NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 2, 2004

Biology

Describe concepts and processes that relate to genetic variation and change (90459)

Describe concepts and processes relating to ecology (90461)

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

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

Describe cell structure and function (90464)

National Statistics

Assessment Report

Assessment Schedule

Biology, Level 2, 2004

General Comments

Candidates gaining Achievement had understood what to do from the key words of the standards and the key words of the questions.

Those who were assessed as Not Achieved lacked one or more of these.

The requirement of 90462 and 90463 are very similar, requiring an extended answer. Candidates presenting prepared answers irrespective of the wording of the question were usually unsuccessful. Successful candidates presented answers framed in response to the particular question.

Candidates gaining Achievement in 90459, 90461 and 90464 understood the biological concepts and processes, and used appropriate vocabulary.

Candidates who could use the appropriate terminology and presented well-ordered answers generally did well. Those who addressed the question and organised their answers, rather than just 'dumping' as much information as possible, could achieve. Candidates must avoid using anthropomorphisms in their answers.

Biology: Describe concepts and processes that relate to genetic variation and change (90459)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
11,585	36.2%	25.6%	31.0%	7.2%

Assessment Report

Candidates were asked to describe concepts and processes related to genetic variation and change. Thus, an ability to communicate their knowledge on the processes of dihybrid inheritance, crossing over, mutation, back crossing, gene pool and the founder effect was examined.

Candidates able to use the key terminology such as homologous, homozygous, gene pool, genetic code, species, population, gene allele, crossing over, mutation, genotype and phenotype were generally able to gain Achievement.

The understanding of the concept, *genetic variation and change,* is central to the achievement of this standard. Candidates that clearly understood that variation is inherited, that it is provided by sexual reproduction and mutation, and that it is acted on by selection pressures to provide the change to the population over time, were able to achieve against the criteria.

Candidates gaining Achievement were also able to demonstrate their knowledge by using appropriate examples, correct diagrams and Punnett squares, and understood and used correct terminology.

Candidates gaining Achievement with Merit or Achievement with Excellence showed additional skills and knowledge. These candidates aligned answer content to question requirements and fully understood the questions. These candidates were also able to recognise the key biological concepts and processes, and link several relevant ideas together, explaining and discussing these ideas. Eg mutation gives rise to new alleles, which have the potential to increase in the population if selected for and if favourable in the environment, and decrease in the population if selected against and if unfavourable in the environment.

Assessment Schedule

Biology: Demonstrate concepts and processes that relate to genetic variation and change (90459)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	**Description of how the white-eyed individual appeared** a mutation occurred.		
1(b)	**Description recognises the ratio of this outcome,** it is **not** the expected 1:1:1:1.	**The explanation is related to the ratio obtained,** the genes are linked and the smaller number of individuals are the recombinants.	
1(c)	**Description shows process of crossing over,** Must describe or show by diagram that there has been an exchange of genetic material in the resulting chromatids.		
1(d)	**Description shows the results of crossing over,** chromosomes end up different/ variation in offspring.	**Explanation relates to the importance of crossing over**, variation is important for the survival of the population if the environment changes./ Alleles can be separated and this will lead to genetic variation in the offspring within the population. / Increased variation linked to increased diversity in the gene pool and greater population stability.	
2(a)	**Definition of mutations AND gene pool,** mutation is a change in the genetic material **AND** Gene pool is **all** the genes in a population.		

<table>
<tr><th>Question</th><th>Evidence contributing to Achievement</th><th>Evidence contributing to Achievement with Merit</th><th>Evidence contributing to Achievement with Excellence</th></tr>
<tr><td>2(b)</td><td>A description of a mutation effects on population.

• States that there is a change in the alleles or allele frequency (or genetic variation) of the population.

• OR states that not all mutations affect the phenotype or expression of the gene so there may not necessarily be an effect seen.

• OR states that only gametic mutations are inherited.

• OR states that mutation could lead to speciation over time, but does not explain how this occurs.

• OR mutations may be helpful or harmful.</td><td>An explanation of the possible effects of a mutation on a population

Explanation MUST link to the appropriate description.

• States that there is a change in the alleles or allele frequency (or genetic variation) in the population and explains the potential for the new allele to increase in the population if it is selected for or decrease if it is selected against.

• OR states that not all mutations are gametic and explains why only gametic mutations will affect the population for more than one generation.

• OR explains why dominant alleles can create a faster rate of change in the gene pool than recessive alleles, if the selection pressure is favourable for the new allele.</td><td>A discussion of the possible effects of a mutation on a population

The new allele has the potential to increase in the population if it is selected for if favourable in the environment and also decrease if it is selected against if it is unfavourable in the environment.</td></tr>
<tr><td>3(a)</td><td>Description of phenotype and genotype of the test cross, chestnut pacer
bbtt</td><td>Explanation of why the phenotype and genotype is used in the test cross,
if any offspring turn out to be chestnuts or pacers, the black trotter purchased will carry the relevant recessive allele.</td><td></td></tr>
<tr><td>3(b)</td><td>Description shows correctly completed Punnett square,

(1 minor error in punnet OK if gametes OK)

<table>
<tr><th></th><th>BT</th><th>Bt</th><th>bT</th><th>bt</th></tr>
<tr><th>BT</th><td>BBTT</td><td>BBTt</td><td>BbTT</td><td>BbTt</td></tr>
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<tr><th>bt</th><td>BbTt</td><td>Bbtt</td><td>bbTt</td><td>bbtt</td></tr>
</table></td><td>Explanation of the cross gives a phenotypic ratio or fraction or percentage
correct phenotype AND ratio or fraction or percentage.

9 black trotter
3 chestnut trotter
3 black pacer
1 chestnut pacer</td><td></td></tr>
</table>

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
3(c)	**Description shows understanding of alleles in this cross,** describes only **one** situation correctly.	**Explanation shows the inheritance of BOTH dominant and recessive alleles and their expression,** If two chestnuts are bred together, no black foals will result as the chestnut allele is recessive, therefore there will be no black alleles in the cross. Could show a simple punnet square. If two black horses are bred, there is a possibility of getting a chestnut horse if both the black horses are heterozygous – the chestnut alleles would be masked in the parents but there is a chance that they will show in the next generation – could show a punnet square.	
4	**Description of the causes of differences in the gene pools.** Founder effect/ there would be a difference in allele frequencies for different genes in both populations/ the original NZ population may not have represented the original population in Europe.	**Explanation relates the reasons for the differences in the gene pool of one or both populations.** The population was small to start with so genetic drift(or implication of) may have affected the NZ population/ the gene pool in NZ would have different selection pressures on it.	**Discussion of at least one relevant aspect of both populations.** First M idea linked to genetic drift (or implication of) is caused by random changes in allele frequencies, especially in small population **OR** Second M idea linked to different selection pressures (or implication of) cause allele frequencies to change.

Judgement Statement

AWARD HIGHEST GRADE ONLY

Judgement Statement

Achievement: 5 As
Merit: Achievement plus 3 Merits.
Excellence: Merit plus 1 Excellence.

NGV has nothing correct in 2a, 2b and 4

NGC has nothing correct in remainder of paper

Only 2A, 2B & 4 relate to genetic variation (others relate to genetic change), candidates need at least one A from 2A, 2B or 4 and at least 1 A from other questions to gain A overall.

Biology: Describe concepts and processes relating to ecology (90461)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
10,564	32.7%	49.0%	17.4%	0.9%

Assessment Report

Candidates were asked to describe concepts and processes relating to ecology. Thus an ability to communicate their knowledge on biodiversity, predation, competition, trophic level, succession, preferred habitat, tolerance, population changes and enhancement were examined.

Candidates able to use the key words of the standard were generally able to gain Achievement. These candidates also had the skill to read the questions and identify the key words of the questions and to relate their knowledge to the context given, describe the biological concepts and processes with the correct terminology, and give relevant answers.

Candidates who gained Achievement with Merit or Achievement with Excellence showed additional skills and knowledge: they had a sound understanding of the question and were able to extract the key points required of the question, they were able to organise and write their answers in a clear and logical way. They used all the information given to them, were able to draw from a broad knowledge base and used examples effectively.

Assessment Schedule

Biology: Describe concepts and processes relating to ecology (90461)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	**Definition describes biodiversity** 'Biodiversity' can be at the level of: genetic / organism / habitat / ecosystem. *Answer must be in terms of variety / differences at one or more of these levels* Eg. The number / range of species **OR** Different types / variety of living things **OR** All the different living things NOT ACCEPTABLE All the living things The number of living things / organisms		
1(b)	**The description shows a possible relationship other than no predation** *A cause for a population increase is identified* **Eg** • competition with kiore for food is removed **OR** • increase in available habitat resources from island restoration leading to … • greater forest cover **OR** • more / more varied breeding sites **OR** • easier to find shelter **OR** • greater food variety, quality **OR** • other	**Explanation of why the skink numbers increased** *How that cause contributes to increase in numbers is explained* therefore … • food less 'limiting' on numbers (of skink) therefore … • better concealment / better, more varied food options • bigger litter / healthier young • survival in winter / wind / heat • faster growth / healthier adults / better feeding of young	

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(c)	**Description includes the need for kiore eradication.** Eg kiore eat seedlings, seeds, insects, fruit, and eggs as well as small animals such as skink and small birds. **OR** kiore compete for food / space / breeding sites / other **OR** more vegetation They will become extinct is not acceptable as this word is too global and final. It is not related to Tiri They will become extinct on the island is acceptable **OR** easier trapping regime in grassland	**Explanation of why the kiore needed to be eradicated *before* re-vegetation and/or release of birds.** Eg so kiore population will increase answer explains what will happen to the kiore population if the rats were still there during re-vegetation and/or release of the birds. **OR** so the birds' population will decrease / not increase answer explains what will happen to the population numbers of birds and/or vegetation if the rats were removed before re-vegetation and/or release of the birds. because ….. • traps easier to access, position • animals greater freedom of movement	**Discussion of why the kiore needed to be eradicated *before* re-vegetation and/or release of birds.** • predation has greater impact on smaller populations / severe affect on number of breeding adults / chick survival (replacement) critically low • seedling plants more palatable / digestible / accessible / preferred • small, establishing population of birds will not be able to compete with large, established kiore population
1(d)	**Description of the correct trophic level for nectar feeders** trophic level 2 **OR** primary consumer **OR** herbivore		

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(e)	**The description shows how changes in environmental conditions relate to a change in a population** **Eg** less light reduces the grass and bracken population. **Eg** increase in moisture / protection from wind / less extreme temperature fluctuations …. favour growth of seedlings other response relating to the environment	**An explanation shows how the re-vegetation process alters the environmental conditions to cause a population change** ***Reason for environmental change*** • as there is less light *caused by the taller trees growing up* through the bracken ….. **Consequence for population** • the bracken will not be able to compete (lower rate of photosynthesis) and will die. *For any one identified factor the Explanation must provide reason and consequence as above.*	**Discussion of the effects of change.** Discussion must link environmental change to population change ***and causing subsequent environmental change*** resulting in succession ***over time.***
1(f)	**Prediction for the takahe population as the re-vegetation progresses** • numbers will **decrease** • move to more favourable area. 'They will move to another island' not acceptable	**Explanation for the prediction of the takahe numbers** ….. because of • increase in intraspecific competition • reduction in suitable habitat • less food • less breeding sites • relocation of takahe by man. 'They will adapt' is not acceptable	

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(g)	**State how re-vegetation has affected biodiversity** an increased biodiversity will **increase** the chances of survival of the birds **OR** imply more variety More quantity not acceptable	**Explanation of why / how the increased biodiversity has affected the survival chances of the birds,** …. because …. • more **different** types of food available • more **variety** of shelter for undisturbed nesting **OR** …because … • greater genetic diversity of plant life.	**Discussion of relationships between biodiversity and the survival of the birds,** therefore … • healthier adults • bigger clutches • better chick survival • better survival in winter • more feeding niches • less intra and inter specific competition for food / territory / breeding sites therefore … • more complex / stable food webs • alternative food sources (plant & animal) *Must be applicable to the Merit statement.*

Judgement Statement

Achievement: 4 Achieved.
Merit: Achievement plus 3 Merit.
Excellence: Merit plus 2 at Excellence.

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

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
11,434	53.1%	29.9%	14.1%	2.9%

Assessment Report

Candidates were asked to describe diversity in the structure and function of animals. They needed to recognise 'diversity' and 'life processes', and realise that they had to write about three different animals.

Candidates who achieved, recognised the word 'adaptations' in the question and proceeded to describe key / important adaptations of an animal for the selected process.

Candidates gaining Achievement presented knowledge of the anatomy and physiology of three different animals using labelled and annotated diagrams to back up written material. They were able to construct sentences that covered a range of processes including surface area, thin moist membrane, diffusion, enzyme activity and concentration gradients for each animal.

Achievement candidates used the correct vocabulary appropriately and wrote in an ordered way covering aspects of the whole process.

Candidates gaining Achievement with Merit or Achievement with Excellence showed additional skills and knowledge: they understood that more depth of explanations / discussions were required which linked the structure, function and a detailed concept. They understood that the purpose or implications of a structure or function must be linked to habitat or environment or lifestyle or survival / success.

Candidates who did not achieve did not understand that description of key adaptations throughout the process is required. Both structure (what) and function (how) were required. Often adaptations covered were too limited, or the detail was not at curriculum Level 7. The word "adaptations" saw candidates often write "the animal is adapted by having gills" for example rather than understanding that individual animals do not adapt, but possess adaptations to aid their survival in a set of environmental conditions.

It is important that candidates realise the achievement standard is for the animal kingdom and not protistans. Those trying to discuss using comparisons between animals generally did it poorly. It was not sufficient to say "Fish live underwater while mammals live above the ground". If a comparison is to be made, it should be linked to the effect this has on the adaptation plus detail on the structure and function.

Assessment Schedule

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

Evidence Statement

Animals / Animal groups must be above the cellular level eg NOT paramecium

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1, 2	**A description of "what and how" is made of important adaptations of each of THREE named animal or animal groups, A1, A2, A3.** eg	**Explanation of functioning, M1, M2 OR how / why the adaptations linked to the habitat / lifestyle / niche / survival of TWO named animal or animal groups, M** eg	**Discussion on the reasons for the structural and functional diversity between TWO animals or animal groups, E** eg A comparison of why one system works for one organism and not the other, relating it to different environments. A discussion of how structural and functional diversity can be used to exploit new, unoccupied niches, reduce competition or is a consequence of genetic diversity.
	Transport: What, how of key structure and functioning eg • open circulatory system • closed single circuit system • closed double circuit system. (not just names, need expansion of function)	**Transport:** function explanation or **linking** to habitat / lifestyle / niche / survival eg • diffusion rate • pressure / gravity • activity, energy requirements • size of animal/blood volume • surface area. • Terrestial/aquatic • Insects eg Gas E separate to Transport	**Transport:** eg relates how the pressure in a double circulatory system is needed by terrestrial organisms compared with single circuit systems in an aquatic org.
	Gas Exchange: What, how of key structure and functioning eg • tracheal systems • gills system • lung system.	**Gas Exchange:** function explanation or **linking** to habitat / lifestyle / niche / survival eg • surface area • better oxygen supply • moist • pressure.	**Gas Exchange:** eg relates differences in gas exchange systems to O_2 requirements / metabolism / different environments.
	Nutrition: What, how of key structure and functioning eg • carnivore • foregut herbivore • hindgut herbivore. • beaks/teeth/insect mouthparts.	**Nutrition:** function explanation or **linking** to habitat / lifestyle / niche / survival eg • food types • energy requirements • beaks/no teeth/weight/crop instead.	**Nutrition:** eg relates differences in guts to food types / body shape or size / energy requirements.
	Excretion: What, how of key structure and functioning eg • an invertebrate system • an aquatic system • a terrestrial system • products.	**Excretion:** function explanation or **linking** to habitat / lifestyle / niche / survival eg • excretion products • energy efficiency • habitat.	**Excretion:** eg relates how use of an excretion product is influenced by environment / lifestyle but has an energy cost.

Judgement Statement

Achievement	Merit	Excellence
A description of 'what and how' is made for important adaptations of **each** of THREE named animal or animal groups, A1, A2, A3.	Explanation of functioning, M1, M2 **or** how / why the adaptations linked to the habitat / lifestyle / niche / survival of TWO named animals or animal groups, M. Must get A1, A2, A3 and M1, M2.	Discussion on the reasons for the structural and functional diversity between TWO animals or animal groups, E. Must get A1, A2, A3 and E.

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

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
9,930	51.4%	34.6%	11.3%	2.7%

Assessment Report

Candidates gaining Achievement understood what to do from the key words of the standard and key words of the questions. Candidates understood the meaning of diversity and selected plant groups that allowed them to describe *variation* between the two groups / plants, that is the plants or plant groups were dissimilar. They were able to use the correct terms to describe the structure and function of the chosen plant / plant groups. The answers related to the selected process.

Candidates who achieved recognised the word “varies” in the question and proceeded to describe key / important adaptations of each plant for the selected process.

Candidates gaining Achievement presented evidence effectively and appropriately by using labelled and annotated diagrams to back up written material. They also had a competent use of literacy to generally construct sentences. They were able to select relevant features that related to the chosen process.

Candidates gaining Achievement with Merit or Achievement with Excellence showed additional skills and knowledge. These candidates were able to relate how the structure of the plant was linked to the process and its natural habitat. These candidates wrote full statements which were well-organised.

There was evidence of prepared answers which prevented candidates answering the given question; these candidates did not achieve. The selection of plant / plant groups for some candidates did not show diversity and these candidates often missed the word *varies* in the question. Candidates also tended to make sweeping statements that were inaccurate.

Assessment Schedule

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

Evidence Statement

NB: That fungi, large trees or terrestrial plants are not appropriate groups.

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1, 2	**Description of how each plant or plant group varies for a specified process.** Eg Question 1 **Photosynthesis:** description clearly shows how each is modified, eg leaf • **size**; SA/vol ratio • **shape**; SA /vol ratio eg pine needles • **thickness**/layers • **structure**; waxy cuticle at top of leaf Palisade layer conc of chloroplasts Spongy mesophyll allows movement of gases/fewer chloroplasts Stomata allows gas exchange Reduced leaves, eg cacti. • **Arrangement**; leaves spread to absorb max light • **conducting tissue** lack of in some plants, eg liverworts, as related to photosynthesis • **reduced leaves** functioning stem eg cacti etc	**The explanation clearly relates the adaptation to an increased chance of survival.** Eg Question 2 **Photosynthesis:** the modification is related to an increased chance of survival in different • light intensity – eg large leaves in shade to absorb available light/chloroplasts located in palisade layer/high light intensity plants – reduced leaves/thicker leaves arrangement of leaves spread to absorb max. light • water levels effect on • stomata • temperature • increase rate – up to a max • wind / exposure • increase transpiration – reduce photosynthesis • harsh conditions – salty air, frost / increased cuticle / sunken stomata/rolling leaves to prevent water loss/cacti – reduced leaves eg leaves are arranged in a mosaic to maximise light falling on leaves or photosynthetic tissues.	**The discussion compares the differences in the plants' natural habitat as reasons for the diversity of structures to increase the chances of survival (**by the exploitation of new niches, or reduction in competition derived from genetic diversity**).** Eg Question 2 **Photosynthesis:** a comparison relates to differences in • light intensity • water levels • temperature • wind / exposure • harsh conditions – salty air, frost. eg a low light plant could not survive in high light conditions due to a thin cuticle to reduce water loss and exposed and more stoma would increase water loss; high light plants could not survive in low light because of insufficient photosynthesis.
	Achievement *Description of how each plant group is modified to a named function.* *4 from each plant* *(accept 5 + 3) A1 and A2*	***Merit*** *Explanation of how the modifications lead to an increased chance of survival for a named function:* *2 for each plant M1 and M2*	***Excellence*** *Reasons for the development of the beneficial modifications is linked to the differences in the plant's environment (such as niche exploitation or the reduction in competition derived through genetic diversity): 1 × E*

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence

	Description of how each plant or plant group varies for a specified process.
	
	Eg
	Question 1
	Transport of materials: description clearly shows how each is modified, eg cell
	• **Types** xylem, vessels (thickening annular, helical, reticulate pitted), tracheids; phloem, sieve tubes and companion cells
	• **Arrangement** Vascular bundles monocots/dicots Stem/roots
	• **Locations** xylem inside used for transport, phloem outside no secondary – bark
	  • **Secondary thickening**
	  • **Monocots vs dicots/**
	  • **Cuticles/leaf hairs**
		The explanation clearly relates the adaptation to an increased chance of survival.
		
		Eg
		Question 2
		Transport of materials: The modification is related to an increased chance of survival in different
		• **water levels**
		• **temperature** transpiration rate increases – therefore loss of turgor-stomata – close – reduced photosynthesis
		• **wind/exposure** – as above
		• **harsh conditions** salty, soil, frost eg leaf roll prevents transpiration etc
			The discussion compares the differences in the plants' natural habitat as reasons for the diversity of structures to increase the chances of survival (by the exploitation of new niches, or reduction in competition derived from genetic diversity**).**
			
			Eg
			Question 2
			Transport of materials: a comparison relates to differences in
			• water levels
			• temperature
			• wind/exposure
			• harsh conditions – salty soil, frost.
			
			Key: Link to environment

	Achievement *Description of how each plant group is modified to a named function* *4 from each plant* *(accept 5 +3) A1 + A2*	***Merit*** *Explanation of how the modifications lead to an increased chance of survival for a named function:* *2 for each plant* *M1 and M2*	***Excellence*** *Reasons for the development of the beneficial modifications is linked to the differences in the plant's environment (such as niche exploitation or the reduction in competition derived through genetic diversity): 1 × E*

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
	Description of how each plant or plant group varies for a specified process. Eg Question1 **Reproduction:** description clearly shows how each is modified, eg structures of • organ veg reproduction Eg bulbs, stolons, rhizomes, floral structure • **gametes** flagellated sperm • **seed** monocot/dicot methods of • **pollination** wind/insect/water etc Monoecious/dioecious • **seed dispersal**: animal/wind etc • Alternation of generations Gametophyte/sporophyte Dominance /length of each/ Visible plant gametophyte, eg moss Sporophyte – angiosperm	**The explanation clearly relates the adaptation to an increased chance of survival.** Eg Question 2 **Reproduction:** the modification is related to an **increased chance of survival in different environments** • **water availability** for transport of gametes eg mosses • **dispersal agents** (seeds / gametes) insects/wind/water/etc • **asexual reproduction** – benefits • alternation of generations. – dominance as relates to survival eg angiosperms dominant sporophyte therefore water independent – able to colonise a greater range of ecological niches	**The discussion compares the differences in the plants' natural habitat as reasons for the diversity of structures to increase the chances of survival (**by the exploitation of new niches, or reduction in competition derived from genetic diversity**).** Eg Question 2 **Reproduction:** a comparison relates to differences in • water availability • dispersal agents • alternation of generations. • sexual/asexual reproduction • factors that contribute to cross pollination eg quantity of pollen (wind-pollination is more random and therefore requires more pollen) insect-pollinated plants must produce pollen when insects are prevalent wind-pollinated plants usually grouped together whereas insect-pollinated plants more spaced out comparing energy costs ensuring cross-pollination
	Achievement *Description of how each plant group is modified to a named function* *4 from each plant (accept 5 +3)* *A1 +A2*	***Merit*** *Explanation of how the modifications lead to an increased chance of survival for a named function:* *2 for each plant* *M1 and M2*	***Excellence*** *Reasons for the development of the beneficial modifications is linked to the differences in the plant's environment (such as niche exploitation or the reduction in competition derived through genetic diversity):* *1 × E*

Judgement Statement

Achievement	Merit	Excellence
Description of how each plant group is modified to a named function	Explanation of how the modifications lead to an increased chance of survival for a named function	Reasons for the development of the beneficial modifications are linked to the differences in the plant's environment (such as niche exploitation or the reduction in competition derived through genetic diversity)
Must get 4 from each plant (accept 5 + 3) A1 + A2	2 for each plant A + M1 and M2	M + 1 x E

Biology: Describe cell structure and function (90464)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
11,582	62.6%	28.9%	6.9%	1.6%

Assessment Report

Candidates gaining Achievement understood what to do from the key words of the standard and key words of the questions. They demonstrated a basic understanding of the terminology of biological concepts and processes relating to cell structure and function. These included the structure of the cell membrane; the importance of the cell membrane and the movement of materials across it; the structure and function of the cell membrane; the differences in cell size (surface area:volume ratio); a description of photosynthesis and a description of enzyme activity.

Students who gained Achievement used their skills and knowledge through writing using appropriate terminology or drawing appropriately labelled diagrams. Their answers were presented in a manner that could be understood.

Candidates gaining Achievement with Merit or Achievement with Excellence showed additional skills and knowledge; these candidates demonstrated a greater depth of understanding of the biological concepts and processes.

Many candidates presented a satisfactory understanding of passive and active transport. However, a significant number considered diffusion passive and osmosis as active transport. Greater emphasis needs to be placed on the chemical composition of the cell membrane in the fluid mosaic model.

Surface area:volume ratio is a very important concept in biology. Yet many students demonstrated confusion and misunderstandings of the effects of the concept on cell growth.

Too many candidates demonstrated misunderstandings of the processes of photosynthesis and respiration. Many thought that oxygen was involved in photosynthesis, carbon dioxide was involved in respiration, photosynthesis occurred during the day and respiration occurred at night. Few candidates linked the processes of photosynthesis and respiration in plant cells.

For questions that require comparisons between concepts, candidates must include the concepts / terms being explained in their answer.

Assessment Schedule

Biology: Describe cell structure and function (90464)

Evidence Statement

Question	Evidence contributing to Achievement 5 As	Evidence contributing to Achievement with Merit 3 Ms	Evidence contributing to Achievement with Excellence 1 E
1(a)	**Description** of cell membrane (a labelled diagram or written description), eg: • double (phospho) **lipid** layers • **protein** molecules.		
1(b)	**Description** of how cell membrane functions, eg: **Passive Transport:** • down **concentration gradient/high to low** **OR** • **no energy** needed **OR** **Active Transport:** • binding onto **carrier molecules/proteins** **OR** • **against concentration gradient/low to high** **OR** • **energy** needed Need to make reference to molecules/particles/substance	**Explanation** of how the cell membrane controls the movement of substances, eg: **Passive Transport:** • down **concentration gradient/high to low** • **no energy** needed **OR** **Active Transport (two of):** • binding onto **carrier molecules/proteins** • **against concentration gradient/low to high** • **energy** needed Need to make reference to molecules/particles/substance	**DO NOT ACCEPT:** Effort in place of energy
1(c)	**Description** of the importance of the cell membrane in maintaining a constant internal environment for the cell, eg: • membrane **controls** (or implies) what passes through it **into** the **cell** **OR** • membrane **controls** (or implies) what passes through it **out of the cell** **OR** • membrane **controls** (or implies) the **concentration of substances** inside the cell **DO NOT ACCEPT:** Unwanted foreign materials	**Explanation** of the importance of the cell membrane in maintaining a constant internal environment for the cell, eg: • membrane **controls** (or implies) what passes **into and out of the cell** **AND (2 out of 3)** • **membrane selectively permeable** (or equivalent) • movement of particles from **high to low conc.** • **no energy** needed **OR (2 out of 3)** • involves **carrier mechanism/pump/ cytosis** • movement of particles from **low to high conc.** • **energy needed**	**Discussion** of the importance of the cell membrane in maintaining a constant internal environment for the cell, eg: • membrane **controls** (or implies) what passes **into and out of the cell** **AND (2 out of 3)** • **membrane selectively permeable** (or equivalent) • movement of particles from **high to low conc.** • **no energy** needed **AND (2 out of 3)** • involves **carrier mechanism/pump/ cytosis** • movement of particles from **low to high conc.** • **energy needed**

Question	Evidence contributing to Achievement 5 As	Evidence contributing to Achievement with Merit 3 Ms	Evidence contributing to Achievement with Excellence 1 E
2(a)	**Description** of the differences between smooth and rough endoplasmic reticulum (ER), eg: • rough ER **ribosomes** attached **OR** • smooth ER does not.		
2(b)	**Description** of the differences between rough and smooth ER in respect to structure and function, eg: **Pancreas:** • **produce/need proteins/enzymes/ hormones** **OR** **Gamete-producing cells:** • **do not produce/need** large amounts of **protein** **OR** • produce/need **other relevant substances.**	**Explanation** of the differences between rough and smooth ER in respect to structure and function, eg: **Pancreas:** • **produce proteins/enzymes/ hormones** **AND** **Gamete-producing cells:** • **do not produce** large amounts of **protein** **OR** • produce **other relevant substances.**	**DO NOT ACCEPT:** Gamete-producing cells **DO NOT** produce proteins
3(a)	**Description** shows the changes of cell surface area:volume ratio during growth, eg: • ratio **decreases** (or **implied**).		
3(b)	**Description** of the importance of surface area: volume ratio to cells, eg: • **efficiency** of moving materials into or out of the cell **decreases** **OR** • **movement** of materials **slower/decreases rate** of movement to centre of cell **OR** • **less material** transported **OR** • **increase** in **diffusion distance** **OR** • **vice versa.**	**Explanation** of the importance of surface area: volume ratio to cells, eg: **As the cell grows (2 out of 4):** • **efficiency** of moving materials into or out of the cell **decreases** • **movement** of materials **slower/decreases rate** of movement to centre of cell • **less material** transported • **increase** in **diffusion distance.** **MAY INCLUDE:** **comparison with small cell for <u>ONE FACTOR</u>**	**DO NOT ACCEPT:** Easier or Harder in place of efficiency

Question	Evidence contributing to Achievement 5 As	Evidence contributing to Achievement with Merit 3 Ms	Evidence contributing to Achievement with Excellence 1 Es
4	**Description** of why the plants did not grow, eg: **Sealed bottle:** • **limited carbon dioxide** **OR** • **limited photosynthesis** **DO NOT ACCEPT:** **no CO_2 OR no photosynthesis OR connection between O_2 and photosynthesis** **OR** **Unsealed bottle:** • **more carbon dioxide** available **OR** • **photosynthesis increased**	**Explanation** of a limiting factor that prevents growth, eg: **Sealed bottle:** • **limited carbon dioxide** • which is important for **photosynthesis** • therefore **limited or no growth** **OR** **Unsealed bottle:** • **more carbon dioxide** available • therefore **rate** of **photosynthesis increased** • therefore **increase in growth**	**Discussion** links why the plants survived, but did not grow, eg: **Sealed bottle:** • plants **respired** producing **carbon dioxide** • used up in the process of **photosynthesis** • but **limited supply** of this **carbon dioxide** • therefore **limited or no growth** **AND** **Unsealed bottle:** • **more carbon dioxide** available • therefore **rate** of **photosynthesis increased** • therefore **increase in growth**
5	**Description** relates the activity of pepsin as the temperature or the pH changed, eg: **Temperature** • enzyme **activity** would **decrease** below 37°C **OR** • enzyme **activity** would **decrease/enzyme denatured** as the temperature **increases** over 37°C **OR** **pH** • enzyme **activity** would **decrease** as the **pH increases** **OR** • a general statement about **change in temp or pH** and the **decrease** in activity of the enzyme/**change in structure**	**Explanation** of the change in activity of the enzyme because of the change in temperature and pH, eg: **Temperature Decrease** • **rate** of **reaction decrease** • because **less energy/less collisions** of particles **OR** **Temperature Increase** • enzyme (pepsin) **denatures** and **can not function properly**/ the protein denatures, making the **bonding** to the enzyme **impossible** **AND** **pH** • **pH increase** affects **enzyme structure/decreases activity/denature/less binding**	**Discussion** shows why the activity of the enzyme is prevented, eg: **Temperature Increase (3 out of 4)** • pepsin **denatured** at **temperatures above 37°C** • shape of **active site altered** • **protein can not attach/fit** to enzyme's **surface/active site** • pepsin not able to carry out its **function/ breaking down** protein into polypeptides **AND** **pH** • pepsin **denatured/shape changed** at **increased pH** • pepsin not able to carry out its **function/ breaking down** protein into polypeptides
	DO NOT ACCEPT: Enzyme killed/dies. Discount any statements that include either of these terms.		

Judgement Statement

Achievement	Merit	Excellence
Five Achievement opportunities 5 × A	Five Achievement opportunities **plus** 3 Merit opportunities 3 × M	Merit **plus** 1 Excellence opportunity 1 × E