

TERTIARY ENTRANCE EXAMINATION, 1995
QUESTION/ANSWER BOOKLET

BIOLOGY

Please place your student identification label in this box

SEA STUDENT NUMBER - In figures

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In words

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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
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 and calculators satisfying the conditions set by the Secondary Education Authority.

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.

SECTION A

Suggested time: 40 minutes (60 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.

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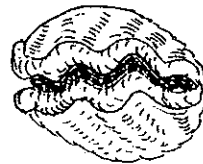
1. All living organisms need a supply of energy, either in the form of sunlight, or in the form of energy rich chemicals. Which one of the following is a **true** statement about energy which applies to **both** plants and animals?

- (a) Respiration occurs in all living cells, trapping energy in complex molecules.
- (b) Living organisms have to take in energy rich material in the form of food to provide for the respiratory needs of cells.
- (c) All living organisms must spend some time in sunlight to provide energy in the form of heat for maintaining body temperature.
- (d) Energy is continually being used by living cells as work is done in maintaining the internal environment.

2. Giant clams (*Tridacnida* sp.) live in shallow, warm, tropical sea water. They feed by filtering microscopic particles from the water. The clams have millions of single celled algae living inside the soft tissues which extend beyond the edges of the shell when the clam is feeding. The algae give the tissue a green colour.

Which one of the following is probably true?

- (a) During daylight, the clam benefits as oxygen is released from the algae into its soft tissues.
- (b) At night, release of carbon dioxide by the algae provides the clam with additional energy.
- (c) Some of the carbon dioxide released by the tissues of the clam will be used by the algae in their respiration.
- (d) The algae benefit from the association as they obtain food from the tissues of the clam.



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3. Charles Darwin and his son Francis studied the bending of plants towards light. The Darwins' experiment was simple: they grew some oat seeds on the window sill and covered some of the recently emerged coleoptiles with glass caps and some with black (opaque) caps. The experiment and results are illustrated in DIAGRAM 3.

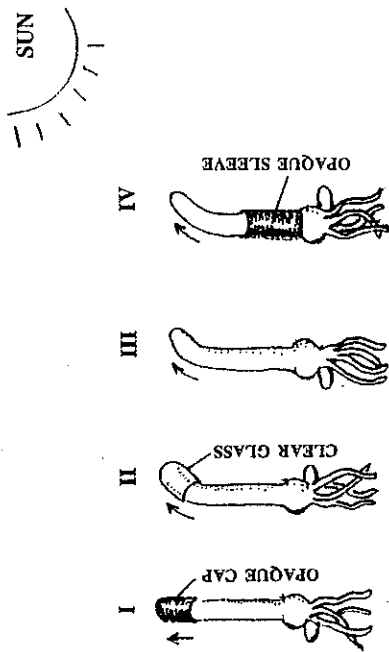


DIAGRAM 3

Forty years later, the Dutch botanist F. W. Went showed that the effect is due to a substance now known as auxin. Which of the following explanations is correct?

- (a) Coleoptile IV bent towards light because auxin is produced in the seed and the light destroys auxin on the well lit side of the coleoptile.
- (b) Coleoptile II bent towards light because more auxin is produced on the shaded side of the plant, increasing the growth rate on that side of the stem.
- (c) Coleoptile III bent towards light because more auxin is produced on the well lit side of the plant, reducing the growth rate on that side of the stem.
- (d) Coleoptile I grew straight because auxin is produced in the roots and the black caps removed the effect of light.

4. Processes that take place in living cells alter the amount or concentration of particular substances within the cells. Which one of the following is a **true** statement about the responses of cells to **changing** internal concentrations of substances?

- (a) Diffusion across cell membranes makes sure that poisonous waste substances will not build up to dangerous levels inside living cells.
- (b) All harmful substances which are produced in cells are actively removed by processes requiring energy.
- (c) Substances which are needed in cells but are continually being used up are replaced from reserves which are stored in an inactive state.
- (d) The internal conditions of living cells are maintained within narrow limits.

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5. DIAGRAM 5 illustrates a simple reflex arc.

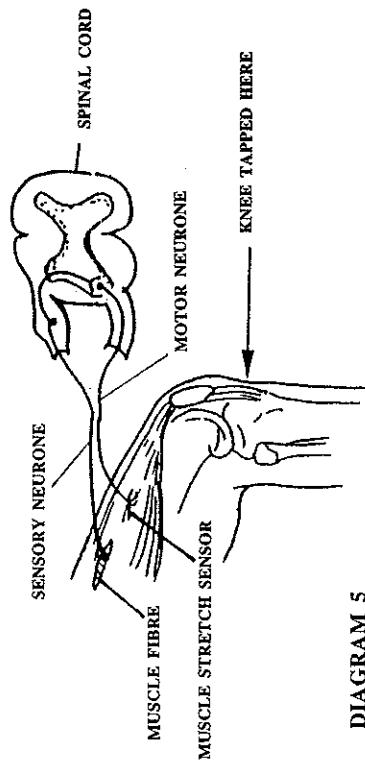


DIAGRAM 5

Which one of the following is correct?

- (a) The sensor is the receptor.
 (b) The muscle fibre provides the response.
 (c) The motor neurone is the effector.
 (d) The muscle stretch sensor is the effector.

6. One result of the activities of humans in industrial societies has been the release of chemical pollutants into the environment. One group of pollutants resemble oestrogen in their biological effect. Consequently, some scientists describe organisms as now inhabiting a 'sea of oestrogen'.

What is the most likely effect you might expect to observe?

- (a) An increase in the growth rate of green plants.
 (b) An increase in fruit setting rate in cherry orchards.
 (c) An increase in salt retention in fish.
 (d) Disruption of reproductive success by males in animal species.

7. Suppose that you have a fruit fly which you suspect is heterozygous for a gene controlling wing shape. To be certain of the genotype of this fly you decide to mate it with another fly which has a known genotype. Which of the following would you select to be the mate?

- (a) A male heterozygous for the wing-shape gene.
 (b) A male homozygous dominant for the wing-shape gene.
 (c) A male homozygous recessive for the wing-shape gene.
 (d) A male sex-linked for the wing-shape gene.

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8. DIAGRAM 6 illustrates the carbon cycle.

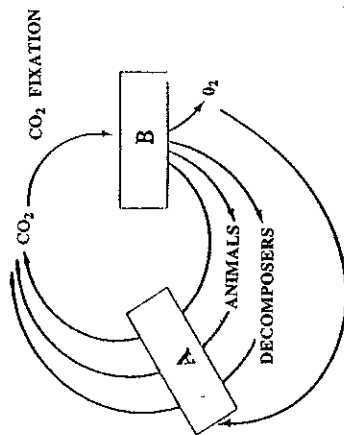


DIAGRAM 6

Which of the following terms are appropriate to place in boxes A and B?

- (a) A: aerobic respiration / B: photosynthesis.
 (b) A: anaerobic respiration / B: respiration.
 (c) A: fermentation / B: aerobic respiration.
 (d) A: anaerobic respiration / B: photosynthesis.

9. Which one of the following has contributed **most** to the study of inheritance?

- (a) The introduction of DNA technology to identify specific genes and the locations of genes on chromosomes.
 (b) The study of pollution and birth defects to show the influence of environment on heredity.
 (c) The study of children raised in different countries to determine the effect of environmental factors on heredity.
 (d) The trials of drugs to reduce the incidence of breast cancer in women with a family history of the disease.

10. Which one of the following conditions would **reduce** the diffusion rate of carbon dioxide into a spongy mesophyll cell of a eucalypt leaf?

- (a) The stomata opening during a rain storm around midday.
 (b) The intensity of sunlight changing with the movement of the sun from sunrise to midday.
 (c) Ringbarking the branch of the tree on which the leaf is located.
 (d) Warm, dry air blowing over the leaf causing water loss.

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11. If large palm trees are to be transplanted, many of the large fronds are first removed, leaving only the small, new growth. Botanists recommend that transplantation be avoided during the summer months and that water be trickled continually for 2 - 3 weeks onto the palm after it is transplanted to its new position. If this advice is followed, there is a high rate of survival of transplanted palms. This is because
- this treatment stimulates the plant to produce new growth rapidly.
 - the rate of photosynthesis in the remaining leaves is at a maximum.
 - the lower transpiration rate reduces the effects of possible root damage through transplantation.
 - this treatment ensures the rapid adaptation of the plant to its new environment.
12. Natural selection operating on a natural population over many generations causes the population to become better adapted to its environmental conditions. Which of the following illustrates this process?
- Parrots in an open woodland having lighter plumage than the same species living in rainforest areas.
 - Banksia* trees replacing *Acacia* scrub in a reafforestation programme.
 - A rabbit population increasing after good rainfall.
 - Whales migrating annually from warm tropical waters to Antarctic waters.

13. During an early stage of meiosis, the chromosomes are arranged to produce a haploid number of chromosome 'bundles', as depicted in DIAGRAM 13.



DIAGRAM 13

These 'bundles' are

- not relevant to the distribution of DNA to the daughter cells.
- independently arranged chromosomes.
- made during replication of DNA.
- pairs of homologous chromosomes.

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14. Horticulturists and home gardeners grow plants from cuttings, bulbs or runners. New plants produced in this way
- show very little genetic diversity.
 - exhibit a range of phenotypes.
 - are already adapted to the new environment.
 - are able to survive in a greater range of habitats than the parent plant.

15. The family tree in DIAGRAM 15 shows the inheritance of webbed toes through four generations of one family.

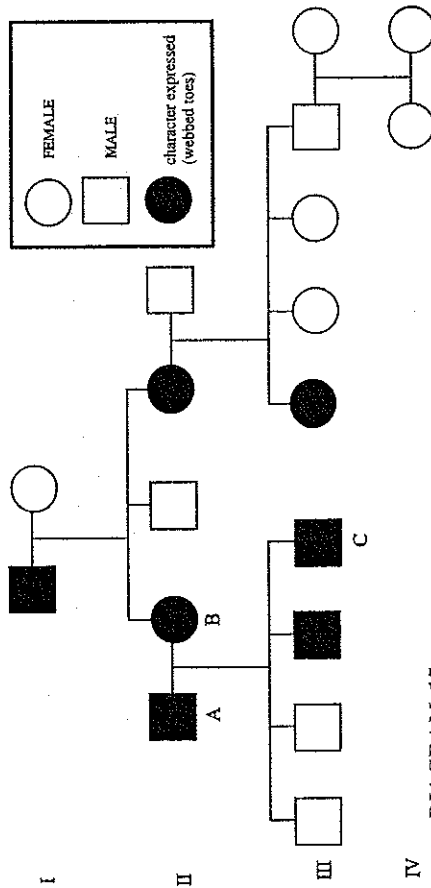


DIAGRAM 15

From the information in the diagram it may be inferred that

- the allele is sex-linked in C, who received it from his mother's egg cell.
- all four parents in generation II have an allele for webbed toes.
- the probability of A and B producing a fifth child with webbed toes is $\frac{3}{4}$.
- the allele for webbed toes is recessive.

16. Substance A, which has a large molecule, is present in low concentration in the environment surrounding a cell. It is required inside the cell, in high concentration, for normal cell functioning. Energy is required to move the molecule across the membrane into the cell. Which one of the following is likely to provide an immediate supply of energy for this transfer?

- A lipid molecule.
- An ATP molecule.
- A carbohydrate molecule.
- A molecule of DNA.

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17. Students at a school were asked to suggest topics for biological science research projects. Which one of the following topics should be rejected - because the title suggests that it would be impossible to test hypotheses in a scientific way?

(a) Growth of seedlings in an atmosphere with reduced CO_2 .
 (b) Seedling growth in a positive emotional atmosphere.
 (c) Altitude as a factor in the growth of seedlings.
 (d) Germination of seeds under pressure.

18. A state government in Australia had to make a decision on whether to set aside a particular area of land as a national park. Which one of the following is a strong biological reason for deciding in favour of proclaiming an area as a national park?

(a) Very few humans had ever been there.
 (b) The tract of land is quite inaccessible.
 (c) A large number of species have been recorded in the area, most known from other places in the state, but not forming similar associations elsewhere.
 (d) A small number of species have been recorded in the area, with a large proportion of them not recorded from elsewhere in the state.

19. Humans do not make equal demands on the resources of the planet. Which one of the following best describes the ecological impact of different groups of people?

(a) Wealthy nations with very high standards of living cause more pollution per head of population than do many poor nations with low standards of living.
 (b) People from wealthy nations with efficient technologies cause less atmospheric pollution per head of population than people engaged in subsistence agriculture.
 (c) Industrialised communities with inefficient technologies cause less atmospheric pollution than highly mechanised agricultural communities.
 (d) The high level of energy use in wealthy nations helps compensate for low levels elsewhere and thereby reduces global warming.

20. In most terrestrial ecosystems, the biomass of predators at the 'top' of a food web is much less than the biomass of herbivores at the 'bottom' of the web. Which one of the following is a true statement helping to explain this?

(a) Predators at high trophic levels require more food than herbivores because they use more energy in capturing their food.
 (b) Energy is lost at each trophic level as animals use some of the energy of their food to maintain their body functions.
 (c) Because top predators individually require more food than animals lower in a food web, fewer of them can be supported on the same resource.
 (d) Because top predators are larger than animals lower in a food web, fewer of them can be supported on the same resource.

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21. We often find problems caused by organisms from one part of the world being introduced into new areas. The introduction of case-building marine worms, originally from the Mediterranean Sea, into Cockburn Sound, Western Australia, is an example of such a problem. The fact that this worm can survive and reproduce in Western Australian waters is probably because

(a) the aquatic environment forms the major component of the biosphere of planet Earth.
 (b) the sites in the Mediterranean Sea and Western Australia belong to the same ecosystem.
 (c) similar species of organisms occur at the sites in the Mediterranean Sea and Western Australia.
 (d) similar environmental conditions occur at the sites in the Mediterranean Sea and Western Australia.

22. Scientists studying the ecosystem in a large lake found that the new phytoplankton growth in one year was between $25 - 55 \text{ g C}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$ (grams carbon per square metre per year). The annual new growth of fish from the lake was estimated from the commercial catch to be $0.2 \text{ g C}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$.

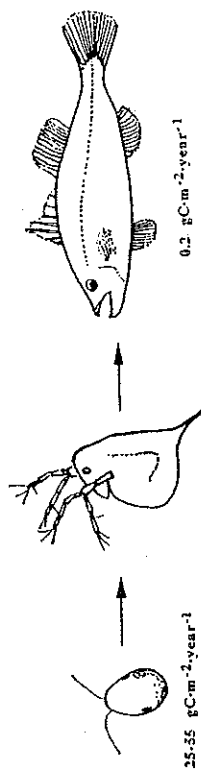


DIAGRAM 22

If the main food for the fish was zooplankton, and the zooplankton relied on phytoplankton for food (DIAGRAM 22), which of the following is the most reasonable estimate of the annual new growth of zooplankton?

(a) $2 \text{ g C}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$.
 (b) $12 \text{ g C}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$.
 (c) $22 \text{ g C}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$.
 (d) $24.8 \text{ g C}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$.

SEE PAGE 12

23. *Phytophthora cinnamomi* (the die-back fungus) has been reported from lowland areas of Australia for many decades. The fungus had not been reported from upland areas until recently. Early in 1995, it was announced that *P. cinnamomi* had been discovered killing pencil pine trees in highland areas of central Tasmania.

What is the LEAST likely explanation for the outbreak of *P. cinnamomi* in Tasmania?

- It represents a mutant form from the lowland Australian stock.
- It had always been present, but only now exerted a lethal effect.
- It had always been present, but only recently became abundant.
- It is a new species to Tasmania, brought in by some migrating agent.

24. Milkweed plants (Family Asclepiadaceae) secrete substances called cardiac glycosides which are toxic to vertebrates. Monarch butterfly caterpillars feed on milkweed but are not affected by the toxic substances. Birds which prey upon these monarch butterfly caterpillars either vomit violently or die.

Which one of the following could NOT be explained by natural selection?

- The vomiting response.
- The tolerance of monarch butterfly caterpillars to milkweed extract.
- The death of birds which eat lots of cardiac glycosides.
- The accumulation of the toxic substances in milkweed plants.

25. Animals living in an aquatic environment need to regulate the level of salts/water in their body tissues. Some sharks living in sea water maintain a higher concentration of organic molecules dissolved in their body fluids than is normally recorded from sharks.

The sharks with increased concentration of organic molecules dissolved in their body fluids will consequently show, in comparison with a typical shark

- no change in the amount of water diffusing into their body.
- no change in the rate of water diffusing from their body.
- an increase in the rate of water diffusing into their body.
- a decrease in the rate of water diffusing from their body.

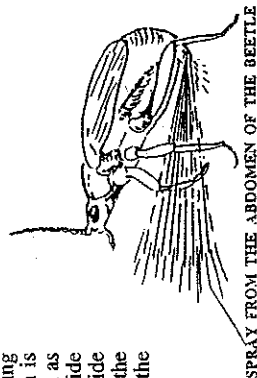
26. Many chemical reactions in living organisms depend upon an exact binding between two molecules. The action of enzymes is an example.

The role of enzymes is

- to help the different cells of a body recognise that they all belong to the same individual.
- to increase the rate of reaction by lowering the energy barrier to the reaction.
- to create the optimum conditions (of temperature and pH) for the reactions to proceed.
- to serve as binding sites for hormones so that the target organs can respond to the hormones.

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27. Bombardier beetles are able to squirt a hot irritating solution to their prey. The solution is forced out of a 'cannon' on the insect's abdomen as oxygen is rapidly released from hydrogen peroxide with release of heat. Normally hydrogen peroxide will decompose slowly to water and oxygen but the reaction occurs very rapidly in the beetle and the mixture reaches a temperature of 100°C.



SPRAY FROM THE ABDOMEN OF THE BEETLE

Which of the following is probably the best explanation of the splitting of hydrogen peroxide in the beetle, based on the information given? The reaction

- is brought about by an enzyme at an optimum temperature of 100°C.
- is brought about by an enzyme at 38°C.
- is brought about by an enzyme at natural beetle temperature.
- occurs spontaneously without any enzymes involved.

28. Part of the sequence of events following a fall in the level of blood glucose in mammals is presented in DIAGRAM 28.

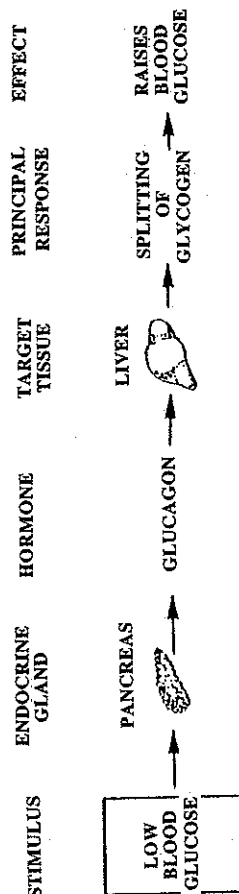


DIAGRAM 28

The sequence of events is an example of

- a reflex action because hormones are involved.
- a metabolic pathway because the principal response involves metabolism of substances within the bodies of mammals.
- positive feedback because the response is an increase in blood glucose levels.
- negative feedback because the effect is opposite to the stimulus.

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29. A group of biologists was investigating ways of controlling foxes in forests in Western Australia. In discussions, a number of comments were made. Which one of the following comments is stated as a scientific hypothesis?

- (a) If foxes are eradicated, rabbits will become an even more serious nuisance.
- (b) Foxes were introduced into Australia in the 19th century for sport hunting.
- (c) Foxes can be killed by using bait containing the poison Chemical X.
- (d) Domestic dogs will be at risk if Chemical X is put into poison baits.

30. Which of these statements about foxes in Western Australia can be described as an observation?

- (a) Foxes have caused a serious decline in the populations of the chuditch.
- (b) After killing its prey, the fox ate the entire carcass.
- (c) Because foxes are intelligent, it is not easy for hunters to eradicate them.
- (d) Foxes compete with native animals which have a similar ecological niche.

SECTION B

Suggested time: 90 minutes (100 marks)

Attempt all questions in this section. Write your answers in the spaces provided. Use a black or blue pen or ball point pen when answering this section.

31. (20 marks)

DIAGRAM 31A shows an open forest from south western Australia with a variety of vegetation types.



(a) i) Which ecological niche is occupied by the following organisms in this ecosystem? (2 marks)

Earthworm: _____

Honeyeater: _____

ii) Indicate a food chain containing four organisms likely to occur in a forest like that illustrated in DIAGRAM 31A. (2 marks)

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31. (continued)

- (b) Describe the **two** probable long-term effects of introducing feral cats into this ecosystem? (4 marks)

- (c) If all the trees were removed in a programme of land clearing, some physical changes to this environment would occur. State **two** possible effects upon the organisms in the soil layer. (4 marks)

DIAGRAM 31B-1 illustrates a jarrah forest; DIAGRAM 31B-2 illustrates a pine plantation.



DIAGRAM 31B-1

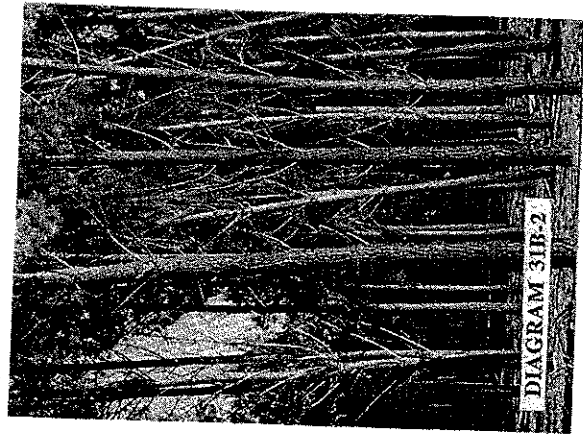


DIAGRAM 31B-2

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31. (continued)

- (d) Use a word or phrase to make comparisons between the jarrah forest and the pine plantation in the following Table. (4 marks)

	jarrah forest	pine plantation
species diversity		
cycling of matter		

- (e) DIAGRAM 31C illustrates a jarrah forest with dieback.

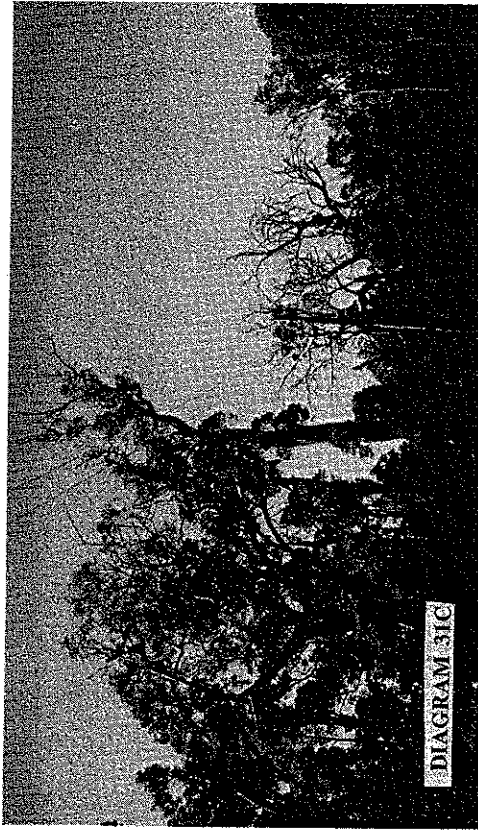
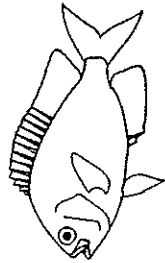


DIAGRAM 31C

Describe **two** measures which could be taken to control the spread of dieback from infected areas? (4 marks)

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32. (20 marks)



Coral reefs are famous for the diversity and colour of many of the living organisms inhabiting them, including fish. One such fish is the Princess Damselfish, *Pomacentrus vaiuli*, which occurs in the Pacific Ocean, and along the coast of Western Australia northwards from Point Quobba, north of Carnarvon.

Adult fish lay their eggs in deep water. After hatching, young fish swim to the shallow water of the reef. This movement is called recruitment. To study the rate of recruitment by young fish a biologist placed a net (50 m long, 1 m deep) across a water channel used by young fish. DIAGRAM 32 shows the position of the net.

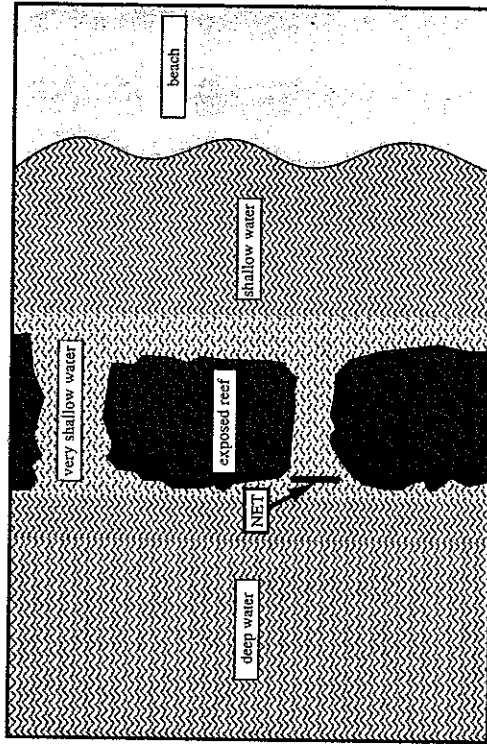


DIAGRAM 32

The biologist left the net out at night at the times of full moon and new moon (i.e. no moon) once every two months as indicated in TABLE 32. The number of specimens of *P. vaiuli* in the nets was counted on each occasion. The data are presented in TABLE 32 on the page opposite.

- On the grid opposite, label the axes that you will use when graphing the data. (4 marks)
- Graph the data of Table 32 on the grid opposite. (4 marks)

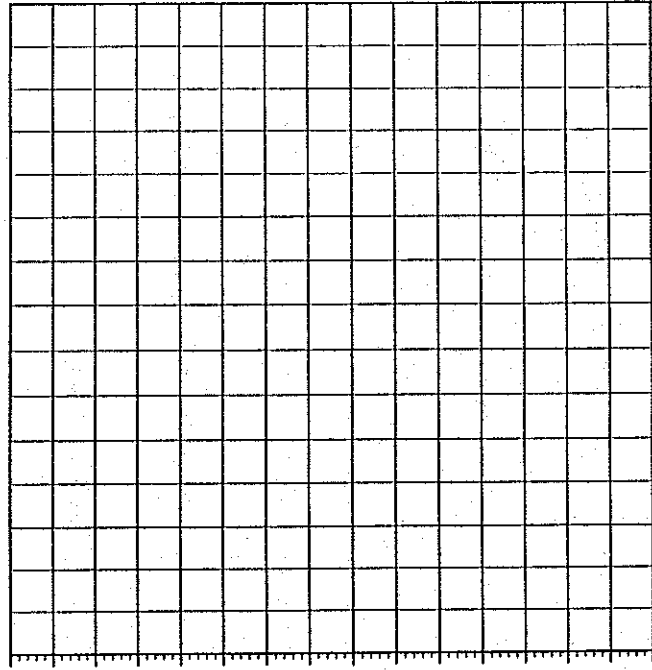
NB: If you make a mistake, there is an extra grid page on p. 33 at the end of this booklet.

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32. (continued)

TABLE 32:

SAMPLING MONTH	FULL MOON	NEW MOON
December	12	180
February	42	1060
April	36	640
June	30	270
August	0	56
October	0	0



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32. (continued)

- (c) i) State an hypothesis which the biologist might be testing. (2 marks)

- ii) As it is described, the study is not particularly well controlled. Suggest one change to the design of the study which would make the study better controlled? (2 marks)

- (d) What conclusions can be drawn from the data? (4 marks)

- (e) i) If the biologist wanted to compare the **rate** of recruitment onto two separate reefs, which other factor should be measured to enable valid comparisons to be made? (2 marks)

- ii) How would rate of recruitment units then be expressed? (2 marks)

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33. (20 marks)

A biologist studying the internal anatomy of a recently discovered animal was trying to work out the function of a tube found in the body. Cross-sections of the tube were put onto slides for examination with a light microscope and then an electron microscope. The tube was found to consist of a single layer of cells surrounding a central cavity, or lumen. DIAGRAM 33A is a sketch of a cross-section of the tube as seen under the light microscope, and DIAGRAM 33B illustrates cell H as seen with an electron microscope.

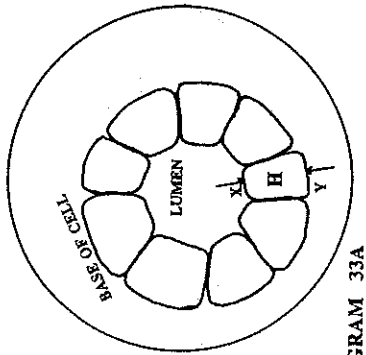


DIAGRAM 33A

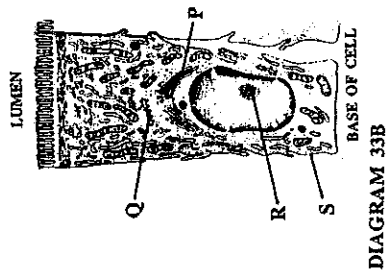


DIAGRAM 33B

(a) Consider just the cross-section for light microscopy (DIAGRAM 33A).

i) How might the preparations on slides be treated to make the cell structures easily visible by microscopy? (2 marks)

ii) The diameter of the field of view is 1.8 mm. What is the length of the cell as shown by the line XY of cell H? (2 marks)

(b) Consider the diagram drawn from the electron micrograph (DIAGRAM 33B).

Name the organelles P, Q, R and S. (4 marks)

P: _____
Q: _____
R: _____
S: _____

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33. (continued)

(c) What is the function of organelles P and Q? (4 marks)

P: _____
Q: _____

(d) The biologist noticed in the electron micrograph that the cell membrane bordering the lumen of the tube was heavily folded.

i) Suggest a possible explanation for the folding. (2 marks)

ii) ATP was found to be present in this part of the cell in comparatively high concentrations. Suggest an explanation. (2 marks)

(e) DIAGRAM 33C illustrates the nucleus of a cell undergoing division.

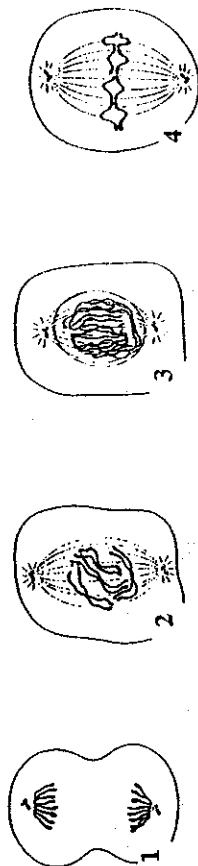


DIAGRAM 33C

Name the phases of the cell division, and list them in order from interphase. (4 marks)

Name of phase	Diagram number

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34. (20 marks)

A research team was trying to understand how the Australian desert hopping mouse, (*Notomys alexis*), can survive in dry habitats without drinking. They measured the metabolic rate ($\text{mL O}_2\text{g}^{-1}\text{hour}^{-1}$) and the rate of water lost through breathing ($\text{mg H}_2\text{Og}^{-1}\text{hour}^{-1}$) for an animal in different air temperatures. The data are shown in TABLE 34. The scientists were then able to calculate, for *N. alexis*, the amount of water lost by breathing per mL of oxygen used in respiration ($\text{mg H}_2\text{O}\cdot\text{mL O}_2^{-1}$)

(NOTE: $\text{mL O}_2\text{g}^{-1}\text{hour}^{-1}$ = millilitre oxygen per gram of body tissue per hour)

TABLE 34

Temperature (°C)	Metabolic Rate ($\text{mL O}_2\text{g}^{-1}\text{hour}^{-1}$)	Rate of water loss ($\text{mg H}_2\text{Og}^{-1}\text{hour}^{-1}$)	Water loss per mL O_2 ($\text{mg H}_2\text{O}\cdot\text{mL O}_2^{-1}$)
10	5.4	2.59	
20	3.4	2.04	
27	2.1	2.10	1.0
33	1.3	1.50	
35	1.6	1.92	
37	1.9	4.28	

(a) Explain why the amount of oxygen taken up by an animal is a measure of its metabolic rate. (4 marks)

(b) From the data in Table 34, answer the following questions. Some calculations may be necessary.

i) At which temperature did the animal have the highest metabolic rate? (1 mark)

ii) At which temperature does this animal have the greatest rate of water loss? (1 mark)

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34. (continued)

iii) Calculate the rate of water loss for each mL of oxygen used by the animal by completing the right hand column in TABLE 34. At what temperature, for the animal, is the rate of water lost per mL O_2 least? (2 marks)

(c) Suggest a physiological explanation for the changes in metabolic rate at the different temperatures shown in TABLE 34. (4 marks)

(d) Write words or phrases under the headings below to indicate two different ways by which desert mammals may gain water in dry environments where no drinking water is available, and two different ways in which water will be unavoidably lost. (4 marks)

Way	Water gained by	Water lost by
1		
2		

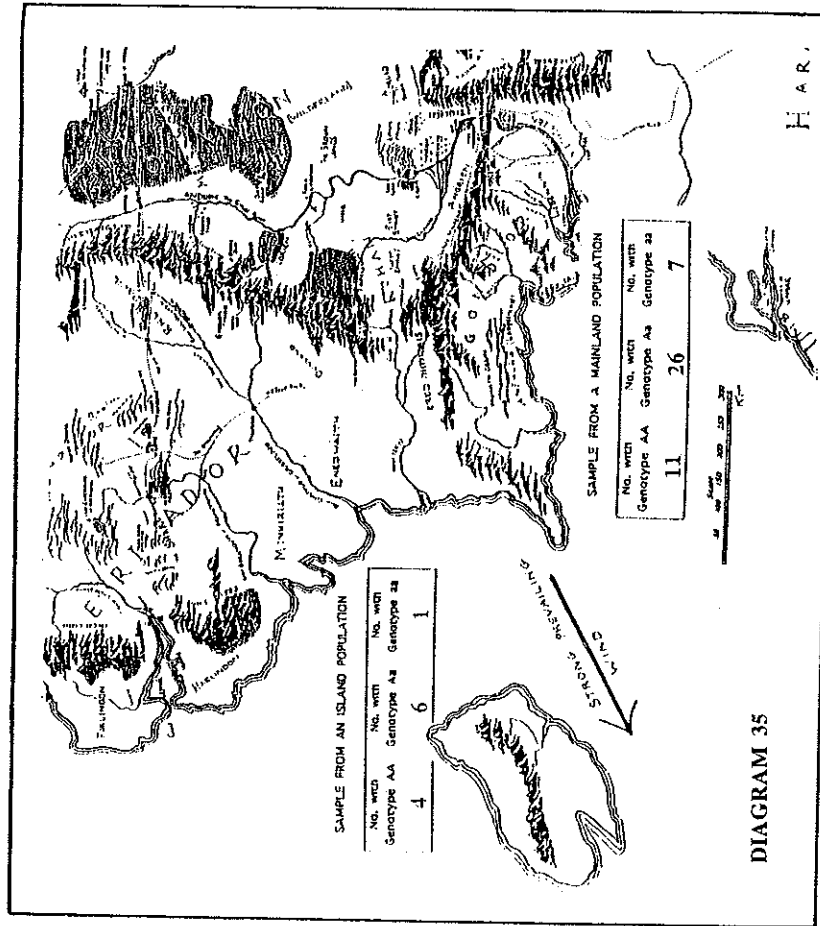
(e) Many small mammals living in dry environments have adaptations enabling them to survive conditions in which some closely related animals might perish. Complete the chart below, with a brief description of one physiological and one behavioural adaptation which assist these dry land mammals to survive. (4 marks)

	ADAPTIVE FEATURE	HOW THE FEATURE PROVIDES FOR SURVIVAL
PHYSIOLOGICAL		
BEHAVIOURAL		

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35. (20 marks)

DIAGRAM 35 shows the relationship between a continent and an offshore island. The direction of strong, prevailing winds is also shown.



Conditions on the mainland and island are suitable for the survival of slugs and insects, and some seed plants are common to both areas.

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35. (continued)

- (a) Describe **two** possible ways by which organisms could have dispersed to the offshore island from the mainland. (4 marks)

Also shown in DIAGRAM 35 are the genotypes of samples of an animal species on the mainland and of the same species on the offshore island.

In calculating the frequency of alleles in a sample of animals, we count the number of times one allele is present in that sample and express it as proportion of the total number of alleles. For example, the frequency of allele A in the sample of 11 specimens of the animal species from the island (DIAGRAM 35), of which 4 specimens are homozygous A, 6 are heterozygous and 1 is homozygous a is 14; since the total number of alleles is 22 the frequency of A = $\frac{14}{22} = 0.64$ (to 2 decimal places).

- (b) (i) What is the frequency of allele a in the sample from the mainland? (2 marks)

- (ii) What assumption do we make when we claim that these allelic frequencies are approximately the same values for the frequencies for the same alleles in the whole populations of the same species of animal from the island and mainland? (2 marks)

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35. (continued)

- (c) Name two processes which could explain the difference between the frequency of allele A on the mainland and on the island. (4 marks)

- (d) Describe the changes you would expect in the gene pool if the dominant phenotype were disadvantaged by some change in the environment. (4 marks)

- (e) Many species of insects which live on islands are wingless. Briefly describe how the idea of natural selection can be used to explain this observation. (4 marks)

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SECTION C

Suggested time: 50 minutes (40 marks)

ANSWER SECTION C IN THE STANDARD ANSWER BOOK

Answer both questions in this section. The first question is intended to assess your knowledge of the content of the course and the second is intended to assess how well you can apply your understanding of biological processes. Each question is worth 20 marks and has four parts. **Candidates should answer two parts of each question.**

Concisely worded statements are expected for each answer. Where it is appropriate, answers should be supported with clear, labelled diagrams. Marks may be deducted for answers which are poorly presented or difficult to read. Use a black or blue pen or ball point pen when answering this section.

Question 36

There are four parts (36a to 36d) to this question. Candidates may select any **TWO** parts to answer. Each part is worth ten (10) marks.

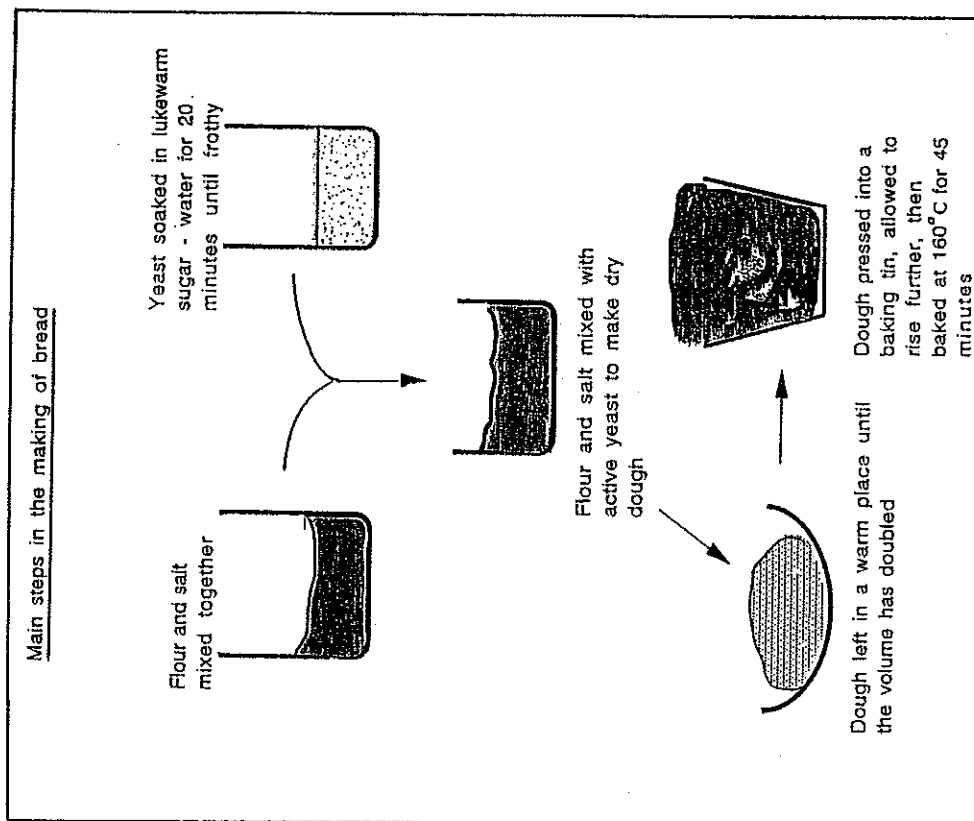
- (a) Describe the structure of DNA. Describe how this structure helps to explain the role of DNA in a living cell and the role of DNA in cell replication.
- (b) Angiosperms are adapted to cope with variation in environmental temperatures and water supply. Explain how water loss from angiosperms is regulated in response to changes in conditions of humidity and temperature.
- (c) Two adult rats, both black, were allowed to mate. As a result of the mating, eight offspring were born alive, seven black, one white.
- Use your understanding of genetics to explain the probable pattern of inheritance of coat colour in this example. Explain why the observed ratios of coat colours in the offspring have differed from the predicted ratios.
- (d) Many elements, including carbon, oxygen, nitrogen and phosphorus, move between the living and the non living world. Choose **either** carbon or nitrogen and describe the pathways that can be taken by this element, and some of the different forms in which it occurs, as it moves between the living and non-living parts of ecosystems.

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Question 37

There are four parts (37a to 37d) to this question. Candidates may select any **TWO** parts to answer. Each part is worth ten (10) marks.

- (a) Bread making relies on cellular reactions of yeast. What cellular reactions of yeast are important in bread making? How are these cellular reactions controlled to produce the desired outcome?



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37. (continued)

- (b) The carbon dioxide concentration in the atmosphere has increased during recent decades. Describe the physiological responses that might be expected in plants and animals in response to an increasing concentration of carbon dioxide in the atmosphere.
- (c) There are many examples of animals and plants for which population numbers have fallen to low levels and extinction is a strong possibility. For some vertebrate animals 'captive breeding programmes' have been started with the intention of reproducing animals which can later be released to the wild. However, the success of these programmes depends on more than just breeding large numbers. There are important aspects of the genetic diversity of populations which the breeders must understand.
- Explain some of these issues of population genetics. How might breeders use the information provided by geneticists to increase the chances of successfully reintroducing animals to the wild?
- (d) During the last 200 years, significant changes have occurred in the distribution of many plant and animal species in Australia. A variety of factors have caused some species to increase their range but have caused other species to become restricted to areas much smaller than they occupied previously. Give examples of changed distribution patterns for both plants and animals in Australia. Describe some of the main factors that have probably brought about the changes.

THE END

(THERE IS A SPARE GRAPH GRID ON P. 33)