

Write your Examination Number here

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AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1991

BIOLOGY—HIGHER LEVEL

WEDNESDAY, 12 JUNE—MORNING, 9.30 to 12.30

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 answerbook you use for answering Part II.

1. Answer five of the following

- (a) Cobalt chloride is used to test for
- (b) The vertebral column protects the
- (c) In the female mammal what is produced during lactation?
- (d) What type of lens is used to correct myopia (short sight)?
- (e) Rickets can result from a deficiency of
- (f) Spiracles on insects are used for

2. (a) (i) Name the apparatus used to measure the rate of water uptake by a shoot.

.....
(ii) State a precaution that you would take in setting up this apparatus.

.....
(iii) What is the reason for this precaution?

.....
(iv) Why may an atmometer be used in conjunction with this apparatus?

.....
(b) (i) What term is used to describe plants that live in arid regions.

(ii) Name one such plant and give one feature of this plant which you consider to be an adaptation to its environment.

Name:

Adaptation:

3. (a) The diagram shows a transverse section through bone.

(i) Name the parts labelled W, X, Y, Z.

W

X

Y

Z

(ii) State the contents of X.

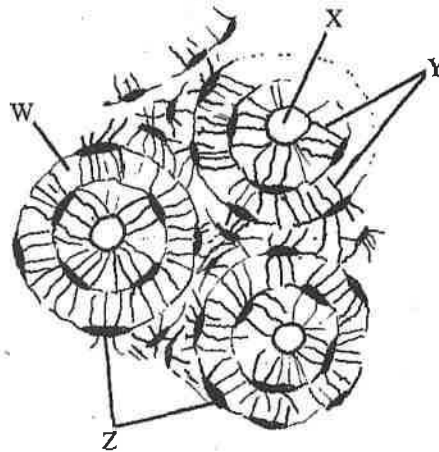
.....
(iii) State the function of Z.

.....

(b) (i) Distinguish between ligaments and tendons.

.....
.....
(ii) Name the bones of the forelimb which are the equivalent to the tibia and fibula in the hindlimb.

.....
.....
(iii) What are floating ribs?



4. State two differences between members of each of the following pairs.

(a) Parenchyma and sclerenchyma:

(i)

(ii)

(b) Rods and cones:

(i)

(ii)

(c) Monocotyledons and dicotyledons:

(i)

(ii)

(d) DNA and RNA:

(i)

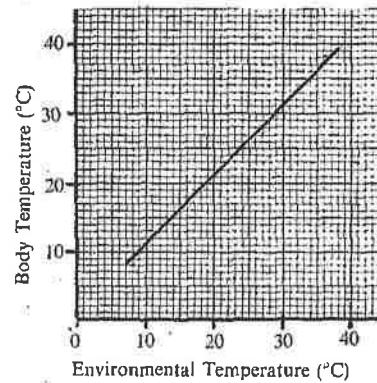
(ii)

(e) Angiosperms and gymnosperms:

(i)

(ii)

5. The graph shows the relationship between the body temperature of a frog and the environmental temperature.



(i) What does the graph tell you about the physiology of the frog?

.....

(ii) Why is the frog's body temperature always slightly higher than the environmental temperature?

.....

(iii) How does the frog adapt its pattern of life to low environmental temperature?

.....

(iv) Draw a graph using the above axes to show the relationship between human body temperature and environmental temperature.

(v) Comment on the graph that you have drawn in relation to the graph for the frog.

.....

.....

P.T.O.

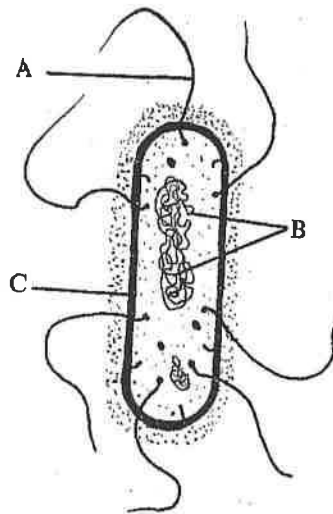
6. Locate as precisely as possible within the cell the site of occurrence of each of the following processes.

- (a) oxidative phosphorylation
- (b) photophosphorylation
- (c) storage of starch
- (d) protein synthesis
- (e) glycolysis
- (f) Krebs cycle
- (g) formation of spindle fibres

7. (a) The diagram shows the structure of a generalised bacterial cell.

(i) Name the parts labelled A, B, C.

- A
- B
- C



(ii) Give two ways in which this cell differs from a typical plant cell.

- (1)
- (2)

(iii) In what units of length are bacteria normally measured?

(iv) What are pathogenic bacteria?

(b) (i) Define immunity

(ii) Distinguish between active and passive immunity.

(iii) Does vaccination result in active or passive immunity?

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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 answerbook.

Answer four questions. Each question carries 70 marks.

8. (a) Processes collectively referred to as weathering result in the formation of soils. Explain the meaning of the term weathering and give an account of the processes involved. (20)
- (b) (i) What is 'available water'? Describe an experiment you could carry out to determine the available water content of a soil.
- (ii) In an experiment to determine the amount of air in a soil, a sample of the soil was placed in a 1 litre measuring cylinder and the base of the cylinder was then gently tapped against the laboratory bench. The volume of soil in the cylinder was read as 180 cm^3 to which were added 200 cm^3 of water and the contents of the cylinder were then stirred and allowed settle. After a period of time the water level in the cylinder was 358 cm^3 .
- Calculate the volume of air that would be present in 1000 cm^3 of this soil. (30)
- (c) Give an outline account of the nitrogen cycle. (20)
9. (a) (i) What is meant by the term classification? Explain why biologists classify living organisms. Briefly describe the binomial system for naming organisms and illustrate your answer by applying it to a mammal.
- (ii) Mammals form a natural group within the Phylum Chordata. In each case give *two* features of mammals which (i) assign them to the Phylum Chordata, (ii) distinguish them from other members of this phylum.
- Carnivorous, omnivorous and herbivorous mammals are to be found in the Irish countryside. Excluding domesticated mammals, give *one* example of each of these nutritional types. (32)
- (b) What is a parasite? Name an animal parasite of a domesticated mammal that occurs in Ireland. In the case of this parasite (i) describe its external structure, (ii) give an outline of its life cycle. State *one* feature of this parasite's structure and *one* feature of its life cycle which are adaptations to its style of life. (38)

10. A picnic hamper contained wholemeal bread, butter, tomatoes, lettuce, cucumber, hard-boiled eggs, tinned salmon, apples, oranges, tea, sugar and milk.

- (a) (i) From the contents of the hamper indicate one good source of each of the following: soluble carbohydrate, insoluble carbohydrate, protein, lipid, vitamin C, roughage and *two* named minerals. Name the soluble and the insoluble carbohydrate whose sources you have indicated.
- (ii) State a function of (a) vitamin C, (b) one of the minerals you named in (i) and, in each case, name a disease which may result from its deficiency in the human diet.
- (iii) Explain briefly why the tinned salmon had not decayed. (30)
- (b) (i) Outline laboratory tests, one in each case, to show the presence of the following in food: protein; vitamin C (or other named vitamin).
- (ii) Name *two* digestive enzymes, each of which breaks down a different food type. In each case name the product(s) of the enzyme's action and state the region of the human digestive system in which the enzyme is normally active.
- (iii) Draw a simple graph, placing rate on the vertical axis, to show the effect of an increase in substrate concentration on the rate of enzyme action. (40)

11. (a) (i) Use labelled diagrams to show the external and internal structure of a leaf.
- (ii) A chloroplast extract was found to contain a number of pigments. Name any *two* of these pigments and state why a range of such pigments is of benefit to the plant.
- Describe how you would (a) obtain a chloroplast extract from a sample of leaves, (b) separate the pigments contained in this extract, in the laboratory. (42)
- (b) What is meant by the term dry weight? How would you determine the dry weight of a sample in the laboratory?

What difference, if any, would you expect there to be between the dry weights in each of the following cases?

- (i) A seed before germination compared with a similar seed five days after germination started.
- (ii) A batch of leaves at dawn compared with a similar batch of leaves 7 hours later on a warm sunny day.
- Briefly explain your answers. (28)

12. (a) An experiment was carried out to investigate the germination of pollen grains. Batches of pollen grains were suspended in small drops of three solutions X, Y, Z. Each drop had a volume of 0.05 cm^3 . Solution X was distilled water; Y was distilled water to which certain nutrients had been added; Z consisted of distilled water, the same concentration of the same nutrients as in Y and an extract derived from crushed pollen grains.

The results are shown in the following table.

Number of pollen grains per drop	Average percentage germination of pollen grains		
	X	Y	Z
45	3	5	70
85	3	9	75
195	6	15	77
275	10	26	80
405	12	30	82
475	15	40	82

- (i) Suggest why the percentage germination of pollen grains in Y is higher than in X?
- (ii) Suggest a reason for the high level of germination in Z.
- (iii) In solutions X, Y, the general trend is for the percentage germination to increase as the number of pollen grains in the drop increases. Suggest a reason for this.
- (iv) Outline what happens in the flower during fertilization. (42)
- (b) State the function of the following parts of the reproductive system of the human male: seminiferous tubules, epididymis, interstitial cells (Leydig cells).
- Outline the role of FSH (follicle stimulating hormone) and LH (luteinising hormone) in the male reproductive system and state where these hormones are produced. (28)

13. (a) Read this extract and answer the questions below.

Agricultural Ecosystems.

An area under intensive cultivation is an immature ecosystem. It has high productivity, relatively little biomass, and few species. It is also a very unstable system, compared to a mature, complex ecosystem, which, with its complicated food webs, has many built-in checks and balances. Individual members of the plant and animal community may be sick or dying, but the natural, mature ecosystem itself is healthy, and species tend to endure in relatively stable numbers. In areas under cultivation, plants do not grow in complex communities, as they do in a forest, but in pure stands. A cornfield, for example, has little inherent stability. If not constantly guarded, it will be immediately overrun with insects and weeds. It is for this reason that insecticides and herbicides play such a large role in our modern life.

The susceptibility of modern crops to predators and parasites was tragically illustrated by the great potato famine of Ireland, which was caused by a fungus infection. A number of plant geneticists have warned that the new strains of wheat and rice, which have made major contributions toward feeding the growing human population, are particularly susceptible to such disasters because of their genetic uniformity and widespread distribution.

(From: Invitation to Biology. Curtis and Barnes. Worth Publishers, Inc., New York.)

- (i) Explain the underlined terms.
 - (ii) Give *one* way in which high productivity is achieved in an area under intense cultivation.
 - (iii) Suggest *one* possible adverse effect of the use of an insecticide or herbicide.
 - (iv) Why are new strains of wheat and rice particularly susceptible to parasites?
 - (v) Why do you think that species 'tend to endure in relatively stable numbers' in a mature ecosystem?
 - (vi) Name the fungus responsible for the potato famine. (36)
- (b) A Local Authority has granted planning permission to a chemical company for the construction and operation of a factory. One of the conditions attaching to this planning permission is that the factory must not interfere with the plants and animals of the area.
- (i) Outline the overall plan necessary to ensure that the company complies with the planning permission condition.
 - (ii) Describe a method you would use in each case to investigate the distribution of (a) the plants, (b) the animals, as part of this plan. (34)

14. (a) Blood is a mass transport system.

- (i) List four groups of materials transported by the blood. For each group listed give (a) a location where it enters the blood, (b) a location where it leaves the blood.
 - (ii) Name the small blood vessels through which materials enter and leave the blood. List three major structural features of these blood vessels and briefly relate these features to how the vessels function in the exchange of materials between the blood and the tissues. (40)
- (b) Xylem and phloem are the plant tissues specialised for transport.
- (i) Describe, with the aid of a diagram in each case, a single xylem vessel element *and* a single sieve tube element and companion cell from phloem as seen in longitudinal section.
 - (ii) State what a ringing experiment is and what it demonstrates. (30)

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

- (a) Give an illustrated account of the life cycle of *Fucus*, relating it to the stages of the tide. Outline how the life cycle of *Fucus* differs from that of *either* the moss *or* the fern; refer particularly to the occurrence of meiosis.
- (b) Give the meaning of the following terms: gene linkage, phenotype, multiple alleles, chromatid, mutation. When a plant of genotype AaBb was crossed with one of aabb the great majority of the offspring were genotype AaBb and aabb. The remainder of the offspring were of genotypes Aabb and aaBb. Does this cross illustrate Mendel's law of Independent Assortment? Explain your answer.
- (c) What is a fossil? Describe three types of fossil. Of what value are fossils as evidence for the occurrence of evolution? Illustrate your answer by reference to the evolution of the modern horse or to some other named fossil record.
- (d) Write explanatory notes on *any four* of the following: thrombin, acetylcholine, auxin, active transport, pyruvic acid, clone.