



**GCSE**

**Science B**

Gateway Science Suite

General Certificate of Secondary Education J640

## **Examiners' Reports**

**June 2011**

**J640/R/11**

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### **Science B (Gateway) (J640)**

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# Chief Examiner's Report

## General Comments

The entry for B621/01, B621/02, B622/01 and B622/02 dropped slightly from the corresponding session in June 2010, possibly because of a shift towards the separate sciences and vocational courses.

The papers produced a full range of marks and mean marks were all in the range 26.9 to 30.2. Centres appear to have the correct entry policies with only a small number of candidates who may have been entered for the incorrect tier.

Candidates have improved their ability to tackle questions involving extended writing. Good use is made of the bullet points which are provided to structure an answer.

Candidates perform well on questions requiring data analysis and interpretation and can successfully carry out calculations involving selection of the appropriate formula, substitution and use of calculator to arrive at the final answer. A small number of candidates appear not to have access to a calculator.

The writing of chemical equations continues to improve with candidates taking more care over the use of subscripts and upper and lower case in atomic symbols.

Areas of the specification that candidates find difficulty with include

- first class proteins
- vasodilation
- binomial system
- conditions for polymerisation
- explanation of how fractional distillation works
- specificity in catalysis
- Earth structure
- evolution of the atmosphere
- reasons for the location of nuclear power stations
- advantages and disadvantages of nuclear power.
- changes of state
- cooking with infrared and microwaves
- how photocells work
- interpretation of data on penetrating power of radiation

# B621/01 Foundation Tier

## General Comments

Candidates in general found the paper accessible. Most attempted all questions: there were few blank responses. Few candidates, however, scored in excess of 50 marks.

Centres with candidates using scribes should be aware that some questions require the use of sub and super scripts in the formulae of chemical compounds. A number of these scripts lost marks by not showing this.

It was very pleasing to see that candidates are able to calculate molecular formulae and count the number of atoms in a formula. The ability of candidates to manipulate data seems to have improved. Most pupils were able to read figures from a graph with a reasonable degree of accuracy and answers requiring a calculation were generally well answered.

Two questions, Q 3a(iii) and Q 11a, were found to be too demanding at this level with only one or two correct responses.

Most pupils had a good idea about the science behind each topic but vague answers were still apparent. Often single words were used such as 'soft' and 'safe' rather than complete phrases or sentences. It was clear that in some cases candidates knew the correct answer to a question but once again had been unable to express it in clear scientific terms. In a number of instances candidates seemed unable to read the question with a sufficient degree of accuracy to understand its full meaning. This is more to do with the student's ability to interpret rather than the difficulty of language used in the question.

In the physics component of the paper pupils were confused regarding the difference between reflection and refraction and in general seemed unsure about the science behind heat transfer.

## Comments on Individual Questions

### Section A

#### Q1 (a) (i)

This was generally well answered. Candidates are able to derive information from graphs.

#### Q1 (a) (ii)

This was similarly well answered, with most candidates able to extract 6 minutes from the graph.

#### Q1 (b)

A number of candidates scored 1 mark by identifying that oxygen is needed for exercise, however, many candidates thought an increase in blood was required. Fewer candidates knew that carbon dioxide or lactic acid were the waste products.

#### Q1 (c) (i)

This was very well done but the spelling of the word thermometer was poor.

#### Q1 (c) (ii)

Few candidates understood that the body temperature is maintained at 37°C before, during and after exercise. Many candidates chose higher temperatures.

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**Q1 (c) (iii)**

This was reasonably well answered. A few answers were seen along the lines of needing to lose liquids and some about losing weight by sweating, or fat being metabolized as a result of exercise.

**Q2 (a) (i)**

This was generally well done.

**Q2 (a) (ii)**

About half the candidates knew that the nucleus contains the genetic material.

**Q2 (a) (iii)**

Very few candidates knew that genes mutated.

**Q2 (a) (iv)**

This was a difficult question with only a handful of candidates able to score a mark for 100%.

**Q2 (a) (v)**

Few candidates identified the retina in the picture of an eye.

**Q2 (b) (i)**

Few candidates understood the meaning of the word 'type'. Most candidates wrote down the name of a drug. The answer expected was 'depressant'.

**Q2 (b) (ii)**

Most candidates knew that vision becomes 'blurry' after consuming too much alcohol.

**Q3 (a) (i)**

About half the candidates recognised that 'kwashiorkor' was the condition suffered due to lack of protein.

**Q3 (a) (ii)**

Many candidates were able to complete the calculation.

**Q3 (a) (iii)**

Only a handful of candidates came close to getting this. Answers fell into 2 categories: explaining that protein was good for growth and repair and that meat and fish have the best protein in them.

**Q3 (b)**

Pupils have little understanding of the life cycle of the malarial parasite although the mosquito was usually correctly identified as the carrier and blood was believed to be involved somewhere. Ideas about 'bugs', 'viruses' and 'germs' were frequently seen. The method of transmission was very poorly understood with a significant proportion of candidates believing the Malaria was sexually transmitted, passed on by contact or by drinking dirty water.

**Section B**

**Q4 (a)**

This was reasonably well answered. A number of candidates lost 1 mark because they referred to germs.

**Q4 (b)/(c)**

These questions were well answered.

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**Q5 (a) (i)**

It was disappointing to see that less than half the candidates knew that plastic bags are usually made of poly(ethene).

**Q5 (a) (ii)**

More candidates knew that polymers are used to make shirts.

**Q5 (b)**

This was quite well done. A few candidates did not understand that moulded means shaped not growing fungus.

**Q5 (c)**

This was a very poorly answered question. Few candidates knew about polymerisation.

**Q6 (a)**

Many candidates were able to count the number of atoms in the formula as 14.

**Q6 (b)**

This was very well done. The table format enabled almost all candidates to write down the correct molecular formula. Some lost marks by writing C3H8 or using superscripts, and a few put h rather than H.

**Q6 (c) (i)**

This was well done, but some candidates added the two numbers together and wrote the rise as 56 not 26.

**Q6 (c) (ii)**

A number of candidates got 1 mark from the idea that the blue flame was hotter. Some indicated that the blue flame shouldn't be used because it would get too hot and break the beaker and the yellow flame was described as a safety flame. Very few mentioned incomplete/complete combustion.

**Q7 (a)**

Few candidates could identify a polymer; a few more recognised a hydrocarbon.

**Q7 (b) (i)**

Only a handful of candidates knew that acids react with alcohols to make esters.

**Q7 (b) (ii)**

This was well answered. Most went for flowers as a source of perfume. Of the incorrect answers, water was the most common.

**Q7 (b) (iii)**

Few candidates knew that a nose has smell receptors or sense cells. Many went for ideas about nose hairs.

**Q7 (b) (iv)**

This was well answered, and many candidates were able to describe why perfumes need to be tested.

## Section C

### Q8 (a) (i)

All candidates were able to choose the object that had the highest temperature.

### Q8 (a) (ii)

Most candidates chose which two objects cooled down.

### Q8 (b)

Few candidates realised that foil reflects heat, a number saying that foil keeps heat in without explaining how. Answers lacked clarity and pupils frequently wrote about 'foil insulating' or 'keeping cold air out'. Some candidates incorrectly used the word 'bounce' for reflect.

### Q9 (a)

About half the candidates knew that the signal used by mobile phones is a microwave.

### Q9 (b)

Many candidates knew that infrared is the signal used to transfer photographs remotely from a mobile phone.

### Q9 (c)

Brain damage was the expected answer. Many candidates wrote about damage to hearing/deafness; ruining eyesight by staring at screens; arthritis from texting; and the usual social dangers.

### Q9 (d)

Many candidates managed to score 1 mark out of 2 for the idea of portability, often just explaining the same idea twice in different words.

### Q10 (a)

Most candidates were able to describe at least one way in which ultraviolet radiation can harm. A number of candidates lost a mark by referring to 'cancer' not 'skin cancer' as was required.

### Q10 (b)

This was reasonably well done for 1 mark. Commonly, candidates wrote that 'high SPF provides more protection' without saying in what way. Mostly the problem here was that candidates explained what the sun cream did rather than saying why high SPF is better than low.

### Q11 (a)

Few candidates explained the meaning of frequency. Many candidates confused frequency with speed of waves.

### Q11 (b)

This was very well answered, and most candidates gave the correct answer of 0.12 m/s.

### Q12 (a)

Only a handful of candidates knew that light travels along an optical fibre by total internal reflection.

### Q12 (b)

A few candidates managed to score 1 mark for recognising that digital signals can be either 1 or 2, on or off etc. Hardly any candidates completed the second and third parts of the question correctly.

# B621/02 Higher Tier

## General Comments

- In general the paper was balanced and accessible to all candidates and very few candidates failed to complete the paper.
- Most candidates were able to answer the examination paper with very few "No Responses" being given. The paper produced a wide range of marks.
- Overall, candidates performed fairly well on this paper and marks ranging from low teens to mid-fifties were seen.
- There were a few candidates that seemed to have been inappropriately entered for this Higher Tier paper and the Foundation Tier might have been more appropriate.
- The calculations on the paper were answered well by candidates of all abilities.

## Comments on Individual Questions

### Q1 (a) (i)

Nearly all candidates identified the correct answer with the most common incorrect responses being scurvy and constipation.

### Q1 (a) (ii)

Most candidates scored 1 mark. Only a small minority failed to score by giving 3000 or 300 or by not calculating the answer.

### Q1 (a) (iii)

This was poorly answered by most candidates, often referring simply to proteins or nutrients. Even those quoting amino acids gave weak responses such as 'humans can't make amino acids', or just 'contains amino acids'.

### Q1 (b)

Weaker candidates often had some confusion as to what was the host, the parasite etc. A number of candidates wrote about the mosquito as the parasite. Even the weaker candidates knew that the malaria was carried in the blood of humans but often also described various methods of transfer e.g. dirty water, sneezes and contact with others.

### Q2 (a) (i), (a) (ii), (a) (iii)

Weaker candidates did not answer these questions successfully with many giving a general description of what a stimulus, receptor and effector were as opposed to identifying them in the example given. Most mistook hearing for stimulus and sensory nerve for receptor and running for effector.

### Q2 (b) (i)

Many said *no* oxygen, or worryingly that his body couldn't *make* enough oxygen. Also seen were frequent descriptions of what anaerobic respiration did rather than why it was happening.

### Q2 (b) (ii)

This was well answered in general, but some candidates thought that lactic acid made muscles stronger/work better.

### Q2 (c) (i)

This was very poorly answered. There were many descriptions of blood vessels widening but very few scored marks because they missed the fact that *more* blood was getting to the surface. Many candidates think that blood vessels come to the surface.

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**Q2 (c) (ii)**

Very few candidates knew how vasodilation increased heat transfer. Heat transfer methods were seldom mentioned.

**Q2 (c) (iii)**

Most candidates gave responses relating to the 'body' or 'cell activity' being best at 37 degrees. Only the most able gave answers relating to enzyme activity.

**Q3 (a) (i)**

Many candidates scored full marks, although details of how they reached the answer were often unclear. Most gave the punnet square and percentage.

**Q3 (a) (ii)**

Most wrote 'he doesn't want to know ...' or referred to offspring, but there were a lot who suggested he would know that he had it because he had the same genes as his brother.

**Q3 (b) (i)**

There were very poor responses to this question overall. Reference to huntingtin was extremely rare (some mentioned H). Several discussed different base codes but failed to mention protein.

**Q3 (b) (ii)**

Too many candidates had not clearly thought out the situation and gave unrealistic suggestions but the most frequent correct response was 'did not want to know'.

**Q4 (a)**

Most candidates gained 2 marks from better taste and either easier to digest or killing microbes.

**Q4 (b)**

Some candidates realised that the cell wall broke down, very few that starch granules burst but very few related this to enzyme activity.

**Q5 (a)**

The need for a catalyst was well known but high pressure was given by only a small minority; most opted, incorrectly, for high temperature.

**Q5 (b)**

This was generally a high scoring question, although giving off gases was a common response that did not score.

**Q5 (c)**

This was very well answered.

**Q5 (d)**

This was generally answered well, although only the most able gave responses linking the strength of the cross links to the strength of the polymer; answers often referred to the cross-links but very few to them being 'strong'. There was a greater use of intermolecular forces than bonds in responses and it was clear that many were unaware of the importance of the bonds between chains.

**Q6 (a)**

Many correct responses were seen with very few wrong numbers and only a very small number of candidates giving superscripts rather than subscripts.

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**Q6 (b)**

There seemed to be an improvement in the number of correct responses to this type of question in this paper. However, too many candidates were confused about what was expected with many responses describing "cracking" and breaking large molecules into smaller ones. Many responses concerned larger molecules coming out at the bottom and smaller hydrocarbons coming off at the top, essentially describing the fractionating column. Another common error was for candidates to describe different molecule sizes and boiling points without specifying whether they were large or small.

**Q6 (c) (i)**

Although this part was generally well answered, many thought that the yellow flame burnt without oxygen.

**Q6 (c) (ii)**

This was generally a high scoring question. Those failing to score either used 69 instead of 54, or miscalculated the temperature change.

**Q6 (d)**

This question did not cause any issues and a large number of candidates scored the mark.

**Q7 (a) (i)**

In the main this question was well answered.

**Q7 (a) (ii)**

F was the most common incorrect response.

**Q7 (b) (i)**

This was a well answered question.

**Q7 (b) (ii)**

Most candidates quoted perfumes but a small number gave nail varnish remover or solvents/plastics as a response.

**Q8 (a)**

This part was answered well, although some weaker candidates gave a description of what they understood by the word frequency.

**Q8 (b)**

This calculation was very well done. Hardly any candidates did not score both marks although a few copied data incorrectly ( $3 \times 0.4$ ) or wrote  $0.12 = 12\text{m/s}$ .

**Q9 (a)**

TIR was rarely seen as an answer. Mostly candidates just referred to 'reflection' or 'refraction' in approximately equal amounts.

**Q9 (b)**

On/off was often the given response but very few got the 'varying' with even fewer the 'pulses' mark.

**Q9 (c)**

Although responses were better than in previous exams, still far too many candidates think that digital signals are faster or more modern, but most got the idea of less interference. Weaker candidates confused this with wireless connections.

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**Q10 (a)**

Candidates often wrote about 'skin reflecting rays' or failed to say that more UV was absorbed.

**Q10 (b)**

This was generally a well answered question but a significant number of candidates either were not aware of a formula or just gave a ball park safe option factor in region 30 – 50.

**Q11 (a)**

Many correct answers were seen to this question but the most common incorrect response was A and C, from incorrectly reading the question.

**Q11 (b)**

Many of the weaker candidates gave similar responses to that given in question 4(b). Water was well known, but conduction given only by the better candidates.

**Q11 (c) (i)**

Very few candidates scored the mark with many focusing on 'energy being used to change state' or 'move/vibrate more' plus 'no change in temperature/change state' instead of breaking intermolecular bonds.

**Q11 (c) (ii)**

This was generally a well answered question. Most incorrect responses multiplied 135 x 60.

**Q11 (d) (i)**

There were some very poor responses to this question. Weaker candidates talked about power/strength or cooking from outside – in and inside – out.

**Q11 (d) (ii)**

Again this was not well answered. When discussing microwaves, candidates had the idea of food being heated right through but very few realised that ALL the waves were being absorbed by the food and how this was aided by reflection within the oven.

# B622/01 Foundation Tier

## General Comments

The paper performed well with centres again entering candidates for the correct tier of paper, as shown by the statistics which show that less than 1% of the candidates scored above 50 marks, i.e. would have been suitable for a higher tier entry.

There were five questions for which a significant number of candidates were unable to give an answer. These were 1(b)(i), 3(c), 6(c), 8(a) and 12(b). Those questions which had the highest percentage of correct answers were 2(a), 2(c)(ii), 6(a) and 7(a).

## Comments on Individual Questions

### Section A

#### **Q1 (a)**

The majority of candidates were able to use the key to identify the plants. Several candidates ignored the first box and chose one from each of the boxes below, A was identified from the box on the left and B from the one on the right.

#### **Q1 (b) (i)**

The majority of candidates were unable to name the square grid as a quadrat, and almost a quarter of candidates gave no response to this question. It was clear that few had seen or used this piece of equipment.

#### **Q1 (b) (ii)**

This was well answered. Examiners were looking for one from space, nutrients, water or sunlight, and accepted light on its own but not sun on its own.

#### **Q1 (b) (iii)**

The fact that there were more of plant A or that plant A was the larger were the two most common correct answers to part.

#### **Q1 (c)**

This produced some interesting answers and spellings. Candidates were not given a list to choose from, increasing the demand of the question. The majority of candidates were able to score at least 1 mark on this question, with better candidates scoring all four. The most common error was chloroplast instead of chlorophyll for the second response and an incorrect reading of the third sentence where candidates missed out "and releases a gas" giving the answer "glucose".

#### **Q2 (a)**

Most candidates answered correctly "camouflage" or gave a correct descriptive answer

#### **Q2 (b)**

Only the better candidates linked the small ears to heat loss, the most common incorrect answers were "to stop them being seen easily" and "to prevent snow getting into them". It was clear from the answers that many candidates had not seen this type of graph before and only about a third of the candidates were able to give the correct range.

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**Q2 (c) (ii)**

This was answered well with the majority of candidates choosing the correct answer 'habitat'.

**Q2 (d) (i)**

Weaker candidates confused "endangered" with "extinct" but the majority of candidates gave a correct explanation.

**Q2 (d) (ii)**

Most candidates said that the ice would melt but a large number of candidates related this to the ozone layer rather than to the greenhouse effect.

**Q3 (a)**

Despite the instruction to draw **one** line, a large number of candidates drew more than one line with either one from each box on the left or one to each box on the right.

**Q3 (b)**

Most candidates knew that the flesh decomposed.

**Q3 (c)**

This part proved difficult, with few candidates knowing that fleas were parasites and many gave descriptions in terms of words like disgusting and unhealthy.

**Q3(d)**

Most candidates chose the correct response.

## Section B

**Q4 (a)**

This caused problems for many of the candidates, especially with Iron, where 'does not bend' was given as the most common answer.

**Q4 (b)**

The majority of candidates knew that water and oxygen were needed to make iron rust, and examiners accepted air in place of oxygen.

**Q4 (c)**

Candidates tended to repeat the question in answer to this part, giving 'conducts electricity' as an answer despite being asked for another reason. Acceptable answers included "can be made into wires" "can bend" "does not corrode".

**Q5 (a)**

This was a random choice for many candidates, and whilst D was slightly in front, there was little to choose between all four.

**Q5 (b)**

Few candidates scored all three marks, and of those choosing C, many only explained one of the reasons rather than the increased rate of reaction and that the material was not used up. Those choosing A, B, or D could score 1 mark for a correct explanation of the factor ('material not used up' for D and 'increased rate' for A and B).

**Q6 (a)**

Very few candidates were unable to score, naming a material used in building.

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**Q6 (b)**

Only about a third of candidates were able to put the materials in hardness order. About a quarter of candidates knew that clay and limestone heated together made cement, a popular wrong answer was brick. About half the candidates identified calcium carbonate as the chemical in marble and limestone.

**Q7 (a)**

This was answered correctly by most candidates with 94% of candidates giving the correct answer.

**Q7(b)**

About half the candidates knew that the core was mainly iron.

**Q8**

This proved difficult for candidates, with few candidates achieving both marks. Acid rain was the most popular correct answer in the table. Surprisingly, only 25% of candidates correctly gave the number of atoms in calcium carbonate as 5.

**Section C**

**Q9 (a)**

Few candidates realised that the waste from nuclear power stations is radioactive and many gave the answer 'poisonous' or 'toxic' which examiners did not credit.

**Q9 (b)**

The majority of candidates thought it was an easy way of getting rid of the waste.

**Q9 (c)**

This was one of the lowest scoring questions on the paper. Most candidates attempted the question but less than 15% managed to give the correct answer of reducing energy loss. The most common misconception was that it speeded up transmission of electricity.

**Q9 (d)**

Few candidates correctly identified the watt as the unit of power.

**Q10 (a)**

Most candidates scored 1 or more marks. The most errors occurred in the second sentence where candidates thought that the power depended on the volume of the photocell.

**Q10 (b)**

The majority of candidates knew that it would not produce electricity at night. A significant number of candidates confused the photocell with the battery and lamp that is usually attached in the garden solar lamp and gave incorrect answers such as "they only give out light at night" The majority of candidates correctly calculated the power of the LED.

**Q11 (a)**

This question was answered quite badly by the majority of candidates. Many candidates repeated the question in the answer, referring to species becoming extinct. This was surprising as the answers came directly from the specification, vis craters, fires, earthquakes etc.

(b) The majority of candidates gave a valid reason for monitoring NEOs.

**Q12 (a)**

Approximately half the candidates knew that a compass or magnet was needed to plot a magnetic field, however, very few candidates were able to give another way of producing a magnetic field. Examiners were looking for the idea of an electric current.

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**Q12 (c)**

About 50% of candidates could give valid uses for artificial satellites.

**Q13 (a)**

The majority of candidates identified the two other types of radiation as beta and gamma.

**Q13 (b)**

The majority of candidates could give at least one safety precaution. Often they scored only 1 mark by giving two examples of the same type of precaution, for example, wearing protective clothing and gloves.

# B622/02 Higher Tier

## General Comments

The paper gave candidates the opportunity to show what they know understand and can do. About 2000 candidates scored less than 15 marks and may have been better served by entry to the foundation tier. Most candidates could access the paper with very few questions omitted. There was no evidence of lack of time.

Performance on calculation questions was generally good, even by weaker candidates. The exception was question 10(c)(ii), where the majority of candidates failed to convert kilowatts to watts and scored 1 mark.

## Section A – Module B2

### Q1 (a)

Over half of candidates could state that heat loss was reduced or that having small ears gave a smaller surface area. Common incorrect answers referred to streamlining, hearing or stopping the snow getting into them.

### Q1 (b)

Part (i) was generally well answered with the most common incorrect answers being 3000 and 600. Part (ii) gave rise to a variety of correct answers including the difficulty of surveying such a large area, samples taken at different times and different sampling techniques used. Answers which just referred to total population size were not credited.

### Q1 (c)

This was well answered with better candidates describing how global warming arises and its impact on the ice caps. Weaker candidates thought that having more carbon dioxide in the air would make it difficult for polar bears to breathe and did not score. Some made reference to the ozone layer and lost the first mark.

### Q1 (d)

Only about a quarter of all candidates scored the mark in part (i). China was the most commonly misplaced country. Part (ii) was better answered with many correct references to developing and developed countries. Some candidates found it difficult to express their answers or concentrated on population size or the idea of wealth, which did not score.

### Q2 (a)

This question was well answered with most candidates stating that soft tissue would decay. Candidates who stated that soft tissue eroded or disintegrated did not score.

### Q2 (b)

'Binomial' was correctly stated by about a quarter of candidates. 15% of candidates did not attempt this question. Other candidates attempted to describe how the system worked or linked it to Georgian man and did not score.

**Q2 (c)**

Part (i) was answered correctly by just over half of all candidates. Most incorrect answers referred to 'mutualism' or 'vectors'. Part (ii) was better answered than similar questions in previous sessions. The marks were awarded for the idea of variation or mutation, idea of 'survival of the fittest' and inheritance or passing on of genes. In part (iii), over two thirds of candidates correctly stated that scratching does not involve genes or that acquired characteristics are not passed on.

**Q3 (a)**

This question was well answered by the vast majority of candidates. Occasionally 'light' featured in the equation and failed to score.

**Q3 (b)**

Few candidates scored all three marks on this question. Most gave the correct answer in column 1. Column 2 was sometimes correct and column 3 rarely correct. Answers in column 3 were frequently yellow then purple, although a range of other colours also featured.

**Q3 (c)**

This question was correctly answered only by the best candidates. Many struggled with the concept of limiting factors. Few answers were linked to the rate of photosynthesis. Common incorrect answers included 'carbon dioxide affects photosynthesis' or 'without carbon dioxide photosynthesis would not happen'.

**Section B – Module C2****Q4 (a)**

Disappointingly, only about a third of candidates scored both marks on this question. Where both marks were scored, it was usually for 'flexible so can bend around corners'. Most incorrect answers stated that copper was cheap, strong or easy to recycle. Candidates should be guided to select properties that they believe to be essential for the purpose.

**Q4 (b)**

Despite the question stating 'write down and explain one advantage and one disadvantage of using aluminium rather than steel to make car bodies', many candidates simply wrote down the properties with no attempt at an explanation and scored a maximum of one mark.

**Q5 (a)**

This question was generally well answered. Where candidates selected 'C', they often went on to explain that the rate of reaction increased and that the catalyst remains unchanged, thus scoring all three marks. Candidates who selected any other letter could score 1 mark for correct reasoning, i.e. if A or B was given, one mark could be scored for increased rate of reaction.

**Q5 (b)**

Many candidates had an idea of what specificity meant but were unable to express it clearly. Some candidates thought that specific meant that catalysts speed up the reaction or that they only did one thing, both of which did not score.

**Q6 (a)**

Just over half of all candidates scored this mark. A number had the rocks in the reverse order.

**Q6 (b)**

Less than half of candidates correctly stated 'cement'. Common incorrect answers included concrete, brick or calcium carbonate.

**Q6 (c)**

Part (i) was generally well answered, particularly by better candidates. Fewer candidates lost the mark for poor sizing of symbols e.g.  $\text{Co}_2$ . A number attempted multiples and missed out a number e.g.



thus failing to score. Part (ii) was better answered than in previous years with many candidates stating 'breaking down of a substance using heat'.

**Q7 (a)**

As expected, candidates found this to be a demanding question. Many candidates scored the mark for describing the temperature difference but often wrote about differences in density or hardness which were not worthy of credit. Answers referring to both temperature and rigidity were rare. A significant number of answers were confused or failed to make a comparison.

**Q7 (b)**

Only about a third of candidates wrote correctly about the plates being less dense but a number wrote about the plates 'floating'. A significant number of answers made no reference to density at all.

**Q8 (a)**

Most candidates scored the mark for photosynthesis or plants in the bottom box. Fewer stated 'carbon dioxide' as one of the gases in the upper box. Very few correctly identified 'ammonia'. The common incorrect answers for the gases were 'oxygen' or 'nitrogen'. Weak candidates wrote answers referring to dust, rocks or stars. Candidates were not confident with this question as there was a lot of crossing out and lines left blank.

**Q8 (b)**

Over half of candidates answered this question correctly. Most correctly transcribed the formulae but fewer went on to balance the equation correctly. A small number of candidates altered the formulae (e.g.  $\text{N}_2\text{O}$ ) and failed to score. As with question 6(c)(i), there was better attention to case when writing formulae this time.

**Section C – Module P2****Q9 (a)**

Only about a quarter of candidates correctly answered this question. An alarming number, at all levels of ability, thought that power stations were built by the sea in order to be able to dump waste into it.

**Q9 (b)**

In part (1) there was a variety of acceptable answers including reference to less air pollution or no contribution to global warming. Significant numbers of candidates thought that uranium was renewable or gave vague answers such as 'less pollution' which were insufficient to score. Part (ii) was poorly answered. Again there was a wide variety of acceptable answers. Many candidates failed to explain their answers in terms of waste being produced; they thought that the uranium was the problem rather than the radioactive waste.

**Q9 (c)**

This question was better answered than in previous years, with many better candidates offering higher level answers in terms of reduced current leading to less energy loss as heat. Many candidates incorrectly thought that high voltages made sure the electricity travelled faster or that it could reach all the homes in the country.

**Q10 (a)**

Significant numbers of candidates gained the mark for 'electrons knocked off' or 'electrons flowing'. Fewer scored the mark for the idea that light is absorbed. Better candidates answered this question well with some making reference to p-n junctions.

**Q10 (b)**

Over four fifths of candidates correctly answered this question; they identified that photocells would not produce power at night or in bad weather.

**Q10 (c)**

As stated in the 'General Comments', part (i) was well answered by almost all candidates. Part (ii) was very poorly answered: candidates failed to convert from kilowatts to watts and either failed to score or scored 1 mark for 16.7 or 1/0.06. Very few got the answer of 16667 hours.

**Q11 (a)**

Two thirds of candidates correctly stated 'Mars and Jupiter' and scored 1 mark. There was no pattern to the incorrect answers given, other than, often, they were not adjacent planets.

**Q11 (b)**

Almost all candidates correctly answered this question, usually saying 'to see if it will hit Earth'.

**Q11 (c)**

Over three quarters of candidates correctly stated that the speed of the comet would increase in part (i). Only a fifth of candidates could explain that this was due to increased gravitational pull. Most only wrote about gravity. Some candidates thought that the speed increases because they get hotter or have more energy or the ice melts so they lose mass.

**Q12 (a)**

Candidates were required to draw a minimum of two field lines from pole to pole (including the axis drawn through the Earth and the poles of the magnet). The mark scheme did not include marks for the direction of the magnetic field lines because the position of the magnet in the question did not represent the magnetic poles of the Earth. Candidates that drew the field lines carefully gained 2 marks. If the lines crossed, the maximum mark available was one. A number of very different field lines were seen including circles around the equator or around the poles.

**Q12 (b)**

Better candidates scored 2 marks on this question. The question differentiated well at the higher grades. Many candidates scored 1 mark for mentioning the Northern Lights. Far fewer mentioned that cosmic rays are deflected by the Earth's magnetic field or that gamma rays are produced.

**Q13**

This high demand question was poorly answered. In order to score the mark, candidates needed to mention two materials. Many candidates did not differentiate between thick and thin aluminium and many just described the colour changes seen on the diagram. They understood the significance of the colours but failed to explain the reasons why.

# B625 (Incorporating separate Biology B635, Chemistry B645 and Physics B655)

## General Comments

For teachers and moderators, Science Skills assessment is now well established.

However, it is not possible to report any improvements in the average performance of candidates though there is some evidence that the expectations of teachers and centres are higher.

For Science Skills assessment, there are two components: Can-Do Tasks and Science in the News.

The aim of Science in the News is to get candidates to research a scientific issue, looking fairly at both sides, before reporting and finally coming up with a reasoned answer to the question. In some centres candidates do this, but in some it is no more than an essay on the topic giving few opportunities for matching the assessment criteria. Too often this year centres have awarded 6 marks routinely for Qualities A and F with little regard for the hierarchical criteria.

It is possible for 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 photocopied each time it is used. Marks cannot be just transferred from one specification to another.

It is disappointing that an increasing number of candidates score 24 for the Can Do tasks and nothing for Science in the News. The skills claimed to be shown in completing Can Do tasks are valuable in the Science in the News task.

Centres are reminded that, if a piece of work is resubmitted in a following year, the Science in the News report cannot be added to but new Can-Do tasks can be attempted. If the Science in the News report is not considered to represent the true standard of the candidate a new and different Science in the News task should be attempted.

## 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. For the first time this year the sample was chosen by OCR's Moderation Manager and not the Moderator.

### 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. Some centres have not realised that new tasks are been added each year and it is a pity that over 90% of candidates complete one of the tasks which were in the original batch. It is of little surprise that candidates say the data is out of date.

## Examiners' Reports – June 2011

Centres completing the same task year after year may give the impression that there is only one scientific issue worth discussing. It is worth noting that for the new Gateway specifications, the Controlled Assessment tasks, still set by OCR, will change each year. Teachers sometimes argue that they use the same task because they have set up mark schemes for the task, but all marking should be against the published generic criteria and so changing the task should not matter.

### **Supervision of Skills Assessment**

One of the strengths of Gateway Skills assessment is that the assessed work is under the direct control of the teacher. This is a good precursor for the new Controlled Assessments which begin in 2012.

All Science in the News tasks are written under controlled conditions so that the teacher can sign the Centre Authentication Form (CSS160) with confidence. Unfortunately, there is sometimes evidence of teachers advising candidates of improvements that should be made before the work is submitted. This is not permitted. Also, candidates cannot bring into the session summaries they have written. They can bring in their research, a bibliography and any graph that they have prepared.

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 may read through the stimulus material and explain any scientific words but they must not give any opinion.

Centres are allowed to use their own writing frames providing they are generic i.e. not specific to the task and the same writing frame must be used for all tasks. There are still a few centres using non-generic writing frames.

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. It is common, in some centres, for candidates to be provided with a list of suitable sources. Even if they are fully referenced, this does not automatically give the candidates 4 marks. Sources must be used and not just quoted. It is not unusual to see 10 or more sources listed. This is totally unnecessary as no candidate can use all of these adequately in the report. Telling candidates which are for and which are against the argument is giving too much assistance.

### **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, and it is emphasised that 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, in some centres the candidates are provided with a complete list of source material for use and the necessary element of choice and selection on the part of the candidate for relevant aspects had therefore been removed.

### **Supervised Session**

When the preliminary research has been completed, the Science in the News 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.

## Examiners' Reports – June 2011

A limit of 400-800 words is also suggested in the specification.

Increasing numbers of candidates use word processors to produce their reports.

Centres are reminded that 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;
- no completed report is taken out or e-mailed to another person;
- the candidate cannot access websites electronically either from storage devices or the Internet; the Internet should be off during the writing up session.

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.

Moderators continue to see word processed reports in which the whole report has been pasted in electronically from websites without any acknowledgement, as if it was the writing of the candidate. Quality F marks can only be assessed against work the candidate has written, even if the source is fully referenced.

Evidence of drafting and redrafting of candidates' reports or too much coaching leads to the work not being accepted for moderation and reported to the OCR Malpractice Committee.

## Can-Do Tasks

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

They are not expected to differentiate candidates above Grade C.

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.

## Science in the News

### Approach

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

The marking criteria must be applied hierarchically. They can only be awarded when the whole statement is fully matched. There are still some centres trying to use a 'best-fit' principle.

It has always been OCR policy to encourage teachers to annotate coursework. As candidates may attempt several Science in the News tasks, 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 the need to report back to students so they can improve in the future. When the sample is requested by the moderator, a little time should be spent checking the annotation of the maximum of 20 reports that have to be sent. In particular annotation should concentrate

## Examiners' Reports – June 2011

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. This year several centres had clearly not internally standardised the marks and consequently the rank order was not valid. In such cases the sample has to be returned to the centre, and it is not desirable for teachers, 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 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. Many candidates try to use it as a source. However, candidates who do not do any research for themselves, but rely on the OCR source material alone, are able to gain marks in the other five Qualities.

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.

Without detailed referencing it is impossible to support a match to 4 marks. A long list of sources, even if fully referenced, does not mean the award of 4 marks unless they are used.

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. The candidate is expected to have looked equally at both sides of the issue. Centres are reminded that 6 marks is awarded for the quality of the research and how it is used to produce a balanced report, rather than the quantity of research which has been done.

Again it is important to say that little credit can be given where large amounts from a website have just been 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 does not have to be sent to the moderator.

### 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.

## Examiners' Reports – June 2011

There are still many examples of candidates carrying out processing, even quite advanced processing, without identifying any trend. This is not worth even 2 marks as the mark descriptors are hierarchical.

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 should be done by the candidate, at a standard approximating to GCSE grade C level. This could be by drawing a graph, pie chart or bar chart from the data, calculating averages or percentages, or extracting and using data from a graph etc. It is important that the processing is correct. A poorly drawn graph with incorrect scales or incorrect average calculations should not gain credit. Teachers are reminded that, for the sort of data obtained, bar charts are often more appropriate than line graphs.

Few candidates progress beyond 4 marks. This is not surprising considering the hierarchical nature of the mark descriptors. 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.

### Quality C (Evaluation of the Data)

There are still some reports where the quality of the data is totally ignored and so a mark of zero has to be awarded.

For 2 marks the candidate needs to make some comment about the quality of the sources used or the data within them. This can be a very simple statement.

For 4 marks the candidate must compare the likely reliability of different sources and explain why one source is likely to be more reliable than another. It is common for candidates to write that the OCR source material must be reliable as it comes from an examinations board. This is not true because, in writing the source material, unreliable sources are used along with reliable ones. The candidate must go back to the reliability of the original sources.

To go above 4 marks the candidate's judgement about reliability of sources must be sensible and supported. They must also consider the validity of the sources.

### Quality D (Relating Data to the Issues)

Social, economic and environmental aspects of the topic are an important part of the assessment and some Centres did not develop these areas sufficiently with their candidates during the teaching process.

Different Science in the News 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. For the award of 6 marks, the information must be accompanied by correct science.

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. There is some evidence that teachers have been more generous in marking this Quality.

### **Quality E (Justifying a conclusion)**

All of the tasks are posed as questions and therefore need an answer. No marks can be awarded where no decision is reached. The aim is that 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 mark 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. Few candidates can do this. It is here that researching sources with different viewpoints becomes helpful.

### **Quality F (Quality of written communication)**

There was some generosity in Centres in awarding marks for this Quality. 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 correct use of scientific vocabulary. Some reports lack scientific vocabulary or it is merely pasted in without understanding. This makes 4 marks insecure.

For 6 marks, there are few errors and a good use of scientific vocabulary.

Some reports had been word-processed and a spell-checker obviously used. Such reports need to be near faultless and to contain scientific vocabulary to award 6 marks.

### **Summary Comments**

The job of moderators is to try to support the decisions of centres whenever possible. Providing the marking is within plus or minus 4 marks of the moderator, no changes are made as the centre is deemed to be 'within tolerance'. Where the marks are outside tolerance and adjustments have to be made, moderators will provide useful reports for centres.

Since the same work can be submitted for Science in the News for Science and separate sciences, the same grade 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.

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