2019L025A1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2019

Biology

Section A and Section B
Higher Level

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

160 marks

Section C is supplied separately

You must return this examination booklet with the answerbook used to answer the questions in Section C

Examination Number					

Centre Stamp

2019L025A1EL0112

Instructions

Write your Examination Number in the box on the front cover.

There are three sections in this examination.
Section **A** and Section **B** are in this examination booklet.
Section **C** is in a separate 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 **A**: Answer any **five** questions from this section.
Each question carries 20 marks.
Write your answers in the spaces provided in **this examination booklet**.

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

This examination booklet will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner.

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

You must return this examination booklet with the answerbook used to answer the questions in Section C.

Section A

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

1. Answer any **five** of the following parts (a) to (f):

(a) State the two main reasons why food is required by all living organisms.

1.
2.

(b) What is the ratio of hydrogen atoms to oxygen atoms in a carbohydrate?

(c) Give a structural role of lipids in cells.

(d) Give a metabolic role of lipids in cells.

(e) Give an example of a fat-soluble vitamin.

(f) Name a disorder due to a dietary deficiency of the vitamin referred to in (e).

2. In relation to the principles of experimentation:

(a) What is meant by the term *hypothesis*?

(b) Explain what is meant by *double-blind testing*.

(c) Explain the necessity for random selection.

(d) Give two other features of good experimental design.

1.

2.

(e) Where are the results of scientific research usually first published?

(f) Why is it important that scientists publish the results of their research?

3. Organisation is one of the characteristics of life. This includes organisation of cells.

(a) What is meant by the term *tissue*?

(b) Name two types of animal tissue.

1.
2.

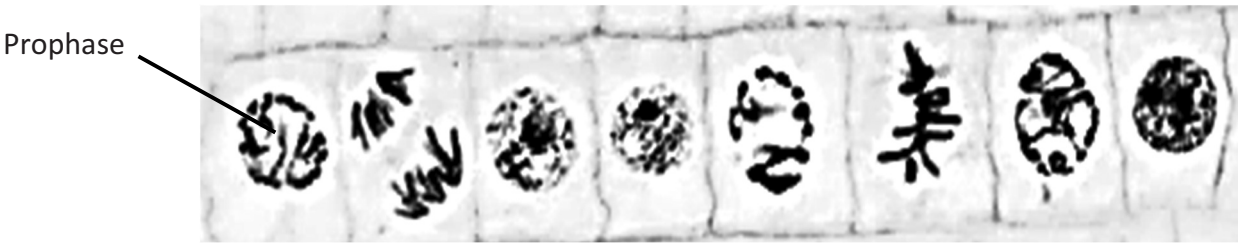
(c) State how each of these tissue types is adapted to carry out its function.

1.
2.

(d) Stem cell research is an application of tissue culture.
What is meant by the term *tissue culture*?

(e) Give one other application of tissue culture.

4. The photograph below is of plant cells undergoing different stages of mitosis.
The cells are not shown in any particular order.



(a) Which type of microscope is used in the school laboratory to observe cells like these?

(b) The first cell is in prophase. Give two observable events that happen during prophase.

1.
2.

(c) On the photograph, use the letter **M** to label a cell that is undergoing metaphase.

(d) On the photograph, use the letter **A** to label a cell that is undergoing anaphase.

(e) After mitosis, the cell divides in two.
This happens differently in animal cells and in plant cells.
Describe what happens in animal cells **and** in plant cells during this stage.

Animal cells.
Plant cells.

5. Some typical human red blood cells are shown below. They are disc shaped.

(a) What word is used to describe the shape of the two faces of these cells?

(b) Red blood cells are wider than some capillaries.
What feature of red blood cells allows them to pass through the narrow capillaries?

(c) Name the molecule in red blood cells that carries oxygen.

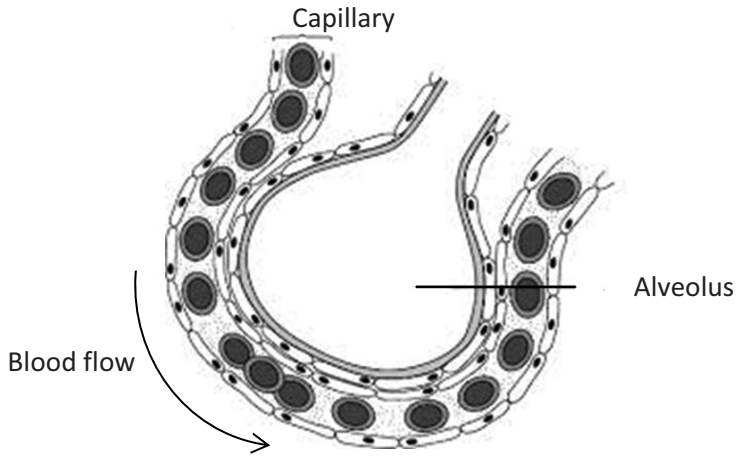
(d) Human red blood cells live for about 120 days.
Give a reason for this, based on the composition of these cells.

(e) Give a location in the body where red blood cells are:

1.	Produced.
2.	Usually broken down.

(f) Red blood cells are transported in the blood plasma.
Name the transport fluid in humans that does not contain red blood cells.

6. The diagram shows microscopic detail of an alveolus and a capillary from the human lung.



(a) Name the blood vessel from which the capillary arises.

(b) Give any three features of alveoli or their capillaries that allow for efficient gas exchange.

1.
2.
3.

(c) Name a disorder of the human breathing system and suggest how it is caused and treated.

Name.
Cause.
Treatment.

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) State a use of each of the following in the biology laboratory.

(i) Biuret reagent (a solution containing copper sulfate and sodium hydroxide).

(ii) Benedict's (or Fehling's) solution.

(b) (i) When preparing a sample of cheek cells on a microscope slide, why did you:

1. Place a coverslip over the cells?
2. Apply methylene blue to the cells?

(ii) When extracting DNA from plant tissue, why did you use:

1. Washing-up liquid?
2. Freezer-cold ethanol?

(iii) When using seeds to investigate the effect of IAA on plant tissue, why did you:

1. Carry out a serial dilution of an IAA solution?
2. Place the seeds on a grid in Petri dishes?

(iv) When carrying out an activity to investigate osmosis:

1. Why did you use Visking™ tubing?
2. How did you know osmosis had taken place?

8. (a) Yeast cells produce alcohol (ethanol) in a process called fermentation.

(i) Is oxygen necessary for this process?

(ii) Where in the cell does this process take place?

(b) Answer the following in relation to a laboratory activity you carried out to prepare alcohol using yeast, and to show its presence.

(i) Draw a labelled diagram of the apparatus you used.

(ii) From which substance did the yeast make the alcohol?

(iii) What is the optimum temperature for this fermentation process?

(iv) How did you maintain this temperature at a constant level for the duration of the fermentation?

(v) How did you know when the fermentation was finished?

(vi) How did you test for the presence of alcohol?

(vii) Give the colour of the positive result of the test.

9. (a) In the course of your practical studies you prepared and examined with a microscope a transverse section (T.S.) of a dicotyledonous (dicot) plant stem.
What is meant by the term *dicotyledonous*?

(b) Answer the following questions in relation to your preparation and microscopic examination of a transverse section of a dicotyledonous stem.

(i) Name the plant you used.

(ii) Why is it important to use a very thin section when examining the tissues in the stem?

(iii) Describe two steps you took to cut the stem safely.

1.

2.

(iv) How did you transfer the section to the microscope slide?

(v) Name the part of the microscope you used to bring the section into a sharp focus.

(vi) Draw a labelled diagram of the section that you observed under the microscope.

Do not write on this page

Section C of this paper is supplied separately

You must return this examination booklet with the answerbook used to answer the questions in Section C

Leaving Certificate – Higher Level

Biology – Section A and Section B

Tuesday 11 June
Afternoon 2:00 – 5:00

2019L025A1EL1212

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.

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

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.

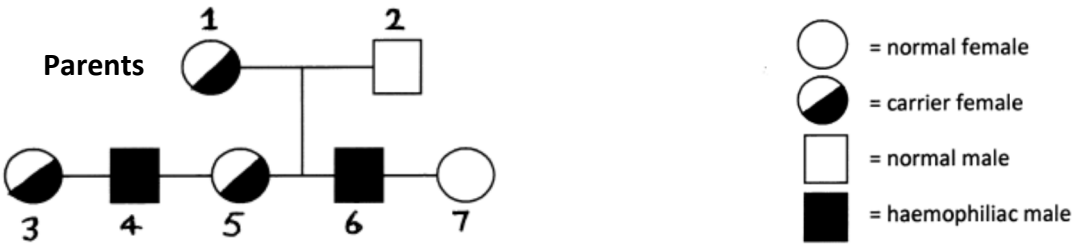
(iv) Describe the events that occur during translation, leading to the formation of a functional protein.

(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.

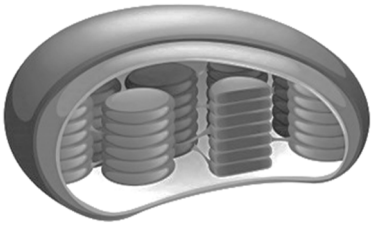
(vi) Give a detailed account of how enzymes work.

(27)

(c) Photosysthesis 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.

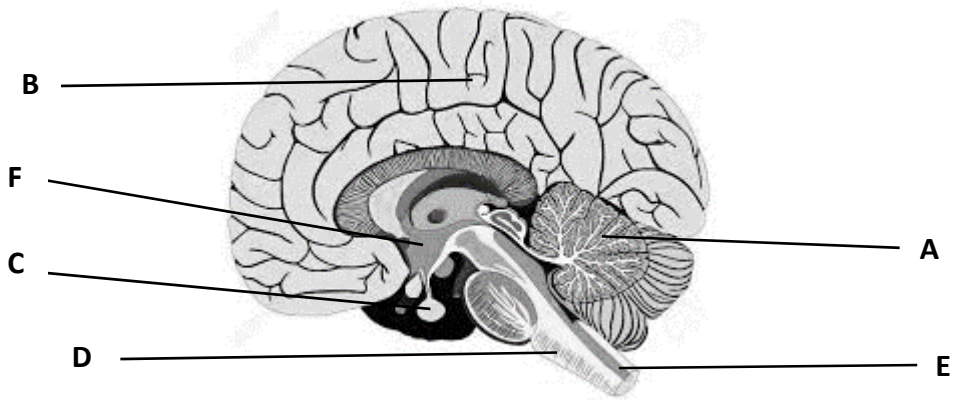
(iv) Embryo cells organise into three germ layers.
Name **each** of these layers.

(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**

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