

Biology B J643

Gateway Science Suite

General Certificate of Secondary Education

Report on the Units

June 2008

J643/MS/R/08

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

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

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B631/01 Foundation Tier

General Comments

Most candidates performed to good standard throughout the paper, although marks on questions 7 and 9 were lower than on many of the other questions. Most candidates attempted all the paper and there was no indication of candidates failing to reach the end in the time allowed. A number of candidates found it difficult to express their ideas in a coherent manner and this may have lost them marks.

Most candidates seemed to be entered for the correct tier although a few scripts were seen with high marks. These candidates may have benefited from a higher tier entry.

Comments on Individual Questions:

Section A (Module B1)

Question 1

Most candidates found this to be a clear accessible start to the paper, with many scoring full marks. Probably the most common error was assigning production of oestrogen to the pancreas.

Question 2

- (a) Many candidates chose virus but bacteria was the strongest distracter.
- (b) Again, most candidates were correct, with acid being the most popular wrong answer.
- (c) Thermometer was stated by most candidates but with a wide range of spellings.
- (d) White blood cell was correctly stated by most although some simply stated blood cell.
- (e) The format of the question seemed to aid many candidates and most scored at least one mark.

Question 3

- (a) The link from 'Nick breathes faster' was usually correct but mistakes often occurred with the other two links.
- (b) Pleasingly, a significant number of candidates ticked the correct box.
- (c)(i) This was one of the main discriminator questions at the C boundary with the more able candidates completing the equation correctly.
- (c)(ii) A number of candidates did not make the link to anaerobic respiration or lack of oxygen but just stated that Nick was tired.

Question 4

- (a) This question was well answered by most candidates with the full range of conditions being seen.

(b) This question was targeted at the C grade candidates but it was pleasing to see that a significant number could interpret the graph correctly and score at least one mark in (ii).

Section B (Module B2)

Question 5

(a) Answered correctly by most candidates.

(b) Most answered correctly, with only a small number incorrectly referring to mates.

(c) Although a significant number of candidates scored marks here, many marks were lost by a failure to qualify answers, simply stating beak of claws.

Question 6

(a) The meaning of the term habitat was understood by most candidates.

(b)(c) Most candidates scored marks here.

(d) Graph plotting was usually sound although the zero result did cause some problems.

(e) Well answered by most candidates.

Question 7

The topic of photosynthesis seemed to be the main area of weakness for the candidates taking this paper. Marks on this question were significantly lower than many other questions.

(a)(b) Few candidates scored correctly on both of these questions.

(c)(d) These questions seemed to be beyond most of the candidates with many repeating the word starch, although it was given in the stem of the question. The most common error for (d) was to simply state that plants respired to stop them dying.

Question 8

(a) Although many candidates scored the mark here, a number tried to compare the characteristics of the two animals.

(b) Although there were some good answers here, too many candidates are still referring to dead animals being squashed by rocks and so leaving their imprint in the rocks.

(c) A generous mark scheme in part **(i)** allowed many candidates to score but in **(ii)** few could correctly recall the term 'cleaner species'.

Section C (Module B3)

Question 9

(a) Worryingly, many candidates seemed to lack a basic idea of the blood flow through the heart.

(b) Very few candidates could correctly name the semilunar valve although more could state the function correctly in **(ii)**.

Report on the Units taken in June 2008

(c) Some candidates correctly named the animal as Dolly whereas other gained credit for writing sheep. However, a full range of different animals were seen. In **(ii)** a number of candidates were distracted by the animal rights idea rather than focusing on other ethical objections.

Question 10

(a) Disappointingly, there were many errors in the answers to this intended low level question.

(b) Many candidates could give a reasonable description of the method but some struggled to express their ideas on paper.

Question 11

(a) Nucleus was correctly stated by most candidates here.

(b)(i) This question proved a good differentiator with a number being distracted by the idea of digestion and its products.

(b)(ii) Very few could answer correctly here, with a number repeating growth from the question.

(c) Many candidates could answer correctly here although a number lost a mark for simply saying that 'it is the same'.

Question 12

(a)(b)(c) Many candidates scored full marks in this series of questions.

(d) Disappointingly, many candidates were unable to define genetic engineering or state a disadvantage. There was much confusion with selective breeding.

B631/02 Higher Tier

General Comments

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates. Questions targeted at grades A and A* allowed the most able candidates to demonstrate what they knew and understood, whilst questions targeted at grades C and D allowed all candidates access to the paper. All candidates appeared to have had sufficient time to complete the paper, with most attempting all, or almost all, questions. The quality of candidates' spelling, punctuation and grammar was generally good and there were only a few cases where it was really difficult to interpret a candidate's writing.

Comments on Individual Questions

Section A (Module B1)

Question 1

(a)(i) Most candidates knew that it is the liver that is affected by cirrhosis.

(a)(ii) About half of the candidates correctly stated that it is the liver and pancreas that together control blood glucose levels, others naming the stomach, small intestine or kidney.

(a)(iii) Although most candidates correctly chose the eye, a surprising minority chose the heart.

(b) To gain the mark, candidates had to explain that the reason why cells only produce the proteins they need is because only the genes for these are active, the other genes having been switched off. Although some candidates did get this mark, most gave weaker answers, for example 'there's no point making the proteins they don't need'.

Question 2

(a)(i) Most candidates correctly completed the word equation for aerobic respiration, although some did reverse their answers, and gained no marks. A few hedged their bets by putting the same answer, e.g. water, down twice thereby still getting one mark.

(a)(ii) Most candidates correctly explained that lactic acid builds up because of anaerobic respiration, or that this happens because the muscles are not getting enough oxygen. Far fewer candidates than in previous examination series, stated, incorrectly, that during exercise the muscles get no oxygen at all.

(b) Although other options were chosen, the majority of candidates correctly chose the first option.

(c) Most candidates correctly named the liver as the organ where lactic acid is broken down.

Question 3

(a) The vast majority of candidates correctly identified 65 on the graph as the age when disability occurs.

(b) Most candidates gained at least one mark, usually for stating that if Doug gives up smoking he will either live longer or will develop disabilities later. Better answers qualified this

quantitatively, e.g. by stating that it would be 20 more years before he became disabled. There was also a mark available for explaining that his lung efficiency would not decline so rapidly, which some candidates said, but not for stating that his lung efficiency would improve, an answer that also appeared.

Question 4

(a)(i) Many candidates correctly explained that a mutation is a change in a gene, DNA, base sequence and so on. Weaker answers just described something 'going wrong'.

(a)(ii) Although weaker answers basically reworded the question by saying that mutations cause cells to 'go wrong' in some way, many candidates did correctly explain that mutations cause cells to make either the wrong protein or no protein at all.

(b) This question proved to be a very good discriminator, with marks ranging from 0 to 3. Although a good number of candidates knew that fats are digested in the small intestine by lipase and that bile emulsifies fat droplets and also neutralises acid from the stomach, there was also a lot of confusion among candidates. Common errors were to state that fat digestion happens in the stomach or that bile is an enzyme. Some candidates thought that lipase digests fatty acids and others that bile neutralises these fatty acids.

(c)(i) Most candidates correctly explained that the allele for MCDA is recessive. It was not enough to simply state that it is not dominant. Some candidates explained that you can carry the allele for MCDA but this was just reworking information already given.

(c)(ii) Most candidates correctly completed the genetic diagram and gave the probability as 0.25, 25%, $\frac{1}{4}$, 1 in 4 or 1:3. Candidates giving answers as ratios must obviously get them correct. So for example an answer of 1:4 probably indicates that the candidate understood the question but a mark can not be given for the final answer. In these cases at least candidates usually gained one mark for a correct diagram.

Section B (Module B2)

Question 5

(a) Fewer than half the candidates gained two marks, probably the most common correct answers being 'cellulose' for 'cell walls', although there were lots of other correct answers that were seen, e.g. 'chlorophyll' for 'photosynthesis'. The two marks were linked so if an incorrect substance was given, there could be no mark for its use. (Although an exception was made if they said that glucose is used for respiration or energy.) Despite it appearing in the question, 'starch' was commonly given, which obviously could not be credited.

(b) Although some candidates did gain the mark for explaining that plants need to respire to release energy, there were many weaker answers, such as 'to stay alive', that were not mark worthy. It was a common misconception that respiration releases energy for photosynthesis, and also that respiration is necessary to produce the carbon dioxide that plants need for photosynthesis.

(c) Although many candidates wrote correct descriptions or explanations of the graph, most did not gain any marks because in their answers they did not explicitly refer to what were or were not the limiting factors. Candidates who ignore explicit instructions given to them in a question are very unlikely to gain marks.

Question 6

(a) Most candidates gained the mark for explaining that the rhinoceros and tapir share a common ancestor. Those that didn't gain the mark usually tried to explain that the species are related because they have similar features.

(b) Around a third of candidates gained two marks for describing how animals become fossilised, but there were a lot of misconceptions or possibly just badly worded answers. For example, there was a mark for saying that bodies become covered in sediment, but this was not given if candidates said that the bodies were covered in rocks. Some said that animals died and decayed and left imprints in rocks without giving more detail. It was pleasing that many knew that bones are replaced by minerals rather than simply saying that bones become rock.

(c) Many candidates correctly gave genes or chromosomes.

(d)(i) Most candidates knew that the relationship between the rhinoceros and oxpecker is an example of mutualism.

(d)(ii) Although many candidates knew that parasites live on, or feed on, a host to their own benefit, relatively few went on to say that this was to the host's harm.

Question 7

(a) Although most candidates did correctly state that only mammals have hair or fur, or produce milk, many gave answers such as 'warm-blooded' or 'have a backbone' which gained no credit. The only exception to this kind of answer was that a mark was given for stating that mammals give birth to live young.

(b) Few candidates explained that occupying a similar niche means that red and grey squirrels share similar roles. Rather, marks were usually gained for giving specific answers, that they share similar habitats and eat similar food. Some candidates tried to use the squirrels' similar features as a reason.

(c) Most candidates explained that grey squirrels have an advantage because they can digest unripe acorns, gaining one mark. Fewer went on to explain that therefore they have access to more food, thereby gaining a second mark.

Question 8

(a)(i) Although some candidates tried to explain what quotas are, for which there was no mark, a significant minority did successfully explain that quotas leave enough fish behind to breed, so maintaining (or increasing) their numbers.

(a)(ii) Candidates gave many valid examples of how fish populations could be sustained, for example fish farming, restricting the fishing season or area, or using nets with large holes. Vague, unspecific answers, such as simply 'conservation programmes', did not gain a mark.

(b) There were also many valid explanations given for why cod numbers could still fall, common answers being that other countries still fish or there may be illegal fishing, or that pollution, disease, habitat destruction or a lack of food may be to blame. No credit was given for answers involving predators or competitors as these would always have been there. Some candidates mistakenly thought that if cod fishing was banned, then cod numbers would rise, causing an increase in their natural predators who would then hunt the cod to extinction.

Section C (Module B3)

Question 9

(a)(i) Although many knew that part X was a valve, the correct identification as a semi-lunar valve was necessary for the mark to be awarded.

(a)(ii) Most candidates knew that a valve is necessary to prevent backflow, or to allow blood flow in the correct direction.

(b) Most candidates correctly explained that the muscle wall is thicker in the left ventricle as this has to pump blood further, or produce a higher pressure, than the right ventricle. In questions like this it is important that candidates give comparative answers. For example it was not sufficient to simply say that the left ventricle produces a 'high' pressure.

(c) There were several acceptable answers to the question why people usually have to wait a long time for a heart transplant, such as a shortage of donors, or more specific answers referring to the correct size or tissue type being needed. Many candidates confuse tissue matching with blood grouping and seem to assume that all that is necessary is that the recipient has the same blood group as the donor.

Question 10

(a) Most candidates made good use of the stimulus material to describe how Dolly was produced. Although some candidates thought that the egg cell and body cell were simply joined (sometimes the term fertilisation was even used) most candidates appreciated that the nucleus from sheep B was inserted into the enucleated egg cell from sheep A.

(b) Most candidates correctly stated that Dolly was a clone of sheep A (although a noticeable minority did choose B), but the mark was for explaining that this was because Dolly received her genes or DNA from sheep B. It was not enough to simply state that she received sheep B's nucleus.

(c) The most common acceptable answers referred to people's ethical or religious views, although a number of candidates instead referred to the problem of premature aging, which was also a valid answer. Some also correctly described the lack of variation or the idea that clones are all susceptible to the same diseases. No mark was given for the idea that this technique could lead to human cloning.

Question 11

(a) The vast majority of candidates correctly identified suspect A, as well as explaining the identical pattern in A's DNA to the DNA from the crime scene.

(b) Few candidates gained both marks for completing the flow diagram of DNA fingerprinting. Indeed, not all candidates fully attempted the question and if any part of the paper was left out, it was likely to be one of these two boxes. More candidates knew that the DNA fragments are separated (by applying an electric charge), than knew that the DNA first had to be amplified or treated with enzymes to cut it up.

Question 12

(a) Most candidates could name either the cell wall, chloroplasts or a vacuole as structures found in plant cells but not animal cells.

(b)(i) Although many candidates knew the vitamin is vitamin A, there were, as you might expect, few candidates who didn't attempt the question, the most common incorrect answers being vitamins B or C.

(b)(ii) Around half of the candidates correctly explained that the genetically engineered rice would provide the vitamin that otherwise would be missing from the diet, or that it would help prevent deficiency disease. It was not enough to simply say that it gave a better diet. Some candidates answered in economic terms, that farmers would be able to sell this rice. No marks were given for this idea.

(b)(iii) Although a minority of candidates gained the mark, usually for the idea that genetic engineering could have unexpected harmful effects, many candidates confused genetic engineering with cloning and some tried to answer in terms of all the offspring being susceptible to the same diseases.

Question 13

(a) Most candidates gained at least one mark, and many gained two, for correctly describing two adaptations of villi that speed up diffusion. The most common correct answers referred to the large surface area and the thin walls. Candidates need to be careful that they use terms correctly though, so an answer referring to 'thin cell walls' would not gain the mark.

(b) Although many candidates correctly described features of capillaries, such as the thin wall, they needed to go further to gain the mark and link this feature to the function of capillaries, i.e. the exchange of materials.

B632/01 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 Alexander Fleming, biogas and biological control.

Comments on Individual Questions

Section A (Module B4)

Question 1

(a) Incorrect answers included worms and other detritivores showing that the lower ability did not understand the term microorganism.

(b) Most candidates understood that heat was involved. However they should be encouraged to make comparisons by saying it is warmer not just warm. In part (ii) candidates incorrectly assumed it was to mix in the microorganisms rather than aerate the compost.

(c) Most candidates knew plastic would not decay.

Question 2

(a) The majority of candidates knew pesticides were used to kill insects.

(b) Few candidates were able to explain biological control in terms of using other living things to kill pests. Many candidates mixed it up with organic farming, simply stating that chemicals were not used.

(c) Only the more able candidates gained both marks.

Question 3

(a) In part (i) candidates tended to say it was the start or end of the food chain. They therefore gained no marks because they did not mention the fact that plants make their own food. More candidates understood that consumers eat food. However some candidates lost the mark because they simply said consumers consume food.

(b) Most candidates were able to carry out the calculation in part (i). However they did not realise that they had to make a comparison in part (ii). A number of candidates answered growth but did not say the cub would need more energy for growth because it was growing faster. Many candidates did not realise the energy was a proportion of 1000kJ and incorrectly stated that the cub would take in less energy because it was smaller.

Question 4

- (a) Most candidates gained both marks.
- (b) Few candidates gained both marks for this question. Some got as far as an adaptation such as chloroplasts but failed to say they were needed to absorb light. There were also many references to other parts of the plant such as roots.
- (c) Very few candidates understood transpiration in terms of evaporation into the air spaces and diffusion through the stomata.
- (d) A large number of candidates simply repeated the stem of the question by saying some roots break off. Of those that realised there would be fewer roots a large proportion incorrectly thought the plant wilted because it had less support from the broken roots or because it lacked nutrients.

Section B (Module B5)

Question 5

- (a) Candidates lost a mark 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) There were a minority of candidates who thought sperm were produced in the sperm duct.
- (c) Most candidates knew eggs were made in the ovary.

Question 6

- (a) Most candidates were able to correctly carry out the calculation.
- (b) Candidates tended to gain the first mark for a peak at 3 minutes but they did not bring the line back to the normal level at 8 minutes. A large number incorrectly took the line down to 0.
- (c) Most candidates gained two marks for this question. However some thought a pacemaker was needed for damaged valves.

Question 7

- (a) Those candidates that got this question wrong tended to ring bronchus instead of bronchiole.
- (b) A large number of candidates incorrectly thought breathing meant taking in oxygen and giving out carbon dioxide. Of those that thought it was taking in air some forgot to remove the air from the lungs. Part (ii) showed that very few candidates understand that respiration is the release of energy from food.
- (c) Most candidates knew that carbon dioxide is excreted from the lungs.

Question 8

- (a) Approximately 50% of the candidates gained all three marks.
- (b) Many candidates identified white and red blood cells. However a minority did get them the wrong way round.

(c) The most common error was to assume the blood type and not the tissue type would need to be the same. Some candidates thought she was having a bone transplant and assumed it would need to be the same size. The most common correct answer was to assume the donor would need to be healthy.

Section C (Module B6)

Question 9

(a) Few candidates realised phytoplankton were producers. However more knew bacteria were used to make yoghurt and that fungi caused athlete's foot.

(b) Very few candidates knew about Alexander Fleming. A small number were able to gain one mark for the mention of antibiotics or penicillin but they did not know how they were discovered.

Question 10

(a) The majority of candidates knew malted barley was used to make beer.

(b) The more able candidates were able to identify carbon dioxide as the gas.

(c) Few candidates knew yeast was a fungus. The majority incorrectly thought it was bacteria.

(d) Most candidates answered this question correctly.

Question 11

(a) Only the more able candidates were able to identify the container as a digester.

(b) There were a large number of incorrect answers to this question. These included carbon dioxide, coal and oil.

(c) Candidates found it difficult to answer this question clearly. Vague answers such it is renewable were common. The emphasis of the question was on remote parts of the world and candidates did not pick this up. They should have explained that fossil fuels were difficult to obtain or that there was no mains electricity.

(d) Few candidates knew that methane was the main gas in biogas.

Question 12

(a) Few candidates knew that the correct answer of alginate.

(b) Few candidates understood the importance of immobilised enzymes. Most incorrectly assumed it speeded up the reaction. Only a few knew it would prevent contamination of the milk and even less answered in terms of ease of separation from the product.

(c) The majority of candidates knew diabetics needed to measure the level of glucose in their blood.

Question 13

(a) Most candidates gained at least one mark with the majority knowing the meaning of all three words.

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(b) Very few candidates knew the term transgenic. Most candidates incorrectly answered genetically engineered, however some gained the mark for using the term genitally modified. In part **(ii)** candidates tried to think of an example which was often incorrect. Vague answers such as pigs or food were common. To gain the mark they needed to be more specific about the food, e.g. to make the food taste better or increase crop yield.

B632/02 Higher Tier

General Comments

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates. Questions targeted at grades A and A* allowed the most able candidates to demonstrate what they knew and understood, whilst questions targeted at grades C and D allowed all candidates access to the paper. All candidates appeared to have had sufficient time to complete the paper, with most attempting all, or almost all, questions. The quality of candidates' spelling, punctuation and grammar was generally good and there were only a few cases where it was really difficult to interpret a candidate's writing.

Comments on Individual Questions

Question 1

(a)(i) The mark scheme required candidates to explain that earthworms feed on the compost, breaking it up to provide a larger surface area which will increase the rate of decay. Many candidates did indeed say this, but many also tried to bring in other things that earthworms do, such as mixing the soil, that were not directly relevant to the question. That the action of earthworms increases drainage and aeration was credited.

(a)(ii) Although most candidates did correctly identify earthworms as detritivores, many other candidates predictably identified them as decomposers.

(b) Although many candidates correctly identified X as nitrogen-fixing bacteria and Y as nitrifying bacteria, there was also much confusion for many candidates. Weaker answers just referred to decay bacteria, the best actually named examples such as *Nitrosomonas*.

Question 2

(a)(i) Almost all candidates correctly calculated 110 kJ.

(a)(ii) The most common correct answers explained that cubs transfer more energy through growth because they are still growing, although there were other valid answers. Weaker answers gave unqualified responses such as just 'growth' which scored nothing.

(b)(i) The vast majority of candidates correctly calculated the efficiency as 4%.

(b)(ii) Many candidates simply described differences between zebras and lions, such as zebras being herbivores. Only a few candidates correctly explained that zebras lose more energy in waste because their food is more indigestible, or explained that they can not digest cellulose. As this question was targeted at an A* perhaps that is to be expected.

Question 3

(a) To gain a mark, candidates not only had to give a feature, such as the presence of chloroplasts, but also write about how it was an adaptation, e.g. chloroplasts absorb light. Less than half the candidates gained two marks. Those who didn't, often just listed the features. Candidates should also be aware that vague or imprecise answers may not always score. For example, to say that leaves have a large surface area to absorb light is a good answer, but to simply say that they are large to absorb light is not enough. Likewise, candidates should avoid referring to just the sun when they mean light, and avoid saying that leaves 'attract' sunlight.

(b) Although many candidates correctly described how transpiration involves evaporation and diffusion of water from the stomata, this question proved a good discriminator.

(c) Most candidates correctly identified cell C and that it was turgid.

Question 4

(a)(i) Although there were many candidates gaining full marks, this was by no means common. All combinations of answers were seen, perhaps indicating that many candidates were simply guessing.

(a)(ii) Around half the candidates correctly named xylem. 'Phloem' was also commonly seen.

(b) Many candidates gave their advantages of hydroponics as the plants then can get water or minerals. This was not sufficient for the mark. It was the control of the mineral supply that was wanted by the mark scheme, or the control of disease. Candidates should be aware that in questions of this sort they should avoid giving simply 'economic' answers such as improved yield, or higher profit, as these will usually not score.

Question 5

(a) Just over half of the candidates gained both marks for correctly drawing the graph. It was surprising how imprecise many candidates were, given that they were told exactly when exercise started and when the subject's pulse rate returned to normal.

(b) Most candidates gained full marks.

(c) This question was very well answered by some candidates with many of these continuing to give a lot of correct detail even after they had gained full marks. Those that did not gain three marks, generally scored none.

Question 6

(a) Most candidates correctly chose the third box. The most common error was understandably to choose the second box.

(b)(i) Most candidates correctly named the cartilage.

(b)(ii) Most candidates understood that synovial fluid lubricates a joint and without it there would be increased friction as the ends of the bones rub together.

(c) Most candidates gave at least one of the two valid answers, firstly the idea that the donor should be fit and healthy, and secondly that the donor should have a similar tissue type to the recipient, or be closely related. The most common non-scoring answer was that the donor and recipient should have the same blood group.

Question 7

(a) Around half the candidates correctly worked out the vital capacity as 3.5 litres.

(b) Most candidates knew that residual air is the air that remains in the lungs and can't be removed, although the quality of candidates' descriptions did vary.

(c) Although many candidates did correctly choose the second box, other answers were also regularly seen.

(d) A minority of candidates correctly chose the first box. The third box (decreased oxygen concentration) was unsurprisingly frequently chosen.

Question 8

(a) The answer required by the mark scheme was that the uterus lining thickens in preparation for the implantation of a (fertilised) egg. This was not very well expressed by many candidates, many of whom gave answers that were not mark worthy such as the lining protects or cushions the fertilised egg.

(b) Candidates could have answered using either their own knowledge, or the graph. A small majority did correctly state that oestrogen causes the uterus lining to thicken; an almost equal number said the reverse.

(c) Although many candidates appreciated that progesterone levels need to stay high during pregnancy to maintain the uterus lining, far fewer explained why this is important.

Question 9

(a) Most candidates correctly chose millipedes for part **(i)**, with fewer correctly choosing bacteria for part **(ii)**. The most common incorrect answer for part (ii) was amoeba.

(b) Although some candidates took a cue from part (a) and wrote, for example, that Fleming had discovered that zooplankton eat phytoplankton, most knew at least a little about the discovery of penicillin, although many mixed up the roles of the fungi and bacteria. Many stated, understandably, that penicillin is the name of the fungus.

Question 10

(a) The acceptable answers were 'transgenic' or 'genetically modified'. 'Genetically engineered' was a common answer that could not be credited because the term had been used in the question.

(b) A minority could name restriction enzymes.

(c) This question was getting at the idea that not all alleles present in a parent are passed onto the children. Although many candidates may have appreciated this, their answers were often too poorly worded to gain the mark. The most common incorrect answer was that for this feature 'the mother's genes were passed on, not the father's'.

Question 11

(a) Most candidates correctly chose 3.

(b) A minority of candidates correctly chose 4.

(c) Many candidates appreciated that the concentration of alcohol can be increased by distillation, although not many gave a full description of the process involving heating, evaporation, cooling and condensation. Others suggested letting it ferment for longer.

Question 12

(a) Most candidates correctly named methane.

(b) Most candidates correctly chose the second box.

(c) Many candidates appreciated that biogas is a sustainable fuel because it can be produced continually or because the materials it is made from are continually produced. Fewer correctly explained why natural gas causes more pollution than biogas. What was wanted was the idea that biogas is carbon neutral, that the carbon dioxide released when it is burnt is balanced by the carbon dioxide taken in by the plants that eventually are used to make it. To say that natural gas simply produces more carbon dioxide when burnt was insufficient for the mark.

Question 13

(a) The majority of candidates did not get full marks, and the wide variation of answers seen may be an indication that many candidates were simply guessing. Candidates should be made aware that the standard of their hand writing is important, particularly in questions like this. If the answer for the first part, 'lactase', was written so it looked like, or couldn't be distinguished from, 'lactose', one of the distractors, the mark could not be given.

(b) Many candidates correctly explained that immobilised enzymes would be more easily recovered or used again. The most common incorrect answer was that they would work faster or better in some way than non-immobilised enzymes.

(c) Most candidates knew that adult cats are lactose-intolerant, that they can not digest lactose, and the best answers went on to describe the symptoms of diarrhoea or wind if milk is taken.

B635 Report on Gateway Science Skills Assessment

A General Comments

Although this is the second year of this specification, for many centres who did not enter candidates last year, this was the first time work had been moderated.

The Skills Assessment for Gateway is very different from the previous Sc1 Coursework component of GCSE and which represented a 'common assessment element' for all Awarding Bodies. For Science, there are two components Can-Do Tasks and Science in the News.

The new Skills moderators appointed by OCR were provided with training in the new requirements, and it is very pleasing to report that the process of moderation, despite large numbers, went very smoothly and that most of the candidates who were entered gained great benefits from all aspects of the Skills Assessment.

Candidates were entered for Skills Assessment 1 (Can-Do tasks and Science in the News) for 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
B625	Science	762	90810
B635	Biology	202	7941
B645	Chemistry	150	5536
B655	Physics	148	5419

It is possible that candidates use the same piece of Science in the News for more than one specification. However, each specification is moderated separately so if the same piece of work is used it must be copied each time it is used. Marks cannot be just transferred from one specification to another.

B Administration Matters

Administration matters - general

Teachers are required to supply, for each of the candidates chosen in the sample, a breakdown of the marks awarded for the Can-Do tasks together with the marks awarded for each of the six Qualities in the Science in the News Task which had been chosen for assessment. Although the form gives spaces for dates these are for internal use and are not required by the Moderator.

It is pleasing to report that there were fewer arithmetical errors in Can-Do tasks than in the previous year. If moderators find any mistakes in the sample, the centre will be asked to check the arithmetic of the whole sample. Centres must use the Can-Do tasks in the system, they cannot devise their own. In a separate science e.g. Physics all the Can-Do tasks must be from the Physics list.

Administration matters – selecting tasks for Science in the News

One of the strengths of Gateway Skills Assessment is that all of the materials which are required for each of the Science in the News tasks are provided by OCR and are available on the secure Interchange website. Teachers do not need to invent tasks to be done but can download suitable materials.

Initially one task was provided for each module B1, B2, C1, C2, P1 and P2. There were also tasks for B5 or B6, C5 or C6 and P5 or P6. A task set for P1, for example, cannot be used for B1 and a task from P5 or P6 cannot be used for Science.

New tasks have been added to the Interchange website in June 2007 and June 2008 to provide even more choice. There will be a continuing programme for the addition of new topics year by year to keep the specification up-to-date. No task will be removed from the listing during the lifetime of the specification but teachers may decide that some of the tasks have become less relevant with the passing of time. In this way it is hoped that OCR will be able to reflect any changes in the way in which the contents of the course are linked to current scientific issues.

At the initial INSET training sessions '*Should smoking be banned in public places?*' was used as an exemplar task for discussion and development but this was not included in the listing of the tasks available for assessment because it was felt it had lost relevance since the decision had been made and become law. A few centres still used this task for assessment this year and it was accepted so that candidates were not disadvantaged. However, it will not be accepted in future years.

There is the facility for centres to write their own Science in the News tasks. No centre has done this yet and obtained the necessary approval. Centres are reminded that if they want to develop their own SinN tasks they should seek advice from OCR before writing them, and that topics need to be approved before they are used.

There were some problems where centres were attempting to double enter from Entry Level. Tasks that were suitable for Entry Level e.g. Chocolate are not appropriate for GCSE Science.

Administration matters - Supervision of Skills Assessment

Another of the strengths of Gateway Skills Assessment is that the assessed work is under the direct control of the teacher. All SinN are written under controlled conditions where the teacher can sign the Centre Authentication Form (CSS160) with confidence.

The teacher should give the candidates the OCR stimulus material for a task after the topic has been studied so that they are fully equipped with the background to the task. The teacher can read through the stimulus material and explain any scientific words but they must not give any opinion. The stimulus material is not differentiated and the same task is presented to candidates across the whole attainment range. One approach with lower-attaining candidates is to provide only the appropriate parts of the stimulus material, rather than presenting them with the complete document. OCR provides a writing frame which could be used with lower-attaining candidates. Centres are allowed to use their own writing frames providing they are generic i.e. the same writing frame for all tasks. Writing frames are not recommended for more able candidates as it will tend to limit their approach.

There is considerable evidence that candidates do their best when they are given independence to study the topic and look at both sides of the argument. Too often when reports are read one gets the impression that the candidate has really not looked at both sides of the issue.

Administration matters – research time

Each topic requires the candidates to undertake some research for themselves in a period of approximately one week. This research could be done in school, either in the laboratory or a computer facility or it could be done at home. The candidates do not need to be supervised during this preliminary research and they do not necessarily need to work on their own. If the preliminary research is done in school, teachers can provide some materials to get the candidates started with their task. However, it was felt that in some centres the candidates had been provided with a complete list of source material for use and the necessary element of choice and selection for relevant aspects on the part of the candidate had therefore been removed. With the previous POAE system it was often felt in Strand A that teachers did not give opportunities for students to select appropriate equipment, it is similar here. The best reports came where students had the freedom to investigate the question set.

Where there are a large number of candidates in the sample it is reasonable to expect:

- different source materials to be used,
- different processing to be done, for example, not all candidates having the same bar chart display,
- candidates to answer the question in different ways.

Administration matters – supervised session

When the preliminary research has been completed, the SinN tasks are written up under controlled conditions in the classroom/laboratory. Candidates are required to work independently and, although a time of 1 hour is suggested, the centre may use more or less time as required. If it extends beyond one lesson, the work should be collected in between the sessions and stored securely.

A limit of 400-800 words is also suggested in the specification. There is no automatic penalty for reports that are longer but long reports, often including large sections copied from a website/book etc, may lose the tightly-focussed structure which is required for a clear match to the 6 mark standard in Quality A.

Candidates can bring into the session completed charts/graphs that they have done together with a completed bibliography. This will prevent time being wasted during the session.

Most of the reports submitted for moderation were hand-written and subsequently photocopied, but centres should ensure that it is possible to read the photocopy and that any annotation by the teacher explaining why particular marks have been awarded is visible. In cases where the photocopy is difficult to read the moderators will automatically return the work to the centre.

Some reports were word-processed and this is acceptable providing the centre can ensure:

- that no complete or largely complete report is brought into the writing session on a USB storage pen or in any other electronic format
- that no completed report is taken out or e-mailed to another person.

If these conditions cannot be guaranteed, it is not possible for the teacher to sign the Centre Authentication Form, and hand-written reports should be used.

Under no circumstances should any Science in the News tasks be drafted and subsequently redrafted. The report produced at the end of the supervised writing session is what has to be submitted. If there are deficiencies, this should be reported to students and they should be told to avoid these when they do their next SinN. There was clear evidence that drafting and redrafting went on in a very small minority of Centres. Evidence of drafting and redrafting of candidates' reports or too much coaching will lead to the work not being accepted for moderation.

C Can-Do tasks

Can-Do tasks are an important part of the Gateway Science specification. They are motivational for students at all attainment levels. The Tasks ensure that practical Science is an important aspect of the specification, and they can also ensure that ICT is used appropriately.

They are not expected to differentiate candidates at Grade C and above.

The Tasks can be used throughout KS3 and KS4 and candidates at an earlier stage will clearly benefit from having their positive achievements rewarded. All the teacher needs to do is to record the tasks each candidate achieves. These tasks must be credited for individual work and not for a group of candidates collectively completing a task. All aspects of a task must be completed before credit is given and it is not possible to award 1 or 2 marks for a 3 mark task.

Centres are not expected to provide any evidence for the moderator to support the awarding of marks for Can-Do tasks.

It is pleasing to see that candidates are taking these seriously and centres are reporting the benefits of motivation of candidates at all levels but especially with lower-attaining candidates.

D Science in the News

Approach

Since Can-Do tasks will not differentiate at Grade C and above, it is essential that the necessary differentiation between the levels of attainment of candidates is obtained using Science in the News.

The mark descriptors need to be applied hierarchically. They can only be awarded when the whole statement is fully matched.

It was still clear that in some centres the candidates had not been fully prepared, and they had been given the task to do without a clear idea of what was required. It is also clear that in some centres only one SinN task has been attempted. This does not provide an opportunity for candidates to improve their performance. Some centres conduct SinN under examination conditions. There is nothing wrong with this but it is not essential.

It has always been OCR policy to encourage teachers to annotate coursework. As candidates may attempt several SinN this represents a burden on teachers when, in reality, very little of the work will be seen by a moderator. It is recommended that the emphasis should be given to reporting back to students so they can improve in the future. When the sample is requested by the moderator, a little time should be spent annotating the reports that have to be sent. In particular annotation should concentrate on why intermediate marks (i.e. 1, 3 and 5) have been awarded. The aim of annotation is to provide evidence that the moderator is able to accept in support of the marks awarded by the centre.

It is important that internal standardisation is carried out and the moderator informed of the way in which it has been done. Several Centres had clearly not internally standardised the marks and consequently the rank order was not valid. In such cases the sample had to be returned to the centre, and it is not desirable for the teachers at centres, for moderators or for OCR if work has to be returned at the beginning of June to be re-marked. It is possible that the marks of a whole centre could be reduced if one or two teachers have over-marked and internal standardisation has not taken place.

Quality A (Approach to the Task)

Candidates who do not undertake any research of their own cannot be awarded a mark in Quality A since the use of the OCR source material does not count for research purposes. However, candidates who do not do any research for themselves are able to gain marks in the other five Qualities.

It is important candidates read and prepare to use the source material before entering the supervised session. This could be compared with the way they would prepare for an exam with pre-release material. Reports sometimes show that nothing has been done with the source material before the supervised session. Criticisms of exams with pre-release material are often centred on candidates not using pre-release material fully. This is certainly the case here.

For 2 marks candidates only need to use one source - from a book, newspaper, Internet etc. The source does not have to be referenced.

For 4 marks, however a candidate must use more than one source. Two sources are sufficient and it helps later in their report if one source is for and one source is against the question posed. It is essential that not only that each of the sources is fully referenced so that it can be checked, but also that it is clearly identified where it has been used in the report. A reference such as www.bbc.co.uk does not provide sufficient information but www.bbc.co.uk/science/hottopics/cannabis does. Without this level of referencing it is very difficult to support a match to 4 marks.

For an award of 6 marks it has to be clear that the sources have been used correctly to produce a structured and balanced report. A good 6 mark report will look at evidence for both sides of the argument. Centres are reminded that 6 marks are awarded for the quality of the research and how it is used, rather than the quantity of research which has been done. Little credit can be given where large amounts from a website are just pasted in but not used even if the work is fully referenced.

It is recommended that candidates attach their preliminary research to the back of the report which has been produced during the supervised session. This will assist the teacher in marking the report since it will save having to go back to the sources to check the information. This preliminary work may also be sent to the moderator as supplementary information, but this is not a requirement. Moderators are expected only to moderate the report. They are not required to look for evidence in research material as this was not produced in the supervised session.

Quality B (Analysis of the data)

The award of marks for this quality is dependent on the candidates actually processing the information/data which they have collected.

For 2 marks the candidate needs to identify a simple trend or pattern e.g. '*...more women get skin cancer than men...*'. It is not sufficient to quote just a fact e.g. '*...7000 women in England get skin cancer...*'. Trends can come from the OCR source material or from the candidate's research. There are always ample trends and/or patterns within the OCR source material. The trends quoted must be correct.

Report on the Units taken in June 2008

For 4 marks there must be evidence of more than one trend, although which is the main trend may not be obvious, and some processing done by the candidate. This could be by drawing a graph, pie chart or bar chart from the data, calculating averages or percentages, or extracting data from a graph. It is important that the processing is correct. A poorly drawn graph with incorrect scales or incorrect average calculations will not gain credit.

Few candidates progressed beyond 4 marks. It is not sufficient just to pick out an apparent anomaly in data. To secure above 4 marks the candidate must do some further processing to identify some new information or to identify anomalies. In a few cases it was apparent that a candidate was told to take a particular approach to get 6 marks but did not fully understand what they were trying to do.

One example of a true 6 mark response is when a candidate looks up the population of women in England, Wales, Scotland and Northern Ireland and uses the information to work out the number of cases in each country per million women. They find out that the rate is the same in England and Wales but significantly more than in Scotland and Northern Ireland. The rate is identical for women in Scotland and Northern Ireland. Candidates are not expected to give a reason why this difference exists but just to identify this information. It is appreciated that this represents a high level of processing of data above the level of processing used for 4 marks.

The moderator does expect to see different approaches to the same Task from different candidates within the Centre.

Quality C (Evaluation of the data)

The accuracy, reliability and validity of data are important aspects of Science National Criteria and they are assessed in Science through SinN. There are still some reports where these are totally ignored and so a mark of zero has to be awarded. Candidates found consideration of accuracy difficult in SinN.

For 2 marks the candidate needs to make some comment about the quality of the sources used or the data within them.

For 4 marks the candidate must compare the reliability of different sources and explain why one source is likely to be more reliable than another. There were still few marks above 4 because candidates did not understand what is meant by validity and appreciate that validity can only be considered when reliability has been established.

Quality D (Relating Data to the issues)

Again social, economic and environmental aspects of the topic are an important part of Science National Criteria and which some centres did not develop sufficiently with their candidates.

Different SinN tasks provide different opportunities for consideration of social, economic and environmental aspects, and it is difficult to link all three of them in some tasks. Teachers should remember that the 2, 4 and 6 mark descriptors are loosely linked to performance at F, C and A respectively. So when awarding 2 marks teachers should ask whether the response matches the expectation from an F grade candidate. Similarly, performance at C and A can be the evidence for awarding 4 and 6 marks. It is not necessary to cover all three aspects even at 6 marks providing the approach to these aspects is at a suitably high level.

Often these social, economic and environmental aspects were diffused throughout reports rather than in a separate section. This does not affect the mark awarded but makes it more difficult for both the teacher and the moderator.

Quality E (Justifying a conclusion)

All of the tasks are posed as questions and therefore need an answer. There are fewer examples of candidates not attempting an answer to the question this series. No marks can be awarded where no decision is reached. In some cases it is obvious that the decision has been made before the question was studied. The aim is candidates come to a decision as a result of their studies.

For 2 marks the candidate needs to decide 'yes' or 'no' and then give a reason. The use of the word '*...because....*' in the candidate's response is useful but not essential. For a match to 4 marks the candidate does need to link clearly their choice to two particular sources. For 6 marks a candidate needs to decide which source is more significant. It was still the case that few candidates could do this. It is here that researching sources with different viewpoints becomes helpful.

Quality F (Quality of written communication)

Centres were quite good assessing this Quality. However, the use of a scribe to write the report for the candidate could limit the mark that can be awarded.

For 2 marks there could be many mistakes but it would still be possible to read the report.
For 4 marks there should start to be the use of scientific vocabulary correctly used.
For 6 marks there are few errors and a good use of scientific words.

Some reports had been word-processed and a spell-checker obviously used. Candidates do need to take care when using spell-checkers since it can result in significant errors, for example '*...defiantly..*' instead of '*..definitely..*'.

E Summary Comments

The job of moderators is to try to support the decisions of centres. Where the marks are outside tolerance and adjustments have to be made, the work was always considered by at least two moderators.

Moderators were encouraged to provide useful reports for Centres. The moderation was accomplished efficiently and effectively, despite the new scheme and many totally new moderators. Much of the success was due to the work of Team leaders in co-ordinating their teams.

Cluster group meetings, attendance at OCR INSET meetings and meetings arranged in-house all provided centres with an appropriate awareness and understanding of the new framework. Centres should have copies of the Science Support booklet (which is also available on Interchange).

Many Centres have used the free OCR Coursework Consultancy service. Each year a Centre can submit good quality photocopies of three marked SinN reports to OCR. They will then receive a written report from a senior moderator on the quality of the marking. This means centres can then enter candidates for moderation with some confidence.

F 2008 Grade Thresholds for B625

The distribution of marks for Science in 2008 was very similar to the distribution of marks for 2007.

Grade boundaries for 2008

	Grade threshold							
	Max. mark	A*	A	B	C	D	E	F
Can-Do tasks and SinN	60	53	49	44	40	35	30	25

Since the same work can be submitted for Science in the News for Science and separate sciences the same boundaries apply for B635, B645 and B655. Approximately two thirds of the separate science cohorts used Science Skills Assessments rather than Additional 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.

Changes to Science in the News Level of Response Grid

Following consultation with teachers and moderators, OCR has made a number of changes to the wording of the Level of Response Grid to assist teachers in interpreting the qualities to be assessed.

The revision to the wording will not have an impact on the number of marks awarded or the standard of the assessment for each quality assessed. This means that any work that has been marked already using the original Level of Response Grid for guidance does **not** need to be marked again.

Centres will be notified of the nature of these changes through a Notice to Centres in October and through our website (www.ocr.org.uk).

B636 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
Biology B (Specification Code J643)
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B631/01	Raw	60	-	-	-	38	32	26	20	14	0
	UMS	69	-	-	-	60	50	40	30	20	0
B631/02	Raw	60	44	37	29	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B632/01	Raw	60	-	-	-	33	26	20	14	8	0
	UMS	69	-	-	-	60	50	40	30	20	0
B632/02	Raw	60	44	36	28	21	15	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B635/01	Raw	60	53	49	44	40	35	30	25	20	0
	UMS	100	90	80	70	60	50	40	30	20	0
B636/01	Raw	60	52	47	41	36	30	24	18	12	0
	UMS	100	90	80	70	60	50	40	30	20	0

B635 & B636 - 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
J643	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
J643	20.6	48.2	72.6	88.6	94.8	97.9	99.2	99.7	100.0	10672

10815 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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