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

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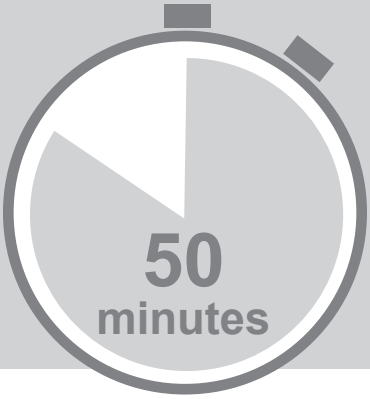
Integrated Science
General course

Externally set task 2018



DO NOT WRITE IN THIS BOX

Student number: In figures

In words

Before starting this task check that you have:

- black or blue pen, 2B pencils
- sharpener
- eraser
- highlighters
- correction fluid/tape
- ruler
- a calculator of the type used in class assessments.

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Ref: 17-043
ISCGT
2018/12127

Total time for the task: 50 minutes
Total marks: 42 marks
Weighting: 15% of the school mark

Question 1 **(6 marks)**

The following two diagrams represent biotic relationships within a farm ecosystem.

Diagram A

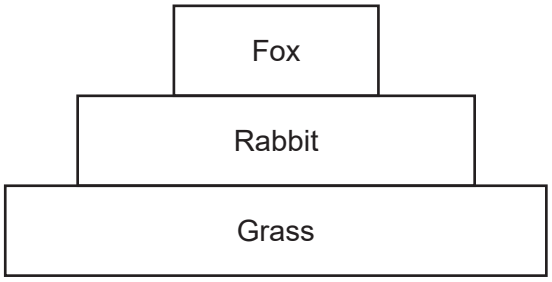
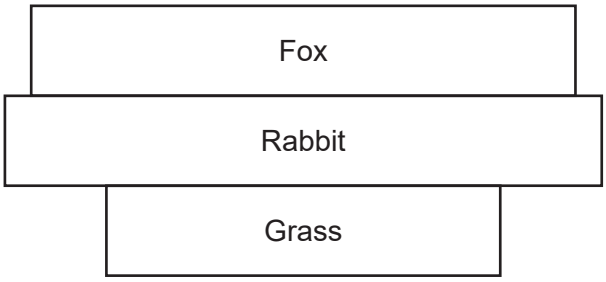


Diagram B



(a) Which diagram, A or B, **best** represents the biomass relationship between the organisms within a farm ecosystem? (1 mark)

Diagram: _____

(b) Explain your choice in part (a). (3 marks)

(c) In an ecosystem, energy enables all organisms to live. Outline how the primary source of energy is transferred into a food chain. (2 marks)

See next page

Question 2 **(15 marks)**

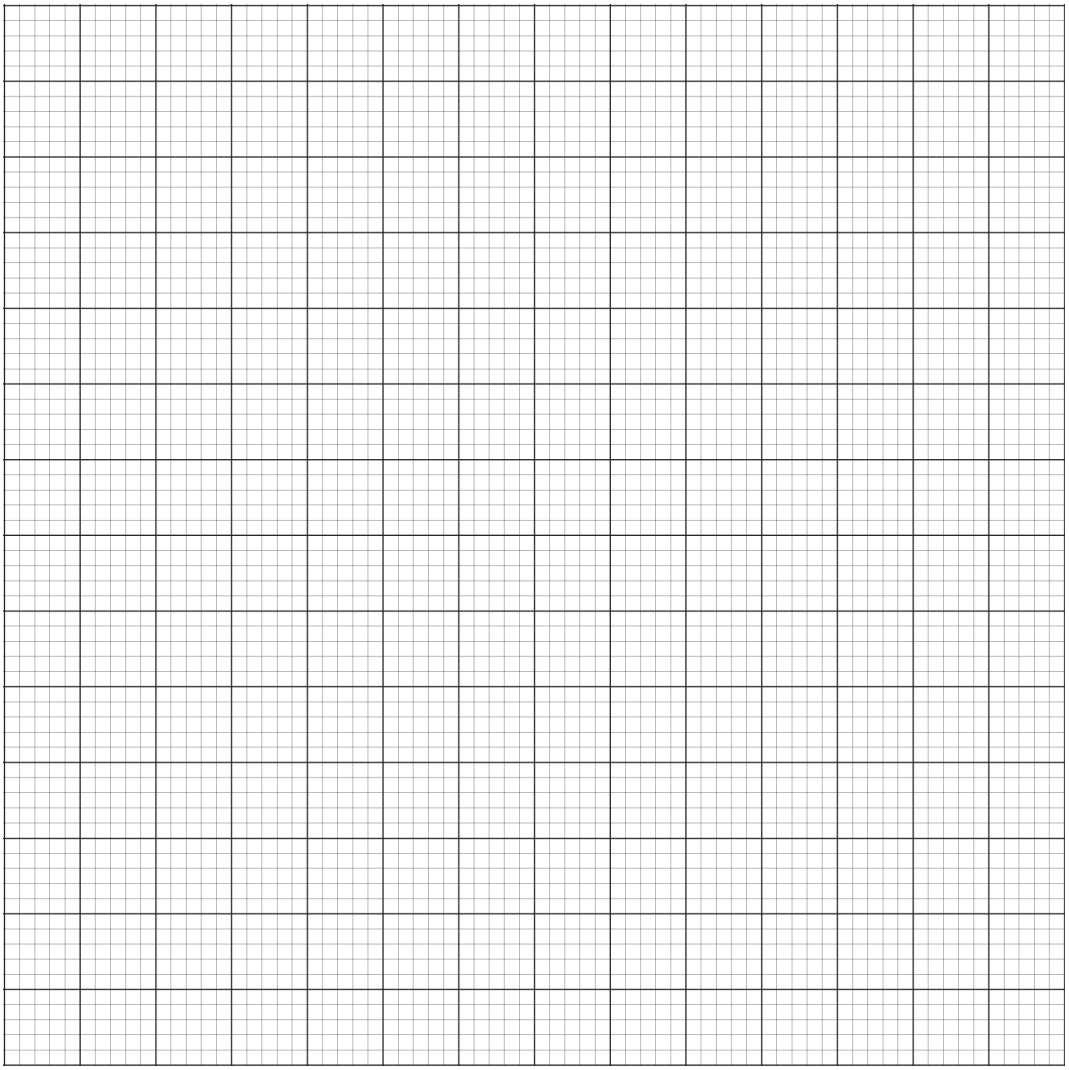
Freshwater river temperatures in Australia can be affected by 'cold water pollution'. This is due to the release of cold waters from damming upstream. The release of cold waters threaten the survival of warm-water aquatic species, such as the silver perch (*Bidyanus bidyanus*). The rapid decline of silver perch along the Murray-Darling Rivers in New South Wales has resulted in the fish being listed as a vulnerable species.

An investigation was undertaken on the silver perch and its tolerance to water temperature. Results are shown in the table below. The table is a combination of a number of experiments showing the tolerance as a percentage of fish you would expect to find at a particular temperature.

Water temperature (°C)	0	5	10	15	20	25	30	35	40
Percentage of silver perch	0	3	5	10	23	28	21	10	0

(a) Draw a graph showing the data in the table above. (5 marks)

Title _____



See next page

(b) For the investigation, identify the dependent variable and the independent variable. (2 marks)

Dependent variable: _____

Independent variable: _____

(c) Use your graph or the table of data to describe the relationship between water temperature and silver perch populations. (3 marks)

_____

_____

_____

_____

_____

_____

(d) Explain **one** way in which water temperature could affect the body functions of fish in environments such as the Murray-Darling Rivers. (3 marks)

_____

_____

_____

_____

_____

_____

(e) Outline **one** sustainability practice that might increase the population of silver perch in the Murray-Darling Rivers. (2 marks)

_____

_____

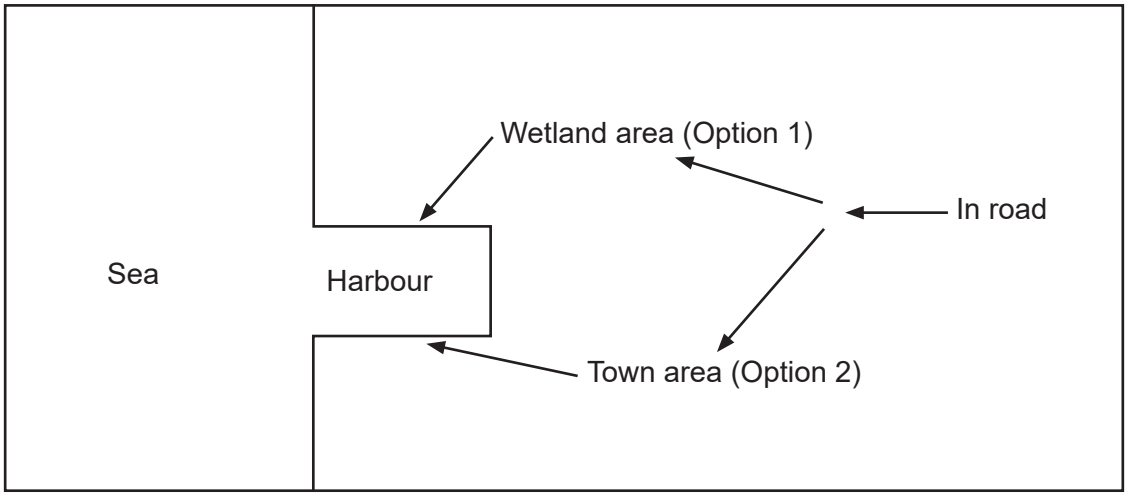
_____

_____

See next page

Question 3 **(7 marks)**

A port authority wants to reduce road congestion into its harbour to increase the productivity of the facility. It wants cargo trucks to get to the harbour from the existing 'in road' more quickly. Below is a 'mud map' of the port.



The authority is considering two options.

Option 1 Build a new road. The planned route of 5 km runs through a large wetland area. This would be a dual carriageway with a number of openings to allow movement of water and native animals. The area also contains some plants and animals that are considered endangered. The estimated cost is $250 million.

Option 2 Upgrade local roads through the adjoining town area to dual carriageways. The estimated cost is $523 million, plus costs associated with compensating local businesses that are affected during the upgrade.

(a) Outline **two** arguments against Option 1, one economic and the other environmental. (2 marks)

Economic: _____

_____

_____

Environmental: _____

_____

_____

See next page

(b) Outline **two** arguments against Option 2, one economic and the other environmental. (2 marks)

Economic: _____

_____

_____

Environmental: _____

_____

_____

(c) Evaluate your arguments for both options and explain which option you would recommend to the port authority. (3 marks)

_____

_____

_____

_____

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_____

See next page

Question 4 **(8 marks)**

(a) State **two** measuring errors that might have occurred in this investigation. (2 marks)

One: _____

Two: _____

(b) Explain what the results indicate about the health of each freshwater pond. (6 marks)

Pond A: _____

_____

_____

_____

_____

Pond B: _____

_____

_____

_____

_____

See next page

Question 5 **(6 marks)**

For each of the following possible climate changes, explain the impact they might have on an Australian biological community.

Increased land temperature and a decline in rainfall:

Increased acidity of seawater:

End of questions

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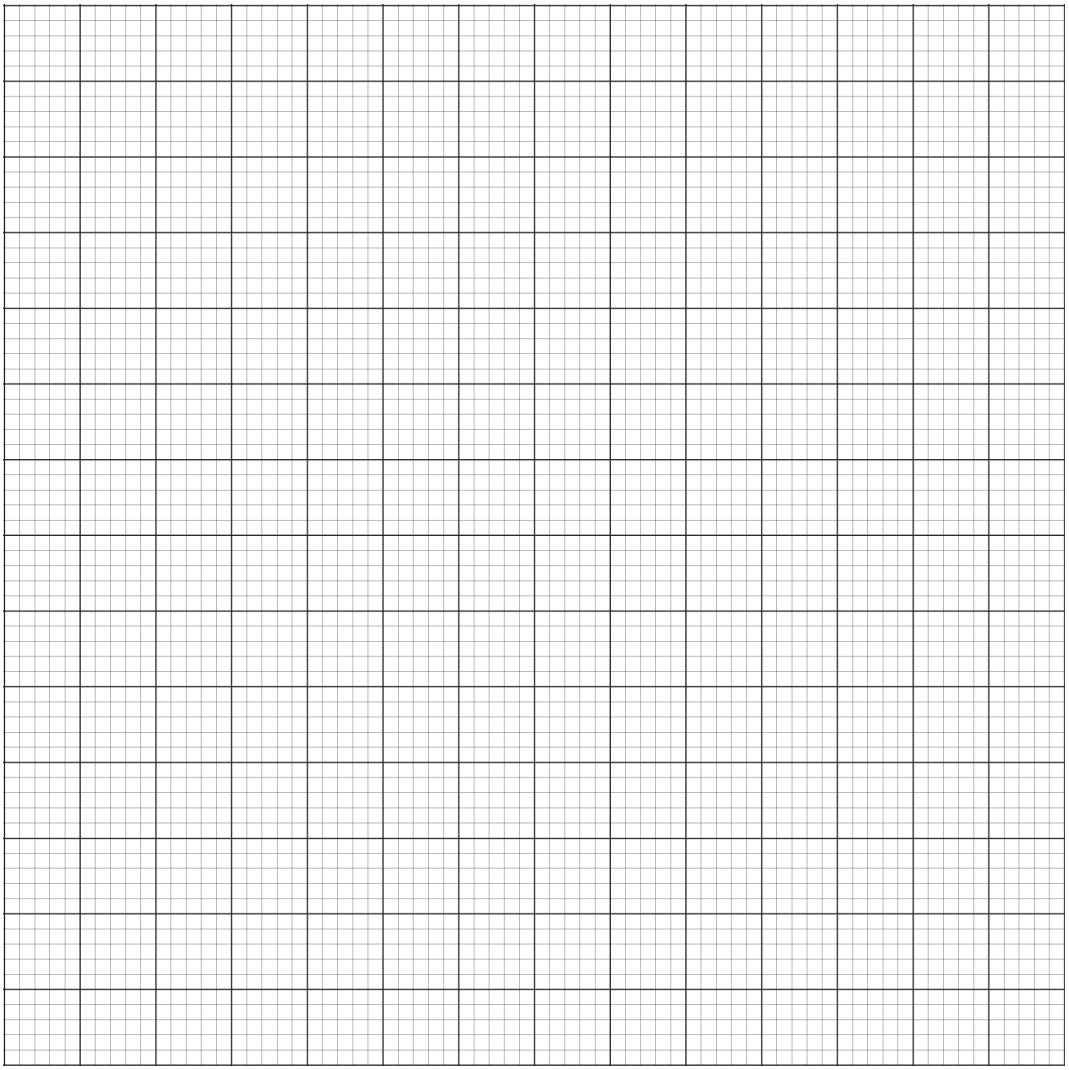
Spare grid

Title _____



ACKNOWLEDGEMENTS

Question 2 Paragraph 1 information from: Department of Primary Industries, Threatened Species Unit. (2006). *Silver perch: NSW recovery plan*. Retrieved October, 2017, from http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/636388/NSW-Silver-Perch-Recovery-Plan.pdf

Question 4 Investigation adapted from: Lofts, G., & Evergreen, M. J. (2014). *Science quest 9 for Victoria* (Australia curriculum edition, p. 184). Milton, Qld: John Wiley & Sons Australia Ltd.

Question 5 Description of climate change from: Australian Academy of Science. (n.d.). *What is climate change?*. Retrieved October, 2017, from https://www.science.org.au/learning/general-audience/science-booklets-0/science-climate-change/1-what-climate-change

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Integrated Science
General course

Externally set task 2018
Marking key

Total marks for this task: 42

Question 1 **(6 marks)**

(a) Which diagram, A or B, **best** represents the biomass relationship between the organisms within a farm ecosystem? (1 mark)

Description	Marks
States diagram A	1
Total	**1**

(b) Explain your choice in part (a). (3 marks)

Description	Marks
Explains clearly the relationship between the trophic levels, referring to the how biomass is lost leaving only a small amount of biomass available	3
Outlines that biomass is lost at each trophic level leaving less for use at the next level	2
States that biomass is lost as you move up the trophic level/food chain	1
Total	**3**
Answer could include: Reflects the flow of biomass from producers to consumers, with the greatest amount at the bottom, as at each level biomass is lost. Only 10% of biomass is transferred to the next trophic level, as most energy is lost as heat	

(c) In an ecosystem, energy enables all organisms to live. Outline how the primary source of energy is transferred into a food chain. (2 marks)

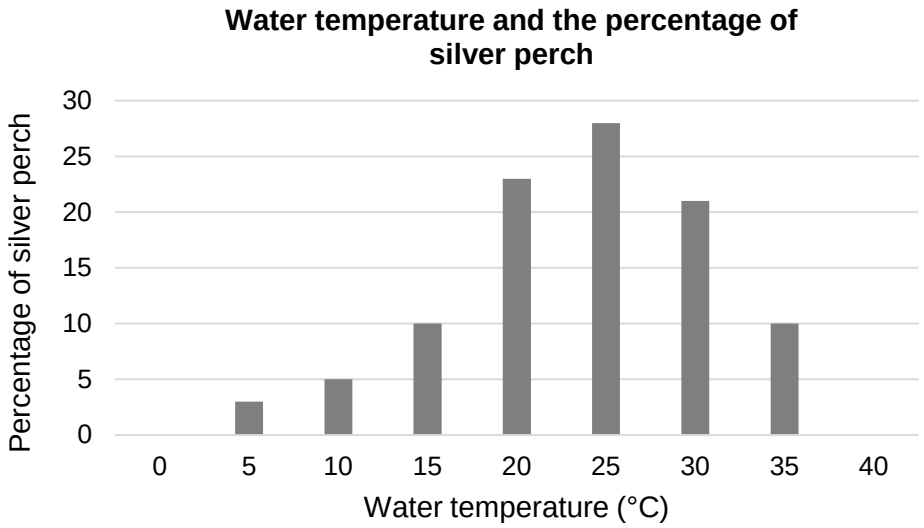
Description	Marks
Outlines clearly that energy originates from the sun and is used in photosynthesis	2
States that the sun is the original source of energy	1
Total	**2**
Answer could include: Plants/producers use photosynthesis to capture energy from the sun	

Question 2 **(15 marks)**

(a) Draw a graph showing the data in the table above. (5 marks)

Description	Marks
Draws a column graph (discrete data)	1
Title appropriate with both independent and dependent variables included	1
X-axis correctly labelled with linear scale and units	1
Y-axis correctly labelled with linear scale	1
Correctly plot points	1
Total	**5**

Answer could include:



(b) For the investigation, identify the dependent variable and the independent variable. (2 marks)

Description	Marks
Dependent variable: percentage of perch	1
Independent variable: water temperature	1
Total	**2**

(c) Use your graph or the table of data to describe the relationship between water temperature and silver perch populations. (3 marks)

Description	Marks
Describes clearly the relationship between the water temperature and the number of perch, including optimum temperature	3
Outlines the relationship between water temperature and the percentage of perch	2
States some relevant information about the relationship between water temperature and the percentage of perch	1
Total	**3**

Answer could include:

The percentage of silver perch increases with an increase in temperature to an optimum temperature of 25 °C, where it then begins to decline

(d) Explain **one** way in which water temperature could affect the body functions of fish in environments such as the Murray-Darling Rivers. (3 marks)

Description	Marks
Explains clearly one effect of temperature on the body functions of fish	3
Outlines one effect of temperature on the body functions of fish	2
States some information on the body functions of fish	1
Total	**3**
Answer could include: • metabolic rate increases as temperature increases due to increased enzyme activity **or** • gas exchange/amount of oxygen changes at different temperatures affecting amount of oxygen available to the silver perch.	
Accept other relevant answers	

(e) Outline **one** sustainability practice that might increase the population of silver perch in the Murray-Darling Rivers. (2 marks)

Description	Marks
Outlines clearly an appropriate sustainability practice	2
States an appropriate sustainability practice	1
Total	2
Answer could include: • limit the release of cold water in such a way that the river water temperature is in the more favourable range for silver perch to be able to flourish • habitat restoration/protection to improve health and reduce threats to silver perch • fisheries management to ensure compliance of laws associated with fishing silver perch.	
Accept other relevant answers	

Question 3 **(7 marks)**

(a) Outline **two** arguments against Option 1, one economic and the other environmental. (2 marks)

Description	Marks
One mark for each valid argument. Maximum of two marks.	
Answer could include: Economical • does not include the costs required for security (protest groups etc.) • does not include the costs associated with the relocation of animals. Environmental • possible extinction of endangered species • clearing of the area would result in habitat loss • increased pollution due to more vehicles in the wetlands area.	1–2
Total	**2**
Accept other relevant answers	

(b) Outline **two** arguments against Option 2, one economic and the other environmental. (2 marks)

Description	Marks
One mark for each valid argument. Maximum of two marks.	
Answer could include: Economical • upgrading the roads is more expensive, costing $373 million more than the causeway • inconveniences of closing/relocating businesses • inconvenience associated with increased transit time during upgrades. Environmental • increased air pollution/noise pollution • increased urban runoff into local waterways.	1–2
Total	**2**
Accept other relevant answers	

(c) Evaluate your arguments for both options and explain which option you would recommend to the port authority. (3 marks)

Description	Marks
Explains clearly the strengths of the preferred option over the other	3
Outlines the strengths of the preferred option	2
States the preferred option with a brief reason	1
Total	**3**
Answer could include: Option 2 has a greater focus on the environmental and social aspects, ignoring the economics, while Option 1 attempts to alleviate the environmental and social impacts whilst considering the economics in detail. Hence recommending Option 1 due to the lower cost **or** Option 2 due to no monetary value could replace a species and its habitat.	
Accept other relevant answers	

Question 4 **(8 marks)**

(a) State **two** measuring errors that might occur in this investigation. (2 marks)

Description	Marks
One mark for each valid measuring error, up to two marks	
Answer could include: • thermometer reading error/parallax error • thermometer faulty **or** accuracy of depth measurement • misinterpretation of the colour chart • solutions used are contaminated • equipment used is contaminated – dirty glassware.	1–2
Total	**2**
Accept other relevant answers	

(b) Explain what the results indicate about the health of each freshwater pond. (6 marks)

Description	Marks
Three marks for each pond, up to six marks	
Pond A	
Explains that the results indicate Pond A is healthy and explains using the pH, salinity and temperature readings as being able to maintain an organisms survival	3
Explains that the results indicate Pond A is healthy and explains using two of the three readings as being able to maintain an organisms survival	2
States that Pond A is healthy	1
Pond B	
Explains that the results indicate Pond B is unhealthy and explains using the pH, salinity and temperature readings as not being able to maintain an organisms survival	3
Explains that the results indicate Pond B is unhealthy and explains using two of the three readings as not being able to maintain an organisms survival	2
States that Pond B is unhealthy	1
Total	**6**
Answer could include: Pond A is healthy as the results show a suitable temperature, a suitable pH and low salinity which would favour a freshwater organism's survival. Pond B is unhealthy as the results show a high temperature, a low pH and high salinity which would not favour a freshwater organism's survival. Accept other relevant answers	

Question 5 **(6 marks)**

For each of the following possible climate changes, explain the impact they might have on an Australian biological community.

Description	Marks
Three marks for each effect of climate change, up to six marks.	
Explains clearly how the change impacts biological communities	3
Outlines relevant information about how the change impacts biological communities	2
States a relevant change	1
Total	**6**
Answer could include: • increased land temperature and a decline in rainfall → decreased numbers of organisms that are not temperature tolerant and a decreased numbers of organisms in inland waters • increased acidity of seawater → coral reef destruction, hence decreased numbers of organisms living in a reef community.	
Accept other relevant answers	

ACKNOWLEDGEMENTS

Question 4 Concept from: Lofts, G., & Evergreen, M. J. (2014). *Science quest 9 for Victoria* (Australia curriculum edition, p. 184). Milton, Qld: John Wiley & Sons Australia Ltd.

Question 5 Description of climate change from: Australian Academy of Science. (n.d.). *What is climate change?*. Retrieved October, 2017, from https://www.science.org.au/learning/general-audience/science-booklets-0/science-climate-change/1-what-climate-change

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