

## WARNING

This Question Paper **MUST** be returned with your answer book(s) at the end of the Examination:  
otherwise marks will be lost.

M. 44

Write your Examination Number here 



# Coimisiún na Scrúduithe Stáit State Examinations Commission

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LEAVING CERTIFICATE EXAMINATION 2003

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## BIOLOGY - HIGHER LEVEL

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WEDNESDAY, 11 JUNE - AFTERNOON, 2.00 to 5.00

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Answer **six** questions from Part 1 and **four** questions from Part II.  
You should not spend more than **45 minutes** on Part I, leaving about **135 minutes** for Part II.

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### PART I (120 marks)

Questions 1 - 7

Answer **six** questions. Each question carries 20 marks.  
Write your answers in the spaces provided.  
Keep your answers short.

### PART II (280 marks)

Questions 8 – 15

Write your answers to this part in your answer book.  
Answer **four** questions.  
Each question carries 70 marks.

**PART I (120 marks)**

Answer **six** questions. Each question carries 20 marks.

Write your answers in the spaces provided.

Keep your answers short.

1. Answer **five** of the following by completing the sentence.

- (a) Deamination takes place in the .....
- (b) The walls of xylem vessels are reinforced with .....
- (c) The organ of Corti is located in .....
- (d) A rhizome is a modified .....
- (e) Interstitial cells in the testis secrete .....
- (f) Cambium is a secondary .....

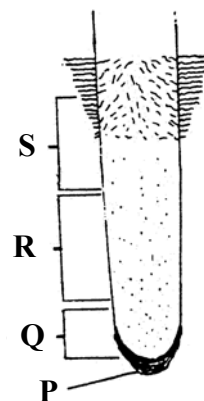
2. For what purpose might a biologist use each of the following:

- (a) Atmometer .....
- (b) Tullgren funnel .....
- (c) Bicarbonate indicator .....
- (d) Chromatography .....
- (e) Alkaline pyrogallol .....
- (f) Clinostat .....
- (g) Sodium or potassium hydroxide .....

3. Answer the following questions in relation to the outline diagram of a longitudinal section through a young root.

(a) Identify P, Q, R, S.

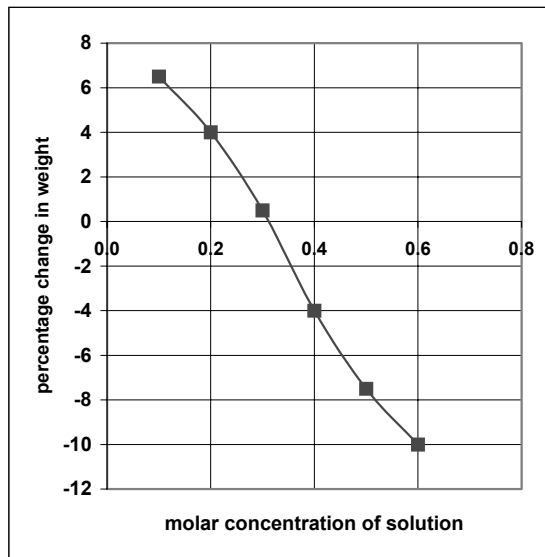
- P .....
- Q .....
- R .....
- S .....



- (b) What is the function of P? .....
- (c) What takes place at Q? .....
- (d) How do the cells in R differ from those in Q? .....
- (e) In which region may non-living cells be found? .....

4. Answer the following in relation to human skin.
- (a) Name the non-living outer layer. ....
  - (b) The skin has protective roles in relation to ultraviolet (UV) light and infection.  
 How does the skin protect against UV light? .....  
 How does the skin protect against infection? .....
  - (c) Name **two** substances excreted by means of the skin. ....
  - (d) State a role of hair other than its involvement in insulation. ....  
 .....
  - (e) Name a vitamin which is manufactured in the skin. ....

5. The graph shows the variation in weight of a plant tissue according to the concentration of a sugar solution in which it has been immersed for a period.



- (a) What substance mainly accounts for the percentage gain or loss in weight? .....
- (b) At what concentration is there no gain or loss in weight? .....
- (c) Explain why there is no gain or loss in weight at the concentration that you have given in (b).  
 .....
- (d) What term is used to describe the cells that have been immersed in solution of concentration 0.6?  
 .....
- (e) Draw and label a plant cell that has been immersed in solution of concentration 0.6.
- (f) How might the cell that you have drawn in (e) be restored to its normal state? .....

6. (a) State the precise location of the diaphragm in the human body. ....  
 .....  
 (b) Of what type of muscle is the diaphragm composed? .....  
 (c) Does the diaphragm rise or lower during exhalation? .....  
 (d) Name another muscle that is involved in exhalation. ....  
 (e) What term is used to describe the volume of air exchanged during a breath of an individual at rest?  
 .....  
 (f) Give **two** differences between inhaled and exhaled air other than in their gaseous contents.  
 .....  
 .....

7. Distinguish between the members of the following pairs of terms by making a brief comment on **each term**.

- (a) Hydrophyte and hydrosere  
 .....  
 .....
- (b) Node and internode  
 .....  
 .....
- (c) Endoplasm and endoderm  
 .....  
 .....
- (d) Integument and testa  
 .....  
 .....
- (e) Parenchyma and sclerenchyma  
 .....  
 .....

## PART II (280 marks)

Write your answers to this part in your answer book.

Answer **four** questions.

Each question carries 70 marks.

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8. (a) (i) Draw a labelled diagram to show the position of the chromosomes (chromatids) during metaphase I of meiosis in a nucleus in which  $2n = 8$ .
- (ii) State **one** way in which the diagram that you have drawn differs from metaphase of mitosis.
- (iii) In animals meiosis is essential in the production of certain cells. Name these cells.
- (iv) Briefly outline the role of meiosis in the life cycle of the flowering plant. (22)
- (b) A child of a marriage between a woman of blood group A and a man of blood group B had blood group O.
- (i) What are multiple alleles?
- (ii) Give the genotype of each of the parents above.
- (iii) What other blood groups may children of these parents have? (18)
- (c) (i) List the nitrogen bases found in DNA. Name **two** other components of the DNA molecule.
- (ii) If you were given the root of a young onion plant describe how you would show the presence of DNA in its cells. (30)
9. (a) Explain any **three** of the following terms;  
glycolysis, aerobic respiration, facultative anaerobe, phosphorylation, photolysis. (15)
- (b) Where does oxidative phosphorylation take place in a cell? Give an account of the events of oxidative phosphorylation. (24)
- (c) Describe an experiment that you would carry out to demonstrate anaerobic respiration. In your answer include a labelled diagram of the apparatus that you would use. (31)
10. (a) In the case of each of the following structures, name an animal that possesses it and state a function:  
clitellum, spiracle, ventral sucker, seminal vesicle. (24)
- (b) Explain the significance of each of the following in animal evolution:  
(i) mesoderm  
(ii) coelom. (18)
- (c) Larvae occur in the life cycles of some animals. Explain the role of larvae in these life cycles. Name, in correct order, the larvae that are found in the life cycle of the liver fluke. For each of these larvae state if it is found in (i) the primary host (ii) the intermediate (secondary) host (iii) outside the host bodies. (28)

11. (a) (i) Contrast the structure of arteries and veins in transverse section by use of labelled diagrams.  
(ii) Give reasons for any **two** differences in the structure of arteries and veins.

(22)

(b) Write notes on **three** of the following:

- (i) Hepatic portal vein.  
(ii) Lymph nodes.  
(iii) Leucocytes.  
(iv) Thrombin.

(27)

(c) The table shows the composition of plasma, glomerular filtrate and urine in respect of certain components.

Component	Plasma g/100cm <sup>3</sup>	Glomerular filtrate g/100cm <sup>3</sup>	Urine g/100cm <sup>3</sup>
Urea	0.03	0.03	2.00
Uric Acid	0.004	0.004	0.050
Glucose	0.10	0.10	0.00
Amino Acids	0.05	0.05	0.00
Salts	0.72	0.72	1.50
Protein	8.00	0.00	0.00

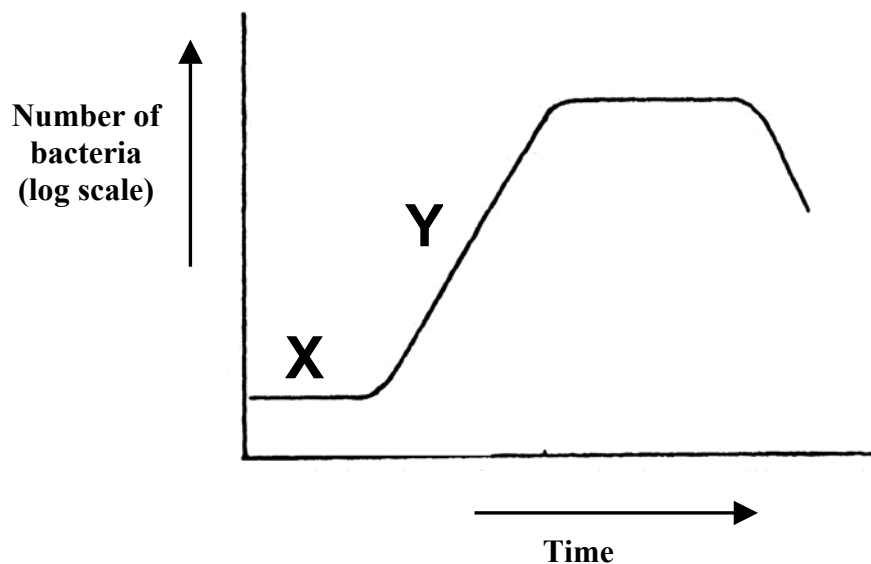
- (i) Explain how glomerular filtrate is formed.  
(ii) Explain why the concentration of urea is higher in urine than in plasma and glomerular filtrate.  
(iii) Why is the glucose concentration the same in plasma and glomerular filtrate?  
(iv) Why are there normally no amino acids in urine?  
(v) Explain the absence of protein from urine.

(21)

12. (a) (i) Draw and label *Rhizopus* (bread mould) to show its main structures.  
(ii) State the type of nutrition of *Rhizopus* and explain its significance in nature.  
(iii) Give **two** ways in which *Rhizopus* and *Phytophthora* differ in structure.

(31)

- (b) The graph shows the changes in the numbers of bacteria in an agar plate.



- (i) X represents a period during which there is little increase in numbers. Explain what is happening during this period.  
(ii) Account for the change that occurs at Y.  
(iii) Suggest **three** reasons for the eventual decline in numbers.

(18)

- (c) Explain the reason for each of the following procedures which are used when growing bacteria in the laboratory.

- (i) Heating a steel loop in a Bunsen flame before picking up a bacterial sample.  
(ii) Incubating an unopened plate.  
(iii) Incubating agar plates upside down.  
(iv) Heating the plates in an autoclave or pressure cooker after identification of the bacteria.

(21)

13. (a) (i) Explain the following terms;  
habitat, ecosystem, biosphere.
- (ii) Distinguish between a food chain and a food web. Give an example of a food chain from a named habitat which includes four trophic levels.
- Why are food chains usually short? (25)
- (b) (i) What is a climax community? Give an example of a climax community.
- (ii) Abiotic and biotic factors influence the composition of climax communities. Explain the underlined terms and give **two** examples of each. (21)
- (c) There are two species of squirrel in Ireland, the red squirrel and the grey squirrel. The red squirrel is native to Ireland whereas the grey squirrel was introduced from North America. The first recorded release took place in County Longford in 1913. Since then the species has spread to many wooded areas.
- In 1934 the capture-recapture method was used to estimate the populations of the two species in a large forest. Forty of each species were captured, tagged and released. One month later the same number of each species was captured. Five of the red squirrels and sixteen of the grey squirrels were found to be tagged.
- In 1948 a similar study was conducted in the same forest. This time forty grey squirrels were again captured but it was only possible to catch twenty red squirrels. Again these squirrels were tagged and released. When the same number of each species was captured one month later it was found that two of the grey squirrels and five of the red squirrels were tagged.
- (i) Calculate the number of squirrels of each species in the forest in 1934.
- (ii) Calculate the number of squirrels of each species in the forest in 1948.
- (iii) State the change in number of each species between 1934 and 1948.
- (iv) Suggest **two** reasons that might explain the changes that you have stated in (iii). (24)
14. (a) Describe the events that take place during the life cycle of a flowering plant from the time that a pollen grain lodges on the stigma of the carpel until fertilisation has been completed. (24)
- (b) By reference to the moss or fern explain what is meant by alternation of generations. Use labelled diagrams in support of your answer. (28)
- (c) In the case of any **three** of the following structures name a plant in which it is found and state a function:  
pyrenoid, lenticel, conceptacle, sieve tube. (18)



15. Answer **two** of the following sections.

(35, 35)

- (a) (i) What is meant by reflex action? Using a suitably labelled diagram show the pathway of a reflex arc.
- (ii) In relation to the transmission of a nervous impulse, write notes on the following:
1. Threshold.
  2. Events involving acetylcholine at the synapse.
- (b) Describe the procedures that you would use in the laboratory to detect the presence of each of the following in a food sample:
- (i) a reducing sugar.
  - (ii) a named polysaccharide.
  - (iii) Vitamin A or vitamin C.
  - (iv) protein.
- (c) Explain the biological basis of each of the following procedures;
- (i) Pruning fruit trees.
  - (ii) Taking cuttings from a hedge.
  - (iii) Taking iron tablets during pregnancy.
  - (iv) Spraying crops with insecticides.
  - (v) Using a spray to burn down the aerial parts of potato plants before harvesting the tubers.
  - (vi) Operating a close season for fishing.
  - (vii) Using salt to preserve meat.
- (d) Plants require in excess of thirty elements for their normal life processes. These elements include nitrogen, magnesium and calcium.
- (i) State **one** use for each of these named elements in the plant.
  - (ii) Describe, using a labelled diagram of the apparatus, an experiment that you would carry out to determine the deficiency symptoms of each of these elements.
  - (iii) State a deficiency symptom in the case of **two** of these elements.

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