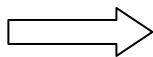


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**Coimisiún na Scrúduithe Stáit  
State Examinations Commission**

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**LEAVING CERTIFICATE EXAMINATION, 2005**

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**BIOLOGY – HIGHER LEVEL**

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**TUESDAY, 14 JUNE – AFTERNOON, 2.00 TO 5.00**

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**Section A.** Answer any **five** questions from this section.  
Each question carries 20 marks.  
Write your answers in the spaces provided on **this examination paper**.

**Section B** Answer any **two** questions from this section.  
Each question carries 30 marks.  
Write your answers in the spaces provided on **this examination paper**.

**Section C** Answer any **four** questions from this section.  
Each question carries 60 marks.  
Write your answers in the **answer book**.

**It is recommended that you spend not more than 30 minutes on Section A and 30 minutes on Section B, leaving 120 minutes for Section C.**

**You must return this examination paper with your answer book at the end of the examination.**

**Section A**  
**Answer any five questions.**  
**Write your answers in the spaces provided.**

1. Answer **five** of the following by writing a word in the space provided.

- (a) Cellulose is an example of a structural .....
- (b) Vitamins are either water-soluble or .....-soluble.
- (c) Fats are composed of oxygen, hydrogen and .....
- (d) When an iodine solution is added to a food sample and remains red-brown in colour,  
..... is absent.
- (e) When two monosaccharides unite they form a .....
- (f) Removal from the body of the waste products of metabolism is called.....

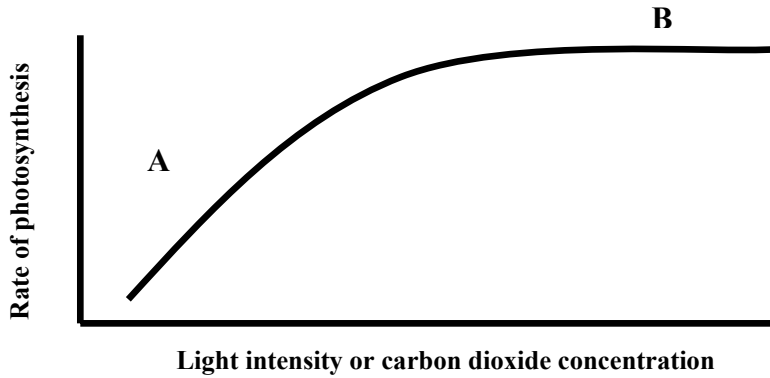
2. Explain each of the following terms in relation to the scientific method.

- (a) Hypothesis.....  
.....
- (b) Control .....
- (c) Data .....
- (d) Replicate .....
- (e) Theory .....

3. Indicate whether the following are true (T) or false (F) by drawing a circle around T or F.

- |   |   |   |
|---|---|---|
| (a) Urea is formed in the kidneys.  | T | F |
| (b) Motor neurons conduct impulses towards the central nervous system.          | T | F |
| (c) Endocrine glands secrete hormones.  | T | F |
| (d) Tendons join muscles to bones.  | T | F |
| (e) The sino-atrial node (pacemaker) is located on the right side of the heart. | T | F |
| (f) A nucleus is absent from human red blood cells.                             | T | F |
| (g) Light is essential for the germination of seeds.                            | T | F |
| (h) Lenticels serve the same function as stomata.                               | T | F |
| (i) Parallel leaf veins are characteristic of monocotyledonous plants.          | T | F |
| (j) Endosperm is a food reserve in some seeds.                                  | T | F |

4. The following graph shows how the rate of photosynthesis varied when a plant was subjected to varying levels of light intensity **or** carbon dioxide concentration.

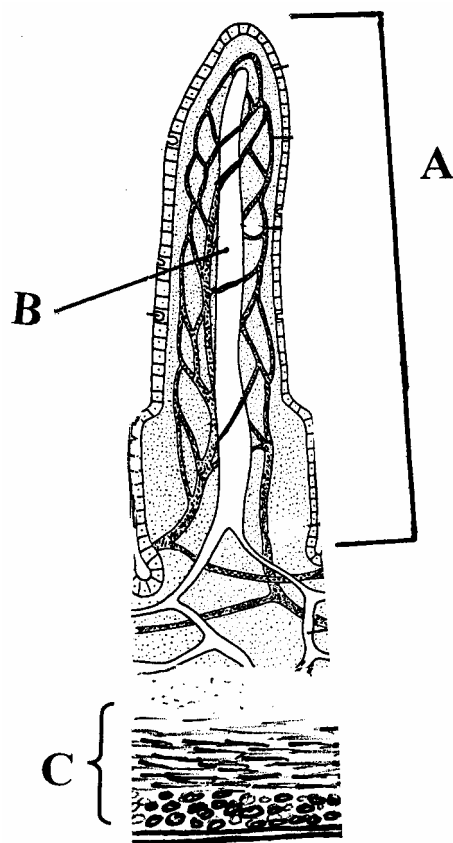


- (a) What is happening at A? .....
- (b) What is happening at B? .....
- (c) Suggest a reason for your answer in (b) .....
- .....
- (d) Where in a cell does photosynthesis take place? .....
- (e) Give **two** sources of the carbon dioxide that is found in the atmosphere.
- (i) .....
- (ii) .....
- (f) Suggest **one** way in which the rate of photosynthesis of plants in a greenhouse could be increased.
- .....
- .....

5. (a) In the space below draw a diagram of a nucleus during metaphase of mitosis where  $2n = 6$ . Label the spindle and a centromere in your diagram.

- (b) State a function of mitosis in a single-celled organism. ....
- .....
- (c) State a function of mitosis in a multicellular organism. ....
- .....
- (d) State one way in which mitosis differs from meiosis. ....
- .....
- (e) When the normal control of mitosis in a cell is lost, cancer may result. Suggest **two** possible causes of cancer.
- 1. ....
- 2. ....

6. The diagram shows part of a section of the human small intestine.



(a) Name A, B, C.

A .....

B .....

C .....

(b) State **two** ways in which A is adapted for the absorption of soluble foods.

1. ....

2. ....

(c) Name a process by which soluble foods are absorbed into the blood from the small intestine.

.....

(d) What type of food is mainly absorbed into B?

.....

**Section B**

**Answer any two questions.**

**Write your answers in the spaces provided.**

**Part (a) carries 6 marks and part (b) carries 24 marks in each question in this section.**

7. (a) Immobilised enzymes are sometimes used in bioreactors.
- (i) What is a bioreactor? .....
- .....
- (ii) State **one** advantage of using an immobilised enzyme in a bioreactor.
- .....
- (b) Answer the following questions in relation to an experiment that you carried out to immobilise an enzyme and use that immobilised enzyme.
- (i) Name the enzyme that you used .....
- (ii) Draw a labelled diagram of the apparatus that you used to immobilise the enzyme.
- (iii) Describe how you used this apparatus to immobilise the enzyme. In your answer name the solutions that you used and explain their purpose.
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- (iv) Describe briefly how you used the immobilised enzyme.
- .....
- .....
- .....
- .....

8. (a) Explain each of the following terms in relation to DNA.
- (i) Replication .....
  - .....
  - (ii) Transcription .....
  - .....
- (b) As part of your practical activities you extracted DNA from a plant tissue. Answer the following questions in relation to this experiment.
- (i) What plant did you use? .....
  - (ii) It is usual to chop the tissue and place it in a blender. Suggest a reason for this.  
.....  
.....  
.....
  - (iii) For how long should the blender be allowed to run? .....
  - (iv) Washing-up liquid is normally used in this experiment. What is its function?  
.....  
.....  
.....
  - (v) Sodium chloride (salt) is also used. Explain why.....  
.....  
.....
  - (vi) What is a protease enzyme? .....
  - (vii) Why is a protease enzyme used in this experiment? .....
  - .....  
.....
  - (viii) The final separation of the DNA involves the use of alcohol (ethanol). Under what condition is the alcohol used? .....
  - .....

9. (a) (i) Yeasts are eukaryotic organisms. What does this mean? .....
- .....
- (ii) To which kingdom do yeasts belong? .....
- (b) Answer the following questions in relation to an experiment that you carried out to investigate the growth of leaf yeast.
- (i) From which plant did you collect the leaf sample? .....
- (ii) Describe how you collected the leaf sample. ....
- .....
- .....
- .....
- (iii) What did you do with the leaves when you returned to the laboratory? .....
- .....
- .....
- .....
- .....
- (iv) Nutrient agar plates are used in this experiment. What are nutrient agar plates and what is their purpose? .....
- .....
- .....
- .....
- (v) What did you observe in the agar plates at the end of the experiment? .....
- .....
- .....
- .....
- (vi) Having finished the experiment, what did you do with the agar plates? .....
- .....
- .....
- .....

## Section C

Answer any **four** questions.

Write your answers in the answer book.

10. (a) (i) What is meant by genetic engineering?  
(ii) State **two** applications of genetic engineering, **one** involving a micro-organism and **one** involving a plant. **(9)**
- (b) Cystic fibrosis is a serious condition that affects the lungs and digestive system. The condition results from the inheritance of a single pair of recessive alleles.  
(i) Explain each of the underlined terms.  
(ii) Suggest why a person with an heterozygous allele pair does not suffer from the condition.  
(iii) If both parents are heterozygous what is the percentage chance that one of their children may inherit the condition? Explain how you obtained your answer.  
(iv) What is meant by genetic screening?  
(v) Parents who are suspected of being carriers of disease-causing alleles may be advised to consider a genetic test. Suggest a role for such a test after *in-vitro* fertilisation. **(27)**
- (c) (i) Define the following terms as used in genetics; linkage, sex linkage.  
(ii) Explain why linked genes do not assort independently.  
(iii) Red-green colour blindness is a sex (X)-linked condition. Normal red-green vision results from the possession of a dominant allele (C). In each of the following cases give the genotypes of the mother and of the father.  
1. A family in which one daughter is red-green colour blind and one daughter has normal colour vision.  
2. A family in which all the sons are red-green colour blind and all the daughters are carriers (heterozygous). **(24)**
11. (a) (i) Distinguish between aerobic and anaerobic respiration.  
(ii) Write a balanced equation to summarise aerobic respiration. **(9)**
- (b) Answer the following questions in relation to the first stage of respiration.  
(i) Where in the cell does this stage occur?  
(ii) During this stage a small amount of energy is released. Explain the role of ADP in relation to this released energy.  
(iii) What is the final product of this stage under aerobic conditions?  
(iv) If conditions in the cell remain aerobic the product you have named in (iii) is used for the second stage of respiration. Where does this second stage take place?  
(v) If conditions in a human cell (e.g. muscle) become anaerobic the product named in (iii) is converted to another substance. Name this other substance.  
(vi) When the substance named in (v) builds up in the blood, a person is said to be in oxygen debt. This debt must eventually be paid. Suggest how the debt is paid. **(24)**
- (c) If yeast cells are kept in anaerobic conditions alcohol (ethanol) and another substance are produced.  
(i) Describe, with the aid of a diagram, how you would keep yeast under anaerobic conditions in the laboratory.  
(ii) Name a carbohydrate that you would supply to the yeast as an energy source.  
(iii) Give an account of a chemical test to demonstrate that alcohol (ethanol) has been produced. Include the initial colour and final colour of the test.  
(iv) What is the other substance produced under anaerobic conditions?  
(v) Alcohol (ethanol) production is an example of fermentation. How would you know when fermentation has ceased?  
(vi) Why does fermentation eventually cease? **(27)**

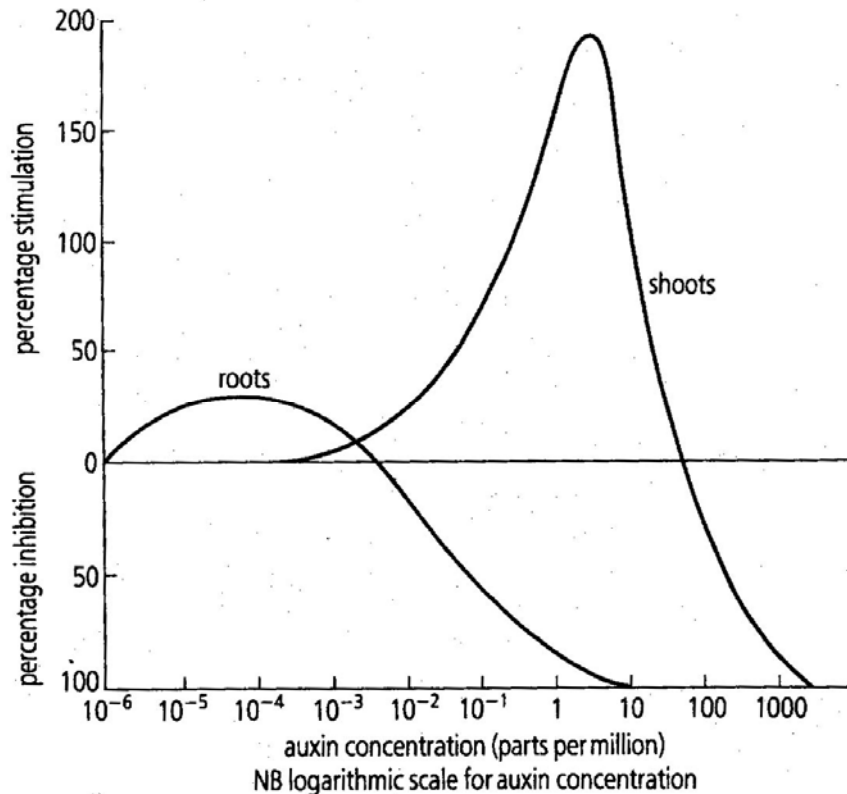


12. (a) (i) What does an ecologist mean by competition?  
(ii) Competition is generally more intense between members of the same species than between members of different species. Comment on the validity of this statement. **(9)**
- (b) Read the following extract and then answer the questions below.  
“A migratory flight involves preparation. The initial stimulus for spring migration among birds wintering in European latitudes comes from the increase in day length past an initial threshold. Physiological changes encourage the deposition of fat, particularly beneath the skin (subcutaneous) and inside the abdomen (visceral). Fat is the vital fuel used by migrating birds, which often have to cross long stretches of sea or perhaps desert where feeding opportunities are either non-existent or very limited.  
Wildfowl preparing for migration, therefore, increase their food intake in order to lay down that vital fat and this shows itself in increased time spent feeding. Conveniently, for plant-eating species such as the grazing geese and wigeon, the onset of spring growth in the plants means higher levels of nutrients in the growing tips on which the birds feed.”  
[From Wildfowl, Ogilvie and Pearson, 1994 Hamlyn Limited]
- (i) What is the stimulus for spring migration?  
(ii) Suggest **two** reasons why birds migrate.  
(iii) What is the “vital fuel” used by migrating birds?  
(iv) Give **two** locations in the body in which this vital fuel may be found.  
(v) Suggest what happens to this fuel in the body tissues of the birds.  
(vi) In which part of plants do wigeon find the highest level of nutrients?  
(vii) Suggest a reason for the nutrient levels being highest in this part of the plant. **(27)**
- (c) (i) Give an account of how you carried out a quantitative survey of a named plant species in an ecosystem that you have studied. In your answer describe how you recorded the results of your survey.  
(ii) As a result of a disease, a species of plant disappeared from an ecosystem. Suggest **three** possible effects of the disappearance of this plant on the populations of other plants and animals in the ecosystem. **(24)**
13. (a) (i) Where is testosterone secreted in the body of the human male?  
(ii) Give a brief account of the role of testosterone. **(9)**
- (b) (i) Draw a large labelled diagram of the reproductive system of the human male.  
(ii) Where are sperm produced?  
(iii) State **two** ways in which sperm differ from ova (eggs).  
(iv) Name a gland that secretes seminal fluid.  
(v) State a function of seminal fluid. **(27)**
- (c) (i) What is meant by contraception?  
(ii) Give an example of a surgical method of male contraception. Suggest an advantage and a disadvantage of the method that you have named.  
(iii) List **three** methods of contraception other than surgical. In your answer you may refer to either or both sexes.  
(iv) Suggest a possible effect on a human population that may result from an increased availability of contraception. **(24)**

14. Answer **any two** of (a), (b), (c).

(30, 30)

- (a) The passage of water through a plant is known as the transpiration stream. Answer the following questions in relation to the transpiration stream.
- Explain how water enters the plant at the root hair.
  - Do minerals enter the plant by the process that you have indicated in (i)? Explain your answer.
  - How is xylem adapted for its role in water transport?
  - Strong forces of attraction exist between water molecules. Give an account of the importance of these forces in raising water to great height in trees.
- (b) The graph shows the effect of varying auxin concentration on the root and shoot of a plant.



- What is an auxin?
  - At what approximate auxin concentration does the root receive maximum stimulation?
  - At what approximate auxin concentration does the shoot receive maximum stimulation?
  - What is the effect on the root of an auxin concentration of  $10^{-2}$  parts per million?
  - Give **two** examples of uses of synthetic (man-made) auxins.
  - Describe **three** methods used by plants to protect themselves from adverse external environments.
- (c) Answer the following questions in relation to systems of response to stimuli in the human body.
- The pancreas is both an exocrine gland and an endocrine gland. Explain the underlined terms.
  - Name a product of the endocrine portion of the pancreas and state one of its functions.
  - Name a disorder other than cancer for each of the following and indicate a possible cause and a means of treatment:
    - Musculoskeletal system
    - Nervous system.

15. Answer **any two** of (a), (b), (c).

(30, 30)

- (a)
- (i) Comment briefly on the difficulty in classifying viruses as living organisms.
  - (ii) Name **two** diseases of humans caused by viruses.
  - (iii) Name **two** types of lymphocyte and state a role of each when viruses or other micro-organisms enter the blood.
  - (iv) “Immunity that results from vaccination is effectively the same as the immunity that develops following an infection”. Do you agree with this statement? Explain your answer.
- (b)
- (i) Draw and label a diagram to show the basic structure of a typical bacterial cell.
  - (ii) Other than being prokaryotic, state **two** ways in which a typical bacterial cell differs from a typical human cell (e.g. cell from cheek lining).
  - (iii) Describe how some bacteria respond in order to survive when environmental conditions become unfavourable.
  - (iv) What is meant when a bacterium is described as being pathogenic?
  - (v) What are antibiotics? Use your knowledge of the Theory of Natural Selection to explain the possible danger involved in the misuse of antibiotics.
- (c) Saprophytic and parasitic fungi are widespread in nature.
- (i) Explain each of the underlined terms.
  - (ii) State a role of each of these types of fungus in the overall scheme of nature.
  - (iii) Give **one** example of a beneficial fungus and **one** example of a harmful fungus.
  - (iv) State a function for each of the following structures that are found in fungi; rhizoid, sporangium, gametangium, zygospore.

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