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## General Certificate of Secondary Education

# Applied Science 4863

## AASC/2H Science at Work

# Report on the Examination

*2009 examination – January series*

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# General comments

All questions were attempted, which indicated that the content and language of the questions allowed the candidates to recognise the subject and gave them the confidence to attempt some or all parts of the question.

As with the foundation paper, those questions which relied on a knowledge of laboratory techniques (question 2: flame test and question 4: chromatography) proved the most difficult to answer consistently.

# Question 1 (standard demand)

The first part of this question consisted of a simple addition of masses extracted from a table of information, but not all candidates managed to get both answers right, although in 1(a)(ii) the majority identified at least one of the two people eating too much salt.

1(a)(iii) was well done, with 50% of candidates gaining at least one and, more often, two marks for identifying ways of reducing salt intake: not adding salt to cooking/cooked food or choosing low salt varieties of food were the most common correct answers.

Answers about exercising, sweating out the salt and cutting carbohydrates lost marks for some candidates.

In 1(a)(iv), answers such as heart disease and heart failure were accepted alongside the expected answers of high blood pressure, heart attack and stroke, which allowed almost three quarters of candidates to gain this mark.

The response to the structural chemistry question, 1(b)(i) was mixed, with some candidates giving confident answers about giant lattice structure and strong forces of attraction, while others struggled to explain the reason for the presence of electrostatic charges. It was insufficient to quote the presence of '$^{+}$ve and $^{-}$ve charges'; these had to be identified as ions. Some candidates gained a mark for identifying the structure as made from a metal and a non-metal.

# Question 2 (standard demand)

In 2(a)(i) 'precipitate formed' **was** accepted, which was fortunate, as few candidates used the word 'solid' in their answers. The answer was less well attempted than some of the more testing parts of this question. In 2(a)(ii) a variety of metals (and quite a number of non-metals) were suggested. The answer of copper, written in any form, was rarely seen.

Again (see general comments), the outcome of a chemical test seemed difficult for the candidates to explain and 2(b)(i) had a variety of answers for both the fizzing/gas given off and the calcium.

2(b)(ii) was rarely answered correctly. There were some excellent, clear and detailed answers to the request to describe a flame test. Equally, many candidates understood the procedure, but their answers lacked detail such as 'the wire/loop must be cleaned' or 'the sample should be placed in a hot/blue flame'. Eye protection was rarely mentioned!

Part 2(b)(iv) had a disappointing outcome, mainly because so many candidates 'sterilised the loop' instead of making sure it was clean. Candidates read the word reliable and immediately thought of repeats, but the question was actually asking for precautions needed. While repeating generally ensures reliable results it would not make much difference in a flame test if the reagents were contaminated and a dirty wire was used. Some candidates were confusing the experiment with microbiology and were insisting on a sterile wire which is not important in this test.

## Question 3 (standard demand)

Almost all candidates answered 'marathon' correctly for 3(a)(i) and in 3(a)(ii) that the marathon was of long duration; however, the second point about using up energy proved more elusive.

In part 3(b)(i) water and glucose (sugar was accepted) were the most common correct answers and most candidates gained at least two marks. Salt was accepted for the third mark, but 'electrolyte' was rarely seen. The main loss of marks was when glucose and sugar were both offered which gained only one mark.

Part 3(b)(ii) was a question about the properties of a polymer, not the material, so that answers about being 'breathable' or 'cool' were not accepted. 'Lightweight' was the most frequent correct answer and quick-drying/wicking were also common answers. A number of candidates however lost this mark by quoting it as absorbing sweat, not letting sweat out. Durable and flexible were given correctly occasionally, but colourfast and stain resistant were seen only rarely.

## Question 4 (high demand)

Only a few of the candidates were able to give the definition of qualitative analysis in 4(a). Although there was a possible range of seven different answers to choose from for the four marks in the chromatography question 4(b)(i), full marks were not very common. It was felt that candidates did not know what Thin Layer Chromatographs (TLC) were, as almost every candidate referred to paper chromatography and thus missed the first point describing TLC. Although there was a general idea of how the experiment was run, inattention to detail such as where the sample was placed on the plate/paper; that the solvent and the ink runs up the paper, not just spreads and the desired outcome is the separation of the components/colours, lost many candidates marks.

The same vague answers again occurred in 4(b)(ii), where they were required to make the point that both samples had to be run and that something eg colours/ patterns had to be compared. 4(b)(iii) was answered well with most candidates gaining one mark.

In 4(c), almost every candidate achieved at least one mark, most commonly for fingerprints or handwriting. Those candidates who did not achieve full marks did so frequently by quoting 'blood' as one of their answers, without qualifying it with either DNA or blood group.

## Question 5 (high demand)

The first half of this question dealing with practical applications was attempted with some success by a reasonable proportion of the candidates. Only a third correctly quoted friction or drag for 5(a)(i). Water resistance was not accepted at this level. In 5(a)(ii), tight fitting, streamlined (but not slim line!), and aerodynamic, were all common correct answers for the first mark, but too often two of these were the only suggestions and thus gained only one mark.

Smooth, slippery and covering the head were less common second choices. References to shark skin were accepted only if the reason was explained. Answers should have related to reducing drag, not just improving performance, so lighter and thinner were not acceptable answers.

In 5(b) many candidates tried to find differences between the two sets of results, which were not valid. A few candidates managed one mark for either identifying that there was no difference between the two sets of results or the mutual rise in velocity and resistance.

5(c) was the first question that many candidates found difficult. Most candidates attempted to identify tidal volume and vital capacity, but often without success; and in consequence, 5(c)(ii) was rarely correct. A number of candidates identified the two lines where the calculation should be made, but read the top line as 6000 and calculated too large an answer.

5(c)(iii) was also poorly answered, considering it was simply naming the correct piece of equipment. The endemic inability to differentiate between aerobic and anaerobic respiration continues and a high proportion of candidates achieved only one or two marks between 5(d)(i) and 5(d)(ii).

## Question 6 (high demand)

Most candidates made a creditable attempt at this high demand question, and it was successfully done by a significant number of the candidates.

The majority of candidates gained both marks in 6(a) (i) making the connection between the number of plants and their effect on growth. They were equally successful in 6(a)(ii) by identifying the reasons for these results.

6(b)(i) and (ii) was not quite so successfully attempted. Although most candidates identified either fertiliser or pesticide as the farmer's choice in 6(b) (i) the effects that these, and some of some of the other options in 6(b)(i), would have on the environment were not well explained. The most successful answers were, for fertiliser, draining into waterways, but many candidates failed to get a second mark. For pesticides, the most successful was either building up in the food chain, or removing a food source for other animals, but, again, a second mark was rare. When herbicides were identified in 6(b)(i) some candidates were successful in identifying both damage to other plants and poisoning animals.

The final question 6(c) was well done, with the majority of candidates successfully identifying larger and faster breeding, as two of the suggestions. They were often able to link one or both of these to their consequences.

## Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.