

Scholarship

2009 Assessment Report

Science

COMMENTARY

Candidates gaining a Scholarship or Outstanding Scholarship in the 2009 Science examination performed to a similar standard to previous years, except for the top scholar who did exceptionally well. Most candidates wrote long answers of good quality, even those who did not reach the required standard to gain a scholarship. There was evidence of good preparation, and very few answers that simply restated the question, or were too brief.

SCHOLARSHIP WITH OUTSTANDING PERFORMANCE

Candidates who were awarded Scholarship with Outstanding Performance typically:

- consistently and fully applied a broad base of knowledge and skills learned to unfamiliar contexts
- integrated a range of scientific knowledge in their discussions, so that their answers were broadly based
- reviewed and evaluated their answers and improved on some parts by adding additional paragraphs.

Comments relating to specific questions:

Question 1

- Candidates:
 - discussed, integrated and evaluated how shape, size and texture of an object affected the intensity of the returning echo
 - understood fully and discussed why the ultrasound frequency used by bats avoids confusion from other sources of sounds
 - successfully identified how bats can determine the direction that prey are flying.

Question 2

- Candidates:
 - discussed and / or showed by an accurate diagram how relative angles of the Sun, the relevant planet and the Earth affect the measurement of albedo
 - identified the importance of mineral composition, providing examples of high reflectivity and low reflectivity minerals
 - successfully commented on the use of standard measurements to help in the interpretation of measurements of the albedo from distant planets.

Question 3

- Candidates:
 - related the different types of point mutations to the degree of shape change in the viral surface proteins and therefore to the degree of binding of the relevant antibodies and the severity of symptoms
 - identified and discussed valid causes of the high mutation rate
 - discussed whether RNA has proof reading mechanisms.

Question 4

- Candidates:

- related the links between unsaturated fatty acids, dipole-dipole bonding between fatty acid chains and melting points to the context by connecting the flexibility of fish to the relevant properties of fatty acids in their cell membranes
- understood how *cis* and *trans* bonds affect the shape of fatty-acid chains.

Question 5

- Candidates:
 - showed a depth of understanding about the relationship between tectonic processes and earthquake distribution.

SCHOLARSHIP

Candidates who were awarded Scholarship but not Scholarship with Outstanding Performance commonly:

- identified from their knowledge of science those aspects that were relevant to an unfamiliar scientific context
- applied that relevant knowledge in a meaningful way to the unfamiliar context enabling them to effectively answer the question
- presented their discussions clearly, succinctly and logically
- reviewed their answers and improved on some parts by adding additional paragraphs.

Comments relating to specific questions:

Question 1

- Candidates:
 - discussed how shape, size and texture of an object affected the intensity of the returning echo
 - understood the Doppler effect and applied it to this particular context
 - understood and discussed why the frequency used by bats was suitable for the purpose.

Question 2

- Candidates:
 - identified that clouds and ice increased the reflectivity of the planet and hence its albedo
 - identified the importance of mineral composition and whether the surface was smooth or uneven
 - used the data in the table to justify the effect of an atmosphere on the albedo
 - included knowledge of the physical characteristics of the planets to enhance their answer.

Question 3

- Candidates:
 - applied their knowledge of the effects of mutations on DNA to the context of mutations in RNA
 - related a mutation to a change in the arrangement of a base or bases and therefore the change(s) in the aa sequence and the resulting shape change(s) in the surface proteins
 - identified valid causes for the high mutation rate.

Question 4

- Candidates:
 - discussed fully the relationship between unsaturated fatty acids, dipole-dipole bonding between fatty acid chains and melting points
 - related the above information to the context by relating flexibility of fish to the relevant properties of fatty acids in their cell membranes
 - understood how varying chain length affects the melting point of fatty acids
 - used the data in the table to inform their answer.

Question 5

- Candidates:
 - skilfully integrated their knowledge of earthquake distribution in different areas of New Zealand to consider the country as a whole
 - related the new information in Maps 3 and 4 to data given in Maps 1 and 2.

OTHER CANDIDATES

Candidates who were not awarded Scholarship or Scholarship with Outstanding Performance commonly:

- restated the question
- focused on only a narrow aspect of the question
- “dumped” knowledge, perhaps because they did not understand what was required by the question
- did not apply information or skills learnt to a new context
- applied rote learnt skills and information from previous exam questions, rather than adapting knowledge and skills to the new questions and contexts
- generalised too many times, even if they were on the right track
- were repetitive in their arguments
- wrote in a vague manner
- did not show evidence of planning their answers
- did not show evidence of reviewing their answers.

Comments relating to specific questions:

Question 1

- Candidates:
 - stated that the bat determined the position or direction of the object without providing the mechanism by which the bat accomplished this, e.g. by stating that the bat could determine shape by determining the direction from which the echo returned, without saying how the direction was determined
 - gave a long explanation of the Doppler Effect at the expense of the rest of the answer
 - used loose English, e.g. “further away” instead of “moving away” and “closer” instead of “moving towards”.

Question 2

- Candidates:

- discussed poorly, or not at all, how ice and/or water affected albedo
- did not use data provided which could have backed up a point made in an answer even if knowledge was weak.

Question 3

- Candidates:
 - discussed the effect of mutations on DNA rather than RNA
 - answered this question as if it was a question about evolution, rather than one about mutations
 - discussed mild or severe symptoms of the flu as if they were caused by lifestyle or environment rather than antibodies being unable to attach to the mutated viral proteins as required by the question.

Question 4

- Candidates:
 - did not show understanding about the relationship between unsaturated fatty acids, intermolecular bonding between fatty acid chains and melting points
 - did not relate any of the above required knowledge to the unfamiliar context or use data from the table to make valid points.

Question 5

- Candidates:
 - did not exhibit sufficient understanding of the relationship between tectonic processes and earthquake distribution
 - did not show understanding of or did not use the data given in the four maps.

ADDITIONAL COMMENTS

Question 1:

In explaining why bats do not emit a continuous wave, most candidates cited “interference” between the outgoing and ingoing waves as the reason why bats opted for pulses. By this the candidates meant constructive and destructive interference. A continuous wave does upset the bat’s capacity to analyse the incoming wave, but only in the sense of overloading it with too much information, rather than in the sense of wave interference.

Question 2:

Very few candidates provided a well justified answer on the effect of angle of incidence. Many were uncertain how the angle of incidence related to the measurement of the albedo. The answer required a well argued, well illustrated, and plausible case, for example, on how the effect of a smooth, reflecting material such as ice will be less significant at the poles than the equator.