

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, 2001

BIOLOGY — HIGHER LEVEL

WEDNESDAY, 13 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 appropriate box.

(a) An element found in all amino acids:

sulfur chlorine nitrogen phosphorus

(b) The human haploid chromosome number:

22 23 24 25

(c) A mineral required for blood clotting:

iron zinc magnesium calcium

(d) **Not** part of a carpel:

stigma anther ovary style

(e) A structure **not** associated with the heart:

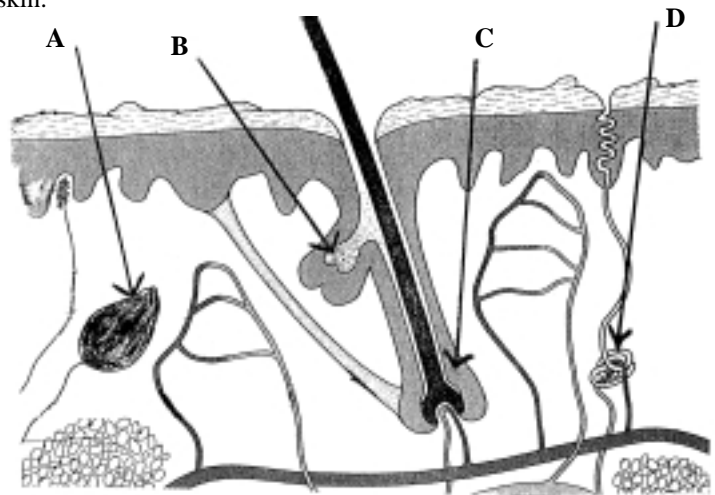
cardiac sphincter bicuspid valve pacemaker tricuspid valve

2. In each of the following cases name an organism that fits the description.

- (i) A flatworm whose adult stage does not live in water
- (ii) A plant that has pyrenoids in its cells
- (iii) A plant that has conceptacles
- (iv) A xerophyte
- (v) An organism that reproduces by budding
- (vi) An organism that has haustoria
- (vii) An animal that has tube feet

3. The diagram shows a vertical section through human skin. Name the parts labelled A, B, C, D.

- A.....
- B.....
- C.....
- D.....



Name **two** liquid secretions of the skin

- 1.....
- 2.....

State **two** functions of the skin that are not related to the secretion of substances.

- 1
- 2

What is a germ layer?

From which germ layer is skin derived?.....

Name a vitamin required for healthy growth of skin.....

LEAVING CERTIFICATE EXAMINATION, 2001

BIOLOGY — HIGHER LEVEL

WEDNESDAY, 13 JUNE — AFTERNOON 2.00 to 5.00

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.

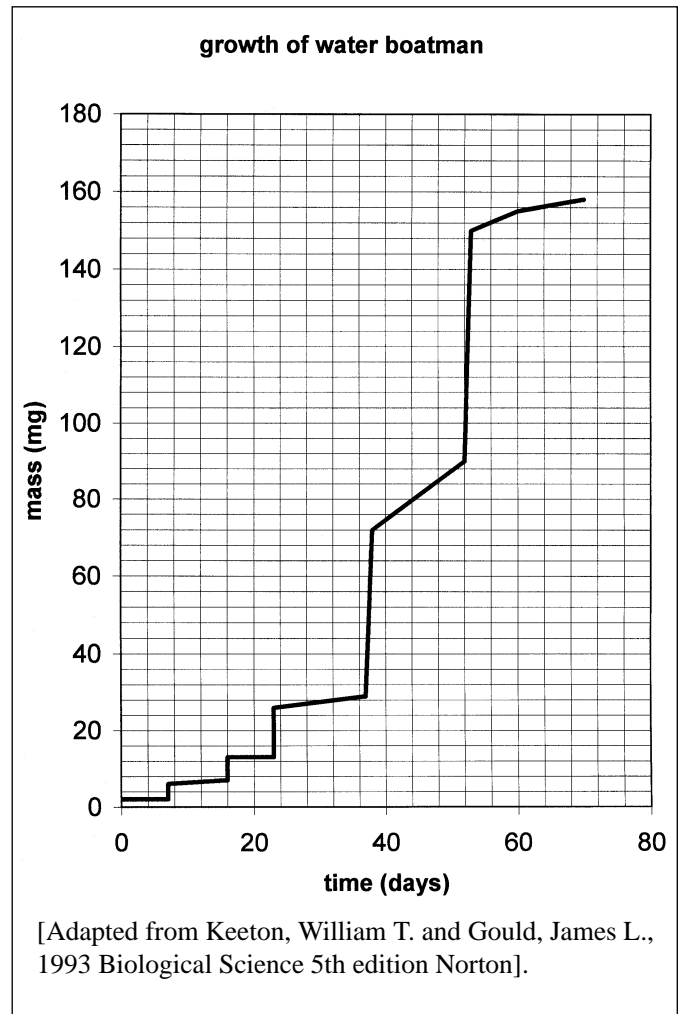
Answer **four** questions. Each question carries 70 marks.

8. (a) Explain the following terms as used in genetics: heterozygous, autosomes, locus, haploid, mutation, phenotype. (18)
- (b) In the flour beetle *Tribolium castaneum* the allele for black eye (**B**) is dominant to the allele for pearl eye (**b**) and the allele for brown body (**S**) is dominant to the allele for sooty body (**s**). These two pairs of alleles are not linked.
- (i) Explain the underlined term.
 - (ii) What is the significance of the fact that the two pairs of alleles are not linked?
 - (iii) Give the genotype of an individual that is heterozygous in respect of eye colour and body colour.
 - (iv) Give the genotypes of the gametes that the individual in (iii) can produce.
 - (v) Give the possible genotypes and phenotypes of the progeny of a cross between the individual in (iii) and a beetle with pearl eye and sooty body.
 - (vi) Give **two** other genotypes that would give rise to an individual with black eye and brown body. (37)
- (c) State **one** source of evidence for evolution. Explain how the study of this evidence supports the theory of evolution. (15)
9. (a) Explain the following terms: translocation, transpiration, transpiration stream. Name the principal tissue involved in (i) translocation, (ii) the transpiration stream. (15)
- (b) Describe, with the aid of a labelled diagram, an experiment to demonstrate that the rate of transpiration is affected by light intensity. Draw a graph of the results that you would expect to obtain from the experiment. (34)
- (c) What is plasmolysis? Draw diagrams of a cell as seen under the light microscope before and after plasmolysis. Describe the role of plasmolysis in food preservation. (21)

10. (a) (i) State **three** functions of the human skeleton.
- (ii) Draw a labelled diagram to show the structure of an articulating joint as seen in vertical section. For **three** of the parts that you have labelled state **one** function in each case.
- (iii) Name **one** mineral and **one** vitamin required for bone growth. (39)

(b) The graph shows the increase in mass of a freshwater insect, the water boatman, in the days following hatching. The increase in mass during periods of ecdysis is due to the intake of water.

- (i) Name a substance that strengthens the exoskeleton of the water boatman.
- (ii) Name a group of organisms other than the Arthropoda in which the substance that you have named in (i) is found.
- (iii) From the graph state how many times ecdysis occurs in the life of a water boatman.
- (iv) How many days elapsed between the last two ecdyses?
- (v) What was the maximum mass gained after a single ecdysis?
- (vi) Suggest a reason for the intake of water during ecdysis.
- (vii) Frog tadpoles, like larval insects, undergo metamorphosis but do not undergo ecdysis. What is metamorphosis? Why is ecdysis unnecessary in frog tadpoles?
- (viii) The exoskeleton in insects imposes certain limitations. State **one** such limitation (other than on growth) and describe how it has been overcome.



(31)

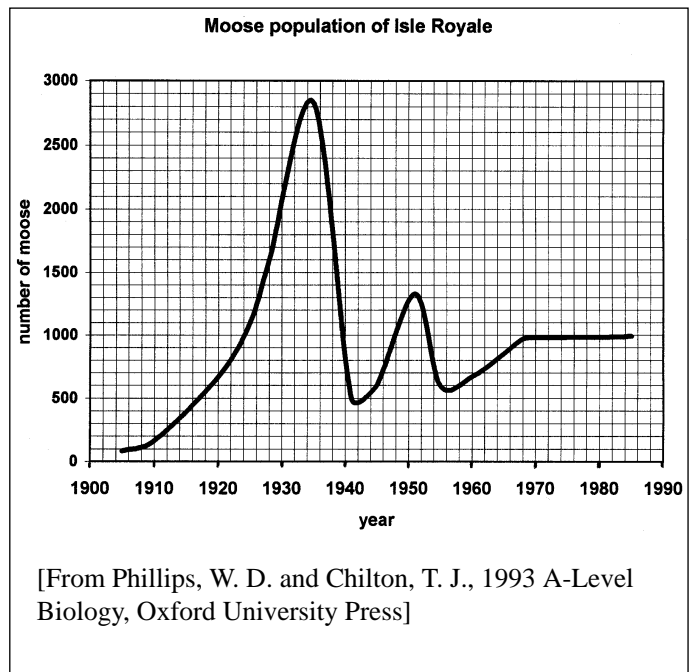
11. (a) (i) What is a virus? State **two** differences between a virus and a bacterium.
- (ii) Unlike bacteria, viruses cannot be grown on agar in the laboratory. Why is this?
- (iii) Influenza is a common disease caused by a virus. Name **three** other diseases caused by viruses.
- (iv) State **two** ways in which a person may contract a viral disease.
- (v) Explain the biological basis of vaccination.
- (vi) What is an antibiotic? (36)

(b) Draw a word diagram to illustrate the main events of the nitrogen cycle. Name a bacterium involved in the nitrogen cycle and state its role. (34)

12. Give a precise biological explanation for each of the following observations.

- (a) When a hedge is cut regularly it becomes thicker due to the growth of side shoots.
- (b) A person's face turns red during periods of heavy exercise.
- (c) Blight is likely to appear in a potato crop if the same ground is used for a number of years.
- (d) On a hot summer's day water droplets may appear on the leaves of tomato plants in a greenhouse.
- (e) *Spirogyra* may appear quickly in a pond that has refilled after drying up.
- (f) There is a low incidence of liver fluke in cattle on well-drained pasture.
- (g) After heavy exercise a person's breathing may remain faster than normal for a number of minutes.
- (h) If a geranium plant and a container of limewater are placed under a bell jar in bright light the limewater is unlikely to turn milky.
- (i) A middle-aged person may require spectacles with convex lenses.
- (j) The human male is more likely to suffer red-green colour blindness than the female.

13. (a) The graph shows the changes in the moose population on Isle Royale in Lake Superior, Canada. Moose colonized the island at the beginning of the twentieth century. No predators were present until the arrival of timber wolves in 1949. Moose then became the main prey species of the timber wolves.



- (i) Explain the terms predator and prey.
- (ii) Suggest a reason for the rapid expansion of the moose population between 1925 and 1935 other than the absence of predators.
- (iii) Suggest a reason for the decline in the moose population between 1935 and 1940.
- (iv) What changes took place in the moose population after the arrival of the timber wolves?
- (v) Would you expect a similar population trend for moose if an endoparasite rather than a predator arrived on the Isle Royale in 1949? Explain your answer.
- (vi) Name a habitat that you have studied. From this named habitat give an example of a predator/prey relationship. (39)

(b) A soil sample was analysed and the following results were obtained.

pH	5.4
% Air (volume)	3.8
% Water (mass)	85.3

- (i) Why would this soil be considered an unsuitable medium for crop growth?
- (ii) How would you increase the pH of this soil?
- (iii) Describe how the percentage water of the soil sample was estimated.
- (iv) Name **three** other soil components. (31)

14. (a) (i) Define excretion. Why is egestion not a form of excretion?
(ii) Nitrogenous substances are excreted by *Amoeba* and the earthworm. Name a nitrogenous waste substance. In the case of **one** of these organisms state how excretion takes place.
(iii) Where are nitrogenous excretory substances made in the human body? (18)
- (b) Draw a large labelled diagram of a human nephron. Include the nephron's vascular supply in your diagram. (28)
- (c) The production of urine in the nephron involves filtration and reabsorption.
(i) State where filtration occurs in the nephron.
(ii) Account for the development of the filtration pressure.
(iii) How does glomerular filtrate differ from blood?
(iv) State where glucose is reabsorbed in the nephron.
(v) What process is involved in the reabsorption of glucose?
(vi) Name another substance that is reabsorbed in the nephron.
(vii) State a function of the nephron other than excretion. (24)
15. Answer *two* of the following. (35, 35)
- (a) Most seeds pass through a dormant period before germination.
(i) Explain the underlined terms.
(ii) State **one** advantage of the dormant period.
(iii) Give an illustrated account of hypogeal germination.
(iv) Describe an experiment to demonstrate that oxygen is essential for germination.
- (b) (i) Distinguish between mechanical and chemical digestion.
(ii) Describe the role of each of the following in human nutrition: stomach, liver, ileum and pancreas.
(iii) Describe a function of the pancreas apart from that mentioned in (ii).
- (c) (i) Draw a labelled diagram of a chloroplast as seen under an electron microscope. Indicate with an X on your diagram the site of the dark phase reactions.
(ii) Name another plastid other than a chloroplast and state its function.
(iii) CO₂, ATP and NADPH₂ are required for the dark phase reactions. State the source of each of these.
(iv) Describe briefly the main events of the dark phase.
- (d) Gametophyte and sporophyte stages occur in the life cycle of many plants.
(i) Explain each of the underlined terms.
(ii) Name a plant that has a gametophyte generation.
(iii) Draw a labelled diagram of the gametophyte generation of the plant that you named in (ii).
(iv) What is meant by heterogamy?
(v) Outline the trends in the evolution of the sporophyte generation.

4. For each of the following state
 (i) where it is found (ii) its function

(a) lenticel (i)

(ii)

(b) otolith (i)

(ii)

(c) corpus luteum (i)

(ii)

(d) guard cell (i)

(ii)

(e) spermatheca (i)

(ii)

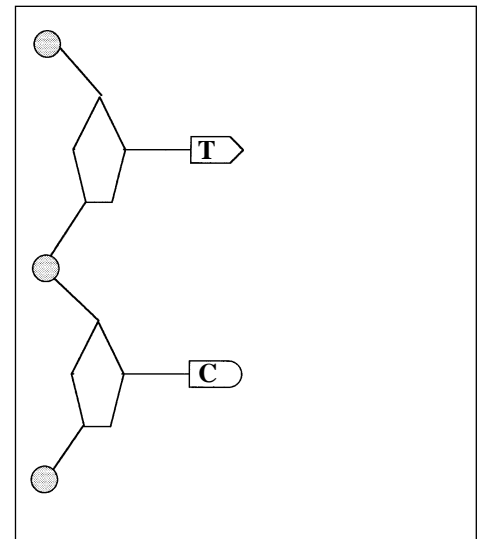
5. The diagram shows an incomplete section of a DNA molecule.

In the space provided complete this section of the DNA molecule.

When you have completed the diagram label all the parts you have drawn.

Name a stain that may be used to detect DNA.

.....



The DNA in chromosomes is capable of being replicated.

What is replication?

.....

What is the significance of the replication of the DNA in chromosomes?

.....

When does the replication of the DNA in a chromosome take place?

.....

6. What term is used to describe glands that secrete hormones?.....

How does a mammalian hormone reach its target organ?.....

State **two** differences between hormonal and nervous stimulation.

1.....

2.....

Name a hormone in each of the following cases:

causes contraction of the womb during birth.....

deficiency results in cretinism.....

secreted in times of stress.....

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

(a) peptide and protein.....

.....
.....

(b) fibrinogen and fibrin.....

.....
.....

(c) ureter and urethra.....

.....
.....

(d) cerebrum and cerebellum.....

.....
.....

(e) collenchyma and sclerenchyma.....

.....
.....

BLANK PAGE

BLANK PAGE