

Science B J640

Gateway Science Suite

General Certificate of Secondary Education

Reports on the Units

June 2010

J640/R/10

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

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

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Chief Examiner's Report

This session's examination papers followed a similar pattern to previous years, with B622 attracting the higher number of entries in the June session. Entries numbers for all units have shown a slight decrease apart from B621/2 which has increased. The pattern of entry for these units is becoming increasingly complicated with centres now entering a significant number of year 9 pupils for B621.

The papers all produced a good spread of marks and when distributions were plotted they formed bell shaped graphs. There continues to be a significant difference between the mean marks on B621 units compared with B622 units. This may be explained by the nature of the specification material covered in the units, coupled with the different patterns of candidate entry.

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

- there does seem to be a significant improvement in the ability of candidates to write accurate chemical symbol equations, with more care being taken over subscript size.
- certain areas of the specification are still causing candidates major difficulties, including the red shift, protein synthesis, refraction and natural selection.

B621/01 Foundation Tier

General Comments

The paper proved more difficult than expected and produced a mean of 22.2. The range of marks obtained on this paper was 0 to 52.

Several questions proved difficult. Candidates in many cases did not read the questions properly and seemed unwilling to use the advice given by the bullet points in the question. This was particularly noticeable in Question 11a where the words conduction, convection and radiation were rarely seen in the candidate's answers.

The vast majority of candidates were entered for the correct tier and centres should be congratulated for this. There has been a slight reduction in entries this session for the foundation paper with a corresponding increase in entries for the higher paper.

Comments on Individual Questions

Question No. 1

1a The majority of candidates were able to identify the countries with a higher percentage of obese men than obese women. In 1b most candidates correctly identified carbohydrate as the nutrient most likely to cause obesity and in 1c the majority of candidates were able to correctly give one health risk of obesity. The most common answer involved problems of the heart.

Question 2

In part (a) about three quarters of candidates correctly gave the response simple reflex. The next most common answer was voluntary response with very few candidates choosing hormone action. Part (b) proved much more difficult with only about 1 in 5 giving the correct answer. Examiners were looking for pressure or temperature but as the question was of low demand were willing to accept touch, heat, hot or cold. Part (c) was answered correctly by the majority of candidates. Part (d)(i) was a low demand question but very few candidates gave the correct answer "mutation". In part (d)(ii) about half the candidates knew that genes were found in the nucleus. The remaining choices were approximately equally popular.

Question 3

Part (a)(i) had many candidates giving incomplete answers. In order to score candidates needed to name the part of the body where the pulse is found, count the number of pulses and mention a time interval, so put the fingers on the wrist and count the number of pulses in 1 minute would score. Many candidates just answered count the number of pulses in a minute. Some candidate said "use a blood pressure / pulse monitor" which did not score. Part (a)(ii) needed to indicate the idea of 'more'. Often the answer said 'salt'. As everyone's diet contains some salt this was marked incorrect the correct answer being 'more salt' or a 'lot of salt' similarly for the other answers in the mark scheme. In part (b)(i) about half the candidates were able to use the graph to get a value between 135 and 140. In (b)(ii) few candidates could give an advantage of respiring aerobically, these being that more energy is released and that no lactic acid is produced. In (b)(iii) candidates failed to explain why, often just stating incorrectly that more blood was pumped round the body. The volume of blood pumped in the body does not change, it just

moves more quickly. The examiners were looking for the idea that more oxygen/glucose was delivered to the muscles or that oxygen/glucose was delivered more quickly.

Question 4

Part (a) About half the candidates correctly identified a bacterium as the cause of cholera. Significantly fewer candidates knew that a mosquito spreads malaria in part (b). In part (c) candidates were asked to write down one way in which the immune system could destroy pathogens. Despite being a low demand question less than 1 in 5 of candidates were able to answer it correctly. Several answers just stated 'white blood cells' which was not enough to score as examiners were looking for the fact that they were engulfed or, at this level, eaten by white blood cells or destroyed by antibodies. In (d)(i) the majority of candidates correctly gave 37°C as body temperature. A tolerance of 0.5°C was allowed as the specification states *approximately 37°C*, although no examiner reported needing this tolerance. Part (d)(ii) was a 2 mark question and as such examiners were looking for two ways in which high temperatures could be harmful to the body. The majority of candidates only gave one. A wide variety of answers were acceptable ranging from symptoms of heat stroke to dehydration and death.

Question 5

In section (a)(i) most candidates correctly identified E425 as an emulsifier or stabiliser. In (a)(ii) candidates were asked to name an **ingredient**, however a large proportion of candidates gave the answer sweetener, which was incorrect, the correct answer being sugar. Parts 5(b) and (c) were not answered well with the majority of candidates unable to state the job of an emulsifier or explain why antioxidants were added to food. The majority of candidates correctly answered part (d) – usually with some comment about becoming soft ie a change in texture.

Question 6

Part (a) was answered correctly by about half the candidates. The most common error was to put the products the opposite way round. Part (b) was the worst answered question on the chemistry section. Only a handful of candidates knew that the broken porcelain acted as a catalyst (part (b)(i)) or that the liquid X was petrol (part (b)(ii)). Part (c) was a two mark question; quite often candidates only gave one problem, the threat to wildlife, but no second problem.

Question 7

In part (a) about half the candidates were able to give factors to be considered when buying fuel and a similar proportion identified the gas as oxygen in part (b). In part (c)(i) only about 1 in 5 could correctly identify the apparatus as a spirit burner even though the examiners allowed any sort of (liquid) burner or just burner, the only exception being Bunsen Burner. In (c)(ii) a majority of candidates correctly gave the starting temperature as 25°C. Several candidates who showed their working failed to score through incorrect subtraction. Candidates should be advised to check numerical calculations carefully and those candidates who find mathematics difficult should be advised to use a calculator. In (c)(iii) most candidates identified the fuel as ethanol and gave a correct explanation for their choice. The second mark was conditional on the fuel being correct. In general few candidates could explain the meaning of exothermic for part (d) but the majority identified the hydrocarbon correctly in part (e).

Question 8

Whilst a majority of candidates scored 1 mark (3 or 4 correct ticks) in part (a) very few candidates scored both marks. The most common errors were that microwaves can penetrate to the centre of all foods and that microwaves are stopped by plastic. In part (b) about half the candidates gave one correct reason for concern but very few were able to give two reasons. References to anti-social behaviour were ignored.

Question 9

This question was from the low demand part of the specification and proved to be difficult for all candidates. In parts (a) and (b) approximately 1 in 4 candidates failed to give any response. Of the remainder only about a quarter of the candidates scored in either part. In part (c) about a third of candidates correctly gave B as the correct answer – possibly the value expected from a guess. Surprisingly only about 1 in 4 candidates realised that the infrared radiation that triggers security lights comes from a person's body.

Question 10

In part (a) most candidates knew that ultraviolet waves cause sunburn but in part (b) only a handful of candidates managed to score. In many cases the candidates had failed to read the words 'increase' and 'extra' and gave the answer cars, people etc. This was not accepted by the examiners who were looking for the idea that there was an **extra** use of fuel or **more** cars or **increased** energy use.

Question 11

In this question candidates seemed unwilling to use the helpful bullet points given in the question. In (a) three quarters of candidates failed to score and despite being told to write about conduction, convection and radiation, most candidates failed to use these words in their answers. Full marks could be obtained from a straight forward answer such as: Conduction reduced by foam, Convection reduced by the stopper, Radiation reduced by shiny metal. Part (b) was a different way of asking about savings with insulation. Candidates were unable to calculate the number of kWh saved each year by loft insulation, the correct answer being 1000.

Question 12

In part (a) about half the candidates were able to draw an arrow on the diagram in an upward direction. In part (b) only a minority of candidates were able to name another insulator containing trapped air. Several candidates gave the answer foam, which was excluded by the question. A variety of materials such as fibre glass insulation, thermalite blocks, carpets, wool, straw, bubble wrap and corrugated cardboard were all accepted. Double glazing did not score but was not marked wrong as it contains trapped air but is not a material.

Question 13

Part (a) About half the candidates correctly gave the correct answer of 20°C for the melting point. As expected the most common incorrect answer was 60°C. In (b)(i) a majority of candidates gave the correct answer 'dull black' for the object absorbing the most radiation. In part (ii) examiners were looking for infrared and did not accept heat as this was too vague. Surprisingly, ultraviolet was a common incorrect answer. In (iii) examiners were looking for the

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idea that the object should have its temperature increased. An alternative could have been to increase its surface area. Vague answers such as change its shape did not score. Despite candidates being told that its colour could not change a surprisingly large number of candidates gave this as their answer.

B621/02 Higher Tier

General Comments

This paper elicited a good range of marks with every mark between 0 and 60 being scored. This resulted in a good mark distribution. Very few candidates left questions unanswered and nearly all candidates were able to complete the paper in the time allowed. Common errors were again found with students having difficulty with the topics of protein synthesis, energy transfer and refraction.

It was good to see that candidates are starting to take more care when writing symbol equations and there were fewer large subscript numbers written.

Comments on Individual Questions

- Q.1 (a) A testing start to the paper with only the better candidates appreciating the recessive nature of the cystic fibrosis allele.
- (b)(i) Well answered by many with regard to the action of lipase but some candidates were confused between fats and fatty acids and wrote about fatty acids being broken down instead of the fats. Others wrote about the fats being absorbed.
- (b)(ii) Generally answered correctly.
- (c)(i) A large number of candidates talked about breaking down the fats into smaller molecules, not understanding that the fats were broken down into smaller droplets.
- (c)(ii) Surprisingly, quite a number of candidates did not recognise that drinking is the major cause of cirrhosis of the liver and many gave the incorrect response of smoking.
- Q.2 (a) Was well answered by most candidates.
- (b)(i) Many candidates gave the incorrect answer of DNA.
- (b)(ii) This mark was gained by the good candidates - generally given for the order of the bases rather than the amino acid sequence. A common incorrect response simply referred to changing the structure of DNA.
- (c) This had a very mixed response and some candidates who did not do that well across the paper still had quite a good idea of this concept. A significant number didn't read or didn't understand the question and gave general answers about various ways to test new drugs.
- Q.3(a)(i) In general, most attempted this but recall of systolic/diastolic was quite intermittent.
- (a)(ii) Well answered apart from a small number of candidates who failed to give a comparative answer.
- (b) Many correct answers here.
- (c) Despite a fair amount of crossing out, most candidates scored well.

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- Q.4(a)(i) Answered well although some candidates confused the vector with the parasite and in part (ii) omitted the heat in heat stroke
- (b) The examiners thought that this was a difficult idea but it was pleasing to see that it was well answered.
- Q.5 (a) Almost universally correct.
- (b)(i) This was generally answered well, although many candidates still wrote about the hydrophilic end loving/liking water and similarly, the hydrophobic end loving/liking oil, thereby lost one of the two marks allocated.
- (c) This provided good discrimination. A large number of candidates managed to produce the chemical equation for the reaction and a large proportion managed to gain full marks for balancing the equation.
- (d) Most candidates could name and describe the limewater test.
- Q.6 Part (a) was reasonably well answered as was (b)(i) but in (b)(ii) it was not clear whether candidates were referring to intermolecular bonds or intramolecular bonds.
- (c) A surprising number of candidates suggested that ethane was used for perfume but many understood the nature of unsaturation and could give the molecular formula.
- Q.7 (a) Candidates showed a good appreciation of the implications of the choice of fuels.
- (b) The calculation was often correct.
- (c) Fewer candidates could correctly define exothermic.
- Q.8 (a) The third and last tick on this table seemed to be a problem for many.
- (b) Well answered by most candidates.
- Q.9 This was not well answered at all.
- (a) Many candidates did not seem to know about the critical angle and if they did they found it difficult to put into words.
- (b) The ray diagrams would often contradict the answer from (a). The middle diagram proved to be the most problematic. The number of candidates who took the dotted line to be the boundary was surprising.
- (c) Was not well answered with most marks scored from statement of more than one signal at a time and little grasp of the process of multiplexing (interleaving).
- Q.10 (a) The candidates seem to be getting better at this subject and gave some good answers. There were very few 'heat particles' and not too many answers had air going through the walls. Where there is a poor understanding, it continues to be evident when candidates still think about heat particles and heat movement with a lack of understanding of the means of energy transfer. The weaker candidates continue to use the term "bouncing off the surface". Few understood the role of the foam and the role of the air that is trapped within. Weaker candidates again showed much confusion and lack of understanding of the term conduction. Surprisingly, many candidates did have an understanding of convection but could not convert that knowledge into the situation of the mug.

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- (b) The two part calculation was a good test of the more able candidates.
- Q.11 Clearly a familiar type of question and answered well. Although (b) was not answered quite so well, with 1440 being a common wrong answer
- Q12.(a) Blocking “sun” or “sunlight” were common incorrect answers. A large number of candidates gave answers relating to heat being lost, as lava escaped from the earth.
- (b) Most candidates gained a mark for ozone layer damage but fewer mentioned CFCs as the cause, often citing other gases or “pollution” or greenhouse gases.

B622/01 Foundation Tier

General Comments

The paper produced a mean mark of 34 and gave candidates the opportunity to show what they know, understand and can do. The paper produced the full range of marks. About 1550 candidates scored 48 marks or more and would perhaps have been better served by entry to the Higher Tier. Examiners felt that the paper was at an appropriate level of difficulty. Most candidates could access the paper with only a small proportion of questions omitted. Question 11 proved challenging even for the better candidates. There was no evidence of lack of time.

Candidates tended to score slightly better on the chemistry and physics sections of the paper than on the biology.

Comments on Individual Questions

Question 1

This question focused on resources and pollution.

- (a) The majority of candidates scored the mark for the idea of an increase in population and/or an increase in the amount of waste produced. Weaker candidates rephrased the question, talking about existing landfill sites being full, or linked the need for more landfill sites to a lack of recycling rather than waste production.
- (b) Minerals as a finite resource was not well known, with the majority of candidates choosing renewable as their answer.
- (c) Most candidates knew that animals close to extinction are endangered. The mark scheme allowed phonetic spelling.

Question 2

This question about ecology and ecosystems was the least demanding on the examination paper.

- (a) This was well answered with the majority of candidates correctly selecting a net as the best piece of equipment to collect swimming animals.
- (b) Almost all candidates were able to use the key to identify the animal shown as a leech.
- (c) The majority of candidates were able to complete the bar chart using the data given in part (i), although a significant minority omitted the question. When preparing candidates for examinations, it is worth centres making candidates aware that not all questions require an answer to be written on an answer line; examiners felt this may have been the reason for the relatively high omit rate on this low demand question. In part (ii) most candidates correctly stated that there were 29 species in pond A. Part (iii) was also well answered. Candidates who failed to score this mark usually selected pond A as the most polluted because it has the highest number of different species.
- (d) The difference between invertebrates and vertebrates was well known.

Question 3

This question about photosynthesis was the most demanding question in Section A.

- (a) Carbon dioxide as the gas used in photosynthesis and oxygen as the gas made were both well known by the majority of candidates.
- (b) Many candidates failed to read the question and stated that more light can increase the rate of photosynthesis. The mark scheme required a comparative answer, so candidates who simply wrote carbon dioxide or water did not gain credit.
- (c) This question discriminated well as only high scoring candidates scored 2 marks. Starch was the most usual correct answer seen for the substance glucose is changed into, but very few candidates could then identify its use for storage. Other correct answers such as cellulose to make cell walls or proteins for growth/repair were rarely seen.

Question 4

This question focused on adaptations and animal relationships.

- (a) The term predator was well known in part (i). Part (ii) discriminated well with better candidates able to describe two ways a kangaroo is adapted to avoid being caught as prey. Weaker candidates identified large feet, rather than long or strong legs as being important or simply stated that the kangaroo was able to run, rather than explicitly stating an ability to run fast. References to large ears were common and did not score unless linked to the idea of good hearing. Other common misconceptions were the idea of binocular vision or eyes on the front of the head.
- (b) This overlap question discriminated well with only the most able candidates correctly making the predator-prey link. The mark scheme required candidates to realise that more kangaroos would result in more eagles (or vice versa) and then to show the link between food and the eagle population for the second mark. A common error was a reference to eagles being hunted by humans or other predators.
- (c) The majority of candidates were able to identify something other than food that eagles compete for.

Question 5

This question about paints was the least demanding question in Section B and provided a good start to the chemistry section.

- (a) Almost all candidates were able to name two construction materials used in making buildings.
- (b) Most candidates correctly gave at least one reason why the clubhouse had been painted, with better candidates identifying both decoration and protection in this familiar question.
- (c) The advantage of using phosphorescent paint was less well known with only a minority of candidates appreciating that it glows in the dark. A significant number of candidates confused phosphorescent paint with thermochromic paint.

Question 6

This question was about the structure of the Earth.

- (a) The majority of candidates correctly labeled the diagram of the Earth.
- (b) In contrast to part (a), only the most able candidates identified continental plate as the other type of tectonic plate. Many candidates simply repeated *tectonic* from the stem of the question. A significant proportion of candidates omitted this question.
- (c) The concept of the relative densities of the tectonic plates and the mantle was not well understood. Common misconceptions were that the tectonic plates protect the mantle or that that the plates float on top of the mantle purely because the latter is liquid. This question also had a significant omit rate.

Question 7

This question about gases in the air was the most demanding in Section B.

- (a) Very few candidates identified gas A as nitrogen; the majority thought it was oxygen or carbon dioxide.
- (b) Given the familiar nature of this question, a surprisingly large proportion of candidates were unable to correctly identify a problem caused by acid rain. Vague answers, such as '*damages the environment*', did not gain credit.
- (c) Even with the word equation for the reaction in a catalytic converter given in the question the majority of candidates failed to score the mark, giving vague answers such as '*the monoxides are removed*' or simply '*nitrogen is made*'. The mark scheme required an appreciation that carbon monoxide/nitrogen monoxide is removed or that less polluting gases are produced.

Question 8

This question focused on rates of reaction.

- (a) Given that it is rare for a chemistry foundation tier section not to contain a word equation, examiners were surprised that over half of candidates failed to score the mark in this question. Despite comments in previous examiner's reports, some candidates continue to use '&' or '*and*' instead of '+' in word equations. *Magnesium*, rather than magnesium chloride as a product was a common error. Candidates also still need to be encouraged to write in the space provided when writing out long word equations.
- (b) Most candidates recognised that the reaction finished after 80 seconds in part (i), although 100 seconds was a common misconception. In part (ii) only the most able candidates appreciated that the reaction was fastest between 0 and 20 seconds. A wide range of incorrect responses was seen.

Question 9

This question was about the properties of metals.

- (a) Copper was usually correct.

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- (b) The majority of candidates scored at least one mark in this question. The mark scheme required candidates to clearly refer to iron or aluminium and consequently some candidates lost marks because, although they identified a property that varied, they failed to indicate the nature of the difference. Some candidates continue to use vague terminology such as '*lighter*', rather than '*lighter weight*' when referring to density.
- (c) Uses for brass were well known.

Question 10

This question focused on renewable and non-renewable energy sources.

- (a) Radiation was a common misconception in part (i). The majority of candidates scored at least one mark in part (ii), with many scoring two marks. 'The wind has *thermal* energy' was the most common error.
- (b) Only a minority of candidates scored the mark in part (i). Most failed to read the question and therefore did not appreciate that they were being asked for a renewable energy source that is **burned** to produce energy. In contrast, the majority of candidates were able to correctly name a fossil fuel (usually coal) in part (ii).

Question 11

This question about electricity generation and distribution was the most demanding on the whole examination paper.

- (a) The majority of candidates failed to gain any marks in this question. The most common misconception was the idea of cooling/condensing water from the river and converting it into electricity. Another common error was candidates stating that the fuel is *heated* rather than *burned*. A significant proportion of candidates omitted this question.
- (b) The concept of electricity transmission at high voltages to reduce energy or power loss was only understood by a tiny minority of candidates. Common misconceptions included the idea that increasing the voltage increased the speed at which electricity could be delivered around the country or that more appliances could be supplied with electricity.

Question 12

This question about our Solar System was the least demanding question on Section C.

- (a) Almost all candidates scored the mark for identifying the Sun on the diagram of part of our Solar System.
- (b) Candidates were usually able to correctly identify a planet.
- (c) Candidates were usually able to correctly identify the Moon.
- (d) Most candidates scored at least one mark, with many scoring two marks. Food, water and oxygen were the most common correct responses. *Space suits* was a common answer, which failed to gain credit.

Question 13

This question focused on the Big Bang theory and ideas about the evolution of the Universe.

- (a) Big Bang was usually correct.
- (b) Most candidates knew that the Universe is still expanding, although a significant minority thought that it was getting smaller.
- (c) Most candidates knew that stars give off their own light in part (i). In part (ii), however, only a minority of candidates knew that stars start their life as a gas cloud. Incorrect ideas about explosions or lumps of rock colliding were common.

Question 14

This question focused on ideas about radioactivity.

- (a) Only a minority of candidates could state an example of how nuclear radiation is *useful*. Most stated nuclear bombs/weapons or gave vague answers about producing energy. Treating cancer was the most common correct response.
- (b) 87% was usually correct.

B622/02 Higher Tier

General Comments

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates, producing a good distribution of marks, covering almost the whole mark range available. The paper gave candidates the opportunity to show what they know, understand and can do and there was real stretch and challenge at grades A and A*. All candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions.

Where students scored very low it was clear that they were of low ability and should have been entered for the foundation paper. Section C seemed to be less well answered than the previous two, with quite rambling answers.

Comments on Individual Questions

Question No.1

- (a) In part (a) candidates tended to score 2 or 0 as they struggled with the formula for glucose. However if they knew the formula they were able to balance the equation. The question discriminated well at the higher grades.
- (b) Many candidates ticked more than the required number of boxes which resulted in a loss of marks. Only the higher grade candidates showed understanding of why plants need oxygen.
- (c) The majority of candidates were able to give a correct answer; many of those that lost the mark did so for not making a comparison.
- (d) The majority of candidates scored one mark for the substance, usually starch, but failed to link it to a correct use.

Question No.2

- (a) The majority of candidates were able to describe the difference between vertebrates and invertebrates.
- (b) In part (i) candidates incorrectly referred to numbers of animals instead of different species. Candidates did well in part (ii) because of the way the question was posed; it allowed them to display their knowledge and understanding having looked at the table. Weaker candidates just mentioned numbers of animals but better candidates found two good reasons without repeating themselves.

Question No.3

- (a) The majority of candidates successfully described the relationship between the kangaroo and the eagle.
- (b) Some candidates incorrectly assumed the larger feet would help with heat loss.

Question No.4

- (a) The majority of candidates scored a mark with the most common correct answer being 'give birth to live young'. Many of the incorrect answers involved breathing and gills.
- (b) Part (i) discriminated well across the grades. Higher grade candidates scored fully showing a clear understanding of Natural Selection. Lower grade candidates merely repeated the stem of the question without explaining that the adaptation would mean they were more likely to survive. In part (ii) about half the candidates understood that genes would not change if legs were lost.
- (c) About half the candidates were able to provide the correct answer. However nearly as many thought the answer was infertile. In part (i) few candidates understood the idea of recent common ancestors and just thought the ancestors were related.

Question No.5

- (a) Very few candidates knew that water was the solvent in emulsion paint. Incorrect answers included glue, oil and pigment.
- (b) Few candidates showed a clear understanding of how paint dries. Many incorrectly thought the oil evaporated and only the high grade candidates mentioned oxidation.
- (c) The majority of candidates gained one mark for either the mention of steel or the idea of increased strength. Fewer candidates put both these ideas together for two marks.

Question No.6

- (a) Two thirds of the candidates correctly gave the answer continental.
- (b) Many candidates incorrectly described the movement of the plates instead of simply writing that they were less dense.

Question No.7

- (a) Most candidates correctly identified nitrogen.
- (b) About a third of the candidates were able to write the formula correctly to gain one mark. Only the higher grade candidates went on to correctly balance the equation. Some candidates lost marks for not using subscript or writing a small o for CO₂.

Question No.8

- (a) The majority of candidates were able to correctly write the word equation.
- (b) Many candidates successfully identified the end of the reaction in part (i). However in part (ii) many thought the reaction was faster between 20 and 40 seconds. The majority of candidates were able to correctly apply the equation to calculate the rate in part (iii).
- (c) Many candidates simply repeated the explanations given in the question instead of taking them further and referring to more effective or successful collisions.

Question No.9

- (a) The majority of candidates gave two correct answers. However candidates should be encouraged to make a comparison and describe the aluminium as 'more expensive' not simply 'expensive'. Some candidates lost a mark for describing aluminium as 'lighter' instead of 'less dense'.
- (b) Most candidates correctly identified the metals in the different alloys.

Question No.10

- (a) The majority of candidates gave two correct answers. Where candidates lost marks it was for the idea of thermal energy being used instead of kinetic energy.
- (b) Most candidates gained two marks. However vague comments about being good for the environment meant that some candidates lost the advantage mark.
- (c) Only the more able candidates were able to rearrange the equation to calculate power. Many candidates used the incorrect equation and multiplied the two values together.

Question No.11

- (a) Most candidates gained at least one mark for heating water or producing steam. Incorrect ideas included the idea of the water being condensed to form steam or the steam moving the generator. Many candidates went on to describe the role of the transformer which was not required to answer the question.
- (b) Very few candidates gave a correct answer. Many candidates thought that a high voltage was needed to travel long distances so some would be left by the time it got there. Those candidates that incorrectly thought it stopped the energy loss completely could not be awarded the mark.

Question No.12

- (a) The majority of candidates gave two correct answers. Those that lost marks did so because they were not specific enough. For example cost needed to be qualified and a reason given as to why it was dangerous.
- (b) Most candidates gave a good reason for the advantage of unmanned spacecraft.
- (c) The majority of candidates scored one mark for a correct answer. However vague answers such as 'what is there' did not score marks.

Question No.13

- (a) Very few candidates scored marks on this question. Many candidates incorrectly thought the galaxies got redder instead of light from the galaxies showing red shift.
- (b) In part (i) candidates tended to refer to size instead of the correct idea of greater mass. Only the higher grade candidates mentioned gravity in part (ii). Many simply said 'everything was sucked in'.

Question No.14

- (a) The majority of candidates correctly identified the different forms of radiation.
- (b) About half the candidates gave the correct answer of nuclear bombs.

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

General Comments

By now, this system of Skills Assessment involving Can-Do tasks and Science in the News has had time to become established. Although many centres can now do this well, there are still some centres that are having problems. The problems are the ones reported previously in these reports in 2008 and 2009. Centres should use the information in these reports, the support of training events and advice available from OCR.

It is pleasing to report that, as last year, there are many candidates who now produce good considerations of the topic, looking for and against and then using their research to come to a considered decision. Unfortunately there are still many who seem to regard this aspect of the specification as irrelevant and go through the motions. This often involves giving Science in the News tasks without preparing the students with the necessary skills.

A total of 108975 candidates, from 1651 centres, entered candidates either for Science B625 or separate Biology (B635), Chemistry (B645) and Physics (B655). The table summarises the number of candidates in each specification.

Specification	Subject	Number of centres	Number of candidates
B625	Science	787	75437
B635	Biology	320	13065
B645	Chemistry	274	10271
B655	Physics	270	10202

It is pleasing to report that there is an increase in the number of candidates doing separate Sciences.

It is possible that candidates use the same piece of SinN 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. Some centres continue to ignore this important point. Failure to do this makes the Moderator's job more difficult and could lead to unnecessary errors.

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. 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 should be attempted.

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. It is noticeable that in many centres all, or a vast majority of candidates, score 24/24 for Can Do

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tasks. It is not uncommon for candidates to score 24 and produce nothing for SinN. Despite the column on the form, dates are not essential.

In a separate science (eg Physics) all the Can Do tasks must be from the separate science (e.g.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. Some centres have not realised that new tasks have been added each year. It is disappointing that the vast majority of centres choose tasks from the original list eg whaling; cannabis etc when new tasks have been added to Interchange each year.

The tasks available for 2010 are shown below. New tasks have been added for June 2011. No further tasks will be added.

Module	Title
B1	Should the use of cannabis be legalised?
B1	Should old people be allowed to drive?
B1	Should the UK drink-driving limit be zero?
B2	Should whale hunting be banned?
B2	Should farmers be allowed to use polytunnels?
C1	Should we stop giving crisps and chips to young children?
C1	Are supermarkets green enough?
C1	Are we making the best use of crude oil?
C2	Are congestion zones a good idea?
C2	Should we recycle the copper from mobile phones?
P1	Should we spend time in the sun?
P1	Is human activity responsible for increased global warming?
P2	Does the UK need new Nuclear Power stations?
P2	Are asteroids a threat to us?
P2	Does the UK need more wind farms?
B5	Is there a bright future for children born with heart defects?
B5	Cosmetic Surgery – a life saver or image makeover?
B6	Should we worry about Bird Flu affecting humans in the UK?
C5	Should we ban salt from all processed food?
C6	Is aspirin still a wonder drug or is it over-rated?
C6	Should we use more bio fuels?
P5	How safe are mobile phones?
P5	Will fitting a child safety seat save lives?
P6	Do high voltage power lines pose a risk to health?

Only the tasks from B1, B2, P1, P2, and C1 or C2 may be used for Science.

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A task set for P1, for example, cannot be used for Biology and a task from P5 or P6 cannot be used for Science. Centres still disregard these instructions. Although the task about mobile phones in P5 may seem suitable for P1 because mobile phones are mentioned in P1d, candidates will not have covered the additional theory in P5.

Some centres still use unapproved and unsuitable tasks, especially if they used them for Entry Level. If they don't match fully the requirements of a task candidate marks will suffer. One centre produced its own Science in the News task which was submitted and approved for use in the centre. However, in the end it did not figure in the moderation sample.

Administration matters - 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.

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

OCR provides a writing frame which should only be used with lower-attaining candidates. 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 for all tasks. There are still a few centres trying to use non-generic writing frames or giving too much direction to candidates.

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 them which are for and which are against the argument is going too far.

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, 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, 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 on the part of the candidate for relevant aspects had therefore been removed. The best reports came where candidates 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 and, for example, not all candidates having the same bar chart display,
- Candidates answering the question in different ways.

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It was not unusual for a centre with over 100 candidates to use the same topic with all candidates and, to make it worse, it to be the same topic as in previous years. Candidates in that centre may finish the course believing there is only one scientific question worth discussing. In the best organised centres a range of tasks were used. Some centres use the same task because they have developed a marking scheme for it which will ensure internal standardisation. Mark schemes are not advised and reports should be marked using the criteria and not a mark scheme.

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.

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.

Some candidates are using word processors to produce their reports.

Centres are reminded 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.

It was an increasing trend, this year, to see word processed reports where almost the whole report had been pasted in electronically from websites without any acknowledgement as if it was the writing of the candidate. Awarding Quality F marks when this is done is very difficult because it is not the work of the candidate.

Under no circumstances should any Science in the News tasks be drafted and subsequently redrafted. What is 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 still clear evidence that drafting and redrafting went on in a very small minority of Centres or teachers advising candidates to make additions. This is totally **unacceptable**.

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

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.

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They are not expected to differentiate well for candidates at Grade C and above. 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 well 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 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. For example the word 'anomaly' appearing anywhere can, in the view of some teachers automatically lead to the award of 6 marks in Quality B.

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. In fact, in line with the sample size in other GCSE subjects with OCR, sample sizes for larger centres were significantly reduced. 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 use to support 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 or parts of it had to be returned to the centre for remarking. Where this was done the remarking was done graciously and centres realised moderators were trying to do their best for the candidates.

It does happen that all the marks of a centre are reduced by one or two teachers over-marking and internal standardisation not recognising this.

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.

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 fully reference and **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.

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Without detailed referencing it is very difficult 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 at both sides of the issue. Centres are reminded that 6 marks are 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. Centres awarded 6 marks routinely even when there was insufficient balance in the report. 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 eg '*...more women get skin cancer than men...*'. It is not sufficient to quote just a fact eg '*...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.

There are still many centres who cannot distinguish a trend or pattern from a fact. There are many examples of candidates carrying out processing, even quite advanced processing, without identifying any trend. This is still not even 2 marks as the mark descriptors are hierarchical.

For 4 marks there must be evidence for at least two trends, although which is the main trend may not be obvious, and some processing 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 be given credit. Teachers are reminded that, for the sort of data obtained, bar charts are often more appropriate than line graphs.

Few candidates progressed 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. This is an increasing and unwanted trend where teachers are pushing candidates to do things they don't understand. This was reported on last year but it still persists.

The moderator does expect to see different approaches to the same Task from different candidates within the Centre. Some examples were identified where several candidates completed the same incorrect processing and where the centre gave some candidates credit and others not. This sort of thing should be picked up in internal standardisation.

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, but fewer than in previous years, where these are 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. 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)

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 during the teaching process.

Often these social, economic and environmental aspects were diffused throughout reports rather than in a separate section. It is clear that the candidates rather than planning to include them as an important aspect of the report, have stumbled across them accidentally.

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.

Quality E (Justifying a conclusion)

All of the tasks are posed as questions and therefore need an answer. Almost all candidates gave an answer to the question but often the answer was not derived from the work they had done but from some preconceived ideas. For example, of course whaling should be banned because it is cruel.

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. Few candidates are doing this. It is here that researching sources with different viewpoints becomes helpful.

Quality F (Quality of written communication)

Most 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.

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

Probably, the most common error was to award 6 marks for a report with little scientific vocabulary. High marks cannot be given when work is just pasted in or copied from a source. Some reports had been word-processed and a spell-checker obviously used. There is nothing wrong with this providing the spell-checker is used correctly.

Summary Comments

The moderator tries to support the marks awarded by the centre. Providing the average marking is within plus or minus 4 marks no change is made as the centre is deemed to be 'within tolerance'. Where the marks are outside tolerance and adjustments have to be made, the work is considered by at least two moderators. Where a centre is outside tolerance the marks of all candidates are changed even if, perhaps only a few candidates are outside tolerance.

Moderators were encouraged to provide useful reports for Centres. Too often centres do not take sufficient notice of these reports. If the report suggests the marking is generous but within tolerance, it is important the centre addresses this because next year it might be just outside tolerance.

The moderation was accomplished efficiently and effectively, with experienced moderators. Much of the success was due to the work of Team leaders in co-ordinating their teams.

The importance of 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.

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

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

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

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