NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2004

Biology

Demonstrate the transfer of genetic information (90163)

Describe the functioning of human digestive and skeletomuscular systems (90166)

Describe plant processes (90167)

Describe how humans use and are affected by micro-organisms (90168)

National Statistics

Assessment Report

Assessment Schedule

Biology, Level 1, 2004

General Comments

Candidates gaining Achievement understood what to do from the key words of the standard and key words of the questions. Candidates should use the terms ‘describe’, ‘explain’, ‘discuss’, as defined in the achievement standards, as an indication of the level of answer expected.

Key terms in bold clearly told the students what was expected.

Candidates need to attempt all questions and give accurate and concise answers. Better-performing candidates were able to qualify their answers either with examples or by linking to biological ideas or concepts.
Many of the candidates who did not achieve, did not attempt sufficient questions from the paper.

Biology: Demonstrate the transfer of genetic information (90163)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
10,210	44.3%	27.5%	18.5%	9.7%

Assessment Report

Candidates gaining Achievement understood key genetic terms and concepts, as given in the explanatory notes. They showed a clear understanding and avoided confusing terms. These candidates understood basic genetic interactions such as punnet squares and pedigree charts. Their answers addressed the question and showed understanding of the biological processes without unrelated information.

Candidates gaining Achievement with Merit or Achievement with Excellence showed additional skills and knowledge. They gave clear and concise answers with appropriate examples. Evidence was given within the boundaries of the question without unnecessary or irrelevant information.

Candidates attempted all parts of a question.

Assessment Schedule

Demonstrate the transfer of genetic information (90163)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	Two male orange-brown, one male white, three female orange-brown OR listed each individual out OR one tiger white and equal no's of male & female.		
1(b)	(Original tigers) have/carry the recessive gene OR (original tigers) are BOTH heterozygous.	Explanation of phenotype masking a heterozygous genotype. Recessive gene carried and passed on to next generation. Eg both parents heterozygous and pass recessive allele on to produce white cub (or a reason).	
1(c)	Could be heterozygous (dominant /recessive genes) or homozygous.	Explain that offspring could result from homozygous or heterozygous female as we only know their phenotype and not their genotype. Eg orange-brown colour has at least one dominant allele. Negates if states actual genotype.	Discussion that includes: can't determine if she is homozygous, dominant or heterozygous. Offspring must all be heterozygous because B breeds with a homozygous recessive male. B could be heterozygous in which case chances of her offspring all being heterozygous are low but possible. (Well-labelled diagrams accepted.) **OR** … relates to both parents and siblings in discussion.
2(a)	Both must be correct: DOMINANT: factor or allele (gene) that is expressed (shows itself). RECESSIVE: the factor or allele that is not-expressed (hidden) / **OR** '2 recessive needed to show' NOT stronger / powerful.		
2(b)	Correctly completed punnet square R r R RR Rr r Rr rr (must be 'R') **OR** 3/4 (75%).		
2(c)	Description that phenotype is physical appearance **AND** genotype is genetic make-up. **OR** … phenotype is round and genotype is homo/heterozygous NOT just letters, but description using letters is OK.	Explanation that relates phenotype to the seed shape **AND** genetype to the genetics make-up (listed) (whilst an allele may be present (in genotype) it may not be seen (in phenotype) **AND** relate to pea plant seed shape.	

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
2(d)	Cross (breed) with a green seed (homozygous recessive) plant.	**Explanation** of cross with a pea being homozygous recessive **AND** state green offspring if heterozygous **OR** Only yellow if homozygous.	Discussion that involves the need for a **back-cross** (**test-cross**) ie crossing with homozygous recessive to see if any recessive character is shown (green seed). What the outcomes would be, and relating outcome to whether the pea is heterozygote. Discuss both outcomes using labelled punnet squares or explanation.
3(a)	Any **TWO** of the three correctly described: phosphate; sugar; base.		
3(b)	(i) All correct: Cytosine 600 Thymine 300 Guanine 600.	(ii) Must have (i) and explain that the diagram shows twice as many C-G pairs as A-T pairs. So, double the amount of C & G expected, the same amount of T. (Don't need pairs in explanation).	
3(c)	Any **TWO** from: nucleotides (pieces of DNA/bases/raw materials), energy, enzymes, existing DNA **OR** prevent mutations.	Explain why the two features are needed / necessary. Nucleotides are the raw materials; energy is needed to power the process; enzymes catalyse the process; information is available to copy from the existing DNA **AND** to avoid errors in what is made / avoid mutation.	Discuss Overview of process, what is needed and why if the sequence is changed the aa's or proteins may be different (MUTATION) and that this could negatively affect the organism.
4(a)	A plant or animal AND correct location (eg MEIOSIS in the TESTES; eg MITOSIS in the ROOT TIP.)		
4(b)	Mitosis is for growth and or repair **OR** meiosis produces gametes/eggs/sperm/ pollen/ova/sex cells / haploid cells).	Explanation **MITOSIS** growth and/or repair, increases the number of **genetically identical cells** **(**related to animal or plant eg growth in the length of the root in sunflower) **OR** MEIOSIS occurs in the sex organs and is concerned with the **production of gametes (haploid cells) AND** related to animal or plant eg production of sperm in a male cat.	

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
4(c)	Mitosis same number chromosomes (identical cells) OR Meiosis half number of chromosomes.	Mitosis As Achieved plus … 'why the no. of chromosomes stays the same' eg because the cells are the same as those that produced them' / 'carry out same function' **OR** Meiosis As Achieved plus 'why' … eg because the gametes only need half the genetic information of the adult animal/plant / join two gametes to restore chromosome number.	Mitosis As Merit plus… 'lack of variation **linked** to function' (importance of being identical AND reason) eg cells will be identical as they need to carry out the **same function** as those they replace **OR** Meiosis As Merit plus… eg variation **linked** to diversity (importance of variation AND reason) eg cells will not be identical as variation aids survival.

Judgement Statement

Achievement

Total of **SEVEN** opportunities answered at Achievement level.

$7 \times A$

Merit

Achievement plus **THREE** questions at Merit level (or higher).

$3 \times M + 7 \times A$

Excellence

Merit plus **TWO** questions at Excellence level.

$2 \times E + 3 \times M + 7 \times A$

Biology: Describe the functioning of human digestive and skeletomuscular systems (90166)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
4,402	48.3%	36.4%	14.5%	0.7%

Assessment Report

Candidates gaining Achievement had a basic knowledge of both systems, skeletomuscular and digestive, and could recall relevant facts. Candidates clearly demonstrated better knowledge of the digestive system than the skeletomuscular.

Candidates answered accurately and specifically eg referring to biceps in Question One (b) instead of arm or arm muscle. They could use correct terminology. For example, candidates were able to refer to enzymes being denatured rather than being killed. They used diagrams accurately to communicate ideas they found it difficult to write about.

Candidates gaining Achievement with Merit or Achievement with Excellence showed more detailed knowledge of both the skeletomuscular and the digestive systems and were able to structure their answers. They were able to use annotated diagrams to explain processes effectively. They attempted all parts of a question.

Assessment Schedule

Biology: Describe the functioning of human digestive and skeletomuscular systems (90166)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	Any **TWO** from • movement • support / posture • breathing • circulation • digestion (any part) **NOT** • protect • generates heat / warmth.		
1(b)	Voluntary **OR** Involuntary **Voluntary** eg skeletal muscle (accept any named skeletal muscle) **OR** **Involuntary** eg gut **OR** Describes **both** but no examples.	Voluntary **AND** involuntary explained with an example of each. **Voluntary:** Muscles that work (under conscious control) because 'we decide to move them' described with example eg skeletal muscle (accept any named skeletal muscle). **AND** **Involuntary:** work without conscious effort eg walls of blood vessels, gut, cardiac, uterus etc.	
1(c)	Description of movement. Eg • Biceps/flexor contracts/pulls to lift arm up (not good enough to say triceps relaxes) • tendons join muscle to bone • joint enables movement between bones / to bend at elbow • ligaments hold joint together. **(Any 1)**	Explanations of movement. Eg • Biceps/flexor and triceps/ extensor are an antagonistic pair biceps contracts **and** triceps relaxes • tendons join muscles to bone **across** a joint **:** when muscles contract, **bones** move; • **ligaments** joining the bones; allow bending without collapse **(Any 2)**	Discussion includes: the antagonistic muscles the **biceps/flexor** and **triceps/extensor** work together. The biceps contracts /shortens to pull up the radius; the triceps / flexor relaxes at the same time. The biceps is attached to the radius by **tendons across** a joint; when muscles contract, **bones** move; • **ligaments** hold joint together • so it doesn't dislocate or collapse. (**Must link, bone, tendon and ligament in their description.**)

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
2(a)	Any **ONE** reasonable example and description eg • skull / cranium protects the brain • spinal cord protected by backbone / vertebra • heart, lungs etc protected by ribcage. **OR** description of how named organ protected.	Explains **how** the protection is carried out Eg the ribs wrap around the lungs **NOT** shield, the cranium encases the brain.	
2(b)	Any **ONE** of the three described: **GREENSTICK FRACTURE** • a partial fracture / break of a bone (usually in children) • the bone is bent but broken; cracked on only one side; **OPEN/COMPOUND FRACTURE** a fracture / break associated with lacerated / cut (soft tissue) or an open wound; **SIMPLE FRACTURE** a single break that causes little or no damage to the surrounding soft tissues.		
2(c)	Names **or** describes movement of at least **TWO** types of joint eg • fixed (fibrous) / immovable • ball and socket • hinge / pivot • gliding / plane • saddle (thumb joint).	Explanation of the need for different amounts and type of movement eg ball and socket joint allows rotation / movement in three planes (NOT 360°) cf hinge joint, moves in one plane only.	
2(d)	Description of Osteoporosis: Bones become: • softer • weaker • less dense • more brittle • break more easily • because of the **hormones, changes** involved in menopause.	Explanation of gender **and** age factors: ***Gender*** - chances of developing osteoporosis are greater for women: • have less bone tissue / lose bone more rapidly **than men /** • because of the **hormones**, **changes** involved in menopause. ***Age*** - the older, the greater risk of osteoporosis, • bones become less dense • weaker with age • become brittle. **Gender AND Age**	Discussion of causal factors: • as you age (around age 30), bone density reduces / bone reabsorption begins to exceed bone formation • osteoporosis develops when bone reabsorption occurs too quickly or if replacement occurs too slowly • bone loss is most rapid in women due to calcium losses from breast feeding and hormonal changes (low oestrogen) at menopause etc. **ALL points covered**

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
3(a)	Descriptions of any **TWO** from: **Teeth**: • mechanical breakdown • increasing surface area • breaking into smaller pieces • chewing / masticating. **Sphincter:** Controls the (rate) flow through the digestive system. Eg lets chyme / liquid food out of the stomach. **Villi**: (increase surface area) for **absorption** of digested food.		
3(b)	Description that swallowing involves muscular action eg peristalsis / muscle action pushes food along (down) the oesophagus **OR** simple diagram.	Explanation that the food (bolus) is **squeezed / pushed** along the oesophagus by muscular contraction called **PERISTALSIS**. Labelled diagram(s).	
3(c)	Description of **ONE** named malfunction: Eg • ulcer • constipation • diarrhoea • bowel cancer.	Explanation of link between the named disease and diet **OR** lifestyle problems. Eg • lack of fibre causes constipation • too much alcohol /coffee-drinking / smoking / use of nonsteroidal Anti-inflammatory drugs such as aspirin, ibuprofen etc can cause ulcers • too much red meat & lack of fibre can cause bowel cancer.	Discussion of **ONE** named malfunction to include Diet **AND** lifestyle Eg ulcers, main cause is triggered by chronic stress stimulating excess stomach acid, irritating lining, allowing infection by bacteria (*H. pylori*). Mentions **avoidance / or by implication** eg lower stress, reduce caffeine, alcohol etc. **Links the points.**

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
4(a)	Any **TWO** rows **correctly completed.** **Saliva** • sugar • maltose (**NOT** glucose) • lubricates food. **G Juice** • (poly)peptides • peptones • amino acids • smaller **molecules** • coagulated milk/ curd • paracasein. **Bile** • emulsifies fats • increases surface area for enzyme action • activate lipase.		
4(b)	Description of enzymes being specific. Eg each food type needs a particular enzyme.	Explanation that enzymes are specific (because humans eat more than one kind of food) and each food type needs a particular enzyme eg Amylase acts on starch.	
4(c)	Description that includes: • different enzymes work in different pH levels.	Explanation of optimum environment, relate to changing pH/digestion • at low pH (acid) pancreatic **enzymes** inactive/less active **OR** • at higher pH (alkaline) **enzymes** more active • different **enzymes** work in different pH levels : stops the action of the enzyme from previous organ / enhances activity of the enzyme from that organ **OR** • **enzyme** inactive / denatured at low pH (acid conditions).	When **acid** stomach contents enter the duodenum, they are mixed with pancreatic juice and bile. This creates the **proper acid/alkali balance (pH value) at which the pancreatic enzymes are most effective** (both bile and pancreatic juice are alkaline) **lack of bile leads to a lower pH**. Range of pH discussed and **related to dysfunction/denaturing of enzymes.** **NOT** kills enzymes.
5(a)	Reabsorption of remaining water.		
5(b)	Large surface area not needed (for water absorption) **OR** larger surface area needed for nutrient absorption **OR** colon plays no direct part on the reabsorption of nutrients	Explanation that colon plays no direct part in the reabsorption of nutrients, **and** that most of the water has already been reabsorbed (from the small intestine) so no need for increased surface area.	

Judgement Statement

	Achievement	Merit	Excellence
Sufficiency	Achievement: **8 × A** • at least **3** from Q 1 / 2, **AND** • at least 3 from Q 3 /4 /5	Merit: 8 × A **+ 4 × M**	Excellence: 8 × A (as above) + 4 × M **+ 2 × E**
Question			
One (a)	A		
(b)	A	M	
(c)	A	M	E
Two (a)	A		
(b)	A		
(c)	A	M	
(d)	A	M	E
Three (a)	A		
(b)	A	M	
(c)	A	M	E
Four (a)	A		
(b)	A	M	
(c)	A	M	E
Five (a)	A		
(b)	A	M	

Biology: Describe plant processes (90167)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
2,661	47.1%	45.1%	6.9%	0.9%

Assessment Report

Candidates gaining Achievement understood key terms; for example they were able to describe pollination and describe each method of seed dispersal. They were able to identify basic structures and describe biological processes, and recognise the correct use of processes and concepts in context to questions. Candidates had an understanding of plant structures, could describe key biological processes and could back up evidence with named examples.

Candidates gaining Achievement with Merit or Achievement with Excellence understood the need to link ideas, used correct biological vocabulary and attempted all parts of a question. They demonstrated a thorough understanding of the key processes. Those that gained Excellence gave explanations that demonstrated confidence and a detailed understanding of a range of processes. Often they used labelled diagrams to support their explanations of the process.

Assessment Schedule

Biology: Describe plant processes (90167)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	Description requires **wind pollination**.		
1(b)	Description of 'dangling or exposed' anthers and 'exposed' or 'furry' or large stigma given. Long stigma. May have reduced petals as a feature. Lack of scent, nectar and colour are **not** acceptable features.	Explanation links structures to wind pollination. Dangling anthers and exposed stigma linked to releasing pollen in wind currents, and catching pollen from wind. If there is a problem with either explanation, may have reduced petals to expose reproductive organs to wind currents.	
2	Description requires **TWO** pistil structures named: eg pollen tube extends (grows) from the pollen grain (on stigma) down to the ovule eg pollen tube forms a passage way from the pollen grain to reach the ovary. Must be a clear description of what pollen tubes do.	Explanation clearly gives the role of the pollen tube as a connection, and vector leading to fertilisation. Eg the pollen tube carries the male nuclei right to the entrance of the ovule. The pollen tube releases the two nuclei into the ovule for fertilisation.	
3	Description of at least **TWO** seed dispersal mechanisms: eg Group A plants all have edible berries. Not eaten by insects eg Group B plants have seeds which attach to animals. Not insects/bees. Not attached to bees/insects eg Group C plants have seeds which float on air currents.		

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
4	Valid advantage and disadvantage of one form of reproduction **OR** two valid advantages of one form of reproduction **OR** two valid disadvantages of one form of reproduction **OR** valid advantage and disadvantage from both types of reproduction **OR** valid advantage from both types of reproduction **OR** valid disadvantage from both types of reproduction.	Explanation lists an advantage and disadvantage of sexual and asexual reproduction, but **not linked** to the survival of the species. Eg asexual reproduction produces identical tubers, whereas sexual reproduction produces variety in the offspring seeds.	Advantages and disadvantages of sexual reproduction and asexual reproduction are linked to the survival of the plant species. Eg sexual reproduction produces variation and diversity in the offspring, which is beneficial long term to the species. Also dispersal of seeds, which may be advantageous colonising new habitats, and avoiding competition. A disadvantage of sexual reproduction is that correct environmental conditions are required (wind or pollinators). Eg asexual reproduction produces genetically identical offspring, which takes advantage of present conditions and not to disperse out of a favourable habitat. However, all are susceptible to the same pests, diseases and climatic conditions, and remaining next to the parent plant will cause huge competition amongst the tubers in the next generation.
5(a)	Description of the internal structure of the seed correctly names at least **TWO** parts **labelled** A to D in the diagram **AND** links them appropriately in a descriptive statement. Must ID parts with labels. The acceptable terminology includes: A = cotyledon(s), seed leaf (leaves, food reserve), endosperm B = plumule, young or embryo shoot C = radicle, young or embryo root D = embryo. Eg the pea seed contains an embryo plant that has a radicle. (C) Eg inside the pea seed there is a young root and a young shoot (B). Eg the internal structure of a pea seed contains cotyledons (A) attached to an embryo plant (D).		

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
5(b)	One **clearly** expressed function is required. The name of the plant is **not** required. Eg Part A contains a store of starch which provides energy for the initial growth of the seedling **OR** the cotyledons are the seed leaves, which produce energy for the growth of the seedling before it is able to produce its own first true leaves. Eg Part B grows upwards towards the light and makes food for the growing seedling **OR** the young shoot takes over from the cotyledons, producing sugars with its true leaves. Eg Part C grows downwards and absorbs water (and nutrients) for growing seedling **OR** the radicle is responsible for anchoring the seedling in the soil.		
6	Description of the **THREE** essential environmental conditions needed, ie: • water • warmth • oxygen.	As for achieved, plus an explanation of how **TWO** of the three essential environmental conditions contribute to successful germination, ie: • water for breaking dormancy, rehydrating seed, activating enzymes • warmth for increasing metabolic rate to the point where cell enzymes can work efficiently • oxygen for cell respiration, providing energy for cell division, building molecules.	As for merit, but explanations needed for the **TWO** essential environmental conditions, **AND** why there is no need for soil and sunlight during the initial germination process, ie: • water for breaking dormancy, rehydrating seed, activating enzymes • warmth for increasing metabolic rate to the point where cell enzymes can work efficiently • oxygen for cell respiration, providing energy for cell division, building molecules.

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
6		**OR** • no need for nutrients from soil until proteins already stored in the seed are used up. Seeds can germinate quite successfully in damp cotton wool or filter paper, but after one week or so, they look weak and spindly, lacking the minerals (magnesium) to build chlorophyll molecules and nitrates to build proteins • no need for sunlight initially as starch, a product of photosynthesis, is stored in large enough quantities to supply the energy and carbohydrate for cell division.	**AND** • no need for nutrients from soil until proteins already stored in the seed are used up. Seeds can germinate quite successfully in damp cotton wool or filter paper, but after one week or so, they look weak and spindly, lacking the minerals (magnesium) to build chlorophyll molecules and nitrates to build proteins • no need for sunlight initially as starch, a product of photosynthesis, is stored in large enough quantities to supply the energy and carbohydrate for cell division.
7	Description suggests that different climatic conditions (not specified) may cause the **width** of the light and dark rings to change. Eg depending on the climatic conditions the tree is growing in, you would notice that the annual rings are closer together or may be spaced further apart. Eg if the tree is growing in poor conditions, the dark bands will be close together.	Explanation correctly links the production of summer wood and/or winter wood to at least **one** specific climatic condition (temperature, drought, fire, wind, carbon dioxide levels, air pollution etc). Light and dark rings may be stated instead of summer and winter wood, but it must be apparent that the light rings would normally be wider than the dark rings. Eg if the climatic conditions favour increased growth rate of the tree, this will be noticeable in the spacing of the annual rings. For the year that seasonal growth was higher, the darker annual rings will be spaced further apart. This is because the greater production of the lighter coloured summer wood occurred. Higher than normal temperatures may increase growth rate.	

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
7		Eg a tree that is growing with a very strong prevailing wind will show the production of compression wood where the annual rings in one part of the circumference are closer together. This is because the xylem cells in a tree are continually dividing and the size of the cells determines the density of the colour of the wood. Small compressed cells produced during colder winter months make up the dark bands (annual rings). Eg in very polluted habitats, the leaves of a tree may be covered with black deposits that reduce the rate of photosynthesis (and growth). This can be seen by examining the annual wood production in the trunk. Normally during the winter, the cells produced are small and appear as a dark ring, whereas during spring/ summer growth, the cells are larger and appear as a lighter band. With reduced growth due to air pollution, the dark rings will be closer together. Eg a fire will burn the leaves and this event will be recorded in the growth of the trunk's annual rings. Normally the summer wood production is seen as a lighter band of wood. The rings of winter wood will be closer together because of the reduced growth (caused by fire).	
8(a)	Description needs appearance **AND** position in leaf cross-section. Eg layer of rectangular-shaped cells beneath the upper epidermis **AND** appearance could be described as: green, closely packed, upright, rectangular cells. **OR** could label diagram and describe cells.		

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
8(b)	Description needs mention of two parts of the leaf that are involved in the passage of CO_2 to the palisade mesophyll cells. Eg the CO_2 enters the stomata and passes between the spongy cells to reach the palisade cells. Eg the guard cells open the stoma and let the CO_2 into the leaf. The CO_2 then moves to the palisade cells. **OR** The description contains **ONE** relevant part of the leaf involved in the passage of CO_2 **PLUS** mention of the process of diffusion (or movement of CO_2 from a high concentration to a low concentration).	Explanation links parts of the leaf that allow the passage of CO_2 to the diffusion of CO_2 from a high concentration outside the leaf to a low concentration inside the palisade cells. Specifically a candidate would need to: • name at least 3 of the following: – guard cell – stoma/stomata – air spaces – spongy mesophyll cells/spongy cells/mesophyll cells – cell membrane/cell wall/cytoplasm. and • show understanding of the process of diffusion, including **ONE** of the following: – either using the term **diffusion** or outlining the movement of CO_2 **from high concentration to low concentration** – there is a CO_2 concentration gradient from a high concentration outside the leaf to a low concentration inside the chloroplasts – CO_2 diffuses into the palisade cells /or diffuses into the chloroplasts. Eg CO_2 diffuses from the atmosphere through the stomata, between the spongy mesophyll cells in the many air spaces, and finally enters the palisade cells by diffusion across the cell membrane. Eg there is a constant CO_2 concentration gradient extending right from the atmosphere to the chloroplasts inside the palisade cells. CO_2 diffuses rapidly through the stomata opened by the pairs of guard cells into all the air spaces of the mesophyll, right to the palisade cell chloroplasts.	

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
8(c)	Description includes at least three of: • broad and flat (large surface area) • veins or xylem and phloem • thin • shiny (waxy cuticle) specialised cells for photosynthesis (palisade cells or spongy cells) stomata or pores on bottom normally (but may be on top or both) • facing the light (at right angles) chloroplasts/green pigment.	As for achieved, plus explanation of how at least three of the features help photosynthesis efficiency, eg: • broad and flat to capture more light • shiny to reduce water loss • veins for support or transport • thin to allow CO_2 to diffuse easier (light only penetrates a small distance) • stomata to allow CO_2 entry and control water loss • orientated towards the light to maximise photosynthesis.	As for merit but requires evidence of further linking of ideas, eg: • veins transport water to leaf for photosynthesis, and turgidity of leaf to maintain flat shape • veins transport sugars away from photosynthesising cells to reduce osmotic potential • thin leaves reduce diffusion distance. Must have features relating to **general shape**, **structure** and **orientation**.

Judgement Statement

Total: 12 Achieved opportunities 7 Merit opportunities 3 Excellence opportunities

Sufficiency Statement

Achievement = 6 × A or M or E

Merit = 10 × A or M or E including 4 × M or E

Excellence = 12 × A or M or E including 2 × E

Biology: Describe how humans use and are affected by micro-organisms (90168)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
8,930	45.7%	40.8%	9.8%	3.7%

Assessment Report

Candidates gaining Achievement understood the key words life processes, reproduction, contamination and preservation. They were able to name parts of micro-organisms and to describe their structure using a diagram.

Candidates were able to link structure to function. Candidates were able to name life process, or products produced by the life processes of micro-organisms. Candidates understood how pathogenic micro-organisms can cause diseases in living things ie food poisoning, colds and flu. They had an understanding of aspects such as binary fission and anaerobic respiration.

Candidates understood life processes of micro-organisms. They could describe the structure of micro-organisms and the functions of these structures. Candidates understood helpful uses of micro-organisms for production of bread, wine and beer.

Candidates made links between causes and prevention of food contamination, and could name two methods of food preservation. Candidates could apply their knowledge to the context of the question, for example, fast foods and suffering from a cold.

Candidates understood that the word ‘grow’ with respect to micro-organisms means an increase in population numbers due to reproduction.

Candidates gaining Achievement with Merit or Achievement with Excellence were guided by highlighted terms such as ‘explain’ and ‘compare and contrast’ in structuring their answers. They showed additional skills and knowledge, such as the difference between short and long term food preservation methods and linked life processes. Candidates understood how the human immune system recognised invading pathogens and were able to link this to mutations in viruses.

These candidates used equations and annotated diagrams to explain processes, for example, binary fission, and attempted all parts of a question.

Assessment Schedule

Biology: Describe how humans use and are affected by micro-organisms (90168)

Evidence Statement

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	**Contamination of food during preparation and storage:** Eg Dirty hands, knives, utensils, cutting boards, bench tops, work surfaces, cloths, tea-towels, storage containers or fridges. Using same cutting boards for raw and cooked food. Sick people preparing food. Unthawed food, under cooked food (pink chicken). Foods reheated more than once or not reheated right through to the middle. Storing cooked and raw food together. Storing raw meat above other food. Warm storage temperatures. Broken seals/exposure to air. **Preventing Contamination** Eg Wash hands, knives… Wear gloves or hair nets/hats. Use different cutting boards, storage containers. Keep sick people out of the kitchen. Cook food thoroughly. Thaw food completely. Keep food cold. Serve hot food hot or serve cold food cold. **Any 2** examples of food contamination **and any 1** example of preventing contamination **or 1** example of food contamination **linked** to how to prevent this chosen example of contamination.		
1(b)	Bacteria reproduce by **binary fission or** description of e.g. bacteria divide/split in two or diagram showing bacteria numbers doubling.	Explanation of **binary fission** e.g. the DNA copies itself, the bacteria/cell/cell membrane/cytoplasm pinches together, two bacteria form **or** a diagram showing the stages of reproduction.	

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(c)	Preservation/**Long term** storage: Freezing **not refrigeration**, freeze drying, pickling (brines), canning/bottling, traditional storage e.g. Maori storage vessel, vacuum packing… Description of **two** methods of preserving food given.	Explains how any two feasible methods of food preservation work. Micro-organisms are killed when food is boiled/heated. The food is then sealed in a tin/can/bottle/vacuum pack to keep out the air (there are micro-organisms in the air). Food stays fresh if it is kept in a freezer because micro-organisms cannot reproduce at cold temperatures. The water is drawn out of micro-organisms if they are surrounded by sugar or salt (brine). This kills the micro-organism. Micro-organisms are killed by vinegar, sodium nitrate and other chemicals. Micro-organisms cannot live on dried food. Once the food has been dried it must be kept in a dry place (air-tight container). Vacuum packing removes air (oxygen) so aerobic bacteria cannot reproduce.	Use biological ideas to **compare and contrast** the chosen methods of food preparation eg heating food before canning kills bacteria, freezing keeps them dormant. So canning is a permanent removal of the bacterial threat, the other is temporary, until conditions change.
2(a)	Description of structure **and** function of any **two** of spore, sporangium or hyphae. **Spores:** small, tough coated reproductive cells. **Sporangium:** swellings at the tips of hyphae that contain/make spores. **Hyphae:** threads used for feeding/growth/spreading. Structure may be described by a labelled diagram.		

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
2(b)	**2** products: Yeast makes carbon dioxide **and** alcohol. **or 1** product **and 1** life function: Yeast produces CO_2 or alcohol (ethanol) when they carry out feeding or respiration (anaerobic) or excretion or fermentation. Life function can be described eg sugar is used as food. **or 1** product **and 1** use: Yeast give off CO_2 which makes the dough/bread rise.	Linked biological ideas: Yeast makes CO_2 or alcohol (ethanol) when they carry out feeding or respiration or excretion or fermentation **and** CO_2 makes the dough rise/beer fizz/wine bubble **or** ethanol makes the beer or wine alcoholic.	
3(a)	Virus structure is named or labelled on a diagram to show both a protein (coat)/capsid **and** nucleic acid/DNA/RNA/genetic material.		
3(b)	Viruses need a host/living cell to grow/reproduce/replicate (grow in context of micro-organisms means growth in population numbers) **or** agar jelly is not a living medium.	Viruses can only reproduce/replicate inside a host cell (because they have no other life functions). Genetic material from the virus enters the host cell. The contents of the host cell are used to make viral genetic material and protein coats.	
3(c)	Viruses **mutate**/evolve or change form/structure/coat/genetic material. Use of antibiotics negates answer.	The **protein** coats/ **antigens** change due to mutation. **or** These are not recognised by the immune system.	Linked biological ideas: Proteins/antigens form the part of the virus that is recognised by the immune system. Frequent mutations lead to different strains with different protein coats/antigens. These are not recognised by the immune system.

Judgement Statement

Question	Achievement	Merit	Excellence
One (a)	A		
(b)	A	M	
(c)	A	M	E
Two (a)	A		
(b)	A	M	
Three (a)	A		
(b)	A	M	
(c)	A	M	E

Sufficiency:

Achievement: $4 \times A$

Merit: $4 \times A$ (as above) + $2 \times M$

Excellence: $4 \times A$ (as above) + $2 \times M + 1 \times E$