NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

# Level 2, 2003

# Biology: Describe diversity in the structure and function of plants (90463)

## National Statistics

## Assessment Report

## Assessment Schedule

# Biology: Describe diversity in the structure and function of plants (90463)

## National Statistics

| Number of Results | Percentage achieved | | | |
|---|---|---|---|---|
| | Not Achieved | Achieved | Merit | Excellence |
| 8,896 | 37.5% | 33.0% | 22.8% | 6.7% |

## Assessment Report

Every candidate for a National Certificate of Educational Achievement examination paper is expected to:
- read the question and do what the question asks
- allow adequate time to complete answers
- be accurate: check and/or proofread
- use appropriate technical terms
- bring the correct equipment
- write and/or draw clearly
- use pen if work is to be eligible for reconsideration.

### General Comments

This achievement standard requires candidates to consider diversity in plant structure and function. Candidates who achieved well in this paper had chosen two dissimilar plants or plant groups that allowed them to clearly consider diversity in structure or function, in relation to the biological processes of transport of materials, photosynthesis, or reproduction. Conversely candidates who chose plants living in similar environmental conditions were generally unable to reach Merit or Excellence level, as they could not point out diversity in a structure or function, or discuss how they were linked to the problems and opportunities provided by the environment. Candidates should note that fungi, large trees, or terrestrial plants, are not appropriate plant groups.

It is important in this style of question that candidates consider the structures or features that each plant has, rather than list features not present. Candidates need to be very specific about the types of conditions the plant lives in. Using terms such as ‘suitable’ or ‘appropriate conditions’ provide insufficient information. Candidates need to be able to apply their knowledge to the context of the question, which this year asked them to consider the problems and opportunities provided by the environment. The focus of the question was on ‘diversity’, and therefore comparisons needed to be made in respect to similar structures or functions. Candidates who considered features of light for one plant, but water loss for another, had difficulty gaining Achievement with Merit or Achievement with Excellence.

A significant number of candidates considered that living in a particular environment gave the plants certain features, rather than the plant’s features making it suitable to live in a particular environment – hence the problems and opportunities.

Candidates need to take more care in using biological terms and processes correctly. Some candidates used terms like pollen (sperm), spore, and seed interchangeably, and showed poor understanding of gametophyte and sporophyte. There was also a lack of understanding of the processes of wind-pollination and insect-pollination. A waxy cuticle was discussed as existing to keep the rain out. All too frequently candidates made generalisations such as ‘dicotyledons are shade plants’.

In order for candidates to gain Achievement with Merit or Achievement with Excellence they needed to link the differences in structure and function to the effect on the process, and set this in the context of the differences in the environments where the plants live.

# Assessment Schedule

## Biology: Describe diversity in the structure and function of plants (90463)

### Evidence Statement

Candidates can provide answers that are annotated drawings or text or a combination of both.

Any two plants can be used, eg ferns / angiosperms, xerophytes / mesophytes, sun plants / shade plants. If two very similar plants are used the student will have to describe, explain or discuss the fine detail of the diversity between the two plants. In doing so they can show their understanding of a higher level of content, but at Excellence level they must still discuss diversity in relation to the problems / opportunities.

Some aspects below cellular level can be used as evidence for Achievement in this standard, eg with photosynthesis which is a cellular process.

Candidates will be able to answer this paper in a variety of ways. The schedule is not able to cover all the possible answers, therefore it contains some examples of parts of possible answers to indicate possible approaches candidates might take.

| | Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|---|
| Criteria | Describe diversity in the structure and function of plants. | Explain diversity in the structure and function of plants. | Discuss diversity in the structure and function of plants. |
| Judgement | Structure of diverse features in TWO plants or plant groups described in words and/or drawings,<br><br>ie plant 1 (A1) and plant 2 (A2). | Explanations of functioning of diverse features in photosynthesis, transport of materials or reproduction OR explanations for diverse features linked to problems and opportunities in the environment<br><br>[Could be covered in (c) or (d).] ie M | Discussion of why two plants have diverse features to deal with problems OR use opportunities in environment.<br><br>[Could be covered in (c) or (d).] ie E. |

| Evidence contributing to Achievement | Evidence contributing to Achievement with Merit | Evidence contributing to<br><br>Achievement with Excellence |
|---|---|---|
| **Reproduction** – description of structures, processes, problems OR opportunities, eg:<br><br>• flower structure<br>• gamete structure<br>• seed structure<br>• wind, insect pollination<br>• seed dispersal method<br>• alternation of generation.<br><br>**Examples of parts of possible answers:**<br><br>In mosses the gametophyte is the main plant and the sporophyte grows out of the top of the gametophyte. The sporophyte produces spores that divide by mitosis and grow into the gametophyte.<br><br>In gymnosperms the sporophyte is the main plant. The sporophyte produces male pollen and female megaspore. The pollen grain and the megaspore both form gametophytes. The female gametophyte develops inside the spore. | **Reproduction** – functioning explained OR diverse features link to problems and opportunities in the environment, eg:<br><br>• pollinators<br>• temperature / light / wind / water as appropriate<br>• dispersal agents.<br><br>**Examples of parts of possible answers:**<br><br>In mosses the gametophyte is the main plant and the sporophyte grows out of the top of the gametophyte. The sporophyte produces spores that divide by mitosis and grow into the gametophyte. | **Reproduction** – why two plants have diverse features to deal with problems and use opportunities in environment, eg:<br><br>• pollinators<br>• temperature / light / wind / water as appropriate<br>• dispersal agents.<br><br>**Examples of parts of possible answers:**<br><br>In mosses the gametophyte is the main plant and the sporophyte grows out of the top of the gametophyte. The sporophyte produces spores that divide by mitosis and grow into the gametophyte.<br><br>Mosses have to live in moist environments because their reproduction and development of the sporophyte needs water. The male and female gametophytes are usually separate plants. The sperm must swim from the antheridia on the male gametophyte to the archegonia on the female gametophyte. Without a moist environment, moss reproduction would not be possible. |

| Evidence contributing to Achievement | Evidence contributing to Achievement with Merit | Evidence contributing to Achievement with Excellence |
|---|---|---|
| **Photosynthesis** – description of structures, processes, problems OR opportunities, eg:<br>• stomata: position, structure (eg sunken);<br>• leaf: layers, thickness, size, shape<br>• arrangement of leaves<br>• stomata – time/cycle of opening<br>• gas exchange/supply of materials<br>• reduction of water loss.<br><br>**Examples of parts of possible answers:**<br><br>Diagram showing spinifex leaf structure. | **Photosynthesis** – functioning explained OR diverse features linked to problems and opportunities in the environment, eg:<br>• light levels<br>• water levels<br>• temperature<br>• wind / exposure<br>• harsh conditions – salty air, frost.<br><br>**Examples of parts of possible answers:**<br><br>The leaves of the spinifex are rolled into a tube and they have all the stomata on the inside of the tube. This helps to reduce the loss of water during transpiration, which is important because spinifex lives in harsh conditions on sand dunes where it is windy and water is limited. | **Photosynthesis** – how and why two plants have diverse features to deal with problems and use opportunities in environment, eg:<br>• light levels<br>• water levels<br>• temperature<br>• wind / exposure<br>• harsh conditions – salty air, frost.<br><br>**Examples of parts of possible answers:**<br><br>Spinifex lives in harsh conditions on sand dunes where it is windy and water is limited. The leaves of the spinifex are long, thin, flexible, and rolled into a tube. This helps to reduce the loss of water during transpiration, because all the stomata are on the inside of the tube. The stomata must open to let carbon dioxide enter for photosynthesis. The rolled shape provides an area beside the stomata that traps moist air.<br><br>Pohutukawa also live in harsh conditions next to the sea. The leaves of pohutukawa are small and flat with the stomata on the surface, but the leaves are covered in a dense mat of hairs that traps a layer of still-moist air next to the leaf surface so that the stomata are able to open for photosynthesis without losing large amounts of water at the same time. |

| Evidence contributing to Achievement | Evidence contributing to Achievement with Merit | Evidence contributing to Achievement with Excellence |
|---|---|---|
| **Transport** – description of structures, processes, problems OR opportunities, eg:<br>• type of cells present<br>• arrangement/location of cells<br>• process for absorption of materials; transpiration rate.<br><br>**Examples of parts of possible answers:**<br><br>In gymnosperms, the xylem tissue that acts as a transport system of pipes throughout the plant is made up of cells called tracheids. Tracheids are long narrow cells with pointed ends. They are packed close together. They have many bordered pits in their walls that allow water to go from one cell across to the next. (Annotated drawing of tracheid showing shape, pits and thicken walls.)<br><br>Angiosperms also have cells called vessels in their xylem. Vessel cells are wider and short than tracheids and they are joined end on end. The end wall between the cells disappears, so they make long pipes up the stem. (Annotated drawing of vessel showing shape, pits and thicken walls.)<br><br>Neither mature tracheids nor vessels have cell contents inside them. | **Transport** – functioning explained OR diverse features linked to problems and opportunities in the environment, eg:<br>• water levels<br>• temperature<br>• wind/exposure<br>• harsh conditions – salty soil, frost.<br><br>**Examples of parts of possible answers:**<br><br>Annotated drawings of tracheids and vessel elements, showing shape, pits, thickening, position, etc and explaining the functioning of both in water transport. | **Transport** – how and why two plants have diverse features to deal with problems and use opportunities in environment, eg:<br>• water levels<br>• temperature<br>• wind/exposure<br>• harsh conditions – salty soil, frost.<br><br>**Examples of parts of possible answers:**<br><br>Pohutukawa live in harsh conditions next to the sea. They are exposed to strong salty winds that increase the transpiration rate and increase the need to transport water to the leaves. The leaves of the pohutukawa are small and flat, with the stomata on the surface, but the leaves are covered in a dense mat of hairs that traps a layer of still-moist air next to the leaf surface. When the stomata open to let carbon dioxide in, the layer of still-moist air reduces the amounts of water that are lost. |

## Judgement Statement

Judgement statements (formerly referred to as sufficiency statements) help students understand how their overall results for each standard were arrived at.

| | Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|---|
| **Criteria** | *Describe diversity in the structure and function of plants* | *Explain diversity in the structure and function of plants* | *Discuss diversity in the structure and function of plants* |
| **Judgement** | Must get all: A1 ***and*** A2 ***and*** A3 ***and*** A4 | Achievement ***plus*** must get all: M1 ***and*** M2 | Merit ***plus*** must get **E** for each plant |