

WARNING: You must return this section with your answer book otherwise marks will be lost.

Write Your
Examination
Number here

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA
LEAVING CERTIFICATE EXAMINATION, 1999
BIOLOGY — HIGHER LEVEL

WEDNESDAY, 16 JUNE — AFTERNOON 2.00 to 5.00

Answer **six** questions from Part I and **four** questions from Part II.
You should not spend more than 45 minutes on Part I, leaving about 135 minutes for Part II.

PART I (120 marks)

Answer **six** questions. Each question carries 20 marks.

Write your answers in the spaces provided.

Keep your answers short.

Write your examination number at top.

Be sure to return this part of the examination paper; enclose it in the answer book you use for answering Part II.

1. Answer the following by placing a tick (✓) in the appropriate box.

(a) The number of molar teeth in a full human set:

4 8 12 16

(b) The chromosome content of endosperm:

n 2n 3n 4n

(c) The chromosome content of cells in cotyledons:

n 2n 3n 4n

(d) Cobalt chloride paper is used to test for:

carbon dioxide water oxygen protein

(e) Diabetes is due to a deficiency of

adrenaline insulin oxytocin FSH

2. From the list below select, in each case, the element that fits the description. (You may use the same element more than once if necessary.)

Calcium, iron, iodine, magnesium, zinc, phosphorus, sodium, sulphur, chlorine, potassium.

- (i) Always found in DNA:
- (ii) Always found in thyroxine:
- (iii) An essential component of chlorophyll:
- (iv) Required for normal blood clotting:
- (v) Required to prevent osteoporosis:
- (vi) Always found in haemoglobin:
- (vii) Essential for energy exchange reactions:

3. The diagram shows asexual reproduction taking place in yeast.

(i) Name this type of asexual reproduction.

.....

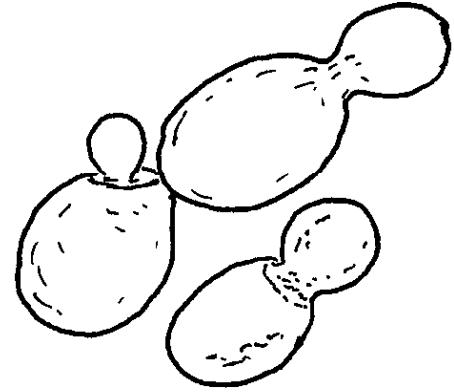
(ii) Are the products of this form of reproduction clones?

.....

Briefly explain your answer.

.....

.....



(iii) Yeast is described as a facultative anaerobe. What does this mean?

.....

(iv) As a facultative anaerobe, yeast produces carbon dioxide and another substance. What is this other substance?

.....

(v) Give an economic use of the carbon dioxide produced by yeast.

.....

(vi) State one way in which a yeast cell differs from a typical plant cell.

.....

4. In an experiment to determine the percentage mass of water in a soil sample, the following procedures were carried out. An evaporating basin was weighed and found to have a mass of 44g. Soil was then added. The mass of the basin and soil together was 80g. The basin and its contents were heated to 100°C for a period of time.

The graph shows the changes in mass during heating.

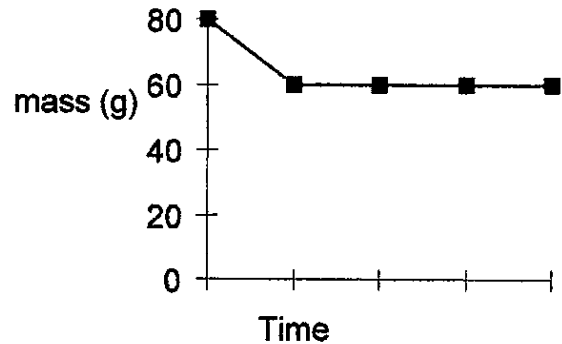
(i) How was the evaporating basin heated to 100°C?

.....

What indication was there that all the water had been removed from the soil?

.....

.....



(ii) State why it is important that the temperature should *not* be allowed to rise much above 100°C.

.....

(iii) Calculate the percentage mass of water in the sample.

.....

.....

(iv) Give an example of each of the following.

A non-living organic component of soil:

Biological weathering:

5. (a) (i) In the space provided draw a diagram to show the basic structure of a cell membrane. Label *two* components on your diagram.

(ii) The cell membrane is said to be semi-permeable (selectively permeable). Explain this term.

.....

(iii) Name *two* processes that are involved in the passage of materials across cell membranes.

1 2

(b) One of the processes involved in the passage of materials across cell membranes requires energy released in the cell.

(i) Name an organelle in which this energy release takes place.....

(ii) Give *one* location in an angiosperm plant where cells possessing a large number of this organelle are found.....

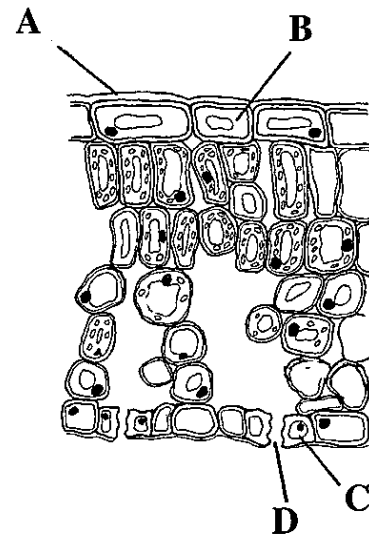
6. (a) (i) The diagram shows a vertical section through part of a dicotyledonous leaf.

Name the parts labelled A, B and C.

A

B

C



(ii) Name *three* substances that pass through D which are involved in the leaf's metabolism.

1

2

3

(iii) State a function of A.

.....

(iv) State *one* way in which a leaf of a dicotyledonous plant differs externally from a leaf of a monocotyledonous plant.

.....

(b) (i) What is a xerophyte?

(ii) Name a xerophyte and give *one* feature that indicates that it is a xerophyte.

.....

.....

7. For each of the following distinguish clearly between the members of the pair of terms by writing a brief explanatory note on each term.

(a) Antenna and anther:

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.....

(b) Antigen and antibody:

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.....

(c) Plumule and radicle:

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.....
.....

(d) Genus and species:

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.....
.....

(e) Dormancy and migration:

.....
.....
.....

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BIOLOGY — HIGHER LEVEL

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Part I is on a separate sheet which provides spaces for your answers. The completed sheet should be enclosed in your answer book.

PART II (280 marks)

Write your answers to this part in your answer book.

Answer **four** questions. Each question carries 70 marks.

8. (a) Draw diagrams of *two* nuclei to show the difference between metaphase of mitosis and metaphase of meiosis I for nuclei in which $2n = 4$. Your diagrams should show chromosomes (chromatids), centromeres and spindle fibres. Label these structures on one of the diagrams. (15)
- (b) A guinea pig is heterozygous in respect of the allelic genes **A** and **B**. These two genes occupy loci on different pairs of homologous chromosomes. **A** is dominant to **a** and **B** is dominant to **b**.
- (i) Explain the underlined terms.
- (ii) State the significance, in relation to gamete formation, of the fact that the two genes occupy loci on different pairs of homologous chromosomes.
- (iii) A guinea pig heterozygous for **A** and **B** is crossed with a guinea pig recessive for **A** and **B**.
Give the genotypes of the two parents.
What is the percentage chance that any one of the progeny will be the same as one or the other of the parents?
If **A** and **B** occupied loci on the *same* homologous pair of chromosomes, would you expect the same result? (Assume crossing over does not occur.) Explain your answer. (37)
- (c) Write notes on *two* of the following: genetic variation, natural selection, fossils. (18)
9. (a) Describe how you would carry out the following procedures in the laboratory:
- (i) prepare a chloroplast extract from leaves;
- (ii) separate the pigments in the chloroplast extract. (21)
- (b) What is meant by the absorption spectrum of chlorophyll? Draw an outline graph of the absorption spectrum of a chlorophyll. Label the axes of your graph.
State the advantage to a plant of possessing more than one chlorophyll pigment. (22)
- (c) (i) Give a diagram to show the carbon cycle.
- (ii) Write summary equations for *two* processes named in your diagram which involve glucose.
- (iii) Global warming is attributable to a build up of carbon dioxide in the earth's atmosphere. Suggest how an imbalance in the carbon cycle may contribute to this build up of carbon dioxide.
- (iv) Nitrogen, like carbon, is circulated in nature. State one difference between the carbon cycle and the nitrogen cycle. (27)

10. (a) Make a three-column table placing *Spirogyra* at the top of one column, *Fucus* at the top of the second and moss or fern at the top of the third.

Complete the table to compare and contrast the three plants under the following headings:

- (i) normal habitat;
- (ii) occurrence of alternation of generations in the life cycle;
- (iii) occurrence of isogamy or heterogamy;
- (iv) occurrence of internal or external fertilisation;
- (v) formation of a zygospore. (30)

- (b) In the case of *Fucus* and the moss or fern, explain the importance of water for the completion of their life cycles. (15)

- (c) (i) *Spirogyra* and *Fucus* are non-vascular plants. What is meant by non-vascular?
- (ii) Name a vascular plant. Name the two tissues it contains that qualify it as a vascular plant. Give the main process occurring in each of these tissues.
- (iii) State the difference in distribution of the vascular tissues as seen in transverse sections of a stem and a root of a dicotyledonous plant early in its first year of growth. (25)

11. (a) (i) Using labelled diagrams show the difference between the structure of an artery and of a vein.

(ii) Name the main gas carried in each of the following: pulmonary artery, aorta.

(iii) For each gas that you have named in (ii), state one way the blood transports the gas.

(iv) Name and state the function of the valve that is found where the aorta leaves the heart. (33)

- (b) (i) Draw a large labelled diagram of the human respiratory system (excluding the rib cage and associated muscles).

(ii) Insert the letters X, Y, Z on the diagram to show, in each case, a region where

- gaseous exchange takes place (X);
- cilia are located (Y);
- cartilage is found (Z). (19)

- (c) The length of time that it takes a person's heart rate to return from the highest rate resulting from a period of exercise to the normal resting rate is called recovery time.

(i) Suggest a relationship between recovery time and a person's degree of physical fitness.

(ii) Devise a simple experiment to measure recovery time. (18)

12. Give a concise biological explanation for seven of the following observations.

(a) Glucose and proteins are normally absent from human urine.

(b) Sweating results in body cooling.

(c) If damp hay is stored in a shed, it is liable to become quite hot.

(d) Removal of the terminal bud of a woody shoot promotes lateral growth.

(e) It is rare to find a father and son both suffering from haemophilia.

(f) As the evening progresses and it gets darker, a time is reached when the human eye can no longer detect colour.

(g) When vegetables are being prepared for deep freezing, it is common practice to first immerse them in boiling water for a few minutes.

(h) The larvae of insects, unlike the adults, undergo ecdysis. (70)

13. (a) A particular species of small herbaceous plant is found in a variety of habitats. It is a typical autotroph and is a major component of the diet of a species of small mammal and a number of other heterotrophs.
- Explain the underlined terms.
 - Name a process associated with autotrophic nutrition.
 - Name *two* forms of heterotrophic nutrition different from that of the small mammal and state the significance in Nature of each of these.
 - Suggest *two* possible consequences for the small mammal population should the population of the herbaceous plant be eliminated from a habitat by the application of a herbicide. (30)
- (b) The herbaceous plant is observed to be an 'aggressive coloniser'.
- State the meaning of 'aggressive coloniser'.
 - Suggest *one* way in which this herbaceous plant may reach new habitats.
 - Suggest *two* likely consequences of the arrival of the species in a new habitat.
 - This species is commonly found in climax communities.
Explain the term climax community as used in ecology and name the ecological process that gives rise to climax communities. (21)
- (c) Name and describe a procedure that you would use to estimate the population of the herbaceous plant in a particular habitat. (19)
14. (a) (i) From each of the pairs of terms listed below select the term which describes the liver fluke.
- | | |
|---------------------------------------|-------------------------------|
| protozoan / metazoan; | diploblastic / triploblastic; |
| radial symmetry / bilateral symmetry; | acoelomate / coelomate; |
| segmented / non-segmented. | |
- In the case of the term in each pair that *does not apply* to the liver fluke, name an animal that is described by that term.
 - Planarians are free-living members of the same phylum as liver flukes. Name the phylum and give *two* external structural features of planarians that are *not* found in liver flukes. (35)
- (b) The liver fluke is a common parasite of sheep and cattle.
- Give the term used to describe the animal in which a parasite like the liver fluke spends the greater part of its life cycle.
 - State *two* structural adaptations of the liver fluke to its mode of life. In each case give an advantage of the adaptation.
 - What is the significance of the sporocyst in the life cycle of the liver fluke?
 - Suggest *one* way in which the liver fluke may cause harm to sheep or cattle.
 - Outline *two* measures that a farmer might use to reduce liver fluke numbers. State the effect of each measure on the adult liver fluke or its life cycle. (35)

(a) The mycelium of *Phytophthora infestans* may be found in the leaves of infected potato plants. The hyphae grow through the leaf and put out haustoria at intervals. During the winter mycelia are found in potato tubers. These tubers are responsible for the appearance of blight in the following year.

- (i) Give the meaning of the underlined terms.
- (ii) Describe the spread of the fungus from an infected tuber to a tuber produced in the following growing season.
- (iii) State two ways in which the spread of potato blight may be reduced. State the effect of each method on *Phytophthora* or its life cycle.

(b) (i) What is digestion? Distinguish clearly between mechanical and chemical digestion. Give two examples of mechanical digestion.

(ii) Describe a role of *each* of the following in the human digestive system:

bile, enterokinase, pyloric sphincter, villi.

(iii) Describe the process of ingestion, digestion and egestion in *Amoeba*.

(c) (i) Draw a labelled diagram of a potometer set up for use in an experiment.

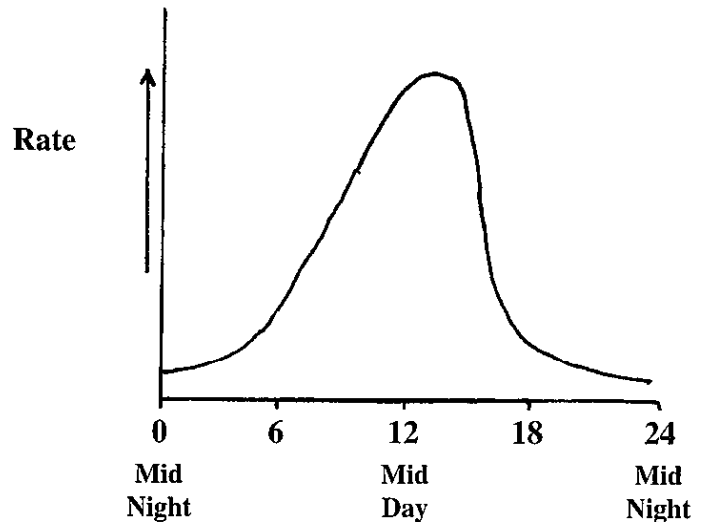
State and give a reason for one precaution which should be taken when setting up a potometer.

(ii) What is an atmometer? Why should an atmometer be used in conjunction with a potometer?

(iii) The graph shows the water loss from a leafy shoot set up in a potometer.

Copy the graph into your answer book and draw on it a second graph to show the fluctuation in water loss from an atmometer over the same period.

Account for the difference between the two results.



(d) (i) Identify, giving your reasons in each case, what is shown in photographs 1 and 2 on the separate page of photographs.

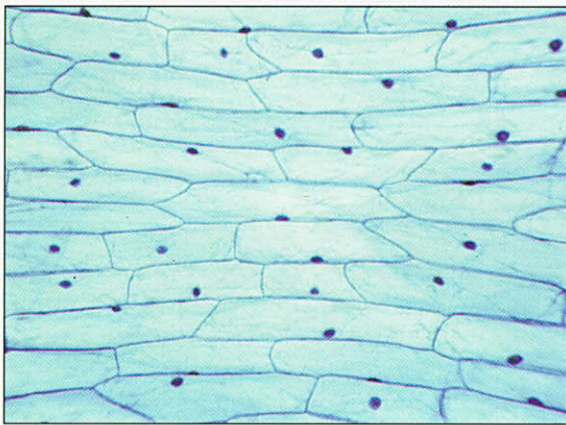
(ii) Write a short explanatory note on the procedure illustrated in photograph number 3.

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA
SCRÚDÚ ARDTEISTIMÉIREACHTA, 1999
LEAVING CERTIFICATE EXAMINATION, 1999

BITHEOLAÍOCHT — ARDLEIBHÉAL
BIOLOGY — HIGHER LEVEL

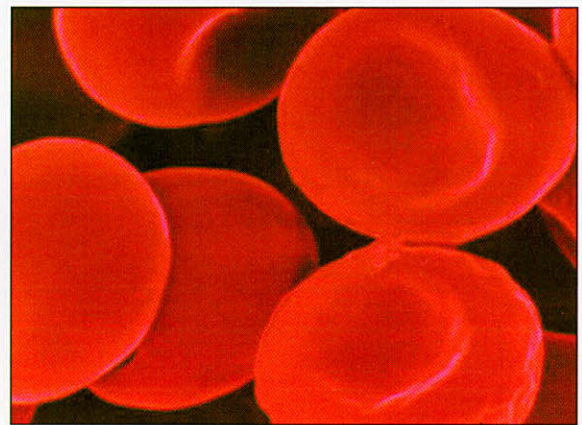
DÉ CÉADAOIN, 16 MEITHEAMH — TRÁTHNÓNA 2.00 go dtí 5.00
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Photographs for Question 15(d)
Grianghraif le haghaidh Ceist 15(d)



1

(x 200)



2

(x 5000)



3