

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, 2000

BIOLOGY — HIGHER LEVEL

WEDNESDAY, 14 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)

Questions 1 – 7

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. In each of the following place a tick (✓) in the correct box.

- (a) Is always present in amino acids:
 nitrogen sulphur phosphorus iron
- (b) Transports deoxygenated blood:
 pulmonary vein renal artery aorta pulmonary artery
- (c) Is **not** a stage of the life cycle of the liver fluke:
 sporocyst zoospore cercaria miracidium
- (d) Is **not** found in animal cells:
 lysosome leucoplast mitochondrion ribosome
- (e) Is the approximate percentage by volume of oxygen in *exhaled* air:
 6% 10% 14% 18%

2. Complete the empty boxes in the following table.

| Vitamin or Mineral | Source in diet | Required for | Deficiency disease | Sign or Symptom |
|--------------------|----------------|--------------|--------------------|-----------------|
| | | | Anaemia | |
| | | | Goitre | |
| | | | Osteoporosis | |
| | | | Scurvy | |

3. Name an organism in each case that fits each of the following descriptions.

- (i) A parasitic, triploblastic acoelomate:
- (ii) A coelomate possessing radial symmetry:
- (iii) An acoelomate possessing radial symmetry:
- (iv) A free-living coelomate **not** possessing limbs:
- (v) A vascular plant which does **not** produce flowers:
- (vi) A non-vascular plant which has adapted to life on land:
- (vii) A parasitic organism which possesses haustoria and produces conidia:

4. (i) State *two* functions of water in the mammalian body.
- 1.....
- 2.....
- (ii) Name a process that occurs in plants but not in animals for which water is essential.
-
- (iii) State *two* ways in which water is normally lost from the mammalian body.
- 1.....
- 2.....
- (iv) Name a chemical which may be used to test for the presence of water.....
- (v) What term is used to describe the quantity of a tissue which remains after all water has been removed?
-

5. The diagram shows the structure of *Rhizopus*.

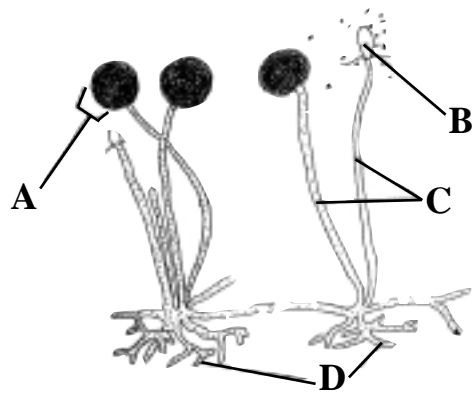
- (i) Name A, B, C and D.

A

B

C

D



- (ii) To which group does *Rhizopus* belong?

.....

Give a reason for placing *Rhizopus* in this group.

.....

.....

- (iii) State a function of D.
-
- (iv) Are the haploid structures produced in A formed as a result of mitosis or meiosis?.....
- (v) What term is used to describe the nutrition of *Rhizopus*?.....
- (vi) State a role in nature for organisms such as *Rhizopus*.
-

6. State the number of each of the named structures in an adult human.

- (i) Long bones in a leg:.....
- (ii) Major blood vessels of the liver:
- (iii) Seminal vesicles in the male:
- (iv) Bones in the middle ear:
- (v) Types of *articulating* bone joints
- (vi) Incisor teeth in a full set:
- (vii) Types of light sensitive cells in the retina:.....

7. The apparatus shown is used to investigate the mineral requirements of plants.

- (i) An essential part of the apparatus has been omitted.

Draw in this part on the diagram.

State why this part is essential.

.....

- (ii) Deionised (or distilled) water must be used in this experiment.

Give the reason for this.

.....

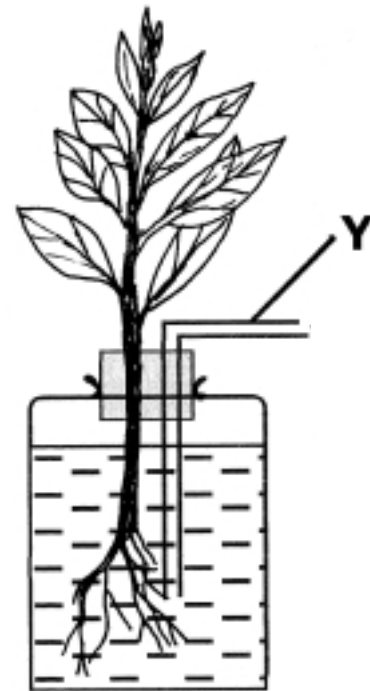
- (iii) What control is used for this experiment?

.....

State the purpose of the control.....

- (iv) To what should tube Y be connected?

- (v) Name a process involved in the uptake of minerals by the roots of plants.....



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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) For each of the following pairs of terms write one sentence that states a relationship between the members of the pair. (Note: definitions of the terms are not required; additional terms may be used in your answer.)
- Multiple alleles and gene.
 - Homologous chromosomes and locus.
 - Genotype and phenotype.
 - X-chromosome and sex linkage.
 - Mutation and radiation. (20)
- (b) Answer this section in relation to chromosomes.
- DNA is one of the two main chemical compounds in chromosomes. Name the other compound.
 - Name a repeating unit in *one* of the compounds in (i) above.
 - Explain the term replication. What is the significance of replication?
 - Draw a simple diagram to show the chromosomes during anaphase of mitosis for a nucleus in which $2n = 4$.
Label *three* parts in your diagram.
 - What have a mammalian sperm and the spore of a moss *or* a fern in common? (28)
- (c) You are supplied with some young onion root tips which include the meristems.
- What is a meristem?
 - Name a stain which you would use to show the presence of chromosomes in the root meristem cells.
 - Describe how you would make a stained preparation of the chromosomes on a microscope slide.
How would you use a microscope to view the prepared slide? (22)
9. (a) Give *two* reasons why insects are classified as members of the phylum Arthropoda and *two* reasons why they are placed in the class Insecta.
Give *one* function for each of the following: (i) antennae; (ii) spiracles; (iii) chitin. (20)
- (b) Define each of the following terms *and* indicate their significance in the life cycle of an insect:
(i) larva; (ii) ecdysis; (iii) metamorphosis.
Give an illustrated account of the life cycle of a butterfly *or* bee. (38)
- (c) Harmful insects may be controlled by one or more of the following methods: mechanical (e.g. sticky paper), chemical (e.g. insecticide), biological (e.g. release of ladybirds to eat aphids).
In the case of each of the control methods given above suggest:
(i) an advantage of using the method; (ii) a disadvantage of using the method. (12)

10. (a) Read the following passage and then answer the questions.

“Black grouse, *Tetrao tetrix*, are a ‘lekking’ species. The males gather annually for courtship displays at traditional lek sites where they jump up and down, and call frantically. The females choose a mate from the posturing crowd. But Jacob Høglund and Sabine Stohr of Uppsala University report in the current issue of *Journal of Avian Biology* (vol. 28, p 184) that they have found an area, some 30 kilometres north-west of Uppsala, where the black grouse do not gather.

‘We could hear them clearly, but there were no leks to be found’ says Høglund. When they tracked down the males, the birds were found to be calling alone.

Høglund says that lekking occurred in the area around 20 years ago so the transition to non-lekking must have occurred quite recently. He suspects that the change in behaviour is related to the habitat. ‘Black grouse leks occur in open spaces, normally in marshy patches within the forest,’ he explains. ‘Here the females can see the males, and both can watch out for goshawks, their major predator.’

‘But in the last two decades, foresters have drained the marshes and allowed birches to colonise former lekking sites. Other changes have included the mix of trees, altering the quality of the forage available to the needle, berry and bud-feeding birds.’ says Høglund. ‘This has lowered the density of the birds to a point when lekking is not a viable strategy.’ ”

(New Scientist; 16 August, 1997.)

- (i) What is ‘lekking’?
- (ii) Suggest a value of lekking.
- (iii) Why do black grouse use open spaces for lekking?
- (iv) What do the authors mean when they say that “lekking is not a viable strategy”?
- (v) Why does lekking appear to have ceased in the area 30 kilometres northwest of Uppsala?
- (vi) From the information provided, are black grouse omnivorous, carnivorous or herbivorous?
- (vii) Suggest a way, other than releasing birds bred in captivity, by which the black grouse population might be increased in the area mentioned in the text. (36)

- (b) (i) Predatory birds such as owls and goshawks regurgitate pellets consisting of the indigestible components of their diet. Outline how a study of these pellets might provide a better understanding of the predator/prey relationship that exists between the goshawks and the black grouse.
- (ii) Describe how, in a given area, you would determine the size of a population of birds such as black grouse. (34)

11. (a) (i) *Amoeba* reproduces only by the asexual process of binary fission. State *one* advantage and *one* disadvantage for *Amoeba* of this form of reproduction.
- (ii) The organisms that result from binary fission are clones. What are clones and why do they result from binary fission?
 - (iii) Give an illustrated account of sexual reproduction in *Spirogyra*. In your diagram indicate the gametes. Why is meiosis *not* involved in the formation of gametes? (31)

- (b) Osmoregulation is not a process of excretion but when the process takes place in *Amoeba* the removal of some waste matter usually occurs.
 - (i) Define osmoregulation.
 - (ii) Describe with the aid of diagrams how osmoregulation takes place in *Amoeba*.
 - (iii) Explain why osmoregulation is not a form of excretion.
 - (iv) Suggest why some waste matter is usually removed during osmoregulation. (24)

- (c) *Amoeba* and *Spirogyra* may be found in the same habitat. The cytoplasm of both organisms is hypertonic to their surroundings. However, *Spirogyra* does not have a process of osmoregulation similar to that of *Amoeba*.
 - (i) Name a habitat in which both organisms may be found.
 - (ii) Define the term hypertonic.
 - (iii) Why does *Spirogyra* not have a process of osmoregulation similar to that of *Amoeba*? (15)

12. (a) Draw a diagram of the apparatus (including a suitable *named* plant) that you would use to investigate the effect of temperature change on the rate of photosynthesis.

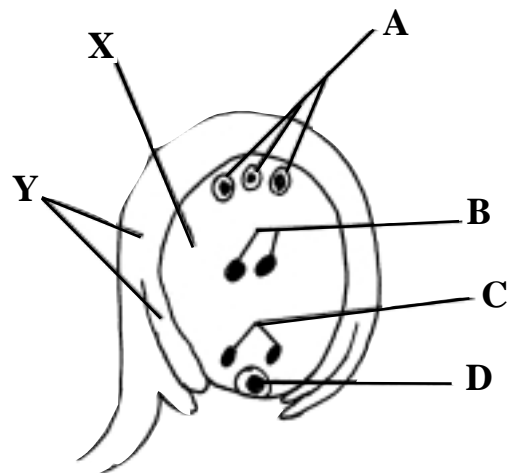
Answer the following questions in relation to the experiment.

- (i) How would you measure the rate of photosynthesis?
- (ii) Name *two* factors which should be kept constant during the experiment.
In the case of *one* of the factors that you have named state how you would keep it constant.
- (iii) Using labelled axes draw a graph of the results that you would expect to obtain.
Explain why the graph has the shape that you have drawn. (36)

- (b) (i) Outline the main events of the light phase of photosynthesis.
- (ii) Iodine solution is used to detect the presence of starch.
When the starch test is being applied to plant leaves, certain additional procedures are necessary.
Describe these procedures and state why each is necessary. (34)

13. The diagram shows the structure of an ovule of a flowering plant.

- (a) (i) Name the nuclei labelled A, B, C, D.
In each case, state whether the nucleus is haploid or diploid.
- (ii) Which of the nuclei A, B, C, D is/are *not* involved in the process of fertilisation?
- (iii) Which of the nuclei A, B, C, D will, as a result of fertilisation, become the zygote nucleus of the new plant?
- (iv) Name the structure labelled X.
X represents the female gametophyte.
What is a gametophyte?
- (v) "In flowering plants the gametophyte is *not* the dominant generation."
What does this statement mean?



- (b) (i) Copy an outline of the diagram into your answer book and add, with suitable labels, the pollen tube just before fertilisation takes place. Name the aperture through which the pollen tube enters the ovule.
- (ii) The growth of the pollen tube towards the ovule is an example of positive chemotropism.
Explain the underlined term.
- (iii) Following fertilisation what does an ovule become? What will form from the structures labelled Y? (25)

14. (a) Enzymes act as catalysts to metabolic reactions. They usually show a high degree of specificity in respect to their substrates.

- (i) Explain each of the underlined terms.
- (ii) Give an example of enzyme specificity.
- (iii) What is the chemical nature of an enzyme?
- (iv) What is a denatured enzyme? State two ways in which an enzyme may be denatured.
- (v) Some enzymes are produced in an inactive form known as a precursor. Give an example.
Suggest a reason why it may be essential for the body to produce an enzyme in precursor form. (30)

- (b) Describe how an enzyme works. (19)

- (c) You have been asked to carry out an experiment to investigate the effect of increasing the inhibitor concentration on the rate of enzyme action.

- (i) Assuming that the inhibitor is in solution, describe how you would produce a number of solutions of different concentrations.
- (ii) List *three* factors which should be kept constant during the experiment. State how you would keep *one* of the factors constant during the experiment.
- (iii) Using labelled axes draw a graph of the results you would expect to obtain. (21)

15. Answer *two* of the following.

(35,35)

- (a) For *each* of the following state (i) a location in the human body where it is found; (ii) a function.
acetylcholine, melanin, haemoglobin, hydrochloric acid, mucilage, co-enzyme A, rhodopsin.
- (b) (i) What is a hormone?
(ii) State *two* ways in which hormonal stimulation differs from nervous stimulation.
(iii) Describe an experiment to demonstrate the action of auxin in causing the bending of plants in response to light.
- (c) Answer the following questions in relation to bacteria.
(i) State *two* ways in which a bacterial cell differs from a typical plant cell.
(ii) Name *two* human diseases for which bacteria are responsible.
(iii) Give *two* ways in which bacteria assist in the circulation of nitrogen in nature.
(iv) State how parasitic bacteria can survive for long periods outside the host body.
(v) State a role of parasitic bacteria in the overall scheme of nature.
(vi) Certain chemical components of bacterial cells are antigenic. What does antigenic mean?
(vii) Suggest a possible consequence for bacterial populations of the excessive use of antibiotics in agriculture and medicine.
- (d) (i) Describe an experiment to demonstrate that respiring organisms produce heat energy. Include in your answer a labelled diagram of the apparatus that you would use.
(ii) Draw a labelled diagram of a mitochondrion. In your diagram place X where the Krebs's Cycle occurs and Y where hydrogen carriers are located.
(iii) Where does glycolysis occur in a cell? What happens to a glucose molecule in the course of glycolysis?