Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination

Biology

Section C

Ordinary Level

3 hours

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) Explain the following terms as used in ecology:

(i) *Ecosystem*

(ii) *Edaphic factor*

(iii) *Habitat*. **(9)**

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

Goats deployed in unique conservation project on Howth Head

A herd of goats is being reintroduced to County Dublin in a conservation grazing project. Twenty-five Old Irish Goats have been relocated from the hills of Mayo to Howth Head in Dublin, where they will be used to reduce gorse cover in an area that has been affected by wildfires.

However, with the decline of goats from 1940, due to their cost and expansion of housing, gorse cover increased, resulting in a highly flammable landscape. Through grazing, the goats will reduce gorse cover, creating natural fire breaks. Grazing will give rise to more diverse heathlands as more space is freed up for other plant species, which can then support other organisms, e.g. other animals.

Machinery could be used to cut the gorse but the goats can graze the hills, which is much cheaper and more sustainable - and from a pollution and conservation perspective, it's nicer to see goats in action than machinery in action.

Adapted from *www.rte.ie*, 8th September, 2021

(i) Give **two** benefits of the reintroduction of Old Irish Goats to Howth Head.

(ii) Suggest **two** reasons, stated in the article or otherwise, why the goat population declined on Howth Head after 1940.

(iii) Suggest a way, from the passage or otherwise, in which goats grazing on the gorse create a more diverse heathland.

(iv) 1. Explain the term *pollution*.

2. Give **one** example of a pollutant from any one of the following areas: domestic **or** agricultural **or** industrial.

(v) 1. Conservation is mentioned in the passage. What is meant by the term *conservation*?

2. Suggest **one** reason why conservation is important. **(27)**

(c) (i) Name an ecosystem you have studied.

(ii) Identify a local ecological issue associated with the ecosystem you named at part (c) (i) above.

(iii) Name **three** animals that are normally present in the ecosystem you have named at part (c) (i) above.

(iv) Give an adaptation of any **one** of the animals you named at part (c) (iii) above.

(v) What is an *abiotic factor*?

(vi) Give an example of an abiotic factor which may affect the distribution of **one** of the animals you have named at part (c) (iii) above. **(24)**

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

(i) *Gene*

(ii) *Phenotype*

(iii) *Gamete*. **(9)**

(b) In carnation flower plants, the allele for red flowers (**R**) is dominant to the allele for white flowers (**r**). However, heterozygous carnations have pink flowers. Two carnations, one with pink flowers and the other with white flowers, are crossed.

Red White Pink

(i) What term describes a situation, such as the one above, where two different alleles are equally expressed in the phenotype?

(ii) What is the genotype of the white-flowered plant?

(iii) What is the genotype of the only possible gamete from the white-flowered plant?

(iv) What is the genotype of the pink-flowered plant?

(v) What are the genotypes of the **two** possible gametes from the pink-flowered plant?

(vi) Pink-flowered and white-flowered carnations result from this cross.
In what ratio do they occur?

(vii) 1. What is the genotype of a red-flowered carnation?
2. Explain why no red-flowered carnations are produced in this cross. **(27)**

(c) The formation of skin grafts is one of many applications of tissue culture.

(i) In terms of living organisms, what is a tissue?

(ii) Tissue culture involves growing cells in a nutritive fluid.
Name a substance that is often present in this nutritive fluid.

(iii) Suggest a suitable temperature at which human skin cells should be grown.

(iv) In preparation for tissue culture, it is important that no micro-organisms are present.
What term describes this situation?

(v) Which type of cell division is involved in the formation of skin grafts in tissue culture?

(vi) Give **one** other application of tissue culture in either plants **or** animals.

(vii) In relation to your answer at part (c) (v) above, state how many daughter cells result from one cell undergoing this type of cell division.

(viii) What stage of the cell cycle describes a cell not undergoing any type of cell division? **(24)**

13. (a) Plants are autotrophic organisms.

(i) Explain the underlined term.

(ii) What is the source of energy for photosynthesis in plants?

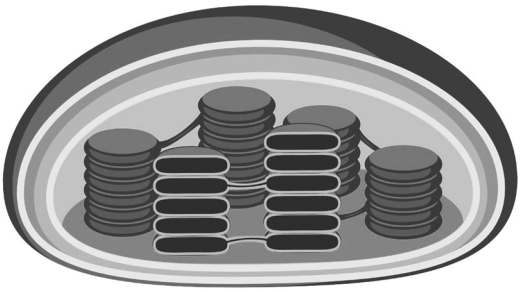
(iii) State **one** way a horticulturist could increase the rate of photosynthesis in a greenhouse. **(9)**

(b) Answer the following questions based on your knowledge of photosynthesis.

(i) **Copy the following partially completed word equation for photosynthesis into your answerbook** and fill in the missing parts:

_____ + water → _____ + oxygen

(ii) The picture shows an organelle in which photosynthesis occurs. Name this organelle.



(iii) A green pigment is present in the organelle shown. What is the name of this green pigment?

(iv) What is the specific function of the pigment you named at part (b) (iii) above during photosynthesis?

(v) Water is broken up during photosynthesis. One of the products is oxygen. Name the other **two** products.

(vi) Give **two** possible fates of the oxygen produced during photosynthesis. **(27)**

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

(ii) Aerobic respiration occurs in two stages. State the location in the cell where each of the following stages occur:

1. Stage 1
2. Stage 2

(iii) In which stage of aerobic respiration is the most energy released?

In anaerobic respiration, only stage 1 occurs. Anaerobic respiration is slightly different between animals and plants.

(iv) Name the acid produced by anaerobic respiration in human muscle cells.

(v) Anaerobic respiration in plant cells produces a gas and another compound. Name the other compound.

(vi) Fermentation is another biological process that is often used in food production; for example, in the baking of bread.

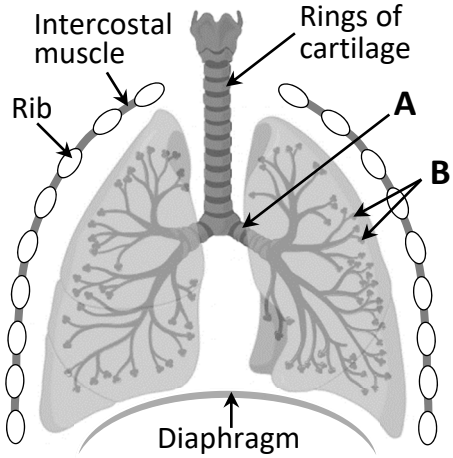
1. Name a micro-organism that can be used in fermentation.
2. Micro-organisms can also be immobilised for fermentation reactions. Give **one** advantage of cell immobilisation. **(24)**

14. (a) (i) Explain the term *excretion*.

(ii) Sweat is an excretory product of the skin. Name any **two** components of sweat.

(9)

(b) The diagram shows the human breathing system.



(i) State the location of the lungs in the human body.

(ii) Name the structures labelled **A** and **B** in the diagram.

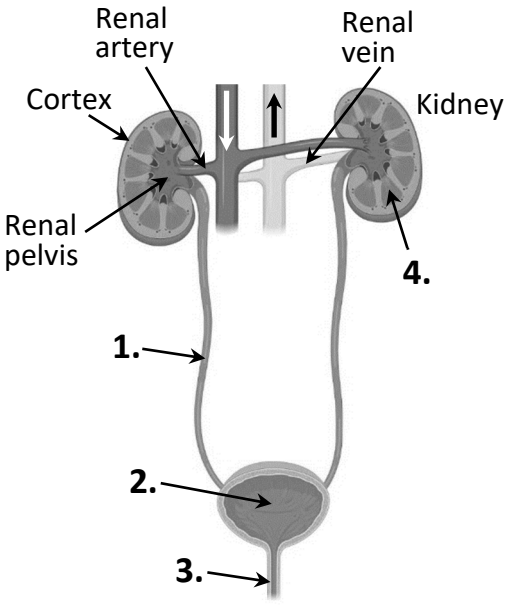
(iii) What is the function of the rings of cartilage?

(iv) Give **one** feature of the structures labelled **B** in the diagram, that enable them to carry out their function.

(v) Using the labels on the diagram, outline the process of inhalation.

(27)

(c) The diagram represents the human urinary system and the internal structures of the kidney.



(i) Name the parts labelled **1**, **2**, **3**, and **4** in the diagram.

(ii) What is the function of the part labelled **2**?

(iii) Give **one** difference between the blood in the renal vein and the blood in the renal artery.

(iv) In relation to the internal structure of the kidney, name the precise location where filtration occurs.

(v) Name any **one** useful substance reabsorbed by the kidney.

(24)

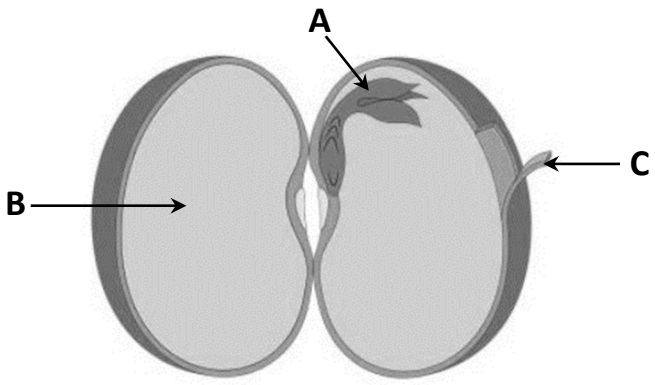
15. (a) Plants have evolved to protect themselves from adverse external environments, e.g. presence of stomata.

(i) What is meant by the term *adverse external environments*?

(ii) Other than presence of stomata, give any **two** adaptations plants possess that help protect themselves.

(9)

(b) The diagram shows the internal structure of a broad bean seed.



(i) From which part of a flower is the seed produced?

(ii) Name the parts of the seed labelled **A**, **B** and **C**.

(iii) What is the function of the part labelled **C**?

(iv) The broad bean seed is an example of a <u>non-endospermic</u> seed.
Explain the underlined term.

(v) Seeds are often classified as either monocotyledonous or dicotyledonous.
Distinguish between the terms *monocotyledonous* **and** *dicotyledonous* by writing a sentence on **each**.

(vi) Seeds are dispersed to increase their chance of survival.
Name **one** resource that seeds could be in competition for.

(27)

(c) A tropism in plants is defined as a growth response to a stimulus.

(i) Why are tropisms important for plants?

(ii) Phototropism and geotropism are two types of tropism in plants.
State what the stimulus is for **each** of these tropisms.

(iii) Growth regulators are also important for plants and are involved in tropisms.
Give any **one** example of a growth regulator in plants.

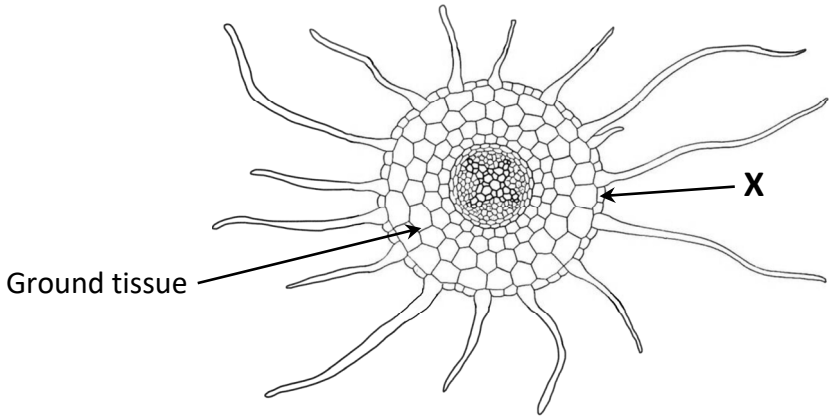
(iv) State **two** ways in which the growth regulators in plants are similar to hormones in animals.

(v) Give **two** examples of the commercial use of plant growth regulators.

(24)

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

(a) The diagram below shows a cross (transverse) section of a part of a plant.



(i) Which part of the plant do you think the diagram represents?

(ii) Give a reason for your answer to part (a) (i) above.

(iii) 1. State a function of ground tissue in plants.

2. Give another name for ground tissue in the part of the plant you named at part (a) (i) above.

(iv) Draw a labelled diagram showing the zones in a longitudinal section of the structure you named at part (a) (i) above.

(v) 1. What name is given to tissue **X**?

2. Give **one** function for tissue **X**.

(b) (i) Explain the term *digestion* **and** its importance to the body.

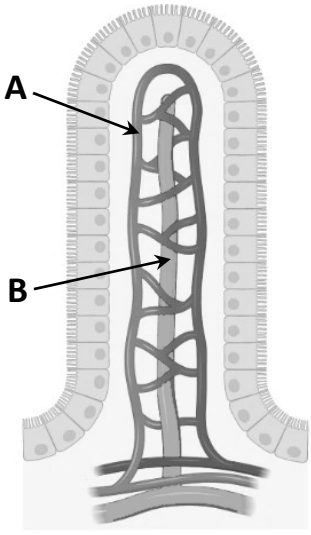
(ii) Digestion can be categorised into two types. Name the **two** types of digestion **and** briefly describe how **each** type occurs.

(iii) The diagram shows a cross section of a villus.

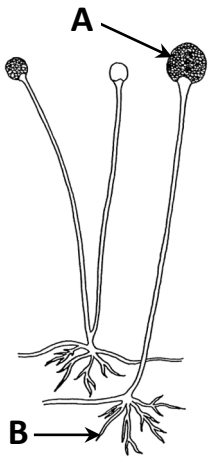
1. Give the location of a villus in the human digestive system.

2. Name parts **A** and **B** on the diagram of the villus.

3. Which food biomolecule is absorbed mainly by structure **B**?



(c) The diagram shows *Rhizopus*.



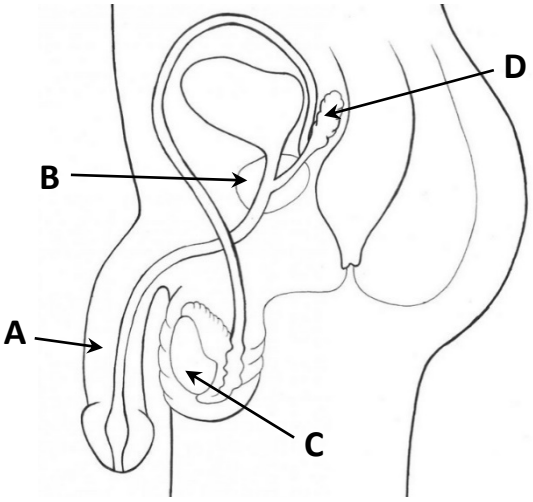
(i) To which kingdom does *Rhizopus* belong?

(ii) Name structures **A** and **B** in the diagram **and** give **one** function of **each**.

(iii) *Rhizopus* can reproduce sexually.
Describe the process of sexual reproduction in *Rhizopus*.

(iv) *Rhizopus* is a harmful member of the kingdom you named at part (c) (i) above as it causes food spoilage.
Name **one** other harmful member of this kingdom.

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



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

(ii) The parts labelled **B** and **D** have a similar function. What is this function?

(iii) In which part of the diagram are sperm cells produced?

(iv) Name a male reproductive hormone involved in sperm production.

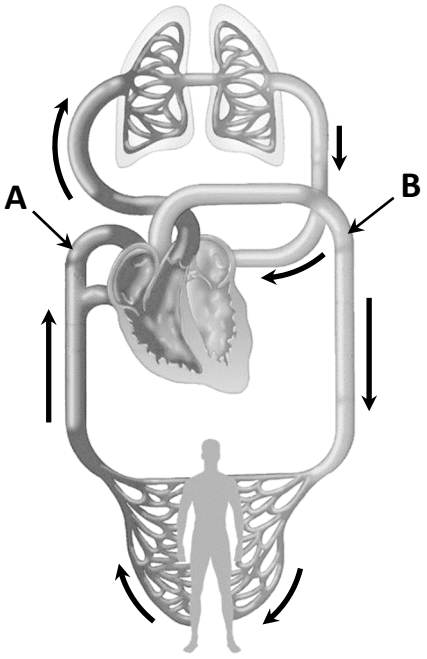
(v) Sperm cells are haploid cells and have half the number of chromosomes as other body cells.
Which type of cell division is involved in producing these haploid cells?

(vi) Suggest a reason why human sperm cells have a tail.

(vii) State any **one** cause of male infertility **and** describe any **one** corrective measure.

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

(a) The human circulatory system is a two-circuit system, and is also a closed system.



(i) In relation to blood flow, what is meant by a 'closed' circulatory system?

(ii) Blood follows a pathway of two circuits in the human body, as shown in the diagram.
Name these **two** circuits.

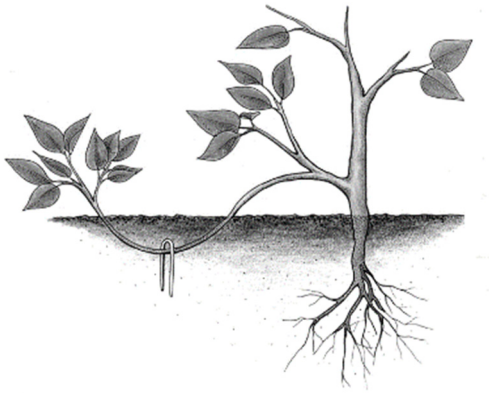
(iii) 1. What is the name of vein **A**?
2. What is the name artery **B**?

(iv) Give **two** structural differences between arteries and veins.

(v) Name the small blood vessels that connect arteries to veins.

(vi) Name any **two** components of blood.

(b) (i) The diagram shows a type of artificial propagation.
Name the type of artificial propagation shown.



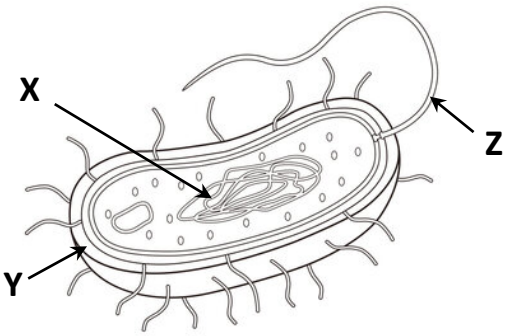
(ii) Name any **two** other types of artificial propagation used by horticulturists.

(iii) Plants can also reproduce naturally by vegetative propagation.
Name any **two** methods by which plants can undergo vegetative propagation.

(iv) **Copy the following table into your answerbook** and complete it.

	Reproduction by seed	**Reproduction by vegetative propagation**
Type of reproduction	**Sexual**	
Amount of genetic variation		
Approximate duration		

(c) Some bacteria are pathogenic.
The diagram shows a typical bacterium.



(i) To which kingdom do bacteria belong?

(ii) Name the parts labelled **X**, **Y** and **Z**.

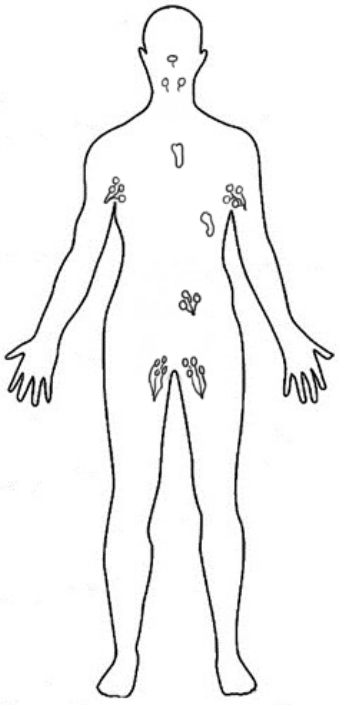
(iii) What is meant by the term *pathogenic bacteria*?

(iv) The bacterial cell shown is rod-shaped.
Name **two** other bacterial shapes.

(v) Name **two** factors that affect the growth of bacteria.

(vi) In unfavourable conditions, some bacteria can form a thick-walled structure that allows them to survive.
What name is given to this structure?

(d) The human body has a general defence system and a specific defence system.



(i) Give **one** example of the general defence system in the human body **and** describe how it protects the body.

(ii) The diagram shows organs that are specific to the immune system.
Name any **two** of these organs.

(iii) Antigens are recognised by the specific defence system. What is an antigen?

(iv) There are two types of induced immunity – active and passive.

1. Give **one** example of active immunity **and one** example of passive immunity.
2. Active immunity is usually long-lasting. Passive immunity is short-lived.
Explain why passive immunity is short-lived.

(v) Antibiotics can aid the defence system in the elimination of infections.

1. What is an antibiotic?
2. Comment on the potential abuse of antibiotics in medicine.

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