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1

90927



909270



NEW ZEALAND QUALIFICATIONS AUTHORITY
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SUPERVISOR'S USE ONLY

Level 1 Biology, 2015

90927 Demonstrate understanding of biological ideas relating to micro-organisms

2.00 p.m. Friday 20 November 2015
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.

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Achievement

TOTAL

12

ASSESSOR'S USE ONLY

QUESTION ONE: MICROBES AND ILLNESS

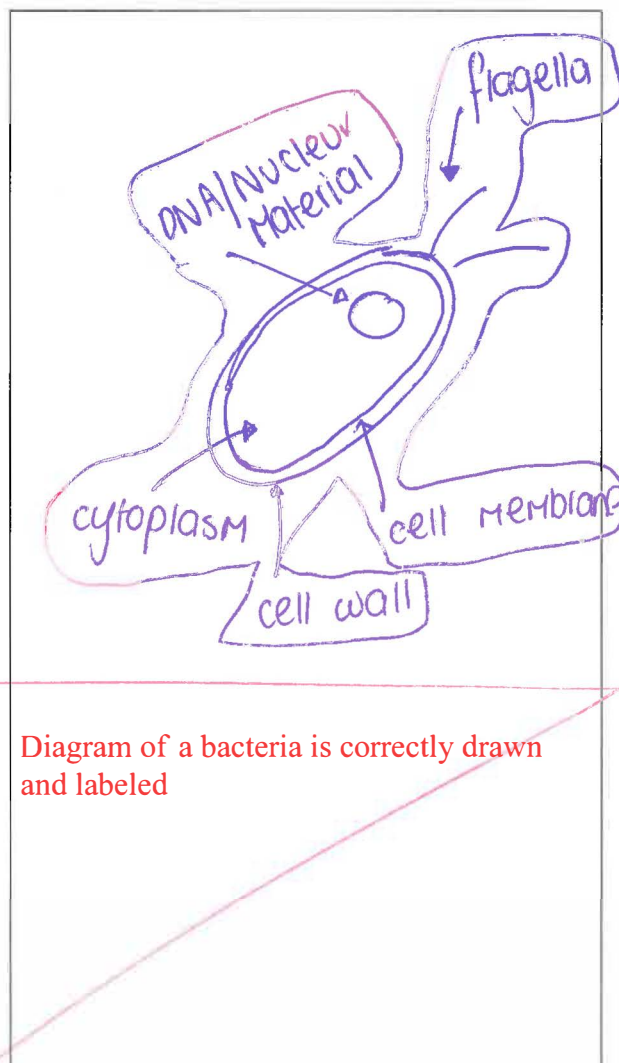
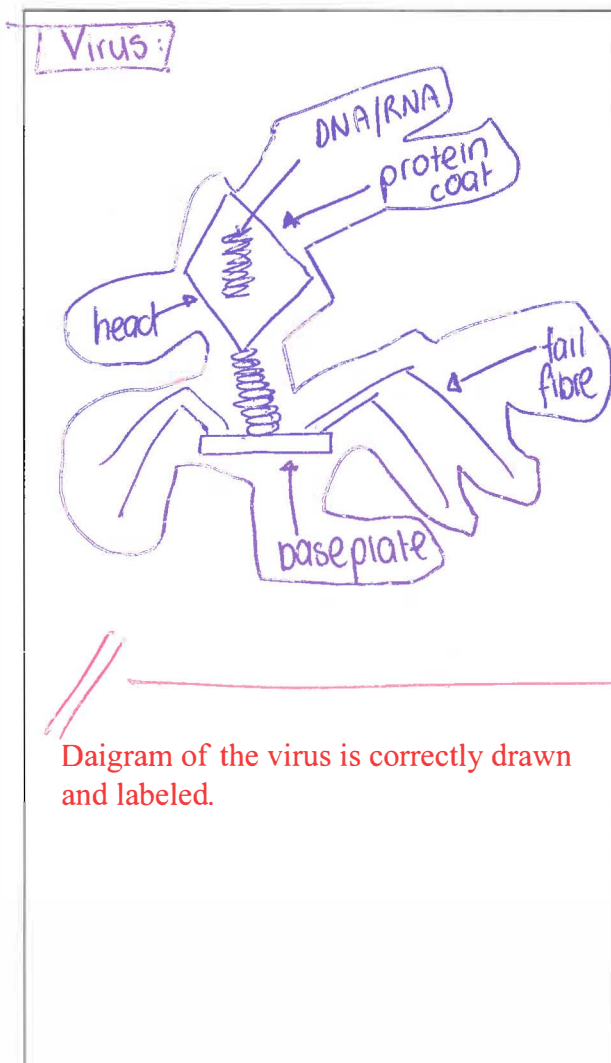
ASSESSOR'S
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Two students, Manaaki and Angela, were sick and went to the doctor on the same day.

Manaaki was told that he had the common cold, which is caused by a viral infection, and was advised to stay home and rest.

Angela had a sore throat, which is caused by a bacterial infection, and was prescribed a 10-day course of antibiotics.

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



- (b) The symptoms developed very differently for Manaaki and Angela before they saw the doctor.

Manaaki's symptoms (caused by a virus) had become worse suddenly in the morning, while Angela's symptoms (caused by bacteria) became worse gradually throughout the day.

Explain why Manaaki developed the symptoms more quickly than Angela.

In your answer you should:

- explain how the reproduction of viruses and bacteria affected how quickly Manaaki and Angela developed the symptoms
- compare and contrast the way viruses and bacteria reproduce, including their requirements of energy.

Discription of the speed of replication of viruses but not linked to symptoms.

• For viruses, reproduction is quick and can spawn 100s of virus cells through a host cell (bacterial).

Description of the reproduction of bacteria using the correct terminology

As for bacteria, they go by a process called 'binary fission' which is where a cell splits into two, then the two cells split into two and so on.

discription of differences in the rate of reproduction but is not linked to how the infected/ surrounding cells are affected.

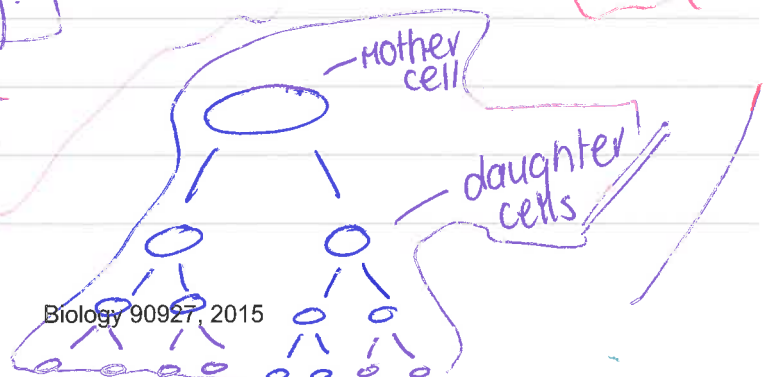
Although bacteria reproduce quickly, viruses reproduce dramatically by reproducing 100s ~~and~~ at a time, while bacteria split in two by the same time viruses have produced 100s more.

To improve this candidate could have explained how bacteria produce toxins that affect the surrounding cells and as the population of bacteria increases so would the volume of toxins released.

It affected how quickly both Manaaki and Angela depended on how rapid the microbes reproduced.

• For a virus to reproduce, it needs to take over a cell (a host cell) causing the cell to burst, with hundreds more viruses. This requires not a lot of energy.

Bacteria reproduction:



This candidate could also have linked the need of bacteria to respire to produce their own energy compared to viruses which uses the host cells energy to carry out its reproduction.

- (c) Angela was prescribed antibiotics to help her get better. Some bacteria can become resistant to some antibiotics.

Explain how antibiotics work on bacteria and how bacteria can become resistant to antibiotics.

In your answer you should:

- explain how life processes of bacteria can be affected by antibiotics
- explain how bacteria can develop antibiotic resistance if Angela did not complete her 10-day course of antibiotics
- explain how this process might affect Angela's symptoms.

Antibiotics can do two things, stop the bacteria from gaining nutrition causing it to die off or destroy the cell wall, leaving the bacterium exposed.

If Angela did not complete her course of antibiotics, the bacteria could become resistant to it because the bacteria is not killed off, leaving some bacteria to mutate to become resistant to the antibiotics.

The antibiotics will be killing off the ^{bad} bacteria, ~~but can~~ also ~~be~~ ~~harm~~ by locating it and not killing the good bacteria within your body.

Explains that the bacteria requires nutrition and that one way a antibiotic can work is to cause damage to the cell wall leaving the bacteria exposed. Explains that some bacteria are not destroyed and may have a mutation that allow them to be resistant to the antibiotic.

Although the student has not explained the reproduction of viruses there is enough evidence on bacterial reproduction and the antibiotic resistant explanation to award a M5 for this answer.

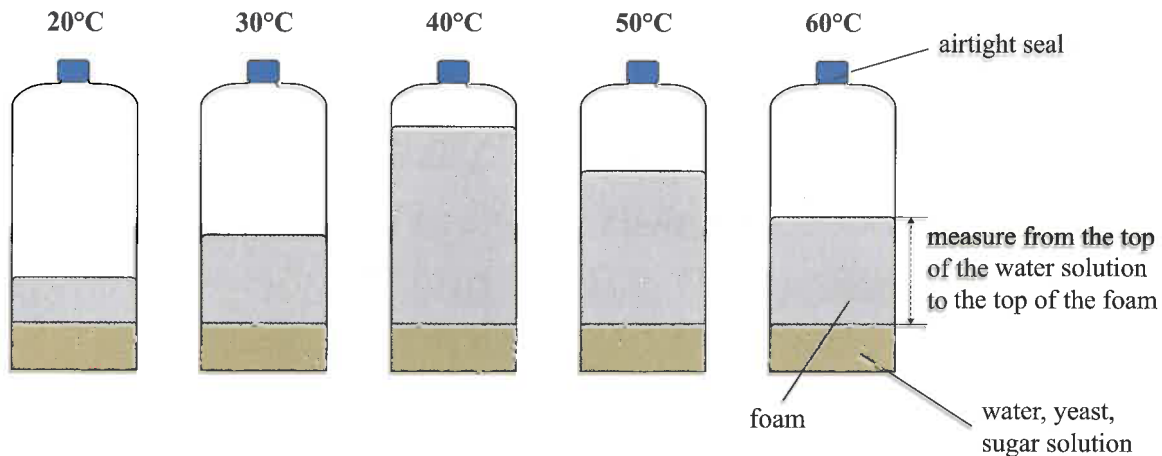
M5

QUESTION TWO: THE SCIENCE OF MAKING BREAD

ASSESSOR'S
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The following experiment was set up by a group of Year 11 students who wanted to investigate respiration in fungi (yeast) cells. When fungi (yeast) are mixed with sugar and water, foam forms, and may be measured to indicate the amount of carbon dioxide produced.

Year 11 Fungi Respiration Experiment



The type of yeast the students used was dried active yeast.

The instructions say to refrigerate the container after opening. There is an **airtight** seal on the top of the container under the lid that must be removed before use.

Discuss what the students can determine about respiration from their experiment.

In your answer you should:

- describe three conditions required for the growth of fungi (yeast)
- describe anaerobic respiration
- explain how fungi (yeast) gain their nutrients
- identify the optimal temperature for growing fungi (yeast) as shown in the experiment above, and explain how this can be applied to the production of bread and the storage of fungi (yeast)
- discuss the importance of keeping the fungi (yeast) sealed and refrigerated once opened.

http://www.hellokiwi.co.nz/index.php?route=product/product&product_id=231

Three conditions that are required for the growth of the yeast are moisture, warmth and nutrition

3 general conditions required for the growth of fungi are described

Anaerobic respiration is when the microbe does not require oxygen to respire, while aerobic respiration does.

Description of anaerobic respiration

• Once the yeast is opened, putting it in the fridge slows the rate at which ~~bacteria~~ fungi reproduce (once activated with moisture and nutrition i.e. sugar) and also stops bacteria in the air contaminating the container. ~~hence~~

describes by placing the fungi in the fridge the reproduction decreases. this could have been improved by linking the fridge to a decrease in temperature and a decrease in respiration resulting in a decrease in energy

• Yeast need warmth to reproduce (budding) along with nutrition and moisture. This is why you would normally use warm water and sugar to activate the yeast.

Optimal temperature as shown in the experiment is identified.

• The optimal temperature to keep the yeast at is 40°C , since it is just warm, not hot or cold which allows the yeast to activate and start to bud (reproduce)

• Yeast gain their nutrients from the sugar, which helps in the life process of nutrition.

This candidate could have improved their mark by describing extracellular digestion and linking this to the temperature required for the enzymes to break down the larger sugar molecules into smaller particles that can be absorbed through the fungi membrane. etc.

A4 as four descriptions are given.

A4

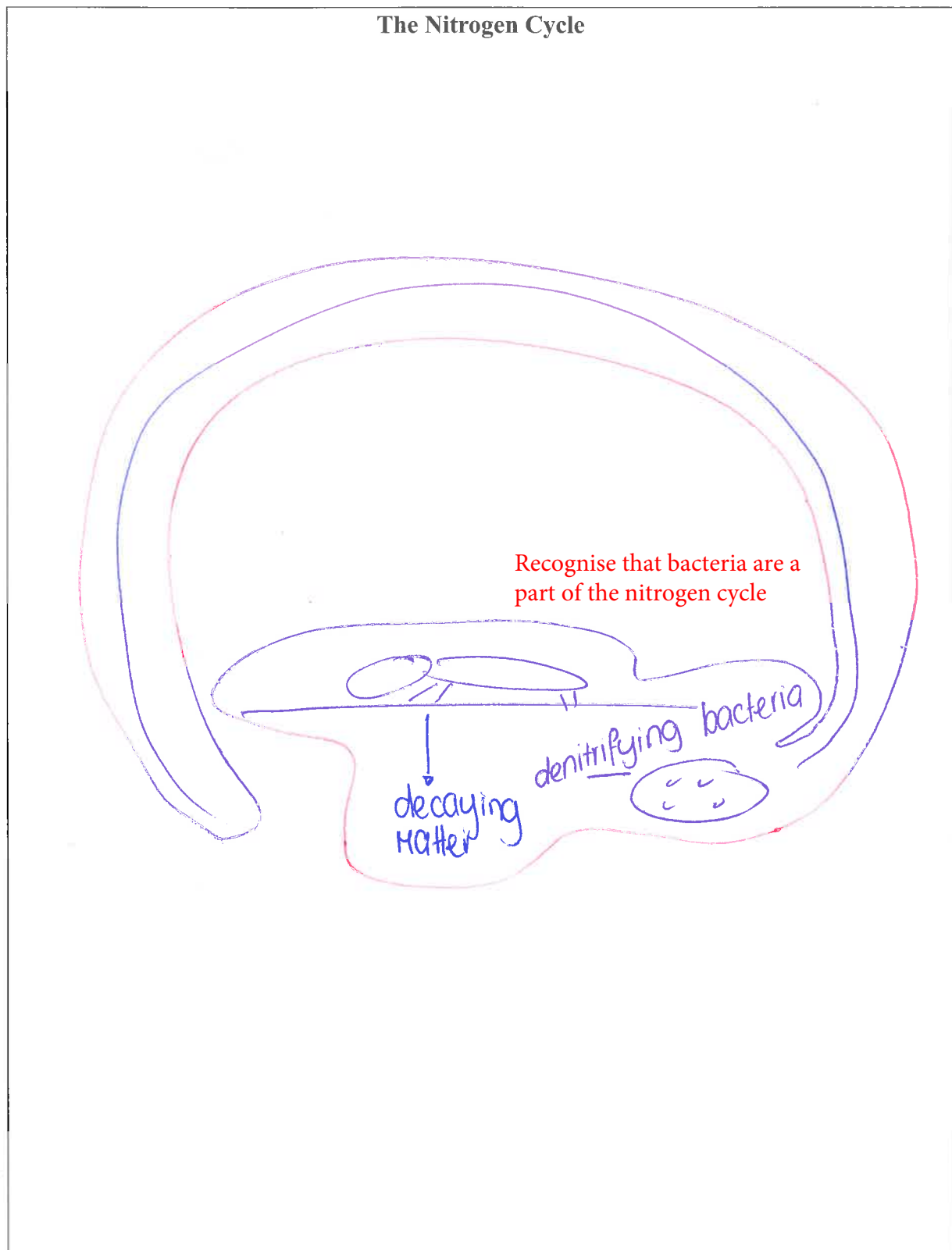
QUESTION THREE: A PILE OF COMPOST

ASSESSOR'S
USE ONLY

Compost is decayed organic matter. Composting is the process carried out by bacteria, turning organic matter such as vegetable matter and manure into compost. A successful compost heap requires good air flow.

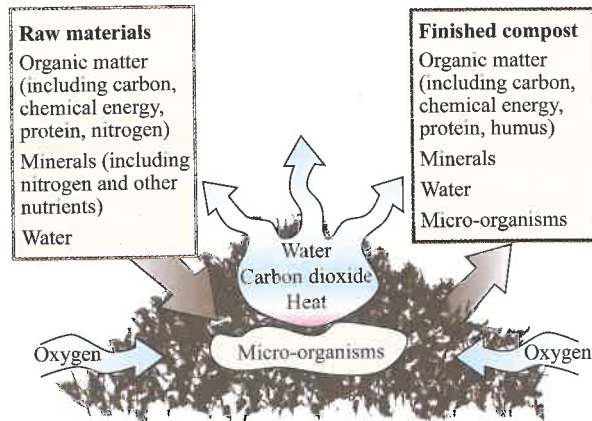
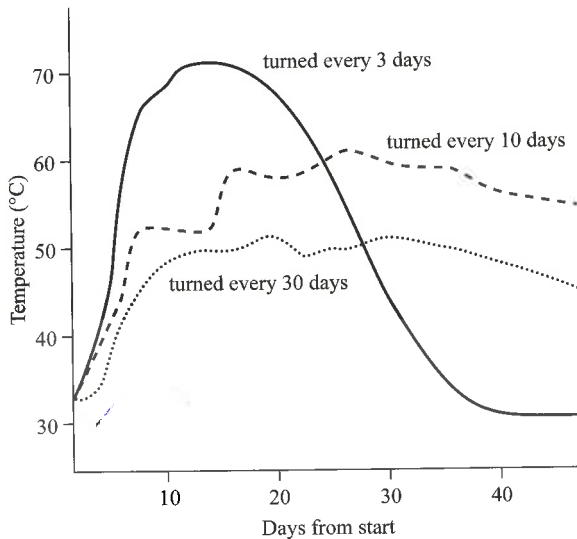
Bacteria play a big part in the nitrogen cycle and the carbon cycle.

- (a) Draw a labelled diagram of the nitrogen cycle that shows the role of **bacteria** in this cycle.



(b)

The Carbon Cycle: How the frequency of turning the compost affects its temperature over a period of 40 days



Adapted from: <http://goo.gl/sVfgZ>

Discuss the role that microbes play in releasing carbon dioxide from the compost heap shown above.

In your answer you should:

- name the type of bacteria involved in breaking down the dead and decaying organic material
- describe how the frequency of turning the compost changes the temperature of the compost, as shown on the graph above
- explain the effect of turning over the compost heap on the microbes, using the information from the graph above.

The type of bacteria involved in breaking down the dead and decaying matter are decomposers.

Type of bacteria is identified as decomposers

~~It changes the temperature since the sunlight (i.e. warmth) can get into every place within the compost, and ox~~

It changes the temperature since oxygen can get to the aerobic bacteria, providing it to respire, which then gives off heat.

Oxygen required for respiration which gives off heat

• Turning the compost heap on the microbes allows the aerobic (ones that require oxygen to respire) to respire.

- (c) Analyse the importance of the bacteria in cycling carbon and nitrogen in the compost heap.

They act as decomposers, meaning they break down dead organic matter and then providing other things.

This answer could be improved by linking the importance nitrogen to the essential proteins that plants and animals require which are broken down and made available by decomposers (denitrifying bacteria) and the availability of carbon dioxide for plants to use in photosynthesis which produce oxygen for respiration. etc.

Three ideas described A3

A3

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

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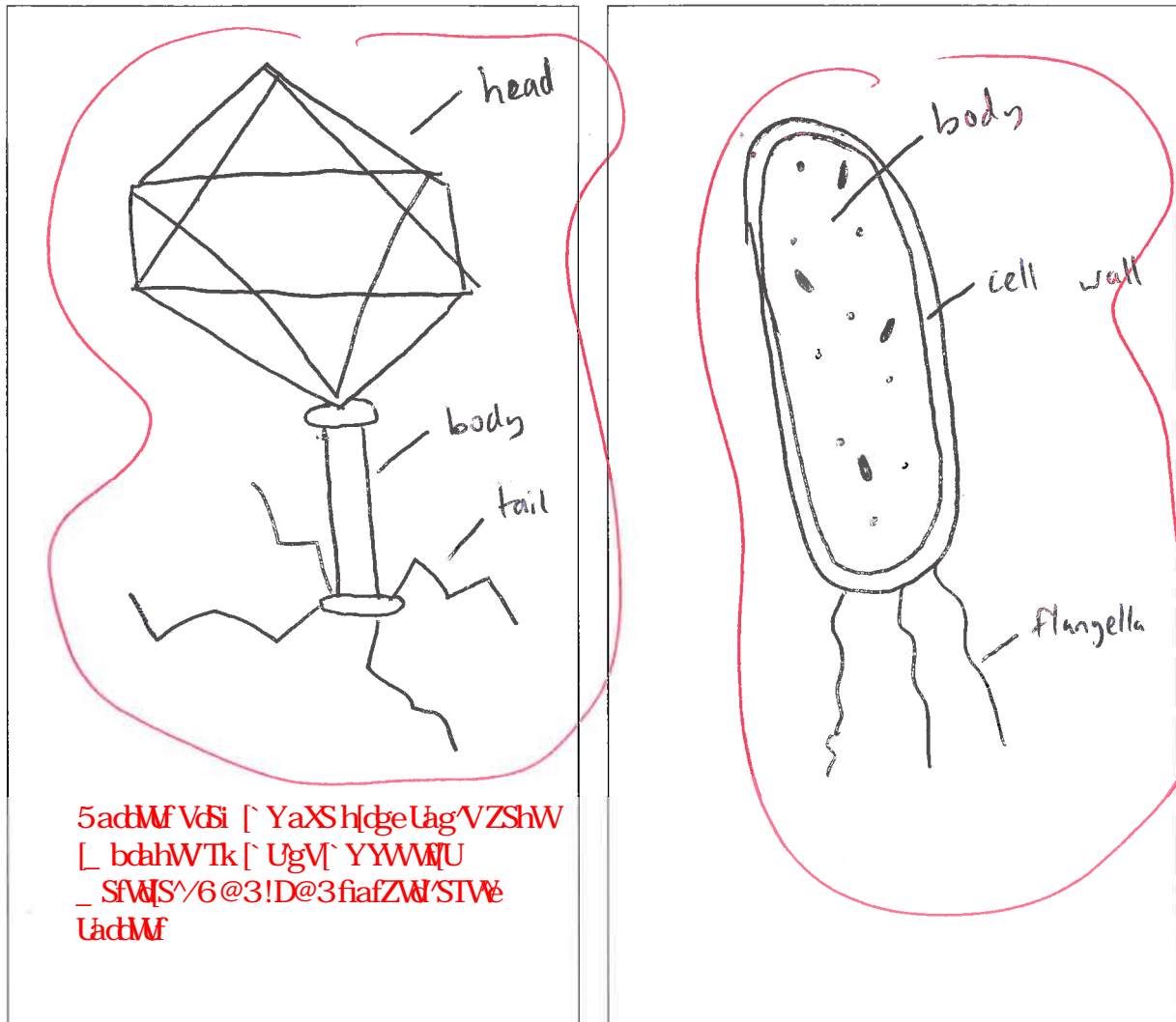
ASSESSOR'S
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Angela had a sore throat, which is caused by a bacterial infection, and was prescribed a 10-day course of antibiotics.

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



Correct drawing of a bacteria cell.
Cell wall not is not labeled correctly
the genetic material could also be added
and labeled as well as the cell membrane.

- (b) The symptoms developed very differently for Manaaki and Angela before they saw the doctor. Manaaki's symptoms (caused by a virus) had become worse suddenly in the morning, while Angela's symptoms (caused by bacteria) became worse gradually throughout the day.

Explain why Manaaki developed the symptoms more quickly than Angela.

In your answer you should:

- explain how the reproduction of viruses and bacteria affected how quickly Manaaki and Angela developed the symptoms
- compare and contrast the way viruses and bacteria reproduce, including their requirements of energy.

The reason Manaaki developed symptoms quicker than Angela is because when viruses reproduce they take over ^{all of} the host's cells to replicate themselves, whereas Angela's symptoms caused by bacteria are slower because when bacteria reproduce they use binary fission which is when the bacteria keeps splitting its genetic information into two halves and spreading throughout the body. This proves that Manaaki developed symptoms more rapidly than Angela. In terms of energy that is required to reproduce

The reason Manaaki developed symptoms quicker than Angela is because when viruses reproduce they take over all of the host's cells to replicate themselves using less energy than bacteria because the virus uses the host's energy, whereas Angela's symptoms caused by bacteria are slower because when bacteria reproduce they use binary fission which is when the bacteria keeps

Describes idea that viruses need a host cell

Bacteria use binary fission described

splitting its genetic information into two halves and spreading itself throughout the body, bacteria also uses its own energy that is gained from nutrients to reproduce which is another reason that the symptoms would occur throughout the day as opposed to a sudden reaction.

- (c) Angela was prescribed antibiotics to help her get better. Some bacteria can become resistant to some antibiotics.

Explain how antibiotics work on bacteria and how bacteria can become resistant to antibiotics.

In your answer you should:

- explain how life processes of bacteria can be affected by antibiotics
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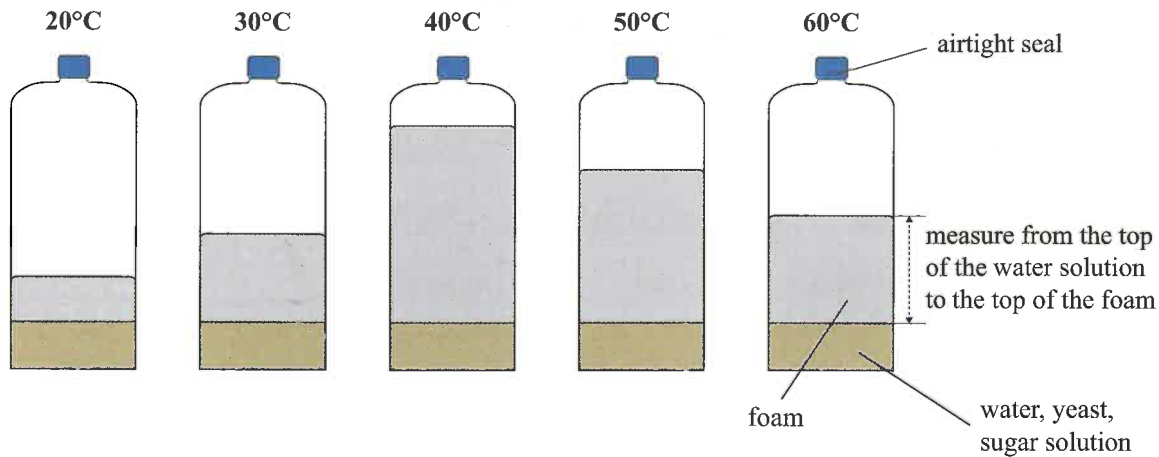
Antibiotics work on bacteria by killing them and removing them from the body's system. But if Angela does not complete her prescription because she feels "fine" then some bacteria will still be left in her system causing a few of the bacteria to become resistant to the antibiotics. Those bacteria ~~that are~~ resistant then start to reproduce rapidly in numbers and soon all of the bacteria will be immune to that antibiotic. This will affect Angela's symptoms by causing her to feel ill again and not being able to treat it with that antibiotic.

description of antibiotic resistance

QUESTION TWO: THE SCIENCE OF MAKING BREAD

The following experiment was set up by a group of Year 11 students who wanted to investigate respiration in fungi (yeast) cells. When fungi (yeast) are mixed with sugar and water, foam forms, and may be measured to indicate the amount of carbon dioxide produced.

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The type of yeast the students used was dried active yeast.

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Discuss what the students can determine about respiration from their experiment.

In your answer you should:

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- explain how fungi (yeast) gain their nutrients
- identify the optimal temperature for growing fungi (yeast) as shown in the experiment above, and explain how this can be applied to the production of bread and the storage of fungi (yeast)
- discuss the importance of keeping the fungi (yeast) sealed and refrigerated once opened.

Conditions for fungal growth described - moist, warmth and nutrients,

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For the growth of fungi it needs a warm environment with moisture. Fungi gain their nutrients through the hyphae and absorb them into the digestive system. Anaerobic respiration is where the micro organism can respire without oxygen being present. The students can

Anaerobic respiration described.

determine that the optimum temperature for growing yeast is at 40°C because it produces the most foam (CO_2) which means that the fungi excretes best at that heat. It is important to keep the yeast refrigerated once opened because in the refrigerator the fungi will stop growing because of the cool temperature.

Optimal temperature for growing yeast at 40°C
links to producing the most foam and this is linked to CO_2 production.
cool temperature of the refrigerator stops growth.

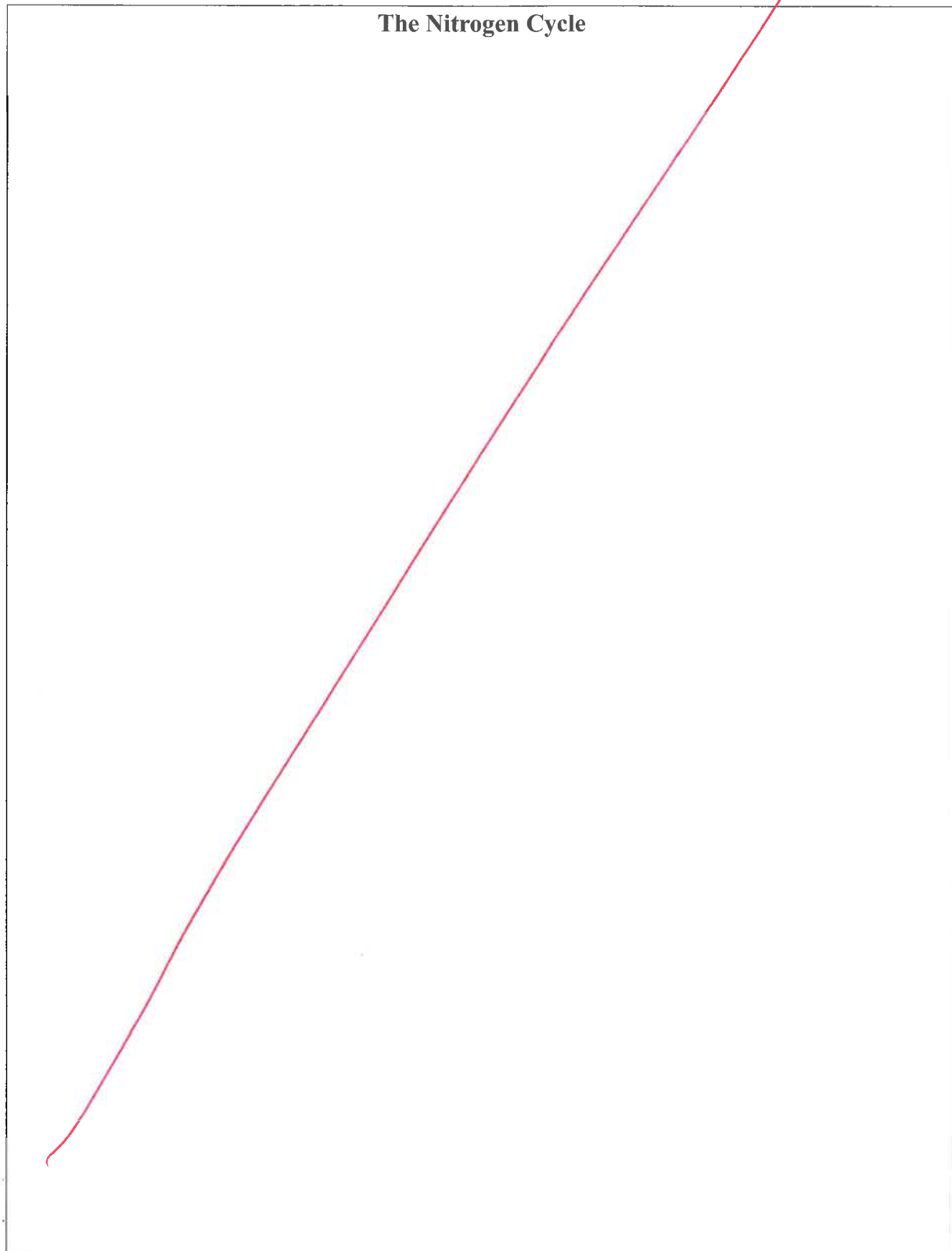
Could have improved the answer by linking reproduction and cellular respiration to extra cellular digestion to temperature.

QUESTION THREE: A PILE OF COMPOST

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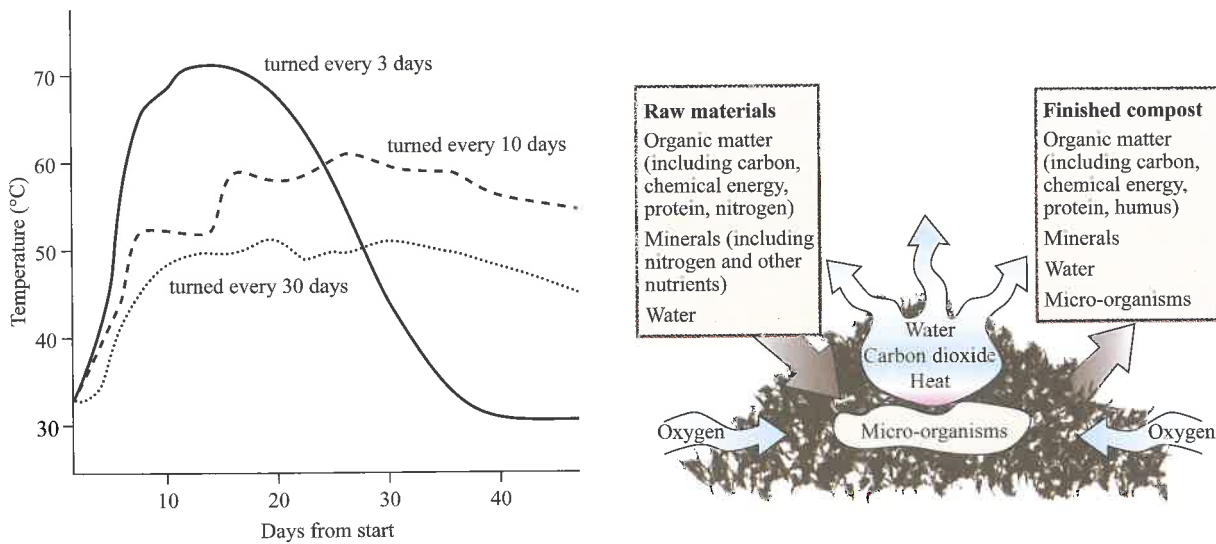
- (a) Draw a labelled diagram of the nitrogen cycle that shows the role of **bacteria** in this cycle.



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(b)

The Carbon Cycle: How the frequency of turning the compost affects its temperature over a period of 40 days

Adapted from: <http://goo.gl/sVfgZ>

Discuss the role that microbes play in releasing carbon dioxide from the compost heap shown above.

In your answer you should:

- name the type of bacteria involved in breaking down the dead and decaying organic material
- describe how the frequency of turning the compost changes the temperature of the compost, as shown on the graph above
- explain the effect of turning over the compost heap on the microbes, using the information from the graph above.

Decomposers are described - could have linked this to aerobic respiration.

Enzyme breaks down the organic matter.

~~Microbes~~ The dead and decaying organic matter is broken down by the decomposers. The microbes then send enzymes to further break down the organic matter then the microbe absorbs the nutrients and excretes CO_2 . The frequency of turning the compost changes the temperature greatly, by turning it every 30 days the temperature sits at around 50°C where as if the compost is turned every 3 days the temperature gets up around 70°C then drops rapidly down to 30°C .

The effect of turning over the compost heap on microbes is important because if you turn ~~the~~ frequently ~~the~~ (3 days) the microbes may overheat and stop producing CO_2 . But if you turn the compost ~~very~~ rarely (every 30 days) the microbes stay at a good temperature to keep producing CO_2 at.

Could improve by linking aerobic respiration and the turning of the compost.

- (c) Analyse the importance of the bacteria in cycling carbon and nitrogen in the compost heap.

It is important to have bacteria in the compost heap because the bacteria is at the core of the heap absorbing nutrients and excreting CO_2 . If there was no bacteria there would be no CO_2 being produced and the compost would go to waste.

A3

Extra paper if required.
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QUESTION
NUMBER

from CO_2

warm, moisture,

decomposers

budding is like binary
fission but produces identical
genetic variation

- warm, moisture
- respiration used without oxygen
- through the lysosome
- 40°C
- to stop the budding

nutrient



excrete



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