

OCR Report to Centres

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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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Advanced Subsidiary GCE Science (H178)

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G641/01 Principal Examiner's Report

General comments

The candidates seemed to find the paper straightforward and invariably answered all the questions. There was no evidence that any of them were short of time.

Comments on individual questions

- 1
 - (a) Candidates are now much more aware of the meaning of the term *productivity* although few were able to come up with sensible units. Most just suggested kJ. In part (iii), some confused higher *latitudes* with higher *altitudes*. A common error was to fail to compare the two types of forest.
 - (b) The term *biodiversity* was well known and many students realised that a tropical rainforest could support a larger and more varied number of species because of the greater number of habitats available. Most were aware of the importance of the rainforest to mankind.
 - (c) This question has been asked many times in one form or another and students are answering it much better. In the past, they have thrown in phrases like *natural selection* and *survival of the fittest* almost at random without actually addressing the subject matter. This time, they did actually talk about the lemurs. The commonest misconception is the belief that an adaptation is learned, or that an immunity is built up, so that a lemur acquires a tolerance through eating a bit more poison each day. Basically, the lemur either lives or dies. If it lives, it may pass on the helpful gene.
- 2
 - (a) The mechanics of photosynthesis, including the roles of the light dependent and independent stages, is becoming much better understood.
 - (b) On the whole, this question was poorly answered. Many candidates didn't realise that much of the light reaching the leaf is reflected and few were able to suggest a use for the energy, with low level answers like 'for growth' common. More worryingly, a significant number suggested it is used for photosynthesis.
 - (c) Most could suggest at least one condition necessary for anaerobic respiration and name a possible biofuel produced.
- 3
 - (a) Most candidates scored well here.
 - (b) The role of rods and cones in the retina was well understood. However, some candidates are under the impression that rods only operate under poor light conditions. This is not so.
 - (c) This was a higher level question and candidates made a valiant effort at it. However, marks were lost by merely describing the sensitivities of the sensors, rather than comparing them.
 - (d) Generally correctly answered.
- 4
 - (a) As ever, this question was poorly answered, despite having been asked several times in recent years. We expect to see a type of compound named. It is not sufficient to answer 'growth' at this level.

- (b) Only the very weakest candidates failed to score here. The reactants and conditions of the Haber Process are well known. Marks were lost in part ii due to lack of detail.
 - (c) The details of the nitrogen cycle were not well known by candidates. They appreciated that decomposing bacteria were involved in the breakdown of manure, and maybe that nitrates were involved somewhere along the line, but that was about it.
 - (d) The role of nitrogen fixing bacteria in the root nodules of beans was not well known at all. In this and the previous question, marks were lost by loose talk of 'nitrogen' rather than the appropriate ion.
 - (e) The role of nitrates in polluting bodies of water is well understood.
- 5
- (a) Weaker candidates found this question difficult. The commonest error was failing to divide the figure for the solar water heating panel by 4 to make a comparison with the PV panel.
 - (b) A good discriminator.

G642/01 Principal Examiner's Report

General comments

407 scripts in total were submitted with a mean mark of 43.6. The top mark awarded was 91/100 and the lowest did not score. The general standard of the papers was very similar to previous years with a significant proportion not scoring sufficiently well to secure an E grade or above. The best scripts showed a good grasp of the specification and fluency with the necessary terminology. Some scripts were still very poorly presented but the majority of scripts were legible.

Comment by question

- 1
- (a) Most candidates who realised that water was the second product then went on to balance the equation correctly. There are still a substantial number of candidates who think that hydrogen is a product of combustion.
 - (b) A good diagram would have secured 2/3 marks here. The question required candidates to recall and appreciate the concept of electronegativity which needed to be referred to for the 3rd mark.
 - (c)
 - (i) Many candidates answered 2 bonds.
 - (ii) Very few candidates recognised that it is the SHAPE of the molecule that cancels out electronegativity differences.
 - (d)
 - (i) This was well answered but a few candidates are failing to read the stem of the question and thus misinterpreting the graph.
 - (ii) Those who answered part (i) correctly, generally scored well on (d) (ii)
 - (e) The first two parts were generally answered well but balancing this simple equation (iii) is still poorly done with many candidates not realising that the charges must balance.
- 2
- (a) A straight forward definition; generally well answered.
 - (b)
 - (i) A well plotted graph (more than half the axes used in each direction) scored well but many failed to realise that as a first order decay curve, the line of best fit could not be straight.
 - (ii) If (b)(i) was well drawn, then (ii) was an easy mark.
 - (c) Generally well learned.
- 3
- (a)
 - (i) Most candidates labelled the alpha helix although a significant minority referred to it as a DNA helix.
 - (ii) This was generally fine but weaker answers referred simply to 3rd level of structure.
 - (iii) This turned out to be a good discriminator with weaker candidates giving a generic answer as to why a change in amino acid might affect protein shape but only better answers realising that the absence specifically of a Cys residue meant that a Cysteine bond could not form.

- (b) This was also a good discriminator with good answers regularly scoring 5 giving a clear description AND explanation.
- 4 (a) It was apparent than many candidates had never seen an IR spectrum and had little idea of what processes gave rise to a spectrum.
- (b) Both parts were generally well done by candidates familiar with these equations. However, there are still some problems with calculations using numbers in standard form and with units.
- 5 (a) and (b) These question parts were generally well done although some candidates are not referring specifically to the kinetic theory to explain the observations in part (b) and just re-stating Charles' and Boyle's law.
- (c) Better answers specifically referred to hydrogen bond formation.
- 6 (a) Most scored Glycine in (i) but some misread the question for (ii).
- (b) Good answers showed a good understanding in parts (b) and (c) and scored well. Many candidates showed a real confusion over the role of tRNA.
- 7 (a) This proved to be an easy question that required two correct answers for 1 mark.
- (b) Weaker answers were very confused about which processes were exothermic and which were endothermic.
- (c) Extended questions of this type continue to be demanding for candidates who do not prepare an outline for their question in rough first. The question required a comparison between bio-butanol and bio-ethanol although so many answers compared bio-butanol to fossil fuels that the mark scheme was modified to credit this answer as well.
- 8 (a) This was well answered.
- (b) Only the better answers mentioned that the freezing of water left behind the salt, increasing the salinity and thus density of the sea water.
- (c) The calculation was well done but the explanation in (ii) only moderately well done.
- 9 (a) This question scored well although less than half of candidates knew that the coulomb was the unit for charge.
- (b) These calculations were well done although problems with units were the most common source of error.

G643 Practical Skills in Science

This component gives centres the opportunity for candidates to show their competence and ability in skills not assessed in the written papers. Staff are thanked for their preparation and marking of both the case studies and the practical tasks. Generally the marking was supported. However, the assessment for quality A in the Case study and the evaluation for the practical task were often found to be generous. Annotation of reports is a helpful way of confirming the marks and teachers are asked to supply their own results of the practical study to confirm the accuracy of candidates' outcomes. Centres are to be congratulated for the promptness of sending the samples for moderation and the organisation of their candidates' work. Marking was usually very clear and this supported the moderation which is appreciated. Although a few clerical errors were found generally the administration procedures were carried out well.

Case study

The case studies offered this session were

- Carbon capture
- Radioactive dating
- Structure of the atom

The structure of the atom and radioactive dating were the most popular. Centres are advised to use the additional guidance which accompanies the criteria when marking.

For Quality A, generous assessment was seen on many reports. Centres were awarding full marks where candidates had listed a number of references, many of which were just websites. As well as correctly referencing their sources, for five marks candidates need to show effective use of these sources. Referencing using superscripts throughout the report is a good way of indicating the 'effective' use of the sources used. Candidates scoring high marks should also be selecting suitably relevant and accurate information. The inclusion of excessive research in reports which is not directly relevant to the tasks is not worthy of top marks. In addition, for 4-5 marks candidates need to use material from the original scientists' work or work of their contemporaries.

For Quality B, the candidates need to show understanding of the science underlying the study for the lowest marks. For the higher marks candidates need to use their research and not just 'paste' it into a report. For 3 marks and above it is a requirement of the criteria to show an understanding both of the science involved and ethical issues and/or safe and skilful techniques used. Assessment was generous where simple statements or references to ethical issues were included e.g. 'In this experiment alpha particles were used and this may be viewed as unethical as they are ionising radiation and these can cause cancer'. Candidates need to discuss such issues rather than identify them where the higher marks are being awarded.

Quality C, even for 1 mark a conclusion or a pattern or trend needs to be identified and for 3 marks candidates need to carry out basic processing of data. To award 4 or 5 marks candidates need to show evidence of further higher level processing to reveal further information. For 5 marks work should also show that candidates have considered the reliability and validity of the data used, simply stating a particular source is reliable, is not sufficient. Conclusions also need to have depth of scientific understanding for the higher mark bands.

Practical Tasks

The tasks available this session were

- Studying reaction rates
- Measuring temperature change
- Effect of concentration on action of urease on urea solutions

Measuring temperature change and studying reaction rates were the most popular. The evidence seen through moderation indicated that the practical tasks were achievable by the candidates and results collected were suitably processed.

Where the tasks required a description of associated risks and hazards, candidates need to ensure not to include just generic hazards and risks. In addition candidates need to look at both the materials involved and the task itself.

Assessment of B1 & B2 was generally supported and it was good to see detailed annotation from teachers to show coverage of these criteria. Although most centres included staff results, it is important that these are sent with the candidates' work. Moderators are required to check candidates' results against those completed by the staff. Centres need to ensure that opportunities are given to candidates to design their own table for their results, correct units are included and where appropriate candidates need to understand the meaning of concordance and to omit the inappropriate value. Graph plotting was variable although graphs were usually plotted correctly but scales were often poor and triangles for gradients were not always at least half of the length occupied by the plotted points.

Evaluation assessment C3 was often over marked, where candidates were including generic statements on repeatability. Acceptable statements included: scatter/range bars were small, points were on a straight line, and all 3 values were considered and were within +/- stated value. Care also needs to be taken that candidates describe the reliability of the experiment carried out and not how the reliability would be improved if it were carried out again. To access the higher marks candidates need to provide a detailed explanation of the nature of the procedural errors with improvements clearly linked. Both experimental design and procedural methodology should be considered.

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