

Structure of this paper

Section	Number of questions available	Number of questions to be attempted	Suggested working time	Marks available
A Multiple choice	1-30	All	40	60 (30%)
B Short answers	31-35	All	90	100 (50%)
C Extended answers	36*	Two parts	50	40 (20%)
	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

- The rules for the conduct of Tertiary Entrance Examinations are detailed in the booklet *TEE Handbook*. Sitting this examination implies that you agree to abide by these rules.
- Answer the questions according to the following instructions:

Section A

Answer **all** questions, using a 2B, B or HB pencil, on the separate Multiple Choice Answer Sheet. Do **not** use a ball point or ink pen.

Section B

Write your answers in the spaces provided in this Question/Answer Booklet. A blue or black ball point or ink pen should be used.

Write your answers in the spaces provided in this Question/Answer Booklet. Spare answer pages may be found at the end of this booklet. If you need to use them, indicate in the original answer space where the answer is continued (ie give the page number).

You should note that the space made available for an answer is not necessarily an indication of the length of the answer.

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 your Question/Answer Booklet should be attached to the front of the Standard Answer Book(s) with the paper binder provided.

SECTION A (60 marks)

Record an answer for Questions 1-30 by marking your choice of alternative on the separate Multiple Choice Answer Sheet using a 2B, B or HB pencil. Each question is worth two marks. Marks are not deducted for wrong answers.

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.

- Which of the following hypotheses would be most difficult to test with a scientific experiment?
 - Dinosaurs were endothermic.
 - Chickens hatched in spring will grow more quickly than chickens hatched in autumn.
 - Placing unripe tomatoes in a sealed container will speed up the ripening process.
 - Placing seeds in the freezer will kill them.
- The term "biosphere" is best described as which of the following?
 - All the ecosystems of a large, distinct area such as an island or a continent
 - Any group of ecosystems in a particular area
 - All the ecosystems of the Earth combined
 - All the living organisms of the Earth
- The productivity of an ecosystem is important. What would be the main consequence of an area having low productivity?
 - There would be less biodiversity in the ecosystem.
 - There would be fewer species of producers.
 - The food chains of the ecosystem would be shorter.
 - The area would have a low biomass of consumers.
- Modern farmers are adopting more sustainable methods of agriculture. This means they are using methods that do less long-term damage to the ecosystem and therefore allow them to operate efficiently well into the future. Which of the following strategies would be the best practice in a stable agricultural ecosystem?
 - Attempt to balance inputs and outputs and promote recycling.
 - Reduce inputs and increase outputs to prevent pollution of the environment.
 - Reduce both inputs and outputs to a minimum and increase recycling where possible.
 - Increase inputs but reduce outputs by promoting recycling.

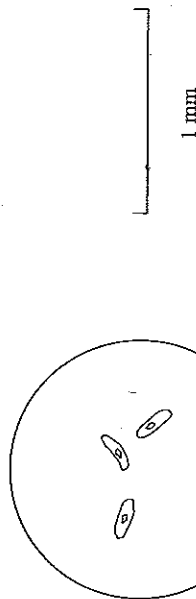
SEE NEXT PAGE

SEE NEXT PAGE

5. When investigating the use of introduced predators for biological control programmes scientists must gather a lot of information about the proposed predators. Which of the following pieces of information about a proposed predator would be of LEAST value?
- Whether the predator can breed in its new environment
 - Whether the predator is widespread in its own native habitat
 - Whether native species will prey on the introduced predator
 - Whether the predator eats species other than its intended prey

Questions 6 and 7 refer to the following information.

The following diagram represents the view of a slide seen through a monocular microscope using a 10x ocular lens and a 10x objective lens. The scale on the right has been drawn to the same magnification.



6. What is the best estimate of the length of one of the cells shown in the slide?

- 20µm
- 85µm
- 200µm
- 600µm

7. The microscope was altered to a 40x objective lens without altering anything else. What, approximately, was the new field diameter?

- 50µm
- 300µm
- 800µm
- 5000µm

8. A microbiologist discovered a new anti-cancer drug that slowed the growth of cancer cells by interfering with cellular respiration. She found that cancer cells treated with the drug produced about 15 ATP molecules for every glucose molecule they consumed, rather than the usual number of 38. Which of the following hypotheses could explain the drug's effect?

- Treated cancer cells cannot perform anaerobic respiration.
- Treated cancer cells contain mitochondria with reduced function.
- Treated cancer cells cannot use their mitochondria.
- Treated cancer cells are forced to rely on fermentation for ATP.

9. An oceanographer has suggested slowing the rate of greenhouse warming by fertilising the ocean to increase the growth of algae. How would this reduce the greenhouse effect?

- It would produce oxygen, reflecting sunlight from the atmosphere.
- It would repair Earth's ozone layer.
- It would consume CO₂, which is a gas that traps heat in the atmosphere.
- It would trap sunlight that would otherwise warm the Earth.

10. A pea plant with purple flowers is heterozygous for flower colour. Its genotype is Pp. Where are the P and p alleles located within the cells of the pea plant?

- Next to each other on the same chromosome
- On different chromatids of the same chromosome
- Some distance apart on the same chromosome
- At the same location on homologous chromosomes

11. A brown mouse is mated with a white mouse. All their offspring (the F₁ generation) are brown. Mating these F₁ generation brown offspring produces the F₂ generation, which includes both brown and white mice. If you wanted to know the genotype of one of the brown F₂ mice, which of the following steps would be most helpful?

- Keep careful records of the parent mice.
- Mate it with a brown mouse.
- Mate it with a mouse of its own genotype.
- Mate it with a white mouse.

12. When two grey-bodied fruit flies are mated, they produce 86 grey-bodied males, 81 yellow-bodied males, and 165 grey-bodied females. Which of the following statements about the allele for yellow body is correct?

- The allele is sex-linked and dominant.
- The allele is autosomal and dominant.
- The allele is sex-linked and recessive.
- The allele is autosomal and recessive.

13. Red-green colour blindness is a human recessive sex-linked trait. A man and woman with normal vision have a colour-blind son. What is the probability that their next child will also be a colour-blind son?

(a) 0
(b) 1/8
(c) 1/4
(d) 1/2

14. Which of the following would usually result in a species becoming better adapted to the environment in which it lives?

(a) Non-random mating
(b) Genetic drift
(c) Natural selection
(d) Mutation

15. The nitrogen present in proteins can be eliminated in the form of ammonia, which is highly toxic and must be removed from the body rapidly. In which of the following habitats would you be most likely to encounter organisms using ammonia as their nitrogenous waste?

(a) In deserts
(b) In the air
(c) In water
(d) In rainforests

16. The trout is a fish that spends part of its life in the ocean and part of its life in freshwater. Which of the following statements correctly describes the water and salt balance of a trout in a **freshwater** environment?

(a) Water and salts are lost by diffusion. These are balanced by drinking large quantities of water and by active uptake of salts across the gills.
(b) Water is gained and salts are lost by diffusion. These are balanced by constant drinking and by active excretion of water across the gills.
(c) Water is lost and salts are gained by diffusion. These are balanced by constant drinking and by active excretion of salts across the gills.
(d) Water is gained and salts are lost by diffusion. These are balanced by the excretion of dilute urine and by active uptake of salts across the gills.

17. The antibiotic streptomycin is thought to combine with the ribosomes in bacteria and to disrupt their normal functioning. Which of the following would be the most **immediate** effect of streptomycin on bacterial cell function?

(a) The synthesis of enzymes would be prevented.
(b) Cell division would be inhibited.
(c) Energy production within the cell would stop.
(d) Substances would be prevented from crossing the cell membrane.

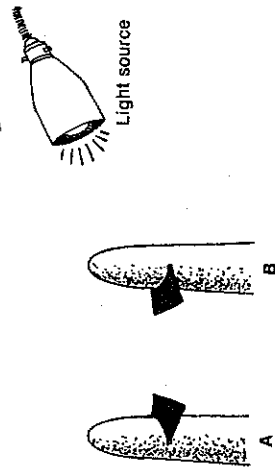
SEE NEXT PAGE

18. Which of the following compounds contains the greatest amount of chemical energy per molecule?

(a) H_2O
(b) Glucose
(c) ADP
(d) ATP

Questions 19 and 20 refer to the diagram and information below.

A coleoptile is a protective sheath that covers the tip of the shoot of a young plant in the grass family. The diagram shows an experiment in which thin metal sheets have been partly inserted into two coleoptiles labelled A and B. The only source of light is the lamp illustrated.



19. What will happen to the coleoptiles as they continue to grow?

(a) Both will grow towards the light.
(b) A will grow towards the light and B will grow away from the light.
(c) A will grow straight and B will grow away from the light.
(d) A will grow towards the light and B will grow straight.

20. Which of the following statements most accurately explains the response of plants to light?

(a) Substances produced in the tip of the shoot travel via the xylem to inhibit growth on one side of the shoot.
(b) Substances produced in the leaves travel via the phloem to stimulate growth on one side of the shoot.
(c) Substances produced in the tip of the shoot travel via the phloem to stimulate growth on one side of the shoot.
(d) Substances produced in the leaves travel via the xylem to inhibit growth on one side of the shoot.

SEE NEXT PAGE

Questions 21-23 relate to the following information.

The experiment shown below was set up near an ants' nest.



DISH A ANTS' NEST DISH B

Dish A contained 2 mL of soft drink (Coca Cola) and dish B contained 2 mL of diet soft drink (Diet Coke). The dishes were left for 5 minutes after which the number of ants in each dish was recorded. The results are shown in the table below.

TRIAL	NUMBER OF ANTS	
	DISH A (Coca Cola)	DISH B (Diet Coke)
1	43	4
2	26	3
3	31	8
4	38	4
5	29	2

21. What is the independent variable in this experiment?

- (a) The type of liquid placed in the dish
- (b) The number of ants in each dish
- (c) The locations of the dishes near the ants' nest
- (d) The activity of the ants

22. Which of the following variables would need to be controlled in the experiment?

- (a) The concentration of the substances in each dish **and** the number of ants in each trial
- (b) The volume of liquid in each dish **and** the distance of each dish from the ants' nest
- (c) The time taken for each trial **and** the type of liquid in each dish
- (d) The size of the ants' nest **and** the number of trials

23. Which of the following is a valid observation from the above experiment?

- (a) The mound of soil around the ants' nest is for protection.
- (b) Ants like Coca Cola.
- (c) Ants are attracted more to Coca Cola than to Diet Coke.
- (d) There is more sugar in Coca Cola than in Diet Coke.

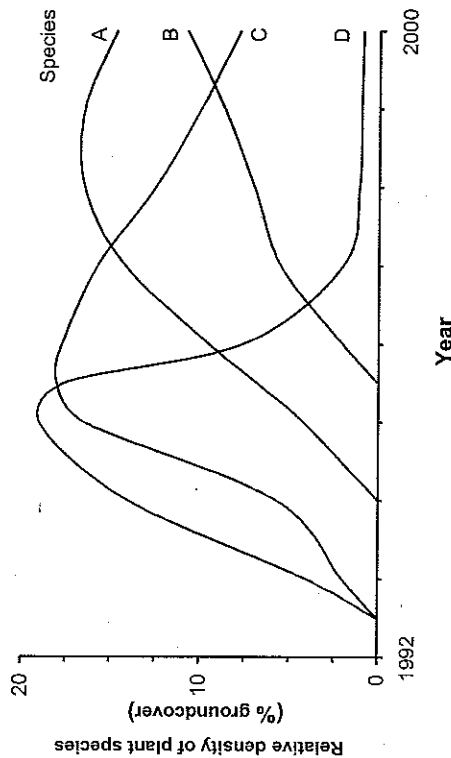
24. The world is faced with many environmental problems at the present time. Which of the following is the underlying cause of these problems?

- (a) Overpopulation of the human species
- (b) Excessive land clearing
- (c) Extensive burning of fossil fuels
- (d) Rapid changes in the composition of the atmosphere

SEE NEXT PAGE

Questions 25 and 26 refer to the following information.

A fire swept through an area of bush land in 1992. Careful monitoring of key plant species (A,B,C and D) produced the following data on relative population sizes.



25. According to the data, which of the following has occurred since the fire?

- (a) Regeneration of burnt trees
- (b) Evolution
- (c) Migration
- (d) Ecological succession

26. Which of the following would be a reasonable prediction about this area?

- (a) The burned area will eventually return to its exact original state.
- (b) Consumers will gradually migrate back into the burned area.
- (c) All species living in the area are adapted to fire and will therefore recover.
- (d) The bushland will degenerate unless it is burned every few years.

27. Carbon, hydrogen, oxygen and nitrogen are the most abundant elements in plants. Which of these elements does a terrestrial green plant obtain mainly from the soil?

- (a) Hydrogen and oxygen
- (b) Oxygen and nitrogen
- (c) Carbon and nitrogen
- (d) Nitrogen and hydrogen

SEE NEXT PAGE

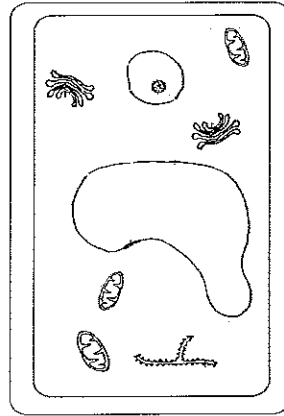
28. A kangaroo kept in captivity was observed to completely remove a layer of bark from around a tree, effectively "ring barking" the tree. It was noticed that the leaves of the tree retained their normal appearance for several weeks, during which the weather was hot and sunny, but the tree eventually died. Which of the following correctly explains these observations?

- (a) Phloem tissue lies outside xylem tissue.
- (b) Xylem tissue lies outside phloem tissue.
- (c) Phloem and xylem tissues are found together in the bark.
- (d) Neither phloem tissue nor xylem tissue is found in bark.

29. Agents that cause proteins to be denatured are sometimes referred to as "non-competitive inhibitors" of enzymes because they reduce or halt enzyme activity. Which of the following is the most likely reason for the loss of enzyme activity after protein denaturation?

- (a) The protein molecule is broken up into small fragments which are incapable of catalysing reactions.
- (b) Denaturation changes the structure of the enzyme molecule, making it incapable of binding to the substrate.
- (c) An enzyme is denatured in the process of catalysing a reaction and so can only be used once.
- (d) Denaturation increases the amount of energy required to catalyse the reaction and so lowers enzyme activity.

30. Examine the diagram below, which shows a cell section as seen with an electron microscope.



Which of the following statements about the cell is correct?

- (a) The cell could be a muscle cell because of the many mitochondria present.
- (b) The cell is about to commence cell division because the nucleolus is visible.
- (c) The cell cannot be a plant cell because no chloroplast is present.
- (d) The cell is able to secrete substances because Golgi bodies are present.

SEE NEXT PAGE

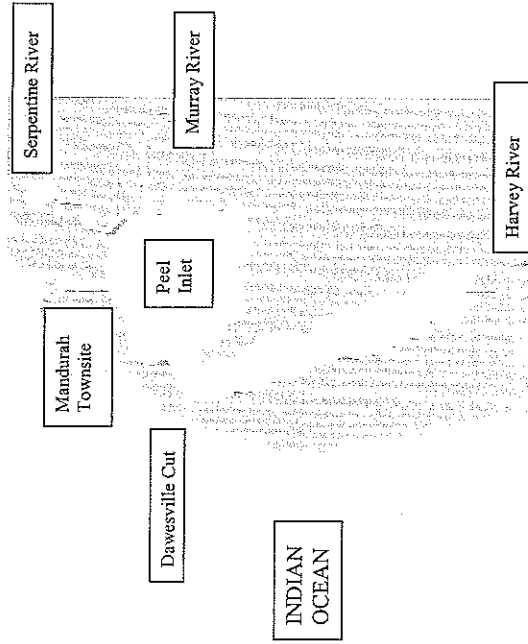
SECTION B (100 marks)

(Suggested time: 90 minutes)

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

31. Eutrophication is an environmental problem that occurs in inland water bodies such as lakes, rivers and inlets. It occurs when excessive nutrient levels in the water cause overgrowth of producer organisms. This can lead to major disruptions in the ecosystem.

The Peel Inlet near Mandurah in Western Australia is a popular area for water sports. The surrounding land is used mostly for agriculture. For several decades the Peel Inlet has had problems with eutrophication and water turbidity (cloudiness).



In 1995 the Dawesville Cut was completed south of Mandurah. This is a deep channel joining the inlet to the ocean. As a result the inlet waters are extensively flushed by the rise and fall of the tides and the waters of the inlet are circulated more effectively.

- (a) (i) Name two possible sources of excess nutrients in the Peel Inlet.

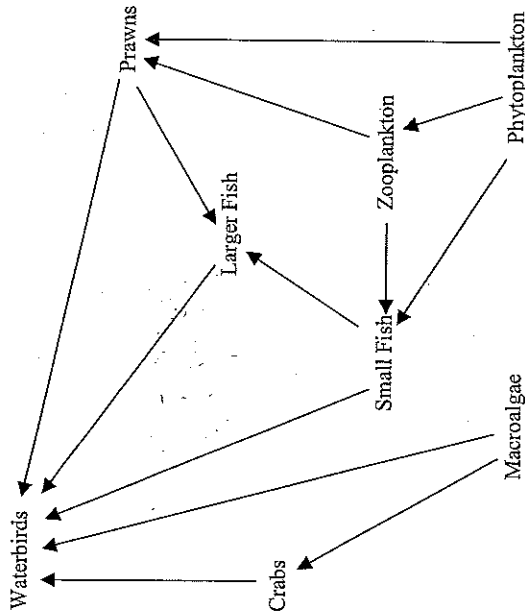
- (ii) Name two possible causes of water turbidity in the Peel Inlet.

(4 marks)

SEE NEXT PAGE

Question 31 (continued)

The diagram below shows a simplified food web for the Peel Inlet.



- (b) (i) Explain how the turbidity could affect the population of macro algae.

- (ii) Explain how the turbidity would affect the populations of commercially important species such as larger fish, crabs and prawns.

(4 marks)

Since the Dawesville Cut was opened tidal variation in water levels has increased, leading to greater areas of salt marsh. Mosquitoes breed in these salt marshes and have become a problem to people living in the area, both as a nuisance and as a carrier of disease. An obvious solution is to spray salt marsh areas with chemical insecticides to kill the aquatic mosquito larvae.

When spraying occurs, the concentration of the insecticide used is known to be harmless if sprayed on vertebrates living in the area. However, water birds have been known to become ill or even die some time later.

- (c) (i) From the above food web draw a biomass pyramid that would lead to the insecticide being concentrated in the bodies of water birds.

- (ii) Briefly explain how the insecticide becomes more concentrated in each higher level of the food pyramid.

(4 marks)

- (d) Give two further reasons why spraying insecticide is bad for the ecosystem. Briefly explain your answers.

(4 marks)

Question 31 (continued)

A more environmentally acceptable technique is now being trialled. It is called "runnelling" and involves digging shallow channels in the salt marshes to allow greater flow of tidal waters into and out of the marshes.

- (e) Describe **two** mechanisms by which this could help reduce the mosquito population.

(4 marks)

SEE NEXT PAGE

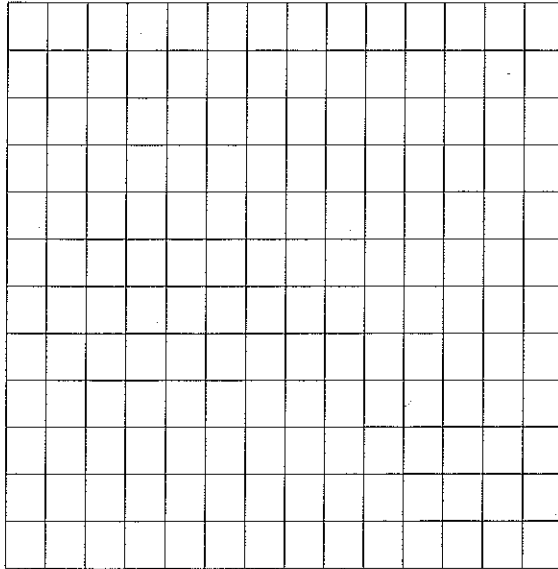
32. A suspension of living plant cells was added to a glucose solution. After thorough mixing the suspension was divided in two portions and placed in separate flasks (Flask 1 and Flask 2). A small amount of chemical X was added to Flask 2 and both flasks were then placed in the dark.

The number of cells per unit volume was counted for each flask over the next five days. The data are recorded below.

DAY	NUMBER OF CELLS PER mm ³ (x100)	
	FLASK 1	FLASK 2
0	1.1	1.1
1	1.8	1.2
2	3.4	1.1
3	5.4	1.0
4	5.3	1.7
5	5.2	3.5

- (a) Plot the data for both flasks on the single grid provided below. (4 marks)

(If you wish to have a second attempt at this item, the grid is repeated at the end of the examination booklet. Indicate clearly on this page if you have used the second grid and cancel the working on the grid on this page).



SEE NEXT PAGE

Question 32 (continued)

- (b) For this experiment name the following:

The independent variable

The dependent variable

Two controlled variables

(4 marks)

- (c) (i) Explain the results obtained for Flask 1 after day 3.

On day 3 the cells from Flask 2 were filtered from their suspension and rinsed thoroughly with water. They were then resuspended in glucose solution and returned to the dark.

- (ii) Explain the results obtained for Flask 2 after day 3.

(4 marks)

- (d) Substance X was thought to greatly slow a particular chemical process that normally occurs in cells.

- (i) Suggest two chemical processes that could have been slowed.

- (ii) Explain how the slowing of one of these processes could account for the results shown in Flask 2.

(4 marks)

SEE NEXT PAGE

During the experiment recordings were also made of temperature fluctuations within the flasks. At the same time the external air temperature was kept constant.

- (e) (i) On the axes below sketch the temperature changes you would expect in flask 1.

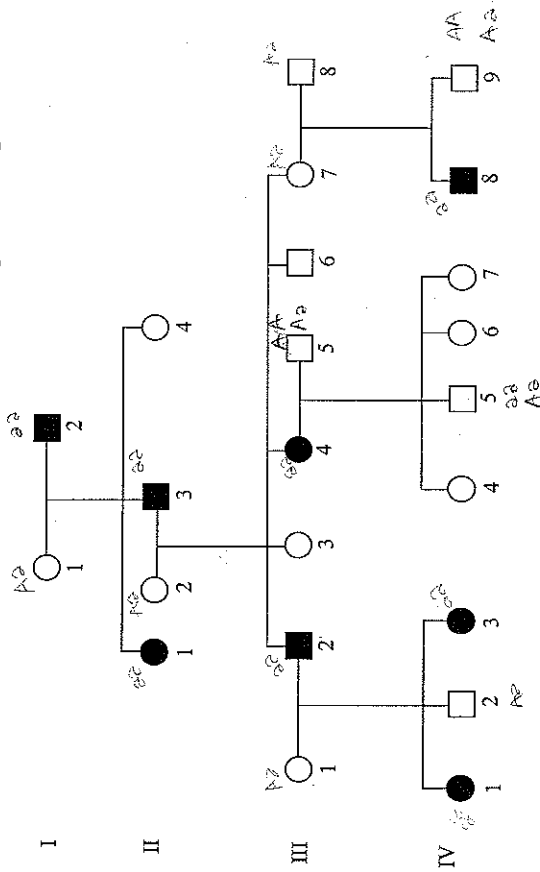


- (ii) Give reasons for the shape of your sketch.

(4 marks)

SEE NEXT PAGE

33. The pedigree below shows the inheritance of a skin disorder in sheep that is rare but not serious. The disorder is recessive and autosomal. Males are indicated by square symbols and females by round symbols. Shaded individuals have the skin disease and unshaded individuals do not have the disease. Using the symbols **A** for the normal allele and **a** for the disease allele, answer the questions below, showing full working.



(a) Write all the possible genotypes of the following four individuals:

- II 3
- III 1
- III 3
- IV 9

(4 marks)

(b) Using evidence from the pedigree, explain why the disorder cannot be transmitted by a dominant autosomal gene.

(4 marks)

SEE NEXT PAGE

(c) Using evidence from the pedigree, explain why the disorder cannot be transmitted by a recessive sex-linked gene.

(4 marks)

(d) Assume that individual III 5 has genotype **Aa**. Individuals III 4 and III 5 have another offspring.

(i) What is the probability that it will be a diseased female? Show your working.

(ii) What is the probability that it will be a normal male? Show your working.

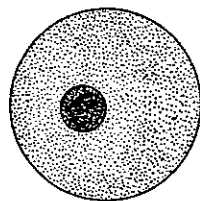
(4 marks)

(e) It is proposed to use a male from Generation 4 for breeding. Keeping in mind that the skin disease is undesirable, which male would you choose? Explain your reasoning.

(4 marks)

SEE NEXT PAGE

34. Study the following diagrams showing a human sperm cell and a human ovum. Note that each cell is drawn to a different scale.



100 μm



10 μm

- (a) (i) Write the name of the structure that would contain the cells' DNA.

- (ii) Name the type of cell division which gives rise to sperm cells.

- (iii) Sperm cells are haploid. What does this mean?

(4 marks)

- (b) (i) Sperm cells have many mitochondria. What does this suggest about the special needs of sperm cells?

- (ii) Name two inputs and two outputs of sperm cell mitochondria.

Inputs

Outputs

SEE NEXT PAGE

- (iii) The seminal fluid which transports the sperm cells contains large amounts of a simple sugar called fructose. What is the likely function of the fructose?

(4 marks)

A student examined four cell types from four different living organisms using an electron microscope. She placed a mark in the table below when she was certain that a structure was present, otherwise she left the space blank.

CELL COMPONENT	CELL TYPE			
	I	II	III	IV
nucleus	+		+	+
nucleolus			+	+
cell wall		+		
cell membrane	+		+	+
cytoplasm	+	+	+	+
vacuole				+
chloroplast				
mitochondrion		+	+	

- (c) From these observations the student made the following conclusions. Indicate whether, on the basis of the data in the table, you believe her conclusions are true or false. Give reasons for your decision in each case.

- (i) Cells II and III must be from animals.

- (ii) Cells I and IV require no energy.

(4 marks)

SEE NEXT PAGE

Question 34 (continued)

- (d) Two of the cell components in the table shown earlier are able to produce ATP in respiration.

- (i) Name the **two** cell components and indicate whether they use aerobic or anaerobic respiration.

- (ii) Write the chemical equation or word equation for the reaction occurring in aerobic respiration.

(4 marks)

- (e) From the structure of the cells shown in the diagrams at the beginning of this question and the information you have been given, give two reasons why sperm cells have a higher surface area to volume ratio than ova. Briefly explain your answer.

(4 marks)

35. (a) The following description of the leaf of a flowering plant was written for the guidance of gardeners who know little biology:

"The water is evaporated into the air spaces of the leaf. Much of this vapour then escapes through thousands of **microscopic holes** (1) that break the continuity of the **skin** (2) on the lower surface. This **loss of water vapour** (3) is a process of first-rate importance. Loss of water from the leaf means that the **bladders within cells** (4) tend to collapse."

Write the correct biological term for each of the highlighted terms in this quotation.

1.

 2.

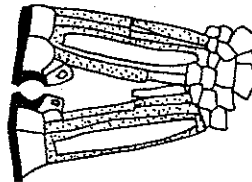
 3.

 4.

- (4 marks)

- (b) Xerophytes are plants that live in arid conditions.
Mesophytes are plants that live in reasonably moist conditions.
Hydrophytes are plants that live in or on water.

The diagram below is part of a transverse section of a rather narrow cylindrical leaf.



To which of the three categories described above do you consider this plant would belong?

Give three reasons for your decision.

1. _____
2. _____
3. _____

(4 marks)

- (c) In the space below, draw a labelled diagram of an apparatus that could be used to measure the rate of water loss from the shoot of a plant.

(4 marks)

SEE NEXT PAGE

Question 35 (continued)

Ten fresh, peeled potato cylinders of 1.0 cm diameter and 4.0 cm length were quickly dried with a paper towel and weighed. Each was then placed in one of the ten sucrose solutions shown in the table below. After a period of time, the potato cylinders were again quickly dried and reweighed. The results were recorded as follows:

Solution No.	Concentration of Sucrose (M)	Initial Mass of Cylinder (g)	Final Mass of Cylinder (g)
1	0.00	2.73	3.31
2	0.10	2.71	3.06
3	0.15	2.68	2.90
4	0.20	2.70	2.82
5	0.25	2.74	2.85
6	0.30	2.74	2.70
7	0.35	2.70	2.58
8	0.40	2.71	2.38
9	0.45	2.72	2.27
10	0.50	2.72	2.15

- (d) (i) Which sucrose solution was closest to the osmotic concentration of potato cells?

Solution No. _____

- (ii) Give one reason for your answer to (i)

- (iii) Describe the events that caused the mass change observed in solution 10.

(4 marks)

- (e) List four variables which should have been controlled in this experiment.

(4 marks)

SEE NEXT PAGE

ANSWER SECTION C IN THE STANDARD ANSWER BOOK

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

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

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

- present a clearly labelled diagram;
- write notes beside a clear diagram;
- write lists of points, with sentences which link them;
- write concisely worded sentences;
- use some other appropriate way 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 for written answers and pencil for diagrams.

Question 36

Answer any two questions from 36(a) to 36(d). (10 marks for each)

36(a) Homeostasis is the maintenance of a relatively constant internal environment within a living organism. In order to survive, living cells must be bathed in a fluid whose properties are not allowed to vary beyond certain limits.

Make a list of the internal conditions that an organism must regulate in order to survive, and give a reason for the regulation of each.

36(b) Explain the roles of autotrophs, heterotrophs and decomposers in maintaining energy flow and matter cycles in ecosystems.

36(c) "The wombat is believed to have evolved from a tree-living ancestor. Perhaps, after leaving the trees, these ancestors began digging into the ground in search of food. The exercise would have strengthened their leg muscles and claws, and sharpened their teeth. These changes, inherited and improved upon through many generations, could have resulted in the modern wombat with its powerful, stumpy legs, highly specialised digging claws capable of burrowing into earth, and sharp incisors for cutting roots."

This description is not consistent with the way modern biologists believe that species evolve.

Explain the evolution of the wombat from a tree-dwelling ancestor in a way that is consistent with modern evolutionary thinking.

36(d) Describe and explain the processes of diffusion and osmosis, highlighting the difference between them. Give reasons for the importance of osmosis to living cells.

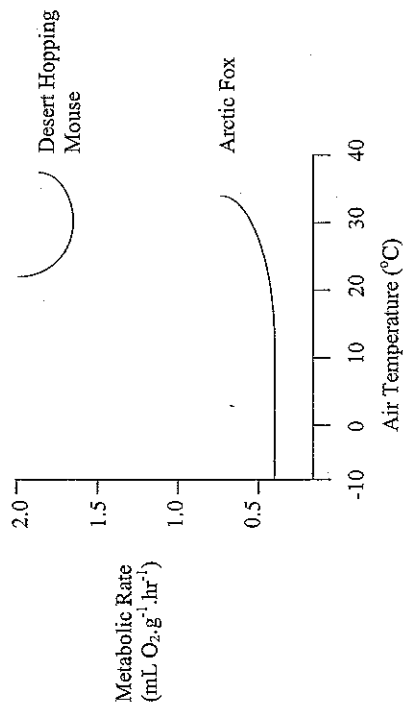
Question 37

Answer any two questions from 37(a) to 37(d). (10 marks for each)

- 37(a) More than 60% of Australia's natural vegetation remains uncleared, yet clearing of vegetation is one of our main ecological problems.

Explain why the type of land clearing that has occurred has had such a serious ecological impact. Describe the essential features of a good policy for the conservation of Australia's natural ecosystems.

- 37(b) The graph below compares the metabolic rates of an arctic fox, a 12 kg mammal that lives in the arctic regions of Canada and Alaska, and an Australian desert hopping mouse, a 25 g mammal that lives in the deserts of central Australia. In this graph, metabolic rate has been standardised for different body masses.



Explain why the mouse has a higher metabolic rate than the fox.

Describe and discuss two distinct adaptations to their special environment that you might expect to find in each of the two species.

- 37(c) Scientists have suggested that they can improve crops and treat diseases by manipulating genes. These manipulations can involve changing genes or introducing new genes into an organism.

How are these processes similar to evolution by natural selection in wild populations?

How are these processes different from evolution by natural selection in wild populations?

37(d)

Cloning of organisms is a common practice in our society. For example, genetically engineered bacterial cells are cloned to produce large quantities of human hormones which are used to treat individuals with hormone deficiencies.

Commercially important plants such as cabbage, citrus fruits, carrots, tomatoes and potatoes can be grown from a single cell taken from an adult plant. Recently, animals such as mice and sheep have been cloned from their parents.

It is clear from experiments such as these that all the genetic information required to produce a complete organism is contained in a single body cell.

Describe the structure and location of the substances involved in the storage of this information, and show how it is possible for a single cell to give rise to a complete organism in which every cell contains identical genetic information.

END OF PAPER

Check that you have written your Student Number on the front cover of this booklet and on the Standard Answer Book(s).