



Government of **Western Australia**
School Curriculum and Standards Authority



BIOLOGY

GENERAL COURSE

Marking key for the Externally set task
Sample 2016

Copyright

© School Curriculum and Standards Authority, 2014

This document – apart from any third party copyright material contained in it – may be freely copied, or communicated on an intranet, for non-commercial purposes in educational institutions, provided that the School Curriculum and Standards Authority is acknowledged as the copyright owner, and that the Authority's moral rights are not infringed.

Copying or communication for any other purpose can be done only within the terms of the *Copyright Act 1968* or with prior written permission of the School Curriculum and Standards Authority. Copying or communication of any third party copyright material can be done only within the terms of the *Copyright Act 1968* or with permission of the copyright owners.

Any content in this document that has been derived from the Australian Curriculum may be used under the terms of the [Creative Commons Attribution-NonCommercial 3.0 Australia licence](#)

Disclaimer

Any resources such as texts, websites and so on that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandatory or that they are the only resources relevant to the course.

Biology

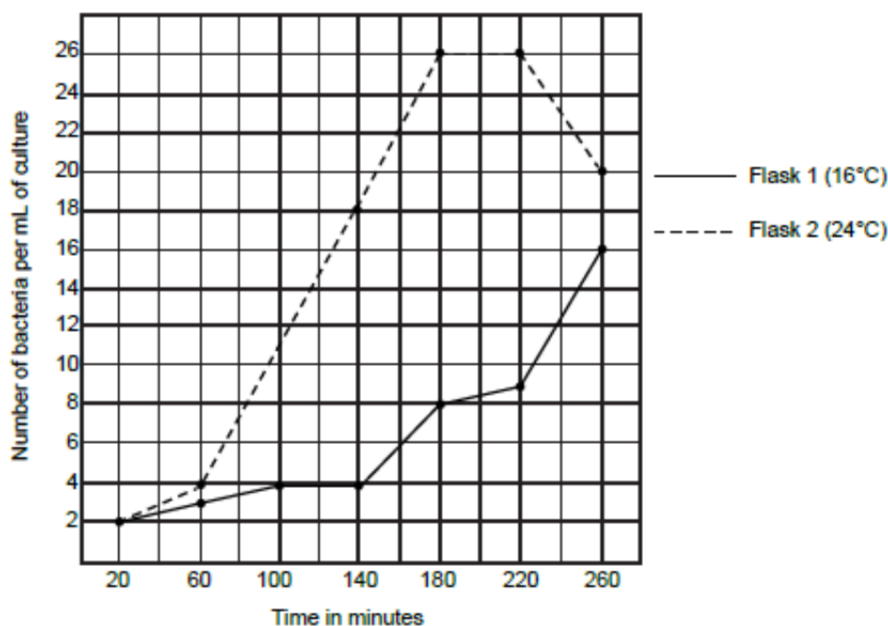
Externally set task – marking key

1. A microbiologist set up two separate, identical flasks of nutrient broth for growing bacteria. She introduced the same species of bacterium to each flask at a concentration of 1 bacterial cell per mL of culture. She then incubated one flask at 16°C and the other flask at 24°C and recorded the concentration of bacteria (number of bacterial cells per mL of culture) in each flask at intervals of 40 minutes over time. The results are shown in the table below.

(22 marks)

- (a) On the grid provided, plot a line graph of the number of bacterial cells per mL of culture against time for each of Flasks 1 and 2. For each flask, plot the data separately but on the same grid below.

Concentration of bacteria in a flask at 16°C and in a flask at 24°C versus time



Description	Marks
Graph construction – chooses correct axes and appropriate scales	1
Plotting – accurately plots points and joins appropriately two lines	1–2
Labelling – accurately labels both axes including units	1
Title – appropriate title that shows the relationship between two variables	1
Key/legend – appropriate key/legend to distinguish the two graphs	1
Total	6

(b)(i) Using the table, what was the number of bacterial cells per mL of culture in Flask 1 at 180 minutes?

Description	Marks
8 bacteria/cells (per mL)	1
Total	1

(ii) Using the table, when did the highest concentration of bacteria occur in Flask 2?

Description	Marks
180 and 220 minutes (Must get both times to get mark)	1
Total	1

(c)(i) Using the graph, predict the concentration of bacteria in Flask 1 at 280 minutes.

Description	Marks
19 bacteria/cells per mL Accept any answer in the range 18–20. Must give units to get mark.	1
Total	1

(ii) Using the graph, predict the concentration of bacteria in Flask 2 at 100 minutes.

Description	Marks
11 bacteria/cells per mL Accept any answer in the range 10–12. Must give units to get mark.	1
Total	1

(iii) Which of the above predictions, for Flask 1 or Flask 2, is likely to be the more accurate? Give a reason for your answer.

Description	Marks
Flask 2	1
Because the estimate for Flask 2 is an interpolation/within the data range while the estimate for Flask 1 extrapolates/goes beyond the data range	1
Total	2

(d)(i) Describe the changes in the concentration of bacteria in Flask 1 during the experiment.

Description	Marks
The concentration/number of bacteria in Flask 1 increased for the entire 260 minutes/for the duration of the experiment.	1
Rise from 2 bacteria/cells per mL at the start to 16 bacteria/cells per mL at 260 minutes/ The cells doubled in number approximately every 80 minutes.	1
Total	2

(ii) Describe the changes in the concentration of bacteria in Flask 2 during the experiment.

Description	Marks
The concentration/number of bacteria in Flask 2 increased for the first 180 minutes/doubled in number approximately every 40 minutes for the first 180 minutes.	1
Levels off at 26 bacteria/cells per mL between 180 and 260 minutes and then declining to 20 bacteria/cells per mL at 260 minutes.	1
Total	2

(e)(i) Give **two (2)** possible reasons why the concentration of bacteria in Flask 2 did not keep increasing throughout the entire experiment.

Description	Marks
Any two of:	
<ul style="list-style-type: none"> • The bacteria had consumed all of the nutrients in the flask/the bacteria ran out of food. • The bacteria had consumed all of the oxygen/ran out of oxygen. • Bacterial waste products were inhibiting growth/cell division. 	1–2
Total	2

(ii) Bacteria reproduce asexually. Asexual reproduction has certain advantages compared with sexual reproduction. Explain **two (2)** ways in which asexual reproduction helps the species to survive.

Description	Marks
Any two of:	
<ul style="list-style-type: none"> • Large numbers of offspring are produced very quickly. • Out-compete neighbouring species. 	1–2
<ul style="list-style-type: none"> • Individuals do not need to find a mate. • Less costly in energy and resource which can be used to rapidly increase numbers. 	1–2
<ul style="list-style-type: none"> • Favourable genotypes/genetic types are perpetuated. • An advantage in a stable environment. 	1–2
Total	4

- 2(a) Meiosis is a type of cell division that results in the production of gametes. Describe the process of meiosis for gamete production.

Description	Marks
Any six of:	
<ul style="list-style-type: none"> The cells that undergo meiosis usually occur in special reproductive structures/in flowers in plants and gonads in animals/in special cells. The process starts with a diploid cell. In this cell, each chromosome comes in pairs/twos. The chromosomes condense/shorten and thicken. The matching chromosomes pair/the pairs of chromosomes come together/homologous chromosomes pair. Each member of a pair of chromosomes separates/segregates to opposite poles/opposite ends of the cell. There are now two cells. The chromosomes in each cell split in two and each part moves to opposite ends of the cell. The overall result is four (potential) gametes/daughter cells. The potential gametes/daughter cells have a haploid number of chromosomes/half the number of chromosomes of the original cell/are genetically different to the parent cell. 	1–6
Total	6

- (b) Describe **four (4)** ways in which mitosis differs from meiosis.

Description	Marks
Any four of these pairs:	
<ul style="list-style-type: none"> Mitosis occurs in general body cells Meiosis occurs in specialised reproductive cells 	1–2
<ul style="list-style-type: none"> Mitosis results in genetically identical cells/diploid cells Meiosis produces haploid cells 	1–2
<ul style="list-style-type: none"> Mitosis is used for growth and repair and asexual reproduction Meiosis is used for gamete production 	1–2
<ul style="list-style-type: none"> Mitosis produces two new/daughter cells or there is one cell division Meiosis produces four daughter cells or there are two cell divisions 	1–2
<ul style="list-style-type: none"> In mitosis there is no pairing of chromosomes In meiosis chromosomes pair/crossing over occurs 	1–2
Total	8