TERTIARY ENTRANCE EXAMINATION, 1991

QUESTION/ANSWER BOOKLET

BIOLOGY

Please place one of your student identification labels in this box

SEA STUDENT NUMBER – In figures

In words

TIME ALLOWED FOR THIS PAPER

Reading time before commencing: Ten minutes
Working time for paper: Three hours

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

This Question/Answer Booklet comprising 35 pages and 38 questions
Separate Multiple Choice Answer Sheet
Standard Answer Book
Paper Binder

TO BE PROVIDED BY THE CANDIDATE

Standard Items: Pens, pencils, eraser or correction fluid, ruler

Special Items: A '2B' pencil for the Separate Multiple Choice Answer Sheet

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room.

It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. Please check carefully, and if you have any unauthorised material with you, hand it to the supervisor BEFORE reading any further.

SEE PAGE 3

SECTION A

Suggested time: 40 minutes (30 marks)

Record each answer for questions 1 - 30 by marking your choice of alternatives on the Separate Multiple Choice Answer Sheet using a '2B' pencil.
If you want to change an answer, rub out your first answer and mark a new one.
The Answer Sheet for Section A will be collected separately by the Supervisor.

---

1. In a grassland ecosystem the biomass of herbivores was measured and found to be less than that of the primary producers.

   This could be because

   (a) the herbivores lose energy in their faeces.
   (b) plants are more efficient than animals.
   (c) energy is lost during energy transfer.
   (d) grasses live much longer than most herbivores.

2. Before examining a section of tissue under the microscope, a biologist prepares the tissue appropriately and then stains it with one or more dyes. The reasons for staining tissue prior to microscopic examination would **NOT** include

   (a) preserving the tissue so that cell activity could be observed.
   (b) enabling differentiation between the different components of a cell.
   (c) causing transparent and translucent structures within the cell to become more apparent.
   (d) allowing the composition of various parts of the cell to be determined.

3. This question is based on DIAGRAM 3.

   What does the arrangement of letters A, G, C and T in the model represent?

   (a) A chemical code.
   (b) A gene.
   (c) A double helix.
   (d) A mutation.

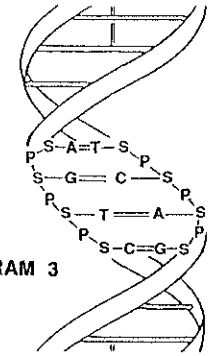


DIAGRAM 3

SEE PAGE 5

4. Which of the following physiological processes requires energy derived from cellular respiration?

   (a) Movement of water from the soil into a root.
   (b) Movement of carbon dioxide into a blood capillary.
   (c) Movement of substances in the phloem tissue of a tree.
   (d) Loss of water from the surface of a leaf.

5. The 'Lock and Key Model' is designed to help explain the interaction between substrate molecules and the enzyme which catalyses a reaction. The model proposes that there is a definite, small area on the surface of an enzyme molecule with a specific shape into which the substrate molecule fits, much as a key would fit into a lock. Once fitted into this "active site", the substrate molecule breaks down to form the products of the reaction. According to this model, it necessarily follows that

   (a) enzymes catalyse a range of compounds with similar sized molecules.
   (b) anything which appreciably alters the shape of the enzyme molecule (e.g. temperature, pH) will affect the rate of an enzyme-controlled reaction.
   (c) once the active site has combined with the substrate molecule the enzyme cannot be reused.
   (d) enzymes need to be present in high concentrations in order to make much change in the substrate concentration.

6. A zoologist was trying to find out why moths are active only at night. In the course of his investigations he noticed small bristles at the base of the antennae of certain moths. He thought that these might be receptors able to detect strong light.
   To further increase his understanding of this problem, he would first

   (a) consult scientific publications to find out what data have been collected by other biologists about the topic, and what interpretations they have made.
   (b) investigate the behaviour of moths each with one antenna removed.
   (c) publish his results as a scientific paper in a widely circulated newspaper.
   (d) devise and try appropriate tests, discarding those whose results do not lend support to his hypothesis.

7. The following are structures found in a plant:

1. root hair cells	3. air spaces in leaf	5. phloem	7. stomata
2. leaf veins	4. cuticle	6. xylem	8. root cap

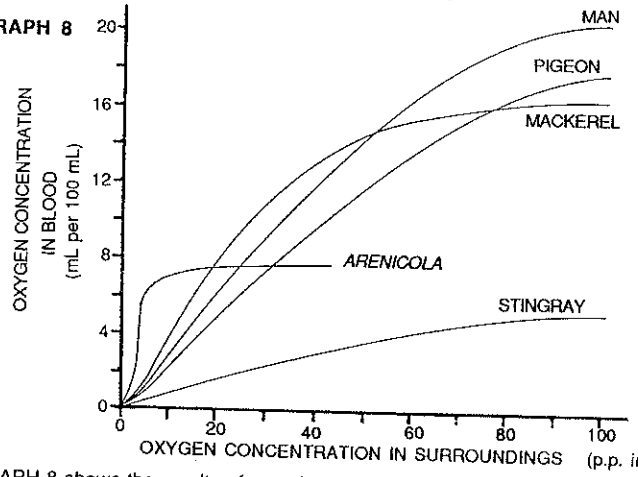
   The pathway of a water molecule taken up from the soil by a rapidly transpiring plant and eventually lost to the air is best identified by the sequence

   (a) 1,6,2,3,7.
   (b) 8,6,2,3,4.
   (c) 1,6,5,7,4.
   (d) 4,6,3,2,7.

SEE PAGE 6

8. The blood of a number of different animals has been found to contain different concentrations of haemoglobin and to differ in oxygen carrying capacity. Animals live in places in which there are different concentrations of oxygen, and some need more oxygen than others for their normal activities.

GRAPH 8



GRAPH 8 shows the results of experiments designed to determine how much oxygen is taken up by the blood of various animals when brought into contact with different concentrations of oxygen. *Arenicola* is an annelid worm which burrows deeply into wet sand on some beaches; the mackerel is a marine bony fish; the stingray is a relative of the sharks which feeds on the sea bottom in shallow coastal waters.

The information contained in GRAPH 8 would lend support to which of the following hypotheses?

(a) Of the animals tested, *Arenicola* would have the lowest haemoglobin concentration and man the highest.
(b) The mackerel is less active than the stingray at all oxygen levels in their surroundings.
(c) The aquatic animals require more oxygen than do the terrestrial animals.
(d) At relatively low oxygen concentrations in the surroundings, the blood of the mackerel would be able to carry more oxygen/unit volume than the blood of the pigeon.

9. 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 of the seedling 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.

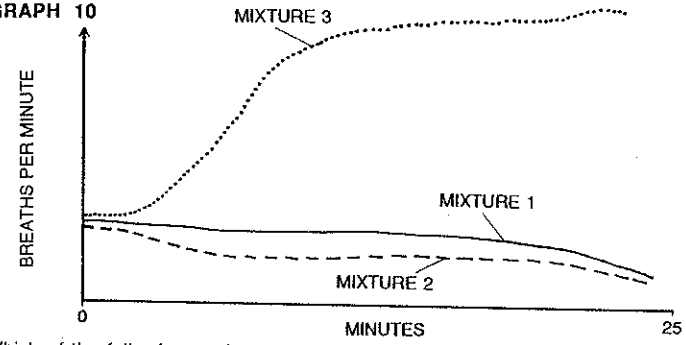
SEE PAGE 7

10. During an experiment at sea level the breathing rate of a mammal was measured while breathing different gas mixtures.

	Oxygen: (O_2)	Carbon dioxide: (CO_2)	Nitrogen: (N_2)
MIXTURE 1	21%	0.03%	78%
MIXTURE 2	100%	0%	0%
MIXTURE 3	92%	8%	0%

Data were recorded over 25 minutes, and are illustrated in GRAPH 10) below.

GRAPH 10

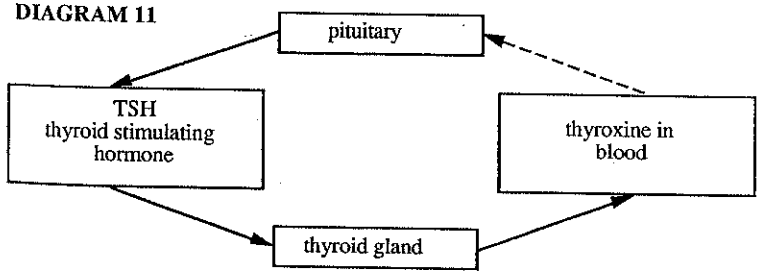


Which of the following explanations is supported by the evidence above?

(a) Oxygen is a stimulus to breathing.
(b) A concentration of 8% carbon dioxide inhibits breathing.
(c) Air without nitrogen stimulates deep breathing.
(d) The rate of breathing is influenced by carbon dioxide concentration.

11. Which of the following statements about DIAGRAM 11 is **INCORRECT**?

DIAGRAM 11

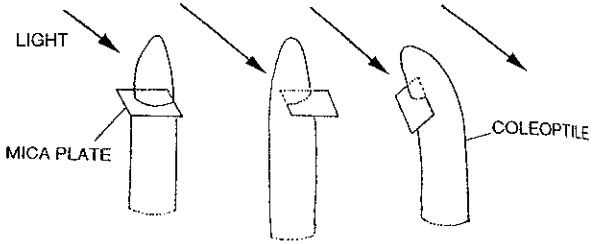


(a) It is an example of homeostasis in a mammalian body.
(b) The activity of the thyroid gland is under the nervous control of the pituitary.
(c) It shows that the activity of one endocrine gland can be controlled by the activity of another endocrine gland.
(d) It illustrates a negative feedback mechanism.

SEE PAGE 8

12. In an experiment on the growth of oat coleoptiles, mica plates were inserted in different positions in three shoot tips which were then oriented in relation to a light source as shown in DIAGRAM 12. After several days, one of the coleoptiles was curved towards light.

DIAGRAM 12



This experiment shows that there is a substance formed

(a) in the stem which causes increased growth in the tip of the shoot.
(b) in the tip of the shoot which slows growth on the side nearest the light.
(c) in the side of the tip nearest the light which slows growth of the shoot.
(d) in the tip of the shoot which increases growth on the shaded side.

13. Small mammals such as mice require more food and oxygen per gram of body weight than do large mammals because

(a) they move more rapidly and respire faster.
(b) they must hunt for their food at night.
(c) they use more energy per gram in maintaining homeostasis.
(d) they are exposed more often to attack by predators.

14. An organ which functions only as an endocrine gland would

(a) distribute its products through a system of ducts.
(b) secrete enzymes into the digestive tract.
(c) be attached to the digestive system.
(d) produce compounds which have an effect on cells elsewhere in the body.

15. Two neighbouring lakes were very similar in their physical and chemical properties, and contained the same range of species except that Lake A supported a large population of carp whereas this species was not found in Lake B. One year, a small number of male and female carp were transferred from Lake A to Lake B where, in the following years, the population grew exponentially. During this period, the fish in Lake B showed great variation in structure unlike the uniform structure of those in Lake A.

Which of the following mechanisms best explains the diversity in body structure of carp in Lake B compared with Lake A?

(a) High levels of natural selection in Lake B, low levels in Lake A.
(b) Low levels of natural selection in Lake B, high levels in Lake A.
(c) High frequency of mutation in Lake B low frequency in Lake A.
(d) Low frequency of mutation in Lake B, high frequency in Lake A.

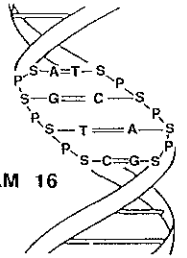
SEE PAGE 9

16. This question is based on DIAGRAM 16.

What is a change in the sequence of the A, G, C and T units termed?

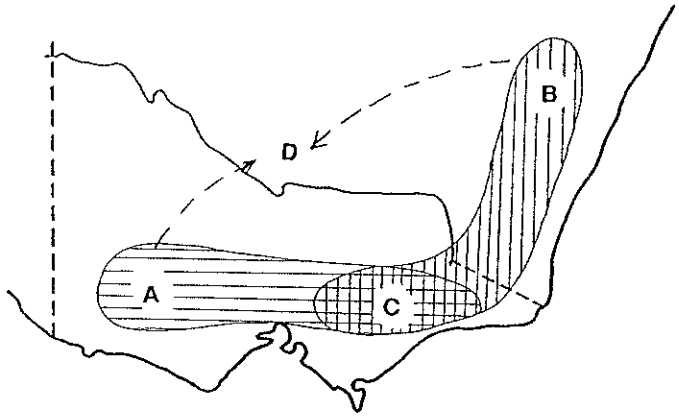
(a) Crossing over.
(b) Segregation.
(c) Random assortment.
(d) Mutation.

DIAGRAM 16



17. A zoologist studying the distribution of brown tree frogs in south-eastern Australia finds that there are two morphologically similar, but still recognizably distinct, forms of the frog. The two forms have overlapping distributions as shown in DIAGRAM 17.

DIAGRAM 17



One of the two forms occurs alone in area A, the other occurs alone in area B. Both forms occur in area C.

The zoologist interbreeds members of the two forms from all parts of the present range of these brown tree frogs and finds that sterile hybrids are produced.

On the basis of this information the zoologist could reasonably conclude that

(a) there are two distinct but closely related species present which are likely to have evolved from an immediate common ancestor.
(b) in time, species A and B in area C will merge to form a common species C.
(c) if the present distributions in areas A and B were to expand so that the two forms met again in area D (see DIAGRAM 17) fertile hybrids would be produced.
(d) in time, three different species of these brown tree frogs will develop in south-eastern Australia.

SEE PAGE 10

18. It is known that a certain marsupial species, although not rare at the present time, is nonetheless believed to be in danger of extinction. The **best** way of conserving the species would be achieved by

(a) preserving one of each sex in a natural science museum.
(b) preserving significant areas of the natural habitat harbouring this species.
(c) breeding the species in zoological gardens.
(d) declaring it a protected species with a severe penalty for killing specimens.

19. The normal body colour of the vinegar fly, *Drosophila melanogaster*, is light brown with black bands on the abdomen. A geneticist bred the light brown flies for many generations without observing any change in body colour, then suddenly she discovered a few yellow-bodied flies in the population. By crossing the yellow flies with one another she found that only yellow offspring were produced.

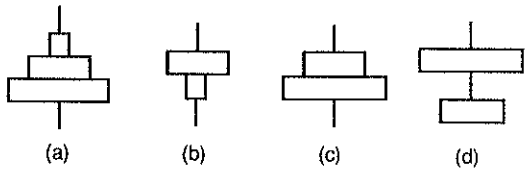
It is found that crossing a yellow-bodied fly with a brown-bodied fly produces an F_1 generation which consists entirely of brown-bodied flies. Although these F_1 flies are heterozygous for yellow body, they are identical in colour with typical brown-bodied flies. **ONE** possible way to work out whether a given brown-bodied fly was homozygous or heterozygous for body colour would be to

(a) cross it with a yellow-bodied fly; a 1:1 ratio of brown to yellow-bodied flies in the offspring would indicate that it was homozygous.
(b) cross it with a yellow-bodied fly; all brown-bodied flies in the offspring would indicate that it was heterozygous.
(c) cross it with a brown-bodied fly known to be heterozygous; a 3:1 ratio of brown to yellow offspring would indicate that it was heterozygous.
(d) cross it with a known homozygous brown-bodied fly; a 1:1 ratio of brown to yellow offspring would indicate that it was heterozygous.

20. This question refers to the food chain:

tree ⟶ aphids ⟶ birds ⟶ hawk

Which of the following pyramids of numbers represents the above food chain?

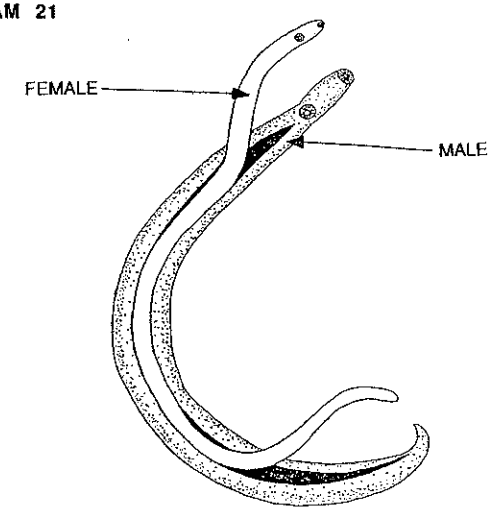


SEE PAGE 11

Information relevant to questions 21 and 22: *Schistosoma haematobium* is a blood parasite found in the veins of the urinary bladder of humans. Males and females of the genus *Schistosoma* occur together, with the female lying in a groove in the male's body (see DIAGRAM 21).

The animals reproduce by a process whereby small cells move from the male to the female. Each of these cells is capable of fusing with certain cells of the female.

DIAGRAM 21



21. The way in which *Schistosoma* reproduces would

(a) ensure uniformity in characteristics from generation to generation.
(b) include an hermaphroditic adult stage.
(c) occur without meiosis.
(d) include a process of fertilization.

22. When *Schistosoma* is reproducing

(a) the small cells which move from the male to the female are diploid.
(b) the body cells of the male would be haploid.
(c) the cells formed by the fusion of male and female cells would contain pairs of homologous chromosomes.
(d) the small cells which move from the male to the female are produced by mitosis.

SEE PAGE 12

23. The table below presents data in grams (g) on food-mass relations in the food chain of a stable ecosystem.

ORGANISMS	food available	food not consumed	food consumed	food not assimilated	food assimilated	metabolic wastes	net gain
Producers (green plants)			3 800		1800	300	X
1st-order consumers (herbivores - mice)	1500	Y	320	100		70	
2nd-order consumers (carnivores - foxes)	150	103			38	Z	15

The values for **X**, **Y** and **Z** respectively are

(a) 2100, 420, 47.
(b) 1500, 1180, 23.
(c) 3800, 1180, 23.
(d) 1500, 420, 53.

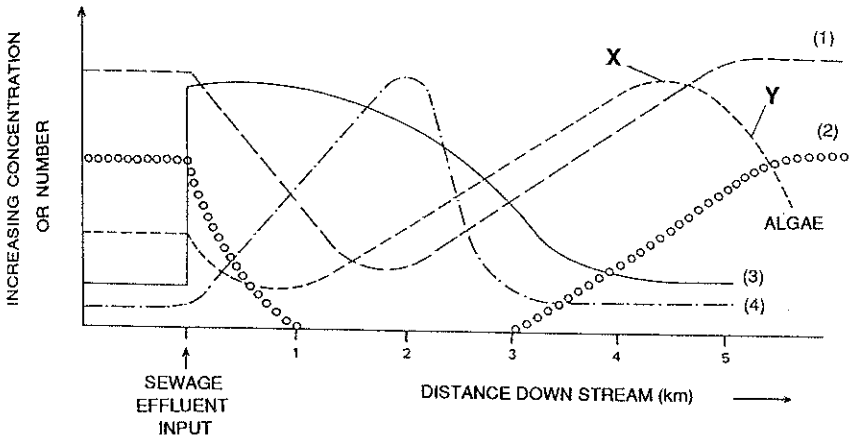
24. Humans cannot survive without a regular supply of fresh water. There is growing concern with respect to the availability of drinking water in south-west Western Australia, particularly for the Perth metropolitan area.
Ecologically, the best solution would be to

(a) increase the use of water from the underground supplies about Perth.
(b) pump water from farther afield (e.g. from the Ord River) to increase the supply for the Perth metropolitan area.
(c) considerably reduce the number of trees around Perth to minimize the loss of ground water through transpiration.
(d) introduce water recycling on a significant scale and increase community awareness into water use.

SEE PAGE 13

Questions 25 and 26 refer to DIAGRAM 25 which shows the effect of sewage effluent flowing into a river from a city.

DIAGRAM 25



25. Which of the following is the most probable identification of the graphs 1, 2, 3 & 4?

	(1)	(2)	(3)	(4)
(a)	freshwater animals	organic matter	oxygen	bacteria
(b)	oxygen	freshwater animals	organic matter	bacteria
(c)	bacteria	oxygen	freshwater animals	organic matter
(d)	organic matter	bacteria	oxygen	freshwater animals

26. The drop in algae between X and Y is probably due to

(a) their being carried away by water.
(b) the presence of poison in the sewage.
(c) their being eaten by the freshwater animals.
(d) the sewage cutting down the penetration of sunlight.

SEE PAGE 14

Questions 27 and 28 refer to Diagram 27 which shows the carbon cycle.

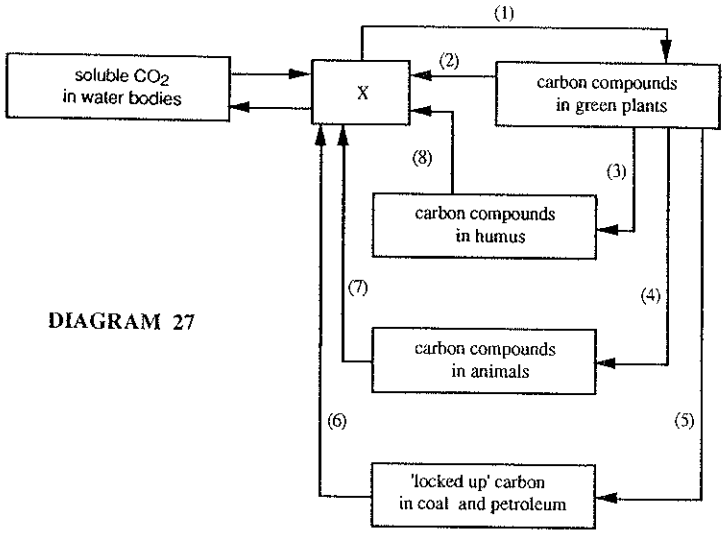


DIAGRAM 27

27. The processes labelled (1), (2), (3), (4), and (6) are respectively known as

(a) photosynthesis, death, respiration, feeding and combustion.
(b) feeding, respiration, death, photosynthesis and combustion.
(c) photosynthesis, respiration, death, feeding and combustion.
(d) combustion, death, feeding, photosynthesis and respiration.

28. The present atmospheric CO_2 concentration is 0.035%. It is estimated that by the year 2050 the atmospheric CO_2 concentration will have increased to 0.045%. Which of the processes in DIAGRAM 27 is mainly responsible for this increase?

(a) (2).
(b) (6).
(c) (7).
(d) (8).

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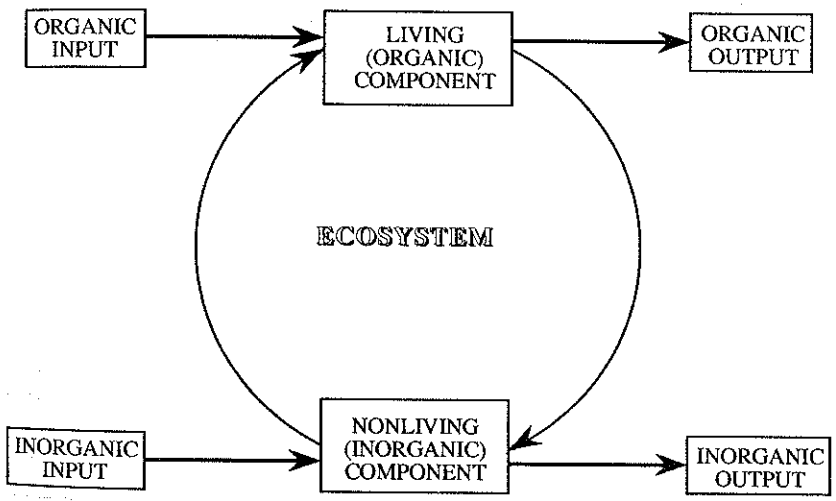
29. The chlorinated hydrocarbon dieldrin, which cannot be excreted by organisms, occurs in similar concentrations in all the plants of a certain garden.
The concentration of dieldrin was measured in arthropods in this garden. Some of the species and their dieldrin concentrations are listed:

A. *Anoplognathus* sp. (0.63 ppm)
B. *Argiope aetherea* (14 ppm)
C. *Sphodropoda tristris* (10.1 ppm)
D. *Valanga irregularis* (0.27 ppm)

The organism most likely to be a herbivore is

(a) A.
(b) B.
(c) C.
(d) D.

30. Ecosystems function through an exchange between the living (organic) and nonliving (inorganic) components:



Agricultural ecosystems differ from natural ecosystems in that

(a) there is considerable recycling between the living and nonliving components of agricultural ecosystems, whereas there is little such recycling in natural ecosystems.
(b) agricultural ecosystems have little organic input, whereas natural ecosystems have significant organic input.
(c) agricultural ecosystems have significant organic output, whereas natural ecosystems have little organic output.
(d) agricultural ecosystems have little nonliving input, whereas natural ecosystems have significant nonliving input.

SEE PAGE 16

SECTION B

Suggested time: 90 minutes (50 marks)

Attempt all questions in this section.
Write your answers in the spaces provided.
Candidates **MUST** use a black or blue pen or biro when answering Sections B and C.

31. (11 marks)

(a) As part of the Biology course, you studied stimulus-response models. Name **ONE** example of a stimulus-response model.

_____

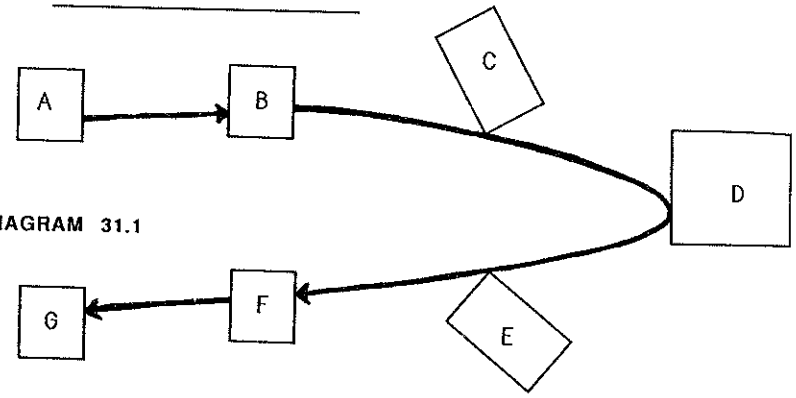


DIAGRAM 31.1

Use your example to name specifically the parts of the stimulus-response model in DIAGRAM 31.1. (4 marks)

A _____
B _____
C _____
D _____
E _____
F _____
G _____

(b) Describe TWO mechanisms by which a plant can respond to some external stimulus such as light. (1 mark)

_____

_____

SEE PAGE 17

31. (continued)

(c) TABLE 31.3 below shows methods of heat loss from an animal.

TABLE 31.3: Contribution of processes to total heat loss.

METHOD OF HEAT LOSS	AMOUNT (kilojoules)
conduction and radiation	7 700
evaporation of water from the skin	1 700
evaporation from the lungs	700
warming air in the lungs	300
urine and faeces	200
TOTAL DAILY LOSS	10 600

From TABLE 31.3, select the method of heat loss which would:

i) decrease most on a hot day? (1 mark)

_____

ii) increase most on a hot day? (1 mark)

_____

(d) Describe two ways by which a desert mammal could reduce its heat loss on a cold day. (2 marks)

_____

_____

(e) Describe one example of a body function controlled by

i) nerves. (1 mark)

_____

ii) hormones. (1 mark)

_____

SEE PAGE 18

32. (7 marks)

In the pedigree shown in DIAGRAM 32.1, shaded individuals have a rare gene defect which causes a major brain dysfunction, such that affected individuals do not survive into adulthood.

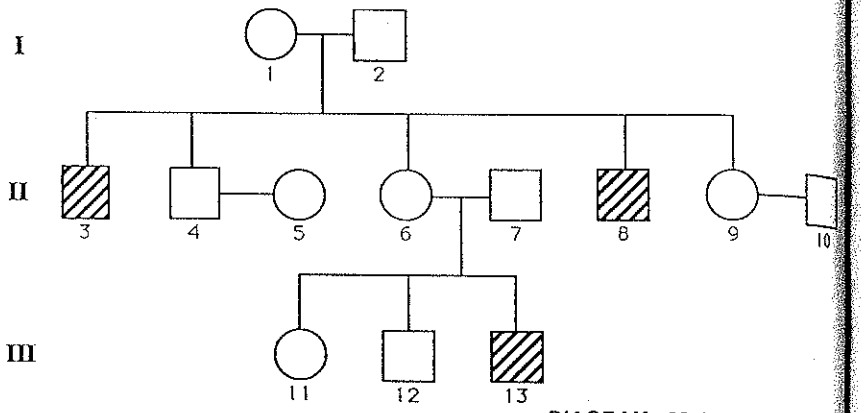


DIAGRAM 32.1

(a) Identify the method of inheritance of the gene which controls this character (whether autosomal or sex-linked, dominant or recessive), and indicate the evidence from the pedigree which supports your answer. (2 marks)

(b) If additional female children were born in generation 3, what would be the likelihood that one would show the trait? Explain. (1 mark)

(c) Having established the inheritance pattern of the gene, should individual II-4 be concerned that he might pass the defect on to his children? Explain. (1 mark)

SEE PAGE 19

32. (continued)

(d) Should individual II-9 be concerned that her children might be affected? Explain. (2 marks)

(e) Which individuals in the pedigree must be heterozygous for the gene? (1 mark)

SECTION B CONTINUES ON P.20

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33. (8 marks)

The following questions (a) to (d) inclusive refer to DIAGRAM 33.1 of mitosis in a root tip of the crocus plant *Crocus balansae*.

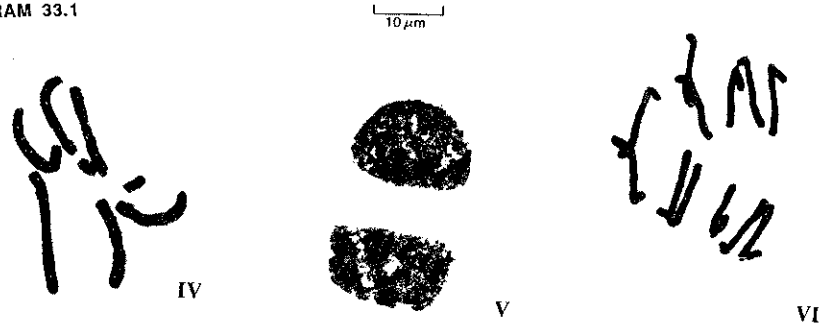


DIAGRAM 33.1

(a) The haploid number of chromosomes for this plant is: (0.5 mark)

(b) The stage called Anaphase is best represented by the diagram: (0.5 mark)

(c) Name two techniques which would have been used to improve the clarity of the cells being observed under the microscope. (2 marks)

SEE PAGE 21

33. (continued)

In the electron micrograph DIAGRAM 33.2, some parts of the cell have been labelled.

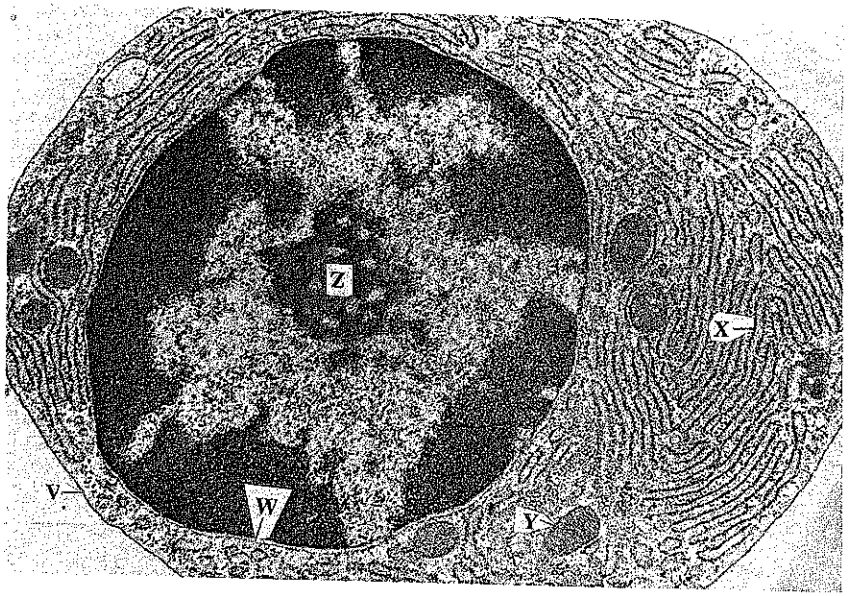


DIAGRAM 33.2

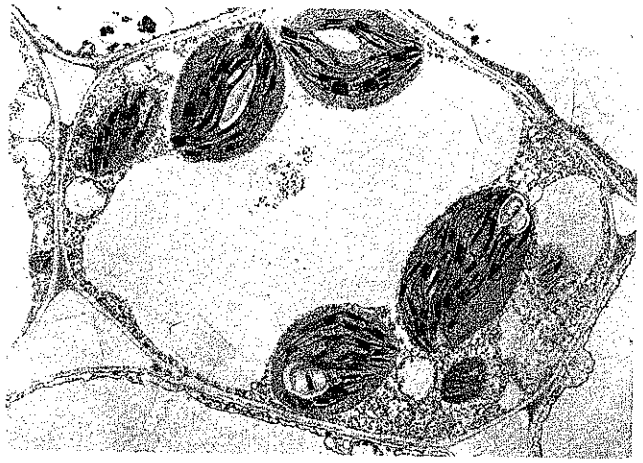
(d) What label indicates the part involved in cell respiration? (0.5 mark)

(e) The structure labelled X would be the: (0.5 mark)

SEE PAGE 22

33. (continued)

(f) DIAGRAM 33.3 shows an electron micrograph of a cell. (2 marks)



Which type of cell is depicted by DIAGRAM 33.3, plant or animal?

_____

Give THREE reasons for your choice.

_____

_____

_____

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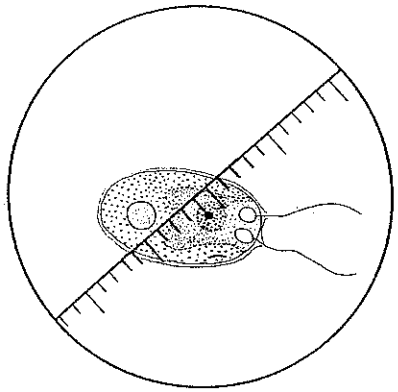
33. (continued)

(g) DIAGRAM 33.4 shows a cell under low power (x 40 magnification) of a light microscope.

DIAGRAM 34.4



i) From the diagram, estimate the length of the cell. (1 mark)

_____

ii) If the magnification was increased from x40 to x400, what would be the diameter of the field of view seen under high power? (1 mark)

_____

SEE PAGE 24

34. (7 marks)

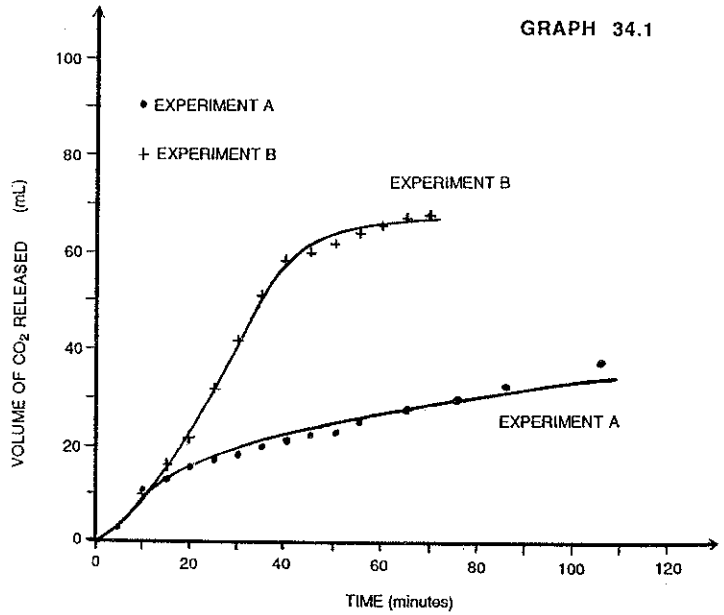
Fermentation is a process used by some microorganisms such as yeasts and bacteria to obtain energy, and is used in brewing and baking because of the products formed. Since the early 1900s it has been known that the rate of fermentation could be varied by altering the inorganic phosphate concentration in solution.

The fermentation process may be summarised as follows:-

$$\underset{\text{glucose}}{C_6H_{12}O_6} \longrightarrow \underset{\text{alcohol}}{2C_2H_5OH} + \underset{\text{carbon dioxide}}{2CO_2} + \text{energy}$$

A scientist designed a series of experiments to investigate the effect that adding inorganic phosphate had on the rate of fermentation. In EXPERIMENT A, he added 25 mL of yeast extract to 5 g of glucose (an excess) in a water solution. Using a specially designed piece of apparatus he was able to measure the quantity of CO_2 released. His data are illustrated in GRAPH 34.1

GRAPH 34.1



(a) The scientist estimated the fermentation rate by measuring the volume of CO_2 released. Suggest another measure he could have used. Explain. (1 mark)

SEE PAGE 25

34. (continued)

(b) Explain why his investigation is more experimentally sound because he used an excess of glucose. (1 mark)

(c) What does the graph indicate concerning the rate of fermentation during the course of the experiment? (1 mark)

In a second experiment (EXPERIMENT B), the scientist added a known quantity of inorganic phosphate to the glucose - yeast solution (i.e. a solution with glucose and yeast in the same proportions as in EXPERIMENT A). His data are again illustrated in GRAPH 34.1.

(d) For graph B, does the fermentation rate speed up or slow down after 40 minutes? (0.5 mark)

(e) Propose a hypothesis to account for the change in fermentation rate after 40 minutes in EXPERIMENT B. (2 marks)

(f) Did the scientist use a control in this investigation? Explain. (1.5 marks)

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35. (7 marks)

In an experiment, seven cylinders of potato were cut using a cork borer. Each cylinder was then weighed. The cylinders were then placed in separate test-tubes as shown in DIAGRAM 35.1. Each test-tube contained a different concentration of sugar solution.

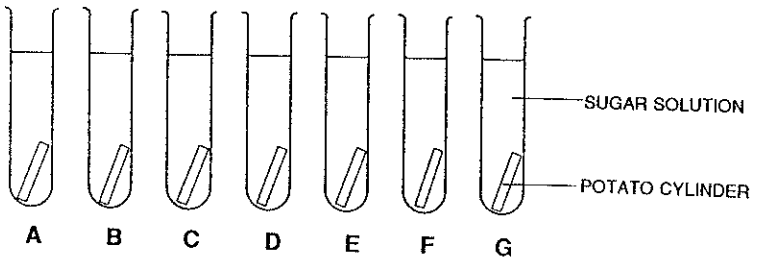


DIAGRAM 35.1

After 24 hours the potato cylinders were removed from the test-tubes and carefully dried using paper towel. They were then weighed again. Some of the potato cylinders had gained mass; some had lost mass. The changes in mass are shown in TABLE 35.2.

TABLE 35.2

Test tube	Amount of sugar in g in 100 cm^3 of solution	Increase (+) or decrease (-) in mass in g
A	20	-0.70
B	18	-0.40
C	14	-0.01
D	12	+0.20
E	10	+0.30
F	6	+0.60
G	2	+0.90

(a) Draw a graph of the results of the experiment on the graph paper provided opposite on page 27. (If you make a mistake, a spare graph is at the end of this booklet). (2 marks)

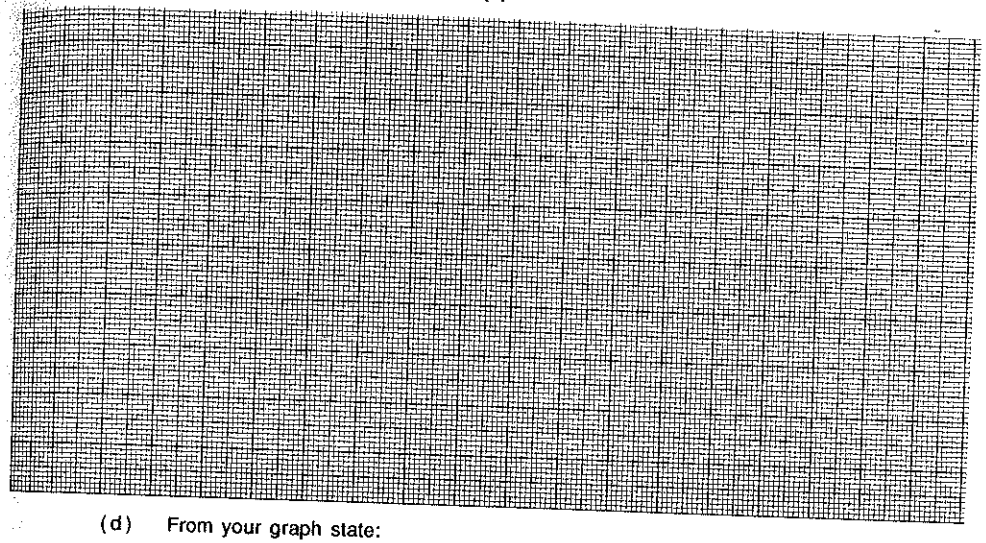
(b) Which test-tube contains the most concentrated sugar solution? (0.5 mark)

(c) Which potato cylinder is the most turgid? (0.5 mark)

SEE PAGE 27

35. (continued)

GRAPH SHEET FOR QUESTION 35 (a)



(d) From your graph state:

i) the sugar concentration at which there would be no change in the mass of the potato cylinder? (1 mark)

ii) the change in mass of the potato cylinder if it had been placed in a test-tube containing 16 g of sugar in 100 cm^3 of solution? (1 mark)

(e) Consider the potato cylinders which increased in mass. Explain in two to three sentences what caused this change. (2 marks)

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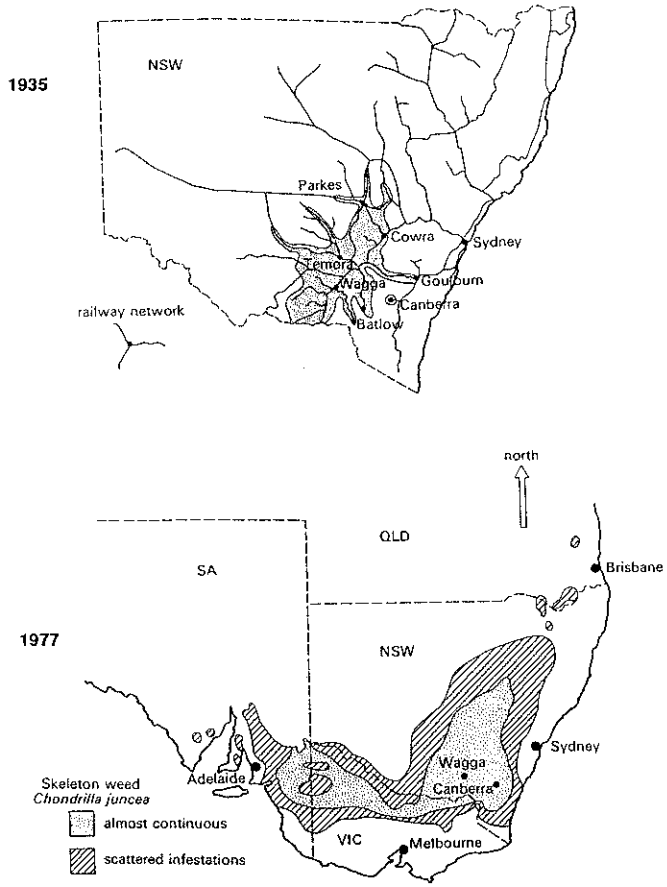
36. (10 marks)

Skeleton weed, *Chondrilla juncea*, is a very serious weed of wheat crops. The species is widespread on sandy soils in Mediterranean Eurasia, and was introduced into Australia prior to 1918. The distributions of skeleton weed in New South Wales in 1935 and again in 1977 are illustrated in DIAGRAM 36.1

DIAGRAM 36.1:

DISTRIBUTION OF *CHONDRILLA JUNCEA* IN SOUTH-EASTERN AUSTRALIA



SEE PAGE 29

36. (continued)

(a) What major factor might have caused the spread of skeleton weed in New South Wales between the years 1935 and 1977? (0.5 mark)

(b) What THREE biological features of an introduced species would allow it to increase in numbers to pest proportions? (1.5 marks)

(c) Describe THREE effects of the introduction of harmful pests on natural ecosystems. (1.5 marks)

(d) Describe a method for quantifying the abundance of skeleton weed at a particular site. (1 mark)

SEE PAGE 30

36. (continued)

(e) Biologists have successfully controlled a number of species which have been introduced into Australia and subsequently become pests. (1.5 marks)

Name ONE such species.

_____

Give TWO non-chemical methods which have been used to manage pests in Australia.

_____

_____

_____

(f) National Parks have been established in certain areas of Western Australia. Name TWO considerations used to determine the siting of a National Park. (2 marks)

_____

_____

_____

_____

(g) Human activity is causing large scale harmful effects upon global ecosystems. Name ONE major effect on the atmosphere. (2 marks)

_____

Suggest THREE biological consequences of this effect.

_____

_____

_____

_____

_____

_____

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SECTION C

Suggested time: 50 minutes (20 marks)

There are two alternatives to each question. Choose **ONE** alternative from each question.

USE THE SEPARATE ANSWER BOOK FOR SECTION C ANSWERS

Each question is worth 10 marks. Answer both questions in **essay** form. Where possible, support your answers with labelled diagrams. **Two** marks may be deducted from each answer which is poorly presented, set out in point form or written with other than a blue or black pen or biro.

37. **EITHER**

(a) The surface area of a cell in contact with the surroundings is extremely important to its survival, and many life processes are dependent on activities associated with surfaces.

i) Explain how this limits the size and shape of cells. (2 marks)

ii) Consider a green plant. Describe, using a clearly labelled diagram, how the plant is structured to maximize the surface areas for photosynthetic processes. (4 marks)

iii) Describe **FOUR** processes by which substances move across cell membrane surfaces. (4 marks)

OR

(b) In order to survive and function normally, a cell requires a stable internal environment.
Discuss this statement by referring to:

(i) the components which must be kept constant of the internal environment of a cell, and the consequences of marked fluctuations in these components. (5 marks)

(ii) the ways in which vertebrates maintain a stable internal environment. (5 marks)

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38. EITHER

(a) Rock lobsters of the genus *Panulirus* inhabit limestone reefs and might be expected to be uniformly distributed throughout such an area. However, early research results summarised in DIAGRAM 38a below indicate that the reef provides habitats for three species of *Panulirus* (illustrated opposite on page 33) each occupying a discrete portion of the reef.

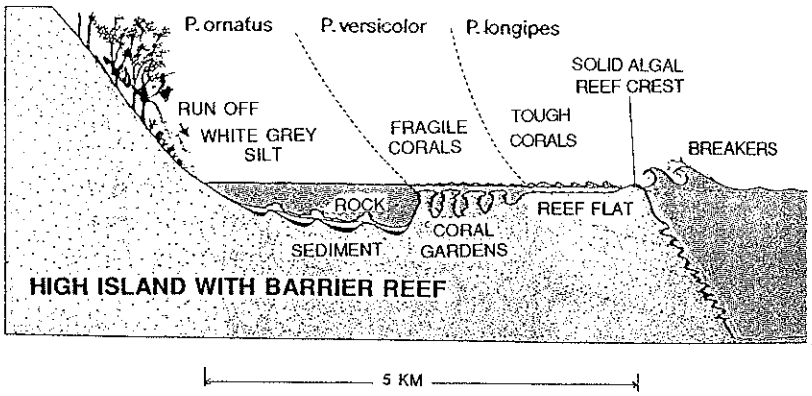

DIAGRAM 38a

i) Describe **FIVE** differences in the habitats of the three species, and suggest unique characteristics for each of the species which would enable them to survive in their particular area of the reef.

(5 marks)

ii) How do morphological differences between species of this sort develop, and how were they maintained during speciation?

(5 marks)

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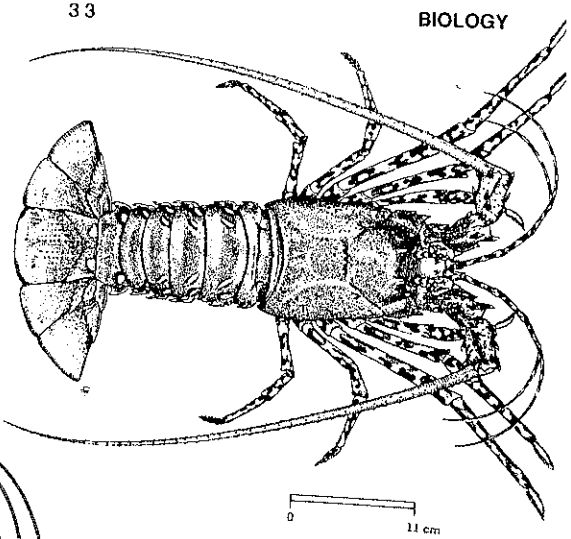
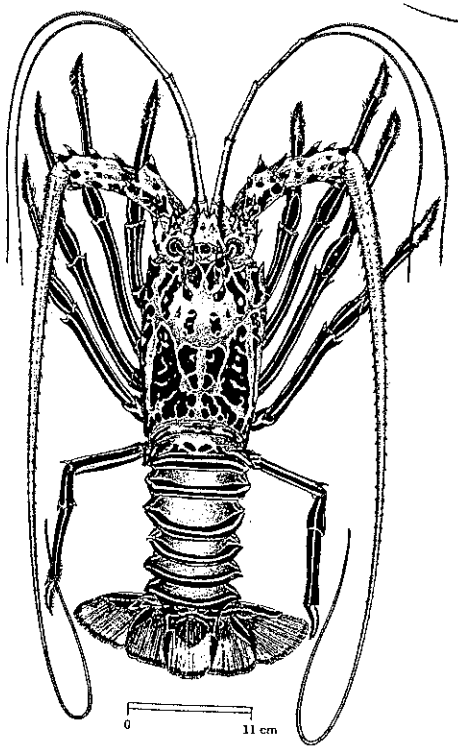
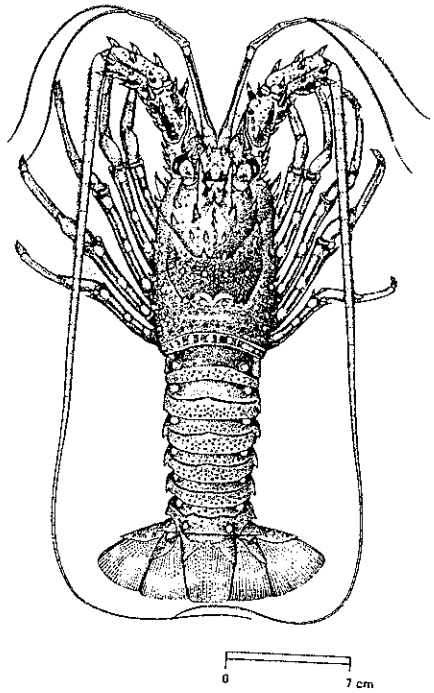
38. (a) (continued)

Panulirus ornatus





Panulirus versicolor



Panulirus longipes

SEE PAGE 34

38. (continued)

OR

(b) DIAGRAM 38b illustrates in simplified detail the food web of the Antarctic Ocean.

i) Identify examples of producers, first order consumers, second order consumers and higher order consumers from this food web.
Describe the role of each category of organism, and by diagram or otherwise, indicate the relative abundance of each in this ecosystem. (6 marks)

ii) Over many years, scientists have estimated that 470 million tonnes of krill are harvested annually by all the organisms within the food web (including humans). During the past 150 years, baleen whale populations have been reduced to 20 - 25% of their former levels. Nevertheless, throughout this period, the biomass of krill has varied little. Discuss the reasons as to how this constancy of krill biomass is achieved. (3 marks)

iii) Explain why, in the diagram, considerable care is taken to distinguish between the water column and the sediments. (1 mark)

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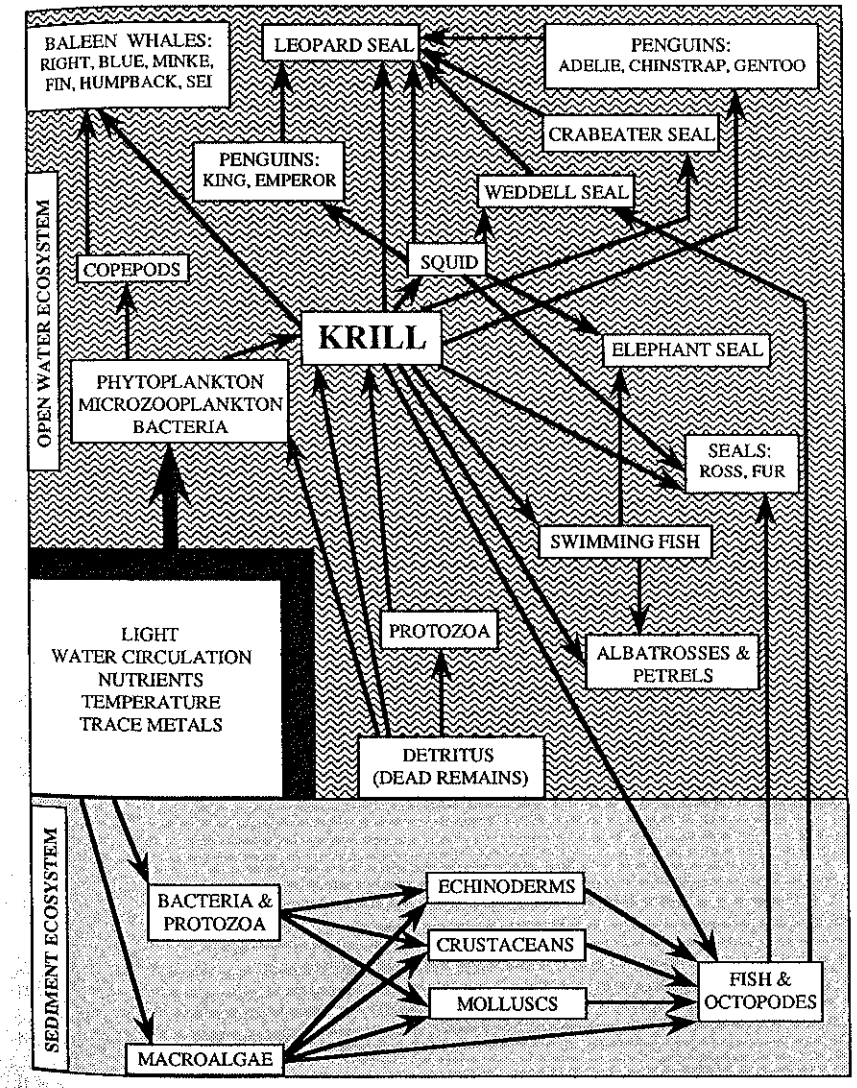
38. (b) (continued)

DIAGRAM 38b



END OF PAPER