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RECOGNISING ACHIEVEMENT

GCSE

# Science B J644

## Report on the Units

## January 2008

**J644/MS/R/08J**

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 syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

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

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## Advanced GCE Science B (J644)

## REPORT ON THE UNITS

# B641/01 Foundation Tier

## General Comments

The entry to this paper was small. The standard of paper and candidates performance was of a similar standard to the previous examination.

It is quite clear that many students do not know the colours of common chemicals or the flame test colours.

The vast majority of questions on this paper require very short answers but some do require longer answers. In some of these candidates are let down by poor powers of expression and vague answers as well as only making one point when more is required.

## Comments on Individual Questions

Q1 This question was generally very well answered. Marks were most likely to be lost in (b)(ii) by vague references to change in shape.

Q2 (a) Many candidates were able to score water on the right hand side but had less idea about the left hand side. Common wrong answers included named alcohols or water on both sides.

(b) This was very well answered. Candidates did not always state what was advantage or disadvantage but it was usually clear from their answer.

Q3 (a) Many candidates got this correct. The most common error was to give the two correct answers in the wrong order. Other common wrong answers included 3 and 8 being direct lifts from the formula.

(b) Many could not correctly identify oxygen as the correct answer. All 4 answers were seen in roughly equal amounts.

(c) (i) The black solid was correctly identified most of the time although there were many interesting spellings with 'sut' being the most common. Graphite, coal or charcoal did not score here.

(ii) This was fairly well answered and some even gave high level responses involving the ability of the blood to carry oxygen. Those that did not score simply reworded the question to say that the gas was harmful.

Q4 (a) (i) This was very well answered

(ii) This was also very well answered with by far the most popular answer being cups. Some answers referring to insulation or packaging were poorly worded. The most common incorrect answer was carrier bags

(b) This was reasonably answered. The most common wrong answer was that it could not be recycled.

(c) This was reasonably well answered with most candidates scoring at least one. Many answers were not as precise as they could have been. Harmful gases or pollution were common responses that did not score. Toxic gases may be produced on burning and this link was required for the mark.

Q5 (a) This was not very well answered. The corresponding question in the Higher Tier of 'How do paints dry?' was much better answered.

(b) + (c) Very well answered.

Q6 (a) With a large number of gases to choose from this was very well answered.

(b) Most candidates scored one here and did not attempt to make a second point that might have lead to a second mark.

(c) The word equation was usually well answered. Some candidates had water on the right hand side and some had carbon dioxide on both sides.

(d) This was not well answered. Most candidates answered in terms of the catalyst giving the particles more energy or speeding them up.

Q7 (a) This was not well known and very few correctly identified both alloys.

(b) (i) + (ii) This was very well answered.

(iii) Some candidates clearly knew the answer but others gave answers in terms of the low density of aluminium or the rusting of iron.

(iv) Most scored at least one here. Poor powers of expression and the use of words like soft without explanation meant that some did not score.

(c) This was reasonably answered but quite a few candidates described how to recycle rather than giving a reason as to why.

Q8 (a) This was poorly answered with a lot of candidates identifying the syringe as a ruler. Other answers included thermometer and measuring tube or cylinder.

(b) (i) Very well answered.

(ii) This was reasonably answered. The most common incorrect response was to give an answer in terms of time rather than rate.

Q9 (a) This was reasonably well answered but group, period and block were mixed up. Lots of candidates did not use the symbols given in the question but just put down any symbol from the whole periodic table.

(b) Candidates do not know the colours of common compounds. The most common answer for copper was orange and for iron was grey which suggests that they were answering in terms of the metal rather than its compounds.

Q10 (a) This was poorly answered. There were two very common incorrect answers. The first was swimming pools with out any explanation and the second was to clean water. Muddy water treated with chlorine will be sterile but still dirty.

(b) This was very poorly answered even though the answer was in effect provided in the table in the next part of the question.

(c) This was very poorly answered with the most common wrong answer of 'reaction'. Very few got the correct colour here.

(d) As in 9b colours of chemicals are poorly known.

(e) This was reasonably well answered but the common wrong answer was to say that they had similar configurations without specifying.

Q11 (a) (i) This was fairly well answered but quite a few candidates gave an answer in terms of electron shell.

(ii) The charge on an electron was poorly known with all 3 possible answers appearing in roughly equal proportions.

(iii) This was very well answered.

(iv) This was poorly answered although most gave an answer related to charge e.g. positive electrode or anode.

(b) This was well answered with the only wrong answer being 23.

12 (a) Many candidates recognised that the alkali metals react with oxygen or water but they failed to say the metals were put in oil to stop this from happening.

(b) Colours were not well known and very few scored 2. Many crossing outs and distorted lines were observed which in some cases made marking more difficult.

# B641/02 Higher Tier

## General Comments

The exam and candidates performance was very similar to that of June 07.

In general many candidates do not fully understand the meaning of the word 'property' in a chemical sense.

Key chemical facts such as colours of compounds, flame colours and chemical tests are poorly known.

In longer responses candidates are not as precise as they could be and sometimes contradict themselves.

## Comments on Individual Questions

Q1 (a) This was reasonably well answered. Common mistakes were to put water on the wrong or both sides, to name an alcohol on the left side or to name a mineral acid.

(b) This was very well answered. Some candidates did not state which was an advantage and which was a disadvantage but this was usually clear from what they had written.

Q2 (a) This was also fairly well answered. The most common mistake was to leave out a bond. The symbol for fluorine F was not always clearly written as upper case.

(b) Well answered.

(c) The name of the chemical was usually correct although a number of bromides were spotted. The result was less well answered. Clear or discoloured were frequent wrong answers along with a wide range of colour changes so unspecified.

(d) Most candidates scored 1 but did not raise a second point for the second mark. Vague answers about pollution will not score. Toxic gases must be linked to burning and dangerous or harmful gases did not score.

Q3 (a) (i) There were a lot of ambiguous answers here, e.g. forces holding molecules together. Credit was given for a clear statement of force between molecules.

(ii) Generally well answered.

(b) Most candidates got the species correct in the equation and a lot were able to balance it. The most common mistake was to balance with 4 $H_2O$ rather than 5. Some candidates doubled everything up but were not penalised for this.

Q4 (a) This was well answered. Cost is not a property. Some answers were about insulation and were not credited as the insulation comes from the lining.

(b) Those who simply answered 'breathable' scored. If they attempted an explanation they tended to answer that goretex did not let water in but did let it out. This was not credited as letting out water vapour was the desired answer.

Q5 (a) Many good answers in terms of solvent evaporating or oxidation. Some confused their answer with solvent oxidising.

(b) Many good answers were seen here but the most common were mugs and beer bottles.

(c) Many good answers but the weaker candidates while talking about light energy being absorbed failed to say that it was later released.

Q6 (a) Many candidates failed to express themselves clearly in this question. They correctly stated what the plants were doing but did not go on to say what might then happen to the composition of the air.

(b) (i) This was well answered. A few candidates had water on the right hand side or carbon dioxide on both sides. The question asked for a word equation. Correct symbol equations are credited but candidates using symbols frequently used N rather than N2 and did not score.

(ii) A lot of candidates got the wrong idea here and had particles with more energy or moving faster instead of the required more collisions.

Q7 (a) Candidates were not as precise here as they could have been, they quoted values from the table but did not identify titanium as the strongest, merely stating that it was strong.

(b) Generally well answered but some did not name the layer, others incorrectly talked about low density and some said that aluminium would not rust rather than explaining why it would not corrode.

(c) Generally well answered

Q8 (a) Well answered but care must be taken with upper and lower case lettering and subscript numbering.

(b) (i) Generally well answered for 2 marks.

(ii) Increased number of reactant particles per unit volume was not clearly stated even though the mark scheme allowed statements such as more crowded. Some candidates talked about increased energy or particles so did not score a second mark.

Q9 A great range of diagrams were seen here. The simplest often scored 2. Many candidates were able to gain the convection current mark but some did not score as the current was not within the mantle. Many candidates indicated that the plates would move but gave no indication of direction. A lot of very good subduction diagrams were seen and those with the correct response scored but it was not subduction that was being examined here.

Q10 (a ) This question was very poorly answered with the most common response of 'reaction'.

(b) Sodium iodide was usually given its correct formula but on the right hand side NaCl2 or a single I were very common. As the species were not correct no balancing mark could be given

(c) A lot got the correct answer of 7 electrons in the outer shell but others talked of same number of electrons or similar structures and failed to score.

(d) The colour of solid iodine was not well known. Purple was given frequently but so were most colours of the rainbow.

Q11 (a) (i) + (ii) If one of these was correct, the second was usually also correct but as in 10(d) it is clear that colours of chemicals are not well known.

(b) Many incorrect answers including the formation of copper and/or oxygen meant that this question did not score well even if some of the given information was correct.

(c) Very few had much idea what to do here and those that did often gave Fe2OH rather than bracketing the OH.

(d) The required answer of nickel was not well known and a wide range, usually transition elements, was seen here.

Q12 (a) Well answered.

(b) This was generally well answered but a few got the 11 and 12 round the wrong way. A small number gave 23 as one answer.

(c) A lot of candidates left this response blank as they could not even guess at an answer.

(d) Usually well answered. The most common mistake was to have too many 8s in the structure.

13 (a) There were some very good diagrams that clearly showed electrons and charge. Many diagrams used arrows to show electron movement and these were not always very clear. The same electron could be taken to be on both the sodium and chlorine. A lot of correct structures did not show charges.

(b) (i) Not many correct answers here. A lot of answers were in terms of electrons and did not score.

(ii) This was generally well answered with an even split between dissolving or melting. An interesting wrong response was ‘add a metal’.

# B642/01 Foundation Tier

## General Comments

Only an extremely small number of candidates were entered for this examination paper. The average mark for this examination paper was 32, and the range of marks obtained was from 22 to 38.

Candidates found Section A much more accessible than the other two Sections.

## Comments on Individual Questions

Q1 This question was about fertilisers and how they are made.

(a) All three elements in potassium sulphate were given as responses, and oxygen was the most popular incorrect response. A significant proportion of the candidates did not attempt this question.

(b) The majority of candidates were able to state that the formula $K_2SO_4$ shows 7 atoms.

(c) Although the majority of candidates were able to calculate the correct relative formula mass of 174 a significant proportion of the candidates did not attempt this question.

(d) In part (i) many candidates realised that a neutral solution had a pH of 7 however a much smaller number could explain that roots can only absorb dissolved fertilisers in part (ii). A significant proportion of the candidates did not attempt part (ii).

(e) In part (i) many candidates correctly chose nitric acid. Only a very small proportion of candidates could recognise a burette in part (ii) and a significant proportion of candidates did not attempt the question. The correct answer for part (iii) was 90% but only a very small number of candidates obtained this mark. Several candidates quoted a percentage yield greater than 100.

Q2 This question was about the cost of manufacturing chemicals.

(a) Most candidates were awarded at least one mark, this was often for an energy related cost or for the cost of the equipment used.

(b) In part (i) many candidates could either describe a continuous process or a batch process, but in part (ii) a significant proportion of candidates just wrote about the costs rather than why the cost was high. Common correct answers were the raw materials were rare and that it would cost a lot of money to transport materials from South America.

Q3 This question was about water resources in the United Kingdom.

(a) Candidates had little difficulty interpreting the rainfall data in the Table.

(b) A significant proportion of candidates referred to sea water which was not given credit.

(c) Hardly any candidate referred to the use of chlorine in killing microbes.

Q4 This short question on fullerenes and nanotubes was the most accessible question in the examination paper with the majority of candidates getting full marks.

Q5 This question was about the electrolysis of aqueous potassium sulfate.

(a) Many candidates could identify the three pieces of apparatus.

(b) Many candidates were awarded one mark for identifying the electrode products but sulfur dioxide was a common error.

Q6 This question was about the properties of weak and strong acids.

(a) The majority of candidates were able to decide that there were three elements in ethanoic acid. A common misconception was to give the number of atoms rather than the number of elements.

(b) Almost all candidates referred to the use of universal indicator or pH paper but very few candidates went on to describe the use of a colour chart.

(c) All candidates could use the equation to identify the gas hydrogen.

(d) Only a small proportion of candidates could recall that carbon dioxide is made when acids react with calcium carbonate.

(e) In part (i) although the majority of candidates could state that hydrochloric acid reacts faster than ethanoic acid a smaller proportion could explain in terms of the gradient of the line. In part (ii) all candidates were able to interpret the graph. Only a small proportion of candidates realised in part (iii) that the reaction would keep going until 55 $cm^3$ of gas was made. A common incorrect answer was 17 $cm^3$.

Q7 This question was about precipitation reactions.

(a) A significant proportion of candidates did not attempt either parts (i) or (ii). The state symbol for a solid was better known than the state symbol for an aqueous solution.

(b) The colour of silver iodide precipitate was not well known.

Q8 This question was about the manufacture of ethanol from ethane.

(a) A significant proportion of candidates did not attempt this question but of those that did most correctly stated that the rate of the forward reaction equals the rate of the backward reaction.

(b) An even greater proportion of candidates than in part (a) did not attempt this equation. Only an extremely small number of candidates were able to clearly state that the concentrations did not change. A common misconception was that the concentrations were the same.

(c) The majority of candidates were able to interpret the data in the table.

Q9 This question was about hardness in water.

(a) A large proportion of the candidates could interpret the data in the results table. More candidates could identify the sample of water with temporary hardness.

(b) Even though these questions were prompted recall candidates still found them difficult. Candidates found part (i) easier than part (ii), and part (ii) easier than part (iii).

Q10 This question was about CFCs and the depletion of the ozone layer.

(a) Many candidates stated the correct names of the three elements however the use of chloride was not given credit.

(b) Although refrigerant was the most popular answer a significant proportion of candidates gave disinfectants.

(c) Although a small proportion of candidates did not attempt this question many wrote about two correct medical problems. The most popular answers were cataracts and skin cancer. Cancer on its own was not sufficient to be awarded a mark.

Q11 This question on sodium chloride and testing for gases was the least accessible question on the examination paper. A significant proportion of candidates left at least one part question blank.

(a) Very few candidates referred to subsidence and a significant proportion just referred to pollution with no further qualification.

(b) The test for hydrogen was more well known than the test for chlorine. A common error in part (i) was to neglect to refer to a burning splint. Very few candidates could describe a chemical test for chlorine.

Q12 This question was focussed on ethanol.

(a) Many candidates could write the word equation for fermentation.

(b) Only about one half of the candidates chose the correct temperature of $40^{o}C$.

(c) Only about one half of the candidates chose fractional distillation.

(d) A significant proportion of candidates did not attempt this question. The most common use was as a fuel or a solvent.

(e) Many candidates could draw the displayed formula of ethanol, although a few made small slip ups by missing hydrogen atoms.

# B642/02 Higher Tier

## General Comments

Only a small number of candidates were entered for this examination paper. The average mark for this examination paper was 26, and the range of marks obtained was from 11 to 55.

Candidates found Section A much more accessible than the other two Sections.

## Comments on Individual Questions

Q1 This question was about fertilisers and how they are made.

(a) The majority of candidates were able to state that the formula $(NH_4)_2SO_4$ shows 15 atoms.

(b) Although the majority of candidates were able to calculate the correct relative formula mass of 132 a significant proportion of the candidates were not able to calculate the percentage by mass of nitrogen which should have been 21%. An error carried forward mark was available for candidates with the wrong relative formula mass.

(c) Many candidates could explain that roots can only absorb dissolved fertilisers in part (ii).

(d) In part (i) many candidates correctly chose nitric acid and in part (ii) were able to describe how and why the pH value changes. The correct answer for part (iii) was 90% and a significant proportion of candidates obtained this value. Several candidates quoted a percentage yield greater than 100.

Q2 This question was about the cost of manufacturing chemicals.

(a) Many candidates found this question difficult and only a small number were awarded more than one mark. Candidates rarely referred to both rate of reaction and percentage yield. The effect of changing the pressure and temperature on percentage yield was not well known. Candidates did not refer to the idea of an optimum temperature.

(b) A small but significant proportion of candidates just wrote about the costs rather than why the cost was high. Common correct answers were the raw materials were rare and that it would cost a lot of money to transport materials from South America.

(c) Candidates frequently referred to the small quantities of the drug being made per year as a reason why it is made in a batch process.

Q3 This question about detergents was the most accessible in the examination paper.

(a) Many candidates were able to correctly label the diagram of the detergent molecule.

(b) The way that detergent molecules remove fat from a dirty plate was well known by most candidates. The candidates were often able to be awarded both marks for this question by their labelled diagrams.

Q4 This short question on fullerenes and nanotubes was one of the least accessible questions in the examination paper with the majority of candidates being awarded zero or one mark.

(a) The formula $C_{60}$ was not well known by candidates.

(b) The most popular correct response was to refer to the large surface area of the catalyst.

Q5 This question was about the electrolysis of aqueous potassium sulfate.

(a) Many candidates were awarded one mark for identifying the electrode products but sulphur dioxide was a common error.

(b) Many candidates could give one factor that affects the amount of gas made during electrolysis but only a small proportion of candidates were awarded two marks.

Q6 This question was about the properties of weak and strong acids.

(a) Candidates were normally awarded two marks or no marks in this question. A common misconception was to write the formula of hydrogen as H.

(b) In part (i) a significant proportion of candidates realised that the reaction would keep going until 55 $cm^3$ of gas was made. A common incorrect answer was 17 $cm^3$. Most candidates in part (ii) were awarded one or two marks. Candidates did not mention that one acid was strong and the other was weak. Candidates also needed to refer to collision frequency and not just the number of collisions.

Q7 This question was about the manufacture of ethanol from ethene.

(a) A large proportion of candidates correctly stated that the rate of the forward reaction equals the rate of the backward reaction.

(b) Only a small proportion of candidates were able to clearly state that the concentrations did not change. A common misconception was that the concentrations were the same.

(c) A very large proportion of candidates were able to interpret the data in the table.

(d) Only a very small proportion of candidates were able to get the correct answer of 9.2 tonnes. Typical answers were poorly organised and did not use the mole concept.

Q8 This question was about two precipitation reactions of copper (II) sulfate solution.

(a) A significant proportion of candidates were able to construct the word equation.

(b) Only an extremely small proportion of candidates were awarded two or more marks. State symbols could only be awarded if the formulae were correct and some candidates changed the formula for example giving the formula of copper(II) hydroxide as $CuOH^+$. The state symbol for a precipitate was not well known.

Q9 This question about hardness in water was one of the least accessible on the examination paper.

(a) Even though these questions were prompted recall candidates still found them very difficult. Candidates found part (i) easier than part (ii).

(b) Many candidates were able to write the balanced equation. The formulae for carbon dioxide and water were well known.

(c) A significant proportion of candidates did not attempt this question and many of the other candidates were not able to explain ion exchange. Candidates rarely mentioned calcium ions in their answer.

Q10 This question was focussed on the electrolysis of sodium chloride solution.

(a) A significant proportion of candidates referred to subsidence but a small proportion just referred to pollution with no further qualification.

(b) A significant proportion of candidates could write the electrode reaction in part (i) but fewer candidates could write the electrode equation for the discharge of chloride ions in part (ii). Common misconceptions included using $e^+$, Cl rather than $Cl_2$ and having the electrons on the wrong side of the equation. Almost no candidates could explain the formation of sodium hydroxide in part (iii).

Q11 This question was focussed on ethanol.

(a) Many candidates could write the word equation for fermentation.

(b) Fractional distillation was not well known.

(c) A common misconception was that the yeast was denatured. This was not given credit. Either the yeast dieing or the enzymes being denatured were the only allowed answers for this question.

(d) Many candidates could draw the displayed formula of ethanol, although a few made small slip ups by missing hydrogen atoms.

(e) Many candidates could deduce the pattern in the formulae of alcohols and so could write the formula for propanol but only a small proportion of candidates could write the general formula.

Q12 This question was about fats and oils.

(a) Many candidates referred to the presence of double bonds.

(b) The use of bromine to test for unsaturation was not well known.

(c) Although saponification was well known all of the other processes proved effective distractors.

(d) A significant proportion of candidates did not attempt this question and the hydrogenation of vegetable oils was not well known.

# Grade Thresholds

**General Certificate of Secondary Education**
**Chemistry B (Specification Code J644)**
**January 2008 Examination Series**

**Unit Threshold Marks**

| Unit | | Maximum Mark | A* | A | B | C | D | E | F | G | U |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **B641/01** | Raw | 60 | - | - | - | 34 | 28 | 23 | 18 | 13 | 0 |
| | UMS | 69 | - | - | - | 60 | 50 | 40 | 30 | 20 | 0 |
| **B641/02** | Raw | 60 | 43 | 35 | 27 | 19 | 14 | 11 | - | - | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | - | - | 0 |
| **B642/01** | Raw | 60 | - | - | - | 34 | 28 | 23 | 18 | 13 | 0 |
| | UMS | 69 | - | - | - | 60 | 50 | 40 | 30 | 20 | 0 |
| **B642/02** | Raw | 60 | 45 | 37 | 29 | 22 | 15 | 11 | - | - | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | - | - | 0 |

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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