

TERTIARY ENTRANCE EXAMINATION, 1993
QUESTION/ANSWER BOOKLET

Please place one of your student
 identification labels in this box

BIOLOGY

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SEA STUDENT NUMBER -- In figures

In words

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 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 30 pages and 37 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. If you have any unauthorised material with you hand it to the supervisor BEFORE reading any further.

SEE PAGE 3

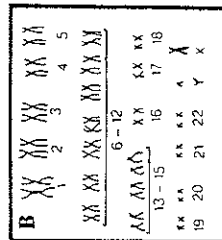
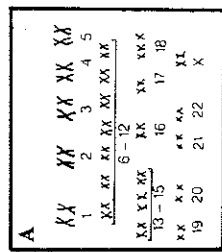
SECTION A

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.

Question 1 is based on the karyotypes from two different humans illustrated in **DIAGRAM 1**.



1. Which of the following is a correct interpretation of the karyotypes?

- Individual A is a female with normal chromosome complement.
- Individual A is a female with abnormal chromosome complement.
- Individual B is a female with normal chromosome complement.
- Individual B is a female with abnormal chromosome complement.

2. Vertebrate limbs have a pentadactyl structure. **DIAGRAM 2** shows hind limbs of three different vertebrates. Differences in the structure of pentadactyl limbs demonstrate

- genetic drift.
- variations which have evolved from a common ancestor.
- that similar structures can evolve from different ancestors.
- inheritance of acquired characters.

3. Pancreatic cells from a camel were cultured in a nutrient solution containing radioactive nucleotides. After the cells were allowed to increase in numbers over a short period of time, radioactivity was detected only in the chromosomes. Some cells were then allowed to divide once more in the absence of the radioactive nucleotides.

Examination of the resulting daughter cells would be most likely to reveal radioactivity in

- the nucleus of half of the daughter cells.
- the nucleus and cytoplasm of half of the daughter cells.
- the nuclei of all daughter cells.
- the nuclei and cytoplasm of all daughter cells.

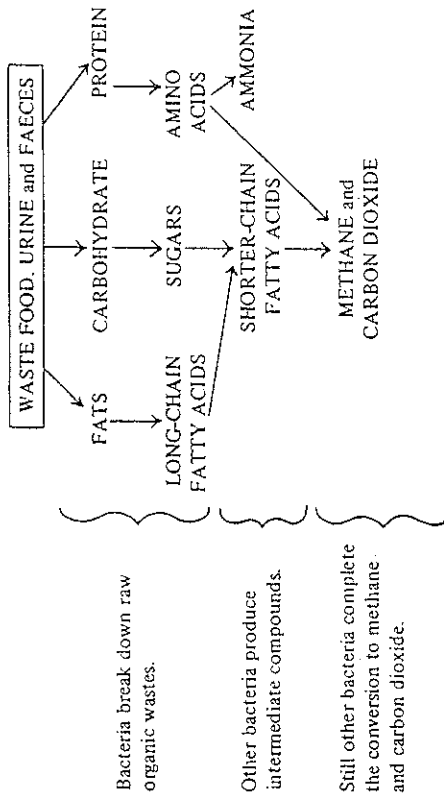
SEE PAGE 5

The following information is relevant to Questions 4 and 5.

Waste digesters are used in some piggeries to recycle animal food scraps, urine and faeces. The digesters produce the gases methane, ammonia and carbon dioxide as end products.

The ammonia and carbon dioxide are waste products. The methane is conducted away and burned to heat enclosures for pigs.

Decomposition in the waste digester is summarised below:



4. How would the total amount of chemical energy present in the original food scraps and animal wastes compare with the chemical energy contained in the final products?

- There would be more chemical energy in the final products.
- There would be more chemical energy in the starting materials.
- Chemical energy levels would be the same.
- All chemical energy would be released during the process.

5. The piggery ecosystem differs from natural ecosystems in that in the piggery ecosystem

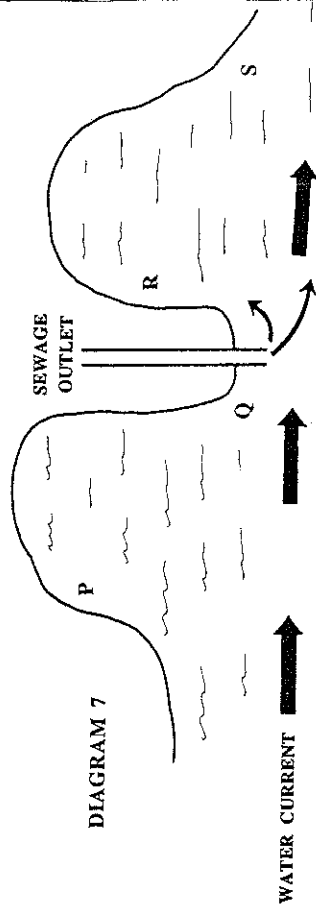
- gases are produced during decomposition at several metabolic steps.
- decomposition is a gradual process requiring numerous small steps within the ecosystem.
- some of the energy released from the wastes is reused within the ecosystem.
- a variety of different microorganisms is involved in decomposition.

SEE PAGE 6

6. Which of the following conditions could result in the formation of a new species?

- Two populations separated in different habitats.
- The appearance in a population of new forms which interbreed with the original forms.
- Strong levels of selection against one particular form in a population.
- Gene flow between two populations separated by a large barrier of some kind.

7. Limpets graze on micro-algae on rocks in the inter-tidal zone of seashores. A biologist was interested in comparing the growth rates of a species of limpet at the four sites labelled P, Q, R and S in **DIAGRAM 7**. Sites Q and S were in regions of high water current, sites P and R were in areas of low water current. A sewage outlet is also indicated on **Diagram 7**.



The results, with +, ++, +++ and ++++ representing mean growth rate of limpets from lowest to highest were as follows

SITE	P	Q	R	S
Mean growth rate of limpets	+	+++	++	++++

These results were most likely caused by

- effluent from the sewage outlet having a toxic effect on marine life.
- water currents aiding in the growth of limpets by killing fouling organisms.
- increased predation in sheltered waters preventing growth of large limpets.
- the concentrations of suitable soluble nutrients varying between sites.

8. During the last century, urban and industrial development close to waterways has affected the biological condition of these waterways. Which of the following is true?

- Eutrophication is caused by heavy metal pollution.
- Low levels of oxygen are caused by excessive fish populations.
- Fish deformity and death is caused by phosphate pollution.
- Algal blooms are caused by excessive nutrient levels.

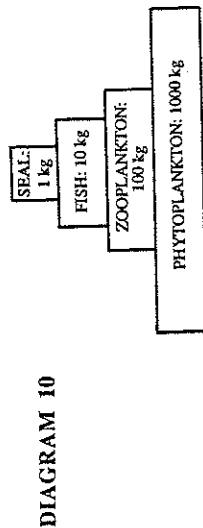
SEE PAGE 7

9. Claims have been made that an increasing 'greenhouse effect' of the world's atmosphere could affect agriculture. A scientist investigated the consequence of experimentally altering the atmospheric carbon dioxide concentration on the rate of growth of vegetables in an artificial environment.

Which of the following is the most likely result of this work?

- Doubling the carbon dioxide content of the air caused vegetable deaths.
- Halving the carbon dioxide content of the air had no effect on vegetable growth.
- Doubling the carbon dioxide content of the air increased vegetable growth.
- Halving the carbon dioxide content of the air increased vegetable growth.

10. **DIAGRAM 10** illustrates a pyramid of biomass for a marine-based food chain. The pyramid shows that, for every 1 kg increase in seal mass, there must be 1000 kg of producer biomass consumed.



The data in this pyramid illustrate that

- energy is recycled between trophic levels.
- mass is lost between trophic levels.
- biomass is recycled between trophic levels.
- a large proportion of food is used to supply energy for living animals.

11. In many parts of the world, carnivorous birds have died from pesticide poisoning. Which one of the following is the most likely explanation?

- Carnivorous birds are particularly susceptible to pesticide.
- On being ingested by carnivorous birds, pesticide is changed chemically and actually becomes more poisonous.
- Pesticide accumulates in higher concentrations in the bodies of organisms near the top of a food chain.
- Aerial spraying with pesticide constitutes a greater danger to birds than to organisms on the ground.

12. *Eichhornia crassipes*, the water hyacinth, was introduced into Australia about the turn of this century. Since then, it has become a nuisance in many waterways because of its rapid growth. The best explanation for the success of this plant in Australia is

- there are no naturally occurring predators.
- the climate provides optimum conditions for growth.
- attractive flowers attract insect pollinators.
- the niche it occupies was previously vacant.

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13. The following item, entitled 'Playful, cuddly...potential killers', was seen in a newspaper some while ago.

Playful, cuddly... potential killers

A wildlife expert is dumpe by unthanking Mr Fox estimates the warned yesterday that people on the fringes of number could run into in a matter of weeks cities, towns and nature millions of delightful reserves.

playful, cuddly potential When this happens they will swell the number of feral cats which are causing havoc among birds, lizards, snakes and small marsupials.

They are cats, the familiar feline domesticus, equally well known on the beach-rog and in back alley.

Their birth will spell death for large numbers of native fauna. Mr Allan Fox, a senior official of the National Parks and Wildlife Service, said in Sydney: "The tragedy is that while some of the kittens will be cherished as pets or painlessly put down, frightening numbers will be dumped by unthanking people on the fringes of cities, towns and nature reserves."

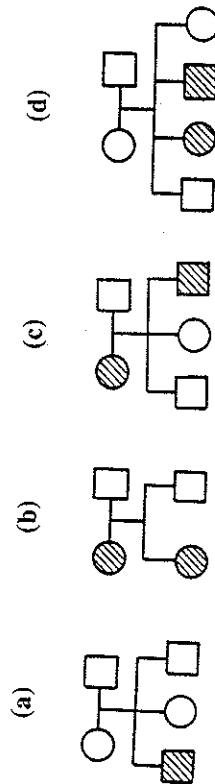
When a household cat goes wild, it goes very wild, indeed. It is a process of natural selection the strongest cats survive and mate, thus producing a kind of supercat.

Wild cats weighing more than 9 kg have been shot recently at National Parks and Wildlife Rangers compared with about 3 kg for the domestic cat. — and there is evidence that these super-cats are quite capable of breeding with their gentle domestic cousins.

Based on the newspaper item, the most likely explanation for the development of feral supercats is that

- a series of spontaneous mutations has transformed small domestic cats into large feral cats.
- large feral cats arise from new combinations of genes which already exist in populations of small domestic cats.
- the effort to survive in the Australian bush greatly increases the size and strength of a domestic cat.
- feral cats result from crosses between domestic cats and native marsupial cats.

14. Which one of the pedigrees illustrated below is consistent with an X-linked recessive mode of inheritance?



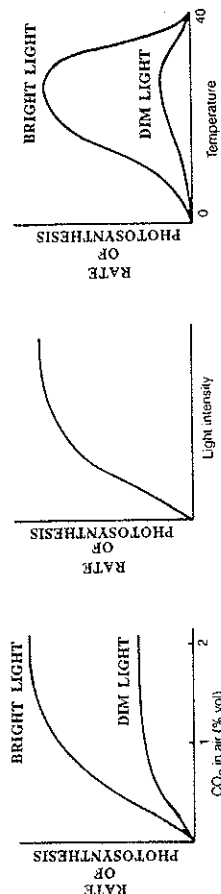
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15. Marfan's syndrome is an inherited disorder of the skeleton in humans. Persons with Marfan's syndrome have abnormally long extremities, particularly fingers and toes, and congenital abnormalities of the heart and other deformities.

This syndrome is inherited in an autosomal dominant manner. For a man who has the syndrome, the chance that

- a son of his would show the syndrome is $\frac{1}{4}$.
- a daughter of his would be normal is 1.
- his father would have shown the syndrome is $\frac{1}{2}$.
- his mother would have been normal is $\frac{1}{4}$.

16. The effects of carbon dioxide concentration, light intensity and temperature on the rate of photosynthesis are shown below.



What conclusion can be drawn from these graphs?

- Carbon dioxide is a limiting factor for photosynthesis.
- Light intensity is not a limiting factor for photosynthesis.
- Temperature is not a limiting factor for photosynthesis.
- Oxygen is a limiting factor for photosynthesis.

17. A scientist showed, using the experimental set-up illustrated in **DIAGRAM 17**, that the three sugars glucose, galactose and mannose, diffuse at the same rate through the semi-permeable membrane into the surrounding water.

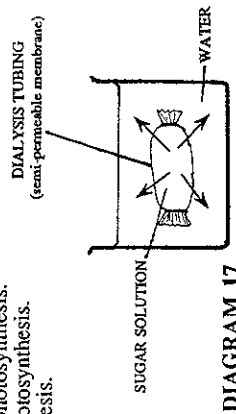


DIAGRAM 17

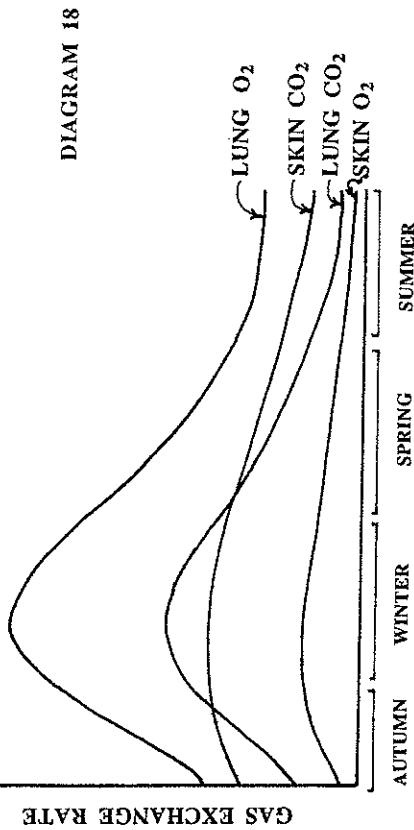
In experiments using isolated portions of intestine from guinea pigs instead of dialysis tubing, the rates of loss of these three sugars varied: mannose was lost more slowly than glucose, and galactose was lost from the bag of intestine most rapidly.

Which of the following statements is not consistent with these data?

- Galactose is a smaller molecule than mannose.
- These sugars are converted to insoluble forms in the liver of the guinea pigs at different rates.
- The three sugars are in different concentrations in the solution.
- These sugars are actively transported by the intestinal cells of the guinea pigs at different rates.

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18. **DIAGRAM 18** is a graph showing the results from a year of measurements of oxygen and carbon dioxide exchange through the lungs and skin of a frog from southwestern Australia.



Which of the following statements is **not** consistent with these data?

- During autumn the rate of cellular respiration in the frog is least.
- During autumn the lungs contribute more as respiratory surfaces than the skin.
- The breathing rate is greatest in winter.
- The energy requirements of the frog are greatest in winter.

19. The flowering responses of long-day and short-day plants to different periods of day-length are illustrated below.

Long-day plant	Day/Night	Short-day plant
no flowers		flowers
flowers		no flowers
flowers		no flowers
flowers		no flowers

LIGHT =

DARK =

Using these data, a student wrote the following hypotheses. Which one is supported by the data collected?

- Short-day plants will flower if the daylength is short.
- Long-day plants will never flower in short-day conditions.
- Short-day plants flower in response to a long period of uninterrupted darkness.
- Long-day plants flower only following a long period of uninterrupted daylight.

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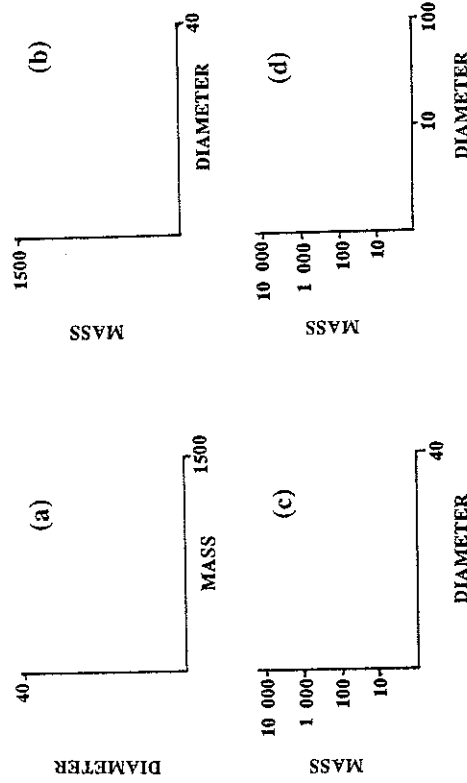
20. A scientist needed to compare the rate of growth of wheat seedlings in trials using different levels of fertilizer. Measurements were to be made on the same seedlings at intervals of 48 hours. Which of the following units of measurement would have been most appropriate to use?

- Height of the seedlings.
- Dry mass of the seedlings.
- Fresh mass of tissues above the ground.
- Fresh mass of the entire seedlings.

21. The following data were collected as part of a study on the growth rate of jellyfish. Measurements made of the diameter and wet mass of 10 jellyfish are shown below.

DIAMETER (cm)	MASS (g)
3	9
5	12
7	24
8	31
12	52
16	91
21	216
25	670
30	1109
31	1201

Which of the following graphs is the most appropriate for displaying these data?



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22. Some areas of farmland in Western Australia have been spoiled for agriculture by increasing levels of salt in the soil. Various approaches to solving the problem of soil salinity have been suggested. Which of the following is the most appropriate long-term solution?

- Establishing plantations of commercially valuable salt-tolerant plants.
- Flooding salt affected areas with fresh water to wash away accumulated salt.
- Establishing plantations of deep rooting trees close to the salt affected areas.
- Using pumps to lower the water table in salt affected areas.

23. **DIAGRAM 23** shows two types of animal cells (P and Q) as viewed by light microscopy. Cells of type P have many more of the organelles with the structure X than do cells of type Q.

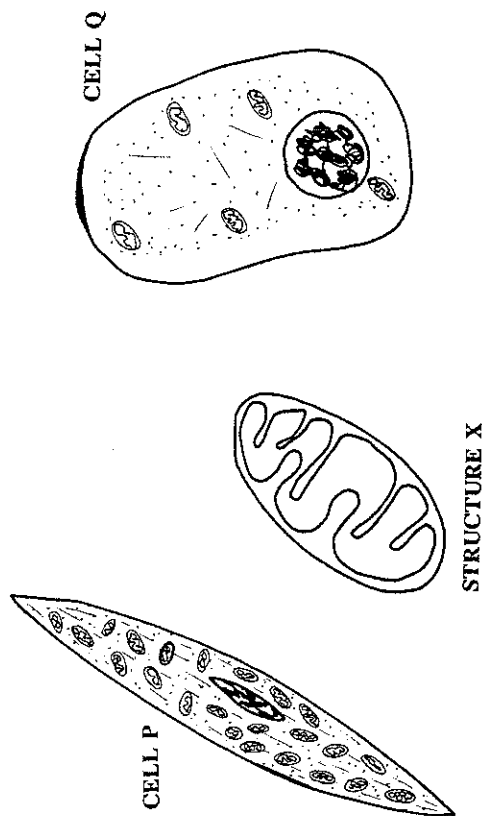


DIAGRAM 23

With reference to these diagrams, which of the following is probably a true statement?

- P type cells come from tissue with a higher rate of oxygen consumption than a tissue rich in Q cells.
- P type cells come from tissues with a lower rate of metabolism than tissues rich in Q cells, but with higher rates of protein synthesis.
- P cells are probably more active in secreting substances synthesized within the cell than are Q cells.
- P cells are more likely to depend upon anaerobic respiration than are Q cells.

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24. For multicellular organisms, growth involves cell division. Large organisms have more cells than small organisms; they do not have larger cells. Which of the following is relevant in explaining this observation?

- The surface area/volume ratio is important in the normal functioning of cells.
- Surface area/volume ratio is constant for structures with the same shape.
- The surface area/volume ratio of very large cells would be too great for them to function effectively.
- The surface area of membranes within cells is important for normal cell function.

25. It has been claimed that tropical forests are important because they absorb large amounts of atmospheric carbon dioxide. If you needed to find information on the capacity of these forests to 'sink' carbon dioxide, which one of the following books would you select? The book titles are

- Tropical Forest Ecosystems of the World.
- Tropical Forests and the Biosphere.
- Biological Communities of Rainforests of the World.
- Conservation of Rainforest Biodiversity.

26. **DIAGRAM 26** shows an experiment to determine the effect of removing leaves on flowering in Cocklebur plants.

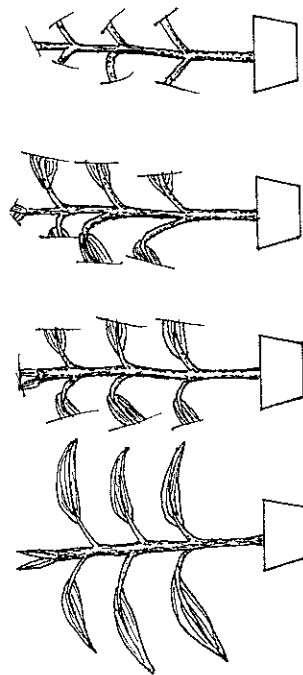


DIAGRAM 26

An experimenter showed that, for the Cocklebur plant, flowering occurs if $\frac{1}{8}$ of one leaf is present, but not if all leaves are removed.

Which of the following statements is an hypothesis being tested by the experimenter?

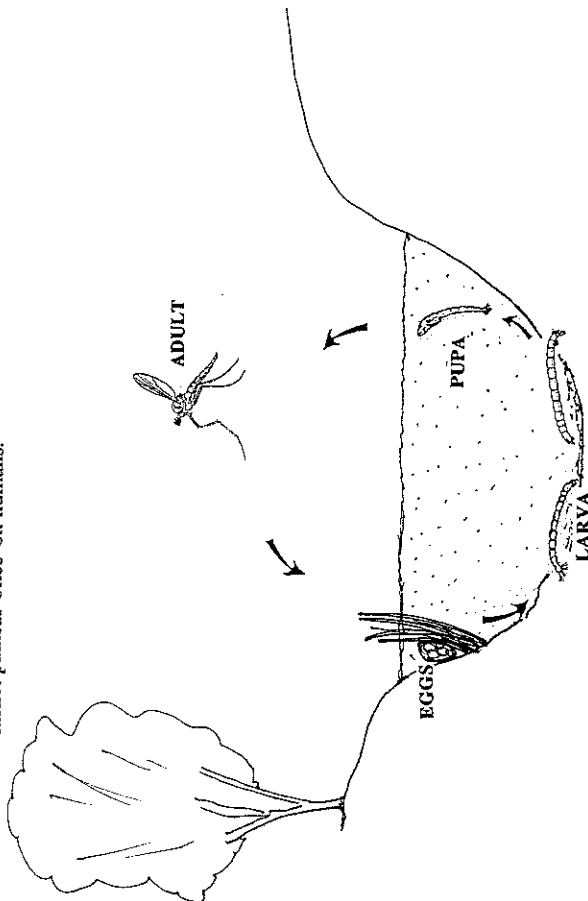
- Flowering in plants is best explained in terms of hormones and light period.
- Substances produced by leaves are not essential for Cocklebur plants to produce flowers.
- Many processes in flowering plants are controlled by chemicals which are produced by leaves.
- Substances produced by the leaves of Cocklebur plants will prevent the plant from flowering.

SEE PAGE 14

27. Considerable anxiety has been expressed in the media concerning the development during summer of a large ozone hole high in the atmosphere over the southern hemisphere. The main ecological consequence resulting from this ozone hole is likely to be:

- humans will suffer more sunburn unless they limit the time spent sunbathing to particular times of the day.
- micro-organisms such as fungi and bacteria living on the skin of humans will all be killed.
- the increase in UV radiation will lead to an increase in the 'greenhouse effect'.
- an alteration in the growth rate of marine phytoplankton.

28. Chironomids are insects. The juvenile stages live in swamps and lakes. Adult chironomids fly, and are usually regarded as undesirable because large numbers of them swarm about dusk around houses built near swamps and lakes, when they can inflict painful 'bites' on humans.



Imagine that you have the task of controlling the chironomid problem affecting many townships and cities in Western Australia. You decide, for sound ecological reasons, that some form of chemical control is not a good method to use, and instead you decide to develop some form of biological control.

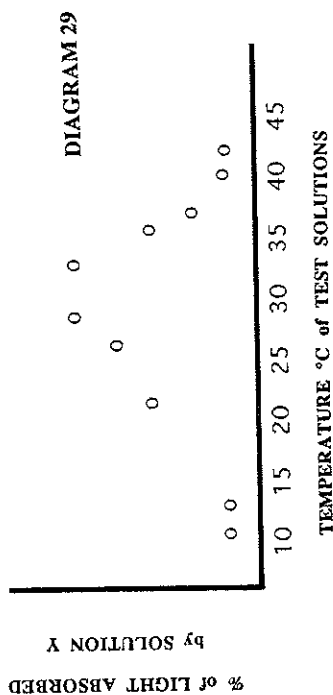
Which of the following features would your agent for biological control show?

- It would have harmful effects on a wide range of non-target species.
- It would be able to attack only a very particular life stage of the target species.
- It would carry a large variety of parasites within its body.
- It would kill most target specimens in an affected area.

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29. An extract from live turnips was tested in the laboratory to measure how effectively the extract converted one colourless substance (X) to a coloured substance (Y) under different temperature conditions. The amount of substance Y that was produced in one minute was estimated from the amount of light absorbed by the solution of substance Y.

The results of trials at different temperatures are shown in **DIAGRAM 29**.



Which of the following is the best interpretation of the results of this work?

- Substance Y is probably very unstable at temperatures greater than 35 °C.
- The conversion of substance X to substance Y is controlled within turnip cells at temperatures less than 35 °C.
- The conversion of substance X to substance Y is probably controlled by enzymes which do not function at temperatures greater than 35 °C.
- Substance X has an optimum temperature around 35 °C and is destroyed at temperatures greater than 35 °C.

30. The red blood cells of mammals are unusual in that they have no cell nuclei. Which of the following is probably a true statement about these cells?

- These cells are able to respire but are unable to synthesize protein.
- These cells are able to synthesize protein but are unable to undergo cell division.
- These cells are able to undergo cell division but are unable to respire.
- These cells are able both to respire and to synthesize protein.

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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 ball point pen when answering Sections B and C.

31. (9 marks)



Large areas of Australia receive low and unreliable annual rainfall. In these arid areas, most of the primary production is by hummock grasses which grow after rain, but for much of the time there is no moist vegetation. Few mammals can cope in these arid conditions, but insects, especially termites, feed on the hummock grass. The termites are, in turn, used as a food source by various types of lizards.

- (a) In this ecosystem: (1.5 marks)
- identify the autotroph: _____
 - what level do the lizards occupy in the food chain?
 - suggest which type of animal might function as a higher level carnivore.

SEE PAGE 17

31. (continued)

- (b) If a fire swept across this ecosystem, predict the likely short term consequences for the biomass of termites and lizards. (2 marks)

- (c) Reptiles and mammals differ markedly in their total energy requirements. How may this help to explain why lizards rather than mammals are successful in this ecosystem? (2 marks)

- (d) Reptiles and mammals differ markedly in the way that they remove toxic nitrogenous wastes from their bodies. How might these differences also help to explain the relative success of lizards in this ecosystem? (2 marks)

- (e) Give ONE method by which lizards thermoregulate. (0.5 mark)

- (f) Suggest a reason why ecosystems such as this should be conserved. (1 mark)

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32. (10 marks)

DIAGRAM 32.1 shows seedlings of *Capsicum annuum* plants growing in pots. A plastic bag sealed to the stem of each plant prevents water loss from the soil by evaporation. Water loss from the plants was estimated by recording the reduction in mass of each pot after one hour under the same conditions. TABLE 32.2 shows the results.

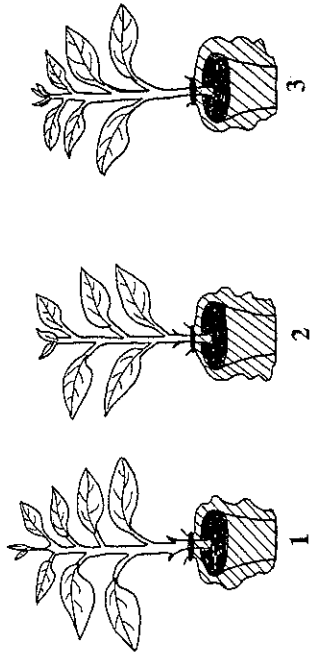


TABLE 32.2

Pot number	A Loss of mass in darkness (mg)	B Loss of mass in daylight (mg)	C Total leaf area (cm ²)	$\frac{A}{C}$
1	325	119	75	4.3
2	412	113	92	4.5
3	295	93	64	4.6

(a) In Table 32.2, explain why the figures in the last column ($\frac{A}{C}$) were calculated in the way indicated. (1 mark)

(b) What are the units for the values calculated in part (a)? (1 mark)

(c) What hypothesis might the experimenter have been testing? (2 marks)

(d) How many replicates were used in this experiment? (0.5 mark)

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32. (continued)

(e) For this experiment, identify the:
dependent variable: _____ (1 mark)

experimental/independent variable: _____

(f) i) Is this experiment controlled? _____ (0.5 mark)

ii) Explain your answer. _____ (1 mark)

Examination of the lower surfaces of the leaves shows structures in the epidermis which appear in DIAGRAM 32.3.

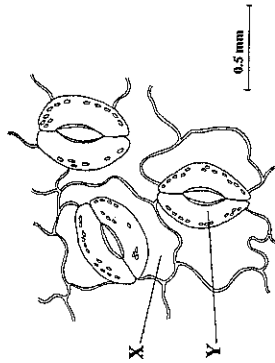


DIAGRAM 32.3

(g) Name the parts of the diagram labelled as X and Y (1 mark)

X: _____

Y: _____

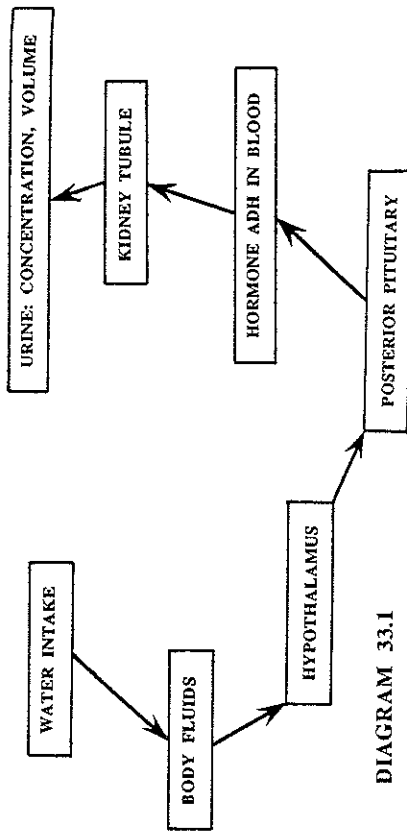
(h) i) Describe a change which could occur in the epidermal cells of the leaf so that the shape of Y changes between night and day. (1 mark)

ii) Explain how the change in shape in structure Y relates to water loss. (1 mark)

SEE PAGE 20

33. (10 marks)

Mammals regulate their volume of body fluids through a pathway which is represented in **DIAGRAM 33.1** following:



(a) In this pathway, name the:

stimulus

response

(2 marks)

(b) Name two effects on body fluids of substantial water intake.

(1 mark)

(c) In terms of a standard stimulus - response model, what is the role of the hypothalamus in this particular pathway?

(1 mark)

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33. (continued)

(d) Describe changes in urine concentration and volume following a **decrease** in water intake. (2 marks)

Feedback is a part of homeostatic stimulus - response models.

(e) Explain how the feedback is achieved in this pathway. (4 marks)

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34. (10 marks)

The cardinalfish *Apogon rueppellii* (DIAGRAM 34.1) occurs around the western coastline of Australia from Albany to the Northern Territory. These fish inhabit shallow water in protected bays along the coastline, around islands, and in estuaries.

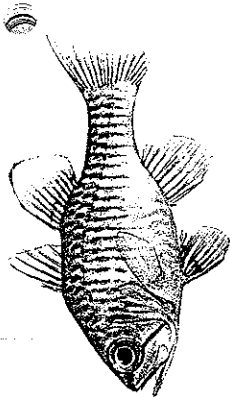
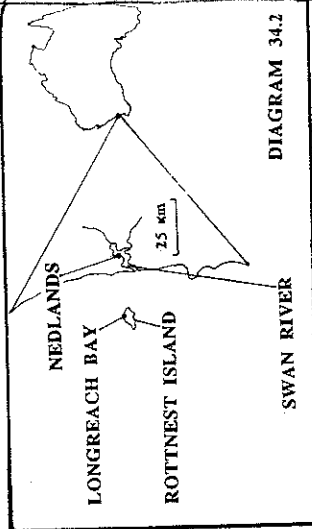


DIAGRAM 34.1

Individual fish do not move far. There are several explanations for this. Adults do not have a migratory phase, the males brood eggs in their mouths to an advanced stage of development, and the larvae which hatch from the eggs have only a short time during which they can be dispersed passively by ocean currents.

The allelic frequencies of a number of genes of specimens of *A. rueppellii* from two sites, the Swan River at Nedlands and from Longreach Bay, Rottnest Island (DIAGRAM 34.2), were measured.



Let us consider just one of these genes which for convenience we will call gene R. Gene R has two alleles.

(a) If one allele is dominant over the other, give a standard method for representing both of them. (1 mark)

The following allelic frequencies were recorded in cardinalfish from the two locations. Note: We have no knowledge on the dominance - recessive relationships between the two alleles, so we will distinguish between them both as follows:

SITE	Allele 1 frequency	Allele 2 frequency
Nedlands	0.68	0.32
Longreach Bay	0.38	0.62

(b) For the gene R, what is the most frequent allele in the sample from Longreach Bay? (0.5 mark)

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34. (continued)

(c) Assuming that *A. rueppellii* is diploid, give the genotypes possible for this fish (1.5 marks)

(d) Name one process, besides natural selection, which might cause the differences in allelic frequencies between fish from the two sites to develop. (1 mark)

(e) If the differences in allelic frequencies between fish from the two sites ARE due to natural selection, suggest one factor which might give rise to the selection. (1 mark)

(f) Using your answer to part (e), describe how natural selection might have brought about the changes in allelic frequency. (2 marks)

(g) If the frequency of allele 1 at Nedlands increased to 1.00, what would be the frequency of allele 2? (0.5 mark)

(h) Suggest two ways by which allele 2 might increase in frequency in the Nedlands population. (1 mark)

If cardinalfish suddenly became mobile:

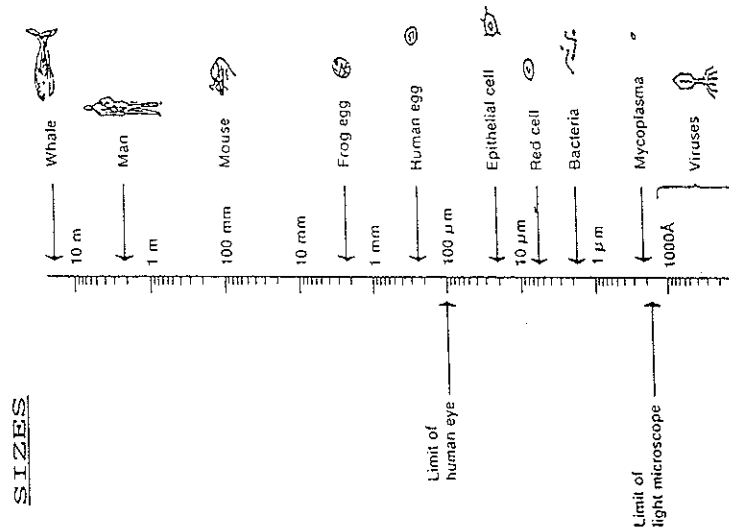
(i) What effect would this have on the observed frequencies of both alleles at the two sampling sites? (0.5 mark)

Explain. (1 mark)

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35. (11 marks)

The scale shows the sizes of various biological entities.



(a) Reading from the scale:

- what is the diameter of the human egg cell?
_____ (0.5 mark)
- how many bacteria, placed end to end, would fit in a straight line across the diameter of a red blood cell?
_____ (0.5 mark)

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35. (continued)

FIGURE 35.1 shows a drawing of several palisade cells of a plant.

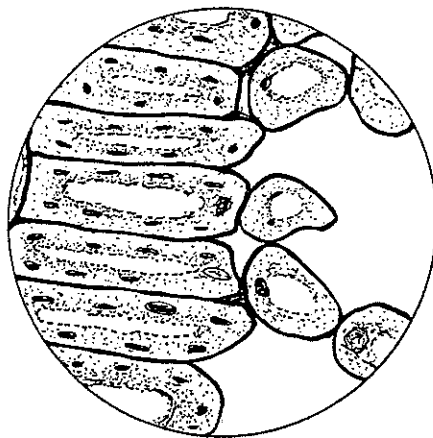


DIAGRAM 35.1

Given that the field of view is 0.5 mm:

- estimate the dimensions of one cell, stating appropriate units; (1 mark)
length: _____
breadth: _____
- Calculate the magnification for this diagram. (1 mark)

If the objective lens of the microscope was changed from $\times 40$ to $\times 10$,

- what would be the new diameter of the field of view in mm? (1 mark)
- how many palisade cells would fit side by side across the field of view using the $\times 10$ objective. (1 mark)

- In DIAGRAM 35.1, several cell structures are visible. Name TWO additional organelles which could be seen if these cells were viewed using an electron microscope? (1 mark)

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35. (continued)

DIAGRAM 35.2 below represents a cell.

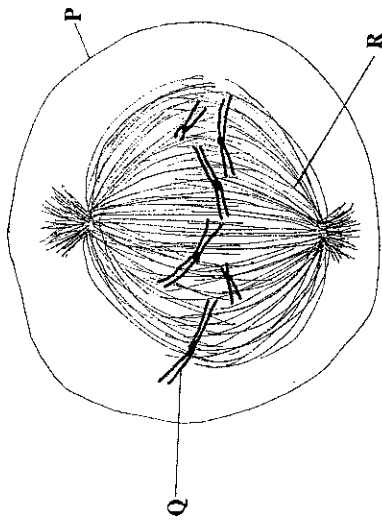


DIAGRAM 35.2

- (d) i) Name a technique which is used to make cell contents more visible. (1 mark)

- ii) Name the structures labelled P, Q, R. (1.5 marks)

P) _____

Q) _____

R) _____

- iii) Name the process which is occurring in this cell. (0.5 mark)

- iv) Structures Q in Diagram 35.2 are two-stranded. What is the significance of this? (2 marks)

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SECTION C

Suggested time: 50 minutes (20 marks)

There are two alternatives to each question. Answer 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.

36. EITHER

- (a) In rabbits, full black coat is dependent on the presence of the dominant gene F. Absence of colour, albinism (f) is recessive to full colour. Other alleles for coat colour also exist. Himalayan (fh) is partial colour of the extremities such as the ear, nose, feet and tip of the tail. Chinchilla (f^c) is a silvery-grey appearance in the homozygous condition. Both are recessive to full coat colour and dominant over albinism. Chinchilla is dominant to Himalayan.

- i) Write an essay on genetic control of coat colour in rabbits. In your answer, include reference to the number of alleles that control coat colour, the possible genotypes which can occur, and the transfer of alleles to the next generation. (6 marks)

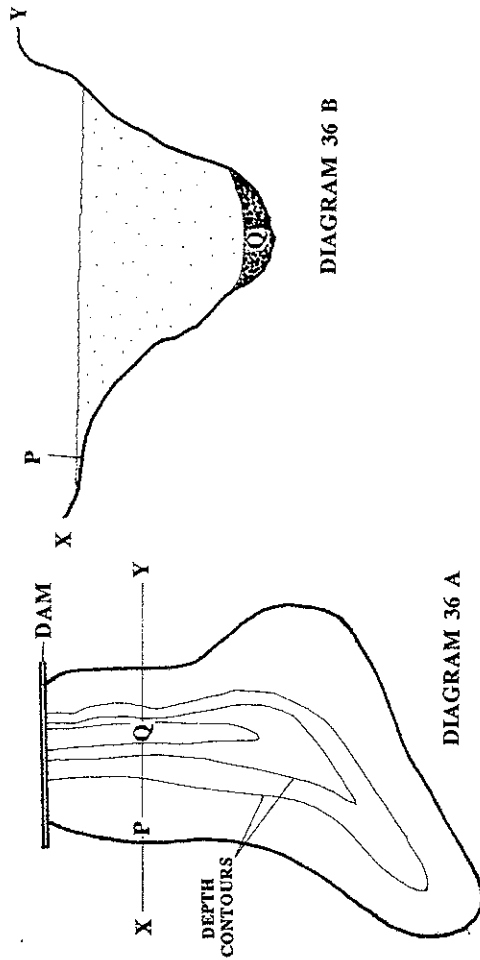
- ii) A breeder proposed to establish a new colony of rabbits by crossing rabbits heterozygous for Chinchilla/Himalayan with rabbits homozygous for black coat. What coat colours would be expected in the F₁ and F₂ generations and in what ratios? Explain how the breeder could determine the genotypes of individuals in the F₂ generation? (4 marks)

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36. (continued)

OR

(b) Diagram 36 is a map of an old water storage dam (reservoir).



The reservoir was formed by building a dam across a stream in a valley. The depth contours of the reservoir are shown in **DIAGRAM 36 A**. **DIAGRAM 36 B** shows the depth profile of the reservoir across transect XY. At location P is a beach with clean coarse gravel. At location Q, at the bottom of the lake, the sediments comprise a layer of black mud from which bubbles of methane gas are released. Methane gas represents an end product of bacterial metabolism.

Dissolved oxygen in the water at P is nearly always close to 100% saturation, but at Q, close to the sediment, dissolved oxygen is always at low levels.

- Explain how two locations within the same lake can have very different levels of dissolved oxygen. (2 marks)
- Different communities of organisms would be expected to occur at the two locations in the lake. What different kinds of organisms would you expect to find at locations P and Q? Explain how you would expect these organisms to differ in the cellular processes that yield energy. (4 marks)
- Explain how the organisms would differ in the type of end products that would result from their metabolic processes. (4 marks)

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37. EITHER

- Tall trees must transport water from the soil in which they stand to their leaves. Describe the structures involved in this transport to the leaves, and explain how the structures achieve this transport. (10 marks)

OR

- The flora of Western Australia is noteworthy for its beauty and diversity. Recently, the media have highlighted the potential this flora might have as a source of drugs for treating disease in humans. However, much of this flora - and the fauna dependent upon it - was lost due to clearing of land for agriculture, especially after World War II. Responding to public pressure, the State Government in 1961 established a system of conservation reserves: "Some of the land was to be left as nature reserves, while road reserves were to be created wider than necessary for traffic so that they could be places 'where wildflowers can grow and flourish in perpetuity'" (P. Hussey, R. Hobbs and D. Saunders, 1991, p vii). Thus, Western Australia's agricultural region has become a mosaic of agricultural land with a network of linear roadside strips serving as corridors linking patches of remnant native vegetation of varying widths and degrees of degradation.

- Describe the **biological** importance of these corridors. (Include in your answer how these corridors could interact with other ecosystems). (2 marks)
- Give an account of the knowledge required to conserve and manage these roadside corridors. (6 marks)
- How would this knowledge be useful in planning the locations of roadside corridors? (2 marks)

(*perpetuity = for ever)

END OF PAPER