Assessment Schedule – 2020

Biology: Demonstrate understanding of biological ideas relating to micro-organisms (90927)

Evidence Statement

Q	Achievement	Merit	Excellence
ONE	**Describes** (single, simple ideas): • Describes the life processes that allow bacteria to be effective in treating sewage. **Examples** of possible descriptions include: • Bacteria digest (feed on, nutrition) the sewage / waste. • Bacteria use the digested waste for respiration. • The population of bacteria will increase. • Viruses do not carry out life processes, except reproduction. • The bacteria will break the sewage down more quickly (idea of time). • Describes ALL life processes bacteria carryout: movement, respiration, sensitivity, growth, reproduction, excretion, nutrition. • Describes viruses are non-living / don't feed by extracellular digestion. • Describe viruses need a host cell for reproduction/ bacteria do not require a host cell for reproduction. **Describes** (single, simple ideas): • Describes how environmental factors affect the treatment of sewage. **Examples** of possible descriptions include: • Oxygen presence means aerobic respiration / no oxygen means anaerobic respiration. • High temperature lowers/stops (kills) life processes. • Warm / optimum temperature causes quicker/optimal life processes. • Low temperatures slower life processes.	**Explains** (gives reasons and examples): • Explains the impact of ensuring O_2 availability to allow aerobic respiration to occur to maximise the processing of digested waste and reducing odour. • Explains (the impact of maintaining sewage and wastewater at) optimum temperature to maximise the rate of feeding / respiration (i.e. the rate of waste breakdown), as these life processes rely on enzymes, which have an optimal temperature. If too cold, enzyme activity decreases and slows the rate of the life processes / the breakdown or if too hot, the enzymes will denature, and the bacterial life processes will cease. **Examples** of possible explanations include: • In order to be most effective, bacteria respire aerobically (with O_2) and hence the rate of sewage and waste breakdown will be quicker. This is because aerobic respiration will provide the bacteria with more energy more quickly, which they can then use for reproduction, increasing the population size and therefore the rate of breakdown. • Breakdown of sewage and wastewater is made more effective when the material is at optimum temperature for the bacteria. This is because the life processes such as feeding, digestion, and respiration are controlled by enzymes within the bacteria. The enzymes require an optimum temperature outside of which their actions slow down if too cold, or, if too, hot the enzymes denature and the bacteria cease to function.	**Discusses** (makes links between explanations): • Discusses why bacteria are useful in treating sewage, while viruses are not **Examples** of possible discussions include: • Bacteria undergo all the life processes (MRS GREN) as they are living things. This makes them useful in processing sewage and wastewater to make it safe to release into the environment. For example, bacteria need to feed. They do this via extra-cellular digestion in which the bacteria secrete digestive enzymes into the sewage material, and then re-absorb the digested material. This breaks down the sewage and reduces it. The products of digestion are then used for respiration and the waste products are (safe) released into the environment. AND Viruses are non-living microbes in that they do not need to feed, but instead utilise the energy inside living cells in order to reproduce. Hence viruses would not be able to process and reduce the sewage, as the sewage is not made up of living cells, and the viruses themselves do not need to feed. • Another way bacteria are useful for treating sewage is that they use the energy released from respiration to reproduce rapidly, thus increasing the population of bacteria. This means there are more bacteria to feed on, and thus process the sewage, and the rate of treatment of the sewage increases. AND Although viruses do reproduce, they require living cells to do so and would not be useful in processing the sewage. *(E8 idea that products are safe to the environment.)*

		• Explains how life processes extracellular digestion / reproduction/respiration makes bacteria specifically useful for sewage treatment OR why viruses are not useful specifically useful for sewage treatment. **For example:** Extracellular digestion is the releasing of enzymes through the bacteria membrane into the surrounding environment. Enzymes break down the sewage into smaller particles and some are reabsorbed. OR Viruses don't carry out extracellular digestion / digest therefore are not useful in breaking down/digesting sewage.	

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.	One E bullet point.	ONE bullet point plus the idea that the products are safe.

Q	Achievement	Merit	Excellence
TWO	**Describes** (single, simple ideas): The life processes of yeast that are involved in making bread: feeding (nutrition), reproduction, respiration, excretion. **Examples** of possible descriptions include: • THREE of the following processes of yeast are involved in making bread: feeding (nutrition), reproduction, respiration, excretion. • Yeast feed by extra-cellular digestion. • Yeast reproduce by budding. • The life processes are carried out more quickly when the environmental conditions are optimal. • At warmer temperatures the bread rises more / faster. At cooler temps the bread rises less. • Yeast excretes CO_2 as a waste product of respiration. • The CO_2 makes the bread rise. • More sugar means higher / rises / more gas bubbles / holes. • Less sugar means lower / rises less / less bubbles / holes. • Glucose $\rightarrow$ carbon dioxide + ethanol + energy (ATP) • Adding warm water provides moisture for reproduction /extra cellular digestion / respiration.	**Explains** (gives reasons and examples): • Explains the impact of not adding sugar as this reduces food available to the yeast; therefore less digestion of food and less respiration; therefore less CO_2 excreted and the bread rises less and is more compact (fewer / smaller air spaces). • Explains the life process of yeast involved in making bread: Extra-cellular digestion / respiration / excretion. • Explains the impact of an environmental factor on the life processes of yeast involved in making bread. **Examples** of possible explanations include: • Yeast feed by extra-cellular digestion. This means they secrete digestion enzymes outside their cells into the food source **sugar** in bread-making, which is then broken down and digested, so that the food molecules are small enough to be reabsorbed into the yeast cell to be used, for example, for respiration. • If sugar is not provided as a food source for the yeast in making bread, there is not a readily available source of food for the yeast, and the process of releasing CO_2 is slowed down, and the bread rises less. This is because when there is not a readily available food source for the yeast, there are limited energy-rich molecules available for the respiration process to release energy, and the waste product of CO_2 is not released. It is the CO_2 gas that the yeast excretes as a waste product of respiration that gets trapped in the dough and causes the bread to rise. Less CO_2 means the bread rises less. • Water is required for extracellular digestion/reproduction AND they use the water to take in sugar across the cell membrane. • Warm temperature causes the yeast to reproduce / respire / digest faster (relate to rate.	**Discusses** (compare and contrast, makes links between explanations): • Make links between environmental factors required to maximise the rate of the life processes in yeast to make good bread. **Examples** of possible discussions include: • The enzymes inside the yeast that control its life processes have optimum environmental factors that allow them to work most efficiently. For example, the enzymes in the yeast that control the rate of respiration work at an optimum rate when the temperature is warm. Therefore it is important that the yeast is initially kept in warm temperatures to maximise the rate of respiration, and thus maximise the rate of CO_2 release, causing the bread to rise more quickly. This is important initially to activate the yeast, and also when the dough is left to rise. The yeast continues to respire when it is inside the dough, releasing CO_2 into the dough, which traps it, making little gas pockets throughout the dough causing it to rise. • Yeast also requires a food source in order to have the energy molecules required for the process of respiration to occur. An easily digestible food source is the sugar provided. The yeast digests the sugar extra-cellularly by secreting digestive enzymes into the food source. These digestive enzymes work at an optimum rate at warm temperatures, and so when making bread, warm water is used. This allows the yeast cells to digest the food and reabsorb the digested molecules more quickly, and thus there is a plentiful supply of energy rich molecules available for the process of respiration.

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.	Discusses ONE bullet point.	Discusses TWO bullet points.

Q	Achievement	Merit	Excellence
THREE	**Describes** (single, simple ideas): • Describes the environmental factors bacteria require to carry out their life processes. • Describes where the bacteria come from. • Describes ways of preventing food poisoning (needs more information than is on the resource). **Examples** of possible ideas include: • Bacteria require warm (optimum / ideal temperature), moist and a food source to carry out life processes. • Bacteria require warm temperatures to reproduce fast. • Bacteria require a source of food (nutrients) in order to feed or gain nutrition / reproduction. • Bacteria require oxygen to carry out aerobic respiration. • The enzymes that control life processes require an optimal range of environmental factors. • Bacteria have an optimal pH range. • Bacteria come from the air around the food OR Bacteria come from the surfaces, e.g. chopping boards, hands, door handles. • Food poisoning can be prevented by storing food in the fridge, slowing the rate of reproduction of bacteria. • Food poisoning can be reduced by putting food in airtight containers preventing access of bacteria to the food / separate raw and cooked food because cooked food enzymes have been denatured/high cooking temps kill bacteria. • Bacteria excrete enzymes / toxins that cause food poisoning. • Describes binary fission of a bacteria cell splitting into two.	**Explains** (gives reasons and examples): • Explains how the life processes of bacteria cause food poisoning: feeding, extra-cellular digestion, excretion. • Explains the effect of environmental factors on the life processes of bacteria. **Examples** of possible explanations include: • Food poisoning is caused by the life processes of bacteria. For example: feeding. Bacteria feed by the process of extra-cellular digestion. This occurs by the bacterial cell secreting digestive enzymes into the food source outside the bacterial cell. The digestive enzymes break down the food source (e.g. some warm chicken) and reabsorb the digested molecules into the bacterial cell. This process, if it occurs on food that we are going to eat (consumption), spoils the food, as it starts to digest it and break it down. • Some bacteria that cause food poisoning excrete toxins into the food. Once the food digested by the enzymes has been reabsorbed, it is then processed inside the bacterial cell. This results in the production of waste products, which are then excreted onto the food source. Because these waste products are toxic to humans, food poisoning results. • When the temperature is warm, for example in the summer, food poisoning occurs more often. This is because warm temperatures allow the bacterial cells to reproduce more quickly, and hence the population increases. This results in more breakdown of food and more excretion of toxins, increasing the rate of food poisoning. • Describe binary fission AND explains reproduction (number of bacteria) increases causing more bacteria to excrete toxins causing food poisoning. • Cooking food with bacteria on it at high temperatures can denature the active site (shape) of the enzymes and no longer catalyse reactions / carryout extracellular digestion for nutrition leading to the bacteria's death. OR Explains high temperatures kill bacteria on food (if cooked through) and chilling slows (dormant) the reproduction/respiration but does not kill.	**Discusses** (makes links between explanations) **Examples** of possible discussions include: • When the temperature is warm, for example in the summer, food poisoning occurs more often. This is because the life processes of bacteria that cause food poisoning are controlled by enzymes that have an optimal temperature range. For example, the enzymes that control reproduction in bacteria work more efficiently when the temperatures are warm, thus increasing the rate of binary fission, and hence the population increases quickly. Because there are more bacteria present, more breakdown of food and more excretion of toxins occurs. • One way to reduce the chances of food poisoning is to store food in the fridge. This lowers the temperature of the food and the bacteria themselves. The enzymes that control the secretion of digestive enzymes and the digestive enzymes themselves are slowed down because they are now out of their optimal temperature range. This means that the rate of secretion of the enzymes and the rate at which the digestive enzymes work are slowed down. This slows the rate of food spoilage, and hence the occurrence of food poisoning is reduced also.

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.	Discusses ONE bullet point.	Discusses TWO bullet points.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24