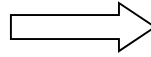


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Coimisiún na Scrúduithe Stáit State Examinations Commission

LEAVING CERTIFICATE EXAMINATION 2018

BIOLOGY – HIGHER LEVEL

Tuesday, 12 June – AFTERNOON, 2.00 – 5.00

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

(a) Give the **two** main reasons why living organisms require food.

1. _____ 2. _____

(b) What is a polysaccharide?

(c) Name the main structural polysaccharide in plants.

(d) Describe the composition of a triglyceride molecule.

(e) Give a structural role of lipids in the human body.

(f) Name a test or give the chemicals used to demonstrate the presence of protein in a food sample.

2. From your knowledge of ecology, explain the following terms:

(a) Biotic factor. _____

(b) Habitat. _____

(c) Community. _____

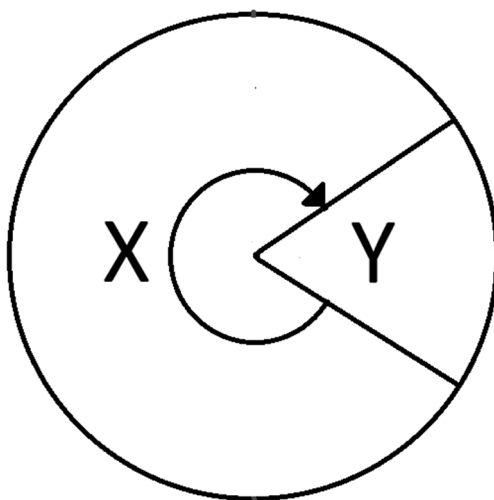
(d) Population. _____

(e) Niche. _____

(f) Biosphere. _____

(g) Qualitative survey. _____

3. The diagram represents the cell cycle.



(a) What stage of the cell cycle is represented by X?

(b) There are two types of cell division, mitosis and meiosis. Define *mitosis*.

(c) State **two** ways in which meiosis differs from mitosis.

1. _____

2. _____

(d) Explain the term *cancer*.

[OVER]

4. (a) What is meant by the term *genetic engineering*?

(b) Genetic engineering involves the following steps but not necessarily in the order given. Rewrite these steps, placing them in the correct order.

Transformation; Cutting; Isolation; Expression.

1. _____

2. _____

3. _____

4. _____

(c) Briefly explain what is meant by isolation and expression in relation to genetic engineering.

Isolation. _____

Expression. _____

(d) In genetic engineering, DNA molecules called cloning vectors are used during transformation. Name the rings of DNA contained in bacteria that may be used as cloning vectors.

(e) Give **one** application of genetic engineering in any **two** of:
an animal, a plant, a micro-organism.

Animal. _____

Plant. _____

Micro-organism. _____

5. (a) What is an auxin?

(b) With regard to auxins, state:

(i) A precise location in plants where they are produced.

(ii) One example of an inhibitory function.

(c) (i) Exactly how does an unequal concentration of auxin in the elongation zone affect the growth of either a shoot **or** a root?

Shoot. _____

OR

Root. _____

(ii) Suggest what could cause an unequal concentration of auxin in a shoot **or** in a root?

Shoot. _____

OR

Root. _____

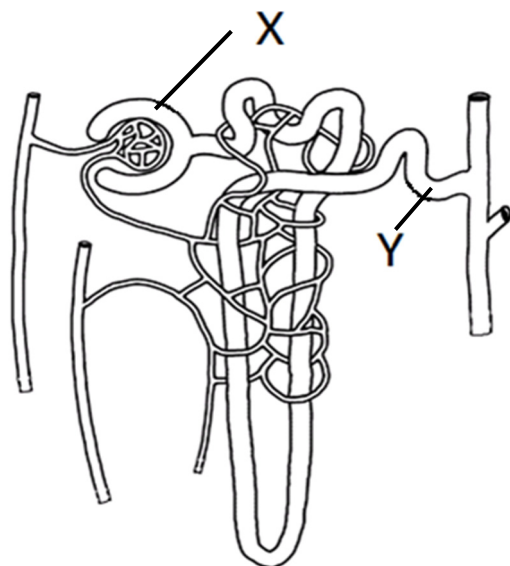
(d) State **two** uses in horticulture of auxins or related compounds.

1. _____

2. _____

[OVER]

6. The diagram shows the structure of a nephron and part of its associated blood supply.



Target area

(a) Name the structures labelled X and Y.

X. _____

Y. _____

(b) Draw a line from the 'Target area' box above, to a precise location on the diagram to indicate where the hormone ADH has its effect.

(c) Briefly describe the effect of ADH on its target area.

(d) What change in blood composition triggers the secretion of ADH?

(e) Name the endocrine gland in which ADH is produced.

(f) Suggest **one** possible treatment for kidney failure.

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

- (ii) How can scientists avoid bias in scientific experiments?

- (b) (i) When carrying out certain experiments at the laboratory bench:

1. How would you ensure that reactants or organisms are maintained at a constant pH over a period of a few hours?

2. How would you ensure that reactants or organisms are maintained at a constant temperature over a period of a few hours?

- (ii) When you used yeast to prepare alcohol:

1. What other product was produced during the fermentation?

2. What test did you use to confirm the presence of alcohol?

- (iii) When using a microscope to examine biological specimens, describe how you:

1. Calculated the magnifying power of the microscope.

2. Altered the amount of light shining on your specimens.

- (iv) In relation to investigations you carried out on food, state:

1. Why the brown paper used to test for the presence of fat should be allowed to dry out.

2. Which other food test required the application of heat.

8. (a) The process of photosynthesis in plants is divided into two stages, the light stage and the dark stage.

(i) Where in the cell does the dark stage take place?

(ii) Why is the dark stage called the dark stage?

(b) Answer the following questions in relation to an activity that you carried out to investigate the influence of light intensity **or** carbon dioxide concentration on the rate of photosynthesis.

(i) Name the plant you used for this investigation.

(ii) Give a reason for using this plant.

(iii) How did you measure the rate of photosynthesis?

(iv) Label the axes below, **and** sketch a graph to show how the rate of photosynthesis would change as your chosen factor varied over a wide range.



(v) Explain the shape of your graph.

9. (a) (i) Name the fungus, other than yeast, that you have studied as part of your course.

(ii) Give **one** way the fungus you have named in part (i) differs from yeast.

(b) Answer the following questions in relation to your investigation into the growth of leaf yeast using agar plates.

(i) Mention **two** aseptic techniques you carried out to ensure a pathogen-free environment.

(ii) What type of agar is recommended for optimal growth of yeast and other fungi?

(iii) Describe how the plates were stored, from introduction of the yeast source until yeast growth was visible on the agar.

(iv) How did you identify the leaf yeast growing on the agar?

(v) Suggest a reason why few or no leaf yeasts may have grown on the agar.

[OVER]

Section C

Answer any four questions.

Write your answers in the answer book.

10. (a) (i) Draw a pyramid of numbers to represent the information in the food chain below.

Rose bush → Caterpillars → Blackbirds → Hawk

- (ii) What term is used to describe the organisms at the top of food chains?
(iii) Explain why pyramids of numbers are usually restricted to three or four levels.

(9)

- (b) Write notes on the following.

- (i) Factors which influence the size of the human population.
(ii) Organism adaptations.
(iii) Conservation.

(27)

- (c) (i) Describe the steps you would take to estimate the size of the population of a particular animal species in the ecosystem you have studied.
(ii) Name a plant from the ecosystem you have studied **and** indicate **two** abiotic conditions which favour its presence.
(iii) How did you measure any **one** of the abiotic conditions mentioned in (ii)?

(24)

11. (a) (i) Blood acts as a transport medium in the human body. Name **two** substances, other than food molecules and water, that are transported in the blood.
- (ii) Give the location in the body where each of the substances you named in (i) enters the blood.
- (9)**

- (b) (i) Draw a diagram to show the structure of the human heart and associated blood vessels, labelling each of the following:
- Vena cava; tricuspid valve; aorta; left ventricle; semi-lunar valve; pulmonary artery.
- (ii) 1. State the precise location **and** describe the role of the sinoatrial (SA) node.
2. State the precise location **and** describe the role of the atrioventricular (AV) node.
- (iii) What exactly is being measured when a person's blood pressure is taken?
- (27)**

- (c) Answer the following questions from your knowledge of the human nervous system.
- (i) Outline the role of each of the following in the transmission of a nerve impulse:
1. Dendrites
 2. Axon
 3. Cell body.
- (ii) Describe how a nerve impulse is transmitted across a synaptic cleft, from one neuron to the next.
- (iii) Explain the importance of the myelin sheath in the transmission of a nerve impulse.
- (24)**

12. (a) (i) Suggest an advantage to the cell of using ATP as an energy source, instead of breaking down a sugar molecule every time energy is needed.
- (ii) Name the nitrogenous base **and** the sugar present in ATP.
- (9)**

(b) Answer the following questions from your knowledge of respiration.

- (i) Give a balanced chemical equation to summarise the process of aerobic respiration.
- (ii) 1. Name the storage polysaccharide in humans from which glucose is produced.
2. Give **one** major storage location of this polysaccharide in the body.
- (iii) What happens to pyruvate molecules that prepares them for the Krebs cycle?
- (iv) Name **three** products of the Krebs cycle.
- (v) Briefly describe the fate of any **one** of the products mentioned in part (iv) above.
- (vi) What is the final electron acceptor in aerobic respiration?

(27)

(c) Answer the following questions from your knowledge of enzymes.

- (i) Explain enzyme specificity with reference to the active site.
- (ii) What happens to the activity of enzymes when they are placed in a medium outside of their optimum pH?
Explain your answer.
- (iii) Name **two** substances used in the school laboratory to immobilise enzymes or yeast cells.
- (iv) Give **two** advantages of using immobilised enzymes.

(24)

13. (a) Most organisms contain both nucleic acids, RNA and DNA.

(i) Name the biologically active entities, each of which contains only one type of nucleic acid.

(ii) Name **two** locations in eukaryotic cells where RNA but no DNA is found.

(9)

(b) Gregor Mendel studied the inheritance of various traits in pea plants. The results of some of his investigations are presented in the table.

Parental Cross	F ₁ Phenotype
Round x Wrinkled Seeds	All Round
Yellow x Green Seeds	All Yellow
Purple x White Flowers	All Purple
Tall x Dwarf Plants	All Tall

(i) As a result of his work, he put forward two laws, the Law of Segregation and the Law of Independent Assortment. State **each** of these laws.

(ii) A dwarf pea plant with green seeds was crossed with a plant heterozygous for both height and seed colour. Indicate by means of a genetic cross, the possible genotypes and phenotypes of the progeny of this cross, if there is no linkage of genes.

(iii) Explain how the results of the cross in (ii) above would differ if the genes for height and seed colour were linked.

(27)

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

(ii) Outline the theory of evolution by natural selection.

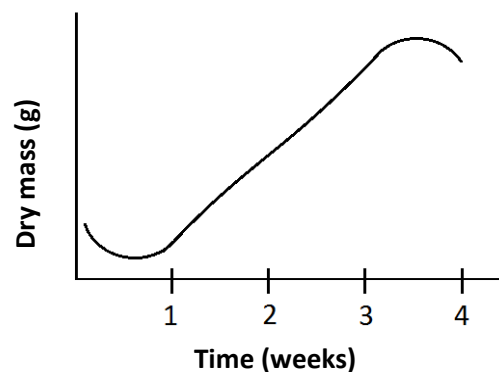
(iii) Describe evidence in support of evolution from any **one** named source.

(24)

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

(30, 30)

- (a) (i) Define *dispersal* in relation to seeds.
Suggest **two** reasons why dispersal is important to plants.
- (ii) Give **one** way in which a knowledge of seed dormancy is useful to humans.
- (iii) Other than water, name **two** essential environmental requirements for successful germination of seeds.
- (iv) What is the role of digestion **and** the role of respiration in seed germination?
- (iv) The graph below shows variations in the dry mass of peas over a period of time after germination. Give a reason for:
1. The initial decrease in mass
 2. The subsequent increase in mass.
- (vi) Name a substance which, because of its changing quantities in the seed, could be responsible for the changes shown in the graph.



- (b) (i) Draw a labelled diagram of a transverse section through a leaf.
- (ii) Place the letter X on your diagram, to show the part of the leaf in which most photosynthesis occurs **and** explain why it occurs mostly there.
- (iii) State **two** other ways in which the leaf is well adapted for photosynthesis.
- (iv) Name **three** substances which are involved in leaf metabolism and which pass through the stomata.
- (v) The concentration of which gas influences the diameter of the stomata?
- (c) (i) The pancreas is both an exocrine and endocrine organ. Define the term *endocrine*.
- (ii) Using your knowledge of the endocrine role of the pancreas, state:
1. A substance produced.
 2. The name of the endocrine tissue in the pancreas that produces it.
 3. A site of action of the substance mentioned in 1.
 4. The role of the substance mentioned in 1.
- (iii) Describe how a feedback mechanism works in the human endocrine system.
- (iv) Give **two** examples of the use of hormone supplements.

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

(30, 30)

- (a) (i) Give **one** example of a beneficial effect of bacteria, other than the production of antibiotics, and **one** example of a harmful effect of bacteria.
- (ii) Bacteria reproduce asexually.
1. Name the specific method of asexual reproduction used by bacteria.
 2. Describe this process of asexual reproduction.
- (iii) Penicillin is an example of an antibiotic produced in large quantities using the batch processing method.
1. Describe batch processing.
 2. Explain why overuse of antibiotics is potentially dangerous.
- (iv) How do certain bacteria survive when environmental conditions become unfavourable?
- (b) Give a detailed biological explanation for each of the following.
- (i) Bile contains bile salts e.g. sodium hydrogencarbonate (NaHCO_3).
- (ii) Active immunity results in long-lasting immunity.
- (iii) Humans sweat during exercise.
- (iv) Antibiotics should not be prescribed to directly treat influenza.
- (v) High sugar or high salt concentrations are used in the preservation of food.
- (c) (i) In relation to the human eye, name **and** explain the role of each of the following:
1. The fluid that fills the rear chamber.
 2. The **two** types of light receptor cells.
 3. The transparent covering in front of the cornea.
- (ii) Suggest an advantage to humans of having two eyes.
- (iii) Name a disorder of the eye **or** of the ear **and** give a corrective measure for the disorder referred to.

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