

Assessment Schedule – 2021**Biology: Demonstrate understanding of biological ideas relating to micro-organisms (90927)****Evidence Statement**

Q	Achievement	Merit	Excellence
ONE	<p>Describes (single, simple ideas):</p> <ul style="list-style-type: none"> • bacteria reproduction • the effect of temperature on the growth rate of bacteria • effect of other environmental factors on the growth rate of bacteria • ways to preserve food. <p>Examples:</p> <ul style="list-style-type: none"> • Bacteria reproduce by binary fission / cell division / mitosis / splitting in two / asexual / labelled diagram. • Increased (high) temperature increases the growth rate of bacteria. • Decreased (low) temperature decreases the growth rate of bacteria. • We can preserve food by refrigeration / freezing / pickling / salting / drying / vacuum packing. • Storing food in the fridge slows the growth of bacteria. • Taking away: air / oxygen or adjusting pH high / low slows (decreases) growth / reproduction <p>etc.</p>	<p>Explains (gives reasons how or why something occurs / provides examples):</p> <ul style="list-style-type: none"> • how bacteria reproduce • how temperature affects the growth rate of bacteria • how other environmental factors affect the growth rate of bacteria • how food is stored to keep it safe to eat • how food can be preserved • the exponential growth rate of bacteria • how bacterial growth makes food unsafe to eat. <p>Examples:</p> <ul style="list-style-type: none"> • Bacteria reproduce through a process of binary fission / cell division / mitosis. This occurs when one cell splits into two, and happens quickly when environmental factors are optimal (favourable) e.g. warm temperature. (This results in an overall exponential growth of a bacterial colony). • Warm temperatures allow the enzymes within the bacteria that control cell processes (cell respiration / reproduction / nutrition / excretion) to work more quickly, allowing cellular processes (e.g. reproduction) to occur more quickly. (This results in an overall exponential growth of a bacterial colony in the food). • Low temperatures slow enzymes within the bacteria which means cell processes are also slow. • pH adjustments to above or below optimal and link to a preserve method. 	<p>Discusses how environmental factors other than temperature can be controlled to affect the growth rate of bacteria linked to storage and preservation of food to keep it safe to eat.</p> <p>Possible environmental factors include:</p> <ul style="list-style-type: none"> • pH, water, oxygen, • ways of preserving / storing: <ul style="list-style-type: none"> - pickling (removes water / adjusts pH) - salting (removes water) - put in sealed / airtight container (removes oxygen) <p>Examples:</p> <ul style="list-style-type: none"> • Bacteria reproduce through a process of binary fission / cell division / mitosis. This occurs when one cell splits into two, and happens quickly when environmental factors are optimal, e.g. optimal level of humidity / water / moisture. When there is sufficient water available, cellular processes can occur at an optimal rate, and therefore reproduction occurs rapidly. However, when there is insufficient water available within the bacterial cells, cellular processes cannot occur at an optimal rate, and the rate of reproduction slows down as a result. This can be used to advantage to preserve food. For example, through pickling and salting food. When foods are pickled or salted, water is drawn out of the bacterial cells. This leaves insufficient water within the cells for rapid reproduction and growth and the growth rate slows down. As a result, the decay caused by the cellular activities of the bacteria, e.g. extracellular digestion and excretion, is slowed, and the food stays edible for longer. • Removing / decreasing oxygen also slows bacterial growth because oxygen is need for cell respiration. $\text{Glucose} + \text{Oxygen} \rightarrow \text{ATP} / \text{energy} + \text{carbon dioxide} + \text{water}$. Oxygen is required to make energy. Energy is required for all cell processes. Therefore, removing oxygen decreases energy available for reproduction / feeding and slows / stops growth rate. Putting food in a sealed / air tight container removes oxygen and food stay edible for longer.

			<ul style="list-style-type: none"> Adjusting the pH out of the bacteria's optimal (specific) range / increasing pH / decreasing pH affects the enzyme's function. Enzymes are required for extracellular digestions / reproduction / growth. Pickling food adjusts pH so bacterial processes are slowed / stopped.
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE relevant idea given.	TWO relevant ideas given.	THREE relevant ideas given.	FOUR relevant ideas given.	Explains ONE relevant idea.	Explains TWO relevant ideas.	Provides ONE relevant example of discussing (making multiple links).	Provides TWO relevant examples of discussing (making multiple links).

Q	Achievement	Merit	Excellence
TWO	<p>Describes (single, simple ideas):</p> <ul style="list-style-type: none"> • the way viruses are spread • how viruses reproduce • what a vaccine is • what an antibiotic is. <p>Examples:</p> <ul style="list-style-type: none"> • Viruses are microscopic biological agents that invade living host cells and infect their bodies by reproducing within their cell tissue. • Viruses are spread by coughing / sneezing / not washing hands etc., which transfers viral particles onto other people. • Viruses infect a host cell, and use this cell to produce a large number of new viruses. • A vaccine is a substance used to stimulate the production of antibodies and provide immunity. • An antibiotic is a substance / chemical that kills or slows bacterial growth. • Antibiotic work on cell walls / viruses don't have cell wall. • Viruses are inside cells, so antibiotics don't work. • Mutations cause new variants. 	<p>Explains (gives reasons how or why something occurs / provides examples) viral reproduction and spread:</p> <ul style="list-style-type: none"> • the way viruses are spread • how viruses reproduce • how immunisation works • why antibiotics are an ineffective defence against viruses. <p>Examples:</p> <ul style="list-style-type: none"> • Viruses are microscopic biological agents that invade living host cells and infect their bodies by reproducing within their cell (tissue). Infection by a virus causes the host cell to break down. This is because viruses reproduce by attaching to the host cell and injecting their DNA or combining their DNA with the host's DNA so that the viral DNA can use the host's metabolic processes to reproduce. The viruses replicate until the cell bursts and releases viruses which go onto to infect other living cells. • Antibiotics are effective at killing bacteria and preventing bacterial reproduction / growth, but have no effect on viral particles, which reproduce within host / living cells and require a living cell to reproduce. • Viruses spread (quickly) through body fluids e.g. when a person sneezes tiny droplets contain copies of the virus. When droplets are inhaled / ingested the infect other people. • Immunisation – is a weakened form of a virus (in a vaccine) which surrounds the viurus and causes an immune / antibody response. The antibodies destroy the virus when the person becomes infected. 	<p>Discusses (provides links between explanations of relevant ideas) why antibiotics are ineffective against viruses, and why the flu virus can be caught more than once.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Antibiotics are chemicals that are useful in reducing the number of bacterial cells in a living thing. Some antibiotics kill the bacteria by interfering with the formation of the bacterial cell wall / membrane protein or contents, while others stop the bacteria from reproducing. Viruses are not living cells, and therefore antibiotics are ineffective against them. • As the flu virus can be easily spread to large numbers of people, it will have the opportunity to form new genetic varieties / mutations / variants, which means that people can catch the flu more than once, even if they are resistant to earlier forms of the virus. (Vaccines can provide protection against new forms of the flu).

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No response / no relevant evidence.	ONE relevant idea given.	TWO relevant ideas given.	THREE relevant ideas given.	FOUR relevant ideas given.	Explains ONE relevant idea.	Explains TWO relevant ideas.	Provides ONE relevant example of discussing (making multiple links).	Provides TWO relevant examples of discussing (making multiple links)

Q	Achievement	Merit	Excellence
THREE	<p>Describes (single, simple ideas):</p> <ul style="list-style-type: none"> • fungal reproduction • ways fungi are spread • how fungi feed • how fungi grow • environmental factors that fungi need to live • defines pathogen. <p>Examples:</p> <ul style="list-style-type: none"> • Fungi grow using energy from the food they eat. They grow in the form of branching threads or hyphae. • Collectively hyphae are called a mycelium. • Fungi reproduce by growing a sporangium, which makes spores. • Fungi are spread by producing spores that can be carried on the wind. • Fungi feed by a process called extracellular digestion. • A pathogen is a micro-organism that can cause disease such as heartwood infection in tōtara trees. • Fungi reproduce by binary fission / make two daughter cells. • No nutrients (food) means the fungi cannot make energy. • Fungi need ideal / correct water, food source, temp and pH to carry out life processes. <p>etc.</p>	<p>Explains (gives reasons how or why something occurs / provides examples) aspects of fungal growth, reproduction, and interaction with environmental factors:</p> <ul style="list-style-type: none"> • fungal reproduction • ways fungi are spread • how fungi feed • how fungi grow • how different environmental factors affect the life processes of a fungus. <p>Examples:</p> <p>Fungi feed through the process of extracellular digestion. This is when the hyphae, which grow and extend through the substrate they are living in / on, secrete digestive enzymes outside the hyphae and into the substrate. This is required because the substrate or food needs to be broken down into smaller food molecules so that they are easily reabsorbed back into the hyphae.</p> <ul style="list-style-type: none"> • Warm temperatures cause fungi to reproduce at a faster rate / cooler temperatures cause fungi to reproduce at a slower rate. • Water is required for extra cellular digestion / reproduction. Water is required to take in nutrients / food across the cell membrane. • Fungi reproduce using spores which grow into a food source using hyphae. The sporangium produce spores via asexual reproduction. The sporangium ruptures and spores are released into the wind, <p>etc.</p>	<p>Discusses the interaction between ONE environmental factors and ONE life processes (growth, reproduction, and feeding) of fungi in the process of decay.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Fungi feed through the process of extracellular digestion. This is when the hyphae, which grow and extend through the substrate they are living in / on, secrete digestive enzymes outside the hyphae and into the substrate. This is required because the substrate or food needs to be broken down into smaller food molecules, so that they are easily reabsorbed back into the hyphae. • In order to carry out the feeding process, there needs to be an optimum amount of water available to the fungus so that it is able to produce the digestive enzymes that are in liquid, so that they are able to be secreted through the wall of the hyphae and into the substrate. • The process of fungal growth requires an optimal temperature in order for the enzymes that control growth to be able to work. If it is too cold for example, enzyme activity will be slow, and thus the growth rate will slow. • Fungi require oxygen to carry out cell respiration. $\text{Glucose} + \text{Oxygen} \rightarrow \text{ATP} / \text{Energy} + \text{water} + \text{carbon dioxide}$. Energy is used for growth / feeding / reproduction. • Temperature increase can cause enzymes to denature and the cell processes slows / stops. <p>etc.</p>

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response / no relevant evidence.	ONE relevant idea given.	TWO relevant ideas given.	THREE relevant ideas given.	FOUR relevant ideas given.	Explains ONE relevant idea.	Explains at least TWO relevant ideas.	Provides ONE relevant example of discussing (making multiple links).	Provides TWO relevant examples of discussing (making multiple links).

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 13	14 – 19	20 – 24