NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 2, 2003

Biology: Describe diversity in the structure and function of animals (90462)

National Statistics

Assessment Report

Assessment Schedule

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National Statistics

Number of Results	Percentage achieved			
	Not Achieved	Achieved	Merit	Excellence
10,254	53.4%	34.9%	10.3%	1.4%

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

Selection of animals: The learning outcome of AS 90462 states 'This achievement standard involves the description of diversity in aspects of the structure and function, above the cellular level, in animals in relation to biological processes.' The achievement standard is about diversity in the structure and function of tissues, organs, and organ systems (ie above the cellular level). It is expected however, that candidates will describe, at or below cellular level, aspects that are relevant and important to the process, eg the use of transport pigments in blood tissue, enzyme action, excretory products, and diffusion of molecules. It is not appropriate to use the nutrition, excretion, gas exchange or transport system of a unicellular organism in one of the three animals.

Candidates that named groups, eg amphibian, rather than Golden Bell Frog or Tree Frog, tended to do better. Likewise, candidates who were able to illustrate the diversity between the systems of two animals, eg *Hydra* and flatworms, and who gave detailed descriptions of their systems, achieved the standard.

Level of detail/length of answer: Candidates are expected to answer the paper using ideas appropriate to *Biology in the New Zealand Curriculum,* achievement objective 7.1(b) Learning Media, Ministry of Education, 1994, p. 20. A number of candidates did not achieve this standard, because their descriptions of the diversity in structure and function did not contain a sufficient level of detail. A small number of candidates provided very high levels of detail in their descriptions, eg medical names, but, because they only gave descriptions, they could only gain Achievement.

Some candidates gained Achievement by providing only a small amount of text that contained concise, quality descriptions. The majority of candidates that wrote two pages on each animal, still only gained Achievement, as the material was only at description level.

It is not appropriate for an answer to be based on a small amount of information in one paragraph, in one text eg, answers relating to nutrition in the Koala.

Time: A number of scripts were completely blank (15%), some just named three animals, some contained part answers, and others showed evidence of rushed answering. The time available in the examination means that candidates must be able to describe (text and diagrams) the systems in three animals in about 20 minutes. The rest of the time is needed for explanation and discussion.

Use of terms/language: It is expected that candidates will use appropriate biological terminology to describe, explain, and discuss, in detail the diversity in structure and function.

Candidates often used imprecise language and partial answers to describe. For example, 'Carbon dioxide comes out', instead of, 'Air with a higher percentage of carbon dioxide is breathed out' and 'passes through the heart once' instead of 'passes through the heart once each circuit' or 'double circulation keeps the blood at constant pressure'.

Use of general words such as 'food' reduced the quality of a number of answers, eg 'food is absorbed in the small intestine', 'mutualistic microbes living in the foregut help to digest the food', 'food is egested out the anus'.
Other examples: 'nutrients sucked out', 'uric acid crystals popped into the system', 'the insects skin', 'insects blood', instead of 'insects haemolymph'.

Diagrams: About half of the candidates used diagrams in their answers. Clear, accurate, well-labelled diagrams increased the candidates ability to describe diversity in structure and function. Although text AND diagram should not be used to convey exactly the same information, the drawings often added clarity and extra detail to the paragraph answer, which allowed the candidate to gain Achievement.

The addition of annotations to diagrams would have allowed candidates to explain diversity in structure and function and therefore gain Achievement with Merit. This may also have saved candidates time, so that more time could be spent on the discussion in order to gain Achievement with Excellence.

Achievement with Merit could be gained in two ways. The first was to clearly explain the functioning of the systems found in two animals. A few candidates did this in part (c) but most answers were limited to descriptions of the parts (eg names, features), or descriptions of the process (eg 'Air is breathed in through the nose and mouth where it is warmed and moistened. Cilia remove dust….').

The second way to gain Achievement with Merit was to explain how the diversity shown was linked to the organisms way of life. A number of candidates were close to gaining Achievement with Merit, but they did not develop their answers into a clear explanation. In this open-ended style of paper, an explanation requires greater development than in a short-answer question, for example, answers such as 'Insects excrete uric acid which means they can live in dry environments' and 'Insects are restricted in size because of the weight of their tracheal system', do not provide enough evidence for Achievement with Merit, and need to be developed further to give a full explanation. Too often the candidates answer would contain two or three different key ideas in a paragraph, but none of the ideas were developed any further than one or two sentences. A large number of candidates answered part (d) by simply repeating the descriptions they had given in part (c).

Elaboration of ideas for Excellence: To gain Achievement with Excellence, candidates need to take one or two key ideas relevant to the question posed, and provide a detailed elaboration of each of the key ideas. Each idea will take a minimum of one or two paragraphs.

Many candidates gave hints of understanding, but poor wording, lack of elaboration of key ideas, and inaccuracies, meant they did not gain higher grades. For example 'The insect trachea system is extremely efficient. It suits the insect because it means that air is carried directly to every cell in the body and there is no need for a separate transport system because the system must reach every cell in the body, insects size is limited as if there were too many cells to reach the system would be very complicated and inefficient.'

The candidates who provided evidence at the Achievement and Merit levels, answered part (d), simply by repeating the information given in part (c), answering in general terms only, describing the advantages and disadvantages of individual systems, or giving a comparison of the three animals.

Assessment Schedule

Biology: Describe diversity in the structure and function of animals (90462)

Evidence Statement

- Candidates can provide answers that are annotated drawings or text, or a combination of both.
- Any three animals can be used, eg insect / amphibian / mammal, carnivore / herbivore / omnivore. If very similar animals are used, the candidate will have to describe, explain, or discuss, the fine detail of the diversity between the two animals. In doing so, candidates can show a higher level of understanding, but at Excellence level, they still must discuss diversity in relation to the animal's way of life.
- Some aspects below cellular level, can be used as evidence for Achievement in this standard. For example use of transport pigments, type of excretory product produced, and use of diffusion.
- Due to the open ended nature of this paper, this schedule only contains examples of possible ideas and partial answers.

	Achievement	Achievement with Merit	Achievement with Excellence
Criteria	Describe diversity in the structure and function of animals.	Explain diversity in the structure and function of animals.	Discuss diversity in the structure and function of animals.
Judgement	Structure of diverse adaptations, relating to transport, gas exchange, nutrition, or excretion, of THREE different animals or animal groups, described in words and/or drawings.	Explanation of functioning of diverse adaptations in transport, gas exchange, nutrition, or excretion for TWO animals. (M1, M2) OR explanations for diverse adaptations for TWO animals or animal groups, are linked to way of life of animals. (M)	Discussion of why TWO animals or animal groups show diversity of adaptation in relation to way of life.
Sufficiency	Must get all: animal 1 (A1), animal 2 (A2), animal 3 (A3).	Must get all: animal 1 (A1), animal 2 (A2), animal 3 (A3). Must get all: animal 1 (M1), animal 2 (M2) OR M.	Must get all: animal 1 (A1), animal 2 (A2), animal 3 (A3). Must get E.

Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
Transport – description of structures / adaptations / processes / functions, eg: • open/closed circulation • single/double circulation • heart eg: number of chambers, shape, size, location, coronary arteries, contraction, pacemaker, direction of blood flow • vessels eg: diameter, wall structure, valves • transport methods, eg: diffusion, pigments, cell structure, cell function. Example of **part of a possible answer**: Sentences and/or annotations on a diagram – an insect has a tube heart and an open circulation. The haemolymph flows around the organs in the head, thorax and abdomen and back into the heart. It is then pumped forward towards the head. Diagram labelling parts (eg heart, ostia, sinuses) and arrows showing direction of blood flow etc.	**Transport** – functioning explained OR explanation of diverse adaptations linked to way of life, eg: • functioning of heart / vessels / transport method explained • use of open / closed / single / double circulation linked to way of life • structure and function of the heart / vessels / transport method linked to way of life. Example of **part of a possible answer**: Relating to functioning: The arteries have elastic fibres in their walls. This is because the contraction of the heart muscles forces the blood into the Aorta under pressure. The blood enters the aorta faster than it can leave, so the aorta expands. The elastic fibres allow it to stretch and then come back to its original size between contractions. Relating to way of life: insects that fly, eg bees, have a high activity level, therefore they need high amounts of oxygen. They can need 10 to 100 times more oxygen when flying. Despite this, they can use the less efficient open circulation system, because they have the separate tracheal system that transports the oxygen around their body.	**Transport** – diversity of adaptations discussed in relation to way of life OR requirements / restrictions of the life process, eg: • diffusion rate • surface area • body size • activity level • speed of movement • efficiency. Example of **part of a possible answer**: The open circulation system is efficient in insects because they have a small body size and with the short distances diffusion is effective. This system is not efficient enough in whales and fish. The much larger body size means that the blood must be kept in vessels that travel close to all the individual cells in the body. This gives the short diffusion distances required for efficient diffusion in animals with large body size etc.

Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
Gas Exchange – must describe how the exchange of gases takes place also description of structures / adaptations / processes relating to gas exchange, eg: • lungs : trachea, alveoli, diaphragm; inspiration / expiration; • gills : filaments; water flow over gills; counter current • skin : structure, diffusion; adaptations to increase SA / reduce drying out **Example of part of a possible answer**: An insect has spiracles on the sides of its body. These lead to thin tubes called tracheae that go throughout the insect's body. Air moves into the insect's body and into the trachea. Trachea have tough ridges that hold them open. Trachea lead to smaller tracheoles. The ends of each tracheole finish in a group of body cells. Oxygen from the air dissolves in the fluid in the tracheoles and diffuses into the cells, etc.	**Gas Exchange** – functioning explained OR explanation of diverse adaptations linked to way of life, eg: • functioning of lungs / gills / trachea / skin explained • use of lungs / gills / trachea / skin linked to way of life • structure and function of the lungs / gills / trachea / skin linked to way of life. **Example of part of a possible answer**: The spiracles are openings to the outside of the body. Spiracles are able to open and close, this allows the insect to control the flow of air as well as slow down the loss of water. This adaptation allows insects to live successfully in very dry habitats, etc.	**Gas Exchange** – diversity of adaptations discussed in relation to way of life OR requirements / restrictions of the life process, eg: • diffusion rate • need for moist surface • close to blood supply • surface area • body size • activity level • speed of movement • efficiency • protection • drying out. **Example of part of a possible answer**: Lungs and gills are similar in that they have a large surface area, a close blood supply, and are thin. The efficient functioning of lungs and gills, however, relies on the properties of the medium from which they are taking the oxygen. Water contains a lower concentration of oxygen than air and is more difficult to move across the gas exchange surface. Water has higher buoyancy than air which means that it holds the fine gill filaments apart. Alveoli require the presence of a surfactant to ensure their surfaces stay apart and maintain the large surface area available for gas exchange, etc.

Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
Nutrition – description of structures / adaptations / processes, eg: • sac, tube, organs present • length of gut, proportions / size • pH, teeth, enzymes • ingestion, digestion, absorption, egestion • suckers, filter feeders, masticators • use of micro-organisms. **Example of part of a possible answer**: Sea anemones use extracellular digestion. They have a sac gut with a single opening. Food is ingested through the mouth into the gastrovascular cavity. Gland cells in the wall of the gastrovascular cavity secrete enzymes to digest the food. Nutritive cells, also in the lining of the cavity, then absorb the nutrients. Digestion of the nutrients is completed inside vacuoles in the cells, etc.	**Nutrition** – functioning explained OR explanation of diverse adaptations linked to way of life, eg: • Function of organs / relationship between structure and function of digestive tracts or organs / relationship to diet / way of life • Relationship between pH and enzyme activity / micro-organisms / type of food **Example of part of a possible answer**: The diet of herbivores, such as sheep, contains large amounts of tough plant material made up of cellulose. Many herbivores do not have the enzymes needed to digest cellulose, so they have to rely on the life processes of micro-organisms to break down the cellulose before absorbing the nutrients from it, etc.	**Nutrition** – diversity of adaptations discussed in relation to way of life OR requirements / restrictions of the life process, eg: • diffusion rate • surface area • solubility in blood, lymph • type or size of food • enzyme activity • system of digestion, eg ruminant • efficiency. **Example of part of a possible answer**: Birds need to be as lightweight as possible so that they require less energy to maintain flight. They do not have the large, heavy teeth seen in some other types of animal. The mouths of birds developed into a beak that can be used to pick up the food, cut or tear it if needed, and then manipulate it into the digestive system. Birds use a gizzard to replace the physical digestion that is usually carried out by teeth. Some birds swallow small stones with the grain that they eat. The thick muscular wall of the gizzard grinds the grain and stones together so that the grain is broken down into smaller particles with increased surface area for enzymes to act upon, etc.

Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
Excretion – description of structures / adaptations / processes, eg: • kidneys: shape, internal structure • flame cells: structure, link to outside, internal connections • filtration, reabsorption • type of excretory product. **Example of part of a possible answer**: Flat worms use protonephridia to carry out excretion. The protonephridia lie inside the animal's body. Interstitial fluid, containing ammonia, is pulled into the blind end of the protonephridia by the beating of long cilia inside a flame bulb. The flame bulb has a cap cell on the top (diagram of flame bulb showing cap cell, thin areas of tube cells, and long tread cilia) from which the cilia hang downwards into the tubule. As the cilia beat, they push the fluid down the tubule, which joins with other tubes to form a duct. The fluid (urine) is expelled through a nephridiopore into the surrounding water.	**Excretion** – functioning explained OR explanation of diverse adaptations linked to way of life, eg: • function of organs / relationship between structure and function of organs / process carried out / excretory product / method of elimination • type of excretory product linked to way of life or environment. **Example of part of a possible answer**: Freshwater fish are hyperosmotic to their surrounding environment, therefore they will constantly gain water from the environment. These fish have to balance the water gained, by excreting large amounts of dilute urine produced by the nephrons in their kidneys.	**Excretion** – diversity of adaptations discussed in relation to way of life OR requirements / restrictions of the life process, eg: • diffusion rate • surface area • body size • wastes produced • type of environment, limiting factors • resources available • efficiency. **Example of part of a possible answer**: Birds get rid of nitrogenous wastes by excreting uric acid. Uric acid has two advantages for birds, that are related to their way of life. Uric acid can be excreted as a paste that has very little water in it, which means that the bird can save water. The other advantage that uric acid has over ammonia and urea is that when the bird is inside the egg, the uric acid precipitates out of solution to form white crystals that can be stored inside the egg and left behind when the bird hatches.

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 animals*	*Explain diversity in the structure and function of animals*	*Discuss diversity in the structure and function of animals*
Judgement	Must get all: animal 1 (A1) ***and*** animal 2 (A2) ***and*** animal 3 (A3)	Must get all: animal 1 (A1) ***and*** animal 2 (A2) ***and*** animal 3 (A3) ***AND*** Must get all: animal 1 (M1) ***and*** animal 2 (M2) ***or*** M	Must get all: animal 1 (A1) ***and*** animal 2 (A2) ***and*** animal 3 (A3) ***AND*** Must get E