General comments

The paper produced a relatively good spread of marks and correct responses were seen in all parts of all questions.

Perhaps surprisingly, some of the lower-scoring answers were seen in the factual recall questions (those testing assessment objective 1 - AO1), especially Questions 10, 16 and 21. Approximately 15% of the marks for this unit are awarded for AO1 skills, so it is essential that students revise the sections listed in the Teachers’ Notes.

The tasks seemed to cause little problem, with only an occasional student objecting to the use of maggots. Nearly all students observed variation in the number of turns, and the time maggots spent on the filter paper.

Task 1

Task 1 was generally answered well, with students demonstrating a good understanding of the task.

Question 1

This question was answered poorly, with only a third of students scoring the mark. The most common correct answer was ‘to prevent the maggot drying out’. Many gave answers referring to the damp filter paper as being the maggot’s ‘natural/preferred environment’, which was not deemed sufficient for the mark at A2. Other incorrect responses included ‘to remove moisture as a variable’ (more likely to be consistent if the paper was dry), ‘to keep the paper flat’ or ‘to create an unfavourable environment so that the maggots move off the filter paper’.

Question 2

(a) Over 80% of students achieved this mark and demonstrated good understanding.

(b) Again, this question was answered well, although some students were not specific about where they folded the paper and some did not point out that the centre is where two folds (in half) intersect/cross.

Question 3

Nearly 90% of students achieved this mark. References to the maggot becoming stressed (poor biologically) were ignored, if the idea of avoiding harm to the maggot was also expressed.

Question 4

To gain this mark, students had to be specific in their answers, eg whole of body changed direction or body changed direction by x°. Vague answers, such as the maggot not continuing in a straight line or the maggot turning its head, were insufficient to score the mark.
Question 5

Students who failed to obtain this mark referred to the presence of another maggot, rather than to the same maggot being influenced by its previous experience. Perhaps students had learnt a rote answer from a previous assessment involving behaviour.

Question 6

This was answered poorly, with only a third gaining this mark. Most students gave vague answers relating to different maggots behaving differently. It was important to state that this ensures that light is the only factor that changes, or that all variation between maggots is removed.

Question 7

Poor terminology was often seen in responses to this question. Few students achieved marking point 1 (the maggot moving out of an unfavourable environment faster) but three quarters of students had some idea about how this would aid survival for marking point 2. Many students failed to obtain marking point 1 because their answers suggested intent in the behaviour of the maggot, thus showing a lack of appreciation that this is an innate behaviour. For example, students suggested that the maggot was ‘trying’ to find a more favourable environment.

Task 2

The Spearman rank correlation test has rarely been used in previous EMPAs. This appears to have produced marks that were a little lower in this section than in previous years and showed slightly better discrimination.

Question 8

(a) Most students had a clear idea as to what constitutes a null hypothesis. The most common mistake seen was ‘there would be no difference between time taken and number of turns’.

(b) Virtually all students correctly chose the Spearman rank correlation test.

(c) Although the vast majority of students achieved this mark, many felt they must write a reason in their own words, when the best answer would have been to repeat the information in the flowchart on the Students’ Statistics Sheet.

(d) The process of ranking caused problems for some, but 75% of students gained this mark.

(e) Relating the result of their statistical test to the critical value and consequently rejecting or accepting the null hypothesis was generally done successfully. Some students did not specifically identify the critical value to be used and so failed to obtain the first mark. Relating the value of the test statistic to the probability of the correlation in the results occurring by chance being less than or greater than 5% still causes problems for some. Most students stated that the ‘results’ occurred by chance. The examiners gave credit for this but it would be pleasing to see better understanding and for students to identify correctly that it is the ‘correlation in results’ occurring by chance. Several students did try to improve on ‘results’ but incorrectly stated that the ‘difference in results’ occurred by chance; this was credited.
Written Test: Section A

Question 9

This question was completed well by all but a few. Some students failed to obtain one mark by simply stating ‘light’, when further qualification (light intensity) is required at A level. Some suggested pH which, in this dry environment, is not appropriate.

Question 10

Less than 40% of students scored two marks for this question. This was disappointing, as it should have involved very straightforward recall from the list of topics students were told to revise. To gain marks, students were required to state that it is the response that is non-directional, and that the response involves a change in the rate of movement/turning.

Question 11

Confusion was seen here between calculating the rate of movement as distance divided by time or as one divided by time. Some students failed to specify the units in which they would measure distance (mm) or time (s). Very few were able to suggest a reliable method of measuring the length of the path taken by the maggot as it moves across the filter paper.

Question 12

(a) Over 70% of students achieved this mark, with most giving the answer ‘to see if there was a correlation/association between the two variables’.

(b) Very few students could give two reasons for variation. The most common correct response was that the maggots differed in age. Some suggested they were different species, which did not gain credit. Many students simply suggested environmental factors.

(c) Disappointing responses were seen here. Students could often state that there was a correlation but less often identified it as positive. Large numbers of students simply picked out individual data points, rather than identifying the trend required for marking point 2. Very few identified that a statistical test would be required to determine whether or not the correlation was significant, despite doing this with their own data.

Written Test: Section B

Question 13

This question was intended as a gentle introduction to ensure the students had read and thought through the resource material and 95% of students gained this mark.

Question 14

This was a high-scoring question, with 65% of students gaining all three marks and 95% gaining two or more. Students who failed to obtain a third mark usually numbered each individual plant, rather than using a coordinate system, or missed out the first step of generating a grid.
Question 15

Students struggled to suggest why bare ground was left. If they thought about competition, they generally answered successfully and scored marking points 1 and 2. The idea of there being less movement of the pest between the maize and grass was rarely expressed clearly.

Question 16

Very poor understanding of the nitrogen cycle was frequently seen. Many students had the N-fixing bacteria providing ‘the plant’ with proteins, demonstrated poor understanding of nitrogen fixation and the use of nitrates by plants or failed to distinguish between the legume and the maize.

Question 17

Most students achieved marking point 1, for identifying a trend in the data. Fewer went on to use the data in a calculation to justify the trend they had reported. Many had the idea of an improved profit, although some expressed this very poorly, but few used the data to calculate the actual increase in profit in order to gain marking point 5. Virtually no students made reference to the standard deviations shown in the data.

Question 18

(a) This was generally answered well, by students who made their answers relevant to this investigation rather than just giving rote, generic answers.

(b) Marking point 1, for identifying the general trend of the data, was gained by nearly 90% of students but only a third went on to score two marks. Many did not study the data carefully enough to see that standard deviation was given in Resource A but the error bars in Resource B showed standard error. Even when they identified that standard errors overlapped, few students correctly identified that this showed there was no significant difference. Many simply stated that this showed the ‘results’ were not significant, which was considered insufficient here.

Question 19

Generally, this was answered very well, with over 90% of students identifying the behaviour as a taxis. When further information was given, for example, positive taxis or chemotaxis, this had to be correct for this mark to be awarded.

Question 20

As with Question 18, most students were able to identify the trend in the results for marking point 1 but struggled to use the standard error. Better answers showed appreciation that more pesticide being eaten was likely to lead to the death of more insects. Those who failed to obtain marking point 1 stated that a greater number of insects were eating food with pesticide, whereas the data only shows mass of food eaten overall.
Question 21

Most students understood that an integrated system used more than one method of pest control. Some did not give two relevant examples, such as biological, chemical or mechanical control, which would have allowed credit to be given for marking point 2. Few students could relate this to keeping the pest numbers low/below the economic injury level; many stated that it would remove all the pests.

Question 22

Poor evaluation skills were demonstrated by students here. Many did not refer to the resources at all and gave vague, subjective answers that gained very little credit. Many wrote about environmental impacts of pesticides and/or about eutrophication caused by pesticides. To gain credit, students had to refer to each resource in turn, describing whether the investigation showed that pesticide use would no longer be necessary.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator www.aqa.org.uk/umsconversion