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Examination
Number here

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1990

BIOLOGY—HIGHER LEVEL

WEDNESDAY, 13 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 answer-book you use for answering Part II.

1. Answer the following by placing a tick (✓) in the appropriate box.

(i) The substrate of the enzyme amylase is

protein starch fat maltose

(ii) Cobalt chloride paper may be used in the laboratory for the detection of

water urea vitamin A glucose

(iii) A nitrogenous base *not* normally associated with DNA is

adenine thymine guanine uracil

(iv) DNA may be detected by the use of

Fehling's solution Feulgen's solution Benedict's reagent Millon's reagent

(v) The middle ear contains

water plasma air lymph

2. (a) In the space provided below draw a diagram of a mitochondrion to show its internal structure. Label clearly the following parts on the diagram:

outer membrane - X, cristae - Y, matrix Z.

Select, from the following list, the process that takes place at Y and the process that takes place at Z: glycolysis, Krebs' cycle, oxidative phosphorylation.

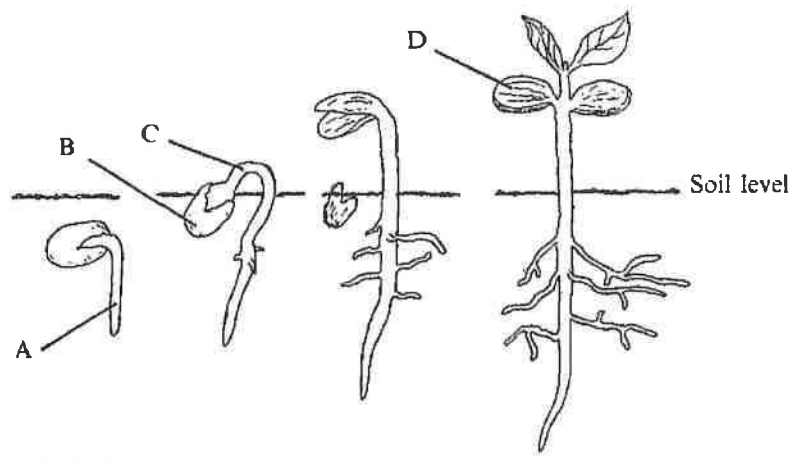
Y..... Z.....

Name (i) a mammalian tissue, (ii) a tissue of a flowering plant, in which you would expect to find large numbers of mitochondria.

(i)..... (ii).....

(b) In the space below draw sufficient detail of a cell to distinguish between a centriole and a centromere. Label each of these structures.

3. The diagrams show the main stages of the germination of one type of seed.



Name the parts A, B, C, D.

What form of germination is shown?.....

Of what type of seed is this form of germination typical?.....

Are the nuclei of the cells which constitute D haploid, diploid or triploid?.....

Mention a process which occurs during germination and which also occurs during digestion in mammals?

.....

Which of the following conditions is not essential for the germination of most seeds:

light, warmth, moisture, oxygen?.....

4. (a) State the location of the liver in the body of a mammal.....

 (b) Name the blood vessel which provides communication between the liver and the intestine.

 (c) Bile is secreted by the liver. Where is it stored?.....
 Give *two* components of bile (i).....
 (ii).....
 (d) State *three* functions of the liver other than the secretion of bile.
 (i).....
 (ii).....
 (iii).....
 (e) Into which region of the alimentary canal is bile released?.....
 (f) The secretion of another gland is released into the same region of the alimentary canal as bile. Name this
 other gland.....

5. In each of the following cases name (i) an organism which fits the description and (ii) the group to which the organism belongs.

- (a) Is an animal which exhibits radial symmetry. It possesses a spiny skin and numerous tube feet.

(i)..... (ii).....

- (b) Is an animal which exhibits radial symmetry. It possesses a ring of tentacles around its mouth. Numerous sting cells are present on these tentacles.

(i)..... (ii).....

- (c) Is a small plant commonly found growing on waste ground, tarmacadam pathways, etc. It does not produce a flower but for a period each year it is observed to bear a stalked capsule.

(i)..... (ii).....

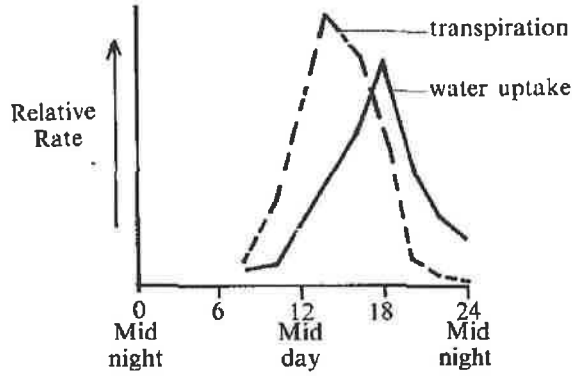
- (d) Is a small animal possessing a dorsoventrally flattened body which is not segmented. It is commonly found in ponds and streams. This animal may be observed to feed by using its eversible pharynx.

(i)..... (ii).....

- (e) Is a tall, woody plant which bears needle-like leaves. Damage to this plant typically leads to the secretion of resin.

(i)..... (ii).....

6. (a) The diagram shows the relative rates of water uptake and transpiration by a plant in June.



Define transpiration.....

Why do you think that the rate of water uptake at 2 p.m. is lower than the rate of transpiration?

Why do you think that the rate of water uptake declines rapidly after 6 p.m.?

Which combination of environmental factors is likely to produce the highest rate of transpiration?

(b) State the meaning of each of the following terms.

Guttation.....

Plasmolysis.....

Hypertonic solution.....

7. Distinguish between the members of each of the following pairs.

(a) ectoderm and ectoplasm (plasmagel).....

(b) carpal and carpel.....

(c) antibody and antibiotic.....

(d) bronchus and bronchiole.....

(e) glycerol and glycogen.....

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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.

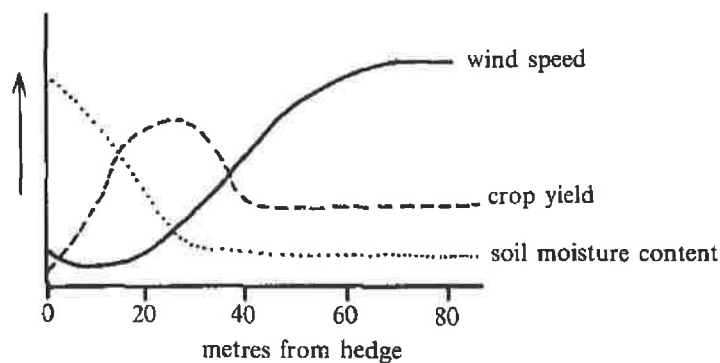
Answer four questions. Each question carries 70 marks.

8. (a) Provide a concise explanation for each of the following observations.
- (i) The sons of a haemophilic father were not haemophiliacs.
 - (ii) When a batch of pea plants with tall stems were allowed to self pollinate, they gave rise to a generation of plants composed of 508 with tall stems and 174 with short stems.
 - (iii) The only child of a marriage between a man of blood group A and a woman of blood group B was found to possess blood group O. (27)
- (b) What is meant by the term variation? Explain how variation arises and relate its significance to the evolutionary process. (25)
- (c) Use labelled diagrams to illustrate the position of the chromosomes in each of the following cases:
- (i) metaphase of meiosis I where $2n=8$,
 - (ii) anaphase of mitosis where $2n=6$. (18)
9. (a) Name the type of skeleton found in each of the following animals: cockroach, fox.
- The type of skeleton found in the cockroach imposes certain limitations upon the animal. Outline these limitations and, in the case of *one* of them, explain how the animal attempts to overcome this limitation. (21)
- (b) State the location in the body and the function of each of the following organs of the earthworm:
- (i) nephridia, (ii) spermathecae, (iii) seminal vesicles, (iv) gizzard, (v) clitellum. (30)
- (c) Unlike the liver fluke, the earthworm possesses a vascular system. Explain the meaning of the term vascular system and briefly account for its appearance at this level of animal organisation. State the main difference between the vascular system of the earthworm and that of man. (19)

10. (a) Draw graphs with suitably labelled axes to illustrate the following.
- (i) The relationship between temperature and the rate of photosynthesis.
 - (ii) The relationship between light intensity and the rate of photosynthesis. (18)
- (b) Describe how you would conduct an experiment to obtain the results that you have shown in (a) (i) or (a) (ii) above. (25)
- (c) Write explanatory notes on *three* of the following:
- (i) The absorption spectrum of chlorophyll,
 - (ii) Glycolysis,
 - (iii) Cyclic photophosphorylation,
 - (iv) Compensation point. (27)

11. (a) The diagram shows wind speed, crop yield and soil moisture content in a field at varying distances from the base of a hedge of height 2.5 metres.

Referring to the diagram answer the following.



- (i) At what distance from its base does the hedge cease to influence wind speed?
 - (ii) Where, in relation to the hedge, is crop yield greatest?
 - (iii) Account for the high crop yield at the point which you have indicated in (ii).
 - (iv) Why is level of soil moisture highest at the base of the hedge?
 - (v) Why do you think that crop yield increased over the first 20 metres from the hedge?
 - (vi) Why do you think that crop yield levels off after 40 metres? (27)
- (b) (i) A rectangular wood of length 150 metres and width 80 metres was divided along its full length by a path of width 2 metres. In order to determine the number of ferns growing in the wood 20 quadrats of edge 0.5 metres were distributed at random. The number of ferns present in each of the quadrats is shown in the following table. There were no ferns growing on the path and no quadrats were placed on it.

Quadrat Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of Ferns present	4	0	0	6	2	0	3	0	0	5	5	4	0	2	7	3	4	0	3	2

Calculate the approximate number of ferns growing in the wood. (28)

- (ii) 60 snails were collected at random from a large rockery and each was marked on the shell with a spot of enamel paint. The snails were then returned to the rockery. One week later a second random collection of snails was made in the rockery. Of the 60 collected 4 were found to be marked. After the elapse of a further week another random collection of 60 snails was made. This time 6 were found to be marked. Determine the likely population range of snails in the rockery. (15)

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

Viruses can multiply only within a living cell. In some virus infections, the protein coat is left outside the cell while the nucleic acid enters; in others, the intact virus enters the cell, but once inside, the protein is destroyed by enzymes, freeing the viral nucleic acid from its coat. In the case of the DNA viruses, the DNA of the virus replicates and also codes for messenger RNA. The messenger RNA, in turn, produces enzymes and coat protein needed by the virus. The virus uses the equipment of the host cell, including ribosomes, transfer RNA molecules, amino acids and nucleotides for its synthetic activities. In the case of the RNA viruses, the nucleic acid both replicates and serves directly as messenger RNA, producing the enzymes and coat protein needed by the virus. The end product of either type of infection is hundreds or thousands of new viral particles. These are produced and assembled within the infected cell, which is often broken apart and destroyed as the particles are released. Characteristically, it is this lysing of the host cell that causes the symptoms associated with a virus infection.

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

- (i) What term is applied to organisms such as viruses which can only multiply in living tissue?
 - (ii) Explain the meaning of the statement 'In the case of the DNA virus, the DNA of the virus replicates and also codes for messenger RNA.'
 - (iii) What is meant by 'synthetic activities'?
 - (iv) What does the virus use for its synthetic activities?
 - (v) What do you think happens to virus particles which are released upon destruction of an infected cell?
 - (vi) State two ways in which bacteria differ from viruses. (36)
- (b) You are given a rotting apple with visible fungal growth on it. Outline how you would (i) isolate the fungus and (ii) test the hypothesis that the fungus causes apples to decay. (34)

13. Comment upon the validity of the following statements and, in each case, provide a brief explanation of your answer.

- (a) "The embryo sac of angiosperms represents a much reduced gametophyte generation".
- (b) "Free water is required at a certain period for completion of the life cycle in the moss or fern".
- (c) "The moss or fern requires dry air for a certain period in order to complete its life cycle".
- (d) "Certain species of flowering plants are fertilised by insects".
- (e) "*Fucus vesiculosus* is so adapted that it can continue to engage in photosynthesis during the period of high tide".
- (f) "By the production of fruits angiosperms reduce the incidence of competition between themselves and their offspring".
- (g) "Because one of its gametes is stationary and the other is mobile, *Spirogyra* provides a good example of heterogamy". (70)

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14. (a) Use a fully labelled diagram to illustrate the structure of a motor neuron. On the diagram use arrows to indicate the direction of impulse transmission.
What are the main differences between motor and sensory neurons? (21)
- (b) What name is given to the specialised junctions that are found between neurons? Why do neurons not come into direct contact at these junctions?
Describe how an impulse which arrives at this junction gives rise to an impulse in the next neuron. (22)
- (c) What is an endocrine gland? Draw an outline diagram of the human body to show the location of the main endocrine glands.
In the case of the thyroid gland state
- The name of the substance which it secretes;
 - A function of this secretion;
 - A disease associated with abnormal activity of the gland. What are the symptoms of this disease? (27)

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

- (a) Use labelled diagrams to illustrate
- The structure of phloem.
 - The location of phloem in a first year dicotyledonous root.
 - The location of phloem in a dicotyledonous stem which is more than two years old.
How would you demonstrate that translocation takes place in phloem?
- (b) Draw a large labelled diagram of a human nephron. In your diagram include the full blood supply. Outline how the nephron produces urine.
- (c) Give an explanation of the biological basis of each of the following practices.
- Pruning a hedge.
 - Allowing the aerial parts of a potato plant to die off before harvesting the crop.
 - Wearing spectacles with convex lenses.
 - Pickling vegetables.
 - Taking cuttings from hedging plants.
- (d) Write an essay entitled "Mineral and vitamin deficiencies of the human diet and their consequences."