OCR
Oxford Cambridge and RSA

Cambridge Technicals

Laboratory Skills

Level 3 Cambridge Technical Certificates in Laboratory Skills
05879, 05847

Level 3 Cambridge Technical Diplomas in Laboratory Skills
05848, 05849

OCR Report to Centres January 2018

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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.

OCR will not enter into any discussion or correspondence in connection with this report.

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Unit 1 – Science Fundamentals

General Comments:

This paper was the second to be assessed for the new Level 3 Cambridge Technical in Laboratory Skills, Unit 1 Science Fundamentals. Candidates appeared to be increasingly well prepared for the themes/topics covered within the specification.

The depth of knowledge and understanding needed to successfully complete the objective format for some items was demonstrated by a number of candidates. It appeared that the use of this objective style provided increased access for some candidates.

The majority of candidates were able to respond to all questions in the time available, although it is noted that the final question was often incomplete. Some candidates used the additional pages in an appropriate manner but in most cases these pages were not required.

Comments on Individual Questions:

1(a) The majority of candidates were able to correctly identify the number of protons and electrons in one atom of calcium.

1(b) It was encouraging to see that most candidates were capable of explaining the term isotope.

1(c) Although a number of candidates obtained one mark for referring to neutrons, the majority did not consider nuclear force.

1(d) This item was generally well answered. The common error for candidates was to present the value without considering the standard form. This limited the full allocation of marks but candidates were credited for their clear use of Fig. 1.1 to show their working.

1(e) The introduction of an objective format enabled many candidates to cope well with parts (i) and (ii). However, a common error was seen with the choice of 20 rather than the correct value of 2 for the number of valence electrons in a calcium atom. Part (iii) presented a challenge for a number of candidates, since they did not appreciate that both covalent and ionic bonds were involved.

2(a)(i) This item enabled many candidates to do well and obtain 3 or 4 of the marks available. General references to the initial increase, decrease etc. were creditworthy. It was encouraging to see that some candidates used values from Fig. 2.1 to support their statements.

2(a)(ii) The majority of candidates were familiar with the other factors known to affect the rate of reactions. The list is included in the specification for this unit and was used well. This was a straightforward, factual recall item.

2(b)(ii) A number of candidates correctly referred to the loss of hydrogen and the formation of the double bond but failed to state the name of the chemical reactions. Some incorrectly stated reduction and displacement, instead of oxidation.

2(b)(iii) Many candidates failed to include two molecules in their diagram and chose to draw a residue of lactic acid surrounded by brackets with the letter 'n'. This was not acceptable since it did not respond correctly to the rubric of the question. Only a few candidates included the release of a water molecule in their diagram.

3(a) Very few candidates were capable of describing the structure/function of epithelia tissues. This was unexpected because this tissue is listed in the unit specification, along with others such as muscle and connective tissue, in the context of structure and functional properties. It was not an essential feature of the response, but it was observed that candidates were generally unable to draw a diagram to show the features of this type of tissue.

3(b)(i) This objective item provided the options for labelling the electron micrograph shown in Fig. 3.1. Relatively few candidates recognised both the plasma membrane and mitochondrion. Since epithelial cells do not exist in plants and the characteristic features of plant cells were not shown in the image, it was surprising to note that some candidates considered the outer edge of the cell to be the cell wall, rather than the plasma membrane.

3(b)(ii) Few candidates appreciated that the dense parts of the nucleus represented chromatin (or DNA). Some considered the dense parts as nuclear pores. This was a good attempt but incorrect since nuclear pores were not visible in the image.

3(b)(iii) Many candidates obtained one mark for observing that structure A (although incorrectly referred to as the cell wall) was involved in the control of movement of molecules in and out of the cell. The expected answers focussed on the plasma membrane acting as a barrier and that it is partially permeable. The mitochondrion (structure B) was often identified correctly as the site of aerobic respiration and ATP generation. Reference to the 'creation of energy negated this marking point. The majority of candidates were unable to state the role of chromatin (structure C) within the nucleus.

3(c) This item was generally accessible to candidates. They successfully described the prominence of the nuclei in the cancerous cells, although reference to 'dots' was not acceptable. Some were also able to characterise the cancerous cells as in the state of mitosis/division, which appeared to be a useful link to general knowledge of such cells.

4(a)(i) Although many correctly named the functional group as an aldehyde, some candidates referred to ketone or acetone.

4(a)(ii) Almost all candidates struggled to identify the correct number of optical isomers (16) for the hexose in Fig. 4.1. The asymmetry of the carbon atoms was not understood.

4(a)(iii) Very few candidates drew the correct isomer features. The geometry of bonding was not apparent in most responses.

4(a)(iv) Most candidates were also challenged by this item. The correct number of isomers (32) was rarely seen in candidate responses. This did mean that they were unable to include references to asymmetric carbon atoms or to the term 'chiral'.

4(b)(i) The formation of glycosidic 1-4 linkages was understood by relatively few candidates. However, some responses were excellent and demonstrated knowledge of bond formation and the release of a water molecule. Many candidates did, however, obtain one mark for correctly including the two reactants.

4(b)(ii) The formation of glycosidic 1-6 linkages was equally challenging for most candidates. Similar features were noted as for 4(b)(i).

4(b)(iii) It was surprising to see that candidates did not recall that glycogen is a polymer of glucose found in animals. Some incorrectly referred to starch (as outlined in the stem of this item) or to glucose.

4(c) The formation of the ester bond between stearic acid and a glucose molecule was poorly understood by the majority of candidates. The item was challenging but some were confused and redrew the stearic acid using the typical formation shown in textbooks and online, without reference to glucose.

5(a)(i) Most candidates did not appreciate that nitrogen is available to plants as nitrate. There appeared to be some confusion, since some candidates referred to the route of availability such as the soil, air or as a liquid or gas.

5(a)(ii) Only some candidates appeared to understand that nitrogen is a component of DNA and is used in protein synthesis. No clear pattern of incorrect, alternative responses could be observed.

5(a)(iii) Many candidates successfully identified those elements showing an increase in 'fifth cluster' tomatoes and those elements with no change.

5(a)(iv) It was unfortunate that a number of candidates considered that calcium (along with nitrogen) were important for the development of fruit clusters. They had clearly focussed on the highest values, rather than those elements showing the greatest increase.

5(a)(v) Very few candidates were able to give two reasons why the element manganese is essential for plant growth. Reference to the role of manganese is provided in the exemplification section of the Unit 1 specification (LO 5.1). However, some were clearly aware that this element has some form of role in photosynthesis. This was a creditworthy response.

5(b)(i) A number of candidates were able to balance the second chemical equation but struggled with the first in this item. No clear pattern of incorrect, alternative responses was observed.

5(b)(ii) A description of the effect of fish density on the growth of the lettuce plants was challenging for many. However, some candidates correctly referred to the overall pattern and included mention of the optimum (= best) performance at 5.0 kg m^{-3} and the underperformance at 8.0 kg m^{-3}. Others provided an unnecessary explanation, in addition to a description.

6(a) Some candidates were capable of listing similar features of the two polymers, such as strength and flexibility. However, it was unfortunate that many repeated the feature of 'wear resistance' included within the stem of this item. The instruction for this item referred to 'two other' properties. Many candidates noted the special feature of the top surface (polyurethane) in relation to friction/grip. It was also interesting to see some correct references to the potential to discharge static electricity in the top surface. Reverse arguments were fully acceptable with reference to the different properties.

6(b) This objective item provided six options for the selection of the two correct responses. Some correctly selected cross-linking but very few considered that the addition of plasticizers would alter the mechanical properties of the polymers. 7(a) Responses to this question varied greatly. Candidates from some centres provided fully correct responses with clear calculations shown. Other candidates were very much challenged by this question and failed to identify potential difference, current or power.

8 Responses to this question varied greatly. Again, some centres included candidates achieving 2 or 3 marks whilst other candidates either failed to complete a response to the question or appeared to be very confused. Some candidates used the space below the question on page 25 to calculate their responses. This revealed that many candidates were struggling to determine the series and parallel arrangements of the three resistors.

Unit 2 – Laboratory Techniques

General Comments:

This paper was very different than has probably been seen before by many candidates or Centres. Historically candidates do not sit a paper that contains more than one science discipline in a level 3 paper. This is only the second time this paper has been sat. Some areas were answered well and candidates showed good knowledge of safe working practice and flame tests. They were able to calculate the number of genomes in a sample. Areas that were weaker were some of the more complex laboratory techniques such as gel electrophoresis and ICP-AES.

This is a techniques paper and so the focus is on the techniques they need to know.

Comments on Individual Questions:

1(a),(b)(i) and (b)(ii) These questions were well answered. There was good understanding of safe working practice. Some candidates confused bacteria and viruses which affected their answers.

1(c)(i) This question was about how to produce repeatable results. Many candidates discussed accuracy. They did not consider how the current test should be similar to that carried out in 1992.

1(c)(ii) Few candidates stated that the components of blood should be separated. Many knew to freeze the blood although some just said keep cool which was not creditworthy. Some were able to explain why the blood should be separated and frozen.

1(d)(i) This was answered well with an understanding that the lab may not be specialised enough. A few candidates gave an answer relating to traceability or procedures.

1(d)(ii) Many candidates incorrectly gave modes of transport such as truck or boat when answering this question. They needed to discuss how the sample was packaged/stored/labelled etc.

2(a) Many candidates answered this in terms of blood samples and not DNA samples, and so discussed disease or contamination. This was not creditworthy. Candidates needed to discuss quantity and quality of DNA to score marks.

2(b) This was answered very poorly. Candidates did not know this process and many answered in terms of addition polymerisation reactions. They needed to describe the actual steps in the process. 2(c)(i) This question was answered poorly. Some candidates described TLC. Others new a little but were not able to give enough detail to gain a mark e.g. having wells was not enough to gain the mark. It must be clear the wells are near the negative electrode. This could have been shown on a diagram.

2(c)(ii) Many candidates put the same answer for 2ci as 2cii. This was an explanation question and so they should have shown an understanding of how gel electrophoresis works.

2(d) This question was answered very well. Most candidates could calculate the answer correctly. However, the question asked for complete genomes and so some candidates lost a mark as they did not give a whole number.

2(e) A well answered question.

3(a)(i). Candidates answered this question well. Marks were lost as they did not state that the acid was 'concentrated' hydrochloric acid or they did not have the Bunsen burner on a 'blue' flame. Some dissolved the alga rather than dipping the loop in powder.

3(a)(ii) This was a well answered question in general. It is important that candidates know key information such as flame colours.

3(a)(iii) This question was also well answered with most candidates getting at least one mark. Some did not express the idea that not all elements give flame colours and so did not gain this mark.

3(b) Most candidates did not perform well here. It was clear they had not had any experience of this technique. Centres must ensure candidates use or see demonstrations of all the techniques in the specification.

4(a)(i) It was nice to see that most candidates could complete this equation. They lost marks where they did not read the question.

4(a)(ii) Most candidates were not able to answer this question. They did not understand equivalence points and did not know why different indicators are used for different titration reactions.

4(b) Again a description of the technique was required here. Most candidates tried to give a calculation and so did not score marks.

4(c)(i) Candidates lost this mark because they included the rough titre in their average calculation.

4(c)(ii) Error was carried forward from 4(c) in order to not penalise candidates. Many lost marks because they did not convert cm^3 to dm^3.

4(c)(iii) Again error was carried forward from 4(c)(ii). Candidates divided 176.12 by their answer for 4(c)(iii) rather than multiply it and so lost marks. Most did not divide by 5.

5(a)(i) Many candidates did not know how to work out the diameter. It is important to practice these types of calculations as although they are in different contexts the maths is quite simple.

5(a)(ii) There needed to be a comparison e.g. higher resolution to gain these marks.

5(b)(i) Candidates struggled with this question. Most drew a line with no real scale or units. It was unclear why the length of the scale bar had been chosen.

5(b)(ii) Many got one mark for light microscope but then did not get the second mark. Almost no candidates mentioned use of incident light.

5(c) Most candidates only got one mark for being able to see the dust particle. Some understood that you did not need higher resolution. No candidates understood that staining aids identification of different types of cells.

5(d) This question was really well answered. Most candidates were awarded 2 marks.

6(a) Many candidates produced level 1 or level 2 responses to this question. However, they did not understand that once the culture was grown they would need to isolate the bacterium. This meant they could not gain credit for a level 3 response. This is a technique they should be familiar with and candidates should be able to describe both stages.

6(b)(i) Candidates lost marks because they just said to prevent contamination. They needed to give specific examples of what would be contaminated to get full marks.

6(b)(ii) Candidates were unable to answer this question. This is knowledge from the specification that should be covered.

6(c) Candidates needed to be specific in order to gain marks here e.g. it is not enough to say it should be place in a bag, the candidates needed to state it was an autoclaving bag.

6(d)(i) Candidates could calculate the average, however they lost the mark as they did not give a whole number. This question was about number of cells so should be a whole number.

6(d)(ii) There was an error carried forward form 6(c)(ii). Many candidates got the division upside down and so lost marks. Most candidates gained marks for correctly calculating the volume of the cell.

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