a square. An appropriate straight line or curve should complete the graph. An appropriate line is one which fits the data obtained unless the candidate could be expected to know that a particular relationship should produce a straight line.

A table of results on its own is rarely worth any credit as the format for a table is usually given and a table alone is not the most appropriate method of recording the data.

The candidate's raw data and the averages should be given as well as the graph. There were some occasions, this year, where centres did not include the raw data which made the checking of averaging and plotting impossible.

Quality B (Analysis of the Data)

Finding patterns and trends presented few difficulties for most candidates. Sometimes a full description was lacking which limited the mark obtained. Sometimes a straight line was taken to mean direct proportionality, which, of course, need not be the case. The processing part of the criteria could be satisfied by the simple processing included within the task e.g. averaging. It should be noted, however, that incorrect processing should not be given credit. Four marks was usually secure but a real score of six was rare.

To score six marks additional processing is necessary. This additional processing must lead somewhere. One place it could lead is to the discovery of an anomaly but it is not sufficient to spot an anomaly by examining the graph or the raw data. Neither is it sufficient to do some extra processing e.g. calculating a gradient and combine it with the detection of an unrelated anomaly. The further processing must lead to additional information.

Where six marks were validly scored it was usually by assessing the validity of the data. This was sometimes done by quantitatively comparing two data sets and showing agreement or otherwise (this could be own data with the fall-back data or two sets of class data). It could also be done by assessing whether a best-fit straight line showed proportionality when the exercise should have shown this. An anomaly could be detected by calculating a theoretical value and comparing it with the experimental value obtained.

Quality C (Evaluation of the Data)

This skill was also often marked over generously. Centres should note the wording 'Evaluation of the Data' not of the method.

Data is reliable if it is consistent. If all three repeats of a particular value concur then that data is reliable, whether or not it is accurate. If the values do not concur it is not reliable. In Data Tasks where there are no repeats proximity to the best fit line could be used instead. This is part of the skill, the other part does refer to the method and comments should be made as to how the method used resulted, or did not result, in reliable data.

The assessment grid is hierarchical and both parts need to be present to score four marks. Many candidates produced a very thorough description of the limitations of their method and suggested suitable improvements but only scored three marks.

To achieve six marks the validity of the data needs to be discussed. This was rarely seen in studies moderated. Validity has to do with whether the data are sufficient to give a firm conclusion. Comparing two data sets to show concurrence or comparing quantities calculated from the data with known values could show this. It doesn't matter whether the data is valid or not, as long as its validity is assessed.

Quality D (Justifying a Conclusion)

Centres were usually quite accurate in assessing this part of the Data Task. There was sometimes a tendency to give too high a mark for a conclusion which was correct science but which was not really linked to the data which had been produced.

It is important that the science used in explaining the trends and patterns observed is correct and that it explains all of the trends and patterns completely.

To gain six marks the explanation should also be set out logically, demonstrating understanding of the science involved.

Quality E (Planning Further Work)

Gaining full marks in this quality was a rare occurrence. There were a number of problems, all regularly seen.

- The further work planned had little to do with the question asked.
- The further work was planned in insufficient detail.
- The second part of the question was not addressed.

Centres are reminded once more that the assessment grid is hierarchical so, if there is insufficient detail in the method, the maximum mark which can be scored is three.

If the work planned does not address the question asked then no marks can be scored.

Report on the Units taken in June 2008

The detail has to be sufficient to allow a third party to carry out the intended experiment. It is not necessary to write a full page of very detailed instructions but the following basic information must be included.

- What variable will be changed and how.
- What variables will be held constant and how.
- What range of reading will be taken.
- How the data obtained will be treated.

The method used for the original data task can be used as a starting point to save having to give a detailed description of apparatus. Candidates are not expected to devise a totally new experimental method but to adapt the method already used.

The discriminator which decides whether more than four marks can be scored is an appreciation of how the results of the experiment increase understanding of the topic. This can usually be achieved by a good answer to the second part of question 5.

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.

Some 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.

It was rare to see examples of Research Studies and Data Tasks from the units attached to the separate science (modules 5 and 6) and some were not seen at all.

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 Grade Boundaries

Grade	A*	A	B	C	D	E	F
Mark/60	52	47	41	36	30	24	18

Since the same work can be submitted for Additional Science and Biology, Chemistry or Physics the grade boundaries apply for B626, B636, B646 and B656. Approximately one third of the separate science cohorts used Additional Science Skills Assessments rather than Science Skills Assessments. A great deal of care was taken to ensure that performance by the two routes was comparable.

The grade thresholds have been decided on the basis of the work that was presented for award in June 2008. The threshold marks will not necessarily be the same in subsequent awards. Some adjustments may be expected as experience with the mark descriptors grows.

Grade Thresholds

General Certificate of Secondary Education
 Additional Science B (Specification Code J641)
 June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B623/01	Raw	60	-	-	-	33	27	21	16	11	0
	UMS	60	-	-	-	60	50	40	30	20	0
B623/02	Raw	69	48	40	30	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B624/01	Raw	60	-	-	-	33	27	21	16	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B624/02	Raw	60	46	37	27	17	11	8	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B626/01	Raw	60	52	47	41	36	30	24	18	12	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 2008. 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	5.0	17.6	40.1	67.6	83.5	92.3	97.0	98.9	100	62429

63077 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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