



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

Leaving Certificate Examination 2019

# Biology

Section C  
Higher Level

Tuesday 11 June – Afternoon 2:00 – 5:00

240 marks

**Sections A and B are supplied in a separate examination booklet**

**You must return the examination booklet for Sections A and B  
with the answerbook used to answer the questions in Section C**

## Instructions

There are three sections in this examination.

Section **A** and Section **B** are in a separate examination booklet.

Section **C** is in this question paper.

This examination carries 400 marks in total.

**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.**

Section **C**: Answer any **four** questions from this section.

Each question carries 60 marks.

Write your answers in the **special answerbook** which the Superintendent will give you.

Do **not** write your answers to Section C on this question paper.

The special answerbook for Section C will be scanned and your work will be presented to an examiner on screen.

Write your answers in blue or black pen. You may use pencil for graphs and diagrams only.

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## Section C

Answer any four questions.

Write your answers in the special answer book.

10. (a) (i) What is the importance in nature of recycling elements such as carbon and nitrogen?  
(ii) Name **two** of the types of bacteria that play a role in the nitrogen cycle. (9)

- (b) Invasive mammals have been shown to have a detrimental impact on island biodiversity. Worldwide, invasive mammal species have led to the decline or extinction of bird and other species through predation and competition. Under an EU directive, Lough Mask in county Mayo is designated as a candidate Special Protection Area for wild birds. Both common and black-headed gulls have significant nesting colonies on islands in Lough Mask. Both are considered to be species of conservation concern because their national breeding populations have declined by 25 – 50% in the last 25 years. The reasons for the decline in these breeding colonies are not fully known, but it is considered that predation by the American mink is a problem. Mink are known to visit colonies and kill both adults and chicks.  
*Adapted from www.invasivespeciesireland.com*

- (i) Explain what is meant by the terms  
1. *Predation*  
2. *Conservation* (of species).  
(ii) Suggest why the mink has become a successful predator of the gulls.  
(iii) Mink are omnivores. Why is this an advantage when mink invade an island?  
(iv) Other than predation, suggest a way in which the mink could cause a decline in the populations of these gulls.  
(v) Suggest another impact on food chains in this ecosystem caused by the presence of mink on these islands.  
(vi) Sketch and label a graph to show the typical relationship between the populations of a predator and its prey. (27)

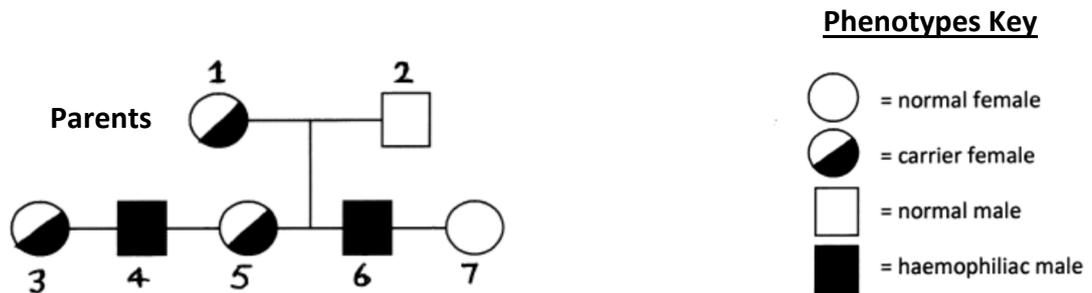
- (c) (i) From your knowledge of ecological surveys, explain the meaning of the terms:  
1. *Quantitative*  
2. *Qualitative*.  
(ii) In the course of your ecological studies you investigated an ecosystem. Name this ecosystem **and** describe how you conducted a quantitative survey of flora present in it.  
(iii) How did you present the results of your survey?  
(iv) Suggest a possible source of error in your survey. (24)

11. (a) (i) Name the sugar present in DNA.  
(ii) Other than the sugar, give two structural differences between DNA and RNA. (9)

- (b) Protein synthesis is a complex process, involving both transcription and translation, that occurs in all cells.  
(i) Where does transcription occur in animal and plant cells?  
(ii) Where precisely in the cell does translation occur?  
(iii) Name the **three** types of RNA involved in protein synthesis.  
(iv) Describe the events that occur during translation, leading to the formation of a functional protein. (27)

- (c) (i) Explain the following terms used in genetics:  
1. *Sex linkage*  
2. *Heterozygous*  
3. *Genotype*.

- (ii) The diagram below shows the pattern of inheritance of haemophilia in a family. The haemophilia gene (n) is sex-linked and recessive.



1. What are the genotypes of the parents for both sex and haemophilia?
2.
  - If person 7 has a carrier daughter, give the phenotype and full genotype of the daughter's father.
  - What was the chance of that couple having a carrier daughter?

(24)

12. (a) (i) What is meant by the term *metabolism*?  
(ii) Give an example of one anabolic reaction **and** one catabolic reaction in animals. (9)

- (b) "The single most important property of enzymes is their ability to increase the rates of reactions occurring in living organisms"

*Adapted from "Enzyme Activity", section 18.7, Introduction to Chemistry: General, Organic, and Biological*

- (i) What is an enzyme?  
(ii) Which type of biomolecule are enzymes?  
(iii) Name **two** factors that affect enzyme action.  
(iv) What is meant by the term *specificity* in relation to enzyme activity.  
(v) Name the part of an enzyme responsible for its specificity.  
(vi) Give a detailed account of how enzymes work.

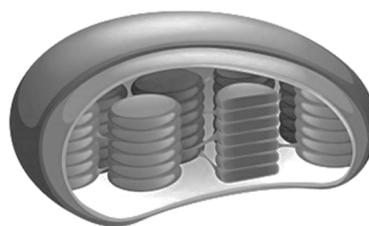
(27)

- (c) Photosynthesis occurs in two stages, the light-dependent stage and the light-independent (dark) stage.

Two structures found in plant cells are shown below.



A



B

- (i) In which of the two structures, A or B, does photosynthesis occur?  
(ii) Give a balanced chemical equation to summarise the process of photosynthesis.  
(iii) Name **two** products of the light-dependent stage of photosynthesis.  
(iv) Some of the products of the light-dependent stage are used in the light-independent stage. Outline the events of the light-independent stage.

(24)

13. Answer the following questions from your knowledge of human reproduction.

- (a) Contraception can include natural, mechanical, and chemical methods.  
Give **one** example of **each** of the above types of contraception.

(9)

- (b) (i) Draw a large diagram of the human female reproductive system.  
On your diagram, label the following parts.

**oviduct (Fallopian tube)      cervix      ovary      vagina      uterus      endometrium**

- (ii) On your diagram,  
use the letter **M** to label the site of meiosis,  
use the letter **F** to label the usual site of fertilisation.

- (iii) Name a human female menstrual disorder.

For this disorder give:

1. A possible cause
2. A method of treatment.

(27)

- (c) (i) What is meant by the term *implantation*?

- (ii) Name, in the correct order, the developmental stages from the fertilised egg to implantation.

- (iii) Outline what happens to each of the following after implantation has taken place:

1. The level of the hormone progesterone in the blood
2. The endometrium.

- (iv) Embryo cells organise into three germ layers.

Name **each** of these layers.

(24)

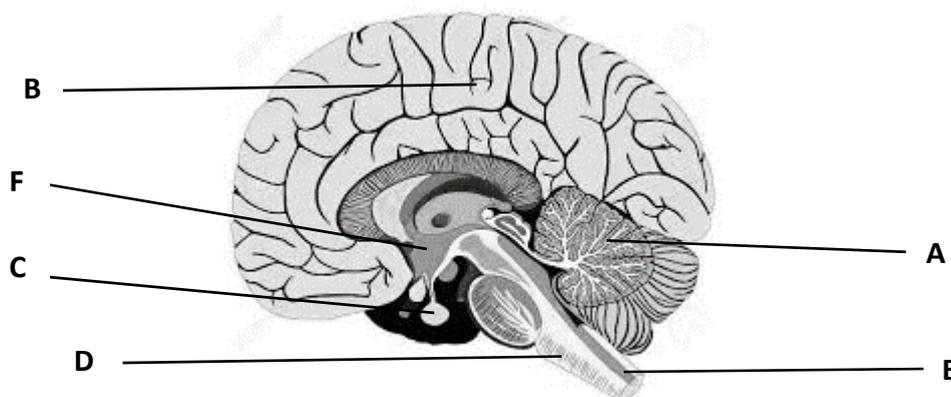
14. Answer any **two** of (a), (b), (c).

(30, 30)

- (a) (i) The diagram shows parts of the human central nervous system and some related structures.

**In your answer book**, match each of the parts labelled A – F to one of the names from the list below.

**cerebrum    medulla oblongata    pituitary gland    cerebellum    hypothalamus    spinal cord**



- (ii) 1. Give a function of the medulla oblongata.  
2. Give a function of the cerebellum.
- (iii) The brain is composed of both grey matter and white matter.  
1. Why is grey matter so called?  
2. Why is white matter so called?
- (iv) Endocrine glands produce hormones. What is meant by the term *endocrine*?
- (v) The pituitary gland is an example of an endocrine gland.  
1. Name a hormone secreted by the pituitary gland.  
2. Give a function of this hormone in the human body.
- (vi) Name **one** gland in the human body that has **both** endocrine and exocrine function.

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

- (i) Vaccination.  
(ii) Antibiotic resistance in bacteria.  
(iii) The mechanism of phototropism **or** of geotropism in plants.  
(iv) Batch food processing.  
(v) The sounds created during the cardiac cycle.

- (c) Answer the following questions from your knowledge of the human musculoskeletal system.

- (i) Give **two** functions of the skeleton.  
(ii) Name the **two** main parts of the appendicular skeleton, to which the limbs are attached.  
(iii) Name **two** of the types of bones that make up the foot.  
(iv) What is meant by the term *antagonistic muscle pair*?  
(v) Name an antagonistic muscle pair in the human body.  
(vi) Describe in full how this antagonistic muscle pair works.

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

**(30, 30)**

- (a) (i) Draw a large labelled diagram to show the structure of *Rhizopus* during asexual reproduction.
- (ii) What mode of nutrition does *Rhizopus* use?
- (iii) Describe an environmental condition that would cause *Rhizopus* to reproduce sexually.
- (iv) Describe in detail the process of sexual reproduction in *Rhizopus*.
- (b) Answer the following questions from your knowledge of the human digestive system.
- (i) What is meant by the term *digestion*?
- (ii) Give **two** reasons why digestion is necessary.
- (iii) Name **and** describe the method by which food is passed along the alimentary canal.
- (iv) Name an enzyme that digests dietary protein.
- (v) Where is this enzyme produced?
- (vi) Where is this enzyme active?
- (vii) Name the products formed by the complete digestion of a protein molecule.

These products are transported to the liver.

(viii) Name the blood vessel that transports these digestion products to the liver.

- (c) Answer the following questions from your knowledge of sexual reproduction in flowering plants.
- (i) Describe in detail the development of the embryo sac from a megaspore mother-cell.
- (ii) A double fertilisation occurs in the embryo sac.
1. Outline what happens during **each** fertilisation.
  2. State what is produced by **each** fertilisation.
- (iii) Draw a large diagram of a seed and label the following parts:

**testa      plumule      radicle**

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