WARNING

This Question Paper MUST be returned with your answer book(s) at the end of the Examination: otherwise marks will be lost.

M. 44

Write your Examination Number here ☞

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

LEAVING CERTIFICATE EXAMINATION 2002

BIOLOGY - HIGHER LEVEL

WEDNESDAY, 12 JUNE - AFTERNOON, 2.00 to 5.00

Answer **six** questions from Part 1 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.

PART II (280 marks)

Questions 8 – 15

Write your answers to this part in your answer book.
Answer **four** questions.
Each question carries 70 marks.

PART I (120 marks)

Answer **six** questions. Each question carries 20 marks.
Write your answers in the spaces provided.
Keep your answers short.

1. Answer **five** of the following

(a) State the location of the epiglottis ……..

(b) Name the structure in the mammalian ovary that secretes progesterone …….

(c) State the function of the Eustachian tube ……..

(d) What have corms and rhizomes in common? ……...

(e) State the function of guard cells in a leaf ……...

(f) State the location of the pyloric sphincter ……...

2. State a use for each of the following in the laboratory

(a) Alkaline pyrogallol ……...

(b) Bicarbonate indicator ……...

(c) Cobalt chloride paper ……...

(d) Iodine solution ……...

(e) Sodium hydroxide (soda lime) ……...

(f) Lime water ……...

(g) Fehling's (or Benedict's) solution ……...

3. Select the correct partner for each term in column I from the following list of terms and write it in column II.

Rhizoid, archegonium, involuntary muscle, bone, columella, diploid, synovial fluid, amnion, budding, mucosa, triploid, skin, diaphragm, sperm, haustorium.

Column I	Column II
Duodenum	…….
Phytophthora	……..
Endosperm	……..
Acrosome	……..
Malpighian layer	……..
Inhalation	……..

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

(a) Obligate parasite ……...

(b) Possesses a dominant gametophyte generation ……...

(c) Possesses a dominant sporophyte generation ……...

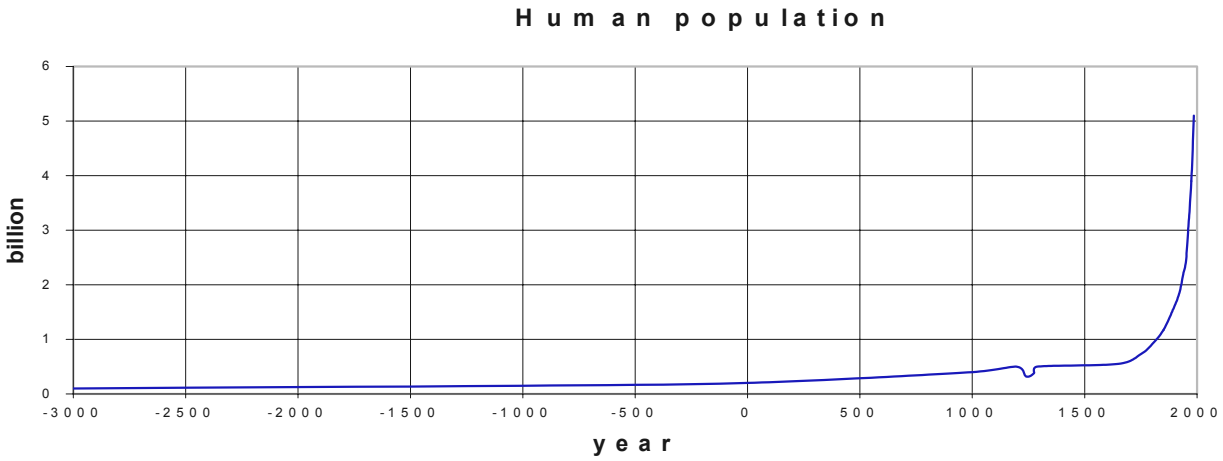
(d) Autotroph ……...

(e) Vector of a viral disease ……...

(f) Biennial ……...

(g) Possesses a body temperature that varies with environmental temperature ……...

5. Study the graph of the human population and answer the following questions.



(a) Suggest **two** reasons why the population showed little increase between 3000 BC and 1000 AD.

(i) ……

(ii) ……

(b) The graph shows an interruption in the population growth between 1000 AD and 1500 AD. Suggest a reason for this.

……

(c) Give **two** possible reasons for the eventual massive increase in the human population.

(i) ……

(ii) ……

(d) A population cannot continue to expand indefinitely. Suggest **one** reason for this.

……

(e) A population of wild animals is very unlikely to show a pattern of population growth similar to the human one. Why do you think this is the case?

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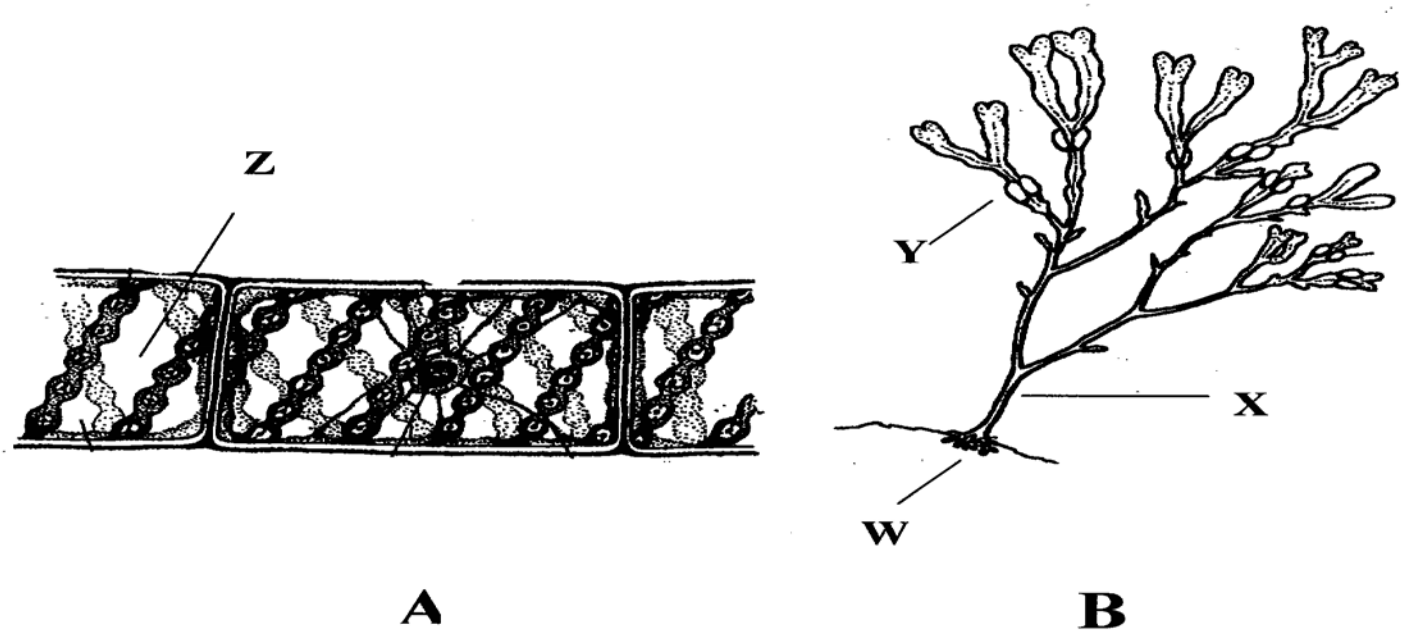
6.



(i) To what group do both organisms **A** and **B** belong? ……

(ii) Name W, X, Y, Z

W …….. Y ……

X …….. Z ……..

(iii) In the case of each organism state whether the nuclei of its cells are haploid or diploid.

A …….. B ……

(iv) What is the normal form of reproduction used by organism B? ……

(v) How does structure Y benefit the organism? ……...

7. Distinguish between the members of the following pairs of terms by writing a short phrase about **each member**.

(a) nucleus and nucleolus

……

……

(b) antibiotic and antigen

……

……

(c) gamete and gametophyte

……

……

(d) bacillus and coccus

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……

(e) prothrombin and thrombin

……

……

PART II (280 marks)

Write your answers to this part in your answer book.
Answer **four** questions.
Each question carries 70 marks.

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8. (a) Describe the structure of DNA and briefly explain its role in heredity. **(21)**

(b) "Variation may result from mutation".

(i) Explain the underlined terms.

(ii) Comment on the validity of the statement above.

(iii) State **two** agents responsible for mutation. **(21)**

(c) What is evolution? Describe how studies of the following provide evidence for the occurrence of evolution:
(i) palaeontology (fossil record) (ii) comparative anatomy (iii) embryology **(28)**

9. (a) Describe how you would dissect a mammal (e.g. rabbit) to display the alimentary canal and its associated glands. **(22)**

(b) Give an account of the liver and the pancreas under each of the following headings:

(i) location in the body (ii) role in digestion.

State **one** function of each of these glands other than in relation to digestion. **(24)**

(c) Describe how you would investigate the relationship between temperature change and the rate of enzyme action for a **named** enzyme. Include a labelled diagram of the apparatus you would use. **(24)**

10. Give a concise biological reason for each of the following:

(i) *Amoeba* expels water by means of its contractile vacuole.

(ii) Ecdysis occurs more than once during an insect's larval period but does not occur in the adult stage.

(iii) The starfish is classified in the phylum Echinodermata.

(iv) Circular and longitudinal muscles both play a role in the movement of earthworms.

(v) Moving sheep to high ground at a certain time of year helps to reduce the risk of liver fluke.

(vi) A vascular system is present in the earthworm but not in the liver fluke.

(vii) Insects and spiders are placed in different classes of the phylum Arthropoda.

(viii) Agricultural soils benefit from the presence of earthworms.

(ix) The snail is classified in the phylum Mollusca.

(x) Metamorphosis does not occur in mammals. **(70)**

11. (a) Dry weight is used in certain investigations in plant physiology.

(i) What is dry weight and why is it used?

(ii) In the determination of dry weight a certain temperature is not exceeded. What is that temperature and why is it important that it is not exceeded?

(iii) Is it equally important not to exceed this temperature when obtaining the dry weight of a soil sample? Explain your answer. **(20)**

(b) Sketch a graph with suitably labelled axes to show the dry weight changes of batches of seeds and seedlings from the beginning of germination to the establishment of young plants. Explain the changes that you have shown in your graph. **(20)**

(c) The changes in dry weight that you have shown in your graph in (b) are primarily due to processes taking place in two types of organelle. Name these **two** organelles and draw a labelled diagram of each of them. **(30)**

12. (a) Describe with the aid of labelled diagrams the external structure in summer of:
(i) a **named** deciduous tree (ii) a **named** conifer. **(24)**

(b) Give an illustrated account of the process of secondary thickening in plants. Suggest **two** ways in which this process is of benefit to a plant. **(22)**

(c) Write notes on **three** of the following; primary meristems, lenticels, sclerenchyma, phloem. **(24)**

13. (a) Explain briefly the meaning of the following terms as used in ecology; predator, producer, food niche, mesophyte, succession, biosphere. **(18)**

(b) Answer the following questions in relation to the capture/recapture method for investigating the size of a **named** animal population.

(i) How might the animal be captured?

(ii) Comment on the distribution of capture points in the study area.

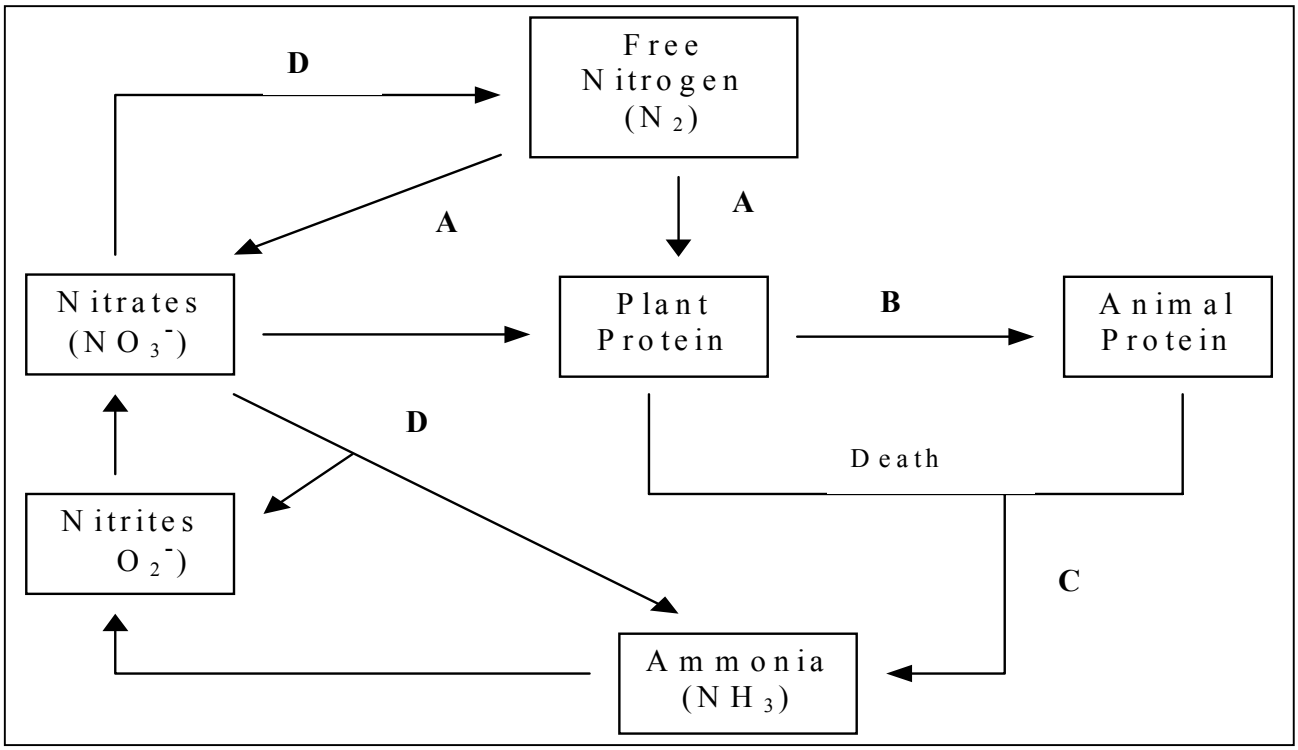
(iii) Suggest a suitable form of tag for the animal.

(iv) Where precisely should each tagged animal be released?

(v) Show, by means of an example, how the population size is determined from the figures obtained in the investigation. **(24)**

(c) Write a short essay entitled "The decline of commercial fish stocks in the Irish Sea". In your essay mention **two** possible causes of decline and suggest **two** ways in which the decline might be reversed. **(28)**

14.



(a) Answer this section in relation to the diagram.

(i) What term is used to describe the events shown in the diagram?

(ii) What is process A? Name a plant that is especially associated with process A.

(iii) State **two** ways in which nitrates enter the root hairs of plants.

(iv) What form of nutrition is involved in process B?

(v) What is process C? Name **two** groups of organisms responsible for process C. State the form of nutrition of these two groups of organisms in the context of the diagram.

(vi) What is process D? **(33)**

(b) Describe how you would grow a pure culture of one species of soil organism involved in C above. Assume that the soil sample with which you start contains many species of these organisms. **(19)**

(c) (i) Could the procedure that you have indicated in (b) be used to grow a culture of viruses? Explain your answer.

(ii) State **two** ways in which viruses differ in structure from one of the groups of organisms that you have named in (a) (v) above.

(iii) Give **one** example in each case of a disease caused by a virus in wild animals and in crop plants. **(18)**

15. Answer **two** of the following. **(35, 35)**

(a) (i) Distinguish between transpiration and guttation.

(ii) What environmental conditions would lead to the occurrence of guttation?

(iii) Name and draw the apparatus that you would use to demonstrate transpiration. Describe how you would set up and use this apparatus.

(iv) Plants that are adapted to life in arid regions are termed xerophytes. Name **one** xerophyte and state **two** adaptations that are indicative of its xerophytic nature.

(b) (i) Explain the following terms; allele, locus, homologous chromosomes, heterosomes, sex (X) - linkage.

(ii) Red/green colour blindness is a sex (X)-linked condition in humans. If a colour blind man married a carrier (heterozygous) woman, what is the probability (in percentage or fraction) that
1. a son of this marriage will be colour blind?
2. a daughter of this marriage will be colour blind?

Explain how you determined these probabilities.

(c) (i) Explain clearly the relationship between blood and lymph. Use a labelled diagram, including capillaries and a small lymph duct, in support of your answer.

(ii) How is lymph circulated?

(iii) Describe the transport function and defensive function of the lymphatic system.

(d) (i) What is a hormone? State **two** ways in which hormonal stimulation differs from nervous stimulation.

(ii) Give an account of the functions of thyroxine. Refer in your answer to **two** diseases that result from abnormal functioning of the thyroid gland.

(iii) Describe an experiment that you could carry out to investigate the effect of thyroxine or iodine concentration on the metamorphosis of frog tadpoles.