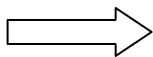


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**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2011

BIOLOGY – HIGHER LEVEL

THURSDAY, JUNE 16 – MORNING, 9.30 TO 12.30

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:

- (a) Which food type may be identified in the laboratory by the use of Sudan III or brown paper?

- (b) Give one role for a **named** mineral in plants.

- (c) What colour indicates a strong positive result of the Fehling's or Benedict's test for reducing sugar?

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

- (e) Give a role of water in the human body other than as a component of cytoplasm and body fluids.

- (f) How many common amino acids are found in proteins?

2. Use your knowledge of mitosis to answer the following questions:

- (a) What is the role of mitosis in single-celled organisms?

- (b) What medical term is used for the group of disorders in which certain cells lose normal control of mitosis?

- (c) Suggest a possible cause of one of the group of disorders referred to in (b).

- (d) Name the stage of mitosis in which the chromosomes are located at the equator of the cell and before they begin to separate.

- (e) To what are the chromosomes attached in the stage of mitosis referred to in (d)?

- (f) Towards the end of mitosis, in what type of cell does a cell plate form?

- (g) Give **one** way in which mitosis differs from meiosis.

3. Choose suitable terms from the list below that most closely match each of the following descriptions:

population; producers; competition; predation; community; symbiosis; decomposers; parasitism

(a) A situation in which one organism lives on or in a second species, feeding on it and causing it harm.

(b) Organisms capable of making their own food.

(c) All the members of a species living in an area.

(d) Micro-organisms and other organisms that return nutrients to the environment by decay.

(e) A situation in which two organisms of different species live together and at least one benefits.

(f) A struggle between organisms for a scarce resource.

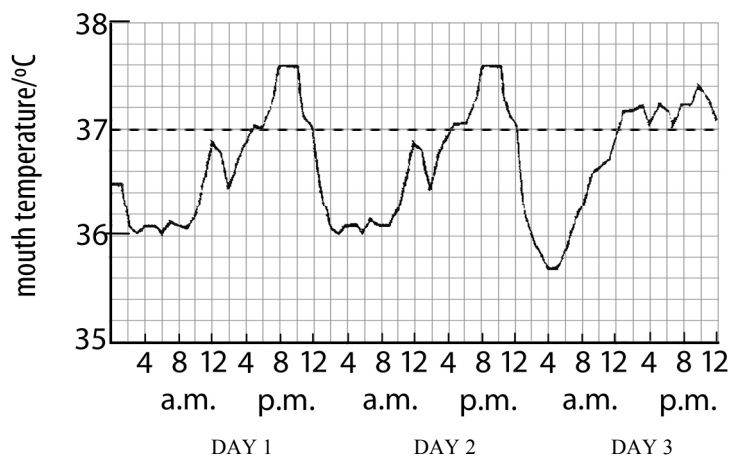
(g) One organism killing and eating another organism.

4. (a) (i) What is an *endotherm*? _____

(ii) What word is used to describe animals which are not endotherms?

(iii) Suggest an advantage of being an endotherm. _____

(b) The graph shows daily variations of human body temperature over three days.



(i) What is the maximum range of body temperature under normal conditions as shown in the graph?

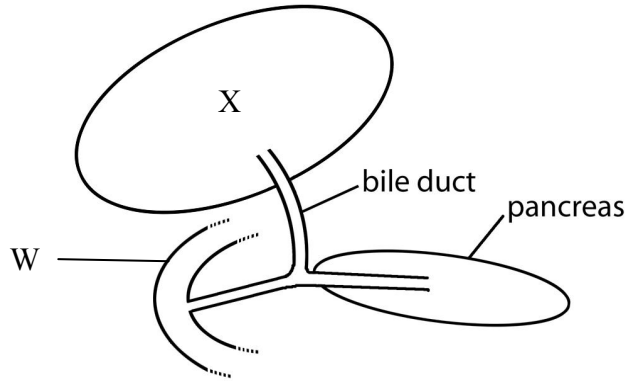
(ii) At what time each day does body temperature drop to its lowest level? _____

(iii) Suggest a reason for the drop in temperature at the time referred to in (ii).

(iv) Children typically have higher body temperatures than adults. Suggest a reason for this.

5. (a) (i) What is meant by the term *digestion*? _____
- (ii) Why is digestion necessary? _____
- (iii) Distinguish between mechanical and chemical digestion by writing a sentence about each.
- _____
- _____

(b) The diagram shows part of the human alimentary canal and associated structures.



- (i) What part of the alimentary canal is labelled W? _____
- (ii) The bile duct is connected to X. Name X. _____
- (iii) From which part of the alimentary canal does food arrive into W? _____
- (iv) State **one** digestive function of the pancreas. _____

6. Cellular respiration may occur in one stage or two stages.

- (a) Give **two** differences, other than location, between Stage 1 and Stage 2.
- (i) _____
- (ii) _____
- (b) Where in a cell does Stage 1 occur?
- _____
- (c) What term is used to describe respiration in which only Stage 1 occurs?
- _____
- (d) Name a chemical end product of the type of respiration referred to in (c).
- _____
- (e) In Stage 2 of respiration electrons pass along an electron transport chain, releasing energy. In what molecule is this energy stored in the cell?
- _____
- (f) To what are these electrons transferred at the end of the electron transport chain?
- _____

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) In relation to the scientific method, explain each of the following.

(i) Experiment. _____

(ii) Theory. _____

(b) Scientists investigated the effect of a certain mineral on the growth of wheat.

Use your knowledge of biology and laboratory procedures to answer the following questions.

(i) Suggest a reason why the seeds used were all taken from one parent plant.

(ii) The compost in which the wheat plants were grown was sterilised at the start of the investigation.

1. Suggest a way in which the scientists may have sterilised the compost.

2. State **one** reason why it was important to sterilise the compost.

(iii) Why did the scientists divide the young wheat plants into two equal groups?

(iv) During the investigation the scientists kept the two groups of plants under identical conditions. Why was this?

(v) Name **two** conditions you think the scientists would have kept constant during the investigation.

1. _____

2. _____

(vi) Why did the scientists repeat the investigation several times before publishing their results in a scientific journal?

8. (a) State a use for each of the following in the biology laboratory:
- (i) Buffer solution. _____
 - (ii) Biuret test. _____
- (b) (i) In the course of your practical studies you used a solution of iodine in different investigations. State **two** different uses of the iodine solution.
- Use 1. _____
- Use 2. _____
- (ii) State **two** different uses of a water bath in biological investigations.
- Use 1. _____
- Use 2. _____
- (iii) In the course of your practical studies you found that heart rate and breathing rate increase with exercise.
Explain why this is the case.
- _____
- _____
- _____
- (iv) In the course of your practical work you prepared a transverse section (T.S.) of a dicot stem for microscopic examination.
How did you prepare the T.S.?
- _____
- _____
- _____

9. (a) (i) How are the two strands of a DNA molecule joined together? _____
- (ii) What is 'junk' DNA? _____
- (b) Answer the following questions by referring to the procedures that you used to isolate DNA from a plant tissue.
- (i) Having obtained a plant tissue e.g. onion,
1. What was the first procedure that you followed?

2. What was the reason for that procedure?

- (ii) Washing-up liquid is then used in the isolation. Give a reason for its use.

- (iii) Salt (sodium chloride) is also used in the isolation. Give a reason for its use.

- (iv) 1. What is a protease?

2. Why is a protease necessary when isolating DNA?

- (v) The final stage of the isolation involves the use of freezer-cold ethanol.
1. Describe how it is used. _____
2. For what purpose is it used? _____

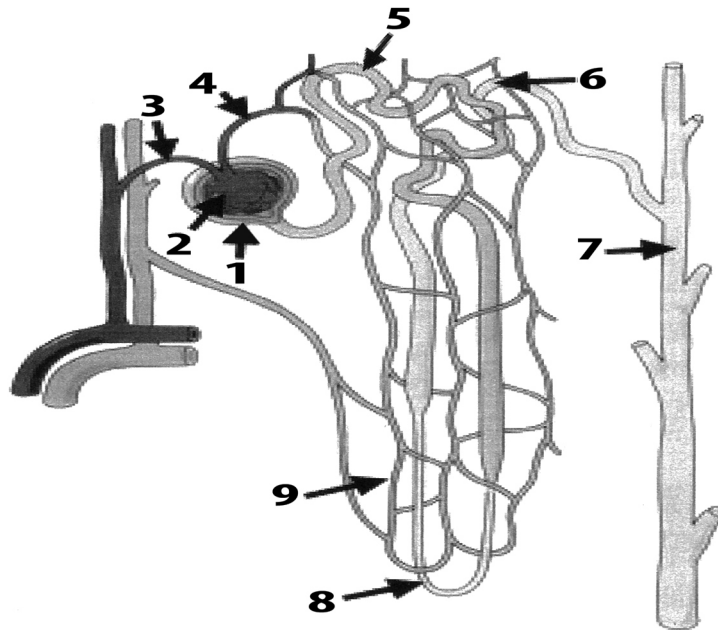
Section C

Answer **four** questions.

Write your answers in the answer book.

10. (a) (i) Distinguish between *contest competition* and *scramble competition* by writing a sentence about each. (9)
- (ii) Name a factor, other than competition, that controls wild populations. (9)
- (b) What deduction is it possible to make from each of the following observations?
- (i) In a particular area the population of a predator did not decline following a big reduction in the population of its main prey.
- (ii) Mortality levels resulting from infection by a particular virus tend to decline over the years.
- (iii) Where some members of a species remain in the same general area throughout life and some members are migratory, mortality levels tend to be higher in the migratory part of the population.
- (iv) There is a greater variety of herbaceous (non woody) plants in areas where grazing species, such as rabbits, are more plentiful than in areas where grazing species are less plentiful.
- (v) In some species of migratory ducks in the northern hemisphere it is found that the wintering grounds of the males lie further south than those of the females. (27)
- (c) (i) In relation to a study of an ecosystem distinguish clearly between *qualitative* and *quantitative* surveys by writing a sentence about each.
- (ii) How were you able to identify the different plants in the ecosystem that you investigated?
- (iii) Describe how you carried out a quantitative survey of the major plant species.
- (iv) Give **two** possible sources of error that may have arisen in the course of your survey. (24)
11. (a) (i) What do you understand by the term *adverse external environment*? (9)
- (ii) Give **two** ways in which plants protect themselves from adverse external environments. (9)
- (b) (i) Name the group of substances in plants which control responses to external stimuli.
- (ii) 1. What name is given to the regions in plants in which these substances are produced?
2. Give locations for **two** of these regions.
- (iii) Most plant shoots are positively phototropic. Explain the underlined term.
- (iv) How does the plant benefit from this response?
- (v) Explain the mechanism of response by a plant to a **named** external stimulus. (27)
- (c) (i) What is a hormone?
- (ii) State **two** ways in which hormones are similar to the group of substances referred to in (b)(i).
- (iii) 1. What is meant by *feedback* in relation to hormone action?
2. Give a brief account of the feedback mechanism for a **named** hormone.
- (iv) Describe **one** deficiency symptom of a **named** hormone. (24)

12. (a) (i) What is meant by the term *excretion*?
(ii) Mention **one** method of excretion in flowering plants. (9)
- (b) (i) Draw a large labelled diagram of a vertical section through a human kidney. Label the following parts of your diagram: cortex, medulla, pelvis.
(ii) Indicate clearly on your diagram where re-absorption takes place.
(iii) 1. Name the blood vessel that supplies blood to a kidney.
2. From which blood vessel does the blood vessel referred to in (iii)1 arise?
(iv) In which cavity of the body are the kidneys located?
(v) Name **one** substance, other than water, excreted in the urine.
(vi) Give a feature of the kidney which indicates that it is an exocrine gland. (27)



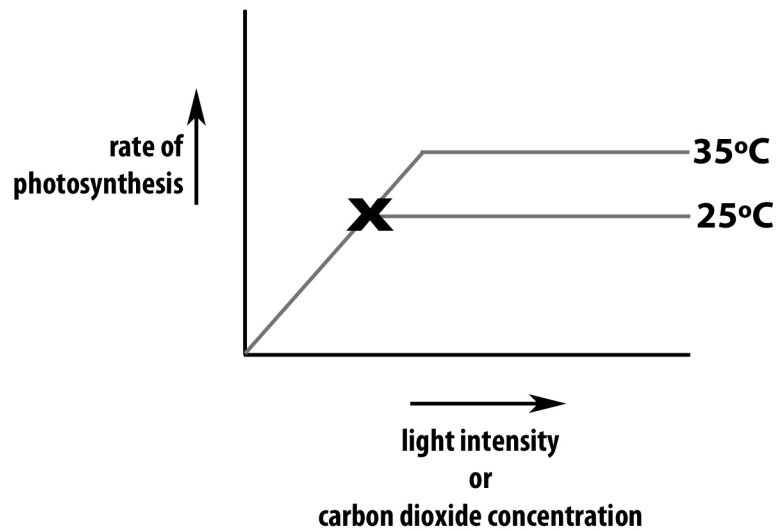
- (c) (i) The diagram above shows the structure of a nephron and its associated blood supply.
1. Name the parts numbered 1 to 6.
2. Indicate clearly by number where filtration takes place.
3. Name the hormone associated with changing the permeability of the structure at 7.
(ii) A sample of urine was found to contain protein.
1. Would you consider this to be normal?
2. Explain your answer.
(iii) A sample of urine was found to contain glucose.
1. Would you consider this to be normal?
2. Explain your answer. (24)

13. (a) (i) What is meant by the term *evolution*?
(ii) Name either of the scientists responsible for the Theory of Natural Selection. (9)
- (b) In the antirrhinum (snapdragon) there is no dominance between the allele for red flower and the allele for white flower. Heterozygous individuals have pink flowers.
The allele for tall stem is dominant to the allele for short stem.
These pairs of alleles are located on different chromosome pairs.
(i) What is the significance of the fact that the two allele pairs are located on different chromosome pairs?
(ii) A plant which had pink flowers and was heterozygous in respect of stem height was crossed with one which had white flowers and a short stem.
1. Using suitable symbols determine the genotypes of all the possible offspring of this cross.
2. For each of your answers, state the phenotype that would result. (27)
- (c) Distinguish between the members of each of the following pairs of terms, by writing a sentence about **each** member of each pair.
(i) Gene and allele.
(ii) Homozygous and heterozygous.
(iii) Genotype and phenotype.
(iv) Linkage and sex linkage. (24)

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

(30, 30)

- (a) The graph shows the results of a classroom investigation into the factors affecting the rate of photosynthesis. The variable investigated was **either** light intensity **or** CO₂ concentration.

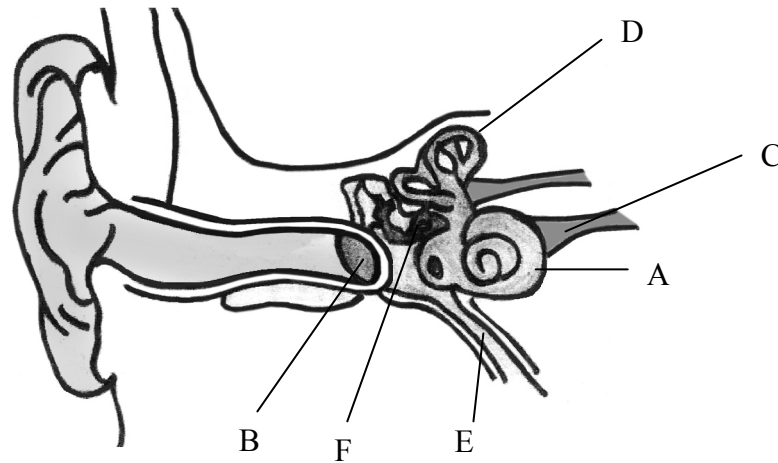


In your answer book, indicate clearly which factor you choose to address and answer the following questions:

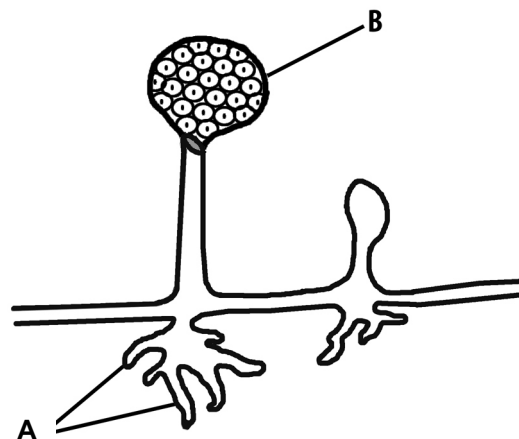
- (i) Suggest a suitable plant for such an investigation.
- (ii) How was the rate of photosynthesis measured?
- (iii) Name a factor that must be kept constant during this investigation.
- (iv) Explain how you would keep constant the factor referred to in (iii).
- (v) Why is it necessary to keep that factor constant?
- (vi) 1. What happens to the rate of photosynthesis at X when the investigation is
A. carried out at 25°C?
B. carried out at 35°C?
2. Give a reason for **each** answer.
- (b) (i) What is meant by the term *metabolism*?
- (ii) “Enzymes are essential for metabolism”.
Explain why this statement is true.
- (iii) In **each** of the following cases state whether the process is anabolic or catabolic.
1. Protein synthesis.
 2. Conversion of ADP to ATP.
 3. Reactions in which product molecules are larger than substrate molecules.
- (iv) State **one** way by which an enzyme may be denatured.
- (v) Give **two** features of a denatured enzyme.
- (vi) Apart from carbon, hydrogen and oxygen, there is one other element always present in the building blocks of enzymes. Name that element.
- (c) (i) State the precise location of the cell membrane in plant cells.
- (ii) With what type of cell do you associate membrane-bound organelles?
- (iii) What corresponding term is used to describe bacterial cells?
- (iv) The cell membrane is described as being *selectively permeable*. What does this mean?
- (v) Why is diffusion alternatively known as *passive transport*?
- (vi) Osmosis may be described as “a special case of diffusion”. Explain why.
- (vii) Describe, with the aid of a labelled diagram, how you demonstrated osmosis in the laboratory.
- (viii) Name the structure by which *Amoeba* gets rid of excess water that has entered by osmosis.

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

(30, 30)



- (a) (i) The diagram above shows the internal structure of the human ear.
1. Name the structures labelled A, B, C.
 2. Give the functions of parts D and E.
 3. Which letters denote the parts of the ear in which nerve impulses are generated?
- (ii) In what part of *the eye* are nerve impulses generated?
- (iii) Suggest **one** way by which the ear may be protected.
- (iv) Explain how a corrective measure for a **named** defect of hearing **or** vision works.
- (b) (i) Name the tissue in plant stems through which water rises to the leaves.
- (ii) Give **one** way in which this tissue is adapted for the transport of water.
- (iii) Give a precise location of this tissue in the stem.
- (iv) State another function of the tissue referred to in (i).
- (v) The cohesion-tension model of transport attempts to explain water movement in plants against a particular force. Name this force.
- (vi) Describe the principal features of the cohesion-tension model.
- (vii) Name the two scientists mainly associated with the cohesion-tension model of transport.
- (c) The diagram below shows part of the mycelium of the fungus *Rhizopus*.



- (i) Give the name **and** state a function of the part labelled A.
- (ii) Name part B **and** explain why the reproduction associated with it is asexual.
- (iii) The nutrition of *Rhizopus* is described as being *saprophytic*.
1. What does the term *saprophytic* mean?
 2. Explain the importance of saprophytic nutrition in the overall scheme of nature.
- (iv) Saprophytic nutrition is a form of *heterotrophic* nutrition.
What does the term *heterotrophic* mean?
- (v) Name another form of nutrition employed by some fungi.
- (vi) Give **two** examples of harmful members of the kingdom Fungi.