



SEA SECONDARY EDUCATION AUTHORITY (WA)

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**TERTIARY ENTRANCE EXAMINATION, 1996
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, B or HB 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.

Ref: 005

STRUCTURE OF THE PAPER

Section	Questions	Students should attempt	Marks	Suggested time/minutes
A Multiple choice	1-30	ALL	60 (30%)	40
B Short answers	31-35	ALL	100 (50%)	90
C Extended answers	36*	Two parts	40 (20%)	50
	37*	Two parts		

Total marks = 200

* Questions 36 and 37 each consist of four optional parts, of which two should be attempted in each question.

INSTRUCTIONS TO CANDIDATES

Section A Write your answers on the separate Multiple Choice Answer Sheet using a 2B, B or HB pencil. Do not use a ball point or ink pen. Marks are not deducted for wrong answers.

Section B Write your answers in the spaces provided in this Question/Answer Booklet. Use a blue or black pen (not pencil) for this section.

Section C Write your answers in the Standard Answer Book. Use a blue or black pen (not pencil) for this section. Do not copy the questions when answering; merely write the number of the question in the margin.

AT THE END OF THE EXAMINATION

Make sure that your SEA Student Number is on your Question/Answer Booklet and Standard Answer Book(s).

Attach the Question/Answer Booklet to the FRONT of the Standard Answer Book(s) with the paper binder provided.

SECTION A

Suggested time: 40 minutes (60 marks)

Record an answer for Questions 1 - 30 by marking your choice of alternatives on the separate Multiple Choice Answer Sheet using a 2B, B or HB pencil.

If you want to change an answer, rub out your first answer and mark the new choice. The answer sheet for Section A will be collected separately by the supervisor.

1. Flowering plants on land have green leaves which capture energy of sunlight. They also have roots which take up water and soluble nutrients from the soil.

Which of the following best describes what happens to most of the energy captured by the plants?

- (a) Most of the energy is used as plants take nutrients from the soil.
- (b) Most of the energy is lost during cellular activity.
- (c) Most of the energy is used as plants take up water from the soil and transport it to the leaves.
- (d) Most of the captured energy is contained in new growth.

2. Which of the following best describes how soluble nutrients are used by plants?

- (a) Nutrients are an essential raw material in the process of energy capture.
- (b) Nutrients are used in the synthesis of a range of complex biological compounds.
- (c) Nutrients are an essential source of food energy for plants.
- (d) Nutrients are required to make plant tissues nutritious in the diet of animals.

3. Many animals feed on plant leaves. Which of the following is a true statement about the benefits that herbivores obtain from their food?

- (a) Herbivores make use of heat stored by leaves which have been in sunlight.
- (b) Herbivores obtain energy from the muscular activity required to chew leaves.
- (c) Herbivores obtain energy from compounds within the tissues of the plant.
- (d) Herbivores obtain energy from the nutrients taken from the soil by the plants.

Questions 7, 8 and 9 are based on the information below.

Breathing by mammals brings about the removal of CO_2 from the body and the uptake of O_2 from the atmosphere. Normal atmosphere contains 0.035% CO_2 and approximately 20% O_2 .

Table 7 shows the breathing rate of a resting small mammal in an experimental chamber. The number of breaths taken per minute (Breaths min^{-1}) is shown in the right column. In different trials, the breathing rate was measured while gas with different mixtures of CO_2 and O_2 was flowing through the chamber.

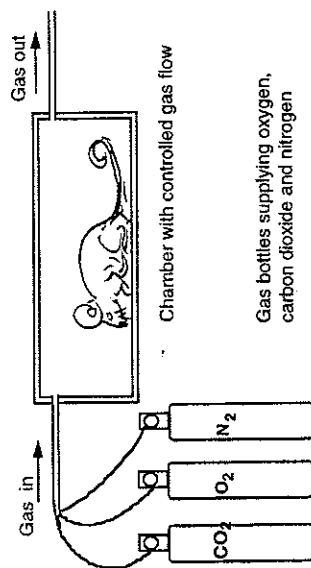


TABLE 7

	% of CO_2 in gas	% of O_2 in gas	Breaths min^{-1}
Mixture 1	0.035	20	68
Mixture 2	0.05	20	69
Mixture 3	0.7	20	134
Mixture 4	0.035	15	72
Mixture 5	0.035	12	73

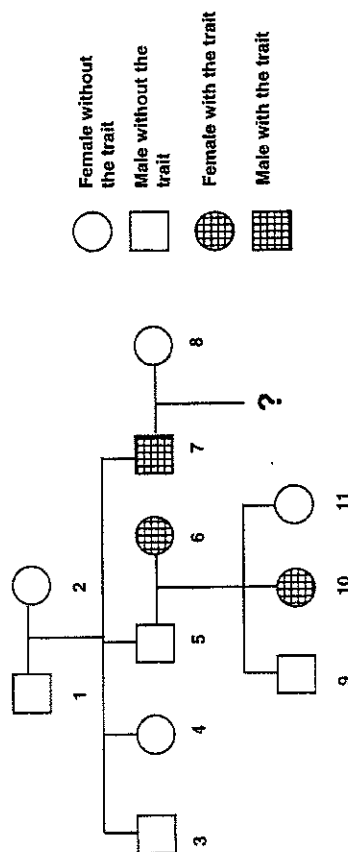
(Note: Table 7 is reproduced on the next page.)

SEE NEXT PAGE

Questions 4, 5 and 6 are based on the information shown on the pedigree chart, Figure 4.

A gene controlling a particular trait occurs in the forms F (dominant) and f (recessive).

FIGURE 4



4. Which of the following describes the genotypes of individuals numbered 1 and 2?

- FF and ff
- Ff and Ff
- ff and ff
- Ff and Ff

5. If the individuals numbered 5 and 6 produce one more offspring, which of the following is a correct statement?

- The probability of it being a male without the trait is 0.75
- The probability of it being a male with the trait is 0.5
- The probability of it being a male with the trait is 0.25
- The probability of it being a female with the trait is 1.0

6. Individual number 8 does not have the trait. If, in the whole population, the frequency of f is known to be very low, which of the following is a true statement about the offspring produced by the mating between 7 and 8?

- There is a very low chance of their first offspring having the trait.
- The chance of their first offspring having the trait is the same as it is for the mating between 5 and 6.
- It is not possible for their first offspring to have the trait.
- The chance of one of their offspring having the trait increases with each offspring.

SEE NEXT PAGE

TABLE 7

	% of CO ₂ in gas	% of O ₂ in gas	Breaths min ⁻¹
Mixture 1	0.035	20	68
Mixture 2	0.05	20	69
Mixture 3	0.7	20	134
Mixture 4	0.035	15	72
Mixture 5	0.035	12	73

7. Which of the following statements is the best interpretation of the data presented in Table 7?

- Increasing CO₂ concentration of inhaled gas has a stronger effect on small mammal breathing rate than does decreasing the O₂ concentration.
- 0.7% CO₂ is the highest level that the mammal could breathe and survive.
- Combining high CO₂ and low O₂ has the greatest effect on breathing rate.
- Increased breathing rate causes increased rate of removal of CO₂ from the body.

8. Which of the following best describes the processes involved in controlling breathing in the small mammal?

- The rate of breathing affects the concentration of gases in exhaled air. This concentration provides negative feedback and alters the original stimulus.
- The concentration of gases in the inhaled air is a stimulus. The rate of breathing is a response.
- The concentration of dissolved gases in the blood of the animal is a stimulus. The rate of breathing is a response.
- Increased breathing rate is a stimulus. Alteration in the concentration of dissolved gases in the blood is a response.

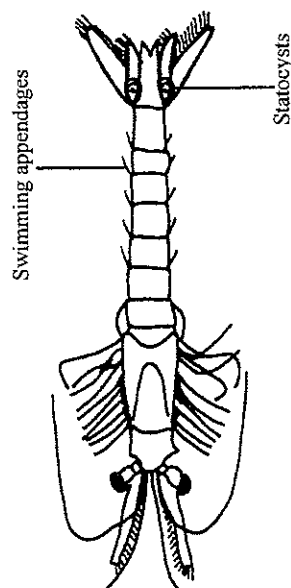
9. Carbon dioxide is toxic at high concentrations in blood. Which of the following best explains the changes in mammal breathing rate shown in Table 7?

- Decreased O₂ in inhaled gas causes loss of control over breathing mechanisms and a sharp decrease in breathing rate.
- High CO₂ in inhaled gas stimulates increase in the metabolic rate, causing breathing rate to increase and supplying more oxygen for metabolism.
- Decreased O₂ concentration in inhaled gas causes the metabolic rate to increase, requiring faster breathing to supply O₂.
- When the CO₂ concentration in the blood rises, faster breathing increases the rate at which it is removed.

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Questions 10 and 11 are based on the information on Figure 10 below.

FIGURE 10



Some shrimps (Figure 10), which are common in estuaries, have organs of balance called statocysts which contain sensory hairs. These help the animal to stay the right way up in the water.

10. Which of the following is the most likely explanation of the processes involved as a shrimp controls its body position?

- The statocysts receive nerve stimulation from the nerve coordination centre, signalling them to adjust the body position.
- Nerves connect the statocysts to a nerve coordination centre which then sends signals to muscles of the swimming organs.
- The statocysts have nerve connections with the muscles of the swimming appendages, signalling them to adjust the body position.
- Eyes detect the direction of light from the surface, enabling the animals to adjust the orientation of the body.

11. If the body positioning mechanism of the shrimp is thought of as an example of a stimulus - response - negative feedback system, which of the following represents the response?

- Signals from the statocyst, as the body orientation changes.
- A new orientation of the body, after the swimming appendages bring about movement.
- Activity of the swimming muscles, causing the body to move in the water.
- Signals from the eye to the statocyst, indicating that normal body position has been achieved.

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12. Early in 1996, scientists reported an unexpectedly large 'ozone hole' over the Arctic region of the northern hemisphere. Which of the following is most likely to result from an 'ozone hole'?

- (a) Global warming, as atmospheric carbon dioxide level rises.
- (b) Rising sea levels as polar ice caps melt.
- (c) Increase in ultra violet radiation at the land surface.
- (d) Greater phytoplankton growth as light intensity increases.

13. The diets of animals differ in the relative amounts of carbohydrate, fat and protein that they contain. In very arid environments, the most successful mammals get most of their energy from carbohydrate. Mammals which usually have high protein diets are less likely to occur in very arid areas.

Which of the following is **not** part of an explanation for this?

- (a) High protein diets provide for body growth and repair but cannot provide enough energy for mammals in arid environments.
- (b) Metabolism of carbohydrate produces CO_2 as a toxic waste but this can be removed without much loss of water.
- (c) When mammals use protein as a source of energy, toxic wastes must be removed in urine, which involves loss of water.
- (d) Aerobic metabolism of carbohydrate releases water which contributes to the water needs of mammals.

14. Many animals have a sense of smell. They can detect the presence of particular molecules when these are present in the air. Which of the following best describes the processes which occur as an animal uses its sense of smell?

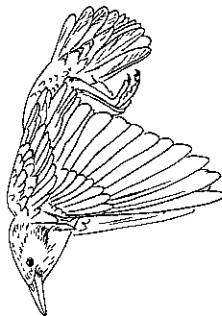
- (a) The molecules diffuse across the sensory nerve endings in sense organs and travel along the nerve to the brain.
- (b) Molecules of the particular substance attach to sensory nerve endings and cause the nerve to be stimulated.
- (c) The molecules travel along the sensory nerve and pass from one nerve cell to another by diffusing across the synaptic gap.
- (d) The molecules enter the blood vessels of the sensory receptor and are carried to the capillaries of the brain.

15. Atoms of nitrogen are continually moving between living organisms and the non-living world. Which of the following is a true statement about the movement of nitrogen?

- (a) Nitrogen is taken from the atmosphere by green plants and used in synthesis of important biological molecules.
- (b) Some bacteria are able to take in atmospheric nitrogen and 'fix' it in a chemical form which can be used by green plants.
- (c) The proportion of nitrogen in the atmosphere stays constant because it is not affected by biological processes.
- (d) Compounds which contain nitrogen are poisonous to animals and are rapidly excreted into their non-living environment.

16. The European starling, a small bird, was introduced into eastern Australia during the 19th century. Since then it has spread through eastern Australia and become a pest, but it has not established a population in Western Australia. Which of the following is the most likely explanation for the absence of starlings in the west?

- (a) Starlings are better adapted to climatic conditions in eastern Australia than to conditions in the west.
- (b) The Nullarbor plain is such a vast and inhospitable barrier that they cannot cross it.
- (c) Government authorities in Western Australia eradicate any starlings that they are able to locate in the west.
- (d) More natural predators of starlings occur in the west than in eastern Australia.



Questions 17 and 18 are based on the information on Table 17.

Tidal estuaries occur where a freshwater river meets the ocean. The salinity of the water in estuaries varies from that of the sea (Salinity 35), to fresh (Salinity 0). The data below show the salinity tolerance of some animals which occur in an estuary.

TABLE 17

Animal	Range of Salinity Tolerated
Garfish	0 - 1
Crab	1 - 35
Oyster	5 - 30
Shrimp	10 - 52

17. On the basis of their salinity tolerance, which of these animals is most likely to occur throughout the estuary and in the ocean?

(a) Garfish.
(b) Crab.
(c) Oyster.
(d) Shrimp.

18. Which of these animals is most likely to occur in shallow tidal pools in a coastal area with a warm dry climate?

(a) Garfish.
(b) Crab.
(c) Oyster.
(d) Shrimp.

19. A prediction, published in the press, was that the human population of Western Australia may increase from the present 1.5 million to 3.7 million by the year 2029. Providing for a larger population requires planning.

Which of the following would most likely cause the greatest problem to planners if the population grows as predicted?

(a) Housing and transport needs.
(b) High quality water needs.
(c) Domestic and industrial energy needs.
(d) Provision of sufficient food.

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20. Table 20 shows data on the concentration of various substances in the cells of a seaweed and the concentration of the same substances in seawater. The units of concentration are all the same.

TABLE 20

Substance	Concentration inside Cells	Concentration in Seawater
Calcium	1.7	12
Magnesium	0.005	57
Sodium	90.0	5000
Potassium	480 - 500	12
Chloride	500 - 600	520
Sulfate	0.01	36

Which of the following is most likely to be true?

- (a) Calcium enters the cells by osmosis, chloride diffuses out of the cells.
(b) Potassium is actively absorbed, magnesium is actively secreted by the cells.
(c) Sodium diffuses out of the cells, sulfate diffuses into the cells.
(d) The concentration in the cells of all of these substances is controlled by passive processes.

21. Water fleas in a lake have been shown to eat single celled algae. In one day a single water flea takes in 100 units of carbon in food. Some of this leaves the body as faeces, some is respired and leaves as carbon dioxide.

Which of the following is closest to the amount that is likely to become new tissue as the animal grows?

(a) 0.5 units of carbon.
(b) 1 unit of carbon.
(c) 15 units of carbon.
(d) 50 units of carbon.

22. Nearly every kind of cell in the body of a large animal has a nucleus. Which of the following best describes what you would expect to happen if the nucleus was removed from a typical cell?

- (a) The cell would die immediately because the nucleus is essential for all living cells.
(b) The cell would continue to live as long as similar cells because it would gain essential substances from the surrounding cells.
(c) The cell would live for a long time but not be able to divide.
(d) The cell would live for only a short time because it would be unable to repair itself.

23. A student was studying a living cell under a microscope and observed chromosomes becoming visible. As the student continued to watch, the original cell divided into two daughter cells. Which of the following would the student have observed if this cell was undergoing mitosis?

- (a) Each chromosome became attached at the centromere to a spindle fibre.
(b) Each chromosome paired up with another of similar size.
(c) Sections of chromosome being exchanged between pairs.
(d) The daughter cells had half the number of chromosomes of the original cell.

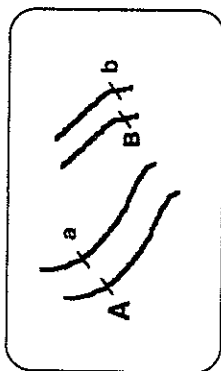
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24. In the 18th century, in London, there was a man with s_x projections on his skin. His son and his grandson had the same condition. They were known as porcupine men. Which of the following is the most likely explanation for the 'porcupine' condition?

- (a) The condition is controlled by genes on the X chromosome.
- (b) The condition is controlled by genes on autosomal chromosomes.
- (c) The condition is controlled by genes on the Y chromosome.
- (d) The condition is caused by environmental factors. When living conditions in London improved, the condition was not seen again.

Questions 25 and 26 are based on the information given in Figure 25.

FIGURE 25



25. Figure 25 shows a cell with two pairs of chromosomes and two identifiable genetic regions. Which of the following is a true statement?

- (a) A and a are not alleles because they represent different codes.
- (b) The chromosomes carrying A and B are homologous but those carrying a and b are not homologous.
- (c) The chromosomes carrying A and a are homologous because they carry the same genes.
- (d) The chromosomes carrying A and a are homologous because they carry identical genetic information.

26. Consider a **population** of organisms which has these two identifiable genetic regions: A, a and B, b. If selection occurs, leading to an increase in the frequency of a, which of the following is true?

- (a) The frequency of B will decrease.
- (b) There will be no effect on the frequencies of B and b.
- (c) The frequency of b will increase.
- (d) There will be no effect on the frequency of A.

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27. A certain animal is known to reproduce asexually. Which of the following is most likely to be a true statement about reproduction by this animal?

- (a) A large number of offspring are produced with a high level of genetic difference between them.
- (b) Very few offspring are produced, with very little genetic variability.
- (c) Large numbers of offspring are produced with very little genetic variability.
- (d) Few offspring are produced, but no two are genetically alike.

28. If an animal shows the phenotype controlled by a dominant allele and you need to find out whether it is homozygous or heterozygous, which of the following breeding procedures should be followed?

- (a) Cross the animal with one which has the same phenotype.
- (b) Cross it with one which is known to be heterozygous.
- (c) Cross it with one which is known to be homozygous for the dominant allele.
- (d) Cross it with one which shows the recessive phenotype.

29. A virus called the calicivirus infects the liver of rabbits. It is described as being highly virulent because most infected rabbits die. Calicivirus now occurs in Australian rabbits. Which of the following predictions is most likely to be true?

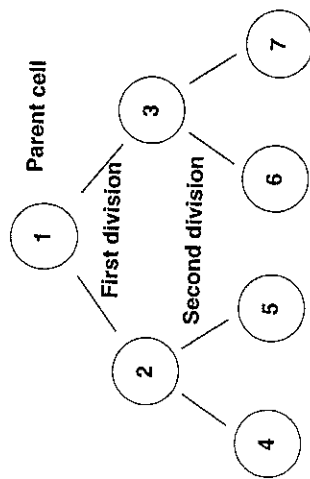
- (a) The virus will kill all infected rabbits and will eradicate the rabbit from Australia.
- (b) The virus will become less virulent over time because some rabbits which survive infection will breed.
- (c) The virus will eradicate rabbits because the few that survive the virus will be unable to breed.
- (d) The virus will kill all infected rabbits because there will be changes in its genetic make-up which will make sure that it remains virulent.



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30. Meiosis is a cellular process involving two divisions, resulting in two, then four, cells. Figure 30 is a summary of the pattern of division.

FIGURE 30



Which of the following is a true statement about the cells produced by meiosis?

- (a) Cell 1 is diploid, all other cells are haploid.
- (b) Cells 2 and 3 have identical genetic information.
- (c) Cells 6 and 7 are haploid and genetically identical.
- (d) Crossing over occurs in cells 2 and 3.

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SECTION B

Suggested time: 90 minutes (100 marks)

Attempt all questions in this section. Write answers in the spaces provided. Use black or blue ink or ball point pen.

31. (20 marks)

The region of Western Australia which is shown on Figure 31 is described as 'the wheat belt'. Throughout most of this area natural vegetation has been replaced by farms growing cereals and sheep. On many farms, sheep graze on the stubble which remains after the cereal crop has been harvested. Faeces from the sheep are a resource for flies and beetles.

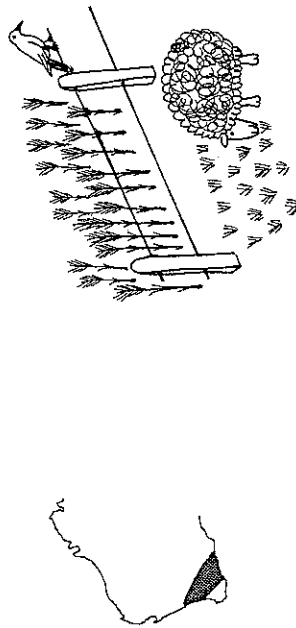


FIGURE 31

- (a) Write the name of an organism, likely to occur in this ecosystem, which has the role of

a primary producer

a decomposer

a first order consumer

a second order consumer

(4 marks)

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- (b) Draw a diagram showing the movement of energy in a simple food web which links six different organisms in this agricultural ecosystem.

(4 marks)

- (c) The average production of wheat in Western Australian farms is 1.2 tonnes of grain per hectare per year. Some farms achieve 3 tonnes, others much less.

Explain how two factors which affect plant growth may differ between districts, making some more productive than others.

(4 marks)

- (d) Small areas of uncleared land remain in the wheatbelt of Western Australia, surrounded by farmland. Complete the table below with words or phrases which compare the ecosystems of the farm and the uncleared vegetation.

(4 marks)

	Farm	Uncleared land
Inputs from outside		
Length of food chains		

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- (e) i) Many people claim that in all farming areas, some uncleared land should be set aside to conserve remnants of natural vegetation. State one reason in support of this sort of conservation.

(2 marks)

- ii) State one reason why remnants of natural vegetation on **small** areas of land may not be effective for conservation.

(2 marks)

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32. (20 marks)

The respiratory gills of freshwater crayfish are located in a chamber on each side of the body, protected by a large overhanging plate called the carapace. A small limb at the front of each gill chamber pumps water across the gills with a beating action. A scientist measured the beating rate of this limb for a single crayfish when it was kept at different temperatures. Table 32 shows the data that were recorded.

FIGURE 32 A freshwater crayfish

carapace (cut away to show gills in gill chamber)

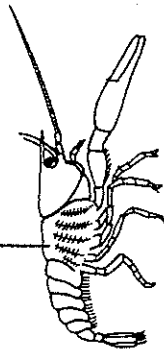


TABLE 32

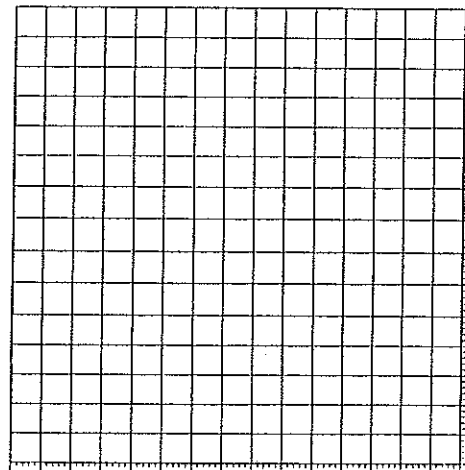
Number of Beats per Minute	Water Temperature °C
16	10
42	20
64	30
64	40
0	50

- (a) i) Write an hypothesis that the scientist might have been testing (2 marks)

- ii) For the experiment which tests the hypothesis that you have stated, which is the independent variable?
dependent variable?

(2 marks)

- (b) Use the grid below to plot the data shown on Table 32. Label the axes. (4 marks)



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N.B. The grid is repeated at the end of the examination book. If you make a mistake put a line through it, write "see back page" beside it, and answer on the grid at the end of this booklet.

- (c) i) State **one** conclusion which can be made from the data. (2 marks)

- ii) Write a statement which **explains** (interprets) the data. (2 marks)

- (d) i) The scientist was advised to repeat the experiment using five crayfish. Explain why this was good advice. (2 marks)

- ii) More than 100 crayfish were available in a large tank. How should the scientist select just five specimens for repeating the experiment? (2 marks)

- (e) Write a list of four differences between individual crayfish which could affect the results of the second experiment. (4 marks)

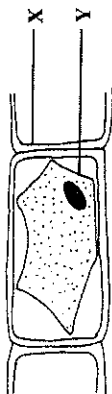
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33. (20 marks)

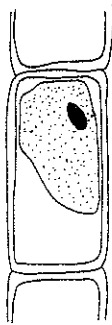
Figure 33 has four separate diagrams, P, Q, R and S, showing cells of a freshwater flowering plant, as seen at 400x magnification. The cells of the plant had been taken from fresh water and bathed in salt solutions of different concentrations.

FIGURE 33

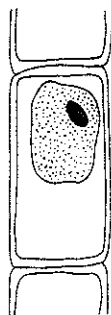
P. A cell in a 0.5% salt solution.



Q. A cell in a 1.0% salt solution.

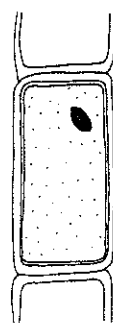


R. A cell in a 1.5% salt solution.



The next diagram, S, shows the same cell as diagram R (above), 30 minutes after returning the cell to freshwater after it had been in a salt solution.

S. The same cell as diagram R after return to fresh water.



(a) Complete the table below with information about the structures which are labelled X and Y on Figure 33. (4 marks)

Name of the structure	Function of the structure
Structure X	
Structure Y	

SEE NEXT PAGE

(b) Name and explain the process that occurred, causing the structure X to change shape after being bathed in salt solutions of different concentration. (4 marks)

Name of the process: _____

Explanation: _____

(c) As the freshwater plant grows and produces new cells, nutrient salts containing nitrogen and phosphorus must be taken from the water and used to build the biological compounds that are part of the living cells. Complete the table below with the names of four different important biological compounds, two which contain nitrogen and two which contain phosphorus. (4 marks)

Examples of biological compounds in cells

Containing nitrogen	1.	2.
Containing phosphorus	1.	2.

(d) In most freshwater environments, the concentrations of nitrogen and phosphorus are much less than the concentration of these elements within living cells.

Name the processes that might be involved as the nutrient salts move through both structure X and structure Y from the water and into the living cell. (4 marks)

Through X: _____

Through Y: _____

(e) If this freshwater plant is found in very calm water in strong sunlight, streams of very small gas bubbles may be seen leaving the surface of some leaves.

Write the name of the gas. Name and describe the process that results in gas production. (4 marks)

Name of the gas: _____

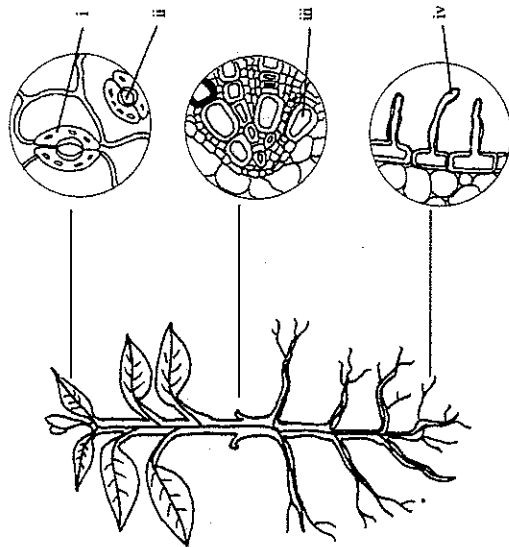
The process: _____

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34. (20 marks)

Figure 34a is a diagram of a terrestrial flowering plant.

FIGURE 34a



(a) Use the left hand column of the table below to write the name of the features or structures that are labelled i - iv in Figure 34a. (4 marks)

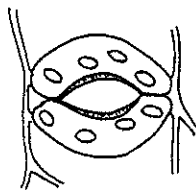
(b) Use the right hand column of the same table to state briefly the part played or the involvement of each structure in the movement of water through the plant. (4 marks)

Name	Role of the structure in water movement
i	
ii	
iii	
iv	

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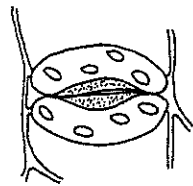
(c) At different times of day, the structures which are labelled 'Y' in Figure 34a may change in shape. They may appear as shown in Figure 34b or Figure 34c.

FIGURE 34b



or as

FIGURE 34c



Explain the **benefits** that come to the plant when the structures are in each of the two conditions. (4 marks)

When as in Fig. 34b:

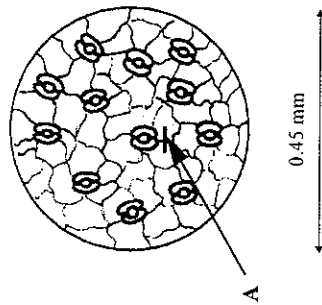
When as in Fig. 34c:

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(d)

Figure 34d shows the lower epidermis of a leaf as seen with a microscope at 400x magnification.

FIGURE 34d



i) The diameter of the field of view at 400x is 0.45 mm. Calculate the width, indicated by the bar (A), of the structure shown on the diagram. (2 marks)

ii) The area of the field of view is 0.16 mm^2 . Calculate the number of obvious structures that would be expected per square millimetre of lower leaf epidermis. (2 marks)

(e) List four structures or features that would be expected in a species of flowering plant which survives in very arid habitats. (4 marks)

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FIGURE 35a

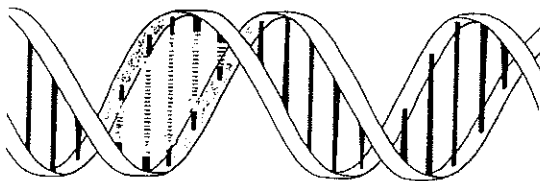
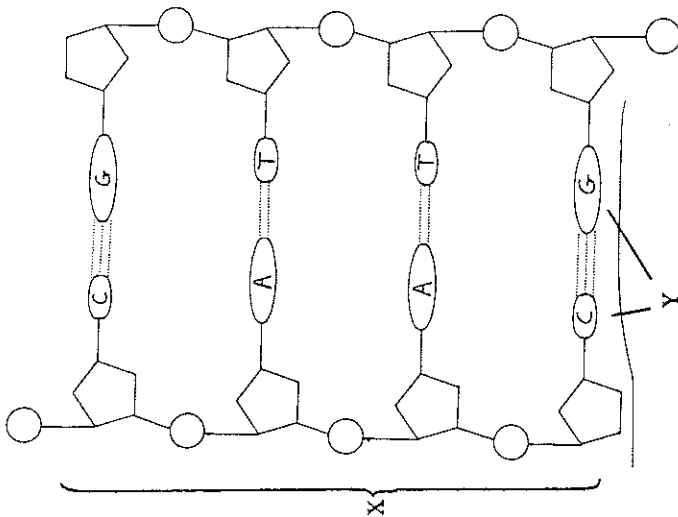


FIGURE 35b



Figures 35a and 35b are simplified diagrams of the structure of a molecule of DNA. The shape of the molecule is often described as a 'double helix of complementary strands'.

- (a) i) Write names for the parts of the DNA molecule which are indicated by the different shaped symbols labelled X and Y. (2 marks)

X: _____

Y: _____

- ii) Research workers have put great efforts into discovering the **order or sequence** of the parts of DNA which are labelled Y above. Explain briefly why the sequence is so important. (2 marks)

- (b) i) Explain what is meant by 'complementary strands' in the DNA molecule. (2 marks)

- ii) Explain the biological importance of DNA having complementary strands. (2 marks)

- (c) i) Describe **two** changes that could occur in the structure of the DNA, shown in Diagram 35b, as the result of a mutation. (2 marks)

- ii) Explain why mutations are important. (2 marks)

- (d) The idea that different species of organisms share common ancestors is central to modern biology. Give two different lines of evidence which support this evolutionary view of life. (4 marks)

i)

ii)

(e) Many species of Australian plants and animals are at risk of becoming extinct.

- i) Give an example of a species which is at risk and state one conservation strategy which could reduce the risk. (2 marks)

- ii) Briefly describe how this strategy would reduce the selection pressure against this species. (2 marks)

SECTION C

Suggested time: 50 minutes (40 marks)

ANSWER SECTION C IN THE STANDARD ANSWER BOOK

SECTION C consists of Question 36 and Question 37. There are four parts to each question. You must choose to answer two parts from Question 36 and two parts from Question 37. Each part carries ten (10) marks.

Question 36 tests your **knowledge** of syllabus content. **Question 37** tests how you apply your **understanding of biological principles**.

Answers may be presented in different ways provided that they communicate your ideas effectively. You may choose to

- present clearly labelled diagrams
- write notes beside clear diagrams
- write lists of points, with sentences which link them
- present information in tables
- write concisely worded sentences
- use other appropriate ways to present ideas.

Marks may be deducted for answers which are poorly presented or difficult to read.

Use black or blue pen or ball point. Write answers in the Standard Answer Book.

Question 36

Answer any **TWO** parts from 36a to 36d. Ten marks for each part.

- (a) Adenosine triphosphate (ATP) is produced in living cells when phosphate is linked to ADP with a high energy bond. ATP then becomes a temporary energy store.

Describe major differences between the processes of anaerobic respiration and aerobic respiration with respect to the location in cells where ATP is produced and the amount of ATP produced when these cells metabolise the same amount of glucose.

Briefly explain how the energy stored in ATP is used in the living cell.

- (b) Regulation of internal conditions and regulation of growth in both plants and animals involves chemicals (hormones) which are produced in one place but have effects on tissues in different parts of the body.

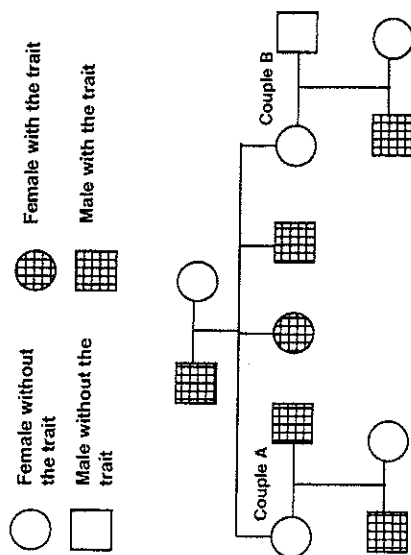
Choose an example of physiological regulation in a plant or animal and draw a well presented flow chart or diagram to describe the processes that are involved.

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- (c) The pedigree shown in Diagram 36c shows the occurrence of one inherited trait in a family.

DIAGRAM 36c



- Explain the pattern of inheritance for this trait.
- The couples A and B both have a son with the trait and a daughter without the trait. Compare the observed ratios of phenotypes of their children with the ratios of phenotypes and genotypes that would be predicted by theory.
- Explain any differences between the predicted and the observed ratios.

- (d) In Australia, the ecology of many inland waterways has changed markedly in recent decades, especially in areas close to agricultural land.

Write a list of ways in which agricultural activities in nearby land may affect the ecology of waterways. Briefly describe the ecological effects of each point on your list.

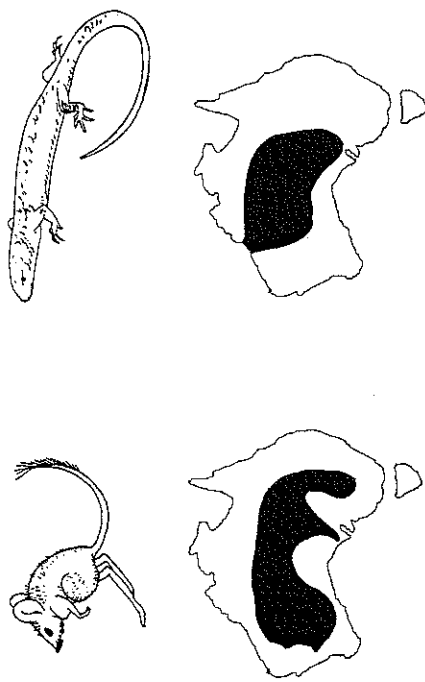
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Question 37.

Answer any **TWO** parts from 37a to 37d. Ten marks for each part.

- (a) The Kultarr, a small marsupial mouse and the Pygmy Mulga Monitor lizard, both live in the same region of Central Australia, where extreme temperature differences occur between night and day. Figure 37a shows the geographic range of these two animals.

FIGURE 37a



Make comparisons between these animals to show:

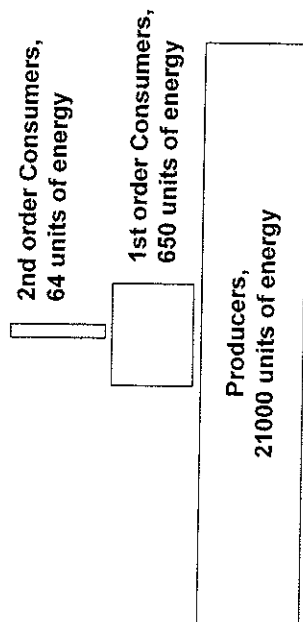
- how the internal body temperatures of each are affected by extremes of environmental temperature,
 - how each maintains internal temperature within certain limits.
- (b) Many processes in living cells involve changes in the structure of biological molecules. Simple structures may be linked together to form complex molecules or the reverse may occur. These processes do not occur in a single step. Explain why many steps are involved, each controlled by different enzymes.

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- (c) Figure 37c shows the relative amount of biologically useful energy in the biomass of organisms in a productive grassland community.

Explain why differences in biomass occur at each level.

FIGURE 37c



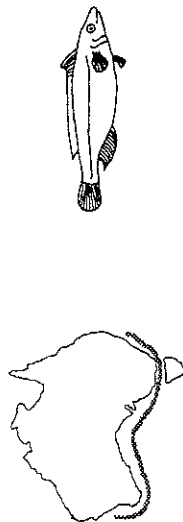
- (d) Figure 37d shows the distribution of some different fish which inhabit coastal waters of southern Australia. A single population of the Little Rock Whiting extends from east to west. Two separate species of Salmon, the Western and the Eastern Salmon, overlap near Tasmania. The other fish shown on Figure 37d vary in the extent of separation of populations.

Use the example of the distribution of other species of fish to explain how two species of Salmon might have evolved from a single ancestral species.

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FIGURE 37d

1. A single population of Little Rock Whiting



2. Two separate populations of Knight fish



3. Two separate populations of Talma fish, with different characteristics



4. Two separate species of Morwong, with no overlap



Western Morwong

Eastern Morwong

5. Two separate species of Salmon with overlapping ranges



Western Australian Salmon

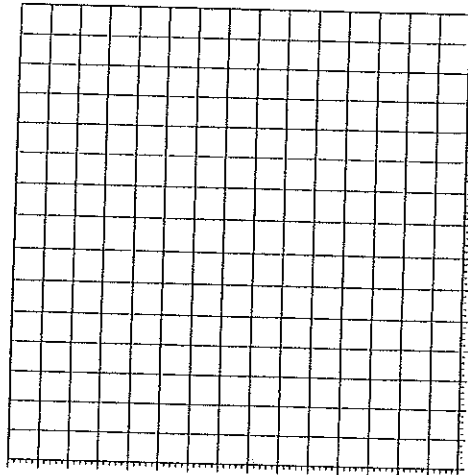
Eastern Australian Salmon

END OF PAPER

32. Table 32 and the grid are repeated here. You may use these if you made a mistake on page 18.

TABLE 32

Number of Beats per Minute	Water Temperature °C
16	10
42	20
64	30
64	40
0	50



ACKNOWLEDGMENTS

Question 37a, distribution maps adapted from;

Cogger, H. G. (1983). *Reptiles and Amphibians of Australia*, A. H. & A. W. Reed Pty Ltd. Frenchs Forest, N. S. W.

ISBN 0 598 50356 1 pp 258 and Figure 549

and

Strahan, R. (Ed.) (1983). *The Australian Museum Complete Book of Australian Mammals*. Angus & Robertson Publ. Sydney.

ISBN 0 207 14454 0

Question 37d, illustrations adapted from;

Australia's Biodiversity, an overview of selected significant components. (1994). Biodiversity Series, Paper No. 2. Department of the Environment, Sport and Territories. Commonwealth of Australia.

ISBN 0642 22154 5