

Final Examination 2022

NSW Year 11 Biology

**General
Instructions**

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black pen
- Draw diagrams using pencil
- Calculators approved by NESA may be used

**Total Marks:
75**

SECTION I – 15 marks (pages 2–7)

- Attempt Questions 1–15
- Allow about 30 minutes for this section

SECTION II – 60 marks (pages 9–24)

- Attempt Questions 16–26
- Allow about 1 hour and 30 minutes for this section

SECTION I

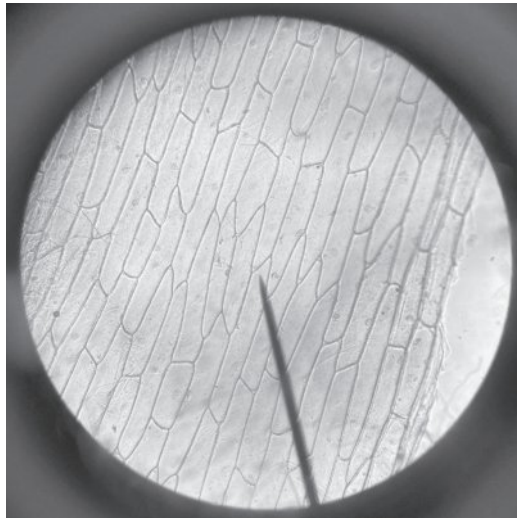
15 marks

Attempt Questions 1–15

Allow about 30 minutes for this section

Use the multiple-choice answer sheet for Questions 1–15.

- 1** Which of the following is an example of a prokaryotic cell?
- A. virus
 - B. bacterium
 - C. prion
 - D. fungal cell
- 2** A photograph of an onion epidermis under a monocular light microscope is shown.

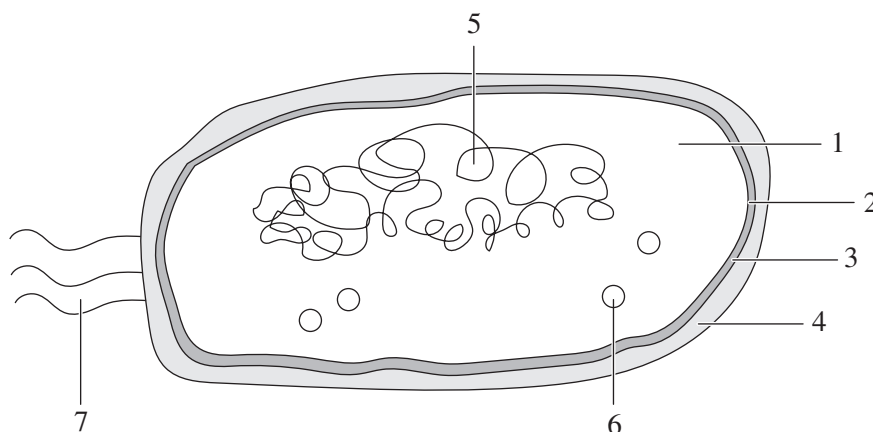


Source: Reproduced with permission from Litchfield C (2021), *Onion epidermis* [photograph].

Which of the following cell components can be identified in the photograph?

- A. chloroplast, nucleus and cell wall
- B. nucleus and mitochondria
- C. cell wall, nucleus and mitochondria
- D. cell wall and nucleus

3 The diagram shows a bacterial cell.



Which row of the table correctly identifies the labelled parts of the bacterium?

	<i>1</i>	<i>6</i>	<i>7</i>
A.	plasma	plasmid	pilus
B.	plasma	DNA or RNA	flagellum
C.	cytoplasm	plasmid	flagellum
D.	cytoplasm	DNA or RNA	pilus

4 Which of the following processes is responsible for the transport of glucose into a cell if the concentration of glucose outside the cell is less than the concentration of glucose inside the cell?

- A. osmosis
- B. diffusion
- C. passive transport
- D. active transport

5 Animals and plants have adaptations that make them suited to their environment.

Which row of the table correctly classifies the adaptations shown by each species?

	<i>Structural</i>	<i>Behavioural</i>	<i>Physiological</i>
A.	Cactus plants have limited numbers of stomates.	Fennec foxes have large ears that enable them to dispel heat.	Penguins huddle to keep warm.
B.	Fennec foxes have large ears that enable them to dispel heat.	Storks urinate on their own legs to cool their bodies in a process called urohydrolysis.	Camels can withstand a body temperature of 40°C before they begin to sweat.
C.	Camels can withstand a body temperature of 40°C before they begin to sweat.	Penguins huddle to keep warm.	Cactus plants have limited numbers of stomates.
D.	Penguins have a layer of thick feathers to keep them warm.	Camels can withstand a body temperature of 40°C before they begin to sweat.	Storks urinate on their own legs to cool their bodies in a process called urohydrolysis.

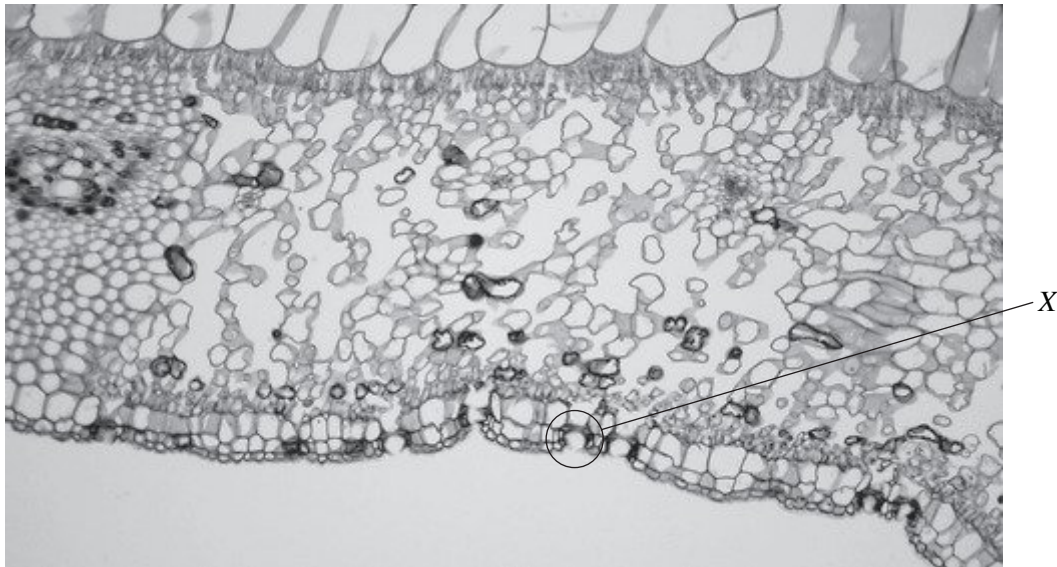
Use the following information to answer Questions 6–8.

A student wanted to investigate the effect of light on photosynthesis. They decided to measure the production of starch in a leaf, as starch is a polymer made from glucose (a product of the photosynthetic reaction). The student placed a plant in a cupboard for one week and another identical plant on a sunlit windowsill for the same time period. At the end of the week, the student boiled a leaf from each plant to break the cell walls and release chemicals from within the cells. They then tested the leaves for the presence of starch by using iodine. When adding iodine, a colour change from orange-brown to blue-black occurs if starch is present.

On the addition of iodine, the leaf from the plant that was kept on the sunlit windowsill turned blue-black in colour, and the leaf from the plant that was kept in the cupboard remained orange-brown in colour.

- 6 Which of the following is the most suitable hypothesis for the student's investigation?
- A. Chlorophyll is required for photosynthesis to occur.
 - B. Light is required for photosynthesis to occur.
 - C. If a plant is kept in a cupboard, then it will photosynthesise.
 - D. If a plant is green, then it will photosynthesise.
- 7 Which of the following lists the variables that the student would need to keep controlled to make the test valid?
- A. amount of soil in each pot, amount of water added to each plant, amount of light each plant was exposed to, genetics of the plants
 - B. amount of soil in each pot, amount of water added to each plant, genetics of the plants, the cupboard one plant was placed in
 - C. amount of soil in each pot, amount of water added to each plant, amount of light each plant was exposed to, amount of iodine added to each leaf
 - D. amount of soil in each pot, amount of water added to each plant, genetics of the plants, amount of iodine added to each leaf
- 8 The student repeated the experiment THREE times and obtained similar results each time. They repeated the experiment because repetition with
- A. an average ensures reliable results in an investigation.
 - B. similar results improves reliability in an investigation.
 - C. similar results improves accuracy in an investigation.
 - D. an average ensures validity in an investigation.

- 9 The photograph shows a cross section of an angiosperm leaf.

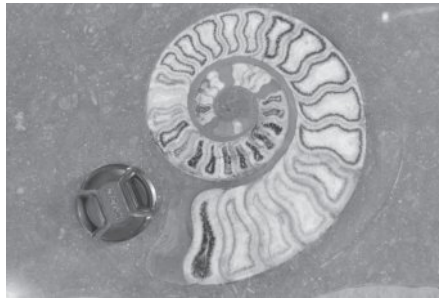


Source: Fayette A and Reynolds M S (14 August 2017), Berkshire Community College Bioscience Image Library. Accessed May 2022. <https://www.flickr.com/photos/146824358@N03/36408199682>.

The function of the structure labelled X is

- A. diffusion of oxygen and carbon dioxide into and out of the leaf.
 - B. photosynthesis.
 - C. respiration.
 - D. osmosis of water out of the leaf in transpiration.
- 10 Antibiotic resistance evolves because
- A. doctors prescribe too many pills and people become immune to the antibiotics.
 - B. antibiotics cause mutations in bacterial cells, which gives those cells an adaptive advantage. Those cells then survive and reproduce, so the bacterial population becomes resistant.
 - C. random mutations in bacterial cells can cause some bacteria to be resistant to antibiotics. Those cells then survive and reproduce, making the bacterial population resistant to antibiotics.
 - D. the agricultural sector uses too many antibiotics that magnify through the food chain. Animals higher up in the food chain then become resistant to antibiotics.

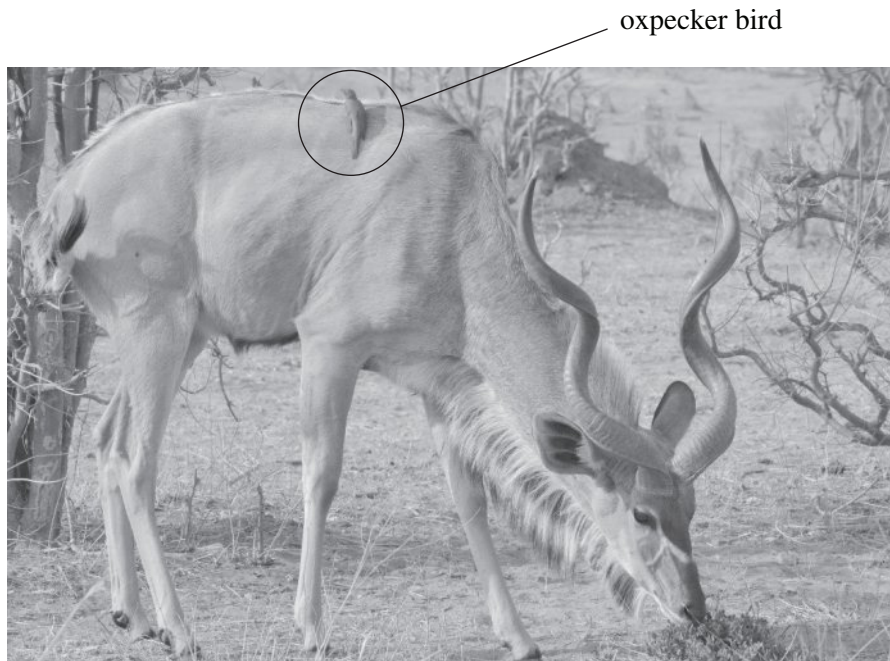
- 11 The photograph shows an ammonite fossil. The lens cap to the left of the fossil has a diameter of 6.5 cm.



Source: Reproduced with permission from Litchfield C (2021), *Ammonite fossil* [photograph].

Which of the following best estimates the diameter of the ammonite?

- A. 6–10 cm
 - B. 15–25 cm
 - C. 33–50 cm
 - D. 55–62 cm
- 12 The photograph shows a kudu (an African antelope) with an oxpecker bird on its back. The kudu feeds on a shrub while the oxpecker feeds on ectoparasites such as ticks that live on the kudu.



Source: Reproduced with permission from Litchfield C (2021), *Kudu and oxpecker bird* [photograph].

Which row of the table correctly identifies the ecological relationships shown in the photograph?

	<i>Kudu eating shrub</i>	<i>Oxpecker eating ticks on kudu</i>	<i>Ticks living on kudu</i>
A.	carnivorism	commensalism	predation
B.	predation	mutualism	parasitism
C.	herbivorism	commensalism	mutualism
D.	herbivorism	mutualism	parasitism

- 13** Living things require nitrogen
- A. to make carbohydrates.
 - B. for energy.
 - C. to make proteins.
 - D. to facilitate photosynthesis.
- 14** In a typical food chain, approximately how much energy is lost at each trophic level?
- A. 10%
 - B. 50%
 - C. 75%
 - D. 90%
- 15** What is the main function of a decomposer in an ecosystem?
- A. recycling energy only
 - B. recycling matter only
 - C. recycling matter and energy
 - D. removing dead and decaying animals from the ecosystem

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NSW Year 11 Biology

Section II Answer Booklet

60 marks

Attempt Questions 16–26

Allow about 1 hour and 30 minutes for this section

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
 - Show all relevant working in questions involving calculations.
 - Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.
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Please turn over

Question 16 (7 marks)

During a Year 11 Biology class, a group of students modelled the processes of diffusion and osmosis.

- (a) Describe how a student could model the process of diffusion. **2**

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- (b) A student performed an experiment to investigate the effect of osmosis. They placed small cubes of potato into six beakers, each containing 100 mL of different glucose solutions. After 30 minutes, they measured the mass changes of the potato cubes.

The table shows the data recorded by the student.

<i>Beaker</i>	<i>Concentration of glucose solution (% w/w)</i>	<i>Initial mass (g)</i>	<i>Final mass (g)</i>	<i>Change in mass (g)</i>	<i>Percentage change in mass (%)</i> $\left(\frac{\text{change in mass}}{\text{initial mass}} \times 100 \right)$
1	0	4.9	5.9	1	+20
2	5	5.09	5.75	0.66	+13
3	10	5.02	5.1	0.08	0
4	15	5.02	4.1	-0.92	-18
5	20	4.9	3.6	-1.3	-27
6	25	4.9	3.3	-1.6	-33

- (i) Identify the independent variable in the investigation. **1**

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- (ii) Identify TWO controlled variables. **1**

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Question 16 continues on page 11

Question 16 (continued)

- (iii) Use your knowledge and understanding of osmosis to explain the results of the investigation. **3**

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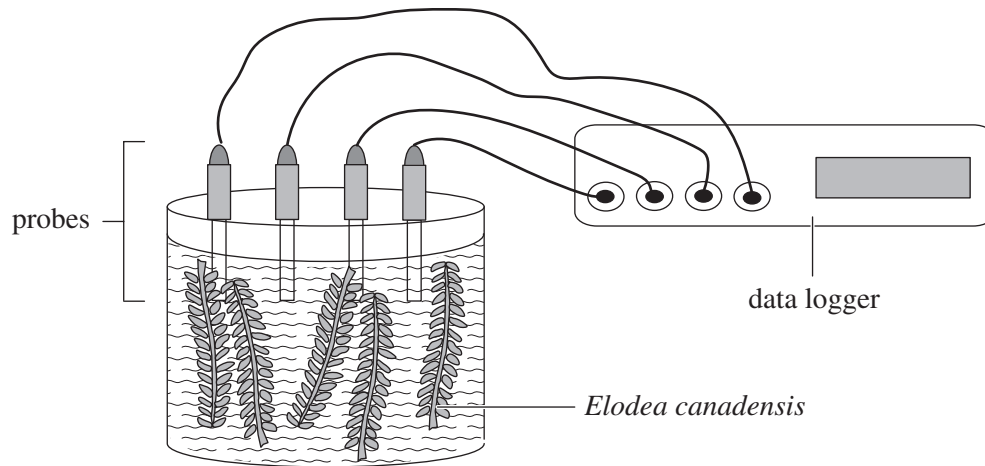
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End of Question 16

Question 17 (10 marks)

A student investigated the change in abiotic factors in a water tank containing elodea pondweed (*Elodea canadensis*) and set up their experiment as shown in the diagram.



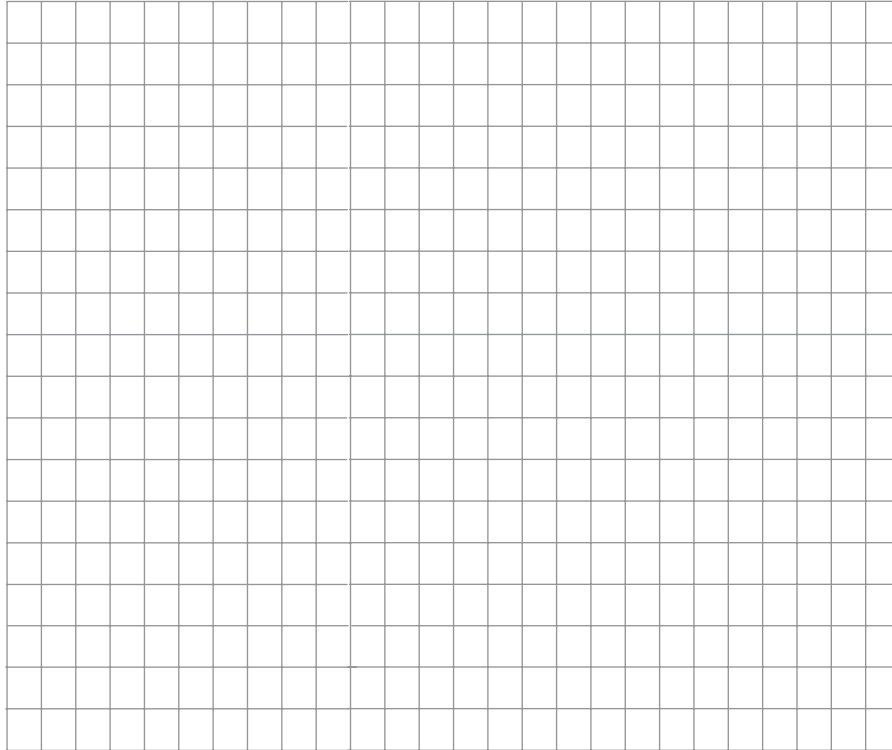
Data was recorded over a 24-hour period using a light probe, a pH probe, an oxygen probe, a temperature probe and a data logger. The student's results are shown in the table.

<i>Time (hour)</i>	<i>Light (lux)</i>	<i>pH</i>	<i>Oxygen (% saturation)</i>	<i>Temperature (°C)</i>
10 am	600	3.57	96.2	22
12 pm	1000	4.09	98.5	22.7
2 pm	877	4.33	99.5	23.3
4 pm	135	4.45	94.8	23.3
6 pm	0	3.50	88.5	21.3
8 pm	0	3.80	99.2	21.9
10 pm	0	3.22	68.3	20.3
12 pm	0	3.35	78.1	20.7
2 am	0	3.12	53.4	19.6
4 am	0	3.18	59.7	19.8
6 am	167	3.10	48.1	19.3
8 am	1000	3.22	63.4	21.2
10 am	1000	3.75	87.6	24.5

Question 17 continues on page 13

Question 17 (continued)

- (a) Graph the data to show the pH change in the water tank over the 24-hour period. **3**



- (b) Describe the trend in the graph from part (a). **1**

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Question 17 continues on page 14

Question 17 (continued)

When carbon dioxide is dissolved in water, carbonic acid is formed. As the concentration of dissolved carbon dioxide increases, the acidity increases and the pH of the water decreases.

- (c) Using your knowledge of photosynthesis and respiration, explain the pH curve from part (a) over the 24-hour period. **4**

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- (d) Explain why the oxygen level (% saturation) in the water tank was lowest before dawn (6 am). **2**

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End of Question 17

Question 18 (3 marks)

Draw an annotated diagram to explain how enzymes work to catalyse biochemical reactions.

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Question 19 (2 marks)

Identify TWO differences between plant and animal cells.

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Question 20 (7 marks)

- (a) During a Year 11 Biology class, students modelled the structure of the fluid mosaic model of the cell membrane. **3**

In the space provided, draw a fully labelled diagram of a cell membrane.

- (b) Briefly describe TWO functions of the cell membrane. **2**

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- (c) Outline a benefit AND a limitation of using models in the study of Biology. **2**

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Question 21 (5 marks)

Outline TWO similarities and TWO differences between the transport systems of animals and plants.

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Question 22 (6 marks)

Charles Darwin travelled to the Galapagos Islands and Australia during his voyage on the HMS *Beagle* (1831–1836).

Describe how Darwin’s observations contributed to the development of the key principles of the Theory of Evolution by Natural Selection. Support your answer with reference to ONE organism he studied from the Galapagos Islands or Australia.

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Question 23 (5 marks)

The Mount Canobolas candlebark or silver-leaf candlebark (*Eucalyptus canobolensis*) is a species of eucalypt tree that is endemic to a small area of central New South Wales in the Mount Canobolas State Conservation Area. The tree typically grows to a height of 12 metres.

An ecologist is given the task of investigating the distribution and estimating the abundance of this unique species of eucalypt tree.

- (a) Outline a method that the ecologist could use to determine the distribution of *Eucalyptus canobolensis*. 2

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- (b) Describe a method that could be used to estimate the abundance of *Eucalyptus canobolensis*. 3

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Question 24 (2 marks)

Complete the table to summarise the factors of an environment that biologists would measure as part of an ecology study. 2

<i>Environmental factor</i>	<i>Method/equipment used to measure factor</i>	<i>Abiotic or biotic</i>
wind speed	anemometer	
air temperature		abiotic
abundance of bilbies	traps and tags	
soil pH		abiotic

Question 25 (6 marks)

Using examples, describe how biochemistry and comparative anatomy provide evidence for the Theory of Evolution by Natural Selection.

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Question 26 (7 marks)

Table 1 shows the estimated population of southern brown bandicoots (*Isoodon obesulus*) during a monthly live-trapping program in the Harry Waring Marsupial Reserve in Western Australia. In July, tracks and sightings indicated that a single fox entered the reserve. About six months later, its carcass was found.

Table 1: Estimated population of southern brown bandicoots (*Isoodon obesulus*)

Month	Estimated population of southern brown bandicoots
September	80
October	78
November	60
December	100
January	96
February	125
March	131
April	120
May	116
June	120
July	118
August	60
September	20
October	18
November	13
December	14
January	16
February	14
March	30
April	35

Source: Data sourced with permission from Dickman C R (2012).

Question 26 continues on page 22

Question 26 (continued)

Table 2 shows the impact of the cane toad (*Rhinella marina*) on Mertens' water monitor (*Varanus mertensi*), a type of lizard, as shown by a study conducted in the Kimberly region in Western Australia. Population counts during 2001–2009 were in 'pre-toad arrival' years, while population counts during 2011–2013 were in 'post-toad arrival' years.

Table 2: Impact of the cane toad (*Rhinella marina*) on Mertens' water monitor (*Varanus mertensi*)

Year	Estimated population of Mertens' water monitor
2000	6
2001	8
2002	9
2003	6
2009	8
2010	6
2011	3
2012	1
2013	6

Source: Data sourced with permission from Doody J S, Mayes P, Clulow S, et al. (7 March 2014).

- (a) Using the trends shown in the tables, outline the effects that introduced species can have on other species in communities. **3**

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- (b) As well as the damage caused by introduced species, human activities, such as mining and agriculture, can have a negative effect on natural ecosystems. **4**

Describe the practices used to restore damaged ecosystems.

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End of paper

Neap Final Examination 2022

NSW Year 11 Biology

DIRECTIONS:

Write your name in the space provided.

Write your student number in the boxes provided below. Then, in the columns of digits below each box, fill in the oval which has the same number as you have written in the box. Fill in **one** oval only in each column.

Read each question and its suggested answers. Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely, using blue or black pen. Mark only **one** oval per question.

A B C D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A B C D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word correct and draw an arrow as follows.

A B C D
correct
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SECTION I MULTIPLE-CHOICE ANSWER SHEET

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STUDENTS SHOULD NOW CONTINUE
WITH SECTION II