Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2022

Biology

Section C

Ordinary Level

Tuesday 14 June Afternoon 2:00 - 5:00

180 marks

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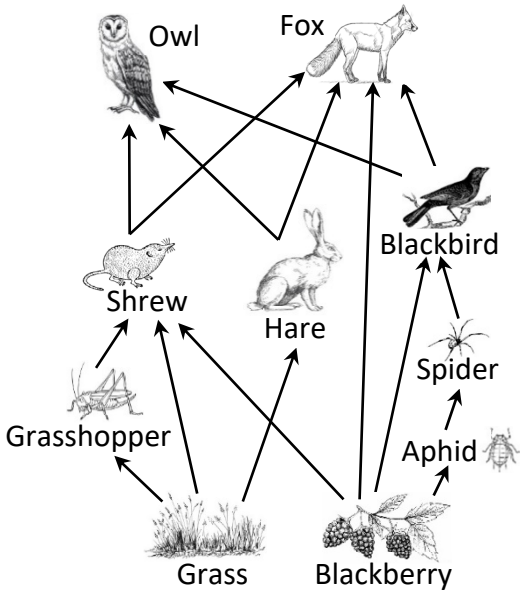
Section C

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

11. (a) Explain the following terms used in ecology:

(i) *Biosphere*
(ii) *Abiotic*
(iii) *Niche* **(9)**

(b) The diagram shows an example of interconnected food chains.



(i) What term describes a collection of interconnected food chains?
(ii) What is the primary source of energy for a producer in a food chain?
(iii) Identify a producer from the diagram.
(iv) Name **one** carnivore from the diagram.
(v) What is an omnivore?
(vi) Name **one** omnivore from the diagram.
(vii) Write out any **one** food chain from the diagram.
(viii) Suggest what would happen to the population of aphids if a disease reduced the spider population. **(27)**

(c) Read the following passage and answer the questions that follow.

A recent Environmental Protection Agency (EPA) report states that a large number of Ireland's rivers are unable to support healthy ecosystems. Many of our rivers are under pressure from excess nitrogen as a result of discharges of poorly treated sewage or slurry and fertiliser runoff from agriculture. Too much nitrogen in a water body can lead to the over-growth of flora, which can also reduce oxygen levels. Reduced oxygen levels often cause fish kills.

(*Adapted from www.epa.ie, 13 November 2019*)

(i) Explain the **two** underlined terms.
(ii) Name **two** activities, referred to in the article, that can lead to high levels of pollutants in rivers.
(iii) State **two** harmful effects, referred to in the article, of pollutants on river ecosystems.
(iv) Name the important biomolecule in living things that requires nitrogen.
(v) Nutrient recycling is essential for healthy ecosystems. Name a group of organisms that act as decomposers in the nitrogen cycle. **(24)**

12 (a) Explain the following terms used in genetics:

(i) *Diploid*

(ii) *Haploid*

(iii) *Allele* **(9)**

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

Cystic fibrosis (CF) is caused by a mutated gene and its protein product that causes the body to produce a thick, sticky mucus that clogs the lungs and leads to lung infections. Inhalers and daily physiotherapy help to manage the symptoms of CF. People that do not have CF have at least one dominant gene (**N**). Some people can be carriers (heterozygous) and not have CF. People with CF have two copies of the mutated gene (**n**), one inherited from each parent. Genetic screening is available to those over the age of 16 where there is a family history of CF.

(*Adapted from mayoclinic.org*)

(i) What is the cause of cystic fibrosis?

(ii) State the genotype of each of the following:

1. A person who is a carrier of the CF gene.
2. A person with the CF condition.
3. The possible gametes a carrier can produce.

(iii) Using a Punnett square, determine the percentage chance of two carrier parents having a child with CF.

(iv) What genotype should one parent have to ensure their children do **not** inherit the CF condition?

(v) What is the purpose of genetic screening? **(27)**

(c) The cell cycle consists of two stages, <u>interphase</u> and mitosis (cell division).

(i) Explain the underlined term.

(ii) Describe the process of mitosis. You may use a labelled diagram to aid your answer.

(iii) Name another form of cell division that introduces variation to the daughter cells.

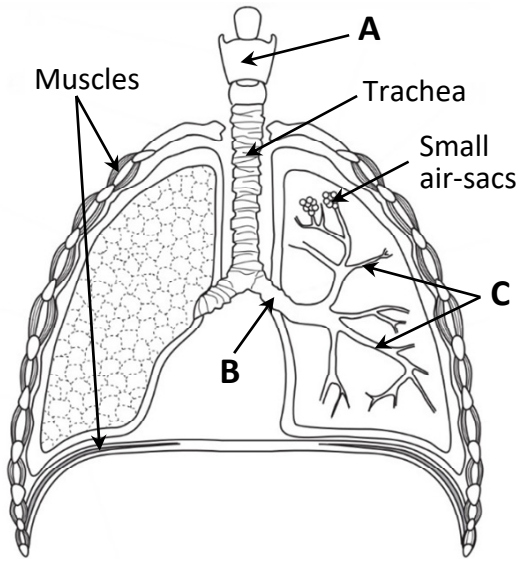
(iv) Name **one** cell in the human body produced by the form of cell division you named at part (c) (iii) above.

(v) Name **one** organ in the human body in which the form of cell division you named at part (c) (iii) above occurs. **(24)**

13. (a) (i) Where are the lungs located in the body?

(ii) Name **two** substances excreted by the lungs. **(9)**

(b) The diagram shows the structure of the human breathing system.



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

(ii) What is the function of the trachea?

(iii) Name the **two** muscles involved in breathing.

(iv) Name the small air-sacs in the lungs, located at the ends of structures **C**, in which gas exchange occurs.

(v) Give **two** ways in which these air-sacs are adapted to carry out their function. **(27)**

(c) Read the following passages and, using either asthma or bronchitis, answer the questions that follow.

Asthma is a condition that affects the airways in the lungs. They can become inflamed by the presence of cold air or dust. When the airways react to a substance, the muscles of the tube walls tighten up, making them more narrow and leaving less room for air to flow.

(*Adapted from www.asthma.ie*)

Bronchitis is a condition that affects the breathing tract. The main airways can become inflamed. Acute bronchitis can occur as a result of an infection and can improve within a few days. Chronic bronchitis can occur as a result of smoking and is a long-term condition.

(*Adapted from www.mayoclinic.org*)

(i) Write down the name of **one** of the conditions and:

1. Give a symptom of the named condition.
2. Describe a cause.
3. Suggest a possible treatment.

As part of her preparation for a race an athlete investigated the effect of exercise on breathing rate and pulse rate.

(ii) Describe how an athlete might have measured **either** breathing **or** pulse rate.

(iii) After measuring the resting rate, what other steps would the athlete have carried out to complete the investigation?

(iv) What is the effect of increased exercise on **either** breathing **or** pulse rate? **(24)**

14. (a) (i) What is an enzyme?

(ii) Name **one** factor that affects the rate of action of an enzyme.

(9)

(b) (i) Photosynthesis is an anabolic process.
Explain the term *anabolic*.

(ii) Name the cell organelle in which photosynthesis occurs.

(iii) Name the pigment that absorbs light energy for photosynthesis.

(iv) $C_x(H_2O)_y$ is the general formula for one of the products of photosynthesis.
What group of biomolecules does this general formula represent?

(v) During photosynthesis water is absorbed and split into oxygen and two other products.

1. Name the other **two** products produced by the splitting of water.
2. Give **one** possible fate for the oxygen.

(vi) Carbon dioxide is absorbed by plants during photosynthesis.

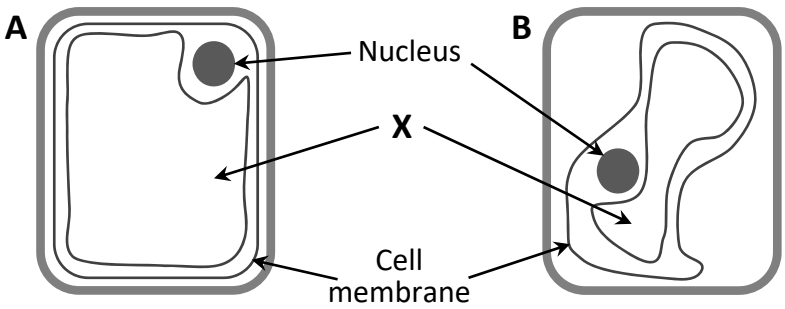
1. State a source for the carbon dioxide.
2. State a structure through which the carbon dioxide enters plants.

(27)

(c) Water enters the roots of plants by osmosis, which is a special case of diffusion.

(i) Explain the term *osmosis*.

Turgor is also important for plants. The pictures, **A** and **B**, show two plants cells.



(ii) Explain the term *turgor*.

(iii) Which cell, **A** or **B**, is turgid?

(iv) Name the cell part that prevents a plant cell from bursting.

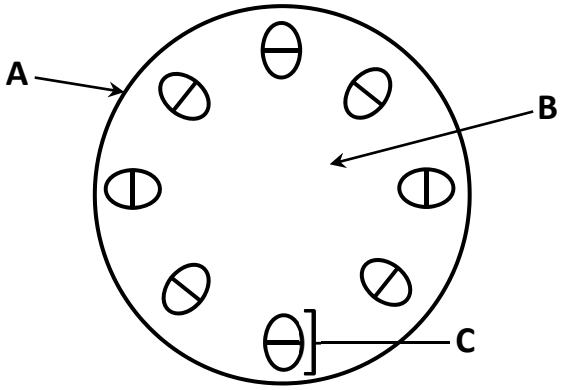
(v) Name organelle **X**, an important storage organelle in plant cells.

(vi) Explain in detail what has happened to cell **B**.

(24)

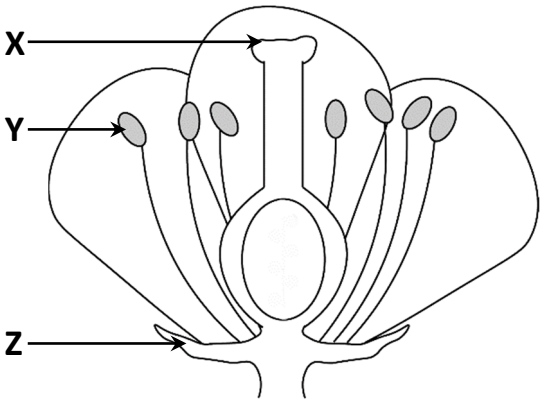
15. (a) (i) Name the growth response in which plant stems grow towards light.
(ii) How do plants benefit from increased light intensity?
(iii) Name another environmental factor that regulates plant growth. **(9)**

(b) The diagram shows a section through a plant stem.



(i) Name the tissues labelled **A** and **B**.
(ii) State a function for **each** of the tissues you named at part (b) (i) above.
(iii) Name the structure labelled **C**.
(iv) Name the cells found in structure **C** that transport water.
(v) Name the cells found in structure **C** that transport food.
(vi) State **one** way in which a section through a root would be different from the section above.
(vii) State **one** reason why the diagram above represents a section through a dicotyledonous plant stem. **(27)**

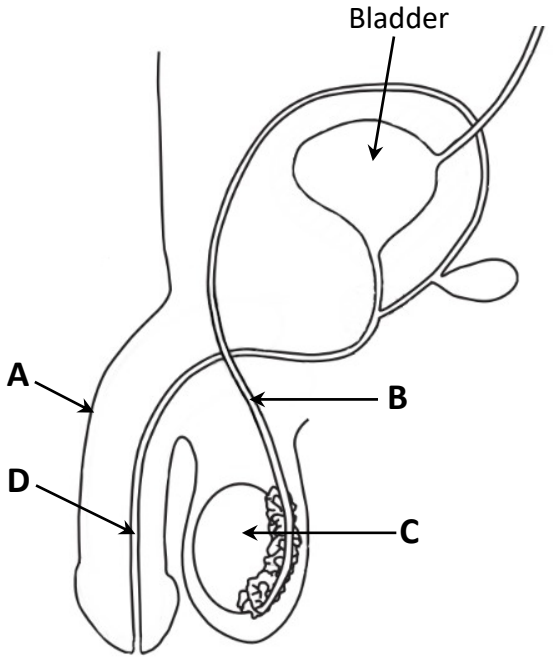
(c) The diagram shows a plant flower.



(i) **In your answer book**, state which letter represents each of the following parts:
1. Stigma
2. Sepal
3. Anther.
(ii) Name the structure in the flower that forms the fruit.
(iii) Explain the term *pollination*.
(iv) Name **two** methods by which plants are pollinated. **(24)**

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

(a) The diagram shows the human male reproductive system.



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

(ii) Name the male hormone produced by the structure labelled **C**.

(iii) Give **one** function of the hormone named at part (ii) above.

(iv) What is meant by the term *infertility*?

(v) Give a cause of infertility.

(vi) Explain the term *contraception* **and** give **one** example.

(b) (i) Draw a large labelled diagram of a typical bacterial cell.

(ii) Name **two** bacterial shapes.

(iii) Explain the term *binary fission*.

(iv) What term is used to describe bacteria and other microorganisms that cause disease?

(v) What are antibiotics?

(vi) Describe a disadvantage of the overuse of antibiotics.

(c) (i) Give **two** functions of the skeleton.

(ii) The human skeleton shown in the diagram can be divided into the axial skeleton and the appendicular skeleton. Name any **one** bone found in **each** of the following parts:

1. axial skeleton
2. appendicular skeleton.

(iii) Draw a diagram of a long bone **and** label the following parts:

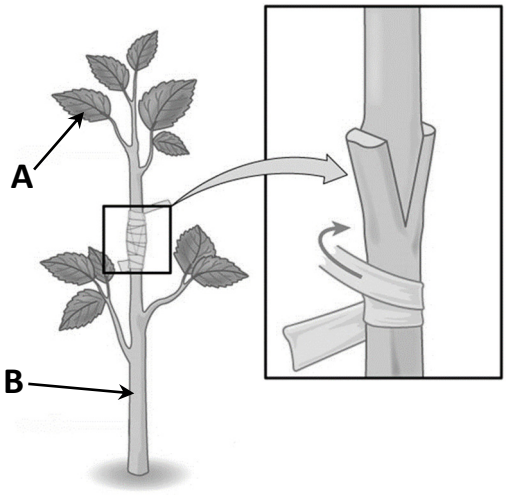
compact bone; **spongy bone**; **bone marrow**

(iv) Name the flexible tissue present between bones in a synovial joint **and** give its function.

(d) Plants can undergo a process of vegetative propagation or artificial propagation.

(i) What is meant by the term *vegetative propagation*?

(ii) Name **one** method of vegetative propagation **and** state the plant organ involved.



The diagram above shows grafting, a form of artificial propagation.

(iii) Name the parts of the plant labelled **A** and **B** on the diagram.

(iv) Name **two** other methods of artificial propagation.

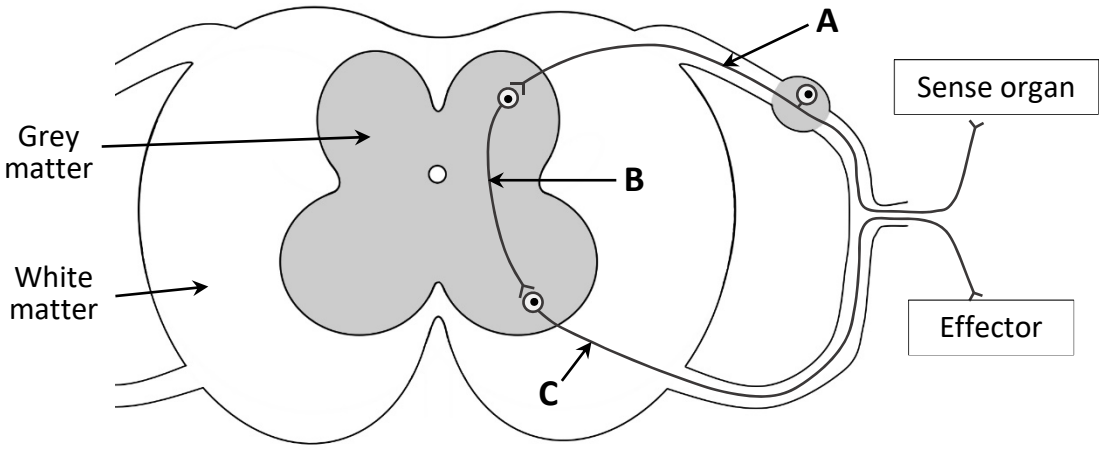
(v) Suggest **one** advantage of artificial propagation for horticulturists.

(vi) Compare reproduction by seed with reproduction by vegetative propagation under the following headings:

1. Variation
2. Dispersal.

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

(a) The diagram shows a section through the spinal cord with attached nerves.



(i) White matter contains axons. What is the function of an axon?

(ii) Grey matter contains cells bodies and dendrites.
What is the function of dendrites?

(iii) Name the nerve cells labelled **A**, **B**, **C** in the diagram.

(iv) Give an example of a sense organ.

(v) Name **or** give an example of an automatic response to a stimulus.

(vi) How does an automatic response to a stimulus benefit the human body?

(vii) Compare a nervous system response with a hormonal system response under the following headings:

1. Speed
2. Duration of effect.

(b) The theory of <u>evolution</u> by <u>natural selection</u> was developed by two famous biologists.

(i) Explain the underlined terms.

(ii) Name **both** biologists who developed the theory of evolution by natural selection.

Genetic engineering is also an important area of biology.

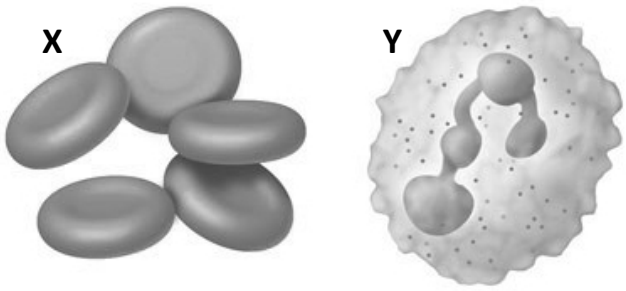
(iii) Explain the term *genetic engineering*.

(iv) Give **one** example of genetic engineering involving a plant **and one** example involving an animal.

(c) The circulatory system is one of two systems that carry fluids within the body.

(i) The heart is an organ of the circulatory system. Draw a large labelled diagram showing the internal structures of the human heart.

(ii) The diagram shows two cell types (**X** and **Y**) present in the blood.
Name the two cell types **X** and **Y**.



(iii) Platelets are another cell type found in the circulatory system.
Give **one** role of platelets.

(iv) Name any **two** blood groups found in humans.

(v) Name the other system that carries fluid within the body.

(vi) Name the fluid carried by the system named at part (c) (v) above.

(d) (i) Distinguish between autotrophic **and** heterotrophic nutrition by writing a brief sentence on **each**.

(ii) Chemical digestion **and** mechanical digestion are part of nutrition. Both can occur in the mouth.
1. Describe how **both** types of digestion take place in the mouth.
2. Name **one** other location in the human digestive system where both types of digestion take place.

(iii) What is the name given to the muscular contractions which force food along the alimentary canal?

(iv) The list below shows some of the organs of the alimentary canal.
Write them in the correct order, starting with the mouth.

mouth; **stomach**; **rectum**; **large intestine**; **small intestine**; **oesophagus**

(v) Egestion is a necessary part of the process of nutrition.
What is meant by the term *egestion*?

(vi) Symbiotic bacteria are present in the alimentary canal.
Give **two** functions of these bacteria.

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