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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.

TOTAL

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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.

QUESTION TWO: ANTIBIOTICS, BACTERIA, AND VIRUSES

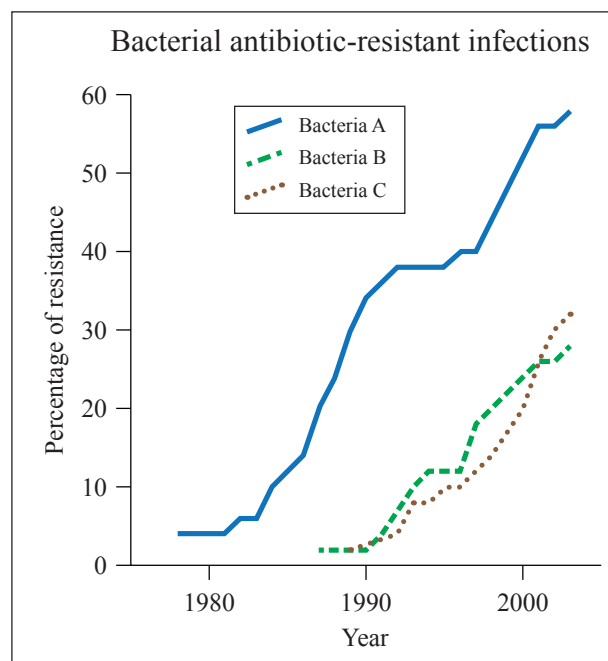
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The use of antibiotics has reduced the number of deaths due to bacterial infections around the world. Antibiotics can kill bacteria, but are not effective against viruses.

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

Diagram of a virus	Diagram of 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.

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.

Extra paper if required.
Write the question number(s) if applicable.

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