

SECTION A - Multiple Choice Questions**Specific instructions for Section A**

This section consists of 25 questions. You should attempt **all** questions.

Each question has four answers. Only **one** answer for each question is correct. Select the answer that you believe is correct and indicate your choice on the Multiple Choice Answer Sheet by shading the letter that corresponds with your choice of the correct answer.

If you wish to change an answer, erase it and shade your new choice of letter.

Each question is worth **one** mark. **No** mark will be given if more than one answer is completed for any question. Marks will **not** be deducted for incorrect answers.

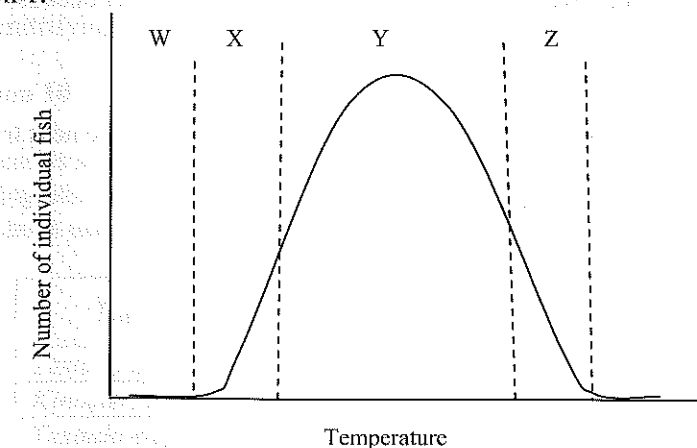
Question 1

A fish living in a fresh water pool is influenced by biotic and abiotic factors. Select the appropriate factors affecting such a fish.

- | Biotic factors | Abiotic factors |
|-------------------------|--------------------------|
| A. dissolved oxygen | photosynthetic algae |
| B. pH | temperature gradient |
| C. decomposers | mineral ions in solution |
| D. photosynthetic algae | decomposers |

Question 2

The graph below shows the number of fish graphed against increasing temperature in the same pool as question 1.



It is reasonable to state that:

- A. fish are found in areas W, X, Y and Z.
- B. the tolerance range is from X to Z.
- C. the tolerance range is Y only.
- D. fish cannot survive in areas X and Z.

Question 3

Camels living in the desert have a problem with water loss. Camels that are dehydrated are able to raise their body temperatures by up to 6°C. The raising of their body temperature means that:

- A. the camel will lose less water as it does not need to sweat until a 6° higher temperature.
- B. the camel will have a higher rate of metabolism, therefore will produce more water by respiration.
- C. the rate of metabolism is decreased due to the higher temperature, therefore less water is lost as water is a product of respiration.
- D. the camel will produce more energy, keeping it alive until it can reach water.

Questions 4 and 5 refer to the following information.

Giant worms *Riftia pachyptila* live in the deepest part of the ocean. These worms contain bacteria in their tissues. The worms lack a digestive system and the bacteria provide them with organic compounds formed from hydrogen sulphide, carbon dioxide and oxygen that the worms absorb from their surroundings. Fish and crabs eat these tube worms.

Question 4

The relationship between the worms and the bacteria is an example of:

- A. mutualism.
- B. collaboration.
- C. parasitism.
- D. predator – prey.

Question 5

In this ecosystem the bacteria are acting as:

- A. primary consumers.
- B. secondary consumers.
- C. producers.
- D. decomposers.

Question 6

Not all of the energy available at one trophic level is passed on to the next trophic level because:

- A. there are fewer organisms at higher trophic levels.
- B. higher trophic levels consist only of carnivores.
- C. some energy is lost as heat at each trophic level so is not available to pass on to the next trophic level.
- D. the animals get bigger at each trophic level and cannot be sustained.

Question 7

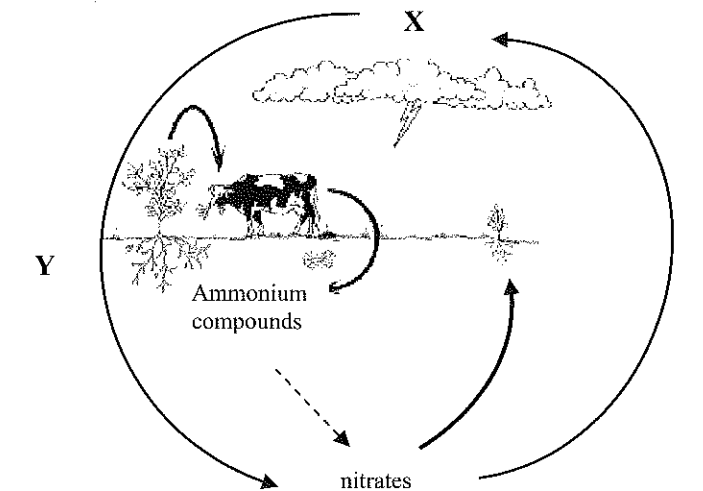
The advantage of being an endothermic animal is that it can:

- A. be active throughout all seasons of the year.
- B. change their temperature to suit the environment.
- C. obtain heat from their surroundings by convection.
- D. maintain a core temperature that is independent of their external environment.

Question 8

A student feeds her goldfish a half teaspoon of fish food daily. The average population of goldfish in the aquarium over 6 months is 42 fish. She decides to increase the food to one whole teaspoon of fish food daily. After a six month period the average population was 63 fish. This data supports the statement that:

- A. the size of the aquarium was a limiting factor.
- B. the amount of food was a limiting factor.
- C. the goldfish reproduced rapidly.
- D. if the student increases the food supply the population will continue to increase.

Question 9

The diagram above represents a naturally occurring cycle. It is reasonable to state that:

- A. X represents carbon dioxide, Y represents photosynthesis and Z represents respiration.
- B. X represents atmospheric oxygen, Y represents the process of oxidation and Z represents reduction.
- C. X represents atmospheric nitrogen, Y represents denitrifying bacteria and Z represents nitrogen fixing bacteria.
- D. X represents atmospheric nitrogen, Y represents nitrogen fixing bacteria and Z represents denitrifying bacteria.

Question 10

Nitrogenous waste formed from the breakdown of protein must be eliminated from the body in urine. The following table shows the nitrogen wastes in urine in three different turtle species in percent of total nitrogenous excretion.

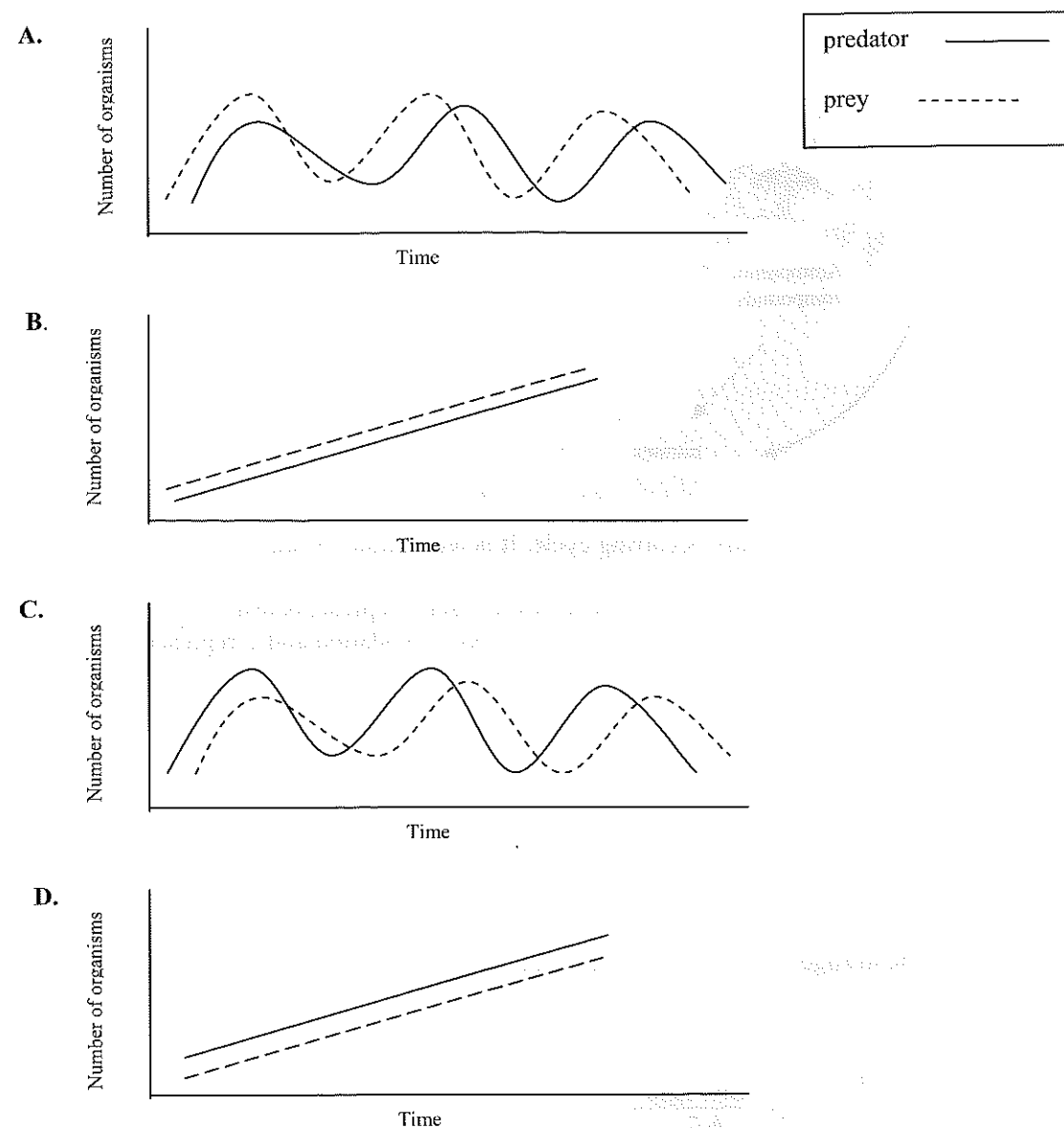
Turtle species	Urine component		
	Uric acid	Ammonia	Urea
<i>Testudo denticulata</i>	6.7	6.0	44.0
<i>Kinosternon subrubrum</i>	0.7	24.0	22.9
<i>Testudo elegans</i>	56.1	6.2	8.5

From this information it would be reasonable to state that:

- A. *Testudo elegans* probably lives in fresh water.
- B. *Testudo elegans* probably lives in the desert.
- C. *Testudo denticulata* probably lives completely in salt water.
- D. *Kinosternon subrubrum* probably lives in the desert.

Question 11

Which graph shows the relationship between predator and prey?



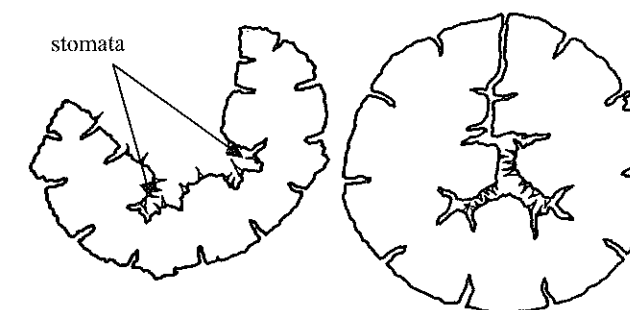
Question 12

The short-beaked echidna, *Tachyglossus aculeatus*, is usually a diurnal animal, meaning that it is active during the day. When conditions become very hot it tends to become nocturnal. It is reasonable to conclude that this is:

- a behavioural adaptation enabling the echidna to avoid the heat of the day.
- a behavioural adaptation allowing the echidna to cool itself in the cool of the evening.
- a structural adaptation so that heat is not lost through the short beak of the echidna.
- a learned response enabling the echidna to keep warm at night.

Question 13

Spinifex grass has leaves that can curl up as shown in the diagram below.

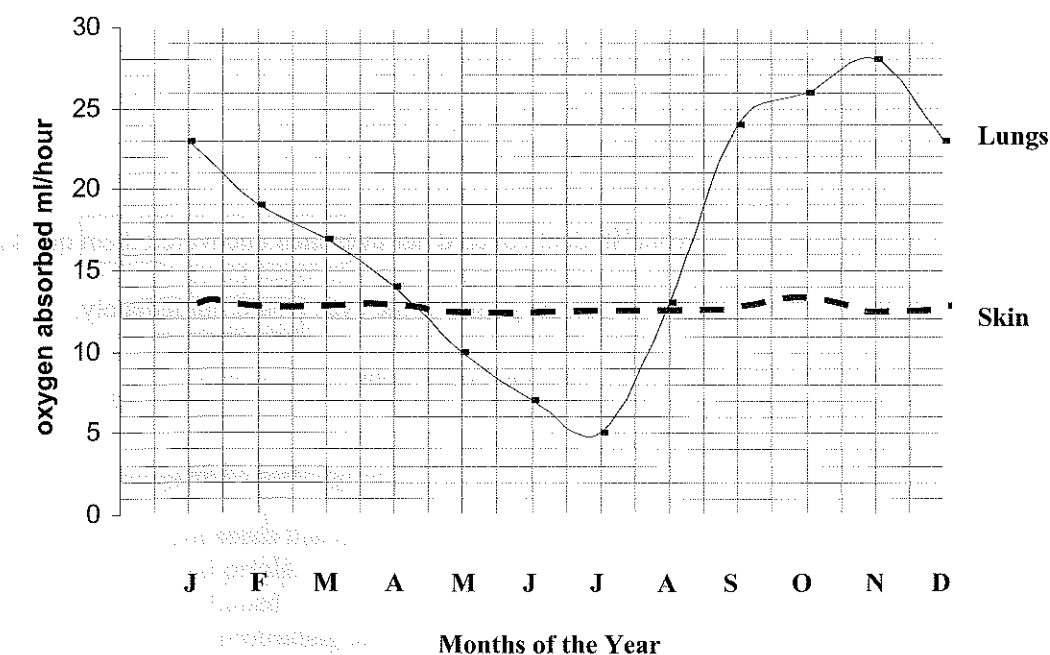


This procedure of curling up is designed to reduce:

- conduction.
- translocation.
- transpiration.
- heat loss.

Question 14

Frogs are able to absorb oxygen through their skin as well as their balloon-like lungs. The graph below shows the oxygen absorbed via the lungs and the skin over a twelve month period by an Australian frog. This frog remains active all year and reproduces in the spring.



From the graph it is reasonable to state that:

- the frog is hibernating in winter so it requires less oxygen.
- the skin of the frog is dry in summer so it cannot absorb as much oxygen.
- it is wetter in winter so the skin of the frog is moist for better absorbing of oxygen.
- the frog is more active in spring than in winter, therefore requires more oxygen.

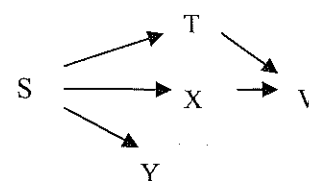
Question 15

Woodlice (slaters) live in dark moist places such as under rocks. Woodlice in these moist conditions tend to move very little. When the conditions dry out the woodlice become active by moving in ever increasing circles. An explanation for this observation is that:

- A. the moisture creates an environment that slows down the movement of the woodlice.
- B. woodlice are more active in dry conditions.
- C. woodlice, by moving quickly in dry conditions, increase their chances of moving into a moist area.
- D. woodlice can survive in any environment, but they like to be in moist, damp conditions.

Question 16

The following is a diagram of a food web.



Key I heterotroph
II primary consumer
III secondary consumer

Species X can be referred to as:

- A. I and III only.
- B. I and II only.
- C. I, II and III.
- D. II and III only.

Question 17

Students performed an experiment in which one student covered her eyes then uncovered them quickly with a bright light shining in them.

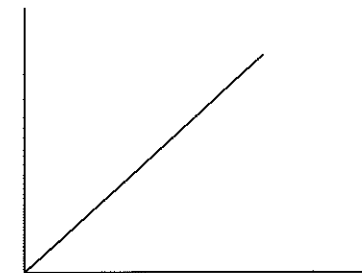
The observation and conclusion drawn would be that the pupils of the eyes would immediately:

- A. dilate as the student received a sudden shock with the bright light.
- B. constrict and the student would have no control over the action.
- C. dilate as the pupils need light in order to see.
- D. constrict as a voluntary response by the student to prevent bright light from damaging the retina.

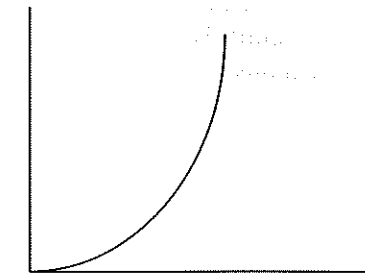
Question 18

A small group of birds arrived on a previously uninhabited area of land where adequate food and resources exist. The graph that best depicts the change in bird population over time would be:

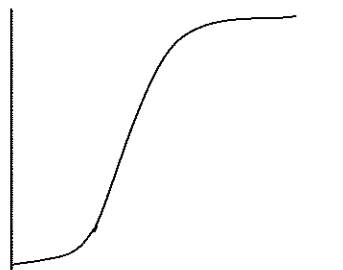
A.



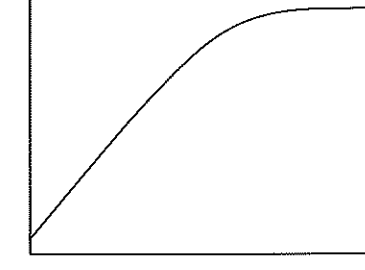
B.



C.

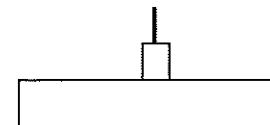


D.

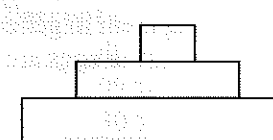
**Question 19**

Select the diagram that shows the flow of energy through a community with three trophic levels.

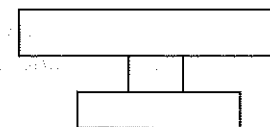
A.



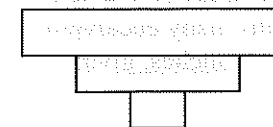
B.



C.



D.

**Question 20**

Plants well adapted to wind pollination would:

- A. produce light seeds that can be carried by the wind.
- B. have coloured petals.
- C. be highly perfumed.
- D. have feathery protruding anthers.

Question 21

An example of positive phototropism in plants is:

- A. following of the sun by sunflowers.
- B. growth of the shoot away from the light.
- C. growth of the shoot towards the direction of the light.
- D. flowering of plants due to the length of uninterrupted darkness.

Question 22

The sense of smell is an important sense in many animals. Animals such as ourselves detect odours when:

- A. lipid-soluble molecules dissolve in the mucus in the nasal cavity.
- B. lipid-soluble chemicals are present near our nose.
- C. water-soluble molecules pass via the nasal passage into the blood-stream.
- D. lipid-soluble molecules bind to receptors that send an impulse to the brain.

Question 23

Populations of organisms have different reproductive strategies depending on their environments. Some organisms are **K** selection strategists and some are **r** selection strategists. Which of the following correctly shows some of the differences between these types of organisms?

- | r strategists | K strategists |
|---|--|
| A. less subject to disasters and closer to the carrying capacity. | more prone to disasters and closer to the carrying capacity. |
| B. small litters with little or no parental care. | large litters with long parental care. |
| C. short-lived with energy conserved. | long-lived with energy wasted. |
| D. early maturation and small size at birth. | late maturation and larger size at birth. |

Question 24

The female snake *Brothochilus children*, after laying her eggs, coils around them until they hatch. If the temperature drops the snake shivers while still coiled around the eggs. This action:

- A. vibrates the eggs so that they are all incubated evenly.
- B. generates heat as a result of muscular contraction to maintain incubation temperature.
- C. vibrates the eggs enabling them to get enough oxygen by absorption through the shell.
- D. ensures that the contents of the eggs are evenly mixed and wastes do not accumulate in one area.

Question 25

Bushfires that destroyed areas of Victoria in February 2009 left trees blackened and lifeless. However, over the next few months many eucalyptus trees showed signs of recovery by growing many green shoots covering the trunks and branches, giving the trees a fuzzy appearance. This regeneration is due to:

- A. deep roots that can take up water to protect against fire.
- B. lignotubers that store water under the ground.
- C. epicormic buds under the bark that survive the fire.
- D. seeds that are capable of regeneration after a fire.

END OF SECTION A

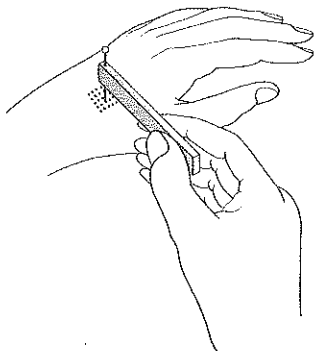
SECTION B - Short Answer Questions

Specific instructions for Section B

This section consists of 7 questions. There are 50 marks in total for this section. Write your responses in the spaces provided. You should attempt **all** questions. Please write your responses in **blue** or **black ink**.

Question 1

Students carried out an experiment to investigate the sensitivity of the skin. They stamped grids on the fingertips, the back of the hand and the inside of the forearm on a subject as shown in the diagram below. The subject was blindfolded and the different areas were very lightly touched with a pin. The subject acknowledged when she could feel the touch.



The table below shows the percentage of times the subject was correct.

Area of skin touched	Percentage correct
Back of the hand	48 %
Finger tips	99 %
Inside of the arm	30 %

- a Name the type of neuron that responds to touch.

(1 mark)

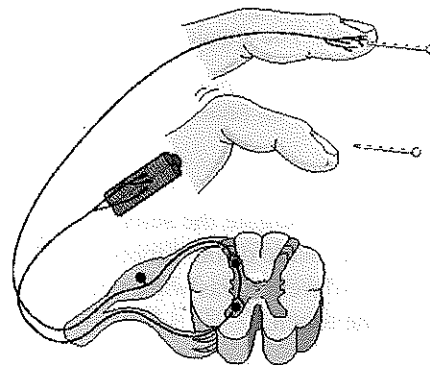
- b Which area is the most sensitive? Suggest a reason for the differences.

(2 marks)

- c What significance does this difference in response in the different areas mean for people?

(1 mark)

Below is a diagram showing the response when a person is pricked harder with a pin.



- d Name the type of nervous pathway shown, and **explain** the importance of such a response to the individual.

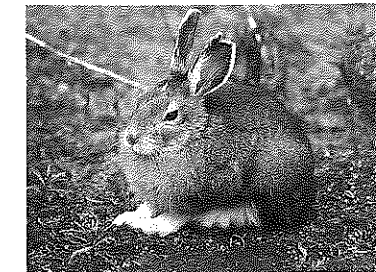
(2 marks)

Total 6 marks

Question 2



Lepus californicus



Lepus americanus

The pictures above show two different species of hare found in America. *Lepus americanus* changes its fur colour to white in winter.

- a What type of environment would *Lepus americanus* be found in? Give **two** reasons for your answer.

(2 marks)

- b Name **two** structural adaptations shown by *Lepus californicus*.

(2 marks)

- c Suggest how **one** of the adaptations you have described above in **b** gives this animal a survival advantage in its environment.

(1 mark)

Total 5 marks

Question 3

Barnacles are marine invertebrates. They start out as free swimming larvae that then attach themselves permanently to rocks or other hard surfaces. They then secrete several calcareous plates that surround their bodies. They tend to be very crowded on the rocks. They feed on plankton by sending out feeding arms or cirri that back and forth. Barnacles are hermaphrodites but are not able to self fertilise. Sperm is deposited directly by means of a penis from one barnacle into another and fertilises the eggs of that barnacle. Many barnacles grow on rocks that are exposed at low tide.



- a Give **two** changes in abiotic factors that these barnacles experience in their natural environment over a 12 hour period.

(2 marks)

- b Suggest an abiotic factor that would aid the barnacle in its feeding when using cirri.

(1 mark)

Barnacles, when out of the water, are able to firmly adhere to the rock surface.

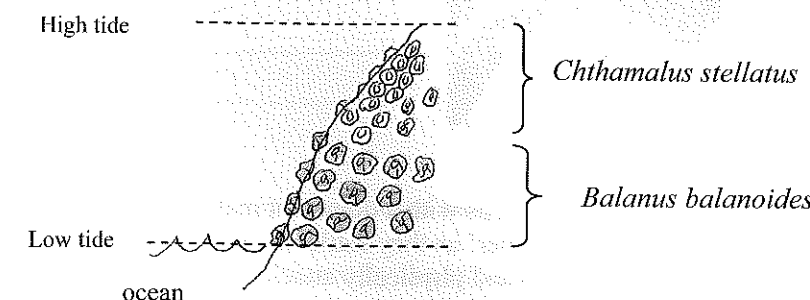
- c i State **two** advantages to the barnacle of being able to adhere to the rock surface.

(2 marks)

- ii State a disadvantage to the barnacle of not being able to move.

(1 mark)

Balanus balanoides and *Chthamalus stellatus* are two species of barnacles that grow on rocks exposed during low tide. *Balanus balanoides* are concentrated on the lower rocks and *Chthamalus stellatus* on the higher areas. The distribution is shown on the diagram below.



The ecologist J. Connell investigated the distribution of these barnacles. He removed *Balanus balanoides* from the lower area and found that *Chthamalus stellatus* occupied the space left. When he removed *Chthamalus stellatus* from the higher area *Balanus balanoides* did not come to occupy areas higher up the rock.

- d How does the tolerance range of these two species compare? Explain your answer.

(2 marks)

- e Suggest why these two species are distributed the way they are.

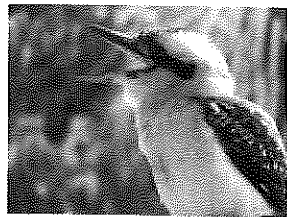
(2 marks)

- f Give **two reasons** why crowding together is an advantage to these animals.

(2 marks)

Total 12 marks

Question 4



The Laughing Kookaburra lives in small family groups with a dominant mating pair maintaining the social order. The birds raise a wild chorus of ‘laughter’ as they settle down to roost for the night and again at dawn. They have been observed to aerial swoop and physically attack other birds.

a Name the type of behaviour demonstrated by the laughing chorus.

_____ (1 mark)

b Suggest **three** advantages that this behaviour has for the species.

_____ (3 marks)

The northern quoll, *Dasyurus hallucatus*, a native marsupial, is being driven to extinction in many parts of northern Australia because it is eating highly toxic cane toads. Quolls tend to eat large toads that kill them outright because of the amount of poison rather than just making them sick.



c What is the consequence of this behaviour for the quolls?

_____ (1 mark)

Ecologists in Australia have taken 62 young quolls and divided them into two groups. They presented one group with a very small dead cane toad that they had laced with a non-toxic but nausea-inducing chemical. Both groups were then presented with a very small live cane toad and observed.

d What results were the ecologists trying to achieve in this experiment?

_____ (1 mark)

The experimental group achieved the desired behaviour.

e Is the desired behaviour shown by the experimental group innate or learned? Explain your answer.

_____ (2 marks)

Scientists then returned the experimental group to the wild knowing that they would have a greater chance of survival.

f Why were the scientists confident that these quolls would have a greater chance of survival?

_____ (1 mark)

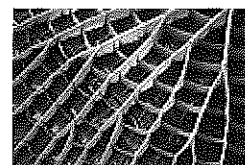
g Would this behaviour be passed down to the offspring of these experimental quolls? Explain your answer.

_____ (2 marks)

Total 11 marks

Question 5

The Victoria lily, *Victoria amazonica*, grows in the shallow waters of the Amazon basin. It has giant leaves, 2.5 m across, that have thorns on the underside, a notch (like the pouring lip of a beaker) in the leaf rim and stomata on the upper surface.



a Suggest a reason for the following leaf adaptations.

i The thorns on the leaf underside.

ii The notch in the leaf.

iii Stomata on the upper surface of the leaf.

(3 marks)

The flowers of *Victoria amazonica* are 30 cm wide and open on the first night at sunset when they are white, female, produce a sweet smell and are up to 12 degrees warmer than the surrounding air. The lily flower attracts scarab beetles. Around midnight on the first day the flowers close, trapping the beetles inside. Here the beetles are able to feed on starchy plant material. A couple of hours later the flower petals change to a deep purple and the flower itself changes to a male flower which now produces pollen. At sunset on the second day the purple flower opens and releases the beetles.

b What is the relationship between the lily and the beetle?

(1 mark)

The ability of the flower to generate heat is called thermogenesis.

c Name the process that would result in thermogenesis in this plant.

(1 mark)

d Suggest **two** functions thermogenesis could have for this plant?

(2 marks)

e Suggest an advantage of the colour change of the flower from white to purple.

(1 mark)

Total 8 marks

Question 6

Heavy metals such as mercury and cadmium are widely used in industry, however, they are extremely toxic because in certain compounds, such as methyl mercurate, they are soluble in water and can be readily absorbed into the body where they inhibit certain enzymes. An investigation of a fresh water lake shows the concentration of mercury in organisms in a food chain in the table below.

Organism	Concentration of mercury (mg/kg)
<i>Lepomis macrochirus</i>	0.071
<i>Erythemis simplicicollis</i>	0.035
<i>Micropterus salmoides</i>	0.427
<i>Pomoxis annularis</i>	0.143

a What does this data suggest about the element mercury?

(1 mark)

b Draw the food chain represented by the organisms above.

(1 mark)

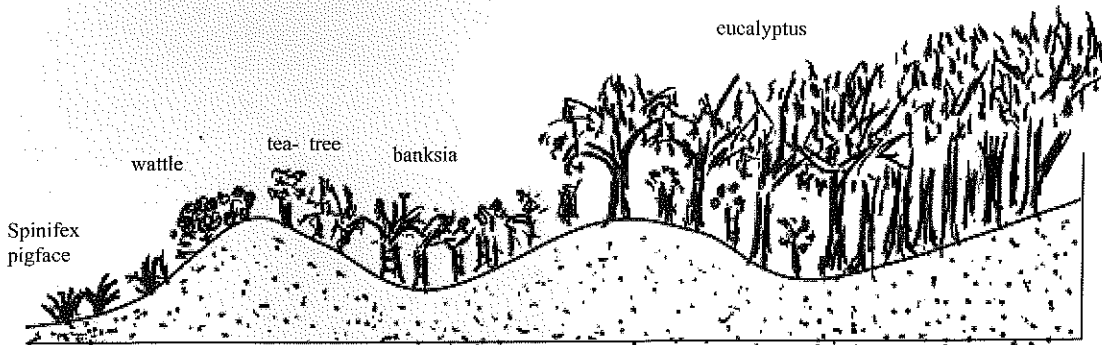
c Using the terms **non-biodegradable** and **biomass**, explain the distribution of mercury in these organisms.

(2 marks)

Total 4 marks

Question 7

The natural coastal sand dune system shown below shows a marked zonation.



a Name the process resulting in a change in communities from spinifex to eucalyptus.

(1 mark)

b By what other name would the eucalyptus community be called?

(1 mark)

c Outline how this change in species composition has occurred.

(2 marks)

Total 4 marks

END OF EXAMINATION

Acknowledgements
SciArt The New Millenium CD, Cambrige Uni Press
Experimental work in Biology, John Murray
Websites
www.anbg.gov.au/education/docs/mallee-2004.doc
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www.greglasley.net/snowshoe.html
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