Sample Assessment Tasks

Biology

ATAR Year 11

**Acknowledgement of Country**

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

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Sample assessment task

Biology – ATAR Year 11

Task 2 – Unit 1

**Assessment type** Science inquiry: Investigation

**Conditions** Time allowed for the task: 3 weeks

* + - * 1 week to research and plan investigation
      * 1 week to collect data using biological field techniques
      * 1 week to collate data, analyse results and write a scientific report in class under invigilated conditions

**Task weighting** 15% of the school mark for this pair of units

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The effect of fire on the forest ecosystem (50 marks)

Periodic burning and wildfires alter the population dynamics in a forest ecosystem. Investigate an area of forest that has been burnt in the last five years and compare it with an area that has been undisturbed by fire for over twenty years.

Present your findings in a scientific report to inform fire management regimes in the forest.

1. **Plan the investigation**

* Research the history of the selected site/s to determine fires that have occurred in the area.
* Research the sampling methods that can be used.
* Discuss other types of evidence that need to be collected.
* Prepare tables to record observations and the results of tests carried out.

1. **Conduct the investigation**

* Prepare an overview of each site being investigated.
* Use sampling methods to show differences in the composition of plants and animals between the sites. You will need to use quadrats, transects and at least one other field sampling method.
* The study site/s may be revisited over a period of time.

1. **Process, evaluate and communicate findings**

* Collate results from all class groups (raw data from each group will be provided to teacher, who will distribute to you).
* Represent data using the most suitable format.
* Analyse results identifying trends and quality of data.
* Discuss the effect of fire on the ecosystem.
* Prepare a scientific report of your findings. Include relevant information from your background notes in the introduction.

Resources

Department of Biodiversity, Conservation and Attractions: <https://www.dbca.wa.gov.au/>

Marking key for sample assessment Task 2 — Unit 1

|  |  |
| --- | --- |
| Description | Marks |
| **Introduction** | **/6** |
| Selects appropriate information from research notes and succinctly writes an introduction to the investigation, including:   * local history of controlled burns and wildfires * clearly drawn maps of each of the study sites * the sampling methods to be used, e.g. quadrats, transects, capture-recapture, pit trapping, radiotracking * other data that needs to be collected, e.g. physical features of the area | 1–4 |
| Aim/purpose clearly identified | 2 |
| Attempts to identify an aim/purpose | 1 |
| **Materials and method** | **/4** |
| Clearly lists materials with sizes and quantities | 2 |
| Briefly lists materials | 1 |
| Explains the method in detail, including how the sampling will be determined | 2 |
| Briefly describes the method | 1 |
| **Results** | **/12** |
| Describes overall visual observations of each study site, including diagrams, maps or other visual representation | 2 |
| Briefly comments on each study site | 1 |
| Presents quadrat data for each site in appropriate tables, including raw and collated data | 3–4 |
| Constructs incomplete tables for quadrat data | 1–2 |
| Presents transect data for each site in appropriate tables, including raw and collated data | 3–4 |
| Constructs incomplete tables for transect data | 1–2 |
| Includes data presented in appropriate tables for other population study,  e.g. capture-recapture, pit traps | 1–2 |
| **Discussion of results** | **/20** |
| Compares data between the two study sites   * overall observations * types of plant species present * number/density of plant species present * numbers/types of animals | 1–2  1–2  1–2  1–2 |
| Explains data using relevant science concepts   * describes adaptations of Australian plants for surviving fires and relates these adaptations to types of plants present * differentiates between plants in each site and their survival for the type of fire or the time since the fire * explains the distribution of plants at each site * explains why different animals may be present at each site related to fire | 1–2  1–2  1–2  1–2 |
| Accounts for factors other than fire that may have impacted on the study sites,  e.g. differences in topography, soil types, human influence | 1–2 |
| Describes any difficulties encountered and suggests improvements in experimental design or method of data collection for accuracy | 1–2 |
| **Conclusion** | **/8** |
| Concisely summarises the results of the investigation | 2 |
| Briefly describes the results of the investigation, omitting some key points | 1 |
| Explains the consequences of both controlled burns and wildfires on the population dynamics of a forest ecosystem | 5–6 |
| Identifies the effects of both controlled burns and wildfires on the population dynamics of a forest ecosystem | 3–4 |
| List the effects of either a controlled burn or a wildfire on the population dynamics of a forest ecosystem | 1–2 |
| **Total marks** | **/50** |

Sample assessment task

Biology – ATAR Year 11

Task 3 – Unit 1

**Assessment type** Extended response

**Conditions** Time allowed for the task:

* + - * 1 week research
      * 50 minutes to respond to questions in class under invigilated conditions

**Task weighting** 5% of the school mark for this pair of units

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Woylie population study (27 marks)

Read the Landscope article 'Down but not out: solving the mystery of the woylie population crash' written by Samille Mitchell and Adrian Wayne. [Landscope 23 (4) 2008] available via request through the State Library of Western Australia.

Use the following questions to focus your reading.

1. What is a woylie?

2. Where does it live?

3. Briefly describe all of the relationships the woylie has with other organisms.

4. What factors (abiotic and biotic) might threaten the survival of the woylie?

5. Describe the conservation measures taken that helped to increase the woylie population from the 1970s to 1996.

6. Describe three measures that have been taken to understand the decline of the woylie population since 1996.

7. Name two possible causes for the decline of the woylie since 1996.

8. Why should we try to save the woylie?

Further research on woylies. Enter ‘woylie population' into a search engine to access other information.

9. What has happened to the woylie population since the article was written?

10. What conservation measures have been established and how effective have they been?

11. What is the future outlook for the woylie population?

You will be asked to answer questions in-class based on your research. These questions will allow you to show your understanding of population dynamics in woylie populations but will not be exactly the same questions that you have prepared. You may bring a single sided hand-written A4 sheet of notes to complete the in-class questions.

In-class questions for Task 3: Extended response

Use your knowledge of population dynamics and your research into woylie population changes to answer the following questions.

Question 1 (4 marks)

Describe **four (4)** factors that could affect the population size and distribution of woylies.

Question 2 (4 marks)

Explain how **two (2)** activities carried out by woylies help to keep the woodlands healthy and productive.

Question 3 (12 marks)

The following graph shows the number of woylies captured at eight different sites in the southwest of WA.

The graph shows the number of woylies captured at eight different sites in the southwest of WA before the introduction of foxes in 1977 and the effect of different baiting regimes on woylie populations.

[Graph from: Wayne, A et al. (2008). *Woylie trap success rates in Perup*. Retrieved 2008 from Science division. Department of Conservation and Environment]

(a) Describe the trend in capture rates of woylies between 1974 and 1996. Use data to support your answer. (2 marks)

(b) Suggest **two (2)** reasons for this trend. (2 marks)

(c) Numerous hypotheses have been suggested by scientists to account for the decline in capture rates from 2001–2003. Some of these hypotheses have been discounted by evidence collected by the scientists.

(i) Explain how **two (2)** hypotheses have been discounted based on the evidence provided.

(2 marks)

(ii) Explain **two (2)** hypotheses that are still being considered by scientists. (2 marks)

(iii) Which hypothesis is considered the most likely cause for the decline in the population of woylies? Explain why. (2 marks)

(d) Suggest **two (2)** reasons for the variation between the sites when the populations began to decline. (2 marks)

Question 4 (4 marks)

Describe **two (2)** conservation measures that are effective in increasing the woylie population since 2008.

Question 5 (3 marks)

Propose a future outlook for the woylie population.

Marking key for sample assessment Task 3 — Unit 1

|  |  |
| --- | --- |
| Description | Marks |
| **1. Describe four (4)** **factors that could affect the population size and distribution of woylies.** | **/4** |
| Predators may limit or reduce woylie numbers | 1 |
| Resources such as plant material for cover and nesting, food sources | 1 |
| Disease such as parasites that can weaken individuals | 1 |
| Climate, extreme weather events (drought, flood, fire) | 1 |
| **2. Explain how two (2)** **activities carried out by woylies help to keep the woodlands healthy and productive.** | **/4** |
| By feeding on plants and fungi, it helps disperse these throughout the ecosystem  Trees and plants rely on some types of fungi to help them to gain nutrients | 1–2 |
| Digging for food  Buries leaf litter, reducing fire risk and helping with nutrient recycling for plants to grow | 1–2 |
| **3(a) Describe the trend in capture rates of woylies between 1974 and 1996.  Use data to support your answer.** | **/2** |
| Capture rates have increased  From 10% or less to a range of between 40–60% | 1–2 |
| **3(b) Suggest two (2)** **reasons for this trend.** | **/2** |
| Any two of the following:   * Resources, e.g. food availability increased * fox-baiting programs have reduced the number of predators * translocations of woylies – reintroductions and establishment of new populations | 1–2 |
| **3(c)(i) Explain how two (2)** **hypotheses have been discounted based on the evidence provided.** | **/2** |
| No significant loss/change of habitat (nor food resources) | 1 |
| Fire history is not related to the declines (nor human interference) | 1 |
| **3(c)(ii) Explain two (2)** **hypotheses that are still being considered by scientists.** | **/2** |
| Disease: parasites have been shown to cause population decline in other species | 1 |
| Predators: either made more vulnerable by other factors (e.g. disease) or increased numbers of predators | 1 |
| **3(c)(iii) Which hypothesis is considered the most likely cause for the decline in the population of woylies? Explain why.** | **/2** |
| Disease | 1 |
| Two parasites have been linked to woylie deaths | 1 |
| **3(d) Suggest two (2)** **reasons for the variation between the sites when the populations began to decline.** | **/2** |
| Any two of the following:   * disease may spread in one population before it reaches another * there may be different numbers of predators in these populations * different habitat quality (i.e. carrying capacity), e.g. differences in available food and shelter | 1–2 |
| **4. Describe two (2) conservation measures that are effective in increasing the woylie population since 2008.** | **/4** |
| Any two of the following:   * habitat restoration * restoring natural habitats to provide woylies with food and shelter   or   * predator control * managing predator populations, especially foxes and feral cats   or   * captive breeding programs * have been implemented to increase the number of woylies in captivity with the goal of reintroducing them into the wild   or   * monitoring and research * are important for understanding woylie behaviour, health and population dynamics | 1–4 |
| **5. Propose a future outlook for the woylie population.** | **/3** |
| Any three of the following:   * some populations have increased in numbers * gradual recovery over time * continue to face significant challenges * habitat loss and predation still a threat * require continuing conservation efforts to survive | 1–3 |
| **Total marks** | **/27** |

Sample assessment task

Biology – ATAR Year 11

Task 7 – Unit 2

**Assessment type** Test

**Conditions** Time allowed for the task: 50 minutes in class under invigilated conditions

**Task weighting** 6% of the school mark for this pair of units

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**Multicellular organisms**

Section One: Multiple-choice (10 marks)

Answer all questions on the separate multiple-choice answer sheet provided. For each question, shade the box to indicate your answer.

1. Which of the following is a logical hierarchy of organisation?

(a) Tissues, cells, systems, organs

(b) Tissues, organs, systems, cells

(c) Cells, tissues, organs, systems

(d) Cells, tissues, systems, organs

2. The ethical handling of animals in biology is governed by three principles, often referred to as the ‘3Rs’. The principles are

(a) replace, reduce and refine.

(b) replace, reduce and restrain.

(c) recycle, reduce and refine.

(d) recycle, reduce and restrain.

3. The type of gas exchange system used by an organism is dependent on

(a) the size of the organism only.

(b) the size of the organism and the environmental medium.

(c) the shape of the organism only.

(d) the shape of the organism and the environmental medium.

4. Gas exchange in insects occurs through the

(a) spiracles.

(b) lungs.

(c) skin.

(d) gills.

5. Which organ in mammals is primarily responsible for filtering blood and forming urine?

(a) Liver

(b) Heart

(c) Kidney

(d) Lungs

6. Which of the following statements about nitrogenous waste is correct?

(a) Ammonia is more toxic than uric acid.

(b) Uric acid is more soluble in water than urea.

(c) It takes more energy to produce urea than uric acid.

(d) It takes more water to excrete urea than ammonia.

7. Birds excrete nitrogenous waste as

(a) ammonia and urea.

(b) uric acid.

(c) urea.

(d) urea and uric acid.

8. The main difference in the circulatory systems of vertebrates is in the structure of the heart. Fish have a

(a) three-chambered heart in a double circulatory system.

(b) three-chambered heart in a single circulatory system.

(c) two-chambered heart in a double circulatory system.

(d) two-chambered heart in a single circulatory system.

9. Mammals are said to have a 'double circulatory system'. This means that

(a) the blood vessels are paired, e.g. an artery to each leg.

(b) there are two types of blood vessel attached to every organ, e.g. an artery and a vein.

(c) the blood circulates twice as quickly.

(d) there is one system from the heart to the lungs and back and another system to and from the rest of the body.

10. The circulatory system in insects is

(a) an open system in which the blood is pumped at low pressure into the main body cavity where it slowly flows about the cells.

(b) an open system in which the blood remains within tubes and materials diffuse in and out of the blood through the walls of the tubes.

(c) a closed system in which the blood is pumped at low pressure into the main body cavity where it slowly flows about the cells.

(d) a closed system in which the blood remains within tubes and materials diffuse in and out of the blood through the walls of the tubes.

Section Two: Short answer (25 marks)

Question 11 (8 marks)

(a) Describe the main structural differences between an open and a closed circulatory system.  
 (4 marks)

(b) Explain why a closed circulatory system is advantageous for larger and more active animals.  
 (4 marks)

Question 12 (8 marks)

Vertebrates excrete three forms of nitrogenous waste.

(a) Explain why ammonia, which is highly toxic, is a common form of nitrogenous waste in aquatic animals. (2 marks)

(b) Compare the excretion of urea and uric acid in terms of toxicity, energy expenditure and water conservation. (6 marks)

Question 13 (9 marks)

Vascular plants contain structures on the epidermal surface of their leaves as shown in the diagram below. These structures are used for gas exchange.



B

A

Epidermal cell

(a) Name the parts of the diagram labelled as A and B. (2 marks)

A

B

(b) State the three main gases that are exchanged through structure A. (3 marks)

(c) Describe how gas exchange occurs through structure A. (4 marks)

Section Three: Extended answer (10 marks)

Describe how mammals exchange gases with the external environment, including the nature of the gas exchange surface and the processes involved.

Marking key for sample assessment Task 11 — Unit 2

Section One: Multiple-choice (10 marks)

|  |  |
| --- | --- |
| **Answer** | **Marks** |
| 1. C | 1 |
| 2. A | 1 |
| 3. B | 1 |
| 4. A | 1 |
| 5. C | 1 |
| 6. A | 1 |
| 7. B | 1 |
| 8. D | 1 |
| 9. D | 1 |
| 10. A | 1 |
| **Total** | **10** |

Section Two: Short answer

Question 11 (8 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 1. **Describe the main structural differences between an open and a closed circulatory system.** | **/4** |
| Open – blood/haemolymph is only sometimes contained in vessels or blood/haemolymph can be free in body cavity  Closed – blood always contained in vessels | 1–2 |
| Open – organs are bathed in blood/haemolymph  Closed – capillaries/blood vessels surround the organs | 1–2 |
| Accept other relevant answer |  |
| 1. **Explain why a closed circulatory system is advantageous for larger and more active animals.** | **/4** |
| Allows for higher blood pressure  Allows for more efficient transport of nutrients, gases and waste products  Supports higher metabolic rates/activity levels  Blood reaches all body tissues rapidly and efficiently | 1–4 |
| **Total marks** | **/8** |

Question 12 (8 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 1. **Explain why ammonia, which is highly toxic, is a common form of nitrogenous waste in aquatic animals.** | **/2** |
| Ammonia easily diffuses from body  Abundant water available to dilute ammonia | 1–2 |
| 1. **Compare the excretion of urea and uric acid in terms of toxicity, energy expenditure and water conservation.** | **/6** |
| Toxicity   * urea – less toxic than ammonia/low toxicity * uric acid – non-toxic   Energy expenditure   * urea – more than ammonia/less than uric acid * uric acid – more energy to produce than urea or high energy cost   Water conservation   * urea – excreted in a concentrated form with moderate water loss * uric acid – excreted as a solid or semi-solid paste with little water loss | 1–6 |
| **Total marks** | **/8** |

Question 13 (9 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 1. **Name the parts of the diagram labelled as A and B.** | **/2** |
| A – stomatal pore/stomata/stoma  B – guard cell | 1–2 |
| 1. **State the three main gases that are exchanged through structure A.** | **/3** |
| Carbon dioxide  Oxygen  Water vapour | 1–3 |
| 1. **Describe how gas exchange occurs through structure A.** | **/4** |
| Requires stomatal pore/stomata/stoma to be open  Diffusion  Area of high concentration to low concentration  Carbon dioxide low concentration in leaf (as used in photosynthesis) net movement of carbon dioxide from outside leaf to inside  **or**  Oxygen high concentration in leaf (byproduct of photosynthesis), net movement of oxygen from inside leaf to outside leaf  **or**  Water vapour high concentration in leaf, net movement of water vapour from inside leaf to outside leaf | 1–4 |
| **Total marks** | **/9** |

Section Three: Extended answer (10 marks)

Describe how mammals exchange gases with the external environment, including the nature of the gas exchange surface and the processes involved.

|  |  |
| --- | --- |
| **Description** | **Marks** |
| **Mammals exchange gases with the external environment:** | **/3** |
| Any 3 of   * Gas exchange occurs in the lungs/alveoli/air-sacs * Carbon dioxide is exhaled/breathed out as a waste product * Oxygen is inhaled/breathed in – a requirement to survive * Gases move to/from mouth (or nose) to/from trachea to/from bronchi/bronchioles to/from air-sacs/alveoli (then converse) | 1–3 |
| **Nature of the gas exchange surface** | **/4** |
| Moist  Very thin  Large/high surface area to volume ratio  Lots of blood vessels/capillaries | 1–4 |
| **Processes** | **/3** |
| The gases must be dissolved (in the moisture) to move between lungs and blood  Gases move between the lungs and the blood via diffusion/from a higher concentration to a lower concentration/along a concentration gradient  Movement of blood maintains a concentration gradient (between gas exchange surface/lungs/alveoli/air-sacs and the blood) | 1–3 |
| **Total marks** | **/10** |

Acknowledgements

**Sample assessment task 3 – Unit 1**

**Question 3** Graph from: Wayne, A et al. (2008). Woylie trap success rates in Perup. Retrieved 2008 from Science division. Department of Conservation and Environment <www.dec.wa.gov.au/component/docman/doc_download/3358/1>