Assessment Schedule – 2017

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

Evidence Statement

QUESTION ONE

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 ideas.	Explains TWO relevant ideas.	Links changes in environmental factors and subsequent effect on life processes for storage in the fridge OR Links changes in environmental factors and subsequent effect on life processes for storage in the airtight container	Links changes in environmental factors and subsequent effect on life processes for storage in the fridge AND Links changes in environmental factors and subsequent effect on life processes for storage in the airtight container
Examples of possible ideas include: **Describes the process of fermentation or a life process of bacteria used in making foods like yoghurt. E.g.** • Fermentation: lactose → lactic acid + energy • Fermentation is a metabolic process that converts sugar to acids, gases, or alcohol. **Describes the environmental factors required for the growth of the culture bacteria (*Lactobacillus*). (Needs more than just a list)** • No oxygen (anaerobic). • Sugars present (in the milk in this case). • Warmth (temperature between 37 – 42°C). • Low pH (<3.5). • Moisture / water available. Describes life processes • nutrition (lactose) • excretion (lactic acid) • fermentation • growth and reproduction.					**Examples** The bacteria produces lactic acid as a by-product of fermentation (as well as energy). The bacteria must produce the acid because it needs to produce energy to carry out its other life processes. The acid reduces the pH of the milk, which changes the flavour and texture of the milk because it reacts with the proteins in the milk. The milk is heated up to a high temperature in step 1 to make sure that any microbes present are killed. They will be killed because most microbes (the ones you'd expect to find in milk) are not tolerant of extreme temperatures as their enzymes will be denatured. This will prevent the growth of unwanted microbes. The milk needs to be cooled down to 30°C in step 2, so that when the starter culture is added, the milk will be cool enough for the *Lactobacillus* bacteria in it to survive and the enzymes involved in the fermentation		**Examples** Low temperature of the fridge (around 4°C) slows chemical reactions because it slows the rate at which the enzymes will work at. This means that the growth and reproduction of unwanted microbes will be slowed down in the fridge. Because the low temperature of the fridge slows the growth and reproduction of unwanted microbes, this is the best place to store the finished yoghurt. Leaving the yoghurt on the bench however, because of the optimum temperature for microbe enzyme activity, has allowed for the growth and reproduction of unwanted microbes such as a the fungi seen in the photo of Lucas's yoghurt. This means the decay process is accelerated in Lucas's yoghurt. The chance of unwanted microbes, or their spores, inoculating the finished yoghurt is reduced by storing it in an airtight container, as there will be no	

	process to work. Low temperature of the fridge (around 4°C) slows chemical reactions because it slows the rate at which the enzymes will work at. This means that the growth and reproduction of unwanted microbes will be slowed down and the yoghurt will be preserved for longer.	airflow. As well as this, any aerobic microbes will run out of oxygen in an airtight environment. This is because aerobic microbes need oxygen to respire and the oxygen in an airtight container is limited. This will allow the Lactobacillus bacteria to continue to survive and ferment the yoghurt, although at a slower rate due to lower temperatures, because it respires anaerobically and therefore does not need oxygen.

QUESTION TWO

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 way resistance can be reduced OR Discusses how antibiotic resistance develops in a bacterial population.	Discusses one way resistance can be reduced AND Discusses how antibiotic resistance develops in a bacterial population.

Examples of possible ideas include:

Viruses / Bacteria

- Labelled diagram of a virus and a bacterium. Each must have at least 2 correct labels.
- Viruses are microbes that cannot survive without a living host (obligate pathogens).
- Trend in the percentage of antibiotic resistance described.
- Description / diagram of viruses and / or bacteria reproducing.
- Viruses reproduce by entering a living cell (host) and making copies of their genetic material using the components of the host cell.

Antibiotics:

- Stop cell wall forming, stop copying of genetic material (reproduction).
- Stop transport of materials through cell membrane (feeding).
- Stop essential chemicals being formed; damaging the cell wall stops an increase in cell size (growth).
- Stop DNA being used, stops RNA from forming, stops proteins being made.

Resistance:

- Mutation.
- Transfer of genetic material from one bacterium to another.
- Survival of those with genes for resistance.

Examples

Viruses are often thought to be non-living because they reproduce but do not grow, feed, respire, or excrete waste. When viruses reproduce they do so by entering a living cell (host). This then allows them to make copies of their genetic material using the components of the host cell.

Bacteria reproduce by binary fission (splitting in two, as quickly as every 20 minutes). This is so that they are able to colonise a suitable environment quickly.

Antibiotics are able to stop the growth and reproduction of bacteria because they interfere with the function of the bacterial cell wall. This then prevents successful reproduction of the bacteria halting its growth.

Examples

There will be naturally occurring genetic variation in any bacterial population. For example, if members of a bacterial population are genetically different from each other, some of them are possibly able to survive the antibiotics since some of the population may be naturally more resistant. So when a person takes antibiotics, some bacteria may survive due to this natural resistance. These bacteria are then able to grow and reproduce resulting ain a population made up entirely of resistant bacteria.

The possibility of the development of antibiotic resistance can be reduced by ensuring that people take their full course of antibiotics. If the full course is not taken any naturally resistant bacteria in the body may survive to then go on and create a resistant population through growth and reproduction of the resistant bacteria. If all the antibiotics are taken the likelihood of any bacteria remaining is reduced.

QUESTION THREE

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.	Links importance of an environmental factor to ONE life process e.g. Links the importance of temperature to respiration OR Links the importance of temperature to digestion.	Links importance of an environmental factor to TWO life processes e.g. Links the importance of temperature to respiration AND Links the importance of temperature to digestion.

Examples of possible ideas include:

Describes the **structure** of the fungus:

- diagram of a fungus
- body consisting of hyphae
- network of mycelium
- walls of hyphae consist of chitin.

Describes the **function** of the fungus

- feeding hyphae grow down into the food source
- hyphae secrete enzymes into food source (extracellular digestion)
- sporangium bursts to release spores.

Describes the **conditions**:

- temperature between 5°C and 45°C
- oxygen / aerobic conditions
- moisture / water available
- nutrients
- competition with other microbes.

Etc.

- The conditions that fungi require to live successfully are moisture, food and warmth (an optimum temperature). Some fungi require oxygen (aerobic fungi) and some don't (anaerobic fungi).
- Different fungi have different nutrient requirements, but all require an energy source (because they are heterotrophs) as well

Examples

- Fungi digest food through extra-cellular digestion. Enzymes are released by the hyphae which digests / breaks down the food source. This means that the food / nutrients are now soluble / small enough to be absorbed by the hyphae.
- Fungal cells divide and grow into new food sources / honeydew to create chains of joined cells called hyphae. This is so that a suitable environment may be occupied.
- Structures called sporangium grow from the hyphae when environmental conditions are optimal. These produce and release spores which grow into new fungal cells / hyphae. Spores are important in the dispersal of the fungi because they are plentiful and light and easily carried in the air.
- Fungi require water because this is the medium in which all chemical reactions take place and materials are transported. For example, if there is no water, the sooty mould will not be able to carry out extra-cellular digestion because this relies on the secretion of digestive enzymes in a liquid medium.

Examples

- An optimal temperature allows chemical reactions, which are controlled by enzymes, such as respiration to proceed quickly, which in turn releases more energy for other life processes. Cooler temperatures will reduce the rate of respiration because the rate that the enzymes work at will down and subsequently growth and reproduction will slow also.

- Extra-cellular digestion uses energy and involves the secretion of enzymes, which break down food particles into smaller, soluble molecules which are then absorbed back into the bacterium. The rate of extra-cellular digestion will be highest at the optimum temperature because the rate of enzyme activity will be greatest.

as vitamins and minerals. The sooty mould is able to gain nutrients from the honeydew that the insects living on the tree have produced. • The optimum temperature is different for different fungi. Optimum temperature describes the temperature at which they grow and reproduce most quickly. • Fungi such as sooty mould feed via extracellular digestion which means that digestion occurs outside the cell. Enzymes are released by the hyphae which digests / breaks down the food source.		

Cut Scores

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