

**Assessment Schedule – 2016****Biology: Demonstrate understanding of biological ideas relating to micro-organisms (90927)****Evidence Statement****Question One**

<b>NØ</b>	<b>N1</b>	<b>N2</b>	<b>A3</b>	<b>A4</b>	<b>M5</b>	<b>M6</b>	<b>E7</b>	<b>E8</b>
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).
<b>Examples</b> Describes environmental factors required by microbes. <ul style="list-style-type: none"> <li>In order to carry out life processes reproduction / nutrition / growth / respiration / excretion / microbes require nutrients / food / oxygen (aerobic) / moisture / warmth / space (needs 3 if just a list, but each can count for individual idea if described more fully).</li> </ul> Describes a life process. <ul style="list-style-type: none"> <li>Microbes feed through a process called extra cellular digestion...</li> <li>Microbes reproduce by producing spores (fungi) or binary fission (bacteria).</li> <li>Fungi grow hyphae through the food.</li> <li>Bacteria populations grow through binary fission.</li> </ul> Describes where microbes come from. <ul style="list-style-type: none"> <li>Micro-organisms that spoil food come from reproductive cells / spores that land on the food or from other contamination / Microbes are everywhere in the environment.</li> <li>Microbes that cause decay are saprophytes.</li> </ul> Describes how life processes of microbes cause food to go off. <ul style="list-style-type: none"> <li>Microbes can cause food to go off by growing / feeding / reproducing / releasing toxins on / decomposing it (needs 3 if just a list, but each can count for individual idea if described more fully).</li> </ul> Describes how freeze drying stops food going off. <ul style="list-style-type: none"> <li>The freeze drying process helps to preserve food by removing the moisture / keeping the oxygen out / making it cold. (needs 2 if just a list, but each can count for individual idea if described more fully).</li> <li>Freezing forms ice crystals which can interfere with cell growth.</li> </ul> etc					<b>Examples</b> Microbes can cause food to go off because through the process of their feeding / extracellular digestion / respiration they breakdown the cells the food are made of. Because the freeze drying process removes moisture / oxygen which is required by the microbes for its life processes (e.g. respiration) the microbes are unable to survive in the food and it is preserved because the decay process is slowed or stopped altogether. Because freeze drying lowers the temperature of the food, microbe reproduction and growth is slowed and the decomposition process is slowed or stopped and the food is preserved. Explains a process eg extracellular digestion. Explains the effect of temperature on enzyme action in relation to extra-cellular digestion or another life process, e.g. respiration. Osmosis explanation in relation to moisture.		<b>Examples</b> Through carrying out life processes such as feeding and respiration micro-organisms cause decomposition to occur. People try to slow this process in relation to food so that it can be preserved for later use. One way to preserve food is by freeze-drying it.... Microbes can cause food to go off because through the process of their feeding / extracellular digestion / respiration they breakdown the food in the process of decay. The enzymes in the digestive secretion makes the food molecules smaller so that can be more easily reabsorbed. This process also moistens the food and degenerates it's structure hastening the decay process. Because the freeze drying process removes moisture / oxygen which is required by the microbes for its life processes (e.g. respiration) the microbes are unable to survive / grow / reproduce in the food and it is preserved. When reproduction is slowed or stopped the number of microbes remains constant and does increase thus slowing the decay process. Because freeze drying lowers the temperature of the food, microbe reproduction and growth is slowed because the enzyme activity is slower and therefore the decomposition process is slowed or stopped and the food is preserved.	

**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.	Provides ONE relevant example of discussing (making multiple links).	Provides TWO relevant examples of discussing (making multiple links)
<b>Examples</b> Defines pathogen. • Pathogens are micro-organisms that cause disease / harm. Describes fungal life processes (feeding, growth, repro). • Fungal hyphae grow through the plant tissues by cell division. • Fungi feed by extra-cellular digestion by secreting enzymes to the outside of their bodies and reabsorbing digested food. • Fungi reproduce / are spread by producing sporangia / spores. Describes environmental factor requirements. • Fungi require food, warmth, moisture and oxygen to grow (needs 3 if just a list but counts for individual idea if described more fully). • Plants provide a good source of food / moisture / oxygen. Describes control methods. • Fungal growth can be controlled by removal of the diseased parts, competition with non-pathogenic fungi, chemical treatment etc. (needs 3 if just a list but counts for individual idea if described more fully). • Fungicides / antibiotic sprays can interfere with the cell membrane of the fungi stopping it functioning properly. • Plant hosts and fungi share many of the same envtl factors for optimal growth so control can be difficult. etc					<b>Examples</b> Fungi feed by the process of extra-cellular digestion. To do this they secrete digestive enzymes from their hyphae into the plant cells / surrounding substrate. The enzymes are required because the food / substrate needs to be broken down / digested so that it can be re-absorbed through the hyphae wall. The food molecules need to be made small because the pores in the membrane are small. Fungi grow through a process of cell division, which allows the hyphae to extend in length. Fungal growth like this is required so that they are able to move into new food sources when the old ones are used up. Fungi reproduce by spores. Spores are required because the fungi need to be dispersed away from the parent hyphae to source new substrates. In order to do this the spores are very small and lightweight which allows them to be carried easily in the air. Once on a new substrate / plant they will grow into a new fungal organism using the new food source. Fungal growth on plants’ cells causes the cells to die and eventually the whole plant. This is because the fungi digests parts of the plant cell for food or grows inside the cell causing the plant cell to burst which prevents it from functioning. Crop damage and food spoilage due to fungal growth can be minimised by controlling the temperature the crops are grown / stored at. This will reduce the rate of cell division of the fungal		<b>Examples</b> Fungi feed by the process of extra-cellular digestion. To do this they secrete digestive enzymes from their hyphae into the plant cells / surrounding substrate. The enzymes are required because the food / substrate needs to be broken down / digested into smaller, soluble pieces so that it can be re-absorbed through the hyphae wall. This process occurs more rapidly when there is sufficient water present. This is because water is required to allow the enzymes that are released into the food to function properly, allowing the food to be broken down and reabsorbed. Therefore, to minimise fungal growth water would need to be minimised. This can be partially achieved by just watering the soil and roots of the plants while trying to keep the rest of the plant dry Fungi grow through a process of cell division, which allows the hyphae to extend in length. This is how fungi are able to move into new food sources. Warm temperatures will also result in rapid growth of fungi on plants. This is because the rate of growth is controlled by enzymes which in warmer temperature work more quickly. However, in cooler temperatures cell division will occur more slowly and thus the rate of growth will also be reduced. This is possible to achieve for plant material once it is harvested eg by putting harvested food in a cool store or fridge the growth rate of any fungi present.	

	<p>cells because the rate of enzyme action controlling this process will be reduced.</p> <p>Crop damage due to fungal growth, can be reduced by removing infected plants or parts of plants quickly. This is because it will prevent any spores that have formed from spreading to other plants and stop the growth of hyphae through other areas of the plant.</p> <p>Plants provide an ideal environment for fungal growth. This is because the plant cells themselves provide food for the fungi as well as moisture and oxygen, which three of the environmental factors many fungi require for growth.</p> <p>etc</p>	
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**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.	Provides ONE relevant example of discussing (making multiple links).	Provides TWO relevant examples of discussing (making multiple links).
<b>Examples</b> Describes the role of microbes nutrient cycling. <ul style="list-style-type: none"> <li>• release nutrients into the environment for use by other living thing.</li> <li>• feed on dead material and release nutrients from the food through the process of respiration.</li> <li>• Micro-organisms in the N and C cycle are saprophytes.</li> </ul> Describes the importance of nutrient cycling. <ul style="list-style-type: none"> <li>• Nitrogen is an essential component of many organic molecules / amino acids / proteins.</li> <li>• C is an essential component of glucose.</li> <li>• N / C are locked in dead organisms.</li> <li>• Disposes of dead animal / plant material.</li> </ul> Describes similarities or differences in the role of microbes in nutrient cycling. <ul style="list-style-type: none"> <li>• Both nutrient cycles rely on microbes to recycle the nutrients.</li> <li>• More steps / types of microbes involved in the N cycle than the C cycle.</li> </ul> NOTE: An achieved point can include any number of ideas (up to sufficient for A4) as indicated in the diagrams ie any correct idea counts as an achieved point, irrespective of whether or not it is taken from the diagrams.					<b>Examples</b> Nutrient cycling is important because without it there would be no C or N available in the environment, which would mean eventually there would be no plant growth because plants require nitrogen for proteins and healthy growth and carbon to build glucose molecules in photosynthesis. If there is no plant growth then there is no food for herbivores and the food chain would stop. Although nitrogen is the most abundant gas in the atmosphere it is not in a form that is usable by plants. This is because plants require nitrogen to be in the form of nitrates in order to be taken up with water through the roots. In the nitrogen cycle nitrifying bacteria are responsible for releasing nitrate in this form. etc		<b>Examples</b> There are various similarities in the role of microbes in the carbon and nitrogen cycles. For example in both the cycles it is the metabolism of the microbes (bacteria and fungi) that decompose or break down dead material to release the essential life elements of C and N so that they can be reused in the food-web. Therefore, we can say in both cycles the work of microbes in this way is essential to the continuation of life because without these essential elements being released for reuse the essential life sustaining processes could not be carried out. For example the process of photosynthesis in plants would not go ahead because they require CO <sub>2</sub> as a raw material. However, there are some differences in the two nutrient cycles in relation to the steps microbes are involved in. For example there are different types of bacteria in the nitrogen cycle that are involved in transforming nitrogen into a form that is usable by plants. One of these types of bacteria are nitrifying bacteria which change ammonium into nitrites and then a further step is required to change the nitrites into nitrates which plants can then take-up in their roots. There are other types of bacteria called denitrifying bacteria which convert nitrates into atmospheric nitrogen, and still further bacteria that work in the root nodules of legumes which transform nitrogen into a usable form for plants. On the other hand in the carbon cycle it is solely through the decomposition of dead or waste organic material through the process of microbe feeding and respiration that C is released into the atmosphere in the form of CO <sub>2</sub> which is then used by plants in the process of photosynthesis to build glucose molecules. etc.	

## Cut Scores

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