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NZQA

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Level 1 Biology, 2017

90927 Demonstrate understanding of biological ideas relating to micro-organisms

9.30 a.m. Thursday 16 November 2017
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of biological ideas relating to micro-organisms.	Demonstrate in-depth understanding of biological ideas relating to micro-organisms.	Demonstrate comprehensive understanding of biological ideas relating to micro-organisms.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement

TOTAL 12

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QUESTION ONE: FOOD PRODUCTION AND STORAGE – YOGHURT

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One way to preserve milk is by fermentation. Yoghurt is made by fermenting milk, using bacteria such as *Lactobacillus* that produce lactic acid. The increase in acidity changes the flavour and texture of the milk, making yoghurt.

Lucas and Sarah each followed the steps below to make yoghurt.

Yoghurt making instructions:

- Heat 200 mL of milk to 80°C.
- Cool the milk to 30°C.
- Add 50 mL of yoghurt that contains *Lactobacillus* bacteria and stir gently.
- Leave in a warm place for 8 hours.

After eight hours they checked the yoghurt, and noticed that it looked thick and white, just like store-bought yoghurt. Sarah then put hers in an airtight container in the fridge. Lucas left his on the bench.

When they came back two days later, Lucas noticed that there were fungi growing on his yoghurt, and that Sarah's still looked fresh and did not have fungi growing on it.

Lucas's yoghurt with fungal growth.

www.ehow.co.uk/info-tip_7984683_dangerous-eat-moldy-yogurt.html

Sarah's yoghurt.

Discuss how the life processes of microbes allow bacteria to be used to make yoghurt, and how the life processes of microbes determine how we need to store food to keep it fresh.

In your answer:

- describe the process of fermentation that occurs in bacteria such as *Lactobacillus*
- describe the environmental factors required for the growth of the bacteria (*Lactobacillus*) in the yoghurt
- explain how the life processes of bacteria allow them to be used in making foods like yoghurt
- discuss the importance of storing the finished yoghurt in an airtight container in the fridge to keep it fresh.

The fermentation that occurs in lactobacillus is because it respires anaerobically to produce lactic acid which give the milk the properties of yogurt.

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The environmental factors needed for the growth of lactobacillus is the warmth because bacterial reproductions optimum temperature is between 30°C and 40°C, So if it was left in a warm place the bacteria would reproduce faster and therefore respire and produce more lactic acid for the yogurt. The life process of bacteria can be used in food such as yogurt because you can easily slow down reproduction by puting it in the fridge which is not optimum reproduction temperatures so they can control how much bacteria is in the food, and if all the food for the bacteria has been used by other bacterias for respiration, the all the bacterias will die. The yogurt must now be stored in an airtight container in the fridge because if the yogurt was exposed the spores from fungi could land in the yogurt or other bacterias in the air, and so there is limited air so any aerobic respiration wouldn't continue very long, it must be stored in the fridge so the bacterias aren't at optimum reproduction temperatures (30-40°C).

M5

QUESTION TWO: ANTIBIOTICS, BACTERIA, AND VIRUSES

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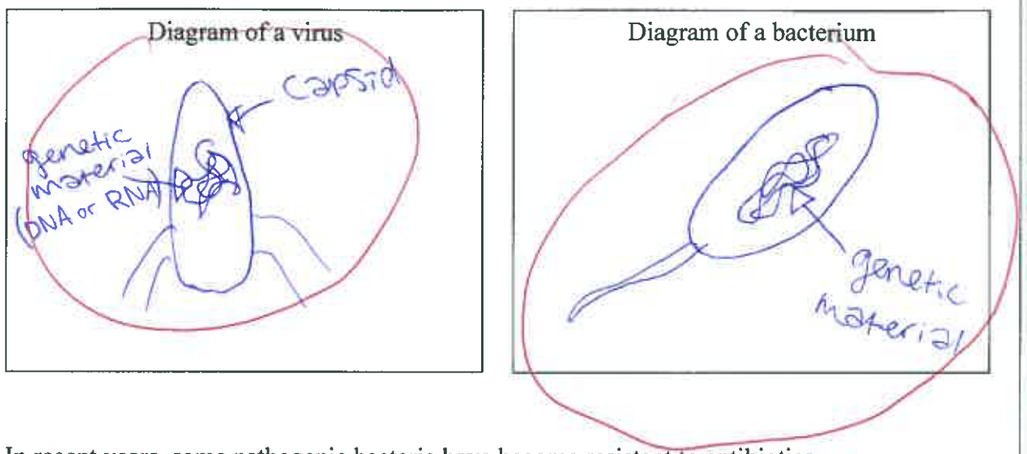
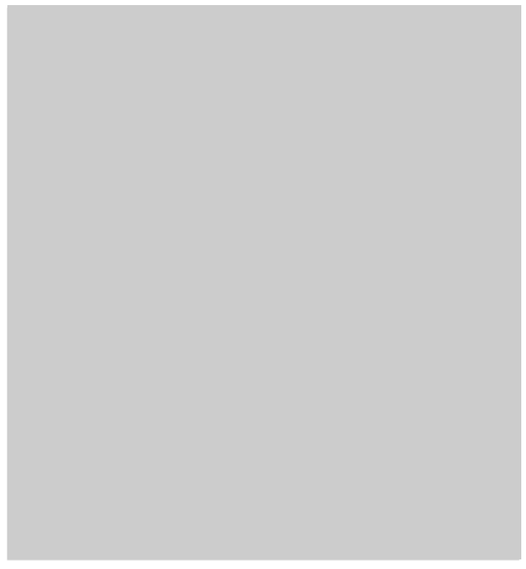
The use of antibiotics has reduced the number of deaths due to bacterial infections around the world. Antibiotics can kill bacteria, but are not effective against viruses.

(a) Draw a labelled diagram of a virus and a bacterium.



(b) In recent years, some pathogenic bacteria have become resistant to antibiotics.



www.futuretimeline.net/blog/2013/04/25-2.htm#.WDTxXaJ968o

Discuss the use of antibiotics to treat bacterial infections.

In your answer:

- describe the trend in the percentage of antibiotic resistance shown in the graph
- explain the effects of antibiotics on the life processes of bacteria
- explain why bacterial infections can be treated with antibiotics, while viral infections cannot
- discuss how antibiotic resistance in bacterial populations can develop, and how it can be reduced.

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From 1980 to 2000 the bacterial antibiotic-resistant infection has increased, bacteria A from 5% to 55%, that's a 50% increase, Bacteria B has increased from 2% to 25% and Bacteria C has increased from 2% to 32%, a major increas in all bacterias. Antibiotics can treat bacterial infections by an antigen latching onto an antibody and killing it, this will either kill all the bacterias or it will kill the weak ones, then the stronger ones, who are more resistant to the antigens will reproduce and the offspring will also be resistant and it will be able to fight off the antibiotics. Antibiotics work by latching onto the antibodies and killing them but this wouldn't work on a virus because viruses are not a living organism, they don't do anything from MRS. C. GREN other than reproduce however they need a host cell to do so, to kill a virus you would have to kill the host which antibiotics don't do. Antibiotic resistance can occur because people don't take the full course of antibiotics and the strong bacteria who haven't been killed reproduce and develop a resistance to the antibiotics, this can be reduced by people taking the full course of

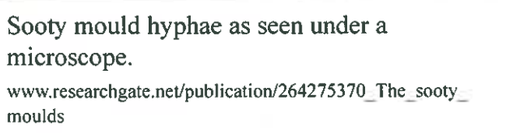
A4

QUESTION THREE: SOOTY MOULD

Sooty mould is a common fungus that grows on beech/tawai trees in New Zealand. It feeds on honeydew, which is an energy-rich substance made by insects that also live on the trees.

Sooty mould growing on the trunk of a beech/tawai tree.

www.sciencelearn.org.nz/images/1738-sooty-mould



Sooty mould hyphae as seen under a microscope.

www.researchgate.net/publication/264275370_The_sooty_moulds

One environmental factor that affects the growth of sooty mould is humidity (amount of water in the air). A student collected some data to investigate the effect of humidity on sooty mould growth. Her results are in the table below:

Humidity (amount of water in the air)	**Percentage cover of sooty mould on beech/tawai trees**
High humidity	Average of 90% of trunks covered
Medium humidity	Average of 50% of trunks covered
Low humidity	Average of 20% of trunks covered

Discuss how environmental factors, life processes and the structure and function of a fungus such as sooty mould, work together to allow it to live successfully on New Zealand's beech/tawai trees.

In your answer:

- describe the structure and function of a fungus such as sooty mould
- explain the environmental factors required for a fungus such as sooty mould to live successfully
- explain how a fungus such as sooty mould feeds, grows, and reproduces
- discuss how the life processes of sooty mould are affected by humidity and other environmental factors such as temperature, oxygen availability, nutrients, moisture and competition.

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The sooty moulds function would be to live off of the tree and honeydew and the optimum environment would be warmth, and moisture, which would make it easier to reproduce in this environment. The fungus sooty mould feeds on the honeydew left on the trees which give it energy to grow and for sporangium to create more spores and those spores to disperse and grow into fungi.

Sooty mould can be affected by different things in the environment such as oxygen, warmth, moisture and more because if there was low oxygen the fungi wouldn't be able to respire and reproduction would slow, all of these factors would affect reproduction and growth rate by slowing it if all of these factors were to decrease, but when the sooty mould is in oxygen rich, warm, humid environment with lots of nutrients this would be optimum and reproduction and growth rates would increase and sooty mould would thrive.

A3

Subject:	Biology	Standard:	90927	Total score:	12

Q	Grade score	Annotation
1	5	This response is an M5 because it mainly demonstrates understanding through description but sufficiently demonstrates in-depth understanding through explanation (saying how or why something occurs) of one idea. The response describes fermentation, the environmental factors required for the growth of the bacteria, the impact of storing yoghurt in the fridge and the impact of storing yoghurt in an airtight container. In addition, the response has sufficiently explained how placing the yoghurt in the fridge allows for the control of the number of bacteria that grow and linked this to the usefulness of using bacteria in making yoghurt.
2	4	Although this response contains some inaccurate information, there is sufficient evidence for A4 because it demonstrates understanding through describing the trend in antibiotic resistance shown in the graph, the idea that bacterial resistance can be passed on to new bacterial cells, that antibiotics are not effective against viruses because they are non-living and describing how antibiotic resistance can occur. In order to be an M5 the response would need to demonstrate in-depth understanding of one idea, for example explaining how bacterial resistance develops.
3	3	This response is an A3 because it demonstrates understanding through description of some of the environmental factors required for sooty mould to live successfully, a simple description of fungal reproduction and describes how environmental factors can affect life processes.