2024.M44

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Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Biology

Section C

Higher Level

Tuesday 11 June Afternoon 2:00 - 5:00

240 marks

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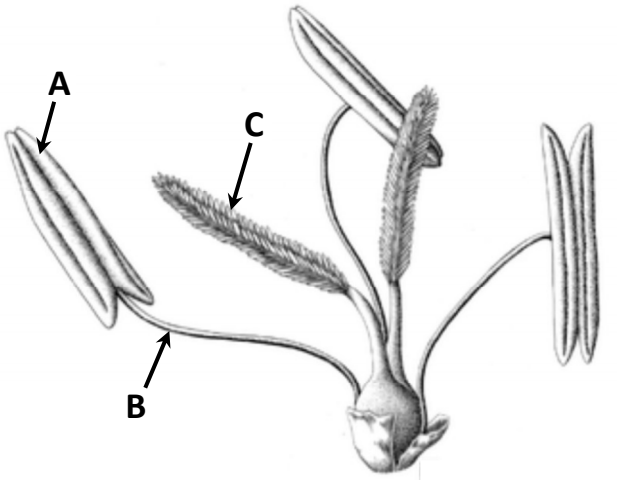
Section C

Answer any four questions.
Write your answers in the answerbook containing Sections A and B.

11. **(a)** **(i)** What is meant by the term *pollination*?

(ii) Distinguish between self-pollination **and** cross-pollination by writing a sentence on **each** type of pollination. **(9)**

(b) The diagram shows a wind-pollinated flower.



(i) Name the parts of the flower labelled **A**, **B** and **C**.

(ii) Give **one** adaptation of this flower (visible or otherwise) that shows it is wind-pollinated.

(iii) In which of the labelled parts is pollen formed?

(iv) Describe the main events of pollen grain development.

(v) Two fertilisations occur during sexual reproduction in flowering plants.
Describe what happens during **both** of these fertilisations. **(27)**

(c) Seeds can have either one or two cotyledons, and can therefore be classified as monocotyledonous (monocot) or dicotyledonous (dicot).

(i) **1.** What is a cotyledon?

2. Give **one** function of the cotyledon.

(ii) Other parts of a seed include the testa, plumule and radicle.
Give **one** function for **each** part.

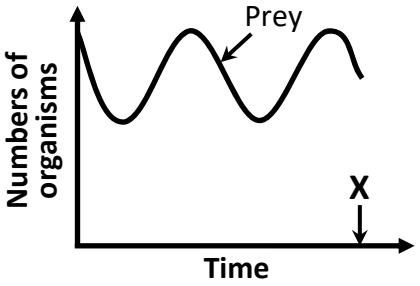
(iii) Fruit formation often follows seed formation.
Dispersal of fruit and seeds then occurs.

1. Give any **two** methods of fruit and seed dispersal.

2. Give **one** reason why fruit and seed dispersal are of benefit to plants. **(24)**

12. **(a)** Define **each** of the following terms: e*cology*; *biosphere*; *conservation*. **(9)**

(b) The graph shows the fluctuating numbers of prey over time in a habitat.



(i) **Copy the graph into your answerbook**. Then, using a dashed line (- - - -), show how the population of the prey's main predator species varies over the same time period.

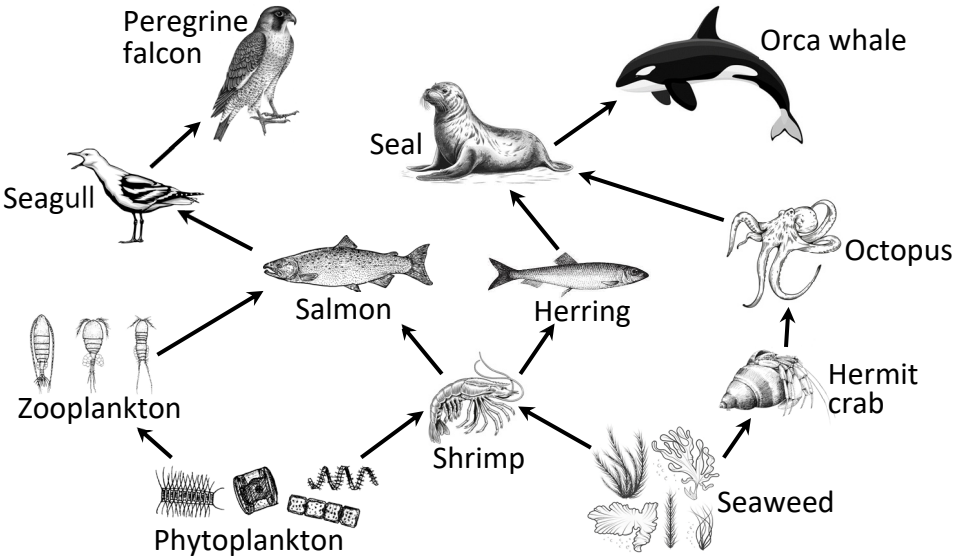
(ii) Give a detailed explanation of the graph that you have drawn for the **predator** species.

(iii) If a disease affected the predator at time **X**, what would you expect to happen to the graph showing the prey? Explain your answer.

(iv) Give a role for predation in the overall scheme of nature.

(v) Human population numbers do not follow a similar pattern to the one shown in the graph. Suggest **two** reasons for this. **(27)**

(c) The diagram below shows a food web from a marine ecosystem.
Study the food web and answer the questions that follow.



(i) Give **one** example of **each** of the following from the food web shown above:

1. A producer

2. A secondary consumer

3. A top consumer (top carnivore)

(ii) What is meant by the term *producer*?

(iii) Write out a complete food chain from this food web.

(iv) How many trophic levels are in the food chain you wrote in part (c) (iii) above?

(v) What is meant by the term *trophic*?

(vi) Explain why food chains have a limited number of trophic levels.

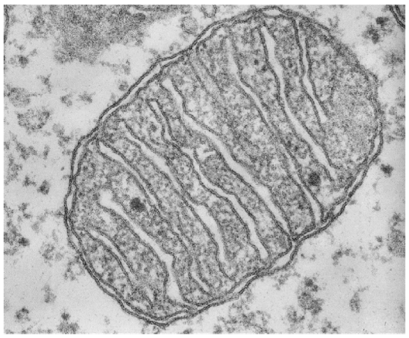
(vii) Name the type of diagram an ecologist may draw to indicate the relative sizes of the populations at different trophic levels. **(24)**

13. **(a)** Photosynthesis and respiration are metabolic reactions.

(i) Explain the term *metabolism*.

(ii) Distinguish between the terms *anabolic* and *catabolic*. **(9)**

(b) The image shows a transverse section (TS) through a cell organelle involved in aerobic respiration.



(i) Identify the cell organelle shown in the image.

(ii) Write out the balanced chemical equation for aerobic respiration.

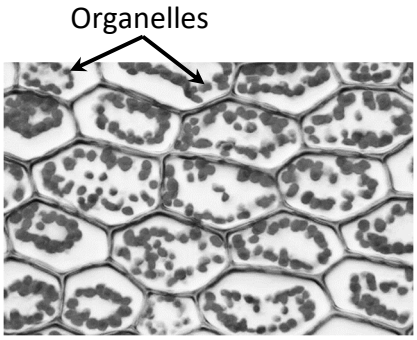
(iii) Aerobic respiration involves two stages (stage 1 and stage 2).

1. What is the name given to stage 1?

2. Describe the events in stage 1.

3. Stage 2 involves the Krebs cycle and the electron transport chain. Describe the role of the energy carrier NAD in stage 2. **(27)**

(c) The image shows leaf cells under the light microscope.



The cell organelles indicated on the image are responsible for photosynthesis, which occurs in two stages – the light stage and the light-independent stage. During the light stage, energised electrons enter two pathways known as pathway 1 and pathway 2.

(i) Name these cell organelles which are responsible for photosynthesis.

(ii) Where do the energised electrons come from?

(iii) Briefly describe what happens to these energised electrons in pathway 1.

(iv) What is another name for the light-independent stage?

(v) Compounds of the general formula $C_x(H_2O)_y$ are formed during the light-independent stage of photosynthesis.

1. What name is given to the group of compounds described by this general formula?

2. Name the simple molecule from which a plant obtains the protons (H^+ ions) used to make these compounds.

3. Name another simple molecule from which plants obtain the carbon (C) used to make these compounds. **(24)**

14. **(a)** **(i)** In relation to micro-organisms such as bacteria and fungi, describe their distribution in nature.

(ii) Explain the terms *asepsis* and *sterility* as applied to micro-organisms. **(9)**

(b) Answer the following questions in relation to bacteria.

(i) Draw the structure of a bacterial cell **and** label any **three** parts.

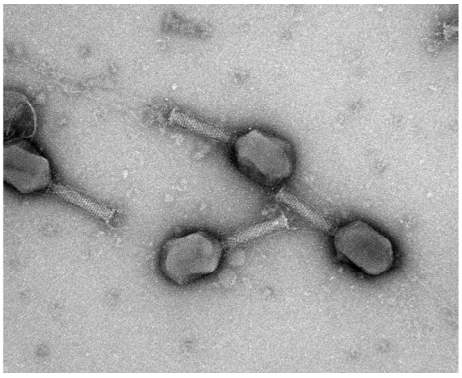
(ii) Are bacteria prokaryotic or eukaryotic? Justify your answer.

(iii) Bacteria reproduce asexually. Name **and** describe this process.

(iv) Some bacteria are pathogenic. Explain the term *pathogenic*.

(v) Antibiotics are used to treat pathogenic bacterial infections, but are often misused.
Give a possible effect of the misuse of antibiotics. **(27)**

(c) Viruses are shown in the image.



(i) Explain the difficulty in describing viruses as living organisms.

(ii) Name the **two** biochemical components that make up **all** viruses.

(iii) Describe the process of viral replication.

(iv) Some viruses can be harmful and some can be beneficial.

1. Give **one** example of a harmful virus.

2. Give **one** way in which viruses can be beneficial. **(24)**

15. **(a)** **(i)** What is meant by the term *species*?

(ii) Give **two** causes of variation within a species. **(9)**

(b) In snapdragon plants, the allele for tallness is dominant over the allele for dwarfness. However, the allele for red flower shows incomplete dominance with the allele for white flower. Pink flower is the phenotype that results in the heterozygous condition. The two genes are not linked.

(i) Explain the underlined terms.

(ii) **A homozygous tall, red snapdragon plant is crossed with a dwarf, pink snapdragon plant.**

Using suitable letters, give the genotypes of **both** plants in the above cross.

(iii) Using a Punnett square, or otherwise, show the possible genotypes **and** matching phenotypes of the offspring of the cross described above.

(iv) What percentage of the offspring of the cross have pink flowers? **(27)**

(c) Two famous biologists independently developed the theory of evolution by natural selection.

(i) Name these **two** famous biologists.

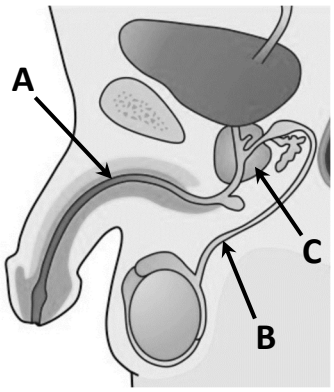
(ii) What is meant by the term *evolution*?

(iii) Describe the main points of the theory of natural selection.

(iv) Give **one** piece of evidence that supports the theory of natural selection. **(24)**

16. Answer any **two** of (a), (b), (c), (d). **(30, 30)**

(a) The diagram shows the human male reproductive system. Answer the questions that follow.



(i) **1.** Give the names of tubes **A and B and** the name of gland **C**.

2. Give **one** function for **each** structure labelled **A**, **B** and **C**.

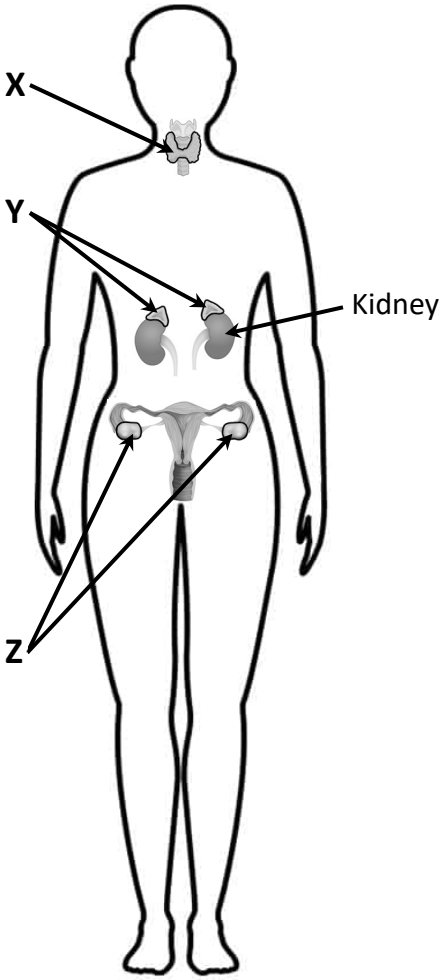
(ii) In which part of the male reproductive system does meiosis occur?

(iii) Which part of the male reproductive system is directly involved in copulation?

(iv) Give **one** cause of male infertility **and** a corrective measure.

(v) Give any **two** methods of contraception.

(b) The diagram shows an outline of the human female body.
Three important endocrine glands are indicated by the letters **X**, **Y** and **Z**.



(i) Name glands **X**, **Y** and **Z**.

(ii) Name **one** hormone secreted by **each** gland **and** give **one** function for **each** named hormone.

(iii) For any **named** human (male or female) hormone, give:

1. a symptom of its deficiency.

2. a symptom of its excess.

3. a corrective measure for **either** its deficiency **or** excess.

(iv) Briefly describe the feedback mechanism of any **one** human hormone.

(c) The photograph shows a plant growing towards light.

(i) What name is given to the growth response of plants to light?

(ii) How does this growth response benefit plants?

(iii) Name any **other** type of growth response in plants.

(iv) Growth regulators are important in plants.
Explain the term *growth regulator*.

(v) Describe the mechanism of any **one** plant growth response to an external stimulus.

(vi) Give **one** example of the use of plant growth regulators, e.g. by horticulturists.

(vii) Plants have adaptations that help in protection.
Give any **two** methods plants use to protect themselves.

(d) Answer the following questions in relation to the human defence system.

(i) The human defence system can be categorised as the general defence system and the specific defence system (immune system).

1. Name any **two** methods used by the general defence system.

2. Name any **one** organ that is specific to the immune system.

(ii) The organs of the immune system have lymphocytes that take part in an antigen-antibody response.

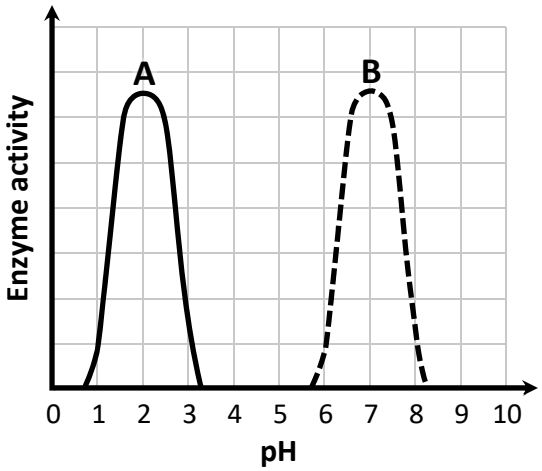
1. Distinguish between the terms *antigen* **and** *antibody* by writing a sentence on **each** term.

2. T cells are one type of lymphocyte involved in the antigen-antibody response.
Name the **other** type of lymphocyte.

3. There are four types of T cells in the human immune system.
Name any **two** types **and** give **one** function for **each** named type.

17. Answer any **two** of (a), (b), (c), (d). **(30, 30)**

(a) The graph below shows how the rate of activity of two human digestive enzymes (**A** and **B**) changes with pH.



(i) **1.** What is the optimal pH of enzyme **A**?

2. What is the optimal pH of enzyme **B**?

(ii) Which of these enzymes (**A** or **B**) is most likely to be found in the stomach? Justify your answer.

(iii) Describe the active site theory of enzyme action to explain enzyme function and specificity.

(iv) Amylase, lipase and protease are three enzymes found in the human digestive system.
Amylase acts on starch, lipase acts on lipids, and protease acts on proteins.
Give the product(s) of **each** enzyme.

(b) Fungi can be classified into saprophytic and parasitic forms.

(i) Explain the terms *saprophytic* **and** *parasitic*.

(ii) *Rhizopus* is an example of a fungus.
Draw a large labelled diagram of *Rhizopus* during asexual reproduction.
Indicate clearly **on your diagram** which part is involved in asexual reproduction.

(iii) Answer the following in relation to the life cycle of *Rhizopus*:

1. Sexual reproduction in *Rhizopus* results in the formation of a thick-walled, dormant structure that can survive a long time in unsuitable conditions.
What is the name of this structure?

2. What happens to the structure you named in part (b) (iii) 1. above if suitable conditions return?

(iv) Fungi can be beneficial.
Give any **two** examples of beneficial fungi.

(c) Answer the following questions in relation to the kidneys and urine formation.

(i) The kidneys are important in maintaining a constant internal environment within the body.
What term describes the maintenance of a constant internal environment within the body?

(ii) The nephron is the functional unit of the kidney.
Draw a large labelled diagram of the human nephron **and** its associated blood supply.

(iii) Give **one** way in which the composition of blood is different to the composition of glomerular filtrate.

(iv) Large amounts of water are reabsorbed into the blood during urine formation.

1. Name any **two** parts of the nephron that reabsorb water.

2. Name any **two other** substances that are reabsorbed during urine formation.

(d) The image shows a stage of mitosis in an onion cell.
Mitosis is a stage of the cell cycle.

(i) What name is given to the stage of the cell cycle when the cell is in a state of non-division?

(ii) Give any **two** cell activities that occur during the state of non-division.

(iii) **1.** What name is given to the stage of mitosis shown in the image?

2. Explain how you know it is this stage.

(iv) What stage of mitosis occurs immediately before the stage you named in (d) (iii) 1. above?

(v) Sketch a diagram of a cell with a diploid number of 4 (i.e. 2n = 4) that is at the stage of mitosis you named at part (d) (iv) above.

(vi) What is the function of mitosis in multicellular organisms such as the onion?

(vii) What name is given to the group of disorders where a cell loses control of mitosis and the number of cell divisions?

There is no examination material on this page

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Leaving Certificate – Higher Level

Biology Section C

Tuesday 11 June

Afternoon 2:00 - 5:00