

The University of Western Australia
Leaving Certificate Examination, 1972

Leaving level

BIOLOGY

Candidate's Number

DATE AND COMMENCEMENT TIME:

Thursday, November 23rd, 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 35 pages and 46 questions,
one piece of blank paper for rough work.

INSTRUCTIONS TO CANDIDATES

See page 2 of this question paper.

FOR EXAMINERS' USE ONLY					
Question Number	First Mark	Second Mark	Question Number	First Mark	Second Mark
1-40			45		
41			46		
42			Total		
43					
44					

2.

Biology - Leaving level

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.

When you start work, detach page 35 which is the answer sheet for Section A and write your number in the box at the top of the page.

When you have completed the Section A answer sheet, insert it inside the cover of this question paper.

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.

see page 3

Biology - Leaving level

3.

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 35). For example, if your choice is 3, show it as follows: -

1	2	3	4	5
---	---	---	---	---

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

Give only ONE answer to each of questions 1 - 40.

1. Mitochondria are found in

1. all living cells
2. plant cells only
3. muscle cells only
4. fly muscle cells only
5. striated muscle cells only.

2.

Biological processes such as photosynthesis and respiration may be modified in rate or completely inhibited by "limiting factors". Which of the following factors would not limit the process of aerobic respiration, regardless of presence, absence or quantity?

1. carbohydrate
2. oxygen
3. carbon dioxide
4. light
5. water.

3.

Proteins are compounds consisting of many units of

1. fatty acids
2. simple sugar
3. starch
4. glycerol
5. amino acids.

see page 4

4.

Biology - Leaving level

Questions 4 and 5 are based on the following information : -

The concentrations of ions inside a Paramecium and in its environment were measured and tabulated in ion-units per millilitre.

	Na ⁺	K ⁺	Cl ⁻	HCO ₃ ⁻
Paramecium	1	42	3	119
Environment	21	16	41	119

4. The differences in concentrations of K⁺ and Na⁺ between the environment and the inside of the animal indicate that

1. diffusion is not occurring
2. free energy has been increased
3. free energy has been expended
4. osmosis has occurred
5. the Paramecium is dead.

5. Free diffusion alone could account for which ionic concentration inside the Paramecium? (Assume the membrane is permeable to all the above ions.)

1. Na⁺
2. HCO₃⁻
3. Na⁺, K⁺, Cl⁻ and HCO₃⁻
4. Na⁺, Cl⁻ and HCO₃⁻
5. None of the above ions.

see page 5

Biology - Leaving level

5.

Questions 6 - 9 are based on the following information : -

A coloured, gummy material was accumulating in gasoline storage tanks. The material was composed of round, budding "blobs" about 10 - 15 microns in diameter.

6. To determine if the material were living, the microbiologist would probably first

1. attempt to culture it
2. run a bioassay on it
3. autoclave it at 121°C for 1 minute
4. test for the presence of organic sources of carbon
5. examine it under a microscope.

7. Which would the "blobs" most likely be?

1. yeasts
2. viruses
3. bacteria
4. Paramecia
5. Amoebae.

8. A medium in which this organism can grow must

1. have oxygen
2. have a pH of 5 - 7
3. contain ammonium sulphate
4. have carbon dioxide
5. contain organic compounds as sources of carbon.

9. An enzyme was isolated from this gummy material and purified. This enzyme was composed of

1. sugars
2. protein
3. gasoline
4. fatty acids
5. resins.

see page 6

Biology - Leaving level

- 6.
10. Water may be lifted to the top of tall trees due to all of the factors listed below EXCEPT
 1. a push from below. (root pressure)
 2. a pull from above. (evaporation pressure)
 3. an attraction of the water to the walls of the vessels. (capillary attraction)
 4. the pumping action of the "sodium pump"
 5. the narrow diameter of the xylem vessels.
11. A fundamental difference between the growth pattern of higher plants and that of higher animals is that
 1. animal growth depends on cell division; plant growth does not
 2. animal growth depends on cell enlargement; plant growth does not
 3. plants grow throughout their lives; animals do not
 4. plant cells become specialized; animal cells do not
 5. plant growth occurs throughout the body but animal growth does not.
12. In animals, two systems which are highly specialized as control systems are the nervous system and the
 1. muscular system
 2. intestinal system
 3. integumentary system
 4. endocrine system
 5. lymphatic system
13. Which one of the following statements would be true of a person running forward?
 1. all of the muscles of his legs will contract at the same time
 2. his center of gravity will be directly over the leg on the ground
 3. his center of gravity will be in front of the leg on the ground
 4. the force exerted by his foot on the ground will not affect his speed
 5. the length of his pace will be about the same as in walking.

see page 7

Biology - Leaving level

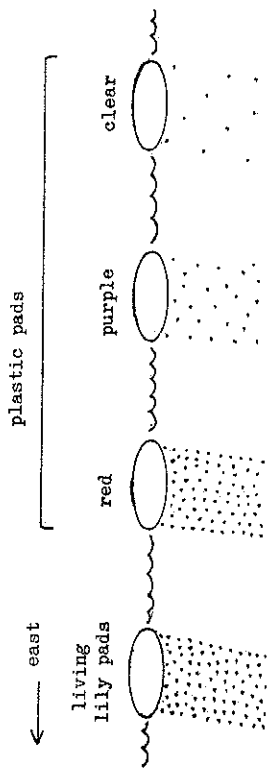
- 7.
14. Tissue grafts from one man to another are normally rejected because the graft proteins act as
 1. antigens
 2. globulins
 3. albumins
 4. antibodies
 5. histagens.
15. Bird eggs are able to develop out of water while frog eggs must develop in water because
 1. most birds live on land
 2. the eggs of birds contain a large store of water
 3. the bird embryo requires very little water
 4. parent birds are able to care for and protect their eggs
 5. eggs of birds are covered by a hard shell.
16. Some amphibian eggs of an unknown species were collected from a pond. The best method for determining the optimum temperature to use for the development of these eggs is to
 1. read the literature for the recommended procedure for Hyla aurea
 2. determine the temperature of the water at the source of the eggs
 3. determine the average seasonal temperature reported by the weather bureau for the specific area
 4. place the eggs in a wide range of constant temperatures and observe
 5. incubate the eggs at the temperature of the pond water at the time of collection.
17. A young lady applies lipstick and perfume, and wears swinging gear. Her actions agree roughly with the courtship behaviour of
 1. the frog
 2. the stickleback
 3. *Drosophila*
 4. fowls
 5. the silver gull.

see page 8

Biology - Leaving level

8. If a majority of wood lice congregate in the moist end of a humidity chamber, it is because
1. they prefer the dark
 2. the moist soil is cool
 3. they are more active in dry air
 4. they are social animals
 5. they like dry conditions.

Questions 19 - 22 are based on the following information. The diagram shows the distribution of small organisms in the surface water of a pond when the surface is covered by natural or artificial objects.



19. The distribution probably results from a response to

1. shelter
2. colour
3. gravity
4. temperature
5. light.

20. The data were most likely recorded or collected

1. in the morning
2. at noon
3. in the afternoon
4. at midnight
5. in summer.

see page 9

Biology - Leaving level

21. Which pad serves as a control if colour is the variable factor?

1. living
2. red
3. purple
4. clear.

22. Which of the following most closely resembles the living pad?

1. red
2. purple
3. clear
4. uncovered areas.

23. A pond snail is normally found on a particular type of aquatic plant. The plant is not eaten by the snail, therefore it was concluded that the snail was most likely a

1. host
2. producer
3. parasite
4. commensal
5. scavenger.

24. An investigator placed some of these snails in an aquarium containing a similar but different species of plant. On the third day he observed all of the snails had died. A satisfactory conclusion could not be drawn because

1. the plants might have been poisonous
2. the snails might have been injured
3. he made only one set of observations
4. he did not know the life span of the snail
5. the conditions might have been different in the aquarium and in the lake.

see page 10

10.

Biology - Leaving level

25. Which one of the following is most essential in biological experiments? The

1. analysis of data
2. use of microscopes
3. use of scientific models
4. plotting of data graphically
5. classification of the organism used.

26. The adult pork tapeworm, *Taenia solium*, lives in the intestine of man, where it may grow to a length of eight feet. Usually only one tapeworm at a time inhabits the host. This means that the tapeworm must

1. be a hermaphrodite
2. reproduce by parthenogenesis
3. reproduce asexually
4. be a commensal
5. rely on another tapeworm of the opposite sex to invade the host before it can reproduce.

27. Lichens are an example of two different species of organisms living together. This relationship is an example of

1. predation
2. parasitism
3. saprophytism
4. partial parasitism
5. mutualism.

28. Which of the following depend entirely on a non-living organic source of food?

1. insectivorous plants
2. algae
3. moulds
4. mistletoes
5. Wheat Rust (*Puccinia graminis*).

see page 11

Biology - Leaving level

29.

Which one of the following best describes the insectivorous habit in plants? Insectivorous plants capture small animals

1. because they cannot synthesise their own proteins
2. to gain extra fats
3. but gain no benefit from this habit
4. to gain extra nitrogenous compounds
5. to gain extra food.

11.

Questions 30 and 31 are based on the following information: -
Three of the pairs of organisms are different from the fourth pair.
The pair whose ecological relationship is different from the rest is

- 30.
1. dingo-rabbit
 2. hawk-mouse
 3. snake-frog
 4. cormorant-fish
 5. horse-donkey.

31.

1. goanna-tick
2. bird-louse
3. horse-grass
4. turtle-leech
5. wheat-wheat rust.

32.

A decaying tree trunk lying on a forest floor is found to harbour moulds, mosses, sub-aerial algae, bacteria, termites, spiders, mice and other organisms.
An example of the first-order consumer of the tree trunk would be

1. algae
2. mice
3. moulds
4. spiders
5. mosses.

see page 12

Biology - Leaving level

12. The decaying tree trunk represents
1. a consumer to the micro-organisms
 2. a producer to the algae
 3. protection to the mice
 4. food for the mice
 5. a producer to the mosses.
33. The development of several lines of descent from a single ancestral type is called
1. convergence
 2. replacement
 3. genetic drift
 4. adaptive radiation
 5. divergence.
34. The development of similar structures in organisms of dissimilar ancestry is called evolutionary
1. convergence
 2. replacement
 3. adaptive radiation
 4. divergence
 5. selective pressure.
35. Which one of the following species of the family Proteaceae is most closely related to Dryandra proteoides?
1. Banksia dryandroides
 2. Protea repens
 3. Grevillea dryandri
 4. Protea formosa
 5. Dryandra formosa
36. In an Angiosperm plant the haploid number of chromosomes occurs in the
1. cells of the root apex
 2. pollen grain
 3. pollen mother cells in the anther
 4. cells of the stem apex
 5. embryo tissue of the seed.
- Questions 38 - 40 are based on the following information:-
In mice, there are 40 chromosomes in somatic (non-reproductive) cells and sex determination is controlled by a normal (XY male, XX female) sex chromosome system.
37. How many chromosomes does a mouse receive from its father?
1. 20
 2. 19
 3. 18
 4. 38
 5. 40
38. How many non-sex chromosomes are in somatic cells of a female mouse?
1. 20
 2. 19
 3. 18
 4. 38
 5. 40
39. How many non-sex chromosomes are present in a mouse gamete?
1. 20
 2. 19
 3. 18
 4. 38
 5. 40

see page 13

see page 14.

14.

biology - Leaving level

SECTION B

Suggested time: 75 minutes. (36 marks)

Attempt ALL the questions in this section.

Write your answers in the spaces provided.

41
(6 marks)

In radishes, the gene for long root-tuber shape (L) is co-dominant (incompletely dominant) with its allele for round tuber shape (l). Crosses of radish plants of these two tuber shapes result in oval tubered progeny.

A progeny was produced by crossing oval tubered plants.

- (a) Complete the following diagram showing the genotypes of the gametes produced by the oval tubered parents, and the genotypes of the progeny obtained by all the possible combinations of the gametes.

		female gametes	
Male gametes			

- (b) What phenotype(s) would occur in the progeny?

- (c) State the relative proportions of the phenotypes in the progeny

- (d) What is the phenotype of the heterozygote?

- (e) Progeny of which tuber shape are true breeding?

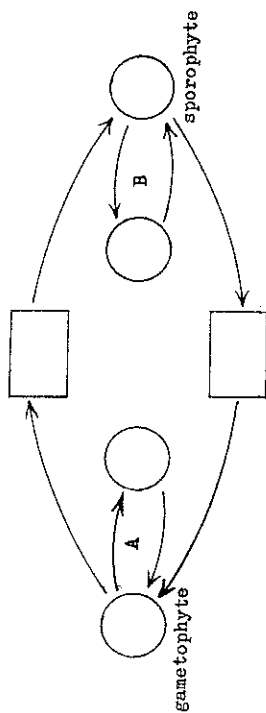
See page 15

Biology - Leaving level

15.

42.
(7 marks)

The diagram below shows in principle the reproductive cycle in plants.



- (a) Write 2N in the appropriate circle and meiosis in the appropriate box.

- (b) What structure represents the gametophyte stage in a fern?

- (c) What structure represents the female gametophyte in an angiosperm?

- (d) What type of reproduction is indicated by the subsidiary cycles A and B?

- (e) Give an example of a plant which commonly reproduces by means of cycle B.

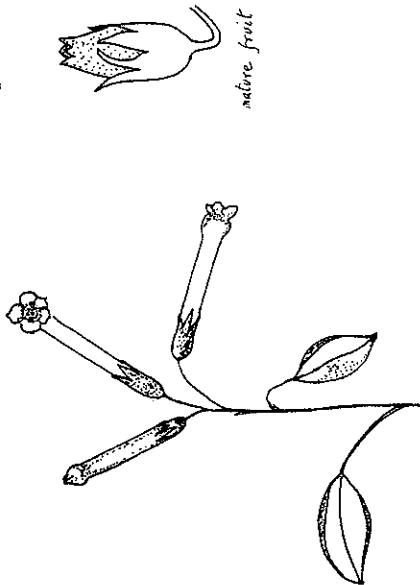
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16.

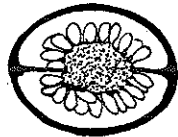
43.
(8 marks)

Biology - Leaving level

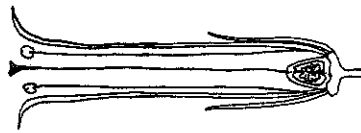
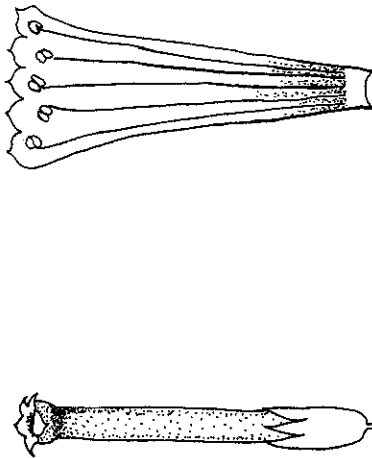
Examine the flower illustrated below. Determine the family to which this flower belongs using the key provided. Mark the positive steps to the key which lead you to your identification by placing X in the appropriate box at each step.



mature fruit



75. ovary



- () 1a Petals free, the stamens not attached to the petals.....2
- () 1b Petals more or less fused to form a corolla tube, the stamens attached to the corolla tube8
- () 2a Ovary superior3
- () 2b Ovary inferior7

see page 17

Biology - Leaving level

17.

- () 3a Pistil of a single carpel, fruit a legume or podLeguminosae
- () 3b Pistil of more than one carpel, fruit not a legume4
- () 4a Carpels free, each with its own style5
- () 4b Carpels fused, with a common style6
- () 5a Carpels 4-10, stamens 4-10Crassulaceae
- () 5b Carpels numerous on a cone-like receptacle, stamens numerousRanunculaceae
- () 6a Carpels 2, petals 4, stamens 6Cruciferae
- () 6b Carpels 5, petals 5, stamens 10Geraniaceae
- () 7a Stamens 10-numerous, or in 4-5 staminal groups, ovary 1 or 5-chambered.....Myrtaceae
- () 7b Stamens 5, ovary 2-chamberedUmbelliferae
- () 8a Ovary superior9
- () 8b Ovary inferior12
- () 9a Corolla with radial symmetry10
- () 9b Corolla with bilateral symmetry (2-lipped).....11
- () 10a Ovary 1-chambered.....Gentianaceae
- () 10b Ovary 2-chamberedSolanaceae
- () 11a Ovary 2-chambered and strongly 4-lobed, style arising from the base of the ovary between the lobes, fruit of 4 nutletsLabiatae
- () 11b Ovary 2-chambered with a terminal style, fruit a capsule.....Scrophulariaceae
- () 12a Stigma bilobed and sunken in a cup-shaped expansion of the style-end (the indusium).....Goodeniaceae
- () 12b Stigma bilobed but without an indusium.....Compositae

see page 18

18.

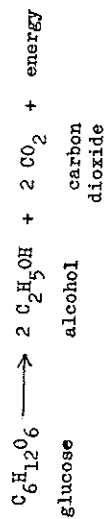
Biology - Leaving level

44.

(15 marks)

It was a well known fact in the early 1900's that the fermentation process could be speeded up by the addition of an inorganic phosphate. A scientist designed a series of experiments in an attempt to find out why the addition of inorganic phosphate increased the rate of fermentation.

The fermentation process may be summarised as follows:-



EXPT. A. To 25 ml of yeast extract he added 5 grams of glucose (a large excess) in a water solution. Using a specially designed piece of apparatus he was able to measure the quantity of CO_2 produced. Table A summarizes the data from Expt. A.

Time (Minutes)	5	10	15	20	25	30	35	40	45	50	55	65	75	85	105
CO_2 produced (ml)	3	10	13	15	17	18	20	21	22	23	25	28	30	33	38

(a) The scientist used quantity of CO_2 produced to measure the fermentation rate. Could he have used anything else? Explain.

(b) Explain why his investigation is more experimentally sound because of the fact that he used an excess of glucose.

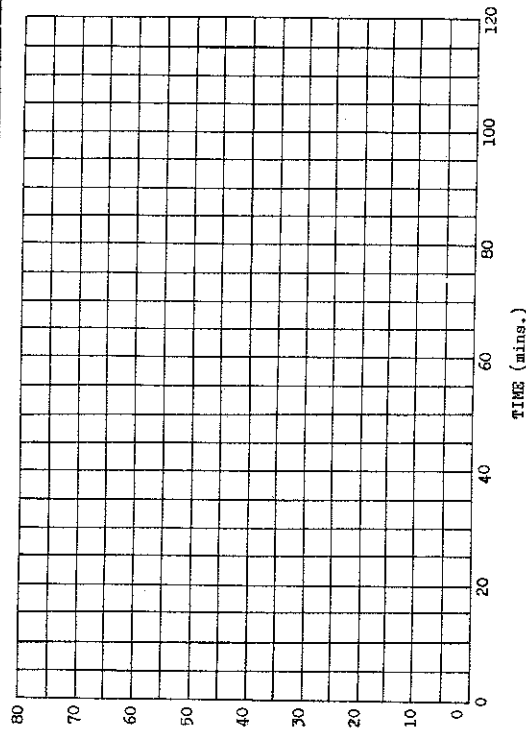
see page 19

Biology - Leaving level

19.

(c) Plot the data for Expt. A.

(d) What does the graph indicate concerning the rate of fermentation during the course of the experiment?



In a second experiment (Expt. B) the scientist added a known quantity of inorganic phosphate to the glucose-yeast solution. (glucose and yeast in the same proportions as in Expt. A). Table B summarizes the data for Expt. B.

TABLE B

Time (Minutes)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
CO_2 produced (ml)	2	9	15	23	32	42	51	58	60	62	64	66	67	68

see page 20

(e) Plot the data for Expt.B on the same graph as before. (use a different colour or a broken line to distinguish the two graphs).

(f) Are there any similarities between the two graphs you have drawn? Explain.

(g) For graph B does the fermentation rate speed up or slow down after 40 minutes?

(h) Propose a hypothesis to account for the change in fermentation rate after 40 minutes, in Expt.B.

(i) Did the scientist use a control in this investigation? Explain.

SECTION C

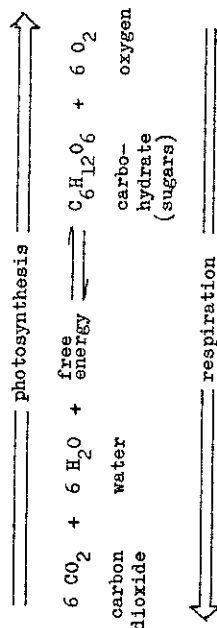
Suggested time: 45 minutes. Each question is worth 12 marks.
Answer BOTH questions.

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

45.

REITER

(a) Show how the two processes summarised below interact to provide energy for plant metabolism.



OR

(b) Construct a food web of the following organisms recorded from a lake.

Water snails, *Daphnia*, unicellular algae, wild ducks, insect larvae, *Gambusia* fish, vascular pond weeds, protozoa, bacteria.

What effects would a sudden large increase in the duck population have on this ecosystem?

22.

Biology - Leaving level

46.

EITHER

- (a) What do you understand by natural selection? Explain how grazing of stock often produces changes in the kind of plant life of a natural bushland ecosystem.

OR

- (b) A small bird, the golden whistler, occurs in many parts of Australia, and through many of the islands of the South Pacific. More than 80 races of the golden whistler have been described from various islands in the area, 10 races from mainland Australia and one from Tasmania. Yet all are believed to have had a common ancestor. Set out, step by step, how these races could have originated.

END OF PAPER

Biology - Leaving level

23.

The University of Western Australia
Leaving Certificate Examination, 1973

Leaving level

BIOLOGY

Candidate's Number
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Reading time before commencing: Ten minutes

For working of paper: Three hours

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