SEA SECONDARY EDUCATION AUTHORITY (WA)

TERTIARY ENTRANCE EXAMINATION, 1987 — QUESTION/ANSWER BOOKLET

BIOLOGY

Please place one of your student identification labels in this box

STUDENT NUMBER — In figures | | | | | | | | |

In words _____

_____

TIME ALLOWED FOR THIS PAPER

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

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

See Page 2

FOR MARKERS' USE ONLY

SECTION	QU. NO	1ST MARKER	2ND MARKER	SECTION	QU. NO	1ST MARKER	2ND MARKER
B	31			C	39a		
	32				39b		
	33				39c		
	34				40a		
	35				40b		
	36				40c		
	37						
	38						
SUB TOTAL B				SUB TOTAL C			

TOTAL	1ST MARKER =	2ND MARKER =	FINAL TOTAL =

SEE PAGE 2

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

This Question/Answer Booklet comprising 39 pages and 40 questions
Separate Multiple Choice Answer Sheet

TO BE PROVIDED BY THE CANDIDATE

Standard Items

Pens, pencils, eraser, ruler

Special Items

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

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room.

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

INSTRUCTIONS TO CANDIDATES

Marks will be allocated as follows:

SECTION A — 30 marks
SECTION B — 46 marks
SECTION C — 24 marks

Write your number on the front of this QUESTION/ANSWER BOOKLET.

Attempt all questions in Section A on the Separate Multiple Choice Answer Sheet, which will be collected separately by the Supervisor.
Use a '2B' PENCIL. Do NOT use a ball point or ink pen.

Marks are not deducted for wrong answers.

Answer Sections B and C in the places provided in the QUESTION/ANSWER BOOKLET. Draw graphs in pencil before inking in the lines.

Do NOT copy the question when writing an essay (Section C). Merely write the number of the question in the margin.

Use a blue or black **PEN** (not pencil) when answering Sections B and C.

You MUST NOT take this QUESTION/ANSWER BOOKLET away from the examination room.

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SECTION A

Suggested time: 40 minutes (30 marks)

Select the statement which best answers the question.
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 your new one.

The Separate Answer Sheet for this Section will be collected separately by the Supervisor.

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1. Which one of the following best describes the function of root hairs? They

   (a) add to the length of the root by repeated cell division.
   (b) provide anchorage for the root.
   (c) protect the delicate surface cells of the elongating root.
   (d) provide a large surface area for absorption.

2. Sexual reproduction always involves two biological processes, the effects of which "balance" each other. They are

   (a) mitosis and meiosis.
   (b) mitosis and fertilization.
   (c) meiosis and fertilization.
   (d) cell differentiation and meiosis.

3. Which of the following reactions releases energy?

   (a) The formation of amino acids from protein.
   (b) The formation of fat from fatty acids and glycerol.
   (c) The formation of glycogen from glucose.
   (d) The formation of nucleic acids from nucleotides.

4. If radioactive amino acids are fed to rats, and the cells of the animals' salivary glands are examined shortly afterwards, the radioactivity would be most concentrated in the

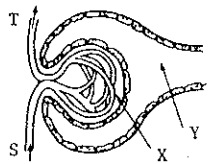
   (a) Golgi apparatus.
   (b) nuclei.
   (c) cell membranes.
   (d) mitochondria.

SEE PAGE 4

5. A cross section of a leaf of a terrestrial plant reveals many large spaces between the cells in the mesophyll. The most important effect of these spaces is to

(a) ensure that the leaf is turgid at all times.
(b) provide an outlet for excess water from the plant.
(c) allow for transport of food substances to other parts of the plant.
(d) allow for rapid diffusion of gases between the leaf and the outside air.

Question 6 refers to the following diagram of a Bowman's capsule with its associated blood vessels.



6. An increased volume of urine would result from

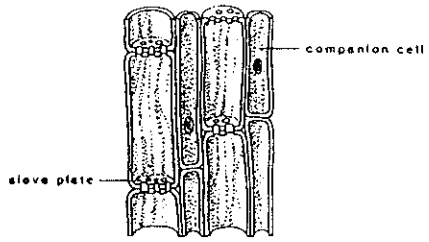
(a) the hormone ADH acting at X.
(b) an increase in diameter of T compared to S.
(c) an increase in diameter of S compared to T.
(d) a build up of back pressure at Y.

7. Identical twins can be distinguished from each other even when brought up in the same family. The differences between the twins

(a) must be due to slight differences in their genotypes.
(b) must be due to slight differences in their environment.
(c) are probably due to slight differences in both their genotypes and their environments.
(d) cannot be accounted for by differences either in their genotypes or in their environments.

SEE PAGE 5

8. The figure below shows a three dimensional diagram of a plant tissue.



The tissue is concerned with

(a) mechanical support of the stem.
(b) the manufacture of sugars for plant nutrition.
(c) the transport of the products of photosynthesis.
(d) water transport and absorption of minerals.

9. Several hours after a balanced meal, blood leaving the small intestine, compared with blood arriving at the small intestine would have a

(a) higher concentration of amino acids and lower concentration of oxygen.
(b) higher concentration of oxygen and lower concentration of carbon dioxide.
(c) lower concentration of carbon dioxide and lower concentration of glucose.
(d) higher concentration of urea and lower concentration of lipids.

10. Yaws is a disabling and disfiguring disease common in Northern Australia and much of the tropical world. It is caused by a micro-organism which severely damages the skin, soft tissues and bone.

However, since the 1950's Yaws is no longer a public health problem in this region. This is most likely the result of

(a) development of natural immunity to this disease in the human population.
(b) introduction of new food plants to the region.
(c) scientific research resulting in production of effective anti-biotic drugs.
(d) widespread spraying for mosquitoes.

SEE PAGE 6

11. Many plants can be grown from structures such as bulbs, corms, rhizomes and runners. Such structures ensure that

(a) the amount of genetic diversity is restricted.
(b) vigorous hybrids are produced.
(c) plants are adapted to environmental change.
(d) a range of phenotypes is produced.

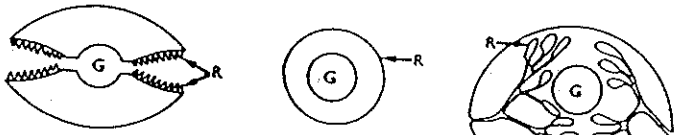
12. Coordination in animals is brought about by nerves and hormones which

(a) always act independently.
(b) are both chemicals carried in the blood.
(c) act at the same speed.
(d) may interact to produce a response.

13. Arthropods which live deep in caves anywhere in the world are usually white, with reduced or absent eyes, long slender legs and very long antennae. Which of the following statements best accounts for these shared features?

(a) During the evolution of these animals the environment exerted a similar selective effect.
(b) All groups of cave animals must share a recent common ancestor.
(c) The environmental conditions in the caves caused these features to be acquired.
(d) These features are important for survival in caves.

14. The diagrams represent cross-sections of three different animals. The respiratory surfaces are labelled R and the gut areas are labelled G.



Animal X Animal Y Animal Z

Which of the following combinations correctly matches the animal and the respiratory surface shown in the diagram?

	Animal X	:	Animal Y	:	Animal Z
a	mammal	:	annelid	:	amphibian
b	amphibian	:	fish	:	annelid
c	fish	:	annelid	:	insect
d	fish	:	mammal	:	insect

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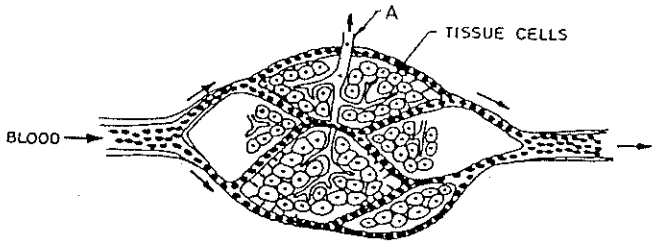
15. In a natural population over many generations, the process of natural selection is likely to result in an overall change in the population so that the population as a whole becomes better adapted to the conditions in which it lives and reproduces. Which of the following is an example of such a change?

(a) Swallows migrating each year from the northern hemisphere to the southern hemisphere.
(b) When a hot water waste drain from a factory was installed, the oysters on the nearby rocks died and were replaced by mussels.
(c) Snails in a rain forest have darker shells than snails of the same species found in an adjoining open forest.
(d) A kookaburra population increases in number shortly after a rapid increase in the lizard population in the same area.

16.



The structure labelled A in the above diagram of an area of human tissue is likely to be

(a) a lymph vessel.
(b) a vein.
(c) an artery.
(d) a capillary.

17. Irreversible cell elongation occurs in plants, but not in animals. What plant cell structures account for this difference?

(a) Absence of centrioles and Golgi bodies.
(b) Absence of endoplasmic reticulum and presence of large vacuoles.
(c) Presence of cell walls and absence of Golgi bodies.
(d) Presence of large vacuoles and cell walls.

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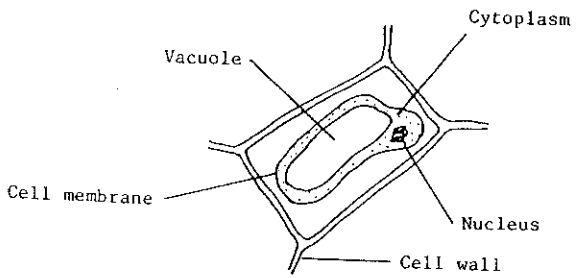
18.



The diagram above shows a plant cell shortly after it was placed in a sucrose solution. Which of the following statements must be true?

(a) Water molecules passed through the cell membrane.
(b) Sucrose molecules passed through the cell membrane.
(c) Neither water nor sucrose molecules passed through the cell membrane.
(d) Both water and sucrose molecules passed through the cell membrane.

19. The following table shows the volume of oxygen evolved from a given leaf area by two plant species, which were placed in sunlight and artificial light at different temperatures and for different lengths of time.

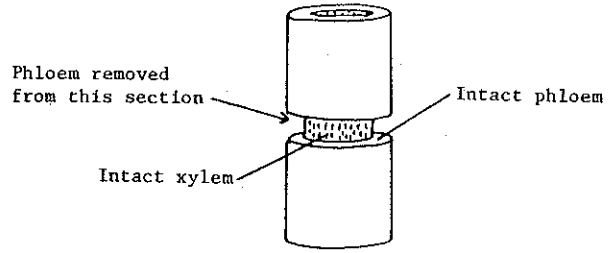
Plant	Type of light	Total volume of oxygen evolved (ml)	Temperature °C	Time in days
barley	sunlight	500	20	5
barley	artificial	1000	22	10
geranium	sunlight	500	22	5
geranium	artificial	300	22	5

To interpret these results, it would be valid for a scientist to compare the volume of oxygen evolved by

(a) barley leaves at 20°C and 22°C.
(b) geranium leaves in artificial light and sunlight.
(c) barley leaves in artificial light and sunlight.
(d) geranium and barley leaves at 22°C.

SEE PAGE 9

20. In an experiment on an actively photosynthesizing sunflower plant, it was observed that the uptake of potassium ions (K^+) by the roots could be stopped by removing a thin cylinder of phloem from the stem. A diagram of the experiment is shown below.



When glucose was added to the culture solution in which these plants were growing, it was rapidly absorbed by the root cells and K^+ uptake by the roots began again. Water uptake by the plant remained constant throughout the experiment. You would NOT be justified in concluding that

(a) the uptake of K^+ by sunflower roots is a process which requires energy from metabolism.
(b) when the thin cylinder of phloem was cut from the stem the functional xylem was not damaged.
(c) in an intact sunflower plant, translocation to the roots provides sugars for K^+ uptake.
(d) K^+ in sunflower plants is transported to the leaves through the phloem.

21. Which of the following genetically-determined characteristics would NOT lead to regional differences between human populations?

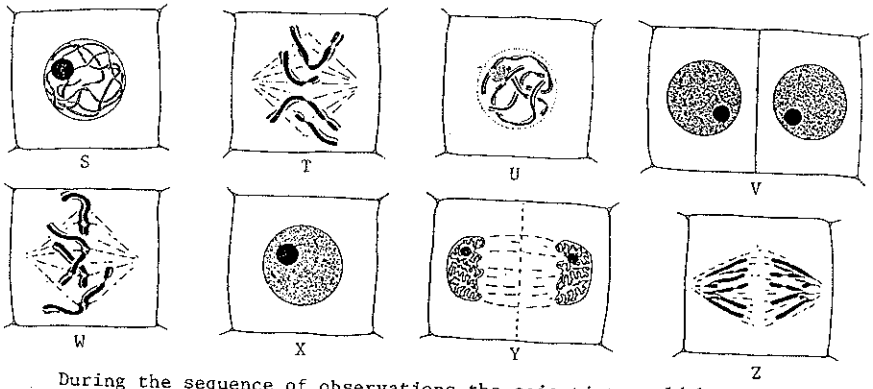
(a) Ability to synthesize vitamin D in the skin.
(b) Haemophilia.
(c) Amount of skin pigmentation.
(d) Human body proportions.

22. The modern concept of the term 'Conservation' is

(a) preservation and wise use of resources.
(b) use of present resources for the benefit of mankind.
(c) to delay as much as possible the inevitable destruction and loss of most of our natural resources.
(d) maintenance of our few remaining natural resources in an undisturbed condition.

SEE PAGE 10

23. Using special microscopic techniques, a cell biologist observed a cell undergoing mitosis. When she first observed the cell it looked like diagram X in the set below. The scientist continued to observe the cell and saw a series of changes take place. The stages of these changes are represented in the set of diagrams below.



During the sequence of observations the scientist would have seen

(a) stage W before stage U.
(b) stage T before stage Z.
(c) stage V before stage Y.
(d) stage U before stage S.

24. A relatively recent method used by scientists to study the relationships between human populations is the use of the

(a) blood type distribution patterns throughout the world.
(b) head lengths and widths of members of various populations.
(c) physical characteristics of individuals, especially facial traits.
(d) appearance of peculiar traits such as albinos in different populations.

25. Examination of the chromosomes of vinegar flies which show the eye shape called Bar Eye found that there was always a repetition of a short segment of the 4th chromosome. This observation shows that

(a) normal vinegar flies lack the Bar Eye gene.
(b) the eye shape of flies is determined by the 4th chromosome.
(c) the eye shape of flies is controlled by a gene on the 4th chromosome.
(d) doubling of the Bar Eye gene is fatal to vinegar flies.

SEE PAGE 11

26. The soils found around disused copper mines have high concentrations of copper ions. Normally, plants cannot survive in such soils, but varieties tolerant to high concentrations of copper ions have evolved in a few plant species.

In a study of one of these species, the distributions of tolerant and sensitive individuals on a mine-site and in the surrounding pastures were determined. Seeds were collected from adult plants in each of the two areas, grown in a laboratory in a standard potting mix, and then tested for tolerance to copper ions in their soil.

The results of that test are shown below.

	Mine-site	Pastures
Adult plants	All tolerant	All sensitive
Progeny grown from collected seed	Most tolerant, some sensitive	Most sensitive, some tolerant

From the observations it can be concluded that

(a) tolerance and sensitivity are determined genetically.
(b) copper ions have caused mutations responsible for tolerance.
(c) the distributions of the two varieties are the result of natural selection.
(d) normal soils select plants which are tolerant.

27. When Linnaeus was classifying and naming organisms late in the 18th century, he classified human beings as mammals. Of the following list of characteristics which group would he have used to make his choice?

S. mammary glands
T. high internal heat production
U. opposable thumbs
V. well developed brain
W. four-chambered heart
X. forward facing eyes
Y. teeth of four well-defined types
Z. bipedalism

(a) S, T, U, Y.
(b) T, U, Y, Z.
(c) T, V, W, X.
(d) S, V, W, Y.

SEE PAGE 12

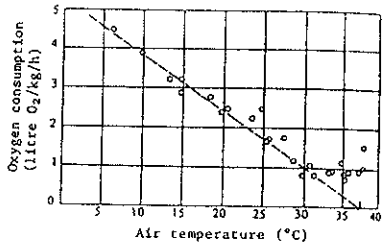
28. An albino (a recessive trait) child was born to a young couple who were much perturbed at this situation. Friends told them that if they hid the child from public view for a few months it would become normal in colour and that such an accident would not happen to them again. After a year the child was still albino. If the parents then visited a reputable human genetics clinic, which of the following would be the likely advice given to them?

(a) There is a 1 in 4 chance of your subsequent children being albino; the condition is permanent.
(b) While the condition is inherited, it can be 'hidden' by regular exposures to a sun lamp.
(c) Since you have had one albino, the next three children will be non-albinos.
(d) The albinism is permanent but it is such a freakish situation that there is only one chance out of 100 that your subsequent children will be so afflicted.

29. It has been estimated that a diploid human cell contains 6.4 picogram of DNA (1 picogram = 10^{-12}gram). Which of the following would be an INCORRECT conclusion?

(a) An egg cell contains 3.2 picogram of DNA.
(b) A skin cell contains 6.4 picogram of DNA.
(c) A cell undergoing meiosis and with chromosomes visible contains 25.6 picogram of DNA.
(d) A cell undergoing mitosis and with chromosomes visible contains 12.8 picogram of DNA.

30. The graph below shows the rate of oxygen consumption of a pigmy possum at different air temperatures.



The graphed data indicate that

(a) the possum cannot survive long at air temperatures lower than 15°C.
(b) energy is expended by the possum to maintain a constant body temperature.
(c) in cold weather possums reduce their energy expenditure.
(d) a high rate of oxygen consumption causes a rise in body temperature.

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SECTION B

Suggested time: 90 minutes (46 marks)

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

31. (6 marks)

In cats there are many colour variations. In this question we shall consider two: fully pigmented black cats and what is called a seal point Siamese cat which has a light body colour and darkly pigmented fur on the extremities such as ears, nose, tail and feet. This is because the recessive gene which results in the Siamese colour pattern produces an enzyme which inactivates pigment production at normal body temperature.

(a) When Siamese kittens are born the whole fur coat is pale. The pigment only begins to develop at the extremities after birth. Explain why this is so.

(b) A black cat that had a seal point Siamese mother was mated to a seal point Siamese cat.

(i) What phenotypes with respect to pigmentation would you expect in the litter after several days?

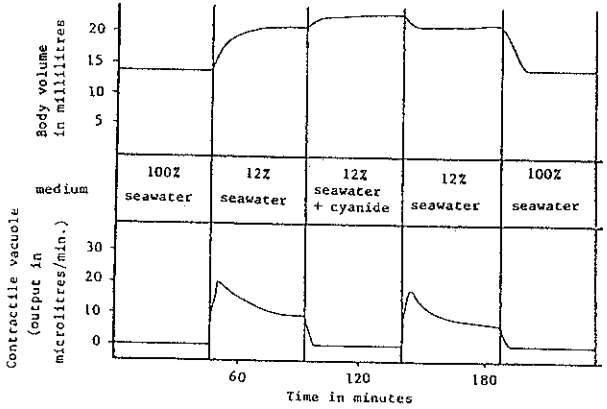
(ii) In what proportions might these phenotypes occur?

(c) Two black cats were mated. The litter of five consisted of four black kittens and one showing seal point Siamese pigmentation. Explain how it is possible to obtain a seal point kitten from two black parents.

SEE PAGE 14

32. (6 marks)

The marine protozoan *Cothurnia* has a contractile vacuole; an organelle which periodically discharges liquid from the animal to the outside. The graphs below show the body volume and the rate at which liquid is expelled from the contractile vacuole of *Cothurnia* during an experiment in which the external medium was diluted and had cyanide, a respiratory inhibitor, added to it.



(a) What is the effect of placing *Cothurnia* in 12% seawater?

(b) Give a possible explanation for the changes you described in (a).

(c) What is the likely composition of the liquid expelled by the contractile vacuole?

(d) What effects are there when *Cothurnia* is placed in 12% seawater + cyanide solution?

(e) Suggest an explanation for the changes you described in (d).

SEE PAGE 15

33. (7 marks)

It has been shown experimentally that North American rattlesnakes have pits in their faces which have an important function. These pits contain structures sensitive to infra-red (heat) radiation which enable the snake to detect its prey.

The Australian carpet snake, *Morelia spilotes* is also thought to be sensitive to infra-red in the same way as rattlesnakes. Assume that you have been asked to test this hypothesis.

(a) Make a list of the equipment you would need.

(b) State what conditions you would alter during the experiment?

(c) What other conditions should be kept constant?

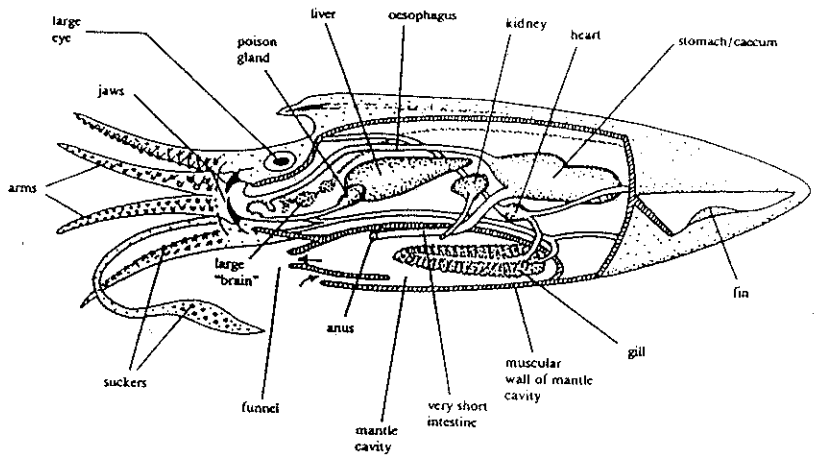
(d) What changes would you record as data for the experiment?

(e) What other aspects of experimental design have not been considered above?

SEE PAGE 16

34. (5 marks)

The diagram below represents a cut-away view of a squid showing its internal anatomy.



The opening of the funnel is surrounded by a ring of muscle and the funnel can be pointed in any direction. The small arrows near the funnel indicate the direction of water flow in this region.

From your knowledge of animal structure and function, consider the following questions in relation to the life of the squid in its marine environment.

(a) List THREE structures involved in maintaining the squid's blood oxygen levels and state the function of each in this process.

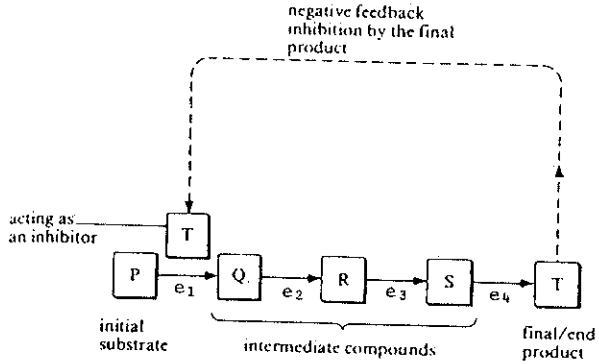
(b) In addition to digestion, name one other function which would be performed by the stomach/caecum in this animal.

(c) How does the squid prevent kidney and digestive tract wastes from contaminating its gills?

SEE PAGE 17

35. (3 marks)

The following diagram shows a sequence of biological reactions in an animal cell.



Assume that this series of reactions is independent of other reactions occurring in the cell. The above animal cell was incubated in a medium containing compound P.

(a) Name FOUR substances the cell would require for P to be converted to T.

(b) What would be the consequence of the cell not producing enzyme e_2?

(c) Explain what must happen for T to be produced continuously.

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36. (8 marks)

Two groups of tadpoles were kept in separate aquaria for 23 days. The water in one aquarium was maintained at 28°C while that in the other was 7°C. The length of each tadpole was measured at intervals and the results tabulated as shown below.

	average length in mm	
day	tadpoles kept at 28°C	tadpoles kept at 7°C
0	15	15
1	19	17
6	25	19
13	33	21
20	38	22
23	30	22

(a) Draw a graph of these results on the graph paper provided. Use only one pair of axes.

(b) Estimate the average lengths of tadpoles at 28°C on day 9 and day 26.

Day 9 _____ Day 26 _____

(c) With which of your two predictions in (b) would you be most confident? Explain.

_____

_____

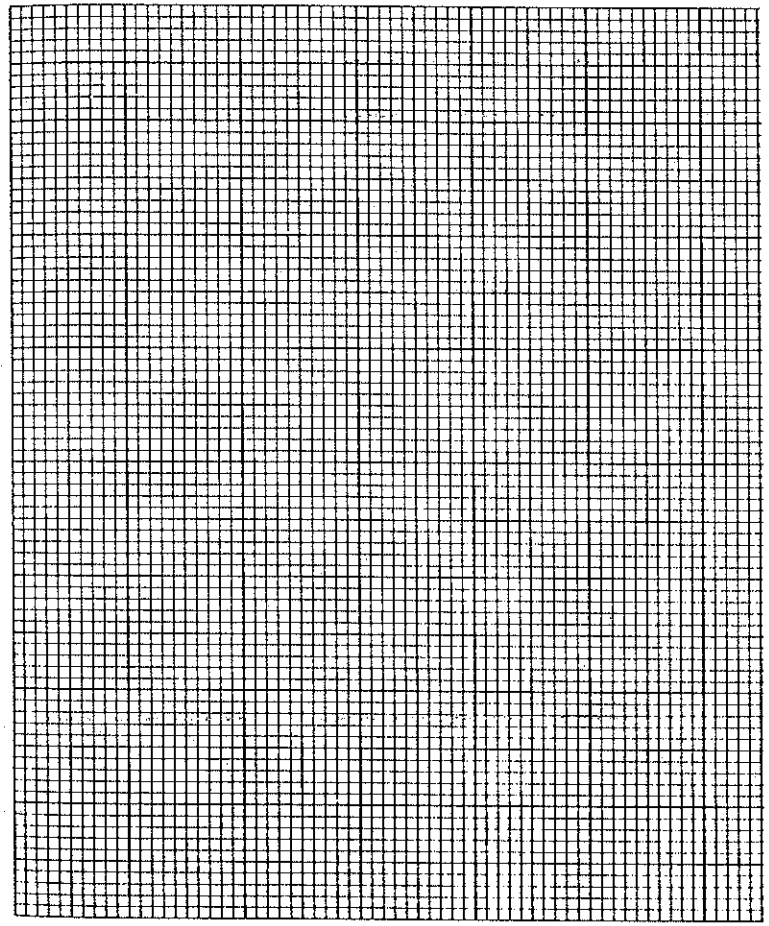
_____

_____

SEE PAGE 19

Question 36 (continued)

The spare graph on page 39 may be used if you spoil this one.



(d) Suggest a reason for the decline in tadpole length between day 20 and day 23 at 28°C.

_____

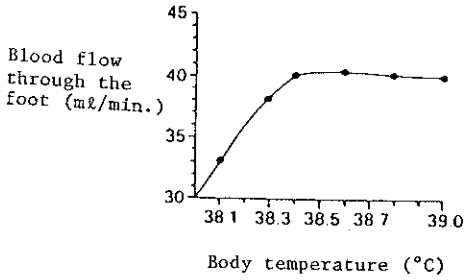
_____

SEE PAGE 20

37. (5 marks)

Some aspects of temperature regulation in a species of sea bird were investigated by monitoring the deep body temperature and the volume of blood flow and blood temperature in an artery and vein in the webbed foot of the bird.

In the first experiment the volume of blood flow was determined when the animal's deep body temperature was changed by directly heating the bird with infrared lamps.



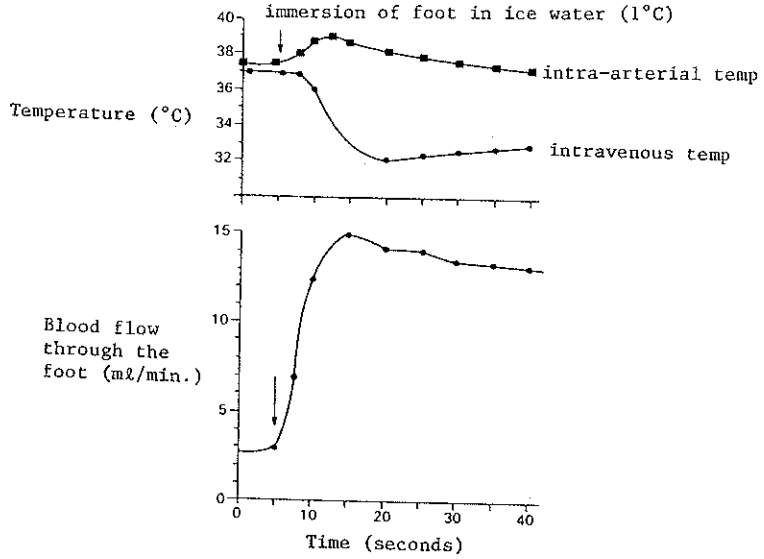
(a) What is the most likely mechanism by which the volume of blood flow changes?

(b) What is the advantage to the animal of the flow change when the deep body temperature rises from 38°C to 38.4°C?

SEE PAGE 21

Question 37 (continued)

Blood flow and the temperature in a web artery and vein were determined following immersion of the foot in ice water. The results are shown below.



(c) Account for the following.

(i) The difference in arterial and venous blood temperature before immersion.

(ii) The change in arterial blood temperature in the 10 seconds following immersion.

(iii) The change in venous blood temperature in the 15 seconds following immersion.

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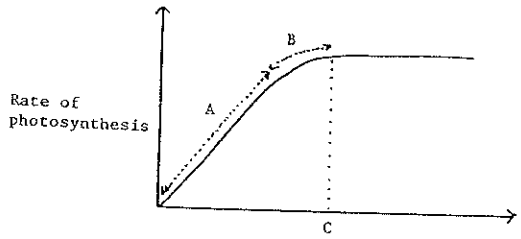
38. (6 marks)

The rate of photosynthesis is an important factor in crop production as it affects yields.

(a) From your knowledge of the equation of photosynthesis, what factors are likely to affect its rate?

(b) Suggest four habitats or natural circumstances, not necessarily related to crop production, where these factors may limit the rate of photosynthesis.

(c)



(i) What is the limiting factor in region A?

(ii) What is represented by the curve at B?

(iii) What is represented by the value C?

(d) For temperate plants the optimum temperature for photosynthesis is 25°C. The rate doubles for the 10°C rise to 35°C. Why should the rate decrease above 35°C?

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SECTION C

Suggested time: 50 minutes (24 marks)

There are three alternatives to each question. Choose ONE alternative from each question.

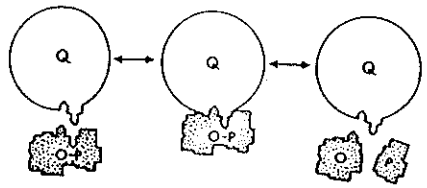
Each question is worth 12 marks. Answer both questions in essay form. Write your answers on the sheets provided at the end of this section. Where possible, support your answers with labelled diagrams. TWO marks may be deducted from each answer which is poorly presented, set out in point form or written with other than a blue or black pen or biro.

39. EITHER

(a) Describe the types of tissue which are developed, and all of the processes which take place, in the period between the first formation of a flower bud on a stem up to the time that the flower opens.

OR

(b) (i) By reference to the diagram below, discuss the properties of enzymes and their mode of operation.



(ii) Viewed superficially, some aspects of digestion seem to be a waste of energy. For example, proteins are broken down to amino acids in the digestive tract, only to be re-assembled into proteins in the body cells. Explain why these apparently wasteful processes are necessary.

OR

(c) Many organisms living on land require

(i) protection against dessication.
(ii) a moist surface for gaseous exchange.
(iii) support against gravity.
(iv) a way of coping with extreme temperature variations.
(v) a moist environment for reproduction and protection of the embryo.

With respect to Australian terrestrial organisms, choose a native animal and a native plant and show how each meets these requirements. Give the name of the animal and of the plant you have selected.

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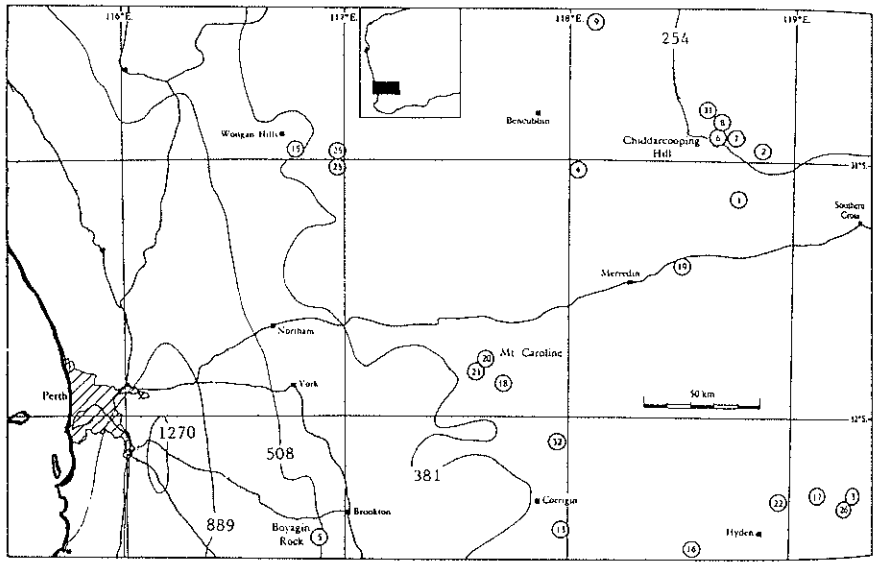
40. EITHER

(a) In the winters of 1978 and 1979, 32 granite outcrops in the central wheatbelt of Western Australia were surveyed to document the distribution and abundance of honey eating birds and of their food plants.

Brown honeyeaters were the most widespread and locally common while white-fronted honeyeaters and New Holland honeyeaters were also locally common. Red wattle-birds and spiny-cheeked honeyeaters, the largest species seen, were scarce on the rocks where they occurred. A number of the dominant shrubs and mallees in the vegetation fringing granite rocks, including species of *Calothamnus*, *Eucalyptus*, *Grevillea* and *Hakea* constituted the winter food plants of, and appeared to be pollinated by, the honeyeaters.



Map of the central wheatbelt of Western Australia showing major highways, towns and annual rainfall isohyets in mm. Numerals enclosed in circles denote the rocks surveyed (modified from S.Hopper, 1981).

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Question 40 (a) (continued)

TABLE OF ROCK LOCATIONS, TIMES OF SURVEYS, AND HONEYEATERS OBSERVED IN 1978 AND 1979

Key to honeyeater species: B, brown; WS, western spinebill; Wn, white-naped; Bh, brown-headed; NH, New Holland; Wf, white-fronted; We, white-eared; S, singing; Sc, spiny-cheeked; LW, little wattlebird; RW, red wattlebird.

	Rock and survey	Dates visited	B	WS	Wn	Bh	NH	Wf	We	S	Sc	LW	RW
1	Bacon Hill	29/6/1978	+	–	–	–	–	+	–	+	–	–	–
2	Baladjie Rock	13/7/1978	+	–	–	–	–	+	–	–	–	–	–
3	Bald Rock	21/9/1978	+	–	–	–	–	+	–	–	+	–	–
4	Billyacatting Hill	8/6/1978	+	–	–	–	–	–	–	+	–	–	+
5	Boyagin Rock	17/5/1979	–	+	+	–	+	–	+	–	–	+	–
6	Chiddarcooping Hill	1/8/1979	+	–	–	+	–	+	+	+	+	–	+
7	Chutawalakin Hill	9/6/1978	–	–	–	–	–	+	–	+	–	–	–
8	Coorancooping Hill	3/8/1978	+	–	–	–	–	+	–	+	+	–	–
9	Dajoing Rock	4/8/1978	+	–	–	–	–	+	–	+	–	–	–
13	Gorge Rock	15/8/1978	+	–	–	–	–	–	–	–	–	–	+
15	Kalguddering	25/8/1979	+	–	–	–	–	–	–	+	–	–	–
16	Karlgarin Hill	6/8/1978	+	–	–	–	–	–	–	–	+	–	+
17	King Rocks	21/9/1978	+	–	–	–	–	–	–	+	+	–	–
18	Kokerbin Hill	15/8/1978	+	–	–	–	–	–	–	+	–	–	–
19	Landsdowne Hill	31/7/1979	+	–	–	–	–	–	–	+	–	–	–
20	Mount Caroline	10/6/1978	+	–	–	–	–	–	+	+	+	–	–
21	Mount Stirling	20/9/1978	+	–	–	–	–	–	+	+	+	–	–
22	The Humps	21/9/1978	+	–	–	–	–	–	–	–	–	–	–
23	Uberin Rock	14/7/1978	+	–	–	–	–	–	–	+	–	–	–
25	Wattengutten Hill	26/7/1978	+	–	–	–	–	–	–	+	–	–	–
26	Wheeler Rock	21/9/1978	+	–	–	–	–	+	–	–	–	–	–
31	25km NNW. of Warrachuppin	3/8/1978	+	–	–	–	–	+	–	–	–	–	–
32	30km NNW. of Corrigin	9/6/1979	–	–	–	–	–	–	–	+	–	–	–

Study the data presented in the table and the map.

(i) Discuss how much variation you would expect to find in each species of honeyeater. Explain how this variability could have arisen.

(ii) The survival of which species is likely to be affected by a widespread drought? Give reasons for your answer.

(Question 40 is continued on next page)

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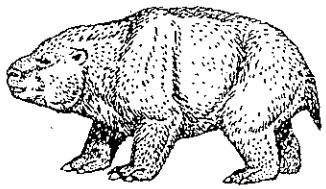
Question 40 (continued)

OR



(b) Many fossils of marsupials have been found at Lake Callabonna in the northern desert of South Australia. Excavations in the dry lake bed have revealed remains of *Diprotodon*, a huge herbivorous marsupial up to 3 metres long. These specimens are of complete skeletons which are often piled on top of one another. However, such complete finds are unusual as in South Eastern Australia the animals are only known from scattered small fragments of jaw bones.

(i) Explain why you would expect most fossil remains to be scattered and broken. Suggest what features of the Lake Callabonna site could have resulted in such good and complete skeletons.

The ancestors of *Diprotodon* were much smaller animals with simple teeth and were found in rocks at least 30 million years old. The earliest remains of *Diprotodon* itself date from 50,000 years ago, and the genus remains in the fossil record up to 19,000 years ago when it became extinct. Some of the later remains are only broken bones mixed with carbon from Aboriginal camp fires.

(ii) Explain how *Diprotodon* remains suddenly appear in the fossil record.

(iii) Suggest what may have caused the disappearance of this genus from the fossil record 19,000 years ago.

OR

(c) Multicellular organisms have a complex arrangement of cells, the functioning of which needs to be integrated. By reference to named organisms, discuss how the functioning of a plant or animal is integrated and regulated

(i) in the long term (such as seasonal influences),
(ii) in the short term from day to day, and
(iii) due to stimuli requiring an instantaneous response.

END OF PAPER