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AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1986

BIOLOGY—HIGHER LEVEL

TUESDAY, 17 JUNE—MORNING, 9.30 to 12.30

No 35887

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 in each case.

(i) In the life cycle of the moss or fern meiosis occurs during

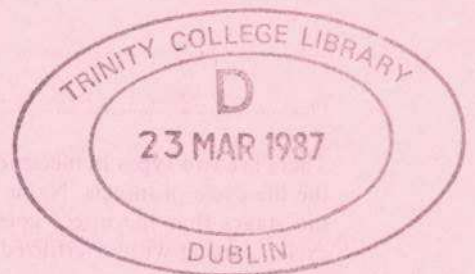
- (a) germination of the zygote.
- (b) formation of the spores.
- (c) germination of the spores.
- (d) formation of the gametes.

(ii) In a longitudinal section of a root tip, the cells are arranged in the following order:

- (a) root cap, meristematic zone, zone of differentiation, zone of elongation.
- (b) root cap, zone of elongation, meristematic zone, zone of differentiation.
- (c) root cap, meristematic zone, zone of elongation, zone of differentiation.
- (d) root cap, zone of differentiation, meristematic zone, zone of elongation.

(iii) In mitosis, the order of the stages is

- (a) prophase, metaphase, anaphase, telophase.
- (b) prophase, anaphase, metaphase, telophase.
- (c) prophase, telophase, metaphase, anaphase.
- (d) prophase, metaphase, telophase, anaphase.



(iv) *Rhizopus* is best described as

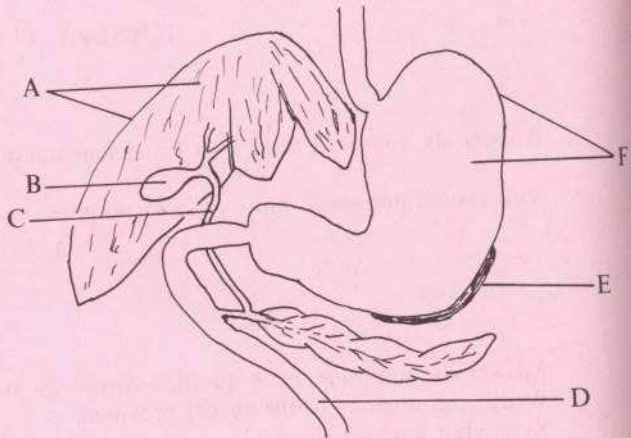
- (a) an autotrophic organism.
- (b) a parasitic organism.
- (c) a symbiotic organism.
- (d) a saprophytic organism.

(v) The vitamin made in human skin in sunlight:

- (a) vitamin A
- (b) vitamin B
- (c) vitamin C
- (d) vitamin D

2. In each case, write down, in the space provided, the name of the following:
- (a) the part of an animal cell that provides a spindle during cell division.....
  - (b) the cytoplasmic extensions *Amoeba* uses for movement.....
  - (c) the response of a flowering plant stem to light.....
  - (d) the structures on a plant stem that allows gaseous exchange.....
  - (e) the vitamin required for blood clotting.....
  - (f) the master gland in the endocrine system.....
  - (g) the part of non-endospermic seed that contains the food store.....
  - (h) the cells in the testes that produce testosterone.....
  - (i) the female hormone that stimulates ovulation.....
  - (j) the phylum to which a snail belongs.....

3. In the diagram that shows part of the alimentary canal of a human, name the parts labelled A, B, C, D, E, F.



- A.....
- B.....
- C.....
- D.....
- E.....
- F.....

Give two functions of the part labelled A.

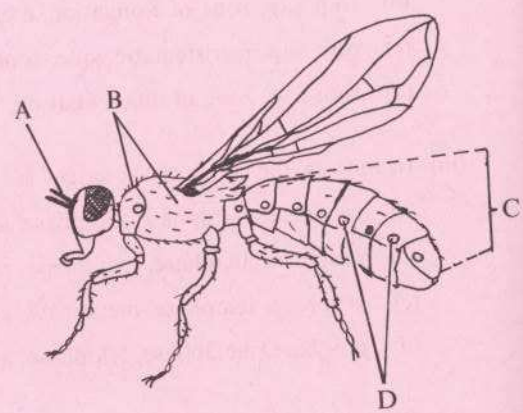
- (i) .....
- (ii) .....

Which part shown in the diagram has a pH of 2-3? .....

Name the fluid that passes through C.....  
Name two substances that are normally in this fluid.

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

4. Name the parts A, B, C, D in the diagram of an insect.



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

There are two types of metamorphosis that can occur during the life cycle of insects. Name each of these types and state the stages that the insect goes through in each type of life cycle, starting with a fertilized egg.

Type 1.....  
Stages in the life cycle: fertilised egg — .....

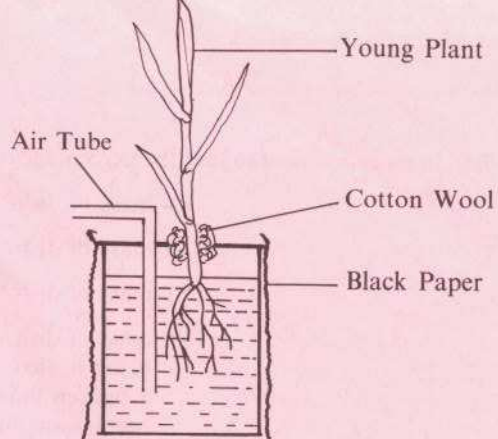
Type 2.....  
Stages in the life cycle: fertilized egg — .....

Explain the term ecdysis.....

Give two examples of how insects can be economically beneficial.

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

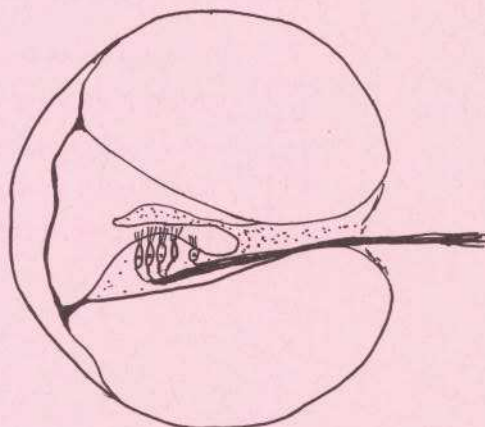
5. An experiment to show the effect of the lack of nitrogen in growing plants was set up as shown in the diagram. Two nutrient solutions were made up by dissolving culture tablets in distilled water. One solution contained all the essential minerals (the control), the other solution contained all the minerals except nitrogen.



- (i) Why was black paper placed around the jars?.....  
 .....  
 (ii) Why was *distilled* water rather than tap water used to dissolve the culture tablets?.....  
 .....  
 (iii) What is the purpose of the control?.....  
 .....  
 (iv) Why should the solution be aerated?.....  
 .....  
 (v) What is the function of nitrogen in a plant?.....  
 .....  
 (vi) Suggest the probable deficiency symptom that will appear in the experiment.....  
 .....  
 (vii) By what processes are mineral salts absorbed by plants?.....  
 .....

6. (a) In the diagram of a T.S. of the cochlea label the following parts:

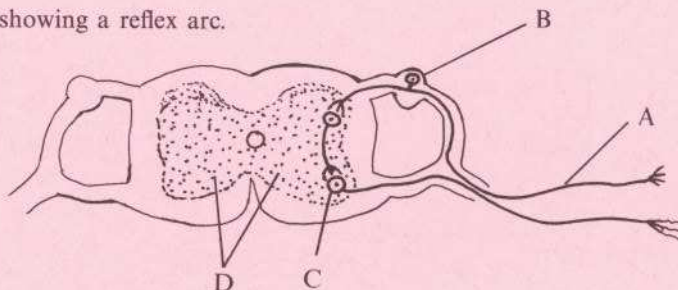
- sensory cells
- tectorial membrane
- sensory nerve
- basilar membrane



Explain how the sound travels from the oval window to the sensory cells.....  
 .....  
 .....

- (b) Name the parts labelled A, B, C, D, in the diagram showing a reflex arc.

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



What is an effector?.....  
 .....  
 .....

7. In an experiment to find the percentage of water and humus in a soil sample, the following readings were obtained:

(i) mass of dish:	50 g
(ii) mass of dish + fresh soil:	220 g
(iii) mass of dish + dry soil:	112 g
(iv) mass of dish + soil after being heated strongly over a bunsen burner until all humus was burned:	101 g

(a) What was the percentage of water in the original fresh soil sample? .....

(b) What was the percentage of humus in the original fresh soil sample?.....

(c) If you were carrying out this experiment

(i) How would you treat the soil to remove all the water?.....

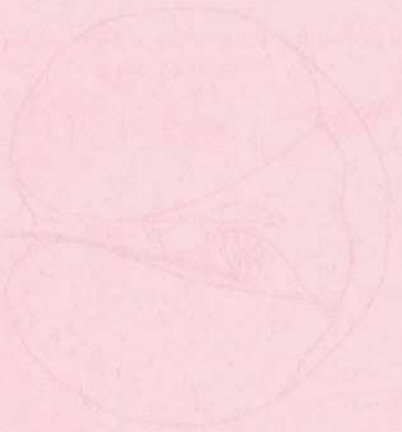
.....

(ii) How would you know how long to burn the soil in order to ensure that all of the humus was removed?

.....

(d) What is meant by a soil profile?.....

.....



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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. *Spirogyra* and *Fucus* belong to the group of plants called Algae.

- (a) (i) Explain the term gamete and describe the mature gametes produced by *Spirogyra* and *Fucus*.  
(ii) Outline the reproductive process leading to fertilization in each of the two algae.  
(iii) Give a labelled outline diagram to show a section through a conceptacle of *Fucus* as seen using the microscope. (52)
- (b) Referring to both structure and reproduction give three reasons why *Fucus* is considered to have evolved more than *Spirogyra*. (18)

9. (a) (i) Draw a large diagram of a nephron (kidney tubule) and its associated blood supply. Label the following parts: loop of Henle, collecting duct, proximal convoluted tubule, glomerulus, ascending tubule, Bowman's capsule, renal artery, capillaries.

- (ii) Filtration of the blood under pressure is a process which occurs during the formation of urine. Write the letter 'F' on your diagram where this filtration takes place and state briefly why a rise in blood pressure occurs at that part. (44)

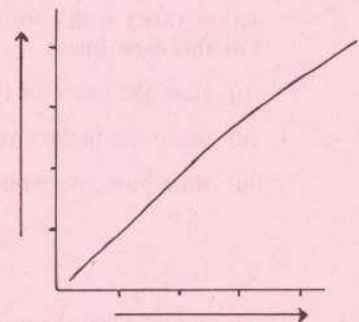
(b) A hormone, ADH (vasopressin), produced by the pituitary gland, plays a part in regulating the amount of water reabsorbed into the blood in the kidney.

The graph shows the effect of blood ADH levels on the amounts of water reabsorbed. What effect would a low level of ADH have on the concentration of the urine?

Give two situations which might cause the level of ADH in the blood to rise.

Name the part of the nephron which is affected by ADH. (26)

Water Reabsorbed



ADH level in blood

10. (i) ATP is a chemical that stores energy for immediate use in living cells.

State the part of the ATP molecule that is important for its function as an energy store.

What is ATP converted to when it gives up its energy?

ATP is formed during the light phase of photosynthesis. Give another example of the formation of ATP. (18)

(ii) Describe how you would carry out an experiment to separate the chloroplast pigments in a leaf using chromatography.

Which wavelengths of light are absorbed by chlorophyll *a* and *b*?

Draw a labelled diagram of a chloroplast as seen under the electron microscope. Indicate on your diagram the site of (a) the light stage and (b) the dark stage of photosynthesis.

Outline the main features in the dark phase of photosynthesis. (52)

11. (a) Draw simple chromosome diagrams to illustrate each of the following, given that the allele **A** is dominant over the allele **a** and that the allele **B** is dominant over **b**.
- The genes for **A** and **B** are not linked and the organism is heterozygous for both genes.
  - The genes are linked, **A** to **B** and **a** to **b**, and the organism is heterozygous for both genes.
  - The genes are not linked and the organism is heterozygous for **A** and homozygous for **B**. (24)
- (b) In a species of plant, the height of the plant is determined by one pair of allelic genes and leaf type by another pair.

The following crosses were carried out:

- A tall plant was crossed with a small plant and all the offspring were tall.
- A plant with rough leaves was crossed with a plant with smooth leaves and all the offspring had rough leaves.
- A tall plant with rough leaves was crossed with a small plant with smooth leaves and the following results were obtained—

15 tall plants with rough leaves  
13 small plants with smooth leaves  
16 tall plants with smooth leaves  
15 small plants with rough leaves.

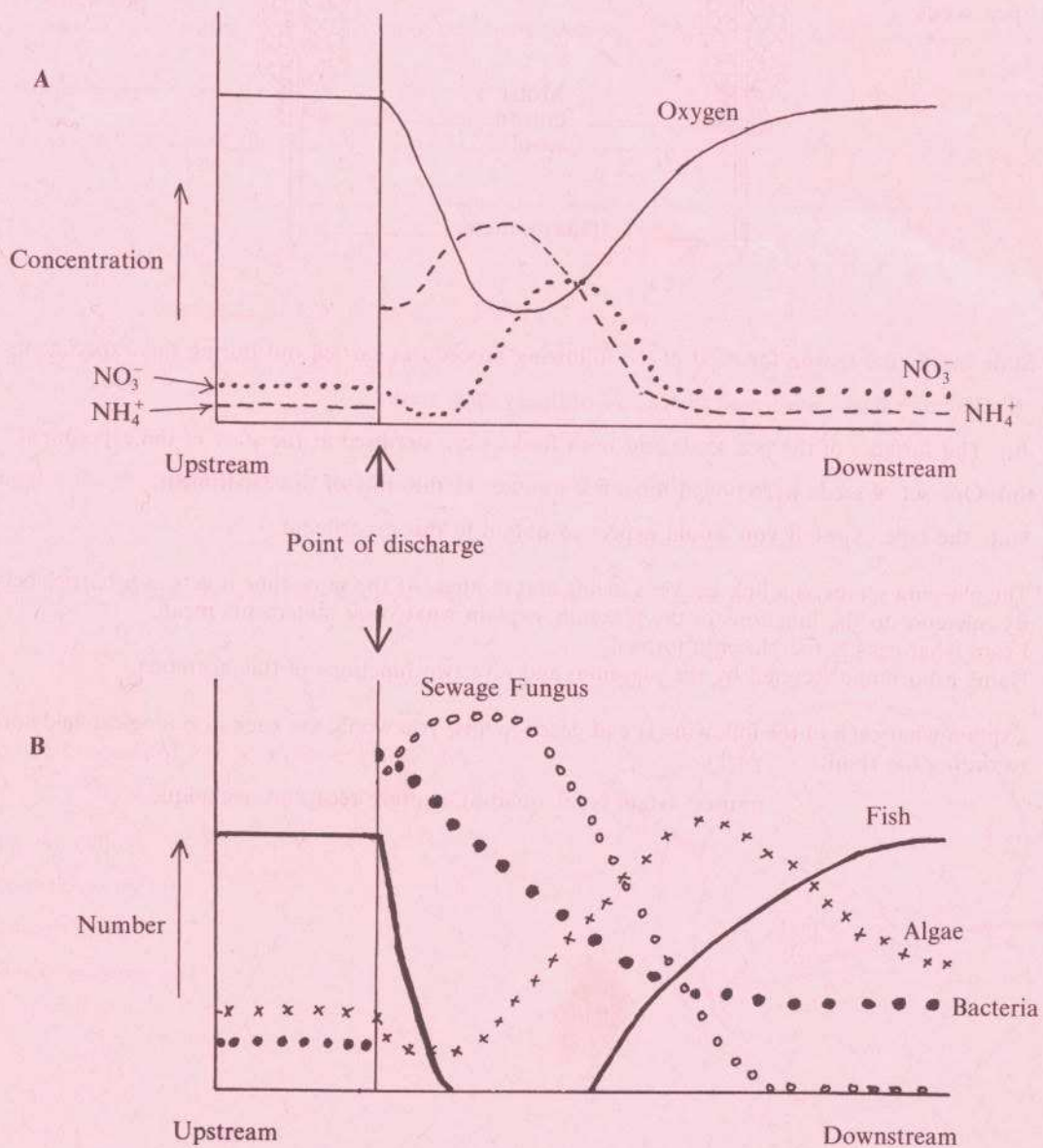
- Give the dominant allele for each gene.
- Give the genotypes of the parents in crosses 1 and 2 and for cross 1 give also the genotypes of the gametes and the genotype(s) of the progeny.
- Give the genotypes of the parents and of the offspring in cross 3.  
Draw chromosome diagrams to show the possible loci of the alleles in the parents of this cross. (46)

12. (a) Where in a cell are enzymes produced? From what major food substance are they produced? Outline a laboratory test you could carry out to show the presence of this substance in a food. Outline the lock and key theory of enzyme action. Name a gland in the body which produces digestive enzymes and which is also an endocrine gland and give its endocrine function. (34)
- (b) Draw the laboratory apparatus you would set up for use in an experiment to show that the rate of enzyme action varies with substrate concentration. For this experiment
- state the name of the substrate and the name of the enzyme you would use.
  - name the factors you would keep constant and state how you would keep each of these constant.
  - state how you would measure the rate of enzyme action. (36)
13. (i) Draw a labelled diagram of a transverse section of bone sufficient to show the following: Haversian canals, periosteum, osteoblasts, canaliculi, lamellae. (20)
- (ii) Name the cell types you would expect to find in woody tissue. In what way are the walls of the cells you name particularly modified to fulfil the support function? Where are the cells of this tissue produced and what type of cell division is involved? (22)
- (iii) Outline how secondary thickening occurs in a dicotyledonous stem. (28)

14. The diagrams A and B represent some of the changes that were observed downstream from a point where a large amount of untreated sewage was discharged into a river. (Data after Hynes, "The Biology of Polluted Waters", Liverpool University Press 1978.) Diagram A shows the chemical changes and diagram B the changes in some of the living organisms in the same part of the river.

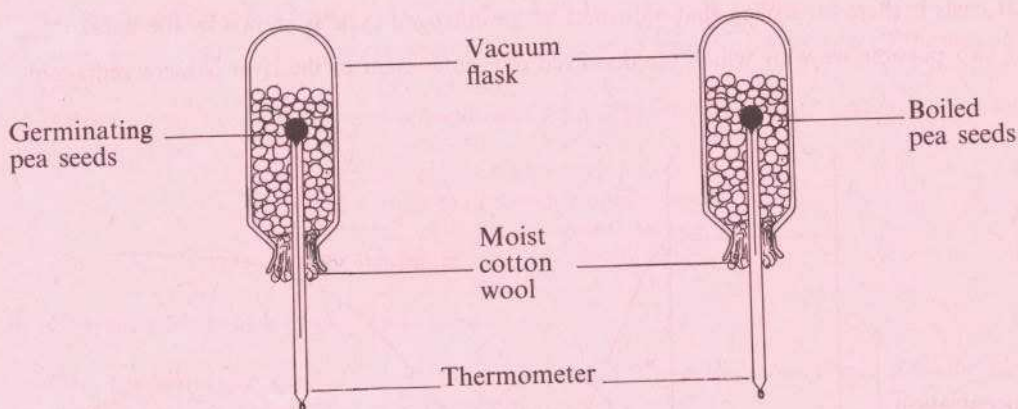
Referring to the diagrams answer the following:

- (i) Suggest an explanation for the large and immediate drop in the amount of dissolved oxygen in the water.
- (ii) Explain
  - (a) the changes in the number of fish;
  - (b) the changes in the number of algae.
- (iii) What basis is there for saying that an aspect of the nitrogen cycle is shown by the data?
- (iv) State two possible ways by which the dissolved oxygen content of the river is increased again. (70)



15. Answer *two* of the following.

- (a) Platyhelminthes, Annelida and Arthropoda are triploblastic metazoans. Explain what is meant by triploblastic. Give an example of one animal from each phylum, and state two structural features that are found in each of these phyla, but *not* in the other two. Draw a diagram of a T.S. through segment 10 of an earthworm, and label the parts. In what way does this T.S. differ from one through segment 33?
- (b) Using labelled diagrams describe hypogeal germination. In an experiment apparatus was set up as shown in the diagram.



State briefly the reason for each of the following procedures carried out during this experiment.

- (i) Vacuum flasks were used instead of ordinary glass flasks.
  - (ii) The surfaces of the pea seeds and both flasks were sterilised at the start of the experiment.
  - (iii) One set of seeds were boiled for a few minutes at the start of the experiment.
- State the type of result you would expect to obtain in this experiment.

- (c) The placenta serves as a link between foetus and mother. At the same time it acts as a barrier between them. By reference to the functions of the placenta, explain what these statements mean. From what cells is the placenta formed? Name a hormone secreted by the placenta, and give two functions of this hormone.
- (d) Explain what each of the following is and describe how you would use each in ecological fieldwork including recording the results.

transect (state type), quadrat, capture recapture technique.