GCSE

Science B

Gateway Science Suite

General Certificate of Secondary Education **J640**

OCR Report to Centres

January 2012

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Oxford Cambridge and RSA Examinations

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Overview

This series examination papers followed a different entry pattern to previous January series, with this specification drawing to an end. Normally B621 attracts more entries than B622, with the pattern being reversed in June. Entry numbers for B621 were about one quarter of the normal level with many of these candidates resitting this unit.

The standard of answers on many of these scripts was rather low and the mean mark was significantly depressed. The mean marks on B622 were less depressed and many of these candidates were sitting this unit for the first time.

As a consequence of some of these changes in cohort, the Principal Examiners noted that the improvements that have been seen in some areas have not been maintained. Full details of this can be found in the individual reports.

B621/01 Foundation Tier

General Comments

This was a much smaller entry paper than in previous years due to the introduction of the new Gateway Science specification. The mean was 23.7, some 4 marks down on last year. Candidates had been entered appropriately for the foundation tier. Very few candidates scored above 50 but at the other end of the spectrum very few candidates scored less than 10. All questions scored and there were no "dead" marks. Candidates should be reminded to show all their working in calculations as there are working marks that can be awarded when an arithmetic error occurs in the final answer. They should also be reminded to read the questions carefully so that they answer the question that has been asked rather than the question they thought was being asked.

Comments on Individual Questions

Section A

Question 1

1(a) Examiners were looking for the idea that yellow fever occurs around the equator or in the hottest parts of the country. Several candidates compared Africa with South America saying, incorrectly, that there was more yellow fever in Africa than South America. In part 1(b) the majority of candidates correctly linked cystic fibrosis with inherited genes and athletes foot with fungi.

Question 2

2(a)(i) Less than half the candidates answered this question correctly. There were two major errors. Firstly, many candidates said 'put your fingers on the wrist or neck' and then went on to say 'and take the pulse rate' rather than count the number of pulses in a minute or other time interval. Secondly, candidates described how to investigate how pulse rate changed with exercise for example, find the pulse rate, run round the room, take the pulse rate again. The first answer scored 1 the second zero. In 2(a)(ii) examiners were looking for the idea that iron is needed to make haemoglobin or that haemoglobin contains iron. Only the more able candidates answered this question correctly with a significant number of candidates thinking that iron killed or destroyed haemoglobin, as though it were some form of disease or microorganism. Part 2(b)(i) was answered well by most candidates who correctly chose anabolic steroids from the list. In part 2(b)(ii) there were three marks. Few candidates scored on this question. Examiners were looking for the idea that the oxygen intake was increased and this, linked with a faster pulse, provided the muscles with oxygen and glucose at a faster rate, removed carbon dioxide at a faster rate and so reduced the chance of making lactic acid. For part 2c sweating, with its various spellings was the most common answer.

Question 3

3(a) Most candidates identified the diet as that of Gazza and Arthur's diet as best for constipation. In part c many candidates described the diet of a growing teenager rather than explain why Arthur's diet was not suitable for a growing teenager. In part 3(d)(i) most candidates were able to calculate the RDA as 60g, but in (d)(ii) far less were able to link this to the protein in the table and confirm that Jilly's diet did provide enough protein.

Question 4

4(a) Less than 25% of candidates were able to label the lens or the cornea on the diagram of the eye. In part 4(b) the majority of candidates explained long sight and red green colour blindness but did not answer the question “what is wrong in the eyes” and therefore failed to score.

Section B

Question 5

5(a) Few candidates were able to explain why fossil fuels are non-renewable, many candidates using the advertising slogan when they’re gone they’re gone. In (b)(i) the majority of candidates gave bitumen as the correct answer but only about 50% were able to give a correct product of cracking in (b)(ii). Petrol was the most common correct answer. Part 5(c) was answered well with the majority of candidates scoring on parts (i) and (ii). Part (iii) proved somewhat more difficult with only the more able candidates able to link the number of carbon atoms in the formula to the fraction in the table.

Question 6

Only 1 in 3 candidates was able to give oxygen as the gas in air that reacts when fuel burns. 6(b) also proved difficult with many candidates using vague answers such as effect on the environment and eco-friendly which failed to score. In part 6(c)(i) C was a common wrong answer especially amongst the weaker candidates as this had the highest end temperature. The most common answer overall was B with a correct explanation as the highest temperature rise. Very few candidates correctly answered 6(c)(ii) in terms of incomplete combustion or a shortage of oxygen.

Question 7

7(a) The majority of candidates correctly counted the number of atoms in one molecule of benzoic acid, but in 7(b) few candidates knew the reason for using an antioxidant. In 7(c)(i) again few candidates gave the correct reason for having an emulsifier. Examiners were looking for the idea of preventing the liquids from separating. The majority of candidates thought it mixed the liquids. Emulsifiers are in most processed foods so the majority of candidates gave a correct answer to part 7(c)(ii). The most common answers were sauce and ketchup. In 7(d) candidates struggled with the properties of plastics. The most common answer was flexible for 7(d)(i) so that it could be squeezed, but others just gave general properties that did not relate to the mayonnaise bottle. Few candidates could explain non-biodegradable and many thought it meant recyclable. In 7(d)(iii) the majority of candidates only gave one method of disposal and scored 1/2 . The clue was in the question that two marks were available.

Section C

Question 8

Question 8 proved a difficult question for all candidates. In 8(a) only about 25% of candidates were able to suggest reasons for the increase in the temperature of the Earth. 8(b)(i) proved equally difficult with only the best candidates realising that the dust prevented the sun’s rays entering and so the temperature would drop. Part (b)(ii) was the question that had the least number of correct answers. Examiners were looking for the idea that the dust caused the infrared to be reflected back to Earth.

Question 9

Most candidates gave the correct response to 9(a) and double glazing was the most popular answer for 9(b). Few candidates were able to explain that the air in the cavity expanded and started to rise in part 9(c)(i). In 9(c)(ii) the majority of candidates correctly gave the saving as £125 each year.

Question 10

The correct answer to 10(a) was reflects. However the most common answer was “bounces off” this was not accepted by examiners as a description of what happens to light at a boundary. Approximately half the candidates correctly gave the two types of waves that travel at the speed of infrared radiation in part 10(b). Very few candidates were able to describe the difference between analogue and digital signals despite this question being asked many times in the past. Most candidates gave *another* use for infra red (10(d)) but many repeated the example in the question.

Question 11

11(a) Most candidates correctly calculated the speed of microwave radiation. The most common error was to be wrong by a factor of 10. In 11(b) candidates were asked for another use of microwaves. Cooking was the most common answer. Examiners accepted microwave *ovens,* but not microwaves on their own. In part c the majority of candidates described the worries about the effects of microwaves on the brain. A significant number of candidates described eye problems from looking at a bright smart phone screen. This was not credited.

Question 12

The majority of candidates gave the correct units for mass and energy.

B621/02 Higher Tier

General Comments

The entry numbers for this paper were considerably lower than in previous series with presumably many candidates taking papers in the new specification. The cohort that sat this paper found the questions very challenging and there were some scripts where large numbers of questions had been left unanswered. Compared to previous examinations, the standard of spelling, grammar and handwriting of candidates was lower. It was also noticeable that the improvements in certain topic areas that have been witnessed in previous examinations were not continued here. This includes areas such as alleles, accommodation, symbol equations and the advantages of digital signals.

Comments on Individual Questions

Q1(a) The majority of candidates correctly identified the person as Gazza.

Q(b)(i) & (ii) The calculation was correctly answered by most candidates but then a number could not interpret the result in terms of the protein intake given in the table.

Q1(c) This question challenged most candidates. A few candidates scored the 1st marking point but very few could identify lacteals or lymph vessels.

Q2(a)(i) Despite the fact that this question has been asked before, answers were very poor. The most common incorrect answer was ‘a type of gene’.

Q2(a)(ii) The idea that alleles code for proteins was not grasped by many candidates.

Q2(b) Again, answers were very poor. ¼ or 25% was a common incorrect answer. Some candidates who had the right idea failed to gain marks because they said the probability was unlikely/small chance, rather than zero.

Q3(a) Not many candidates could balance the equation and a noticeable number still confused the symbol with word equation.

Q3(b) Despite the instruction to use the graph, many candidates failed to mention lactic acid in their answer. Some who did said that the build up of lactic acid in training can be used during the race.

Q3(c) Most candidates answered correctly.

Q4(a)(i) Answers to this question were poor, with lines being drawn in all directions, let alone failing to hit the fovea or retina.

Q4(a)(ii) Very few candidates could describe the process of accommodation, with some answers simply describing the pupil changing size.

Q4(b) Again, few answers referred to what was wrong in the eye, only describing the problem.

Q5(a) The most common incorrect answer was ‘can’t be used again’.

Q5(b) A number of candidates answered well, linking boiling point to molecular size and intermolecular forces. Others just tried to describe fractional distillation.

Q5(b)(ii) & (c) Generally well answered.

Q6(a) Few candidates could use their knowledge of combustion to write a correct equation, with 'dodecane oxide' being a common product.

Q6(b) Many candidates scored both marks here.

Q6(c) Wrong answers varied but few correct answers were seen.

Q6(d) 218.4 was the most common answer, as many candidates used 2g for the mass instead of 100g (they scored one mark for this answer).

Q7(a) There was mixed success on this question with the most common incorrect answer being 17.

Q7(b)(i) Most answers were correct.

Q7(b)(ii) Explanations here varied from good to muddled, usually involving reversing hydrophobic and hydrophilic.

Q7(c) Well answered with 'flexible' the most common correct answer.

Q8(a) Most answers were correct.

Q8(b) A large number of candidates could not write the balanced equation and a significant number of correct answers lost the mark due to inaccurate writing where the case or subscript was then incorrect.

Q9(a)(i) & (ii) The most common error here was candidates referring to 'it, or the graph, going up or down' rather than average annual temperature.

Q9(b)(i) More than half of the candidates correctly said that the temperature would fall.

Q9(b)(ii) Very few candidates scored here, with most answers just saying that the dust traps the heat.

Q10(a)(i) Very few candidates answered correctly with common answers saying 'IR is stronger' or 'because IR is radiation'.

Q10(a)(ii) The most common incorrect answer was 'cavity wall insulation' with few references to foil.

Q10(b)(i) The idea of a decrease in density was missed by most candidates, 'because of convection' being a common incorrect answer.

Q10(b)(ii) Largely correct.

Q11(a) Very few answers mentioned the terms critical angle or angle of incidence.

Q11(b)(i) More candidates achieved the 2nd marking point for the digital signal but the descriptions given for the analogue signals were more confused.

Q11(b)(ii) Despite this question being asked before, many candidates failed to state that more than one signal can be passed at the same time.

Q11(b)(iii) Very few answered correctly, with the most common incorrect answer simply stating less or no interference.

Q12(a) Usually well answered, but a number of candidates missed out one of the zeros, or one of the nines in the number.

Q12(b) Well answered for 1st marking point but fewer candidates mentioned the idea of limited diffraction.

Q12(c) This was poorly answered with 'mobiles not as strong' being a common answer.

Q13 More candidates gained the mark for 'temperature' than 'heat'.

B622/01 Foundation Tier

General Comments

- The overall performance was appropriate for this Foundation Paper. In general the paper was balanced and accessible to all candidates.
- A good spread of marks was achieved. The paper did allow more able candidates to score appreciably higher marks. There were very few candidates with more than one or two no responses to questions and almost all candidates managed to complete this paper in the allocated time.
- Q1(a), Q3(a)(i), Q9(a), Q11(b) and 13(c) proved very challenging for candidates where the vast majority of responses were incorrect.
- Q6(a) proved to be a good indication that this area has been well taught as the word equation was very well answered. Likewise most scored in Q5(b)(ii), Q7(a) and Q11(a).
- The rubric of most questions was interpreted correctly. However, a common misinterpretation was that candidates confused adaptations for predators with adaptations for cold conditions in Q2. Many candidates incorrectly were under the impression that magma had to be denser than the crust in order to rise in Q4.
- Answers were appropriate to the question and there was little evidence of guessing taking place.
- Candidates need to be more aware of making comparisons to avoid losing marks. Candidates should also be more alert to applying their knowledge to given situations in questions.

Comments on Individual Questions

Module B2

Q1(a). This was a poorly attempted question with most candidates only scoring for average per quadrat = 4 or 32 quadrats in the pond.

Q1(bi). Again this was poorly attempted very few referred to either DNA or breeding. Most referred, incorrectly, to features of the mosquitos.

Q1(b)(ii). Generally a well answered question.

Q1(c). Most candidates got both marks here but occasionally some got them the wrong way around.

Q2(a). Many referred to cold weather adaptations rather than those to be a successful predator. Sharp teeth or claws did appear frequently to score at least 1 mark.

Q2(b). Generally well answered although some by linking the thick fur to an explanation of 'not getting cold' rather than the idea of it actually preventing heat loss and so did not gain credit.

Q2(c). Well answered but some referred to being hunted or loss of ice cap area.

Q2(d). Generally well answered, many candidates were able to accurately say it was in danger of becoming extinct.

Q3(a)(i). This was poorly attempted. Often reference to carbon dioxide was made without any connection to photosynthesis, so although candidates frequently scored 1 mark it was very rare to see 2 marks.

Q3(a)(ii). Often vague answers to this question, eg to run cars or for heat, without reference to increased demand.

Q3(a)(iii). Some confused with carbon dioxide and nitrogen as common incorrect responses. Carbon Monoxide did frequently occur more so than did sulfur dioxide as a correct response.

Q3(a)(iv). Many scored well but some were confused and were incorrectly referring to it not being able to be re-used as opposed to re-newed.

Q3(b). Most candidates scored 2 marks.

Module C2

Q4(a). Generally correct responses seen here.

Q4(b). Many candidates were confused and often referred to high pressure or increased density causing it to rise rather than lower density.

Q4(c). Generally a well answered question. Most candidates referred to the fertile soil.

Q5(a). Some confused with carbon dioxide but many responses were correct.

Q5(b). Generally correct responses seen here.

Q5(c)(i). Many scored both marks but some referred to unspecified pollution in both cases and as a result were not credited.

Q5(c)(ii). Most scored this mark, correctly identifying a time between 11 and 12.

Q6(a). This question was frequently correct, but there were a few using symbols.

Q6(b)(i). Many candidates only referred to the appearance of the catalyst at the end.

Q6(b)(ii). Commonly candidates referred correctly to increasing the temperature with fewer shaking or stirring. Several, however, referred to smaller particles without mentioning zinc. Others incorrectly poured in hot water (diluting the acid).

Q6(b)(iii). This was frequently correct, but 4 did also occur.

Q7(a). The vast majority of candidates got this correct, with every correct response in the mark scheme covered in the range of responses seen.

Q7(b). The most common error came from referring to strength instead of hardness.

Q7(c). Many candidates referred to loss of habitat but unspecified pollution and 'big holes' did occur and these were not creditworthy.

Q7(d). Generally correct, although there was evidence of candidates ‘word spotting’ as alloying featured more often than expected probably as it was used in the following question.

Q7(e). Some candidates did 'combine' metals or just referred to properties, eg not rusting.

Module P2

Q8(a). Most scored this mark but there were responses that included UV and warmth.

Q8(b)(i). Candidates usually scored here.

Q8(b)(ii). Many candidates correctly referred to free energy or renewable. Some did simply say incorrectly 'it is cheaper'. 'No pollution' frequently was unexplained.

Q9(a). This was very poorly attempted, most including the magnet in a circuit.

Q9(b)(i). Some candidates just repeated that coal was a fossil fuel, clearly not reading the question carefully enough. Some put ‘crude oil’ which was an inaccurate response.

Q9(b)(ii). Many correctly gave wood as a renewable fuel.

Q10(a). Most candidates got this correct.

Q10(b). Candidates usually got 2 marks for clothing and remote handling but many listed two or more forms of protective clothing, eg gloves and goggles and only scored 1 mark.

Q11(a). Radio was almost universally the correct response.

Q11(b)(i). Some candidates were able to complete the calculation but fewer than expected with one as straight forward as this one.

Q11(b)(ii). This challenged candidates. Occasionally, answers had the decimal point in the wrong place and failed to include the £ sign so were not credited.

Q12(a). This was usually correct.

Q12(b). Some confusion did occur with planets often being used instead of stars.

Q12(c). This was usually correct.

Q13(a). Many candidates quoted ‘The Big Bang’ and if not generally scored from referring to some kind of explosion.

Q13(b). Where correct, it was usually from candidates referring to gas or dust.

Q13(c). This was very rarely correct, many candidates referring to ‘not letting light through them’ appeared frequently but there was little evidence that candidates knew that light cannot escape from black holes.

B622/02 Higher Tier

General Comments

This examination discriminated well and provided opportunity for candidates of all abilities to show positive achievement.

The demand for each of the sections was about the same. There was no evidence that candidates had run out of time.

Candidates were often able to attempt the quantitative questions but the working out was generally very disorganised. As a result it was difficult for Examiners to identify errors carried forward or working out that was worthy of credit.

Only a small proportion of the candidates, in terms of their poor performance in the examination, should have entered for the Foundation Tier component.

Comments on Individual Questions

Question One

This question was the most difficult in Section A and significant numbers of candidates did not attempt 2(c) and 3(c).

Although many candidates correctly calculated the answer as 128 in (a)(i), other candidates included working out that was very disorganised so that it was difficult to award any marks for the working out of either the mean number of mosquito larvae per quadrat or the total number of quadrats needed for the whole pond. A common incorrect answer was 384 which was three times the actual answer. In (ii) the most common misconceptions were to state that the quadrats should be repeated and a mean for each quadrat calculated or use a capture-recapture technique. The mark scheme required reference to a bigger sample size either by using bigger quadrats or by sampling more of the pond.

Many candidates misunderstood (b)(i) and referred to looking at the characteristics of the mosquitos or using a key rather than using the idea that the same species will produce fertile offspring. In (ii) candidates normally referred to adaptation to the same habitat rather than referring to a common ancestor.

Although many candidates could state why to naturally preserve animal bodies in (c) a small proportion of the candidates misinterpreted the question and stated how humans could preserve the animal bodies. The most popular correct answer was ‘frozen in ice’.

Question Two

This was the least demanding question in Section A.

Candidates could often give two correct adaptations in (a) these being normally long hair, white fur, small ears or long claws. A small proportion of the candidates did not qualify the feature stating just fur for example rather than lots of fur. Other candidates gave adaptations for predation rather than for the Arctic.

Most candidates could answer (b) but a small proportion of the candidates did not describe the effect on the fox population but referred to the fox dying out or becoming extinct. This was not sufficient to be awarded a mark.

Most candidates did not really understand the term niche in (c) and as a result referred to the wolf having longer legs rather than referring to overlapping habitats, different prey or different hunting styles.

As in previous examination series candidates could not explain clearly what is meant by a parasite in (d). Able candidates were able to state that the parasite benefitted and the host was harmed but most answers failed to communicate clearly that the host was harmed.

Question Three

Most candidates could give a reason in (a)(ii) why people hunt whales. Answers generally focused on food or research. In (ii) candidates offered very vague answers that did not give clear reasons. The best answers referred to culture or tradition and the difficulties in policing any world-wide ban.

Many candidates in (b) could list two factors that would slow down photosynthesis although oxygen concentration was a common incorrect answer.

Many candidates in (c) found it difficult to clearly express their answers. The idea of survival of the fittest and of passing on the relevant genes was poorly expressed and often candidates were only awarded one of the two available marks. A common misconception was to mention the development of gills.

Question Four

This was the least demanding question in Section B.

In (a) candidates often got the relative densities of the magma and the crust the wrong way round. Other candidates focused on an increase in pressure rather than density.

Only a very small proportion of the candidates did not get at least one mark in (b).

Most candidates referred to predicting volcanoes in (c) although some focused on researching the structure of the Earth.

Question Five

This was the most demanding question in Section B and a significant number of candidates did not attempt 5(b)(i).

Most candidates in (a) were not able to recall the information about the percentage of gases in clean air and in particular the percentage of carbon dioxide in clean air was not well known and often it was quoted as 1%.

In (b)(i) although many candidates referred to burning fossil fuels the idea of incomplete combustion was often missing from the answer. Almost all the candidates could interpret the information in the graph in (ii) and give a time between 11.00 and 12.00.

Candidates often did not put **C** in the correct position in (c) or reversed the positions of **E** and **D**.

Question Six

In (a) many candidates could construct the correct word equation.

In (b)(i) many candidates could not clearly indicate that the catalyst had not changed from its appearance at the start. It was not sufficient to just state the appearance at the end. Other candidates referred to the reaction time being quicker but this was not given credit since the reaction time must be shorter or the reaction could be quicker. The link between powder, surface area and collisions was well known by candidates in (ii), however candidates often did not refer to collision frequency which was required in order to get full marks for the question. Many candidates could predict the reaction time and most suggested 5 seconds.

Question Seven

Apart from the candidates who referred to strength rather than hardness, (a) was well answered.

Many candidates recognised in (b) that steel would not rust easily or that iron would rust easily. Reference to steel being stronger was also given credit in the mark scheme.

Candidates found both parts of (c) extremely demanding. Only a very small proportion of the candidates could decide what each electrode was made from. Often incorrect materials such as steel or graphite were given rather than the impure copper anode and the pure copper cathode. Candidates found it even more difficult to describe what happens at each electrode and often tried to give really complicated answers when the anode loses copper and the cathode gains copper would have sufficed.

Question Eight

This was the least demanding question in Section C. The advantages and disadvantages of a photocell were well known. Candidates often stated that there was no pollution but did not explain this was at the point of use.

Question Nine

Many candidates were able to calculate the number of kilowatt hours used as 10.5 kWh in (a) and then could get the cost as 168 pence in (b). A small proportion of candidates quoted the answer in pounds which was allowed as long as the unit was clearly shown.

Question Ten

The diagrams and explanations written by many candidates were quite poor. Many of the diagrams did not show a complete circuit and it was often difficult to decipher whether the magnet was moving. Candidates would be advised to label their diagrams. Candidates often realised that more turns of the wire or a stronger magnet would increase the current, a larger magnet was not sufficient.

Question Eleven

This was a very demanding question and many candidates wrote contradictory statements or did not attempt to answer the question. Candidates were often unable to apply their knowledge and understanding of nuclear radiation to answer the question. It was not sufficient to just give a list of facts, the facts had to be linked with the data. Only a small proportion of the candidates referred to background radiation and a common misconception was that some radiation was still passing through the thick lead.

Question Twelve

In (a) many candidates could not give the correct order.

Candidates often referred to gravity in (b) without specifically stating Jupiter's gravity which was needed for the mark to be awarded.

Candidates often gave vague answers to (c) or did not attempt to answer the question. The best answers explained how or why the Near Earth Objects were monitored and how they could be destroyed or deflected. A significant proportion of the candidates did not appreciate what Near Earth Objects were and referred to global warming or CFCs.

Question Thirteen

Many candidates in (a) chose the correct shape of the Earth's magnetic field.

In (b) most candidates did not appreciate that the charge particles would experience a force and as a result would change direction or speed. A common misconception was that the charged particle would lose its charge. A significant proportion of the candidates did not attempt this question.

Question Fourteen

This was one of the most demanding questions in Section C and large numbers of candidates did not attempt 14(a)(i) and (ii).

Candidates found it difficult to give a clear accurate answer to both parts of (a). Candidates often appreciated in (i) that the galaxy was a long way away but did not clearly communicate that it was moving further away and in (ii) did not state that the galaxy was moving faster.

All three distractors proved effective in (b).

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