OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Science B J641

Gateway Science Suite

General Certificate of Secondary Education

Reports on the Units

June 2010

J641/R/10

Oxford Cambridge and RSA Examinations

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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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General Certificate of Secondary Education

Gateway Additional Science B (J641)

REPORTS ON THE UNITS

Chief Examiner's Report

Entry patterns in the January and June sessions were repeated in 2010 with a significant number of centres entering candidates for unit 1 in January and unit 2 in June. A number of centres enter candidates for both units in June. The number of candidate entries has dropped this year, but this corresponds with an increase in the number of candidates entered for the separate sciences.

The papers performed consistently all generating mean marks above 30 and producing good mark distributions. Centres appear to have the correct entry policies with only small numbers of candidates 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 a 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 continue to find difficulty with include turgor pressure, electrolysis, static electricity and the use of tracers.

B623/01 Foundation Tier

General Comments

The cohort included a significant proportion of candidates who were retaking this component. The average mark for this examination paper was 35, and the marks achieved by candidates covered the range from 0 to 58. Centres demonstrated good entry policy in terms of the tier of entry and only a very small proportion of candidates would have been better suited to the Higher Tier examination paper.

All three sections of the examination paper differentiated well and allowed candidates to demonstrate their knowledge and understanding of GCSE Additional Science. Candidates found Section B much less accessible than Sections A and C.

Candidates seemed to be able to cope with the calculation questions in Section C.
There was no evidence that candidates ran out of time and questions left blank by candidates reflected a lack of knowledge or understanding rather than a shortage of time.

Comments on Individual Questions

Question 1

This question used the context of a geranium flower to examine aspects of tropism, asexual reproduction and genetics.

Part (a)(i) did not differentiate very well since almost all candidates appreciated that a plant grows towards light. Many candidates in (a)(ii) stated that plants grow down into soil to get water or to grow towards gravity.

Many candidates were able to get at least one mark in the extended answer required for (b). Some candidates just repeated the bullet point about taking a cutting rather than explaining which part of the plant would be used. Many candidates included references to putting the cutting into soil and then watering the cutting. A small proportion suggested water as the growing medium instead.

In (c) a large proportion of candidates appreciated that all the geranium plants came from the same original plant. A much smaller proportion of the candidates referred to the new plants as clones or having the same genetic material as the original plant. Only a small proportion of candidates in (d) could define what is meant by mutation. Typical answers were very vague and did not refer to changes in the genetic material of a cell, instead reference was made to damage to the cell. A common misconception was to refer to genetic modification.

Question 2

This question focused on the selective breeding of pigs and the fertilisation and development of egg cells. This was the most accessible question in Section A.

Almost all candidates obtained at least one mark for (a) and most candidates obtained both marks. Candidates found (b) much less challenging than a similar question set on last June's paper. Typically candidates referred to sperm cells being long and thin and having a tail so they could move. Only a very small proportion of candidates referred to differences in the genetic make-up of the cells or to acrosomes in sperm.

In part (c) more candidates could recognise the statement that represented fertilisation rather than differentiation and cell division.

Question 3

This question was focused on the digestion and absorption of carbohydrates. It was a common question with the Higher Tier examination and not surprisingly it was the most demanding question in Section A.

In (a)(ii) only the most able candidates could give a full description of how the rate of breakdown changes with increasing pH. Many candidates gave vague answers about the rate increasing or decreasing without reference to the optimum pH or stating that the rate went up and then went down. A common misconception in (ii) was to give the highest rate rather than the optimum pH.

All candidates found (b) challenging and only a very small proportion of candidates could recall the terms diffusion in (i) and plasma in (ii). A common error in (ii) was to state either red or white blood cells.

Question 4

This question focused on the electrolysis of dilute sulfuric acid. It was the most difficult question in Section B.

In (a) candidates were often awarded only one mark, usually for referring to the 'squeaky pop test'. A significant proportion of the candidates did not attempt this question. Other candidates gave tests for carbon dioxide or oxygen.

Only a small proportion of the candidates could recall the term cathode in (b). A greater proportion of the candidates gave the answer anode. In (c) only a small proportion of candidates could identify oxygen.

In (d) only a small proportion of candidates recognised H^+ as a cation. The most common incorrect responses were the two negative ions.

Question 5

This question focussed on the chemistry of Group 7 elements. It was the least demanding question in Section B.

In (a) most candidates could name another halogen. Fluorine and iodine were the most common correct answers.

Many candidates in (b) could use the information in the table to name the alkali metal halide formed. The most common error was to use the term chlorine or bromine rather than chloride or bromide. Fewer candidates could write the word equation in (c) and the erroneous substitution of chlorine for chloride reoccurred.

In (d) most candidates could not recognise the use for chlorine. The most popular incorrect answer was 'to sterilise wounds'.

Question 6

This question was about the transition elements.

Many candidates in (a) could recognise the position of the transition elements in the Periodic Table. In (b) many candidates could get one correct colour but only a small proportion could match all three ions with the correct colour.

In (c) candidates could often give one property of a metal. Typically candidates referred to thermal or electrical conductivity, hardness and strength. Credit on the mark scheme was given for chemical properties of metals but only a very small proportion of candidates referred to these.

Question 7

This question focused on formulae and the properties of sodium chloride.

In (a) candidates found (ii) the most difficult and (iii) the easiest part question. A small proportion of candidates confused elements and atoms in (i) and (ii) and reversed the correct answers. A small proportion of candidates gave 63.5 for the atomic number in (iii).

Many candidates misinterpreted (b) and gave answers that referred to the electrical conductivity of sodium chloride. A significant proportion of candidates did not attempt this question. A common misconception was that sodium chloride reacts with water rather than dissolves in water. Some candidates gave the melting point as being low rather than high.

Question 8

This question focused on the speed and acceleration of an athlete. This was the least demanding question in Section C.

Many candidates in (a) could recall the names of the measuring instruments they should use. Credit was not given for a metre rule for measuring distance but only a small proportion of candidates gave this answer.

In (b) most candidates could interpret the speed-time graph. Many candidates gave the answer for (iii) as 3 m/s^2 but did not always state the equation they were using. Only a small proportion of candidates gave an answer of 27 m/s^2. [correct answer = 3 m/s^2]

Question 9

This question focused on braking and thinking distance.

Although most candidates could answer (a) more could recognise braking distance than thinking distance.

In (b)(i) many candidates could calculate the work done by the car as 60000 J. Candidates rarely quoted the equation they had selected from the formula list. Less than half of the candidates recognised that the unit of power is the watt, often candidates quoted the newton instead. [correct answer = 60000 J]

A significant proportion of candidates gave poorly organised answers in which it was impossible to link the factors given with either thinking distance or braking distance. A typical example was ‘drinking alcohol and icy roads increase braking and thinking distance’. This answer scored no

marks but with better organisation such as ‘drinking alcohol increases thinking distance and icy roads increase braking distance’ would have been awarded both marks.

Many candidates answered both (d)(i) and (ii) correctly.

Question 10

The most common safety features given were air bags, crumple zones and seat belts. Most candidates were able to give two correct safety features.

Question 11

This question, using the context of the motion of a parachutist, was the most demanding question in Section C.

In (a)(i) about half of the candidates recognised that the parachutist has most potential energy at the start of their descent, however a much smaller proportion of candidates could recognise when the speed would be highest (part (ii)).

Only the most able candidates in (b) recognised that air resistance or friction would slow down the parachutist. Two common erroneous answers were upthrust and gravity.

B623/02 Higher Tier

General Comments

This was the seventh occasion that this examination was available to be sat by candidates. There were nearly 12 000 candidates and marks ranged from 0 to 60 out of 60.

The mean mark for the paper was 30.5 and the paper discriminated satisfactorily over the target grade range of C to A*.

There was no evidence to suggest that candidates had insufficient time to complete the paper but a tenth of the candidates failed to attempt parts of questions 2, 3 and 4.

Some candidates with very low marks appeared to have been entered inappropriately for the higher tier paper.

It was evident that many candidates had practised their examination technique; writing within the designated spaces and providing two distinct points for two mark questions. A very small minority of candidates wrote well outside the margins indicated which made the marking of their scripts difficult.

Comments on Individual Questions:

Question 1

Two thirds of the candidates correctly identified the pattern on the graph. Some described the increase in the rate of breakdown of starch but failed to mention the decrease. There were some incorrect references to a pH of 41 or to optimum temperature. There was general confusion about the breakdown of food. Some mentioned the acidity of the stomach but few wrote about denaturing. The absorption of sugar from the small intestine into the blood by diffusion was understood by the more able candidates whilst others were able to name the process without providing an explanation. A third of the candidates knew that plasma transports sugar with the remainder mostly believing it to be the blood cells.

Question 2

Just under half of the candidates could identify the parts of the plant where most cell division occurs and just over half knew that mitosis was the type of cell division. A variety of recognisable spellings were accepted. The majority of candidates could identify the responses of shoot and root to light and gravity. There were few good explanations as to why sheep cannot be grown by tissue culture. Most referred to the need for sexual reproduction. Fewer than half the candidates could satisfactorily list an advantage of tissue culture. Cost and speed were common reasons.

Question 3

Part (a) targeted grade A candidates and only the most able scored both marks. The first marking point was more commonly awarded whereas a common response for the second point was ‘to leave in suitable conditions’. There was confusion over the identical nature of insulin made by bacteria and insulin made by humans. Answers often referred to enzymes, the bacteria living in humans and the insulin having DNA. Most candidates scored a mark for suggesting why people are opposed to genetic engineering, playing God being the most common reason. Only

fifteen percent of candidates scored any marks for explaining why large cells cannot survive. Most wrote about not being able to get enough food, inability to fit through spaces and being easily seen. Some mentioned the ratio between surface area and volume but in the incorrect ratio.

Question 4

Just over half the candidates knew that oxygen is formed at the positive electrode. Sulfur, hydrogen and carbon dioxide were amongst the other common responses. Two thirds of candidates could write the symbolic equation, but only half of them could then balance it successfully. The most common error was to omit the 2 before the e-. Half the candidates identified the cathode; others suggested anode, molten aluminium or steel case. Common reasons for using cryolite were to reduce cost, act as a catalyst, and melt aluminium. Half the candidates linked the cost to the large quantities of electricity needed. Some wrote about the cost of the equipment.

Question 5

More than ninety per cent of candidates correctly identified the names of the halides and the vast majority could write a word equation for the formation of sodium chloride. Many incorrect answers added water or oxygen as a product. Only a third of candidates could explain why chlorine is more reactive than bromine. Many simply repeated the stem of the question in their own words. Just under half knew that reduction involves the gain of electrons. Most of the others referred to the loss of electrons.

Question 6

Just under half the candidates scored both marks. A further third knew one of the colours. It was surprising that blue as the colour of copper sulfate was not better known. Many candidates scored one mark for part (b) by stating that a drawback of superconductors is the very low temperatures they require. Few could explain the benefits in terms of loss free power transmission or super-fast electronic circuits. Many simply stated that electricity travelled faster.

Question 7

Whilst most candidates correctly identified the nucleus with the three nucleons as having a mass number of three, a third opted for the nucleus containing three neutrons and three protons. Most correctly identified the two isotopes of the same element. Half the candidates scored at least one mark for their dot and cross diagram. Poorly drawn diagrams which did not clearly show the shared pair of electrons were the main reasons for candidates failing to score.

Question 8

The calculations presented few problems. Most scored all four marks. Only half the candidates knew that the area under the graph represented the distance travelled. Acceleration was a common answer, as was work done.

Question 9

The calculation did not prove to be very demanding. The only errors seen were 4000 ÷ 15 or factor of ten errors. Whilst many candidates knew factors that affected braking and thinking distance, many failed to make clear in their answer to which distance they referred. Part (c) discriminated well. Candidates often failed to mention braking distance in their answer. Many correctly linked braking distance to kinetic energy and the more able could write about the squaring effect.

Question 10

Part (a) targeted the most able and discriminated at this level. They wrote about increased stopping distance and reduced acceleration. Most of the candidates answered in terms of energy or force being absorbed by the crumple zone. It is acknowledged that the meanings of active and passive safety features have not been universally agreed, not least by the motor industry. Examiners marked part (b) in such a way that no candidate was disadvantaged by their own understanding of the meaning of each. Many candidates failed to score because they simply listed other examples of (active) safety features.

Question 11

The first part of this question was testing the specification statement ‘Recognise that acceleration in free-fall (g) is constant’. Whilst acknowledging that the acceleration of the free-fall parachutist is decreasing and when terminal velocity is reached becomes zero, g remains constant. Most candidates thought the acceleration increased. A third of candidates knew that the drag force increases as speed increases. Others related this to increasing air resistance or surface area. Most candidates answered the remainder of part (b) correctly. The majority of candidates believed that kinetic energy increases at terminal speed and that the potential energy is transferred to kinetic energy at terminal speed.

B624/01 Foundation Tier

The paper proved to be very accessible to the candidates and the level of performance was generally good; the mean mark was approximately 2 marks higher than in June 2009. The candidates had been well prepared by the Centres and were generally entered at the appropriate level although there were a relatively high number who gained very high marks and could have coped with the Higher Tier paper.

There was a tendency for candidates to score higher in the Biology section than the Chemistry and Physics sections.

There were no glaringly weak areas within the three Modules though the following topics were poorly dealt with by candidates:

- food chains and biomass pyramids
- relative formula mass and forms of carbon
- radioactive decay and static charge.

These areas were often being assessed in a slightly different context to previous years.

Mathematical ability shown by candidates was acceptable at this level.

There did not appear to be any problem of time constraint.

Question 1

Usually a successful two mark start but metal pen, plastic duck and, more frequently, brick were often given alongside a correct answer.
The vast majority correctly chose 'recycling' in (b)(i) where the most common error was 'rotation'. Although an unprompted response in (c)(i), the mark was gained by most candidates. Those who did not gain the mark usually responded 'leaves', with 'flower' less frequent.
Whilst most candidates gained one mark, two were less frequent in the final part of the question. There was no obvious pattern to incorrect choices.

Question 2

In (a) there was occasional muddling of pesticide with fertiliser or herbicide (to kill weeds) or the candidates wrote about keeping animals off the crops. In b(i) the incorrect answers 15 and 85 000 were sometimes given but the usual error was simply poor arithmetic. Most gained the mark in the next part; those who did not usually answered in terms of hedgehogs not eating the cabbages. Some candidates were confused in (c) and referred to eutrophication. Very few candidates scored both marks. Usually they had the idea of the herons' food being reduced **or** that the pesticide could be passed up the food chain, but they rarely mentioned that the concentration of the pesticide increased at each trophic level.

Question 3

Most candidates scored the first mark, with those who did not score answering 'stem' or 'roots'. The data in the table was usually interpreted correctly; the common mistake was to miss a zero out in transcription with the resulting answer being '0.4'. The second part of (b) produced good differentiation. Candidates often gained the mark for highest mass but failed to convincingly link it to the idea of optimum CO_2 level or higher CO_2 not increasing the mass. Sometimes this may

have been due to poor use of language by the candidate but more commonly candidates quoted figures from the table without drawing a conclusion or making a comparison.

Question 4

The first part of the question revealed a very poor grasp of the concept of a biofuel as incorrect responses such as oil, coal, petrol and carbon biofuel were common. The completion of the biomass pyramid proved to be a skill beyond most candidates and the question differentiated well. Potentially creditworthy responses failed to score due to the absence of **labels** despite the emphasised instruction in the question. Finally in (c) the first mark was gained by the majority but sweating or breathing or for growth and repair did not score on their own. While the calculation of energy loss was usually correct, some candidates either just subtracted one number from the energy gained in food or added up all the numbers.

Question 5

There was similar confusion to that in 2(a) between 'pesticides' and 'fertilisers' in the first part of the question. The usual response that did not score mentioned 'for growth' and failed to include the comparative of growing **larger** crops or growing them **faster**. Phosphorus was not well recalled as an essential element, phosphate or a chemical symbol (Mg/Na/O) were common errors. In (c), determination of the number of elements was better than the calculation of the relative formula mass. The main error in (i) was '5' and in (ii) candidates far too frequently neglected to take account of the O_3 which resulted in an answer of 69.
Deducing or recalling nitric acid from the information in (d)(i) was **very** poor, with a variety of incorrect answers: often 'nitrogen' but also 'hydrochloric', 'sulfuric' and 'ammonia'. Candidates did not answer in terms of the formula.
The correct choice was usually made in the last part, distillation being the wrong one.

Question 6

Air as the raw material was very poorly recalled in the first part of question 6 where natural gas and hydrogen were the preferred responses. The description of a reversible reaction in the next part was usually acceptable with answers such as 'reversing' or 'undoing' being the ones that did not deserve credit.
In (c) candidates were well aware of the cost of plant, raw materials and workers wages but the cost of the catalyst was hardly ever given as an answer.
There was a high rate of success in part (d) of the question with incorrect answers often built around pressure.

Question 7

Most candidates scored very well in this question; when candidates did not score full marks 'fuel' in the second response and 'precipitate' as one of the last two were often the errors.

Question 8

This question was the most poorly answered on the Chemistry section of the paper.
The best performance was in (a), with incorrect spelling accepted if phonetically correct. There was a fairly high omit rate. Incorrect answers merely described the shape of a ball whilst incomplete ones missed out 'fullerene' or 'bucky'. In (b) candidates often used the strong and

weak bond information in the diagram and failed to register a score. Often they wrote about it being soft and used in pencils or as a lubricant.
The attainment rate was very low but the differentiation was good in the final part of the question. 'Strong', 'sharp' and 'hard to break' were regularly repeated responses that were vaguely relevant but did not deserve credit. Very few mentioned high melting point and thermal conductor was never given despite being an acceptable answer.

Question 9

The first part got most candidates off to a sound start in the Physics section.
The errors that did crop up were 'decreases' or 'radioactivity' for the first response, 'increases' for the second and 'outside' for the final response. The radiation used in a smoke detector was usually correctly identified but a significant number thought it was beta and very few chose gamma. A use of gamma radiation was usually successfully given with confusion with X-rays or ultrasound often being the error in wrong answers (eg used to break up kidney stones).The name of the fuel and the type of reaction in a nuclear reactor were poorly recalled; natural gas, oil or coal were frequently given as the fuel (or alpha, beta or gamma, presumably taken from the first part of the question). The chain reaction was often omitted and usually wrong when attempted with no real pattern to incorrect answers (eg 'explodes', 'fast', 'radioactivity', 'chemical', 'breaks up').

Question 10

Candidates displayed their ability to do straightforward calculations in the first part, which produced a very high rate of two marks. In (b) there was a slightly lower level of attainment with some answers that stated the current was less or the same or answered in terms of brightness.

Question 11

Most candidates could either recall the term defibrillator or describe the action of restarting the heart in the first part (shock the **patient** or passing electricity through the **body** being the frequent poor answers) but the action of dust precipitation was less well known. Sometimes the answers were completely wrong in that they described static electricity helping the smoke out of the chimney whilst others had the mechanics wrong in that they thought that dust particles stuck to the **brick** in the chimney sides.

Question 12

Candidates usually knew that humans cannot hear ultrasound because of its frequency or pitch. Most knew it was due to the frequency or pitch being too high but some answered because it was too low. Totally incorrect answers were about ultrasound being too fast or too quiet or that our ears cannot detect longitudinal waves.
The uses of ultrasound were generally well known. The common errors were stating merely 'looking at babies', confusing ultrasound with X-rays or radioactivity or trying to follow on from (a) and write about treating deafness.

Question 13

This was the question that brought about the worst responses in the Physics section, and in the examination paper overall. Clearly Centres need to address the teaching of static electricity with some urgency. Friction and insulators were poorly recalled whilst the idea of electron movement,

albeit a higher level concept, was almost never given in answer to the first part. Although a small majority gained the charges mark in (b) there were a raft of incorrect responses ranging from the more plausible such as ‘AC and DC’ to the ridiculous such as ‘carpet and pole/TV and pole’, ‘static and electricity/wavelength’,’ batteries and power stations’, ‘nerves and brain cells’, ‘anode and cathode’. In (c) the idea of earthing or charge flow were not well known or understood. Often the candidates reworded the question about the film star being charged and touching the pole and getting a shock or talked about the film star/carpet/charge ‘reacting’ with the pole giving a very low level of attainment in this part of the question. There was a better set of responses to the last part: problems with dust, risk of explosion or even death were the frequent answers. ‘Hair standing on end’ or a vague mention of ‘dangerous’ were the most common answers not worthy of credit.

B624/02 Higher Tier

General Comments

The paper produced a mean mark of 33.0 which was similar to the June 2009 performance. The paper gave candidates the opportunity to show what they know, understand and can do. The full range of marks was seen. About 2000 candidates scored less than 20 marks and would have been better served by entry to the foundation tier. Assistant examiners and team leaders thought that the level of difficulty of the paper was appropriate. Most candidates could access the paper with very few questions omitted. There was no evidence of lack of time. Questions involving 2 or more marks were differentiated suitably for A grade candidates.

Comments on Individual Questions

Question 1

(a) 'Upper epidermis' was correctly answered by about three quarters of candidates.

(b) This question discriminated well. Weaker candidates scored 0, many scored 1 for 'more or many chloroplasts/chlorophyll', but only the best candidates scored the second mark for the idea that the palisade cells were at or near the top of the leaf. 'At or near the surface' was a common answer, which failed to gain credit.

(c) 'Xylem' was usually correct in part (i), but 'chloroplasts' was a common error in part (ii), with candidates failing to appreciate that the question was asking for the *substance*, rather than the *structure*, in plants that contains magnesium. As was to be expected of an A* question, only the most able candidates scored 2 marks in part (iii). A pleasing number scored 1 for either the idea of active transport or movement from low to high concentration.

Question 2

(a) Most candidates scored 1 mark for correctly labelling the pyramid of biomass. Fewer candidates than might have been expected scored both marks on this grade C/D question for getting the scale correct.

(b) The process by which energy is lost by the cow in part (i) was well known and about three quarters of candidates correctly calculated the energy lost as 1100kJ in part (ii). More able candidates correctly calculated the efficiency of the energy transfer in part (iii). However, 3450 ÷ 250 = 13.8% was a very common mistake.

(c) Although this was a standard demand question, only the most able candidates understood the idea of bioaccumulation. There was a great deal of confusion between this question and Q4(c) about eutrophication although, because the mark scheme allowed references to eutrophication to be ignored, many candidates scored 1 mark for idea that the herons' food is killed or reduced or that pesticide kills or reduces things in the food chain.

Question 3

(a) About half of all candidates scored the mark on this question. 'The solution prevents microorganisms getting oxygen' was a common misconception.

(b) Osmosis as the process that causes cells to change shape in strong salt solution was known by less than half of candidates in part (i). Candidates more often correctly answered plasmolysed or flaccid in part (ii).

(c) Again, as is to be expected of an A* question, only the most able candidates understood the idea of turgor pressure in part (i). Far more candidates appreciated that turgor pressure does not occur in animal cells because animal cells do not have a cell wall in part (ii).

Question 4

(a) Most candidates correctly calculated the M_r of potassium nitrate as 101.

(b) Most candidates correctly named the acid needed to make potassium nitrate as nitric acid in part (i). Nitrogen and hydrochloric acid were common errors. In part (ii), neutralisation was well known.

(c) This question discriminated very well and had a level of response mark scheme. Most candidates scored 1 mark for the level 1 idea that fertilisers increase the growth of water plants, with most talking about algal bloom. Middle ability candidates on the paper scored a second mark for the level 2 idea that algal bloom blocks off sunlight, whilst only the most able candidates scored the mark for the level 3 idea that aerobic bacteria use up the oxygen in the water. The most common misconceptions were that living organisms in the water died because there was no oxygen as photosynthesis was not taking place or that living organisms were poisoned by the fertiliser.

Question 5

(a) It was pleasing to see the large proportion of candidates who could correctly balance the equation for the manufacture of ammonia. (Candidates continue to get better at balancing equations, year on year).

(b) Most candidates knew that a catalyst increases the rate of reaction, but most also thought a catalyst changes the percentage yield (either up or down). Both responses needed to be correct to score the mark.

(c) Many candidates knew that ammonia is used in the manufacture of fertilisers, although a surprising number of candidates omitted this question or simply wrote an answer such as ‘ammonia is used to make lots of useful things’.

(d) Almost all candidates correctly interpreted the data on the effect of temperature and pressure on the percentage yield of ammonia, and scored both marks in parts (i) and (ii).

Question 6

(a) The processes involved in water purification were not as well known as might have been expected. Many candidates failed to appreciate that filtration removes *solid* or *insoluble* particles. Distillation was a common error instead of sedimentation.

(b) Many candidates realised that lead compounds are sometimes found in water supplies as a results of old lead pipes.

Question 7

(a) Most candidates knew that different solid forms of the same element are allotropes, although isotope was a common misconception.

(b) Only the most able candidates could correctly explain the slippery nature of graphite in terms of weak forces between the layers or the layers sliding. Candidates with a lack of understanding talked about 'weak bonds between the strong bonds'.

(c) More candidates were able to correctly explain the electrical conductivity of graphite, in terms of free or delocalised electrons, than scored in 7(b).

(d) 'Strong' was a common misconception and 'hard to break' was a common answer that failed to score.

Question 8

(a) 'Electrons' was usually correct.

(b) Most candidates knew that dust and clinging clothes were a disadvantage of static electricity, although 'hair standing on end' was a common answer that failed to score.

Question 9

(a) Most candidates knew that the speed of beta radiation was 'fast' or between alpha and gamma – medium – and gained 1 mark. 'Average' was a common answer that did not gain credit. Fewer candidates appreciated that beta radiation is electrons moving.

(b) Better candidates correctly identified 'neutrons' in part (i), although protons was a common error. Fewer candidates appreciated that radioactive atoms are unstable in part (ii). Many candidates simply stated that 'they give out radiation'.

(c) This continuous writing question discriminated well. Only the most able candidates scored 3 or 4 marks; the mark for gamma as the type of tracer and the idea of the tracer in the pipe/liquid were the marks most commonly awarded. Many candidates were clearly confused between the tracer and the detector, thinking that the tracer was above the ground picking up the radiation. Another common misconception was that the blockage was found by simply seeing where the tracer stopped moving, rather than by detecting the change in the radiation level.

(d) The vast majority of candidates correctly used the graph to deduce the half life of the radioactive material as 2 days in part (i). Far fewer candidates could correctly draw the decay curve for material Y. Often the point at (3,40) was correct, but the point at (6,20) was not.

Question 10

(a) Almost all candidates correctly calculated the resistance of the lamp as 4Ω.

(b) Most candidates knew that as the voltage across a lamp increases, the current will increase (although only the most able appreciated that increasing the voltage from 12V to 24V would double the current).

Question 11

(a) The idea that humans cannot hear ultrasound because of its high frequency was well known.

(b) Weaker candidates continue to talk about ultrasound 'bouncing' rather than 'reflecting' off different layers inside the body. Very few candidates talked about reflections returning at different times.

(c) Many candidates gave vague answers, such as 'X-rays will harm the baby', which failed to score.

(d) Only the most able candidates knew that X-rays are made by firing high energy electrons at a metal target.

B626 (Incorporating separate Biology B636, Chemistry B646 and Physics B656)

General Comments

This was the third year for the skills assessment in this specification and, as expected, the majority of centres produced well organised samples of work which did not require scaling.

On behalf of all this year's moderators I would like to thank those centres.

It is the job of a moderator, where possible to support the decisions made by centres. Centres which complete the paperwork correctly and which add helpful annotations to the candidates' work make that task much more straightforward.

Administration

Some centres made administrative errors which delayed the moderation process.

Some of the errors encountered were:

- Failing to include a Centre Authentication Form for each specification entered. This can result in marks being withheld.
- Failing to attach the 'Skills Assessment Record' to the front of the candidates work. This means that the moderator cannot be sure of the candidate's practical skills mark.
- Wrongly transferring marks from the record card to the MS1 sheet.
- Wrongly adding together the three marks on the record card.
- Failing to include a copy of the MS1, this problem usually arose with centres with small numbers of candidates who sent in all the work completed.
- Using tasks from modules 5 or 6 for 'Additional Science'.
- Entering candidates for the wrong skills unit in separate sciences.

Supervision of Candidates

Centres are reminded that, although close supervision is not necessary in the research phase of the Research Study or during the practical part of the Data Task, it is obligatory for the sessions where the written work is done.

Centres have to fill in a 'Centre Authentication Form'. By filling this form a centre certifies that candidates have been supervised as instructed in the board's regulations and that they are satisfied that the work is the candidates' own.

There has been more than one occasion, this year, where two identical pieces of work have been present in the sample requested. There were also a good number of cases where different pieces of work had similarities which seemed to be beyond what could have occurred by coincidence.

Where this occurs and plagiarism has clearly taken place, neither candidate's work should be credited.

If candidates are supervised properly, according to the board's regulations, this should not occur. Please note:

- Candidates are NOT allowed access to the internet during either of the supervised sessions.
- Candidates may not bring any electronic media into a supervised session.
- In the Research Study session candidates may have access to their rough notes and print outs of their research but nothing else.
- In the Data Task session candidates should have access only to their results and the instruction and question sheet for the task.
- Redrafting (producing a second version of the work after teacher correction) is strictly prohibited.

Comments on the assessment of the different qualities

The comments listed by quality below are aimed chiefly at centres which were wayward in the use of the marking criteria. There are, however, hints as to how candidates may gain higher marks in each quality.

Research Studies

These are RESEARCH studies. It is not intended that the content should be taught. Work done 'in class' does not count as research and candidates who approach the task in this way rarely score the highest marks.

Most centres correctly instructed candidates to answer the five questions as the best way to complete a Research Study. An essay type answer does receive credit but it is much harder for candidates to ensure that they answer all the questions fully.

There were a couple of instances of candidates taking the title of the study and then writing their own version of it. This often resulted in poor marks as the questions were not answered.

Quality A: Collecting Information

Two marks can be awarded if sufficient research has been done to allow the questions to be answered, even if no references are given.

For marks of four and above full URLs or the equivalent must be given. It is not sufficient for a teacher to endorse the work saying that the research has been seen, the references must be physically present in the written work.

Higher marks involve the references being linked to the information they have provided. If they are merely linked to questions 5 marks is appropriate. For six, the references must be linked to the information within the answer.

Quality B: Interpreting Information

It should be noted that this quality involves the interpretation of information not merely of data. Answers, in some studies, which involve the drawing of graphs may provide evidence of this skill at a low level but to score higher marks candidates must demonstrate that they understand the science which they use in the study.

Work copied directly from sources can receive credit if it is directly relevant to the question posed. However, to score the highest marks, candidates must have ownership of the information to show that they fully understand it. Their own words are best but at least a comment or analysis of the information copied from the sources must be present.

Quality C: Developing and using Scientific Ideas

The criteria for six marks asks candidates to "demonstrate a clear and detailed understanding of the interaction between scientific ideas and their context".

The context is sometimes a topical issue in science and sometimes an extension of the science in the specification into an area which it does not cover.

Marks can be awarded by considering how well the candidate has linked the science they have researched to the 'context' and how well understood it is.

The same caution should be used about teaching the context. If a candidate does no research it is difficult for them to show their understanding of it.

As above, text copied from a source can only be given limited credit.

Quality D: Quality of Written Communication

This was usually marked accurately. The one exception being centres which gave credit for the written English copied from the internet (or other source). It is the candidate's own English which is relevant. The extensive and correct use of technical and scientific vocabulary is more important than absolute grammatical accuracy.

Data Tasks

It is expected that most centres will actually carry out the Data Tasks. The 'fall back' data are provided for use if a candidate is absent when the practical part of the task is carried out or for use if a candidate's own data is not of sufficient quality to enable the questions to be attempted.

It was worrying to see so many centres not even attempting the practical work. This practice disadvantages candidate in answering the questions linked to qualities B and E in particular.

It is recommended that if a candidate has poor data that they use the 'fall back data' to answer questions 1, 2 and 4 but their own data to answer question 3.

It is important that candidates include their results with their Data Task even if they have used the fall back data. The simple processing (usually averaging) has to be checked as has the accuracy of the plotting in the graph. If the raw data are missing then the maximum mark available for both question 1 and question 2 is three.

Quality A: Interpreting the Data

Graphs were usually well plotted and drawn. Marks lower than four were rare. For the highest marks the graph should be large (at least half an A4 sheet) the axes should be labelled with quantity and unit and be linear.
Plotting should be perfect (or almost) and the points should be joined by a 'best fit' line or curve as appropriate.

An inappropriate line was the most common reason for marks being reduced.

Not all graphs go through the origin.

Quality B: Analysis of the Data

Simple processing and a description of the trend observed were usually accomplished.

References to 'positive correlation' should be discouraged and if there is no statement as to what the correlation is between, the candidates should receive no credit.

A mark for describing the trend can be awarded if it appears in answer to question 4 even if it does not appear in the answer to question 2.

A genuine mark above four was rare.
To gain higher marks additional/further processing must be undertaken. It is not sufficient merely to find a gradient or do some other thing with the data. The processing must reveal something which was not evident before the processing had taken place.

The most common way of achieving this aim was to show that the data was not valid by showing that it did not do what it was supposed to do.

The revealing of an anomalous result would also count. However, it is not sufficient to spot a result which is not on the 'best fit' line. It must be an anomaly which was revealed by the additional processing.

Centres which told candidates what additional processing to do were giving too much help to their candidates. However, it rarely did any good as the candidates did not realise why they were doing it and so received little credit.

Quality C: Evaluation of the Data

Reliability and validity are the key words. Reliability usually has to do with the comparability of repeats but can be addressed through proximity to a 'best fit' line.

It was disturbing to find so many candidates who thought that repeating made data more reliable. It MAY make the average more reliable if the errors are random but not the raw data.

Validity is best addressed by comparing two data sets or be using the data to calculate a known value and comparing the two.

Quality D: Justifying a Conclusion

This was often well answered and was usually accurately marked. In some centres, however, little if any reference was made to the data obtained. Candidates merely regurgitated an explanation which had been taught before the investigation was undertaken. Such answers were rarely worth many marks.

It is essential that the explanation relates to the candidates data and fully explains it.

For the higher marks it is also important that candidates fully understands the science being used.

Quality E: Planning further Work

It is intended that the investigation to be planned will be an extension of the work already done. The same apparatus can usually be used with only the variables and the means of controlling them being different.

A 'detailed' method must include:

- Variables; which are held constant, which varied and which measured.
- Control; how, practically, the variables are to be controlled and varied.
- Range; what range of values are to be used for the controlled variable.

V C R could be a useful mnemonic.

Practical Skills

It was pleasing to see, in some centres, a use of marks other than 6 for practical skills.
It was surprising to see, on a number of occasions, centres awarding 6 marks throughout for practical skills but where all candidates used the 'fall back' data in the Data Task.

Separate Sciences

It was pleasing to note that more of tasks specifically linked to modules 5 and 6 were used this year. Indeed some proved so attractive that they were even (mistakenly) used for Additional Science.
This is, of course, not allowed.
The problems encountered by centres and their candidates were similar to those detailed above though, because of the different spread of abilities in the candidature the marks tended to be higher.

Internal Moderation

Internal moderation by centres is essential and is required by the board. Only in the case of a single teacher marking all of the work is it rendered unnecessary.

The moderator is required to judge whether a centre is marking according to the same standards as others. A moderator cannot change the rank order of the candidates in the centre. This means that, if one group has been marked very leniently and scaling needs to be applied, candidates who have been marked accurately also have their marks reduced. This is not fair to the candidates or the centre.

If such inconsistency is detected in a centre's marking it can result in a request for the whole of a centres work to be remarked.

Other Matters

Where it is necessary to adjust the marks of a centre the work is looked at by at least two moderators.

If the adjustment is large it is looked at by at least three including the Principal Moderator.

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