2024.M44K
(deferred examination)

2024L025A2EK

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Biology

Section C

Higher Level

3 hours

240 marks

This document must be handed up at the end of the examination.

Section C

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

11. **(a)** Answer the following questions in relation to tissue culture.

(i) What is meant by the term *tissue culture*?

(ii) Give **two** applications of tissue culture. **(9)**

(b) Red-green colour vision is controlled by an allele present on the X chromosome. There is no corresponding allele on the Y chromosome. The allele for normal red-green colour vision (**N**) is dominant to the allele for red-green colour blindness (**n**).

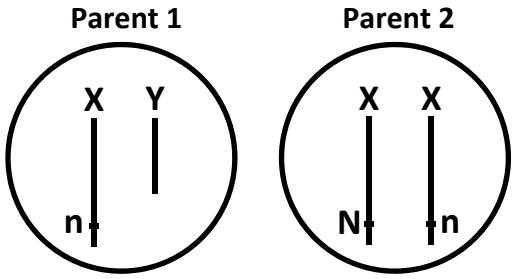
(i) What term describes the presence of a gene on the X chromosome?

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

(iii) The chromosome diagrams show the genetic makeup of two parents.

1. Write down the **full** phenotypes of parent **1 and** parent **2**.

2. If parents **1** and **2** had a child, there are four possible genotypes. Write down **each** genotype **and** its corresponding phenotype.



(iv) Explain why red-green colour blindness is more common in males than females. **(27)**

(c) Gene expression is the use of the DNA code to produce a protein.
The production of a protein involves transcription and translation.

(i) State the location of transcription **and** the location of translation in the cell.

(ii) Describe the events that occur in transcription **and** translation.
Include in your answer the **three** types of RNA involved. **(24)**

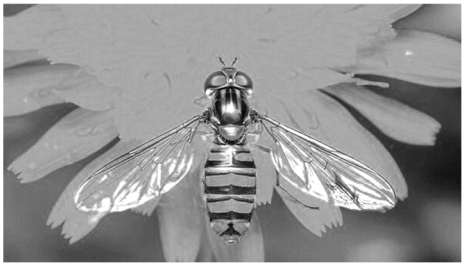
12. **(a)** Define the following terms as used in ecology.

(i) *Biosphere*

(ii) *Habitat*

(iii) *Niche* **(9)**

(b) Read the passage below and answer the questions that follow.



Next time you're about to swat a fly, think again. They're important in many ways, playing a vital role in pollination, which enables plants to reproduce.

Insects such as the hoverfly, play a critical role in pollination. Hoverflies, of which we have 180 species, are more abundant as flower-visitors than might be expected, accounting for more than half of such recorded visits to flowering plants, such as the ribwort plantain. The importance of allowing a certain amount of grassland grow wild is now being highlighted. It allows hoverfly populations to increase, which in turn provides a food source for birds, such as the robin. We need to get a variety of native plants back into Irish habitats to support pollinators – and it's something many people can do quite easily and contribute to conservation efforts.

Adapted from "These pollinators 'dress up' like bees for their own protection", Irish Examiner, 17 Nov 2022

(i) Give **two** reasons why hoverflies are important in a habitat.

(ii) **1.** Conservation is referred to in the passage.
What is meant by the term *conservation*?

2. Outline any **one** conservation practice, mentioned in the passage, **or** from **one** of the following areas: **agriculture**; **fisheries**; **forestry**.

(iii) **1.** Write down a food chain using organisms named in the passage above.

2. How many trophic levels are in the food chain you wrote above?

3. Explain why the number of trophic levels in food chains are limited.

(iv) If the ribwort plantain population reduced due to mowing give **two** effects this might have on the habitat. **(27)**

(c) **(i)** Explain the term *pollution*.

(ii) **1.** Describe **one** effect of a **named** pollutant from **one** of the following areas: **domestic**; **agricultural**; **industrial**.

2. Give **one** way in which pollution may be controlled.

(iii) Outline **two** problems associated with waste disposal.

(iv) Suggest **two** methods of waste minimisation.

(v) Give **one** example of the use of micro-organisms in waste management. **(24)**

13. **(a)** Metabolism can be categorised as anabolic and catabolic.

(i) What is meant by the term *metabolism*?

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

(b) The photograph shows an industrial-sized greenhouse. Photosynthesis and crop growth can be controlled and maximised in greenhouses.

(i) Give **two** factors that horticulturists can adjust in a greenhouse to promote crop growth.

(ii) Write a balanced chemical equation for photosynthesis.

(iii) The biochemical processes in photosynthesis can be described under two main headings: the light stage and the dark stage.
Give a detailed account of **each** of these stages. **(27)**

(c) Respiration occurs in all living cells.

(i) What name is given to the first stage of respiration?

(ii) Name the end product of the first stage.

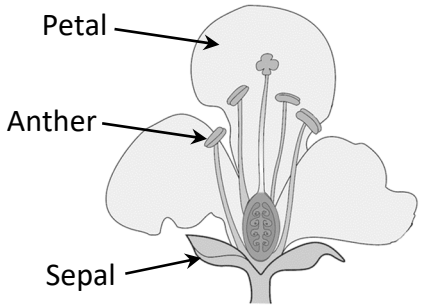
(iii) If conditions within a cell undergoing respiration are aerobic, the product you named above passes into an organelle. Name this organelle.

(iv) What is the name of the two-carbon molecule that is formed from the product you named at part (c) (ii) above?

(v) Name the cycle of reactions that this two-carbon molecule passes directly into **and** give **two** products of this cycle.

(vi) Describe a situation in which some cells in the human body may not be able to take part in the second stage of aerobic respiration. **(24)**

14. **(a)** The diagram shows a typical flower.



Give **one** function for **each** of the **three** structures labelled on the diagram. **(9)**

(b) Pollination can be carried out by animals, as shown in the photograph.

(i) What is *pollination*?

(ii) Name **one other** type of pollination (other than by animals).

(iii) Two fertilisations occur following pollination.
Name the products of **both** fertilisations.

(iv) Seed development follows fertilisation. Draw a labelled diagram of the internal structure of a seed, labelling the following parts:
testa, **cotyledon**, **embryo**.

(v) After seed development, fruit and seed dispersal occurs.

1. What is meant by the term *seed dispersal*?

2. Give **one** benefit to plants of seed dispersal.

(vi) Horticulturists can produce seedless fruits.
Give **one** way in which seedless fruits can be produced. **(27)**

(c) Water, oxygen and a suitable temperature are all required for the germination of seeds.

(i) In the case of **any two** of these factors, describe their effect on the process of germination.

(ii) Seeds can generally be classified as endospermic and non-endospermic.
Give **one** example of **each**.

(iii) Reproduction in plants can be either asexual (vegetative propagation) or sexual (seed development and germination).

1. Give **two** advantages for a plant that reproduces by seed.

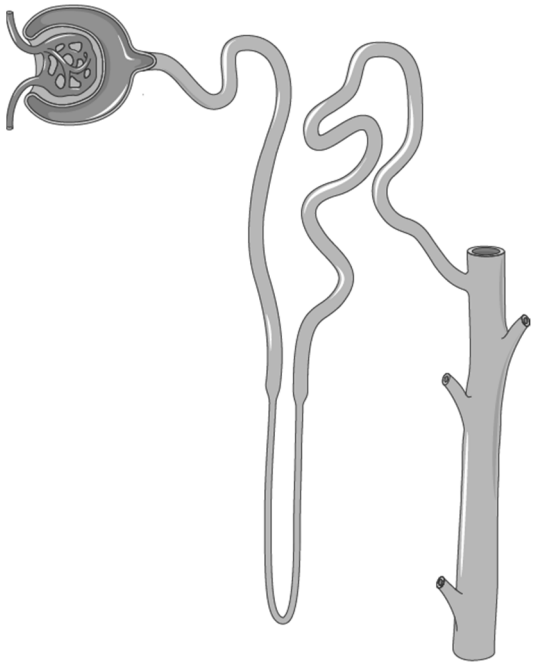
2. Give **two** advantages for a plant that reproduces by vegetative propagation. **(24)**

15. **(a)** Excretion is an important process involved in maintaining homeostasis.

(i) Explain the terms *excretion* **and** *homeostasis*.

(ii) Give **one** reason why homeostasis is important for the body. **(9)**

(b) The diagram shows the structure of the nephron in the kidney. Filtration, reabsorption and secretion are three important processes involved in urine formation.



Using your knowledge of the human urinary system, answer the following questions.

(i) What is meant by *filtration*?

(ii) Which part of the nephron is involved in filtration?

(iii) Reabsorption of substances, such as water, is very important to the body.

1. Name **two** substances (other than water) that are reabsorbed from the nephron.

2. Name **three** regions of the nephron where reabsorption occurs.

(iv) The nephron is also sensitive to a hormone.
This hormone has an effect on the reabsorption of water from the nephron.

1. What is the name of this hormone?

2. Under what condition is the hormone you named above secreted? **(27)**

(c) Answer the following questions based on the human circulatory system.

(i) The human circulatory system is described as a closed circulatory system.
What is meant by a *closed circulatory system*?

(ii) Sketch a cross section of a vein **and** an artery to show the difference between the walls of **each**.
Clearly indicate which is the vein **and** which is the artery.

(iii) Veins have valves along their length. Explain the purpose of these valves.

(iv) Veins generally carry deoxygenated blood and arteries generally carry oxygenated blood. However, there are exceptions.

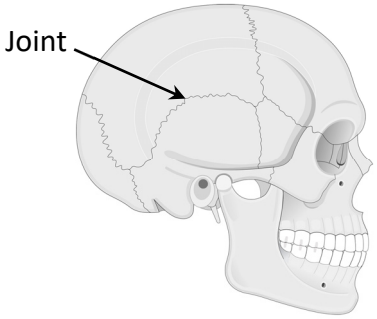
1. Name the vein in the body that carries oxygenated blood.

2. Name the artery in the body that carries deoxygenated blood.

(v) Pulse and blood pressure are two factors that have an effect on blood vessels.
Explain the terms *pulse* **and** *blood pressure*. **(24)**

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

(a) The human skull (also known as the cranium) is shown in the diagram. It is made up of a number of bones connected together by joints as indicated on the diagram.



(i) What type of joint is found between the bones that make up the skull?

(ii) Name another type of joint found in the human skeleton **and** give its location.

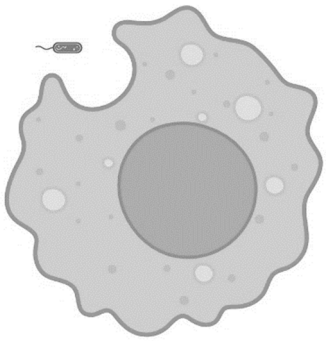
(iii) The skull is part of the axial skeleton.
Name another **two** bones that are part of the axial skeleton.

(iv) The appendicular skeleton is mostly composed of long bones.

1. Draw the internal structure of a long bone **and** label the following parts: **cartilage**, **compact bone**, **spongy bone**.

2. Give **one** function of **each** labelled part.

(b) The human defence system is a network of organs, cells and proteins that defend the body against infection, while protecting the body's own cells. The diagram shows a phagocyte, a part of the general defence system, engulfing a bacterium.



(i) Name another part of the general defence system **and** explain how it defends against infection.

(ii) The specific defence system (also known as the immune system) defends the body against infection using the antigen-antibody response.
This response is part of active immunity.

1. Describe how the antigen-antibody response works in defending the body against infection.
In your answer refer to the type of immune cells involved.

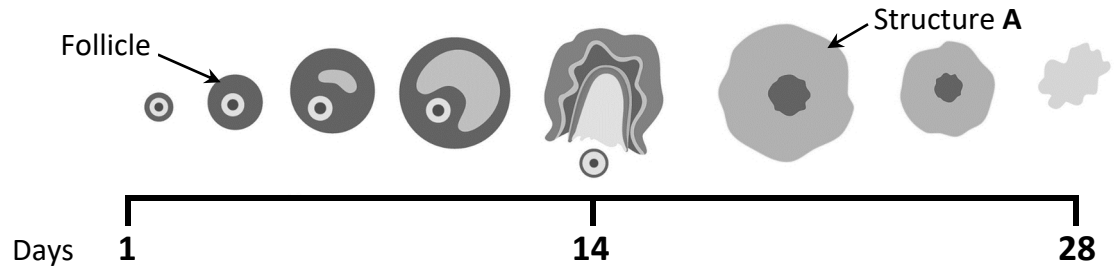
2. Why is this form of immunity described as active?

3. Immunity can also be passive. Give **one** example of passive immunity.

4. Explain why active immunity is long-lived **and** passive immunity is short-lived.

(iii) Vaccines are an important tool used in medicine. What is a vaccine?

(c) The menstrual cycle is a series of events that occurs on average every 28 days if fertilisation has not occurred. It begins at puberty and continues until the menopause which is the end of a woman's reproductive life. The diagram shows the various stages of the menstrual cycle as it occurs in the ovary.



(i) Menstruation normally occurs between days 1 and 5 of the menstrual cycle.
What is meant by the term *menstruation*?

(ii) The follicle increases in size during the first half of the cycle.

1. Name the main hormone the follicle produces.

2. Give the function of the hormone you named above.

(iii) Ovulation usually occurs on day 14.
What hormone is responsible for causing ovulation?

(iv) **1.** What name is given to structure **A**?

2. Name the main hormone that is produced by structure **A**.

3. Describe what happens to structure **A** if fertilisation of an egg cell does not occur.

(v) Name a menstrual cycle disorder **and** state a cause **and** a possible treatment.

(d) Leaves are the main organ responsible for photosynthesis.

(i) Draw a diagram of a transverse section (TS) of the internal structure of a leaf.
Label the following parts:
dermal tissue, **ground tissue**, **stoma**.

(ii) Name **two** gases that enter or exit the leaf.

(iii) Name the process by which the gases move in and out of the leaf.

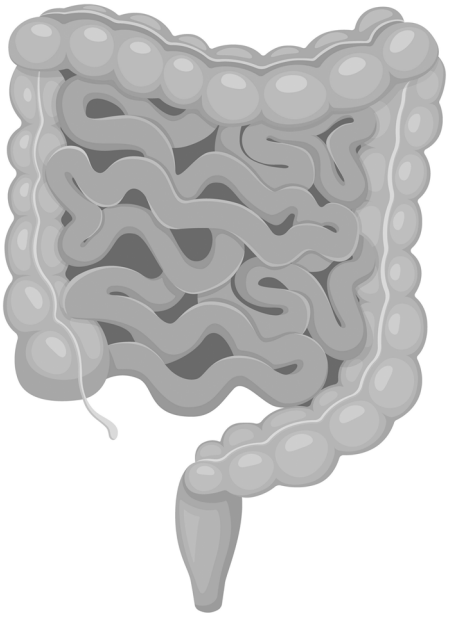
(iv) Stomata are present in leaves.
Name the corresponding structures present on stems.

(v) Describe how minerals are transported from the root to the leaf cells of a plant.

(vi) In some species of flowering plants, the leaves are modified for the storage of food.
Name a plant in which the leaves are modified for food storage.

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

(a) The diagram shows part of the alimentary canal.



(i) Name any **two** parts of the alimentary canal shown in the diagram **and** give the main function for **each** named part.

(ii) Peristalsis is an important process in the alimentary canal.
Explain the term *peristalsis*.

(iii) Villi are present in large numbers in a part of the alimentary canal shown in the diagram.
Draw a labelled diagram of the internal structure of a villus.

(iv) Symbiotic bacteria are present in very large numbers in one of the parts shown in the diagram.
Give **two** functions of these symbiotic bacteria in the alimentary canal.

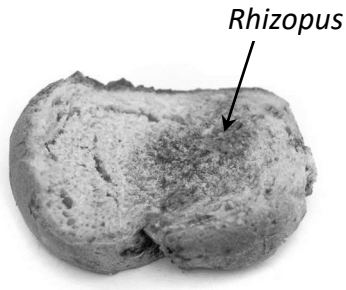
(v) Fibre is an important part of the human diet.
Give **one** benefit of fibre in the diet.

(b) *Rhizopus* is an example of a saprophytic organism.

(i) To which kingdom of organisms does *Rhizopus* belong?

(ii) Explain the term *saprophytic*.

(iii) State a role of saprophytic organisms in the overall scheme of nature.

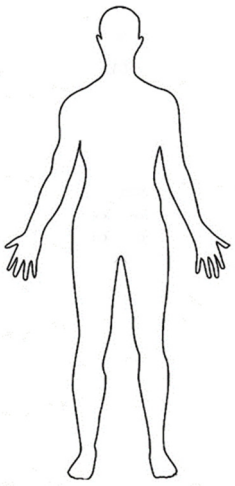


(iv) *Rhizopus* is also known as bread mould (shown in the photograph).
Draw a labelled diagram showing the microscopic structure of *Rhizopus*.

(v) Describe the process *Rhizopus* undergoes during sexual reproduction.

(vi) Name another organism you have studied that belongs to the kingdom you named at part (b) (i) above.

(c) **(i)** Endocrine glands produce hormones.
Explain in detail what happens to a hormone when it is released by the endocrine gland.



(ii) Copy the outline of the human body **into your answerbook**.
Draw in **each** of the following endocrine glands labelling them in their correct locations:

1. Thyroid

2. Pancreas (islets of Langerhans)

3. Testes

(iii) Choosing **one** of the endocrine glands named above, **write it into your answerbook and** answer the following questions based on the chosen endocrine gland.

1. Name a hormone it produces.

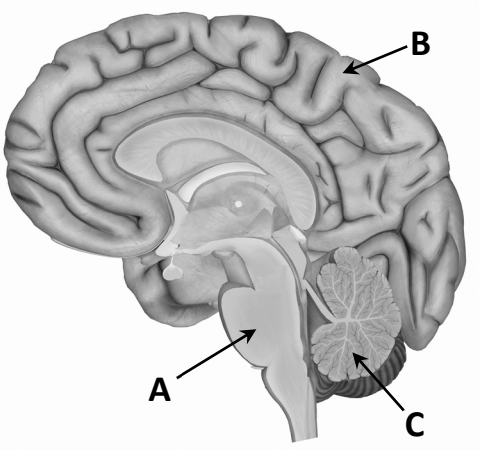
2. Give the function of the named hormone.

(iv) State **two** ways in which hormone action differs from nerve action.

(v) Give **one** use of a hormone supplement.

(vi) Human glands can also be exocrine.
Explain what happens to the product when it is released by the exocrine gland.

(d) The diagram shows a cross section of the human brain.



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

(ii) Choose **one** of the parts named above **and** give its function.

(iii) There are three types of neuron in the human nervous system.
Name **each** type.

(iv) The human brain consists of billions of neurons.
Draw the structure of a neuron **and** label the following parts:
cell body, **axon**, **dendrite**, **Schwann cell**, **myelin**, **axon terminal**

(v) Name **one** disorder of the nervous system **and** give a possible treatment for the named disorder.

There is no examination material on this page

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Leaving Certificate – Higher Level

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3 hours