WESTERN AUSTRALIA

TERTIARY ADMISSIONS EXAMINATION, 1975

BIOLOGY

Candidate's Number

.....

DATE AND COMMENCEMENT TIME:

Wednesday, 19th November ~ 9.20 a.m.

TIMES ALLOWED FOR THIS PAPER:

Reading time before commencing: Ten minutes.
For working of paper : Three hours.

MATERIAL TO BE PROVIDED FOR THIS PAPER:

Question paper comprising 41 pages and 46 questions.
One piece of blank paper for rough work.

INSTRUCTIONS TO CANDIDATES:

See page 2 of this question paper.

FOR EXAMINER'S USE ONLY

Question Number	First Mark	Second Mark	Question Number	First Mark	Second Mark
1-40			44		
41			45		
42			46		
43			TOTAL		

INSTRUCTIONS TO CANDIDATES:

Marks will be allocated as follows: SECTION A - 40 marks

SECTION B - 36 marks

SECTION C - 24 marks

Write your number on the front of this question paper.

The answer sheet for Section A is on page 41 which is folded into the back of this paper.

Write your number in the box at the top of page 41 before answering Section A. Attempt ALL questions in this section. Marks are NOT deducted for wrong answers.

When you have completed the Section A answer sheet, fold it back inside the question book.

Answer Sections B and C in the places provided in the question paper.

You are provided with a piece of blank paper for rough work.

You MUST NOT take this question paper away from the examination room.

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SECTION A.

Suggested time: 60 minutes (40 marks).

Record each answer for questions 1 - 40 by marking your choice of alternatives on the answer sheet (page 41). For example, if your choice is 3, show it as follows:-

1	2	X	4	5

An error in recording your choice may be cancelled by completely blocking out the error.

Give ONE answer to each of questions 1 - 40. Marks will not be subtracted for wrong answers.

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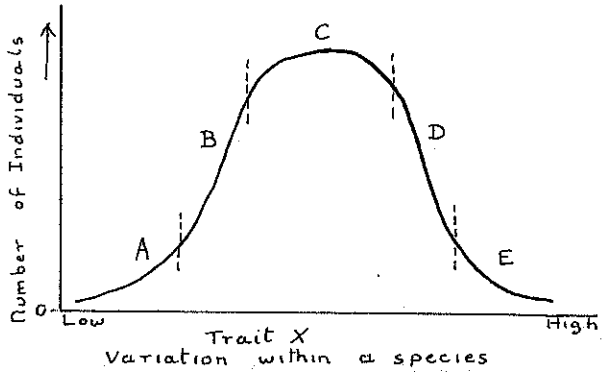
1. This question is based on the following graph:



Under relatively constant environmental conditions which portion of the population contributes most to the continuing stability of the population?

1. B
2. C
3. D
4. E

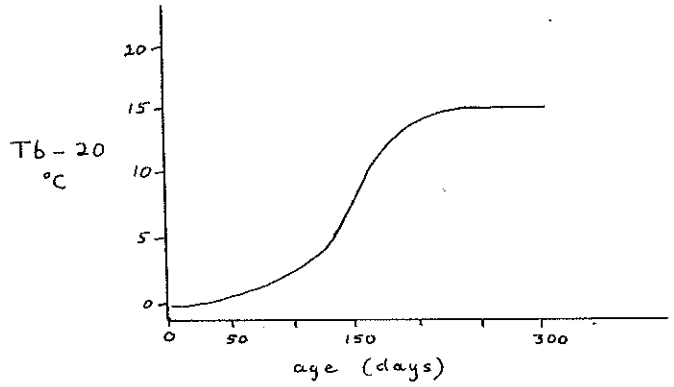
SEE PAGE 4

2. When wallabies are born they have no fur and cannot regulate their body temperature. Homoiothermism and body hair are acquired during life in the pouch.

An experiment was carried out in order to determine when young wallabies could thermoregulate.

Young wallabies of various ages were removed from their mothers' pouches where they were at a temperature of 37°C and placed at 20°C for 30 minutes. Their body temperatures (Tb) were then recorded. The difference between body temperature and that of the environment (20°C) was then plotted against the age of the young wallaby.

The graph obtained is given below.



Which one of the following conclusions about a 150 day old wallaby is NOT correct?

1. It would produce more heat than it loses.
2. It would lose heat by radiation.
3. It would have some fur.
4. It would be able to shiver.

SEE PAGE 5

3. A frog tadpole lacks teeth but has horny jaws, and it has suckers on the side of its head. A salamander larva has teeth and on the side of its head it has balancers and no suckers.

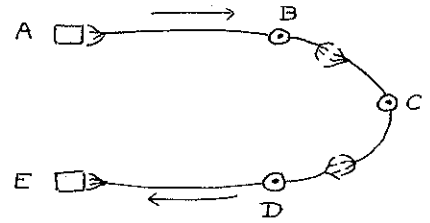
A small group of cells, which normally would differentiate to become skin, was taken from a frog embryo. These cells were transplanted to a salamander embryo on the area that normally becomes the head.

It was found that when the salamander embryo developed it had horny jaws instead of teeth and suckers instead of balancers on the side of its head.

From this experimental result and your knowledge of cell differentiation it may be concluded that:

1. differentiation of the transplanted cells has been influenced by their own nuclei
2. differentiation of the transplanted cells has been influenced by the embryonic cells of the salamander
3. a similar result would be expected irrespective of the age of the frog embryo from which the transplant was taken
4. a similar result would be expected if the frog cells had been taken from an area of the young frog embryo that would normally become the tail.

4. The following diagram represents a simple nerve pathway. The arrows show the direction of transmission of a nerve impulse.

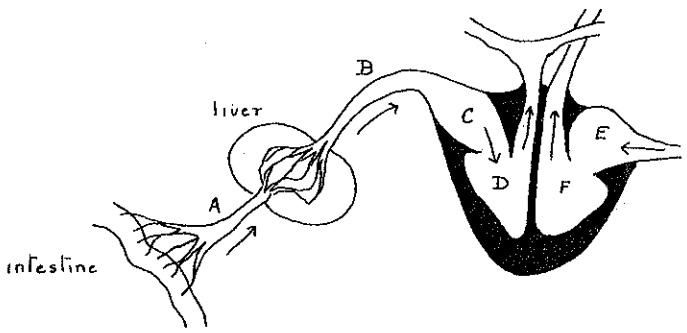


In this diagram:

1. a secretory cell is represented by A
2. a receptor is represented by E
3. a nerve cell in the central nervous system is represented by B
4. a motor neurone is represented by D.

SEE PAGE 6

5. The diagram shows the heart, liver, portion of the intestine and certain blood vessels in a mammal. The direction of blood flow is indicated by the arrows.



In such an animal:

1. blood in vessel B carries a lower concentration of nitrogenous waste than blood in vessel A
2. blood leaving chamber F will reach the lungs before blood leaving chamber D
3. blood entering chamber E will contain a lower concentration of glucose than blood entering chamber C
4. blood entering chamber E will contain a higher concentration of carbon dioxide than blood in chamber D.

6. A three-dimensional concept of material being viewed under high power of a microscope can be obtained by:

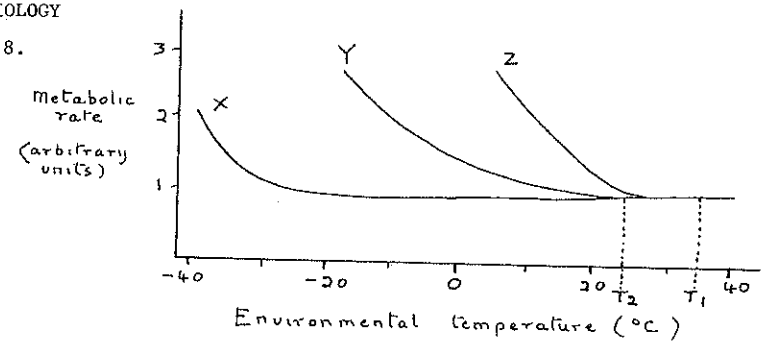
1. changing the intensity of the light entering the tube
2. moving the slide back and forth
3. turning the fine adjustment knob back and forth
4. rotating the ocular (eyepiece).

7. Fungi differ from green plants in that typically they:

1. are unicellular
2. lack the ability to manufacture their own food from inorganic substances
3. do not grow in the presence of light
4. do not possess cell walls.

SEE PAGE 7

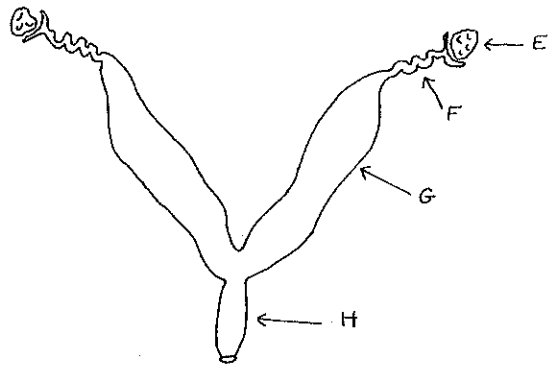
8.



From this graph and your knowledge of thermoregulation:

1. animal X would be better adapted to a cold environment than animal Z
2. animal X has a poorly developed mechanism for responding to temperature changes
3. at temperature T_1 the heat gain of animal Y is less than its heat loss
4. heat production by animal Z decreases at temperatures below T_2.

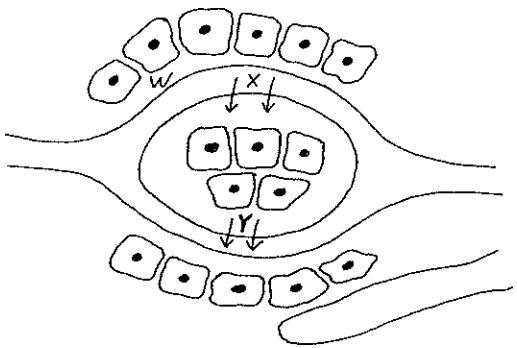
9. The diagram below shows the reproductive system of a female rat. Which statement is NOT correct?



1. Eggs are released from structure E
2. Cilia assist the movement of eggs through structure F
3. Fertilization occurs in structure H
4. Implantation of the developing embryo occurs in structure G.

SEE PAGE 8

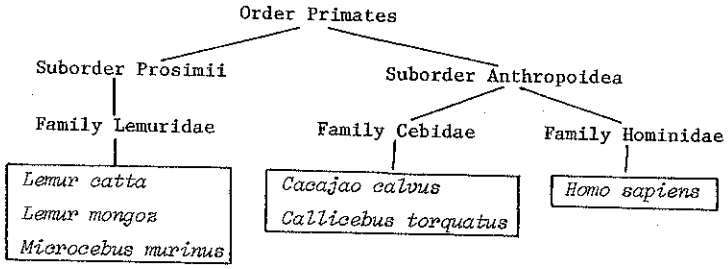
10. The diagram shows a small part of animal tissue and capillary bed.



Which of the following is correct?

1. Arrow Y represents movement of glucose
2. Region W represents tissue fluid
3. Arrow X represents movement of carbon dioxide
4. Arrow Y represents movement of oxygen.

11. Consider the following classification of some organisms.

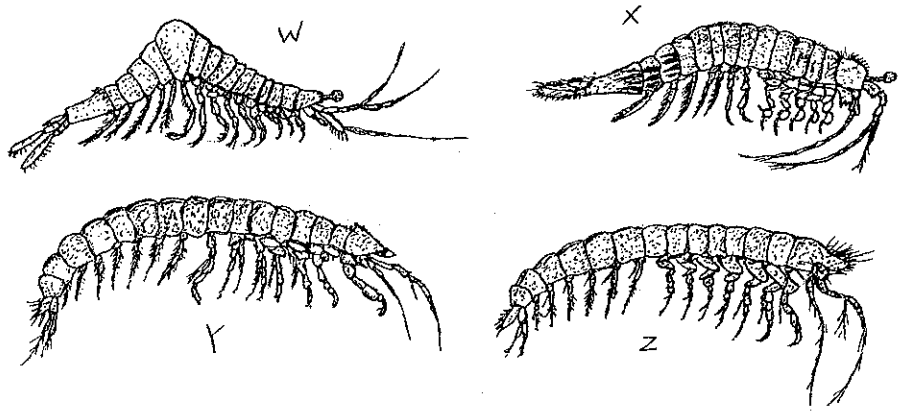


It may be stated that there must be more structural characteristics shared by:

1. *Lemur catta* and *Microcebus murinus* than by *Lemur mongoz* and *Microcebus murinus*
2. *Cacajao calvus* and *Callicebus torquatus* than by *Lemur mongoz* and *Microcebus murinus*
3. *Homo sapiens* and *Cacajao calvus* than by *Homo sapiens* and *Lemur catta*
4. *Lemur catta* and *Cacajao calvus* than by *Lemur catta* and *Callicebus torquatus*.

SEE PAGE 9

12. Shown below are four Syncarids (small crustaceans) found in Australian inland waters.



KEY TO AUSTRALIAN SYNCARIDA

1A Eyes present (either small or large).....2.
1B Eyes absent.....*Micraspides*
2A Prominent "hump" about mid-way along dorsal surface..*Paranaspides*
2B Not with the above characters.....3.
3A Antero-lateral margins of last three pairs of abdominal segments with several robust backwardly projecting spikes.....*Anaspides*
3B Not with the above character.....*Koonunga*

Use the key to identify specimen X. Select from the following list of genera:

1. *Micraspides*
2. *Paranaspides*
3. *Anaspides*
4. *Koonunga*.

13. Movement of dissolved substances in the xylem is:

1. chiefly upward
2. chiefly downward
3. dependent upon the amount of light reaching the leaves
4. chiefly outward (radial).

SEE PAGE 10

14. A woman, who was a keen gardener, won a number of awards at horticultural shows for her plants which had deep blue flowers. She gave one of these prize-winning plants to a visiting friend who replanted it in his garden. The following season, when the plant reflowered, he was surprised to see that it had produced large numbers of flowers, all of which were pink. He asked his gardener friend for her comments.

The gardener could reasonably state that:

1. the change in flower colour had been caused by loss of all or part of the chromosome carrying the allele for blue flower colour
2. the change in flower colour had been caused by a mutation in the gene controlling flower colour
3. the different soil type in the new area had modified the expression of the gene controlling flower colour
4. fertilization of the prize-winning plant by pollen from a nearby plant with pink flowers would have caused the change in flower colour.

15. Which one of the five statements below would be considered a principle?

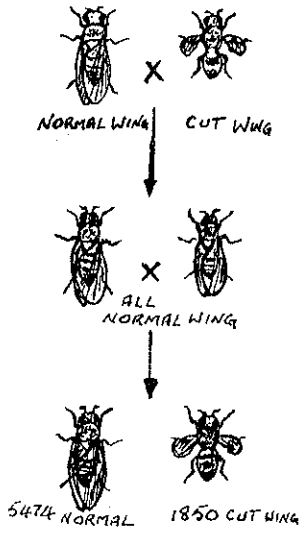
1. All organisms compete with others
2. The outer germ layer of the embryo is known as the ectoderm
3. A distinguishing characteristic of the duckbilled platypus is the fact that while it is classified as a mammal, it nevertheless lays eggs and incubates them externally
4. A simple laboratory test for oxygen - the Winkler test - involves the use of manganous chloride and potassium hydroxide.

16. Robert Brown announced the presence of the nucleus in cells about ten years before Schleiden and Schwann enunciated the "cell theory". Which of the following best explains the time lag between the two announcements?

1. The nucleus is a more important entity than the cytoplasm
2. Nuclei take a darker stain than other parts of the cells
3. The nucleus is a morphological entity while the "cell theory" is an abstract generalization
4. In cell division, the behaviour of chromosomes is the most conspicuous cytological phenomenon.

SEE PAGE 11

17. A summary of the results of crosses between insects with different wing shapes is shown below.



Which one of the following statements is supported by the results of these crosses?

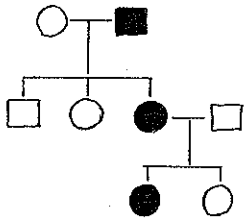
1. More than 3500 F_2 normal phenotypes will probably have homozygous alleles for wing shape
2. All F_1 genotypes have homozygous alleles for normal wing
3. If a normal F_2 is mated with an F_1 we may get offspring with cut wing phenotypes
4. Heterozygous alleles for wing shape would only occur among F_2 normal phenotypes.

18. The part of a plant cell usually believed to be differentially permeable and thus the structure governing the passage of substances into the cell is the

1. middle lamella
2. cytoplasmic membrane
3. nuclear membrane
4. cell wall.

SEE PAGE 12

19. Study the following human pedigree. Squares represent males and circles females. The individuals that show the character are in black.



1. The pedigree shows that the character is dominant and sex-linked on the X chromosome
2. The pedigree shows that the character is definitely recessive
3. The pedigree shows that the character can only be dominant
4. It is not possible from this pedigree to say whether the character is dominant or recessive.

20. The dog, the jackal and the coyote are all members of the genus *Canis*. However they are classified into different species because:

1. while they possess superficial similarities, they are competitors for food in the same ecological community
2. while they look somewhat alike they are natives of different parts of the world
3. they were discovered by man over wide intervals of time and were classified into separate categories
4. they cannot interbreed and produce fertile offspring
5. the system of classification has been perfected to a point where it is infallible.

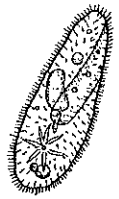
21. In an attempt to estimate the total mice population in a deserted barn, 120 mice were caught, tagged and then released. Ten days later 68 mice were caught of which 12 were tagged. Which of the following is the best estimate of the total mice population?

1. $120 \times 68 \times 12$
2. $\frac{120 \times 12}{68}$
3. 120×200
4. $\frac{120 \times 68}{12}$
5. $\frac{120 \times 200}{68}$

SEE PAGE 13

Questions 22 and 23 are based on possible ways of classifying the following pictured organisms.

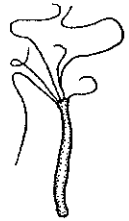
A. Earthworm (x 1)



B. Paramecium (x 230)

C. Planarian (x 3)

D. Crayfish (x $\frac{1}{8}$)



E. Hydra (x 3)

F. Frog (x 1)

22. If D is placed in one group and A, B, C, E and F in another, the basis of this classification would be:

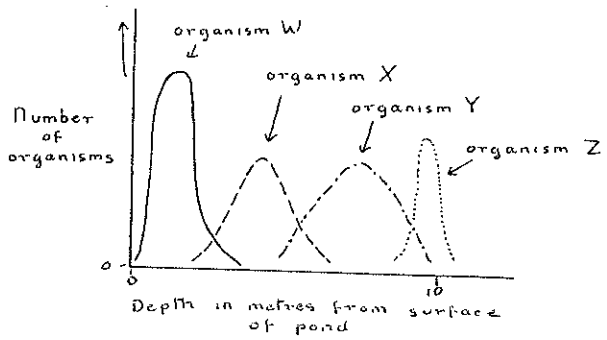
1. bilateral symmetry versus radial symmetry
2. exoskeleton versus endoskeleton or no skeleton
3. segmentation versus no segmentation
4. appendages versus lack of appendages.

23. If D and F are placed in one group and A, B, C and E in another, the basis of this classification would be:

1. backbone versus no backbone
2. segmentation versus no segmentation
3. special respiratory organs versus diffusion of gases through body wall
4. microscopic versus macroscopic size.

SEE PAGE 14

Questions 24 and 25 are based on the following information:



The graph above shows the number of organisms existing at various depths from the surface of a pond The letters W, X, Y and Z indicate the different types of organisms.

24. The organism which is probably the main producer in this community is:

1. Organism W
2. " X
3. " Y
4. " Z

25. The graph demonstrates:

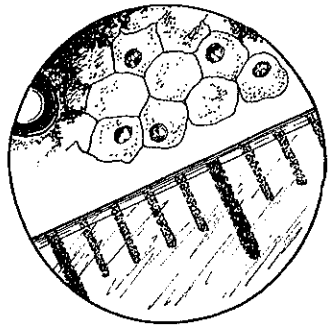
1. ecological zonation
2. dynamic equilibrium
3. ecological succession
4. food chains

26. Which of the following best describes an endocrine gland?

1. It discharges its product into a duct or tube which leads the product to its ultimate place of utilization
2. It produces a secretion which passes directly into the blood
3. It produces a digestive enzyme
4. Its secretion nearly always has an almost instantaneous regulatory effect upon the organs of the body stimulated by it.

SEE PAGE 15

27.



A student observed a part of a tissue under a microscope and at a magnification of X 100. The diagram shows the edge of a clear plastic ruler marked in millimetres and 0.2 millimetre subdivisions. What is the average cell diameter?

1. 1.2 micrometres
2. 0.3 millimetres
3. 1200 micrometres
4. 1.5 millimetres

28. A scientist went into a village whose population was evenly divided between natives of the village and a group of immigrants. He was testing a serum which was supposed to protect against a particular disease so he gave the serum to the natives and nothing to the immigrants and later compared the number of cases of the disease in each group. This procedure could have been improved by which one of the following designs?

1. Inject the natives with the full amount of serum and inject the immigrants with half the amount of serum and compare results
2. Inject the natives with serum and half the immigrants with serum and compare results
3. Inject the natives with serum and inject the immigrants with a harmless inactive solution so the psychological reaction is eliminated
4. Inject half the natives with serum, the other half with a harmless, inactive solution and inject half the immigrants with serum and the other half with a harmless, inactive solution and compare results.

29. Which statement is correct?

1. Plants take in carbon dioxide and give off oxygen in respiration
2. Plants give off carbon dioxide during the day and give off oxygen at night
3. Green plants can live without oxygen
4. Respiration in plants and animals is alike.

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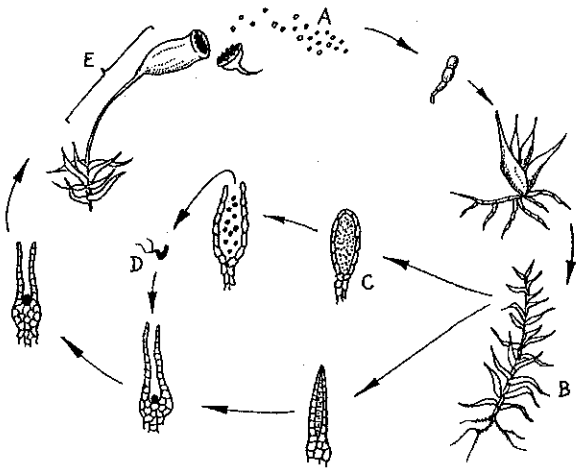
The following diagram relates to questions 30 and 31.



30. Which label refers to a structure with diploid cells?

1. A
2. B
3. C
4. D
5. E.

31. Which is the mature gametophyte?

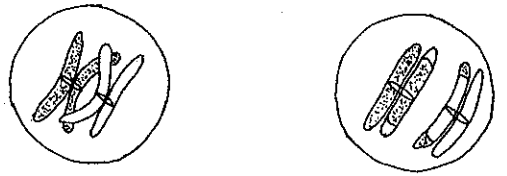
1. A
2. B
3. C
4. D
5. E

32. All plant cells contain the following organelles at some stage of their existence:

1. nucleus, mitochondria, ribosomes
2. chloroplasts, nucleus, mitochondria
3. ribosomes, chloroplasts, nucleus
4. mitochondria, ribosomes, chloroplasts.

SEE PAGE 17

33. These diagrams show successive stages in the division of a cell which has one pair of chromosomes.



The process illustrated is called:

1. fertilization
2. mitosis
3. mutation
4. crossing over
5. binary fission.

The following key is to be used to answer questions 34 and 35. In each case select the term which is best defined by the item given in the question.

KEY

1 isolation
2 genetic drift
3 gene mutation
4 genetic recombination
5 natural selection.

34. A source of variation whose importance is greatly enhanced through the occurrence of bisexual reproduction in the great majority of plants and animals.

35. A necessary preliminary to the splitting of a freely interbreeding population into sub-populations whose gene frequencies differ from that of the original one.

36. Prior to the arrival of European colonizers in New Zealand the Kea, a parrot-like native bird, lived principally upon native fruits. With the introduction of sheep onto the islands, the Kea developed a taste for mutton, thus adding meat to its food habits. It may be said that:

1. bird lice, parasitic on the Kea, had changed from first to second order consumers
2. the Kea itself had become a herbivore as well as a fruit eater
3. the Kea had become a second order as well as first order consumer
4. Keas and sheep had become competitors.

SEE PAGE 18

Questions 37, 38 and 39 are based on the following information:

An isolated plateau supported 4 000 deer with available food for 30 000 deer. The deer population was held in check by wolves. An assumption was made that the removal of wolves would allow a larger deer population. In 1962 all wolves were removed, and by 1964 the deer population rose to 1 000 000. Shortly afterwards, the population dropped to 10 000 sick, old, weak, and starved individuals. The plateau had been reduced to a desert.

37. The information above indicates that the wolves played an important role because they

    1. kept the population down to a point where the land could easily furnish sufficient food
    2. helped maintain the health of the population by feeding on the weak, old, and sick
    3. were necessary if the deer were to remain on the plateau

    or 4. all of the above.

38. By 1964, it was recognised that something must be done to correct the situation. The best solution to the problem may be to

    1. allow unlimited hunting to reduce the population
    2. allow limited hunting to try to maintain the population at 4 000
    3. re-introduce wolves so that a natural balance may be established
    4. remove all deer until the land had recovered and then introduce deer and wolves so that nature could again establish a balance.

39. The information indicates that the plateau was reduced to a desert because

    1. the weather had been dry for several years previously, causing a drought
    2. the soil was not properly fertilized by the animal wastes and decayed remains of the wolves and bobcats
    3. the deer population was so great that everything of value for food was eaten
    4. severe winters had reduced the food supply by freezing and killing much of the vegetation.

40. Plants in general are able to use

    1. nitrates from the soil
    2. ammonia from the air
    3. nitrogenous compounds in the protoplasm of intact dead organisms
    4. free nitrogen gas of the air.

SEE PAGE 19

SECTION B

See Page 20

Suggested time: 75 minutes (36 marks).

Attempt ALL the questions in this section.

Write your answers in the spaces provided.

SEE PAGE 20

41. (9 marks) Red blood cells are very sensitive to a chang . salt concentration of the external solution and if transferred from plasma to a less concentrated solution they swell and may even burst (haemolysis). In an experiment to find the percentage of human red cells haemolysed at different concentrations of solution the following results were obtained:

% salt concentration (gm /100 ml)	0.33	0.36	0.38	0.39	0.42	0.44	0.48
Percentage red cells haemolysed	100	90	80	68	30	16	0

(a) Plot the results on the graph opposite and draw the curve. Use the horizontal axis for the salt concentration.

(b) Give precise answers to the following questions (i) - (vii):

(i) Give a short explanation to account for haemolysis.

_____

_____

(ii) At what percentage salt concentration does haemolysis begin?

_____

(iii) At what percentage salt concentration are all the cells haemolysed?

_____

(iv) At what percentage salt concentration are the proportions of haemolysed and non-haemolysed cells equal?

_____

(v) What do you think would happen to the cells if the percentage salt concentration of the external solution were increased to about 0.6? Explain your answer.

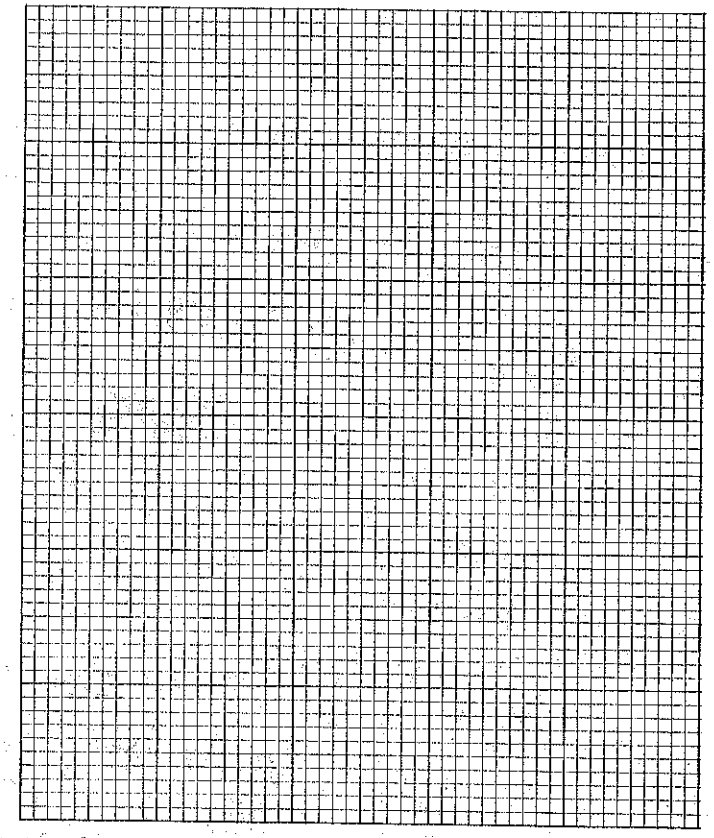
_____

_____

_____

SEE PAGE 21

41. (cont.)



41. (b) (cont.)

(vi) Name the principal organ in man concerned with maintaining a uniform salt concentration in the blood.

_____

(vii) What do you regard as a safe percentage salt concentration for human blood?

_____

SEE PAGE 22

Information relevant to question 42 opposite.

...o boys from the Hillston boys' home in Stonevillo spray water on smouldering trees at Mundar... ...ing yesterday. Fifty-five boys from the home volunteered to fight the blaze.

Half of WA a... fire crisis area

The whole southern half of WA wa... as weary teams battled fires ... al districts and nea...

POOLS MAY SA... ANIMALS, BIRD...

KALGOORLIE: Fauna officers have ... with a novel idea in their efforts to save ... animals driven on to Eyre Highway by ...

Today they will take a number of ... children's swimming pools out to the N... Plain. They will put them in the bush... them with water.

The officials hope that the water wil... wildlife away from the highway. Since ... fires started in the Goldfields hundred... ...als have taken refuge on the ... be killed by cars.

...ls will be used this weekend ... ...pare. An appeal ... to and tele...

THE WEST AUSTRALIAN WEDNESDAY DECEMBER 18 1974

...on owner, John Tonkin, and Trevor Stokes ... ...rest after fighting a blaze . . . while Mar... ...Bob Stokes (12) plans the radio.—Pictures From ... David Tanner.

Days and nights ... fighting fir...

MICE INVADE GO...

KALGOORLIE: Like bushfire ar... ...today not one trap ... ...mice in Kalgoorlie ...

Field mice plague the Fields

Inland river trickles under railway nea...

The inland river flowing th... near Zanthus, dust...

MERCY FLIGHTS DELAY AS FUEL F... OUT

An RAAF helicopter is stan... flooded stations in the north...

The helicopter, which is ... at Leonora, is awaiting a ... convoy of trucks from ... Kalgoorlie with six ... tonnes of food and avia... tion fuel.

The aircraft finished its ... flights across the flooded ... area last night with only ... 40 minutes of fuel left in ... its tanks.

The convoy of truc... to stop at ...

...randed on ...

...ddard Creek, ...

...re no food air... ...e weekend. ...as have occur... the floods. ...of an uniden... was found ...tinat the rail... ...idge at ...

...nus ...

FLOODS MAY CLOSE NW HIGHW...

The flood situation worsened ... North-West Coastal Hig... ...robably be cl...

SEE PAGE 23

42. (8 marks)

Recent extensive bushfires in the eastern goldfields region followed by heavy cyclonic rains (see newspaper cuttings opposite) have resulted in widespread regeneration of shrubs and a dense regrowth of green grasses. Goldfields residents have reported a dramatic increase in mice in both the city and surrounding areas.

(a) What TWO factors could have caused this dramatic increase in mice? Explain each answer.

(i) _____

_____

_____

(ii) _____

_____

_____

(b) What effects could the enormous number of mice have on the different bird populations in the goldfields region? Explain your answer.

_____

_____

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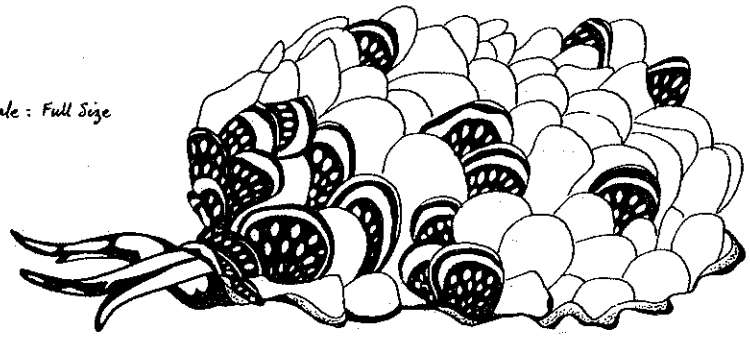
SEE PAGE 24

43. (10 marks)

Observations On An Organism Captured During an Excursion to Rottnest Island on 16/2/1975.

Scale : Full Size



It is about 10 cm long with a soft texture and displays an attractive brown and yellow pattern. It has sensory tentacles at the anterior end and a bunch of finger-like projections along the dorsal surface (these latter projections must comprise the respiratory structures). The body of the animal is covered with petal-like fleshy appendages (called cirrhi) which act like small paddles and assist in locomotion. The frontal veil, and the mantle which spreads along the sides, undulate as the animal swims through the seaweeds.

Occasionally the animal settles on sea anemones or sponges. When pried loose, the organism contracts into a ball and whirls at great speed in a circle or an ellipse, assisted by complicated movement of the cirrhi.

As it lays its eggs, the animal secretes a mucus which cements the thousands of eggs together into a red-coloured, spiral-shaped ribbon egg mass. The embryos have small, coiled shells, but these are later lost and the larvae uncoil and develop external bilateral symmetry.

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43. On a scuba-diving excursion in warm, shallow seas, a student collected an interesting organism for scientific study. His observations are on the opposite page.

(a) Suggest what this animal eats and what characteristics might help it to obtain foods. Explain.

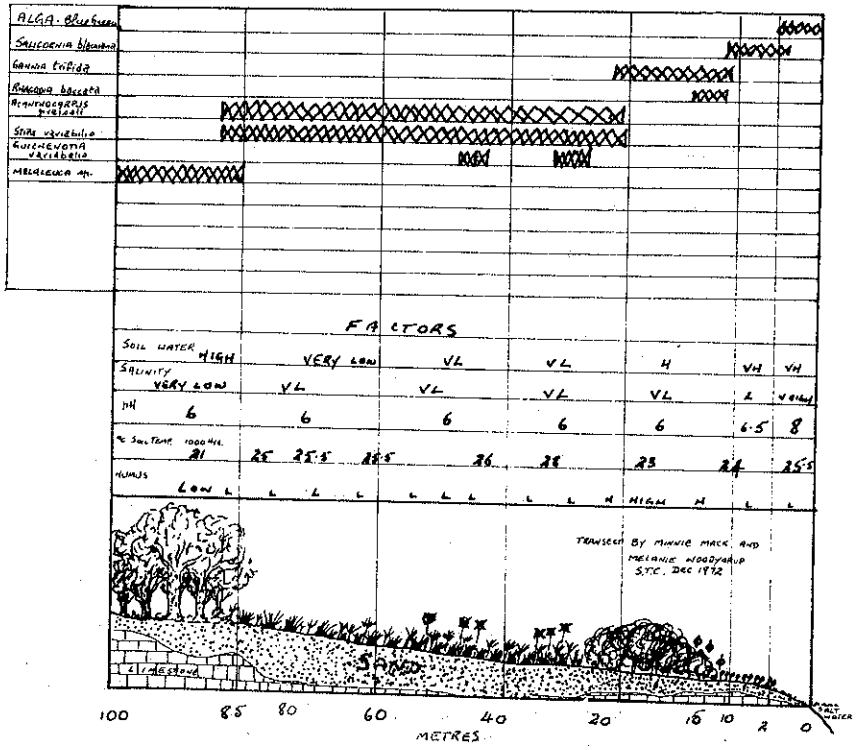
(b) The diver observed an adult of this species being attacked by a scavenging fish. Which of the characteristics observed by the student might help it to survive an attack by a fish? Explain.

(c) Name TWO problems that this species might encounter in reproducing in its usual habitat.

(d) At first sight, some of this animal's features may not appear to assist it to survive and reproduce in its usual surroundings. Suggest THREE of these features not already discussed in your answers to (a), (b) and (c) and say how you would explain their presence.

SEE PAGE 26

Information relevant to question 44 opposite.



THIS TRANSECT OF A SALT LAKE SHORE-LINE ON ROTTNEST ISLAND HAS BEEN TAKEN FROM A STUDENT'S WORK BOOK

SEE PAGE 27

44 (9 marks)

(a) Suggest an appropriate name for the community in the 2-10 metre zone of the transect.

_____

(b) From the given data, which TWO factors seem to be most significant in confining the distribution of algae to the 0-2 metre zone?

(i) _____

(ii) _____

(c) The Stipa-Acanthocarpus community occupies an area of 10 hectares around the salt lake. How would you calculate the population density of *Acanthocarpus preissii*?

_____

_____

_____

_____

_____

_____

(d) List all of the species recorded which are well adapted to survive in the drier soils around the salt lake.

_____ _____

_____ _____

_____ _____

(e) What TWO unrecorded factors might account for the lack of other plants in the Melaleuca community?

(i) _____

(ii) _____

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SECTION C.

Suggested time: 45 minutes. Each question is worth 12 marks.

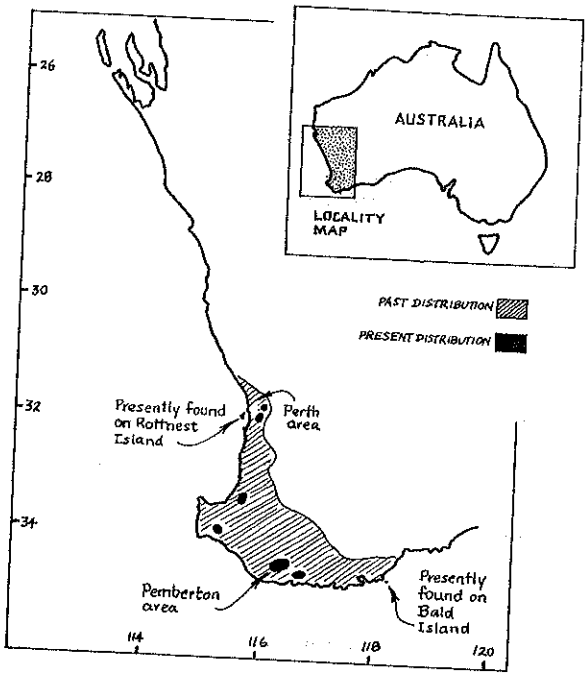
Answer BOTH questions.

Write your answers on the sheets provided at the end of this section.

45. EITHER (a)

(a) When European settlement first came to Western Australia there were extensive areas of natural woodland communities and many native mammals were distributed through much of the state. For instance the Quokka, a small marsupial, was once widespread in its occurrence.

Since then much of its habitat has been cleared for settlement and, instead of its former almost continuous distribution, the species has been split up into a few local populations. There are surviving colonies on some near-shore coastal islands and isolated colonies in bushland areas near swampy ground on the mainland. All of these colonies are separated by wide areas of farmland which the animals avoid.



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45. (cont.)

(i) Write a short, carefully-reasoned essay to explain the changes observed in the Quokka population.

and

(ii) Predict and explain what may happen to the distribution of, and the diversity in, the Quokka in future years.

OR (b)

(b) In a newspaper report on the survival of man as a healthy species, a prominent scientist was quoted as saying:

"Breed sexually; marry the stranger; don't overpopulate; look after your sick; don't kill people; tolerate the eccentric; don't censor but encourage private choice; be curious; seek change; take care; conserve variety in local biological environments; keep communities small so that they can be diverse; retain the family unit."

What TWO principles have you considered in your biology course which are related to the newspaper report? Discuss each of these principles separately and in depth.

(Candidates are advised to spend some time planning their answers to this question. There may be one principle which underlies many of the statements, some statements may be related to more than one principle and it is possible that some statements may conflict with a biological principle.)

46. EITHER (a)

(a) What is an ecosystem? Your answer to the question should include detailed descriptions of:

(i) the components of an ecosystem

(ii) the functional status of different organisms

(iii) the differences in the total mass of organisms at different levels in the system

(iv) the flow of energy through an ecosystem

(v) interdependence.

OR (b)

(b) An English poet, John Donne (1571-1631), referring to a man's relationship with the rest of society once wrote:

"No man is an island, entire of itself."

Although Donne wrote this about a man, a biologist has said that the same applies to a single cell in relation to the rest of the cells in a multicellular animal.

Discuss the biologist's idea using examples drawn from your knowledge of biology. Your answer should make clear whether you disagree, agree partly or are in total agreement with the biologist.

END OF PAPER