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Examination  
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**AN ROINN OIDEACHAIS**

**LEAVING CERTIFICATE EXAMINATION, 1984**

**Nº 35093**

**BIOLOGY—HIGHER LEVEL**

**THURSDAY, 14 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.

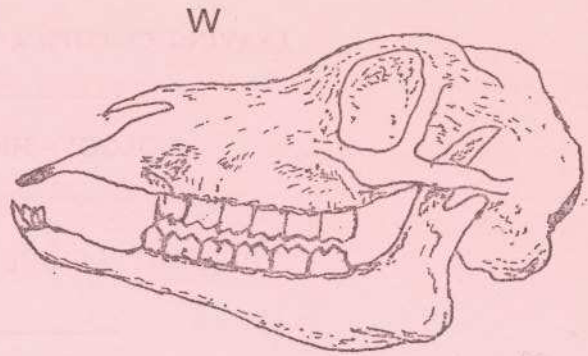
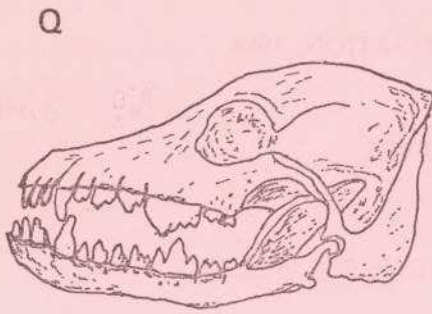
**Be sure to return this part of the examination paper; enclose it in the answer-book you use for answering Part II.**

1. Answer the following by placing the correct answer (a), (b), (c) or (d) in the space provided.
- (i) In photosynthesis, the light trapped by chlorophyll is used to
- (a) obtain carbon dioxide from the atmosphere
  - (b) provide energy to synthesise glucose
  - (c) speed up the conversion of starch to glucose
  - (d) combine with oxygen to produce carbohydrate
- Answer .....
- (ii) In which of the following would the blood first have the highest concentration of amino acids after a meal?
- (a) hepatic artery
  - (b) inferior vena cava
  - (c) hepatic vein
  - (d) hepatic portal vein
- Answer .....
- (iii) Which of the following is the correct order of the groups used in the classification of organisms?
- (a) species, family, class, genus, phylum
  - (b) phylum, class, family, genus, species
  - (c) genus, species, phylum, family, class
  - (d) phylum, family, class, genus, species
- Answer .....
- (iv) An example of a clone is
- (a) egg cells in a flowering plant ovary
  - (b) bean seeds from the same pod
  - (c) daughter cells of an *Amoeba*
  - (d) identical twin daughters and their mother
- Answer .....
- (v) Which *three* of the following are diseases which can be prevented by using vaccines?  
1. penicillin, 2. polio, 3. scurvy, 4. tetanus, 5. rubella
- (a) 1, 3, 5
  - (b) 2, 4, 5
  - (c) 3, 4, 5
  - (d) 1, 2, 5
- Answer .....

2. (a) What is the dental formula of an adult human with complete dentition?

.....

The drawings show the skulls of two mammals.



State the probable diet of each mammal and give a reason in each case based on the features shown in the skulls.

Skull Q: Diet .....

Reason .....

Skull W: Diet .....

Reason .....

(b) A solution is to be tested for the presence of reducing sugar; complete the following details.

(i) What chemical reagent(s) would you add? .....

(ii) Would you boil, heat or leave at room temperature? .....

(iii) What colour change indicates the presence of a reducing sugar? .....

(iv) Name a reducing sugar .....

3. The diagram shows the human male reproductive system.

(i) Name the parts labelled A, B, C, D, E in the diagram.

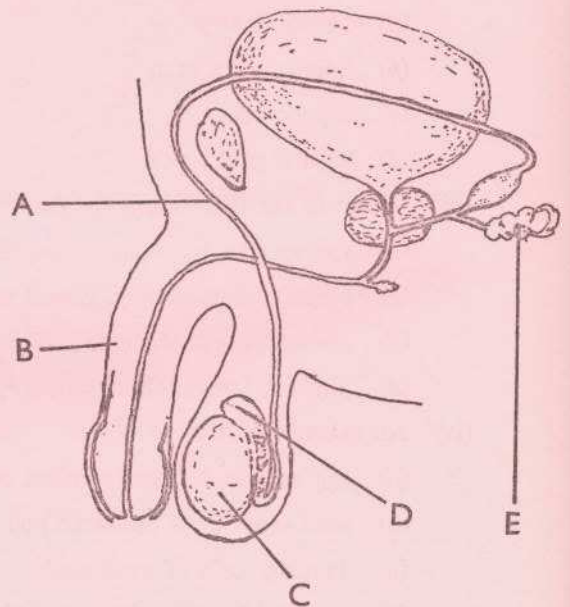
A .....

B .....

C .....

D .....

E .....



(ii) In which labelled part is sperm produced? .....

(iii) Which two labelled parts contribute to the composition of semen? .....

(iv) Give a function of the part labelled D. ....

(v) Name a hormone secreted by the pituitary gland which stimulates sperm formation in the male. ....

4. All sections of this question should be answered with reference to any *one* habitat which you have studied.

(i) Name the habitat .....

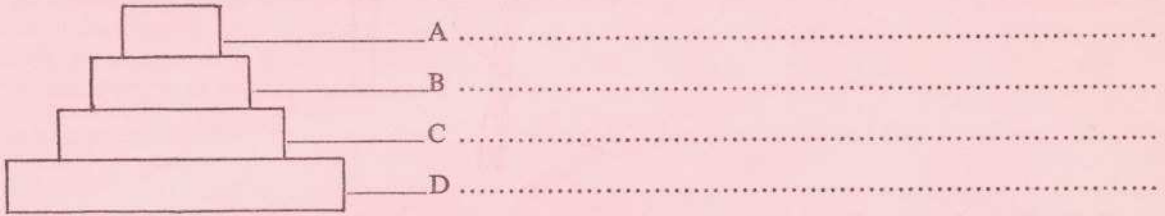
(ii) Name *one* animal you have identified and list *two* external features which aided this identification.

Name of animal .....

Features: 1 .....

2 .....

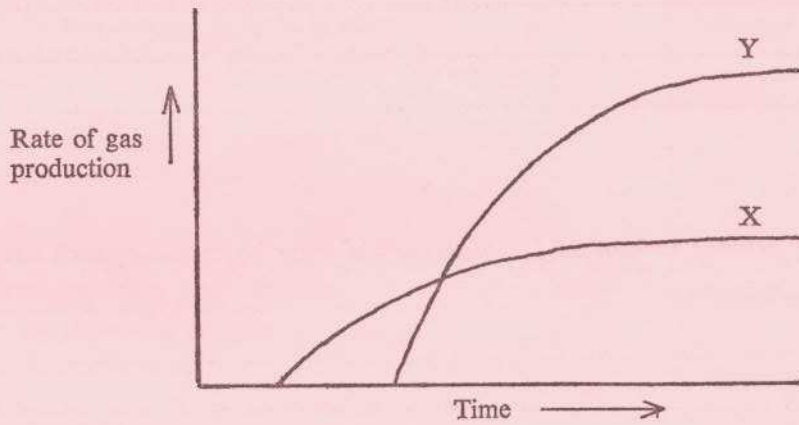
(iii) Giving examples, illustrate the pyramid of numbers shown.



Why is the smallest number of organisms found at level A?

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.....

5. The graph shows the rate at which a strain of yeast released a gas from solutions of two different sugars, X and Y. The experiments were carried out in the absence of air and the temperature of both solutions was kept constant.



Study the graph and answer the following questions.

(i) With which sugar did the yeast release the gas first? .....

(ii) What is the name of the gas? .....

(iii) If you were carrying out this experiment how would you keep the temperature constant?

.....

(iv) Give *two* possible reasons why the rate of gas production eventually levels off in this experiment.

Reasons: 1 .....

.....

2 .....

.....

(v) What substance, other than the gas, is being produced by the yeast during the course of this experiment?

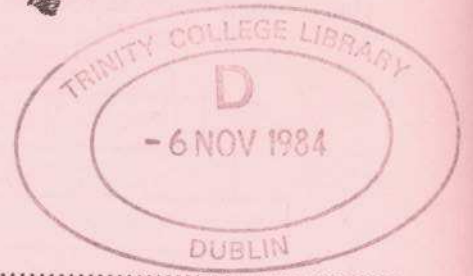
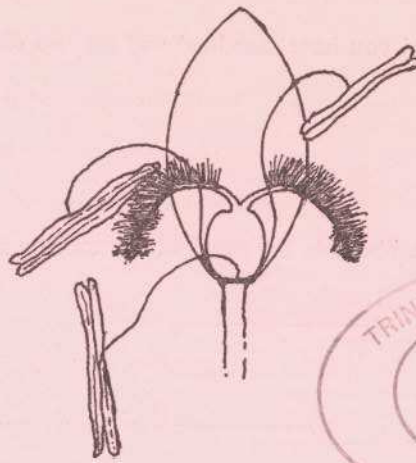
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DIAGRAM

(vi) In the space provided give a labelled diagram to show a yeast cell undergoing asexual reproduction.

6. Label the following parts of the flower shown in the diagram by means of clear lines and the appropriate letter.

- ovary — P
- anther — R
- stigma — S
- stamen — T



Is this flower insect-pollinated or wind-pollinated? .....

State *two* ways in which the flower shows adaptation to the method of pollination used.

Adaptation .....

Reason .....

.....

Adaptation .....

Reason .....

.....

7. Distinguish clearly between each of the following pairs of terms by explaining each term.

(a) centromere and centriole .....

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(b) systole and diastole .....

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(c) nitrogen fixation and nitrification .....

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(d) corm and bulb .....

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(e) stoma and stroma .....

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## LEAVING CERTIFICATE EXAMINATION, 1984

## BIOLOGY — HIGHER LEVEL

THURSDAY, 14 JUNE — MORNING, 9.30 to 12.30

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. Give details of how you would dissect an earthworm.

Draw a large diagram of a transverse section through the intestinal region of an earthworm. Label the following parts on the diagram: coelom, longitudinal muscles, circular muscles, typhlosole, setae, ventral and dorsal blood vessels, nephridia, nerve cord.

State the function of the typhlosole.

Name three structures to be seen in a dissected earthworm, (other than those listed above) and state a function for each.

9. In an experiment to investigate the relationship between light intensity and the utilisation and formation of sugars in two different species of plant, X and Y, the following results were obtained.

- Using the same axes plot these results on the graph paper provided. Put light intensity on the horizontal axis.
- Explain what is meant by the term compensation point.
- From the graph find the compensation point of (a) species X and (b) species Y.
- Which of the two species, X or Y, is more likely to be found in a sunny habitat? Explain your answer.
- Describe a laboratory experiment, using bicarbonate indicator, to determine the compensation point of a plant.

Light intensity (arbitrary units)	Sugars formed (+) and Sugars used (-) (arbitrary units)	
	Species X	Species Y
0	-5.5	-13.5
2	-1.0	-7.5
4	+3.0	-1.5
6	+5.0	+4.5
8	+6.5	+10.5
10	+6.0	+15.0
12	+5.5	+15.0

10. (a) Draw a large labelled diagram of an alveolus from a human lung together with its blood supply. Outline how inhalation and exhalation occur during normal breathing (diagrams not required).

- (b) The diagram shows the different air volumes in the lungs of a human.

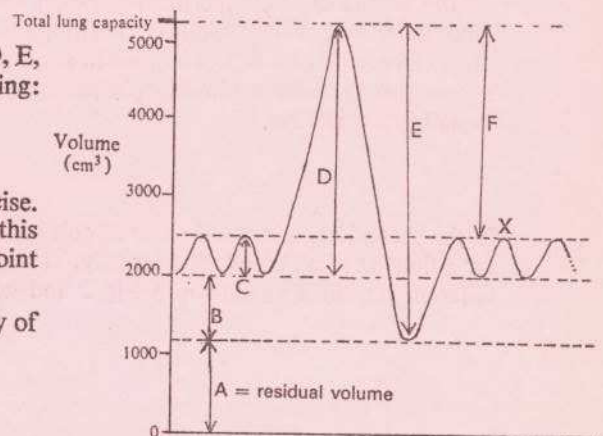
Give the appropriate letter from the letters B, C, D, E, F, on the diagram which indicates each of the following:

- (i) tidal air volume, (ii) inspiratory reserve volume.

State the volume of air (in  $\text{cm}^3$ ) in each case.

The rate of breathing increases during physical exercise. In your answerbook draw a suitable graph to show this increase in the rate of breathing. Start from the point marked X on the diagram.

(Note: rate of breathing = tidal air volume  $\times$  frequency of inspirations)



11. (a) Describe accurately with the aid of simple diagrams *three* features that would enable you to identify a named tree in summer.

Of the large number of seeds produced by a tree each year only a limited number survive to become mature trees. List *five* factors which may affect the survival rate.

- (b) Mosses and ferns show alternation of generations in their life cycles. Flowering plants are usually thought to have evolved from similar plants which also showed alternation of generations. Explain (i) alternation of generations, (ii) how far alternation of generations is still represented in the life cycle of a typical flowering plant.

12. State Mendel's Law of Segregation (1st law) and his Law of Independent Assortment (2nd law). Outline an experiment to demonstrate either one of these laws.

A *Drosophila* fly with grey body(G) and normal antennae(N) was crossed with a black-bodied(g) fly with twisted wings(n). One of the  $F_1$  flies (GgNn) was crossed with a fly homozygous for the recessive alleles and the following numbers of offspring were obtained.

(a) grey body, normal antennae	100	(c) grey body, twisted antennae	11
(b) black body, normal antennae	9	(d) black body, twisted antennae	96

- What is meant by linkage?
- Say, giving your reasoning, which genes in the above cross are linked.
- Outline the mechanism by which the non-parental types of offspring (i.e. (b) and (c) above) were produced.

## 13. Read this extract and answer the questions below.

Dutch elm disease is a disease of elm trees caused by a fungus (*Ophiostoma ulmi*) which is spread from tree to tree by two beetles (*Scolytus scolytus* and *Scolytus multistriatus*).

Female beetles are attracted to withering or dead elms. The beetles make their breeding galleries in the bark of these trees. They lay their eggs in the galleries. The larvae which hatch out eat larval galleries away from the original ones — at this time part of the latest growth ring is often eaten into. The larvae form pupal chambers at the end of the galleries and there they pupate.

It has been found that the fungus does not normally occur in the bark. It has been suggested that the fungus grows mainly in the xylem vessels and spreads from vessel to vessel via the bordered pits. The fungus produces growth substances which, together with enzymes and toxins, are believed to cause the formation of tyloses in the wood. Tyloses are wood parenchyma bulges into the vessels.

Reproduction of the fungus is commonly by asexual spores called conidia. The fungus may come from the infected wood into the network of galleries of the beetles, and produce asexual spores there. Thus when the young beetle emerges from its pupa and bores its way out it can be infected by the fungus. The young beetles fly to the tops of healthy elms where they feed off the sappy bark of young twigs before mating.

(Adapted from Heybroek, H.M. et al., 'Devastation of the elm', Technology Ireland, May 1982.)

- Give an outline life cycle diagram of the beetle.
  - State the type of life cycle shown by the beetle.
  - Indicate clearly on the life cycle diagram (a) where the beetle may become infected and (b) where healthy elms may become infected, by the fungus.
  - Draw and label a diagram of a xylem vessel.
  - The leaves of infected branches wilt and die. Eventually the tree dies. Outline one way by which the fungus causes the death of the tree.
  - Diseased trees are cut down and stripped of their bark and the bark burned. Why?
14. (a) The importance of water to living organisms derives from its solvent properties, specific heat capacity, surface tension, capillarity and freezing properties. Outline the biological significance of any *three* of the above properties of water.

- (b) Name *three* naturally-occurring plant hormones and state one function for each.

Two experiments were carried out to investigate the growth of oat coleoptiles.

In the first experiment three groups of oat coleoptiles were set up and were illuminated from one side only (unilateral light). Group A were untreated; members of group B had black paper sleeves around them except at their tips; group C had black paper caps over their tips. The results are shown in Fig. 1.

Do the results of this experiment support the hypothesis that some kind of hormone is passed from one part of a coleoptile to another in order to produce a phototropic response? Explain your answer.

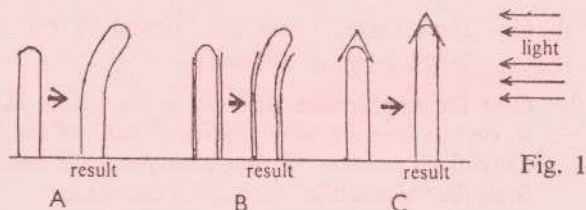


Fig. 1

In the second experiment the tips of coleoptiles previously grown in uniform light were cut off and placed for a time on small blocks of agar jelly. These blocks of agar were then placed on decapitated coleoptiles in different positions as shown in Fig. 2 and left there in uniform light for some time.

State the results obtained with group K and group L coleoptiles and suggest an explanation in each case. What result would you expect from group M coleoptiles?

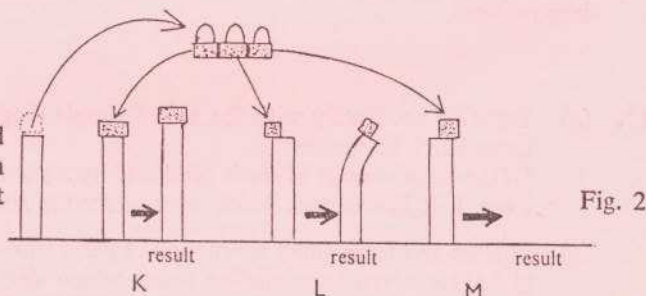


Fig. 2

15. Answer *two* of the following:

- List the characteristic properties of enzymes. Describe fully an experiment to show the effect of temperature on the rate of enzyme action.
- What is a meristem? Distinguish between a primary and secondary meristem. Give a labelled diagram of a transverse section of a dicotyledonous stem to show the arrangement of tissues *after* secondary thickening has taken place. What is the importance of secondary thickening to plants?
- Describe bacteria and *Amoeba* under the following headings:
  - habitat, (ii) generalised structure, (iii) mode of nutrition.
 List the precautions you should take when working with bacteria in the laboratory.
- "Ecological principles need to be applied to agriculture and fisheries" Discuss this statement.