

**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, 1998

**BIOLOGY — HIGHER LEVEL**

WEDNESDAY, 17 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) An element involved in blood clotting:

calcium       magnesium       iron       zinc

(b) An organelle found only in plant cells:

leucoplast       Golgi body       ribosome       lysosome

(c) A vitamin associated especially with citrus fruits (e.g. oranges):

vitamin A       vitamin C       vitamin D       vitamin E

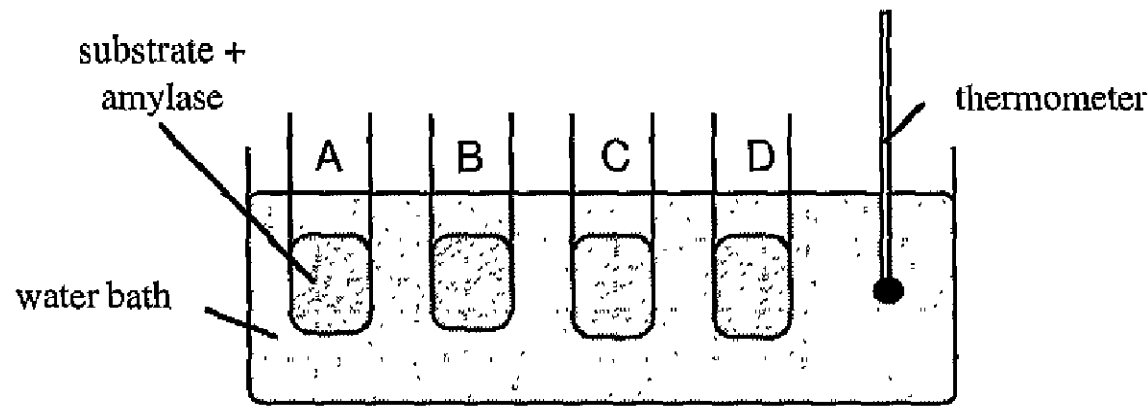
(d) In the binomial classification system an organism is described in terms of its:

phylum and class       class and species       genus and species       family and genus

(e) The correct sequence of bones in the middle ear, starting from the eardrum, is

anvil (incus)	stirrup (stapes)	hammer (malleus)	<input type="checkbox"/>
anvil	hammer	stirrup	<input type="checkbox"/>
hammer	anvil	stirrup	<input type="checkbox"/>
hammer	stirrup	anvil	<input type="checkbox"/>

2. The diagram shows an experiment set up to investigate the effect of change of substrate concentration on the rate of action of human salivary amylase.



- (a) Name the enzyme's substrate. ....
- (b) How would you vary substrate concentration?.....  
 .....  
 .....
- (c) The water bath is set to maintain the enzyme at its optimum temperature during the experiment.  
 State this temperature. ....
- (d) Give one other factor which should be kept constant during the experiment. ....
- (e) State how the factor named in (d) may be kept constant. ....  
 .....
- (f) What would you measure in order to determine the rate of reaction of the enzyme? .....  
 .....  
 .....
- (g) Name the product of amylase action. ....

3. (a) A virus is described as an obligate parasite. State the meaning of the underlined term. ....  
 .....  
 .....
- (b) Name the two main substances which together form a virus.  
 .....
- (c) Which of the substances that you have named in (b) stimulates antibody formation in human blood?  
 .....
- (d) Underline the disease(s) caused by viruses.  
 tuberculosis      influenza      tetanus      rabies
- (e) State one way in which a virus reaches new hosts.....  
 .....

4. (a) What is meant by dry weight? .....

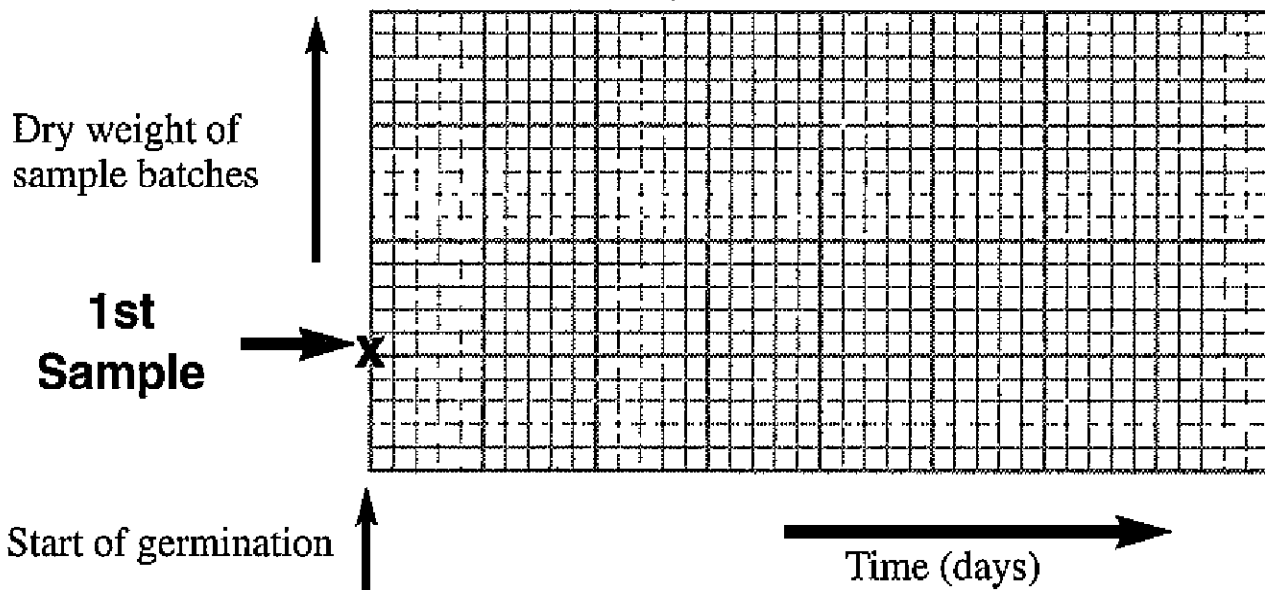
.....

How is dry weight determined in the laboratory? .....

.....

(b) Three hundred bean seeds were grown in the laboratory. At five-day intervals batches of 20 seedlings were removed and their dry weight determined.

(i) Using the axes provided below sketch a graph to show the changes which you would expect in the dry weight of the batches during the germination of the seeds and subsequent growth of the seedlings. The first sample is marked on the graph.



(ii) Name a substance which, because of its changing quantities in the seed/seedling, could be responsible for the changes shown in your graph. ....

(iii) Why was a batch of twenty seedlings weighed each time instead of a single seedling?  
 .....  
 .....

5. From the list below select, in each case, *one* substance which fits the description.

lignin, hydrochloric acid, glycogen, Fehling's solutions, prothrombin, lipase, cobalt chloride, lime water, suberin, sodium hydroxide, alkaline pyrogallol.

(a) A substance used to detect the presence of water. ....

(b) A substance associated with bark. ....

(c) A substance associated with sclerenchyma but not with phloem. ....

(d) A substance used to absorb oxygen. ....

(e) A substance used to remove carbon dioxide. ....

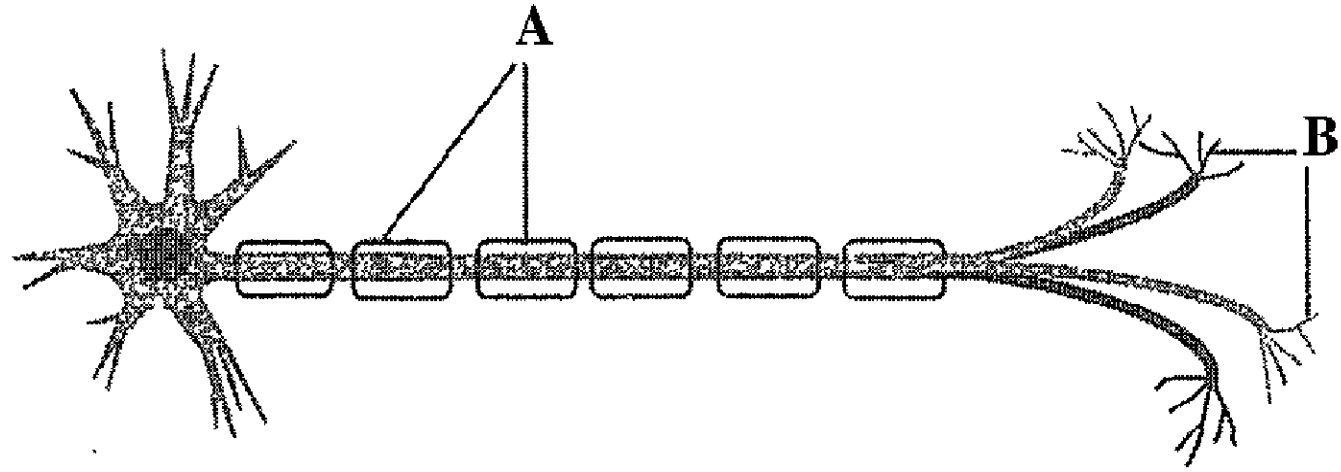
(f) A substance used to show the presence of carbon dioxide. ....

(g) A substance which is not an enzyme but which breaks down starch in the human alimentary canal. ....

6. In the case of each of the following diagrams

(i) name the structure shown; (ii) name the parts labelled A and B; (iii) state a function of A.

(a)



(i) .....

(ii) A ..... B .....

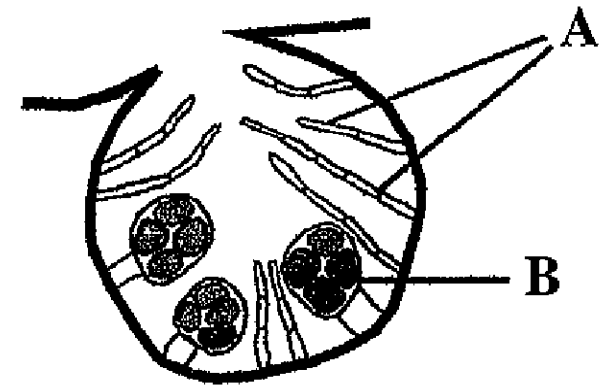
(iii) .....

(b) (i) .....

(ii) A.....

B.....

(iii) .....



7. Answer the following:

(i) Name an animal in which ecdysis occurs in the life cycle.....

(ii) What type of lens is used in the correction of short sight? .....

(iii) Where is the organ of Corti located? .....

(iv) Where are companion cells to be found in a plant? .....

(v) Chromatography is used for .....

(vi) Lichens consist of algae and .....

(vii) Plasmolysis can occur when a cell has lost too much .....

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## BIOLOGY — HIGHER LEVEL

WEDNESDAY, 17 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 terms homozygous *and* heterozygous.

In some breeds of cattle the polled (i.e. without horns) condition is dominant to the horned condition. Using suitable symbols write genotypes for each of the following:

- (i) An animal that is horned.
- (ii) An animal that is heterozygous in respect of the polled condition.
- (iii) The possible gametes of the animals described in (i) and (ii).

In a cattle-breeding programme semen from a polled bull was used to inseminate a herd of polled cows of the same breed as the bull. One of the resulting calves was horned.

State the genotype of the bull *and* the genotype of the mother of the horned calf. (27)

- (b) Indicate how the behaviour of the chromosomes in meiosis and fertilization relates to the inheritance of the alleles of a gene such as in the cross in (a) above. (24)

- (c) Name the type of substance which is combined with DNA to form chromosomes.

Outline how you would demonstrate the presence of DNA in a tissue such as onion root meristem. (19)

9. Describe in detail how you would carry out *each* of the following. (24, 24, 22)

- (a) Determination of the relationship between light intensity and the rate of transpiration.
- (b) Demonstrate that chlorophyll is necessary for photosynthesis.
- (c) Determination of the effect of a deficiency of magnesium on the growth of a plant.

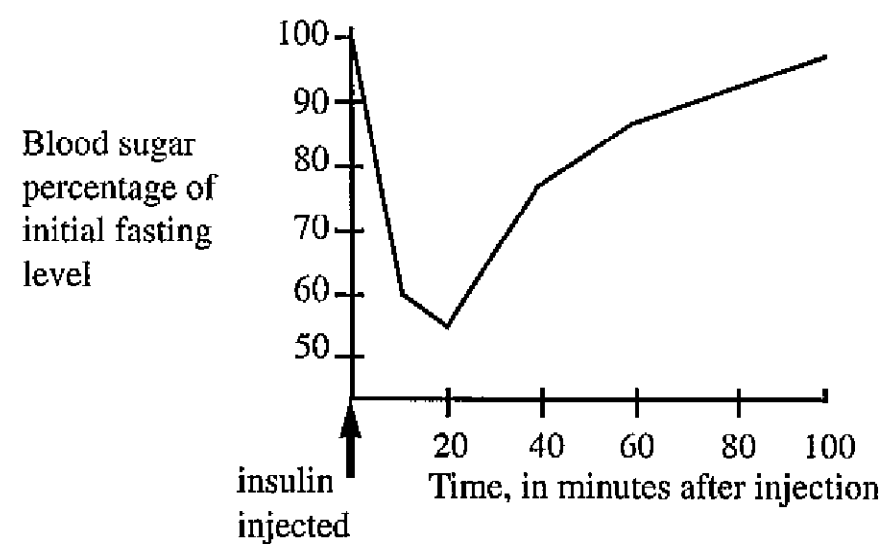
10. The term homeostasis means the maintenance of a constant internal environment in a living organism. In the mammalian body important features of the internal environment which must be kept constant include the volume and concentration of body fluids, temperature and glucose concentration.

(a) Explain with the aid of a diagram of the nephron how the volume and concentration of body fluids are maintained at fairly constant levels. (28)

(b) Outline how the skin and the blood vascular system assist in the maintenance of a constant body temperature. (24)

(c) The graph shows how the injection of the hormone insulin affects the the level of blood glucose in a person. (From: The Open University (1972) S22, 'Comparative Physiology; Unit 9 Hormones and Homeostasis: Blood Glucose and Blood Calcium', The Open University Press.)

- (i) Name the specialised cells which secrete insulin and state where they are located.
- (ii) State, from the graph, the effect of injecting insulin.
- (iii) For how long, following injection, did the insulin affect the level of blood glucose?
- (iv) Suggest a possible fate other than respiration of some of the blood's glucose in the minutes following the injection of insulin. (18)



11. (a) In *each* of the following cases name an animal which fits the description and state whether or not each animal named is free-living:

- (i) Triploblastic acoelomate;
- (ii) Radially symmetrical;
- (iii) Segmented coelomate;
- (iv) Diploblastic. (24)

(b) What is external fertilization? Is fertilization internal or external in the earthworm?

Draw labelled diagrams (including relevant segment numbers) of earthworm(s) to illustrate:

- (i) The location of the various *external* reproductive openings on the body wall;
- (ii) Copulation. (31)

(c) In the case of *each* of the following animals state one way in which an activity of that animal has a beneficial *or* a harmful effect in relation to agriculture:

- (i) Earthworm;
- (ii) Mud snail (*Limnaea truncatula*);
- (iii) Honey bee;
- (iv) Liver fluke;
- (v) Rabbit. (15)

12. (a) In relation to Fungi explain the following terms: hypha, mycelium, haustorium, aseptate, sporangium. (15)

(b) Read the following extract and then answer the questions below.

'In general, healthy plant leaves and stems do not provide a suitable environment for a large amount of microbial growth but they do have their own characteristic microfloras. The roots, however, are surrounded by a region called the rhizosphere where microbial nutrients are provided by excretion from the plant and where environmental conditions do not fluctuate as much as above ground. Consequently, the number of microorganisms in this region may be many times greater than in the soil away from the root influence. The action of such rhizosphere organisms is not entirely clear but normally they appear to be neutral. They may play an important role in antagonizing the growth of potentially pathogenic organisms. However, a more organised relationship can exist with fungi in which the hyphae form an external sheath around the root and may even penetrate it. These mycorrhizas, as they are called, confer an advantage to plants growing in poor soils where they aid in the absorption of essential nutrients, especially phosphate, by increasing the area for absorption. The growth of forest trees is particularly improved by such a relationship'.

(From: J.F. Wilkinson, (1986), 'Introduction to Microbiology', Third edition. Blackwell Scientific Publications)

(i) Suggest a reason why healthy plant leaves and stems do not provide a suitable environment for a large amount of microbial growth.

(ii) What is the rhizosphere?

(iii) Suggest one way in which rhizosphere organisms 'may play an important role in antagonizing the growth of potentially pathogenic organisms'.

(iv) State the meaning of the term 'pathogenic'.

Give examples, one in each case, of a pathogenic *and* a non-pathogenic fungus.

(v) What is a mycorrhiza?

State how mycorrhizas increase the area for absorption.

(vi) Suggest how some fungi may benefit from association with the roots of a tree. (27)

(c) Describe the practical laboratory procedures (including appropriate safety measures) that you would use in an experiment to determine which one of a number of different antibiotics is most effective against a particular species of bacteria. (28)

13. (a) (i) Distinguish clearly between perennation and vegetative propagation.

(ii) Give an illustrated account of how vegetative propagation takes place in a *named* flowering plant. State one advantage *and* one disadvantage of this type of reproduction. (24)

(b) The life cycle of most plants incorporates a gametophyte generation.

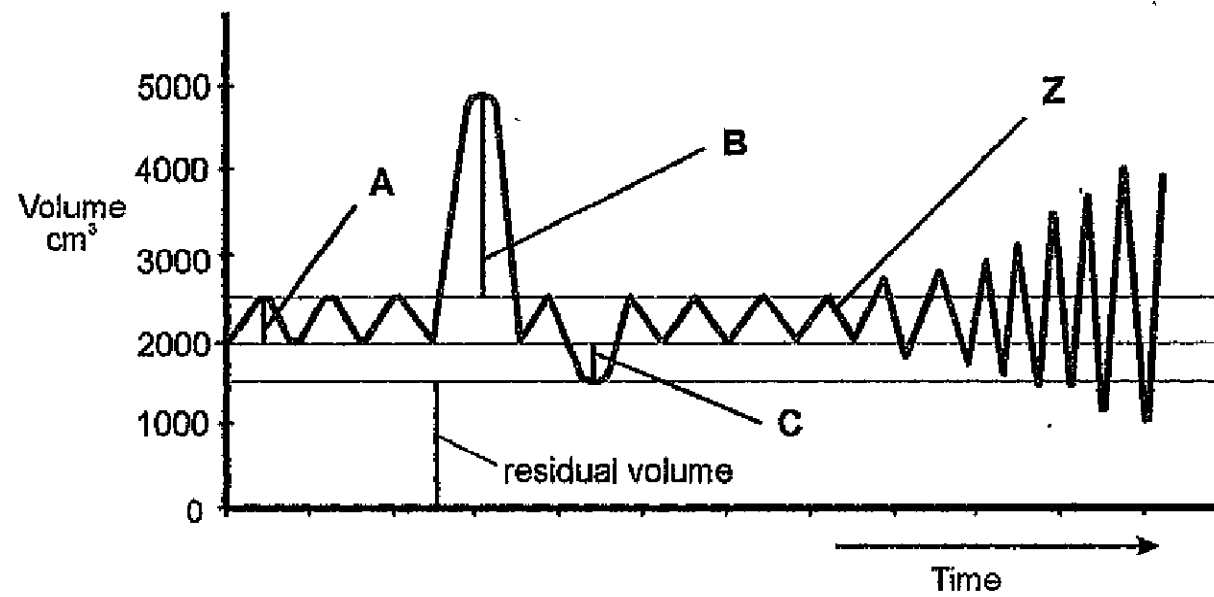
(i) Explain the term gametophyte generation.

(ii) Give a diagram to illustrate the structure of the gametophyte generation of either a moss or a fern and label three parts.

(iii) Name the structures that represent the gametophyte generation in the life cycle of flowering plants. State the feature of these structures which identifies them as the gametophyte generation. (25)

(c) Write explanatory notes on any *three* of the following: dormancy, endosperm, cross pollination, dehiscence. (21)

14. (a) The graph shows the changes in the volume of air exchanged by a person as might be recorded using a respirometer.



- (i) Name the lung volumes labelled A, B and C.
  - (ii) What term is given to the lung volume A+B+C? From the graph state the approximate value of this volume.
  - (iii) The person began to exercise at Z. What *two* features on the graph indicate that exercise is taking place?
  - (iv) Name *two* muscles which are involved in breathing.
  - (v) State why exhalation does not require nervous control.
  - (vi) List *four* differences between inspired and expired air.
  - (vii) Give one other lung volume, besides the residual volume, which is fixed and not variable for an individual. (45)
- (b)
- (i) Draw a labelled diagram to show the internal structure of a mitochondrion.
  - (ii) Name the end product of aerobic glycolysis. State the number of carbon atoms in this substance. What is this substance converted to under anaerobic conditions in a muscle cell *and* in a yeast cell?
  - (iii) Flowering plants respire during the hours of daylight but, in contrast to the case of animals, it is difficult to detect the carbon dioxide which they produce. Why is this? (25)

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

- (a) Write an essay entitled "The biological importance of the properties of water".
- (b) Answer the following in relation to the lymphatic system.
  - (i) What is lymph and from what is it derived?
  - (ii) State two structural differences between blood and lymph.
  - (iii) How is lymph circulated?
  - (iv) What is the eventual fate of lymph?
  - (v) Give one way in which the lymphatic system defends the body against micro-organisms.
  - (vi) What is a lacteal? State the function of lacteals.
- (c)
  - (i) What is an auxin?
  - (ii) Outline the role of auxin in the tropic response of stems to light.
  - (iii) State two functions of auxins other than their roles in tropic responses.
  - (iv) Why may auxins be considered similar to hormones in animals?
  - (v) Name a synthetic auxin and give a use for it in agriculture or horticulture.
- (d) A population is a group of individuals of the same species which occupies a particular habitat. Over a period of time the size of wild animal populations tends to remain reasonably constant despite fluctuations within any one year and between years.
 

Give *three* possible reasons that could account for fluctuations in the size of a population in a habitat.

Give *two* examples of the possible consequences if a population should be wiped out.

For a *named* animal outline how you would monitor its population density.