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

SAMPLE ASSESSMENT TASKS

BIOLOGY
ATAR YEAR 12

Sample assessment task

Biology – ATAR Year 12

Task 8 – Unit 4

Assessment type: Test

Conditions
Time for the task: 40 minutes

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

Homeostasis **(50 marks)**

Section A – Multiple-choice questions **(5 marks)**

Choose the best answer from those given and answer on the Answer sheet.

1. Which of the following would reduce the diffusion rate of carbon dioxide into a spongy mesophyll cell of a eucalypt leaf?

   (a) the stomata opening during a rainstorm around midday
   (b) the intensity of sunlight changing with the movement of the sun from sunrise to midday
   (c) ringbarking of the tree on which the leaf is located
   (d) warm dry air blowing over the leaf, causing water loss

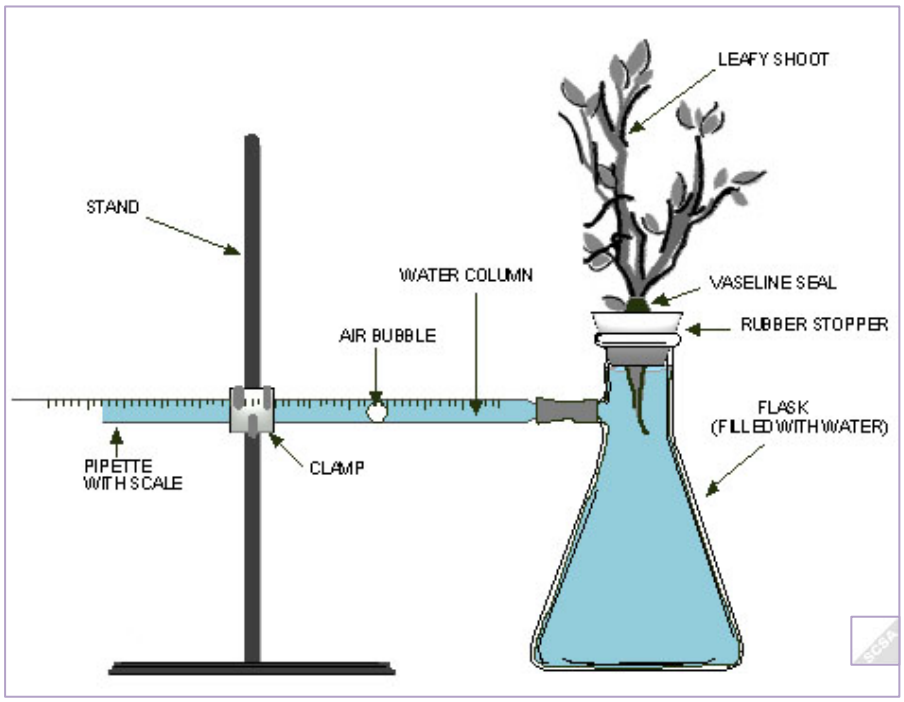
2. When a tree is ringbarked, a complete strip of bark, including the phloem, is removed from the circumference of the trunk.

   The tree dies because

   (a) the trunk is weakened.
   (b) the roots are starved of organic compounds.
   (c) the leaves are starved of water and ions.
   (d) water evaporates from the wound, causing dehydration.

3. A potometer, a simple instrument used to measure transpiration rate in plants, is illustrated in Diagram 1.

Diagram 1



When setting up the equipment, care has to be taken to keep a continuous (unbroken) water column from the pipette to the stem of the plant. This is:

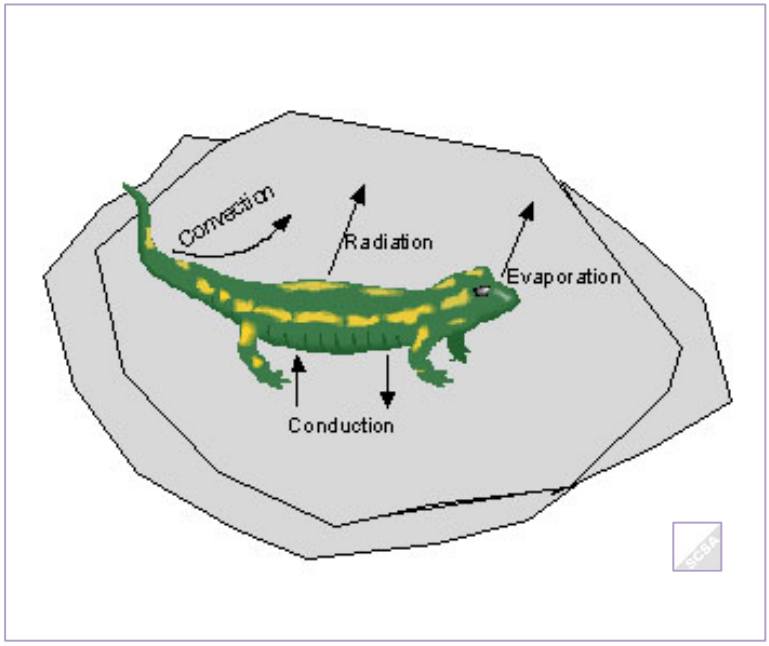
(a) so that no bubbles will form in the xylem vessels to block the flow of water to the leaves.
(b) to make sure that the plant has a continuous supply of nutrients, and will therefore not die during the experiment.
(c) to allow the water in the plant to drain into the flask, causing the measuring bubble in the pipette to move to the left.
(d) to show that the volume of water removed from the flask will remain constant, therefore measurements are easily read from the bubble in the pipette.

4. Some of the leaves of a broad bean seedling were covered on both sides with wax. Radioactive mineral ions were then supplied to the roots. Soon afterwards, all the leaves were tested for radioactivity. It could be expected that radioactivity would be detected

(a) only in leaves not covered with wax.
(b) only in waxed leaves.
(c) in all of the leaves.
(d) in none of the leaves.

5. Diagram 2 illustrates a lizard resting on a rock on a hot day in summer.

Diagram 2



Which of the following heat transfer processes, affecting the animal, would occur?

	Heat gain by the animal	Heat loss by the animal
(a)	evaporation	conduction
(b)	conduction	evaporation
(c)	convection	radiation
(d)	evaporation	conduction

See Answer sheet for Section B and C questions.

Homeostasis

ANSWER SHEET **Name**_____

Section A – Multiple-choice answers **(5 marks)**

1	a	b	c	d
2	a	b	c	d
3	a	b	c	d
4	a	b	c	d
5	a	b	c	d

Section B – Short answers **(25 marks)**

Question 1

A halophyte is a plant that can survive in a saline environment.

(a) Describe **two** structural adaptations of halophytes and explain how each adaptation allows the plant to survive. (4 marks)

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(b) Some halophytes are salt accumulators. Explain how the accumulation of salts allows the halophyte to maintain water balance. (4 marks)

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(c) Xerophytes are plants that are adapted for growing in dry habitats. Describe **four** adaptations that help to reduce transpiration. (4 marks)

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Question 2

The following question's focus is the Desert Scorpion. The Desert Scorpion, which is found in Arizona (United States of America), was studied by Neil Hadley from the Arizona State University. Scorpions are classified into the phylum Arthropoda.

(a) Describe the temperature and water conditions that you would expect to be experienced by a Desert Scorpion throughout its lifetime. (2 marks)

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(b) Is a scorpion an endotherm or an ectotherm? When answering this question, take care to provide a definition of this term. (2 marks)

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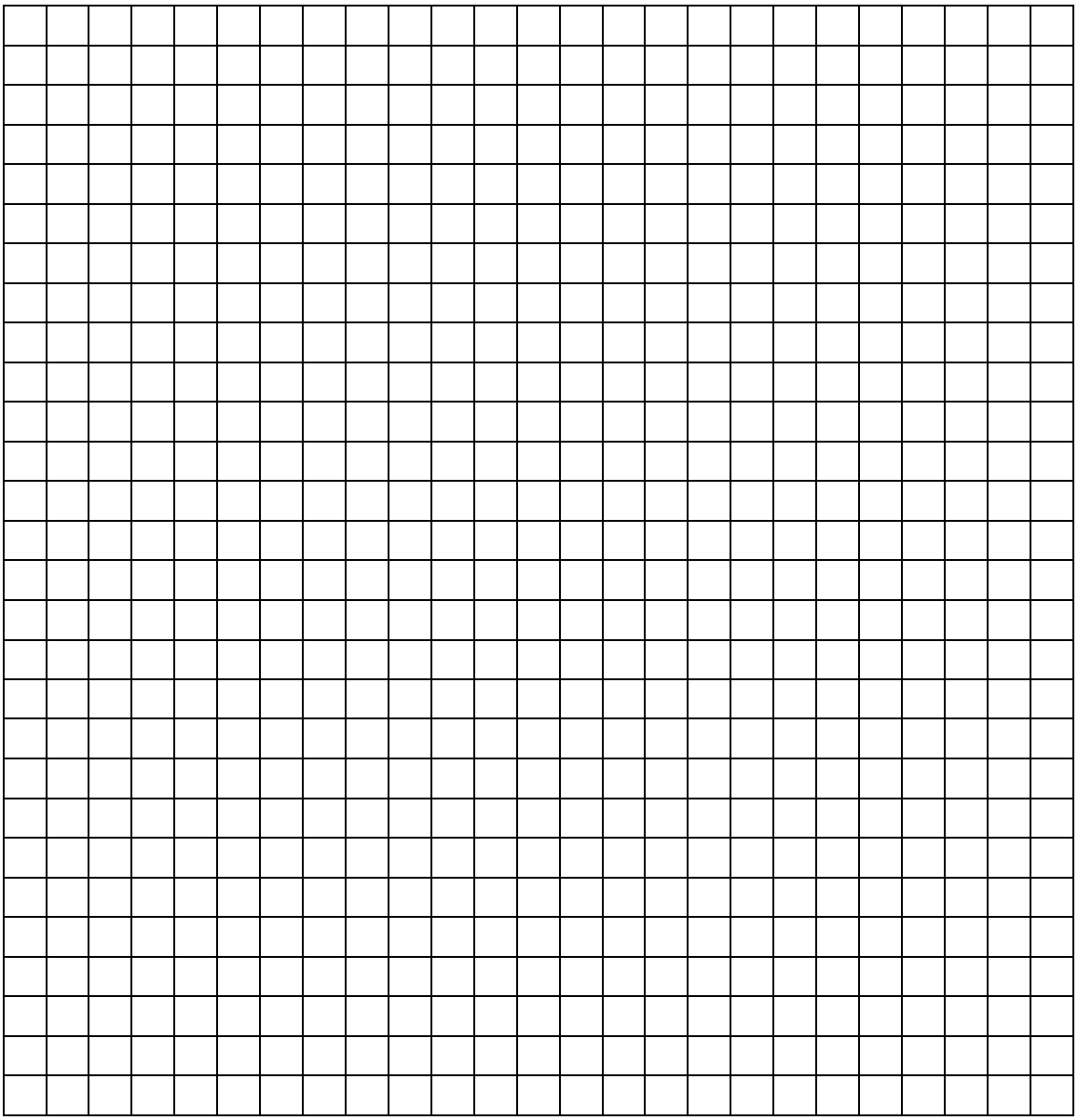
Hadley researched the total water-loss rates for live scorpions in dry air at progressively higher temperatures. Mean hourly rates were calculated from weight changes after the scorpions were exposed to six hours at each temperature. All scorpions survived the temperatures, except at 44 °C where approximately 25% mortality occurred after six hours. Data from dead scorpions are included.

Table 1: The relationship between environmental temperature, percentage weight loss and metabolic rate in Desert Scorpions

Temperature (°C)	% weight lost/hour	Microlitres of O_2 consumed/g/hour
25	0.021	70
30	0.028	82
35	0.035	101
38	0.040	not recorded
40	0.137	140
43	0.701	253
44	1.302	498

(c) Graph the data shown in the first two columns. (4 marks)



(d) State the relationship between environmental temperature and metabolic rate for the Desert Scorpion. Provide an explanation for this. (2 marks)

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(e) Using your knowledge of temperature regulation, predict the most likely way for a Desert Scorpion to maintain its body temperature when its natural environment gets very hot. Provide a supporting explanation as to why this is likely. (3 marks)

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Section C – Extended answer **(20 marks)**

Sea birds and aquatic vertebrates demonstrate a variety of ways to cope with the loss and gain of water and salts associated with both saltwater and freshwater environments. Describe behavioural, structural and physiological adaptations demonstrated by organisms to maintain homeostasis in saltwater and freshwater environments. Use named avian, mammalian and fish examples to support your answer.

ACKNOWLEDGEMENTS

Question 2 Text and table adapted from: Hadley, N.F. (1970). Water relations of the Desert Scorpion, *Hadrurus arizonensis*. *Journal of Experimental Biology*, *53*, p. 549.

Marking key for sample assessment task 8 – Unit 4

Section A – Multiple-choice questions

1	d
2	b
3	a
4	a
5	b

Section B – Short answers

Question 1

(a) Describe **two** structural adaptations of halophytes and explain how each adaptation allows the plant to survive.

Description	Marks
Describes two structural adaptations of halophytes	1–2
Explains how each adaptation allows the plant to survive	1–2
Total	**4**
Answer could include, but is not limited to:	
Due to the high level of salt in the environment, plants have difficulty taking in water. Therefore, adaptations relate to water conservation, e.g. • succulent leaves – stores water in the vacuole • thick epidermis – reduces water loss/prevents excessive transpiration • hairs covering the leaves – reduces water loss/reduces evaporation • sunken stomata – reduces water loss/prevents excessive transpiration • fewer stomata – reduces water loss/prevents excessive transpiration	

(b) Some halophytes are salt accumulators. Explain how the accumulation of salts allows the halophyte to maintain water balance.

Description	Marks
• absorption of salts throughout the growing season • increases salt concentration within the tissues • water potential becomes more negative than the soil • uptake of water occurs through osmosis	1–4
Total	**4**

(c) Xerophytes are plants that are adapted for growing in dry habitats. Describe four adaptations that help to reduce transpiration.

Description	Marks
Describes four adaptations that help to reduce transpiration	1–4
Total	**4**
Answer could include, but is not limited to:	
• leaves are reduced in size and surface area to reduce water loss • cuticles are thick to prevent water loss by evaporation • stomata are opened only at night to reduce the amount of water lost by transpiration • reduced number of stomata to reduce transpiration rate • rolled leaves, leaf hairs and stomata sunk in pits to trap moist air, increasing humidity and slowing diffusion of water vapour from the stomata • waxy leaf cuticle which is impermeable to water (preventing evaporation)	

Question 2

(a) Describe the temperature and water conditions that you would expect to be experienced by a Desert Scorpion throughout its lifetime.

Description	Marks
• clearly describes temperature and water conditions experienced by a Desert Scorpion	2
• only describes one of these or describes two in insufficient detail	1
Total	**2**

(b) Is a scorpion an endotherm or an ectotherm? When answering this question, take care to provide a definition of this term.

Description	Marks
• identifies the scorpion as an endotherm or ectotherm and provides a clear definition of the term	2
• identifies the scorpion as an endotherm or ectotherm, without a clear definition	1
Total	**2**

(c) Graph the data shown in the first two columns.

Description	Marks
Selects correct axes	1
Uses appropriate scales	1
Labels axes including units	1
Accurately plots points and joins appropriately	1
Total	**4**

(d) State the relationship between environmental temperature and metabolic rate for the Desert Scorpion. Provide an explanation for this.

Description		Marks
Statement	• clearly states the relationship between environmental temperature and metabolic rate, using correct terminology	2
	• states the relationship between environmental temperature and metabolic rate	1
Total		**2**

(e) Using your knowledge of temperature regulation, predict the most likely way for a Desert Scorpion to maintain its body temperature when its natural environment gets very hot. Provide a supporting explanation as to why this is likely.

Description		Marks
Prediction	• correctly predicts the way in which scorpion maintains body temperature	1
Explanation	• uses science concepts to support answer	2
	• uses general language to support answer	1
Total		**3**

Section C

Sea birds and aquatic vertebrates demonstrate a variety of ways to cope with the loss and gain of water and salts associated with both saltwater and freshwater environments. Describe behavioural, structural and physiological adaptations demonstrated by organisms to maintain homeostasis in saltwater and freshwater environments. Use named avian, mammalian and fish examples to support your answer.

Saltwater environment

Description		Marks
Behavioural adaptations	• uses named saltwater organism • states adaptation • describes adaptation	1–3
Structural adaptations	• uses named saltwater organism • states adaptation • describes adaptation	1–3
Physiological adaptations	• uses named saltwater organism • states adaptation • describes adaptation	1–3
	Total	**9**

Answer could include, but is not limited to:

Behavioural:

- drink large amounts of seawater (bony fish, e.g. snapper)
- drink freshwater, if available (mammals, e.g. seals)

Structural:

- impermeable outer surface, e.g. skin and scales, reduces the surface area across which diffusion can occur (bony fish, e.g. snapper)
- kidney structure to produce concentrated urine (mammals, e.g. seals)

Physiological:

- produce small amounts of urine (bony fish, e.g. snapper)
- produce concentrated urine (mammals, e.g. seals)
- actively excreting salts (bony fish, e.g. snapper; birds, e.g. gulls)
- retain urea in blood (cartilaginous fish/sharks)

Freshwater environment

Description		Marks
Behavioural adaptations	• uses named freshwater organism • states adaptation • describes adaptation	3
Structural adaptations	• uses named freshwater organism • states adaptation • describes adaptation	3
Physiological adaptations	• uses named freshwater organism • states adaptation • describes adaptation	3
	Total	**9**

Answer could include, but is not limited to:

Behavioural:

- rarely drink water (bony fish, e.g. perch)
- drink freshwater, if available (mammals, e.g. dolphins)

Structural:

- impermeable outer surface, e.g. skin and scales, reduces the surface area across which diffusion can occur (bony fish, e.g. perch)
- kidney structure to produce dilute urine (mammals, e.g. dolphins)

Physiological:

- produce large amounts of urine (bony fish, e.g. perch)
- produce dilute urine (mammals, e.g. seals)
- actively absorbing salts (bony fish, e.g. perch; birds, e.g. gulls)

Description		Marks
Use of examples from the three classes	• describes examples across three classes	2
	• describes examples across two classes	1
	Total	**2**

Sample assessment task

Biology – ATAR Year 12

Task 10 – Unit 4

Assessment type: Extended response

Conditions
Period allowed for completion of the task:

- one week to research the task
- one hour in-class validation, consisting of questions based on this research

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

Amphibian chytrid fungus disease **(44 marks)**

Amphibian chytrid fungus disease, also known as chytridiomycosis, is an infectious disease that affects amphibians worldwide. The fungus, *Batrachochytrium dendrobatidis*, is widespread across Australia, including the south-west of Western Australia.

You are to research amphibian chytrid fungus disease, including:

- geographical and temporal distribution
- ecology (e.g. habitat, life cycle)
- pathology (e.g. clinical signs and diagnostic tests)
- impact on amphibians
- management strategies.

Amphibian chytrid fungus disease **(44 marks)**

A decline in amphibian populations and the extinction of a number of species in Australia since the 1970s can be attributed to a number of causes, including an infectious disease caused by the amphibian chytrid fungus, *Batrachochytrium dendrobatidis.*

1. On the map below, shade the major regions in Australia infected by the amphibian chytrid fungus. (4 marks)

2. Many species of amphibians are threatened by the amphibian chytrid fungus, and the common factors appear to be related to their habitat and behaviour. Describe **three** reasons a species may become threatened due to this disease. (3 marks)

3. The life cycle of *Batrachochytrium dendrobatidis* has two distinct stages; a motile zoospore and a sessile sporangium that grows on the skin of amphibians. Resistant resting spores have not been found in this species.
Explain an advantage and a disadvantage of not having a resting stage in the life cycle for this fungus. (4 marks)

4. The clinical signs of chytridiomycosis can be similar to those of other amphibian diseases. They are non-specific and the disease cannot be diagnosed clinically. Diagnostic laboratory tests available to scientists include microscopy (direct examination of skin scrapings and immunoperoxidase) and Polymerase Chain Reaction (PCR).

   (a) State **two** disadvantages of direct examination of skin scrapings. (2 marks)

   (b) State **two** advantages of using immunoperoxidase. (2 marks)

   (c) State **two** advantages of using real-time PCR. (2 marks)

The following information refers to Question 5.

Scientists, K. M. Kriger & J.M. Hero, conducted a study into the seasonality of chytridiomycosis. They sampled a species of frogs, *Litoria wilcoxii,* along a 1 km stretch of the Nerang River in Numinbah Valley, south-east Queensland, Australia. Sampling took place at six-week intervals between April and January.

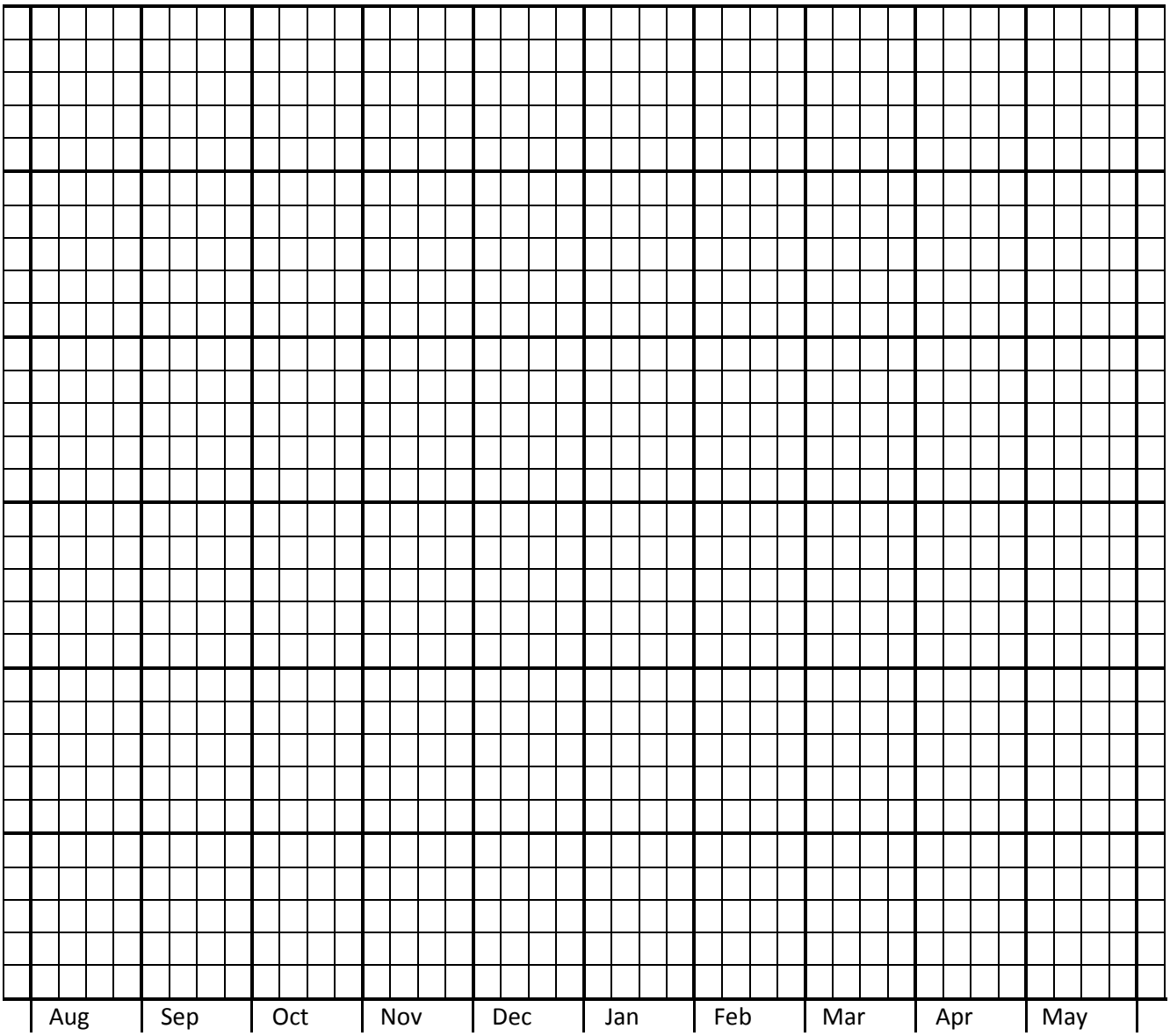
Disease prevalence was calculated by dividing the number of frogs testing positive for the disease by the total number of frogs sampled.

Air temperature at the site was recorded every 90 minutes and the mean of these recordings in the 30 days prior to sampling was used to represent the temperature for that sample.

Prevalence of chytridiomycosis on adult *Litoria wilcoxii* in Numinbah Valley, and mean 30-day air temperature

Season	Sampling date	Sample size (n)	Mean 30-day air temperature (°C)	Prevalence (%)
Winter	4 Aug	2	12.3	50
Spring	8 Sep	26	12.6	38.5
Spring	24 Sept	30	14.7	46.7
Spring	11 Oct	36	15.9	58.3
Spring	3 Nov	30	19.2	46.7
Summer	4 Dec	38	19.5	7.9
Summer	22 Dec	30	20.1	13.3
Summer	14 Jan	32	22.4	12.5
Summer	10 Feb	27	22.2	3.7
Autumn	12 Mar	21	21.0	0
Autumn	13 Apr	11	19.5	0
Autumn	29 Apr	21	18.0	9.5
Autumn	20 May	1	15.8	100

5. (a) Graph the prevalence of chytridiomycosis and mean 30-day air temperature for each of the sampling dates. Use separate scales on the y (vertical) axes for prevalence of chytridiomycosis and 30-day air temperature. (6 marks)



(b) (i) Name the independent variable. (1 mark)

_____

(ii) Name the dependent variable. (1 mark)

_____

(c) (i) State the relationship between prevalence of chytridiomycosis and 30-day air temperature. Use data from the study to support your response. (3 marks)

(ii) In which season/s is the incidence of chytridiomycosis low or almost non-existent? (2 marks)

(d) Prior to this study, many chytridiomycosis field studies relied on opportunistic sampling, involving many variables. The scientists in this study attempted to catch 30 frogs at each sampling session, but winter sample sizes were small due to the difficulty in finding frogs.

Compare the reliability of the results for 4 August with the results for 8 September. Use data to support your answer. (6 marks)

(e) Explain how this information can be used in the scientific research of chytridiomycosis in frog populations. (2 marks)

7. Explain **two** strategies that would help to manage chytridiomycosis in frog populations. (6 marks)

ACKNOWLEDGEMENTS

Question 1 Map from: Martyman. (2007). *File:Australia locator-MJC.png*. Retrieved April, 2015, from http://commons.wikimedia.org/wiki/File:Australia_locator-MJC.png
Used under Creative Commons Attribution-ShareAlike 3.0 Unported licence.

Question 5 Text information from, and table adapted from: Kriger, K.M., & Hero, J.-M. (2007). Large-scale seasonal variation in the prevalence and severity of chytridiomycosis. *Journal of Zoology*, pp. 353–355. [Published by Wiley; © 2006 The Authors]. Retrieved April, 2015,
from www.bio.davidson.edu/people/kabernd/berndcv/lab/website%20(summer%202009)/chytridreswp/Webpage1/Kiger%20and%20Hero-Large-scale%20seasonal%20variation%20in%20the%20prevelance%20and%20severity%20of%20chytridiomycosis%20copy.pdf

Marking key for sample assessment task 10 – Unit 4

A decline in amphibian populations and the extinction of a number of species in Australia since the 1970s can be attributed to a number of causes, including an infectious disease caused by the amphibian chytrid fungus, *Batrachochytrium dendrobatidis.*

1. On the map below, shade the major regions in Australia infected by the amphibian chytrid fungus.

Description	Marks
Shades the following areas: • Eastern Australia (from north Queensland to Melbourne, Victoria) • South West of Western Australia • Adelaide • Tasmania	1–4
Total	**4**
Answer could include, but is not limited to: **(allow some flexibility in areas shaded, provided the area shaded roughly matches the map below)**	
	

2. Many species of amphibians are threatened by the amphibian chytrid fungus, and the common factors appear to be related to their habitat and behaviour. Describe three reasons a species may become threatened due to this disease.

Description	Marks
Any three of the following: • occupy restricted geographic range • small population size • habitat suited to growth of the fungus, e.g. temperature, rainfall • habitat suited to spread of zoospores, e.g. streams/flowing water • low clutch size • any other appropriate reason	1–3
Total	**3**

3. The life cycle of *Batrachochytrium dendrobatidis* has two distinct stages, a motile zoospore and a sessile sporangium that grows on the skin of amphibians. Resistant resting spores have not been found in this species.
Explain an advantage and a disadvantage of not having a resting stage in the life cycle for this fungus.

Description		Marks
Advantage	• Rapid growth/short life cycle • Allows the pathogen to establish quickly in a new area	1–2
Disadvantage	• Adverse conditions • Pathogen may not survive	1–2
	Total	**4**

4. The clinical signs of chytridiomycosis can be similar to those of other amphibian diseases. They are non-specific and the disease cannot be diagnosed clinically. Diagnostic laboratory tests available to scientists include microscopy (direct examination of skin scrapings and immunoperoxidase) and Polymerase Chain Reaction (PCR).

(a) State **two** disadvantages of direct examination of skin scrapings.

Description	Marks
Only small samples of skin can be used without sacrificing the animal	1
Reduced chance of detection in healthy frogs with a light infection/infection of a population may not be detected even though the disease is present	1
Total	**2**

(b) State **two** advantages of using immunoperoxidase.

Description	Marks
Able to detect light infections of the disease	1
Toe clippings can be used/does not require removal of the toe or destruction of the amphibian	1
Total	**2**

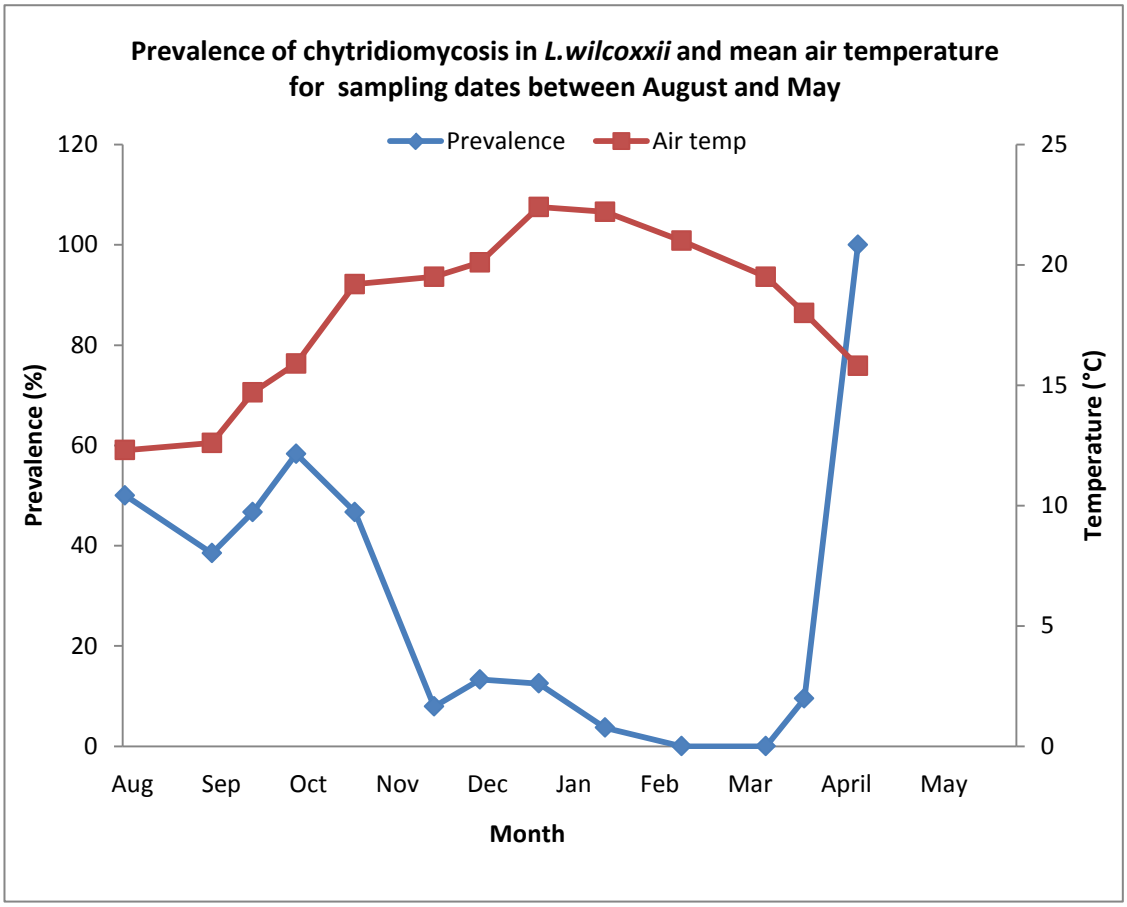
(c) State **two** advantages of using real-time PCR.

Description	Marks
Any two of the following: • highly sensitive/able to detect light infections of the disease/detects zoospores in solution • toe clippings can be used/does not require removal of the toe or destruction of the amphibian • saline solution in which frogs have been immersed can be reliably tested • quantitative/indicates level of infection	1–2
Total	**2**

5. (a) Graph the prevalence of chytridiomycosis and 30-day air temperature for each of the sampling dates. Use separate scales on the y (vertical) axes for prevalence of chytridiomycosis and 30-day air temperature.

Description	Marks
Selects correct axes	1
Uses appropriate scales	1
Labels axes, including units	1
Uses line graphs/identifies each line using a key or legend	1
Accurately plots points and joins appropriately	1
Uses an appropriate title, showing the relationships between the variables	1
Total	**6**

Answer could include, but is not limited to:



(b) (i) Name the independent variable.

Description	Marks
Air temperature for the 30 days prior to sampling	1
Total	**1**

(ii) Name the dependent variable.

Description	Marks
Prevalence (%) of chytriomycosis	1
Total	**1**

(c) (i) State the relationship between prevalence of chytridiomycosis and 30-day air temperature. Use data from the study to support your response.

Description	Marks
States the relationship between prevalence of chytridiomycosis and 30-day air temperature	1
Quotes relevant data to support description of the relationship between prevalence of chytridiomycosis and 30-day air temperature	1–2
Total	**3**
Answer could include, but is not limited to:	
• As air temperature rises, the prevalence of chytridiomycosis decreases • Prevalence of disease was higher at temperatures between 12.3 °C and 19.4 °C • Above 19.4 °C, the prevalence of disease decreased significantly	

(ii) In which season/s is the incidence of chytridiomycosis low or almost non-existent?

Description	Marks
Summer	1
Early autumn/autumn	1
Total	**2**

(d) Prior to this study, many chytridiomycosis field studies relied on opportunistic sampling, involving many variables. The scientists in this study attempted to catch 30 frogs at each sampling session, but winter sample sizes were small due to the difficulty in finding frogs.

Compare the reliability of the results for 4 August with the results for 8 September. Use data to support your answer.

Description	Marks
• More frogs were sampled in September than August • September result is more reliable due to larger sample size	1–2
• In August, only two frogs were sampled, of which one was infected/50% • This may not represent the prevalence of infection in the population • In September, 26 frogs were sampled of which 10 were infected/38.5% • More likely to represent the prevalence of infection in the population	1–4
Total	**6**

(e) Explain how this information can be used in the scientific research of chytridiomycosis in frog populations.

Description	Marks
Clearly explains how this information can be used in the scientific research of chytridiomycosis in frog populations.	1–2
Total	**2**

Answer could include, but is not limited to:

- There is no point in conducting sampling between December and March
- Prevalence of disease is low and would not be indicative of whether disease is present
- Results of past surveys that have taken place between December and March may have underestimated the potential prevalence of the disease or failed to detect the disease

7. Explain **two** strategies that would help to manage chytridiomycosis in frog populations.

Description	Marks
Any two of the following, strategy (1 mark), explanation (1–2 marks): • national survey • captive breeding and restocking programs • research and monitoring • quarantine • disease control standards • community education	1–3 1–3
Total	**6**

Answer could include, but is not limited to:

National survey

- Determine the distribution of the chytrid fungus and fungus-free areas/identify affected amphibian species
- Allow management strategies to be implemented to prevent the spread of the disease/provide a coordinated response to outbreaks/develop an action plan

Captive breeding and restocking programs

- Restock species that are under severe threat from infection
- Use captive-bred stock free of disease
- Standardised techniques and regulations

Research and monitoring

- Monitor threatened species of amphibians to determine changes in distribution and abundance
- Develop diagnostic tools, e.g. trial PCR in the field, determine whether to test tadpoles or adult frogs, research biology of the chytrid fungus, develop survey protocols
- Research into the biology of *B. dendrobatidis,* e.g. limiting factors in the environment, relationship between zoospores and prevalence of disease, spread of disease, vectors, eradication
- Research pathogenesis of chytridiomycosis, including host and environmental factors/investigate surviving populations for evidence of resistance,
- Assess effectiveness of management strategies, e.g. hygiene, whether populations can be reinfected, restocking programs

Quarantine

- Restrict movement into disease-free areas
- Management to prevent accidental introduction of the amphibian chytrid (research, zoos, agricultural produce, pet stores, plants, water)

Answer could include, but is not limited to:
Disease control standards • Movement of amphibians for any reason • Release of amphibians into the wild • Hygiene within facilities dealing with amphibians • Field hygiene • Accreditation **Communication** • Share information between agencies • Educate community targeting particular groups (pet trade, researchers, schools, wildlife carers, recreational water users, tourists) • Signage in parks, reserves and other areas that are infected

ACKNOWLEDGEMENTS

Question 5(a) Graph data from: Kriger, K.M., & Hero, J.-M. (2007). Large-scale seasonal variation in the prevalence and severity of chytridiomycosis. *Journal of Zoology*, pp. 353–355. Retrieved April, 2015, from www.bio.davidson.edu/people/kabernd/berndcv/lab/website%20(summer%2009)/chytridreswp/Webpage1/Kiger%20and%20Hero-Large-scale%20seasonal%20variation%20in%20the%20prevelance%20and%20severity%20of%20chytridiomycosis%20copy.pdf

Sample assessment task

Biology – ATAR Year 12

Task 4 – Unit 3

Assessment type: Science Inquiry

Conditions
Period allowed for completion of the task: one week

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

Changing a gene pool **(40 marks)**

Your task in this investigation is to demonstrate changes in a gene pool due to different selection pressures. Develop a simulation game with **two** different sets of rules to demonstrate how a single gene pool can produce two genetically different populations. For example, you could have one set of game cards with two different sets of playing rules. You can use beads, cards or similar objects to represent individuals in your populations.

Ask others to conduct the simulations and record the changes that occur with each generation.

Write a scientific report on your findings. Include the following:

- simulation game rules (12 marks)
  - the set of rules for each simulation game
  - conditions for testing the game, e.g. number of times played
- data collection (8 marks)
  - an appropriate record of data
  - an appropriate representation of data
- discussion (10 marks)
  - clear statement of the results of the simulations
  - scientific explanations for each set of results
- evaluation (4 marks)
  - problems arising from using the rules for each simulation
  - any modification required during the simulations
- conclusion (6 marks)
  - evidence from real populations that supports your simulation data.

Marking key for sample assessment task 4 – Unit 3

Simulation game rules

Description	Marks
• provides suitable variation for the initial population (initial population is the same for each simulation)	1
• clearly outlines the selection pressures for each simulation	1–2
• clearly outlines the fate of selected organisms for each set of instructions, e.g. die, don't breed, reduced breeding, have more offspring, produce only male offspring, have two litters per year	1–2
• clearly outlines the death rules for each simulation, e.g. all parents die after one year, females live for two years	1–2
• clearly outlines the reproduction rules for each simulation	1–2
• uses numbers that are manageable (numbers for the initial population are the same for each simulation)	1
• uses rules that clearly relate to selection for each simulation	1–2
Total	**12**

Data collection

Description	Marks
• records data in tables with appropriate headings for each simulation	1–2
• calculates averages for each simulation	1–2
• graphs data ▪ uses appropriate scales ▪ graphs data from each simulation on the same graph ▪ accurately plots data for simulation 1 ▪ accurately plots data for simulation 2	1–4
Total	**8**

Discussion

Description	Marks
• clearly states the results for simulation 1, including ▪ statement of change from the initial gene pool ▪ relates to the number of generations ▪ relates to the severity of the selection pressure	1–3
• clearly states the results for simulation 2, including ▪ statement of change from the initial gene pool ▪ relates to the number of generations ▪ relates to the severity of the selection pressure	1–3
• explains the effect of different selection pressures for simulation 1	1–2
• explains the effect of different selection pressures for simulation 2	1–2
Total	**10**

Evaluation

Description	Marks
• states problems arising from the rules for simulation 1 • describes how the problems were solved	1–2
• states problems arising from the rules for simulation 2 • describes how the problems were solved	1–2
Total	**4**

Conclusion

Description	Marks
• states how each simulation demonstrates changes in a gene pool due to different selection pressures	1–2
• clearly outlines evidence to support data from real population cases, using a named example for simulation 1	2
• lists a real population example for simulation 1	1
• clearly outlines evidence to support data from real population cases, using a named example for simulation 2	2
• lists a real population example for simulation 2	1
Total	**6**