

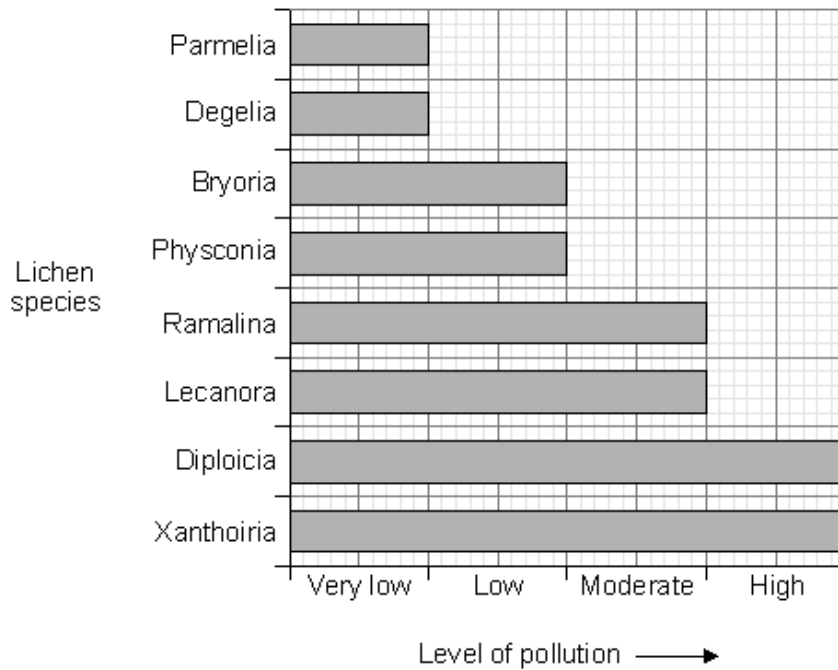
**Q1.** Lichens are pollution indicators.

(a) Complete the following sentence.

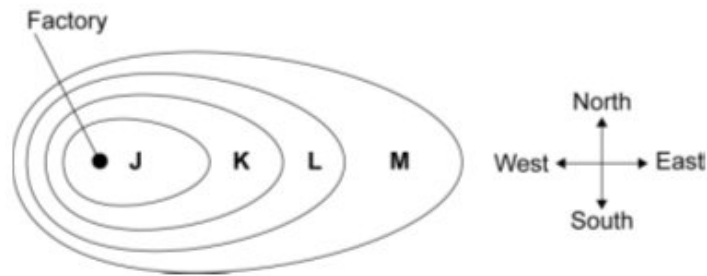
Lichens are indicators of the gas .....

(1)

The chart shows how much pollution different lichens can tolerate.



(b) The diagram shows the areas, **J**, **K**, **L** and **M**, in which different lichen species grew around a factory. The factory burns coal.



- (i) In which direction does the wind blow the pollution from the factory?

Tick (✓) **one** box.

Wind direction	Tick (✓)
From the factory towards the north	
From the factory towards the east	
From the factory towards the south	
From the factory towards the west	

(1)

- (ii) Which row in the table shows a correct distribution of lichens?

Tick (✓) **one** row.

Lichen in area J	Lichen in area K	Lichen in area L	Lichen in area M	Tick (✓)
Xanthoria	Diploicia	Parmelia	Ramalina	
Degelia	Bryoria	Lecanora	Xanthoria	
Xanthoria	Lecanora	Bryoria	Parmelia	

(1)

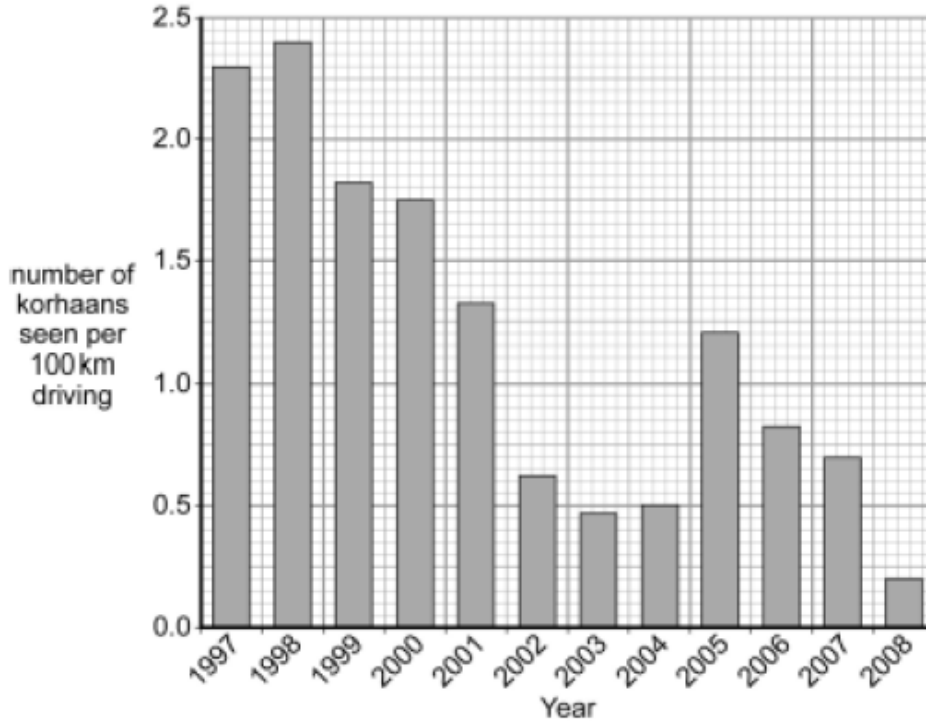
(Total 3 marks)

- Q2.** The photograph shows a bird called the korhaan. Korhaans live in South Africa.



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- Scientists have studied changes in the numbers of korhaans since 1997.
- The scientists asked volunteer drivers to record the number of korhaans they see for every 100 km they drive on particular roads.
- The bar chart shows changes in the numbers of korhaans seen by the volunteers between the start of 1997 and the end of 2008.



Data from *Birds and Environmental Change: building an early warning system in South Africa* © South African National Biodiversity Institute

- (a) This method of counting korhaans could have led to an inaccurate estimate of the number of korhaans.

Explain how.

.....

.....

.....

.....

(2)

- (b) Which statement best describes the change in the number of korhaans between 1997 and 2008?

Tick (✓) **one** box.

Statement	Tick (✓)
There was a steady fall in the number of korhaans.	
The number of korhaans went up and down, but there was an overall fall in numbers.	
The number of korhaans went up and down, and there was no overall trend.	

(1)

- (c) Korhaans live only amongst tall vegetation in areas of the country where there are few people.

Which is the most likely explanation for the change in the numbers of korhaans between 1997 and 2008?

Tick (✓) **one** box.

Statement	Tick (✓)
Many korhaans have been killed by cars.	
Many korhaans have been killed by people for food.	
The habitat of the korhaans is disappearing.	

(1)

(Total 4 marks)

**Q3.** Copper compounds are found in water that has drained through ash from power stations. Invertebrate animals are used to monitor the concentration of copper compounds in water. First, scientists must find out which invertebrate animals can survive in a range of concentrations of copper compounds.

This is how the procedure is carried out.

- Solutions of different concentrations of a copper compound are prepared.
- Batches of fifty of each of five different invertebrate species, **A**, **B**, **C**, **D** and **E**, are placed in separate containers of each solution.
- After a while, the number of each type of invertebrate which survive at each concentration is counted.

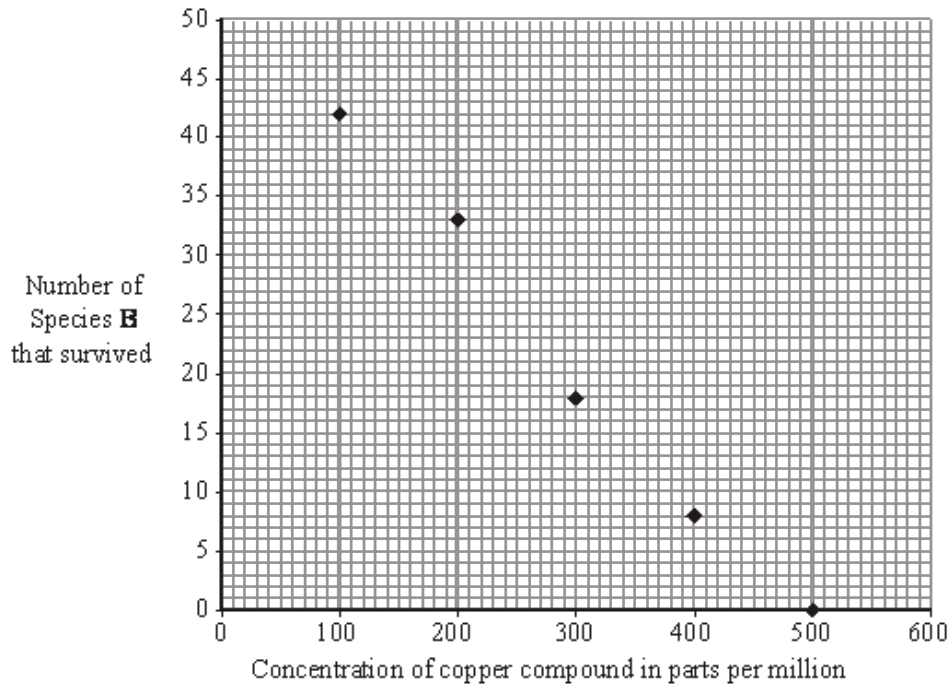
(a) Give **two** variables that should be controlled in this investigation so that the results are valid.

1 .....

2 .....

(2)

(b) The graph below shows the results for species **B**.

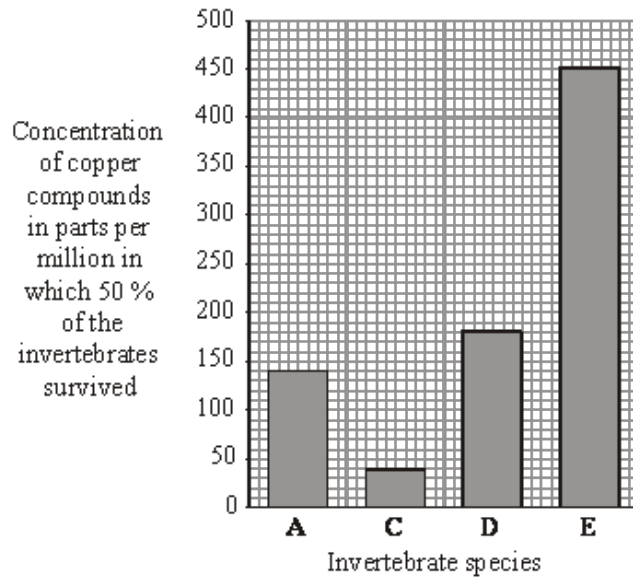


Use the graph to find the concentration of copper compounds in which 50% of Species **B** survived. To obtain full marks you must show clearly on the graph how you obtained your answer.

Concentration ..... parts per million

(2)

(c) The graph below shows the results of the tests on the other four invertebrate species.



(i) Which species, **A**, **C**, **D** or **E**, is most sensitive to the concentration of copper in the water?

.....

Give the reason for your answer.

.....  
.....

(1)

(ii) It is often more convenient to use invertebrates rather than a chemical test to monitor water for copper.

Suggest **one** explanation for this.

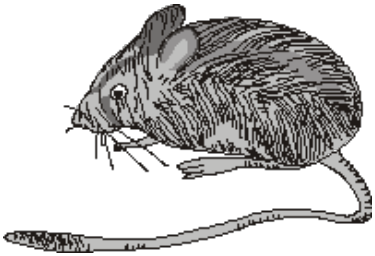
.....  
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.....  
.....

(2)

(Total 7 marks)

**Q4.** The drawing shows a kangaroo rat.

This rat lives in hot, dry deserts.



(a) Explain how each of the following features helps the kangaroo rat to survive in a hot, dry desert.

(i) It does not produce urine.

.....  
.....

(1)

(ii) It lives in a burrow during the day, but comes out at night to search for food.

.....  
.....

(1)

(iii) Its feet and its tail each have a large surface area.

.....  
.....

(1)

(b) The kangaroo rat does **not** sweat.

Explain why **not** sweating could be dangerous for the animal.

.....  
.....

(1)

**(Total 4 marks)**

**Q5.** Organisms have adaptations that enable them to survive in extreme conditions.

(a) The photograph shows an arctic fox.



This fox lives in the arctic, where it is very cold.

Suggest **two** ways in which the arctic fox is adapted for life in very cold conditions. Explain how each adaptation helps the arctic fox to survive in very cold conditions.

Adaptation 1 .....

.....

How this adaptation helps the arctic fox to survive in very cold conditions.

.....

.....

.....

Adaptation 2 .....

.....

How this adaptation helps the arctic fox to survive in very cold conditions.

.....

.....

.....

(4)



(b) The photograph shows an antelope that lives in a sandy desert.



The antelope is prey to large cats such as cheetah.

Suggest **two** adaptations that help this antelope to avoid being killed by predators. Explain how each adaptation helps the antelope to avoid being killed by predators.

Adaptation 1 .....

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How this adaptation helps the antelope to avoid being killed by predators.

.....

.....

.....

Adaptation 2 .....

.....

How this adaptation helps the antelope to avoid being killed by predators.

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.....

.....

(4)  
(Total 8 marks)

**Q6.** Animals and plants are adapted in different ways in order to survive.

(a) Plants may have to compete with other plants.

(i) Name **two** things for which plants compete.

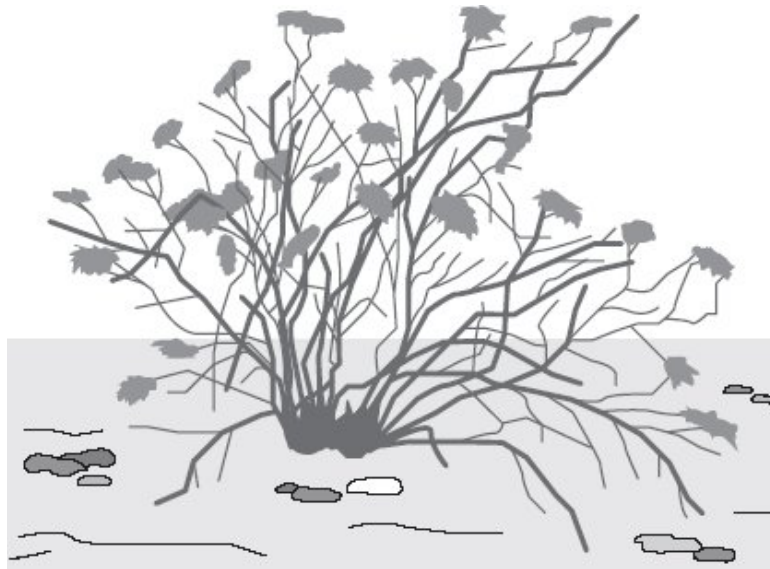
1 .....

2 .....

(2)

(ii) The drawing shows a creosote bush.

This bush lives in a desert.



The creosote bush produces a poison that kills the roots of other plants.

How does this poison help the creosote bush to survive in the desert?

.....

.....

(1)

(b) The photograph shows an insect called a katydid.



The katydid is preyed on by birds.

How does the appearance of the katydid help it to survive?

.....

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.....

.....

(1)  
(Total 4 marks)

##

The table compares some features of a polar bear and the Malayan sun bear. The polar bear lives in the Arctic where the climate is cold. The Malayan sun bear lives in warm tropical forests.

	<b>Polar bear</b>	<b>Malayan sun bear</b>
Colour of fur	White	Black
Thickness of fur in cm	5	2
Thickness of fat layer under skin in cm	11	1
Surface area compared to body size	Low	High

Use information from the table to explain how the polar bear is better adapted than the Malayan sun bear for survival in arctic conditions.

*To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

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**(Total 5 marks)**

- M1.** (a) sulfur dioxide 1
- (b) from the factory towards the east  
*extra boxes ticked cancels the mark* 1
- (c) tick in bottom row  
*extra boxes ticked cancels the mark* 1
- [3]**

- M2.** (a) actual number of korhaans is likely to be higher than estimate 1
- because the birds are not all visible from the road 1
- (b) the number of korhaans went up and down, but there was an overall fall in numbers  
*extra boxes ticked cancels the mark* 1
- (c) the habitat of the korhaans is disappearing  
*extra boxes ticked cancels the mark* 1
- [4]**

- M3.** (a) any **two** from: eg
- same volume of solution  
*do not allow same size of container*
  - left for same length of time
  - same temperature
  - same oxygen
  - same pH
  - same number of invertebrates / animals  
*do not allow same number of species*
  - same age / stage of invertebrates / animals
- 2

(b) line of best fit / curve / point to point drawn going through 240-260 and 25 1

correct interpolation to X axis 1  
*if no work on graph allow 250*

(c) (i) (C) 1  
50% killed at lowest / low copper concentration  
*ignore least survivors*

(ii) any **two** from: 2

- involves counting  
*easy to count gains 2 marks*
- easy to do
- invertebrates more sensitive
- needs less / no apparatus  
*ignore more reliable / accurate*

[7]

**M4.** (a) (i) conserves water owtte 1

(ii) prevents overheating / keeps cool 1  
*allow cooler at night*  
*allow safety from predators*

(iii) increases heat loss / cooling 1  
*allow prevents sinking into sand*

(b) animal could overheat owtte 1

[4]

**M5.** (a) 1 mark for each adaptation and 1 mark for its correct linked advantage

- long / thick hair / fur (1)  
for insulation (1)  
*allow keeps warm*
- small ears (1)  
for reduced heat loss (1)
- small feet (1)  
for reduced heat loss (1)  
*ignore wide feet*  
*ignore prevent sinking*
- white fur / coat (1)  
for camouflage / poor emitter (1)
- small SA/V ratio (1)  
reduces heat loss (1)
- thick layer of fat (1)  
insulates / keeps warm (1)

**max 4**

(b) 1 mark for each adaptation and 1 mark for its correct linked advantage

- horns (1)  
for defence (1)
- long legs (1)  
for speed / escape / vision (1)
- light colour (1)  
for camouflage (1)  
*allow pattern*
- eyes on side of head (1)  
for wider field of vision (1)
- hooves (1)  
for speed / escape (1)
- large ears (1)  
to hear predators better (1)

**max 4**

**[8]**

- M6.** (a) (i) any **two** from:  
*list principle*
- light  
*ignore oxygen / food / sun*
  - water
  - space
  - nutrients / ions / minerals / named
  - carbon dioxide / CO<sub>2</sub>
- 2
- (ii) less competition for water  
*ignore space / light / food*
- or**
- more water / nutrients / minerals available
- 1
- (b) camouflage / same shape as leaf / looks like a leaf  
*allow 'blends in'*  
*ignore colour*
- 1

[4]

**M7.** *The answer to this question requires good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.*

*maximum of 4 marks if ideas not well expressed*

Polar bear has

white fur - camouflage **or** not seen by prey  
*accept converse points re sun bear*

1



thick(er) fur -	insulation <b>or</b> keeps heat in <i>number must be comparative</i> <i>numbers given must be explained</i> do <b>not</b> accept keeps warm / keeps out the cold	1
thicker fat -	insulation <b>or</b> keeps heat in	1
	energy reserve <b>or</b> can release heat	1
lower S.A - (re body size)	slower / less heat loss	1

[5]

