2024.M43

2024L025G1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Biology

Sections A and B and Answerbook

Ordinary Level

Tuesday 11 June Afternoon 2:00 - 5:00

400 marks

Examination Number

Date of Birth

For example, 3rd February 2005 is entered as 03 02 05

Centre Stamp

Instructions

Write your Examination Number and your Date of Birth in the boxes on the front cover.

Write your answers to all parts of the examination into this answerbook. This answerbook will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner.

Write your answers in blue or black pen. You may use a pencil for sketches, graphs and diagrams only.

There are three sections to this examination. Questions for Section **C** are supplied separately but your answers must be written in this answerbook.

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**.

Section **A**	Answer any **five** questions from this section. Each question carries 20 marks.
Section **B**	Answer any **two** questions from this section. Each question carries 30 marks.
Section **C**	Answer any **four** questions from this section. Each question carries 60 marks.

Section A

Answer any five questions.
Write your answers in the spaces provided.

1. Use your knowledge of nutrition to answer the following questions.

(a) Why is food required by **all** living organisms?

(b) Carbon, hydrogen, oxygen and **one** other element are **always** present in proteins.
Name the **other** element.

(c) Give **one** source of protein in the diet.

(d) Which of the following is a **structural** role of protein in living organisms?
Put a tick (✓) in the correct box.

Component of hair and nails ☐

Takes part in enzyme reactions ☐

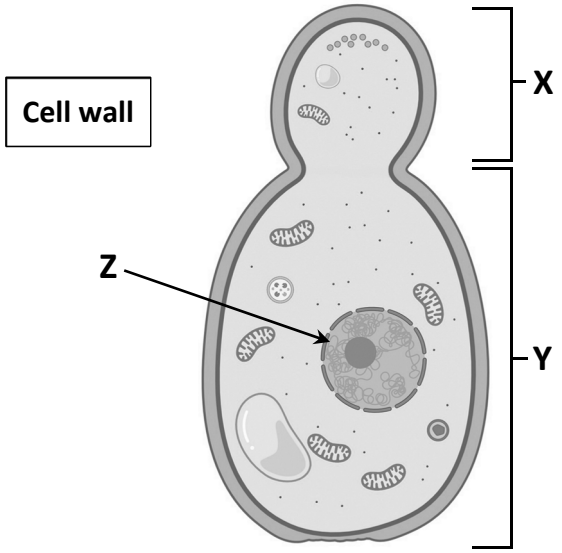
(e) Which one of the following terms is the **smallest** unit of a protein?
Put a tick (✓) in the correct box.

Monosaccharide ☐

Amino acid ☐

Triglyceride ☐

2. The diagram shows a yeast cell budding.



(a) Is yeast a unicellular or multicellular organism?
Put a tick (✓) in the correct box.

Unicellular ☐

Multicellular ☐

(b) What is the reason for budding in yeast?
Put a tick (✓) in the correct box.

Respiration ☐

Excretion ☐

Reproduction ☐

(c) Which part of the yeast cell (**X** or **Y**) is the bud?
Put a tick (✓) in the correct box.

X ☐

Y ☐

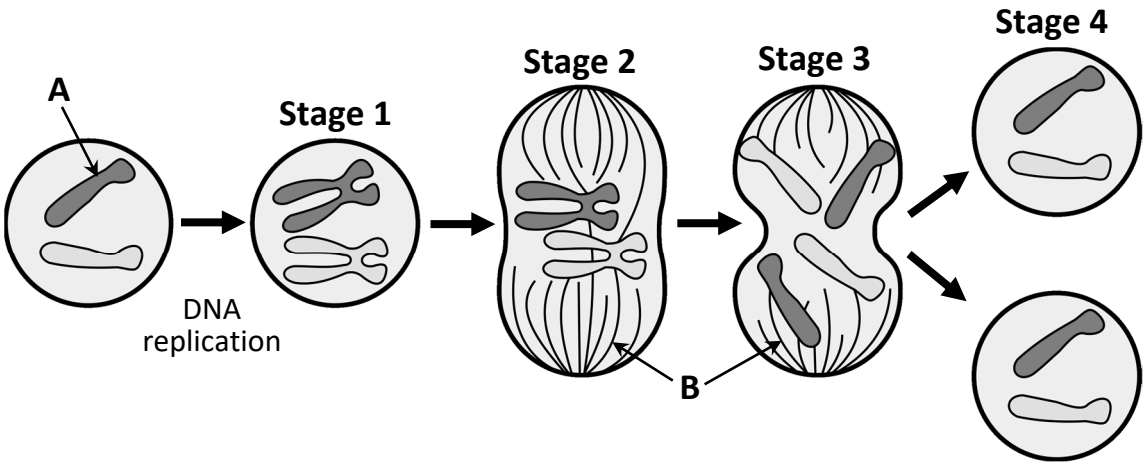
(d) Briefly describe what happens to the bud.

(e) What is the name of the organelle labelled **Z**?

(f) **On the diagram above**, draw an arrow from the label '**Cell wall**' to the location of the cell wall in the yeast cell.

(g) Yeast is a member of which kingdom?

3. The diagram shows DNA replication followed by mitosis.



(a) Structure **A** is made of DNA and protein. Name structure **A**.

(b) Structure **B** is shown during **Stage 2** and **Stage 3** of mitosis. Name structure **B**.

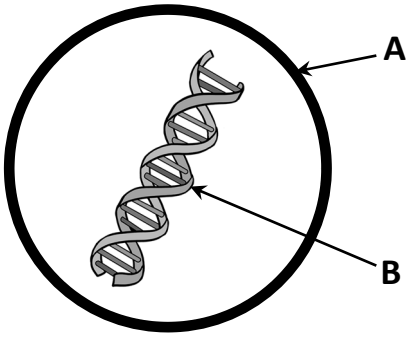
(c) Briefly describe what is happening during **Stage 2** of mitosis.

(d) Briefly describe what is happening during **Stage 3** of mitosis.

(e) How many daughter cells result from mitosis?

(f) What is the function of mitosis in multicellular organisms?

4. The diagram shows the basic structure of a virus.



(a) Name the **two** main components (**A** and **B**) of a virus.

A:
B:

(b) Give **one** example of a harmful virus.

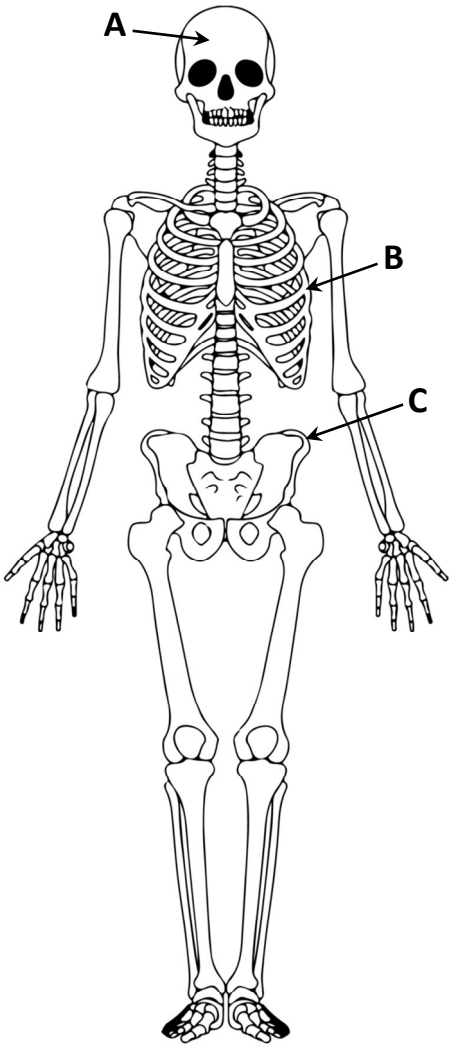
(c) Give an example of how viruses might be beneficial.

(d) Which of the following sentences describes how viruses replicate?
Put a tick (✓) in the correct box.

Viruses replicate outside of living cells. ☐

Viruses replicate within living cells. ☐

5. The diagram shows the human skeleton.



(a) Give **two** functions of the skeleton.

1.
2.

(b) Name the parts of the skeleton labelled **A**, **B** and **C**.

A:
B:
C:

(c) Which of the following types of joint is located between the bones of part **A**?
Put a tick (✓) in the correct box.

Immovable ☐

Slightly movable ☐

Free moving or synovial ☐

(d) Which of the following types of joint describes a hinge or ball and socket joint?
Put a tick (✓) in the correct box.

Immovable ☐

Slightly movable ☐

Free moving or synovial ☐

6. State whether each of the following statements is true or false by putting a tick (✓) in the appropriate box in **each** case.

	True	False
Example:		
Turgor is the pressure of the cell contents against the cell wall.	☑	☐
(a) The stage of a light microscope holds the slide.	☐	☐
(b) Protein synthesis occurs on the ribosome.	☐	☐
(c) Animal cells have cell walls.	☐	☐
(d) A tissue is a group of organs.	☐	☐
(e) Immobilised enzymes can be reused.	☐	☐
(f) Osmosis is a special case of diffusion.	☐	☐
(g) Cell membranes are fully permeable.	☐	☐

7. Choose **each** term from the following list and place it in Column B to match a description in Column A. The first one has been completed as an example.

~~Safety~~ **Hypothesis** **Data** **Control** **Theory** **Experiment**

Column A		Column B
	Principle of experimentation	**Safety**
(a)	Possible explanation for an observation	
(b)	Used to test a hypothesis	
(c)	Comparison to a test	
(d)	Information and measurements collected during an investigation	
(e)	Supported hypothesis	

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.

8. **(a)** **(i)** Define the term *habitat*.

(ii) What did you use to identify fauna and flora in your habitat study?

(b) As part of your habitat study, you will have investigated three abiotic factors.

(i) Name the **three** abiotic factors you studied **and** briefly state how you measured **each** of them; e.g. state the apparatus you may have used.

You will have also used various pieces of apparatus for collecting organisms in your habitat study.

(ii) Name **two** pieces of collection apparatus **or** name **two** methods you used to collect organisms as part of your habitat study.

9. **(a)** **(i)** Define the term *enzyme*.

(ii) Name a factor, other than temperature, that affects enzyme activity.

(b) Answer the following questions based on an activity you carried out to investigate the effect of **temperature** on the **rate of activity** of an enzyme.

(i) Write down the enzyme you used from the list below **and** give the substrate of this enzyme. List: **Amylase**; **Pepsin**; **Catalase**.

Enzyme:
Substrate:

(ii) Briefly describe how you prepared the enzyme.

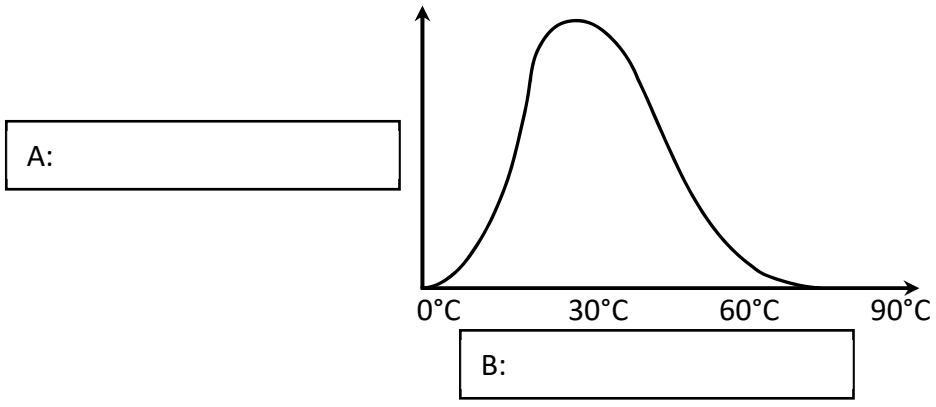
(iii) How did you vary the temperature?

(iv) Name a factor that you kept constant during the activity.

(v) How was the factor named in part (b) (iv) above kept constant?

(vi) Give a safety precaution you took during the activity.

(vii) A graph similar to the one shown below was plotted from the results of this investigation. Using the terms **Temperature** and **Rate** label axes **A** and **B**.



10. **(a)** Give **two** factors, other than exercise, that have an effect on the circulatory system.

1.
2.

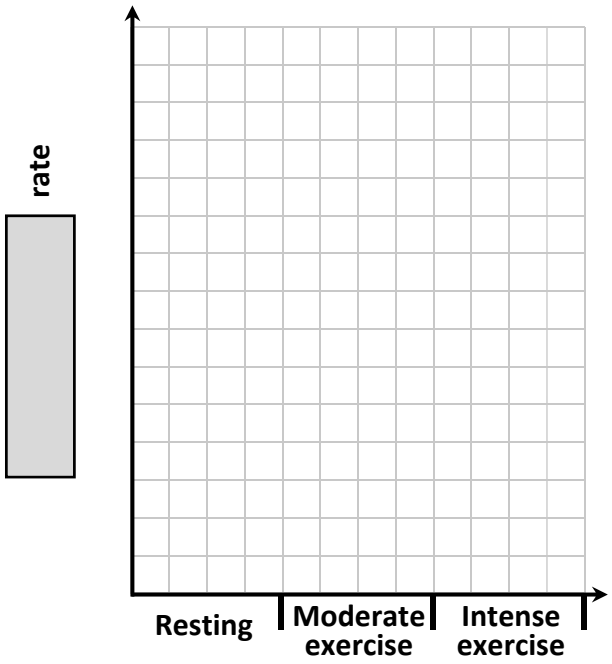
(b) A student investigated the effect of three minutes of moderate exercise and three minutes of intense exercise on pulse rate (**PR**) and breathing rate (**BR**). She repeated the investigation three times and calculated average data for **PR** and **BR**.

(i) Describe how the student measured resting **PR or** resting **BR**.

(ii) The student's average results are shown in the table below.

	PR	BR
Resting	60	20
Moderate exercise	100	30
Intense exercise	150	60

Choosing **either** pulse **or** breathing rate, complete the name of the y-axis **and** on the grid provided, draw (using pencil) a suitable graph to represent the data of **either** pulse rate (**PR**) **or** breathing rate (**BR**).



(iii) State what would happen to the **PR or BR** after exercise has stopped.

(iv) Suggest a reason for the student repeating the investigation three times.

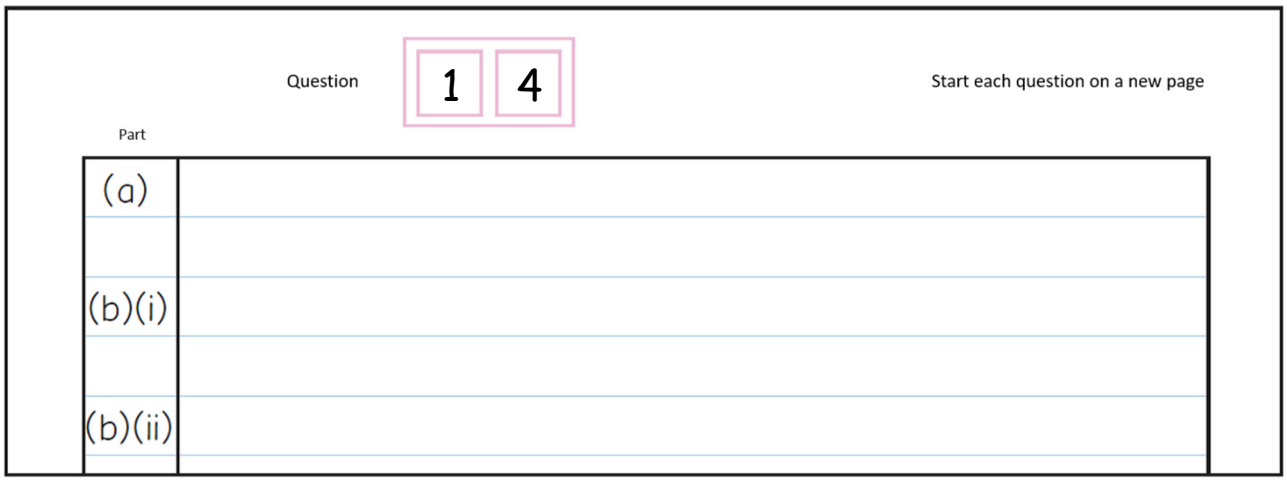
(v) Describe a safety precaution the student would have taken.

Answerbook for Section C

Instructions

Questions for Section **C** are supplied separately.

Start each question on a new page. Write the question number in the box at the top of each page. Use the left-hand column to label each part, as shown below.



There are two pages of graph paper on the next two pages of this answerbook. On pages with graph paper, the box for the question number is at the bottom of the page.

You do not need to use all of the pages in this answerbook. If you run out of space in this answerbook, you may ask the superintendent for more paper or graph paper.

Write your answers in blue or black pen. You may use a pencil for sketches, graphs and diagrams only.

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Leaving Certificate – Ordinary Level

Biology Sections A and B and Answerbook

Tuesday 11 June

Afternoon 2:00 - 5:00

2024.M43

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Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Biology

Section C

Ordinary Level

Tuesday 11 June Afternoon 2:00 - 5:00

240 marks

Do not hand this up.

This document will not be returned to the State Examinations Commission.

Section C

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

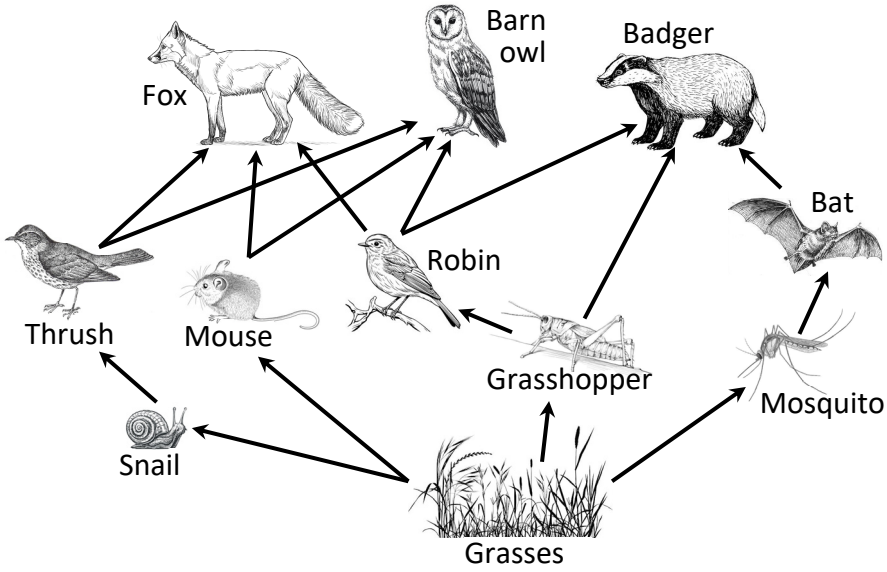
11. **(a)** **(i)** What is the primary source of energy for organisms on Earth?

(ii) Define the following terms as used in ecology:

1. *Biosphere*

2. *Niche*. **(9)**

(b) The diagram shows a food web.



(i) Name the producer from the food web.

(ii) Name a primary consumer from the food web.

(iii) Name a secondary consumer from the food web.

(iv) What do the arrows on the diagram mean?

(v) **1.** Write down any **one** food chain from the food web.

2. How many feeding (trophic) levels are in your food chain?

(vi) Draw a pyramid of numbers for the food chain you wrote down in part (b) (v) 1. above. **(27)**

(c) Pollution, waste management and conservation are three ways humans affect ecosystems.

(i) **1.** What is meant by the term *pollution*?

2. Give **one** example of a pollutant.

3. Give **one** way pollution may be controlled.

(ii) **1.** There are problems associated with waste disposal. Give any **one**.

2. Give **one** way in which waste can be minimised.

(iii) **1.** Explain the term *conservation*.

2. Give **one** conservation practice from **one** of the following areas: **agriculture**; **fisheries**; **forestry**; **and** explain the reason for this conservation practice. **(24)**

12. **(a)** Answer the following questions in relation to metabolism.

(i) Explain the term *metabolism*.

(ii) State whether **each** of the following processes is anabolic **or** catabolic:

1. Respiration

2. Photosynthesis **(9)**

(b) Aerobic respiration is a two-stage process (stage 1 and stage 2) and can be represented by a balanced equation.

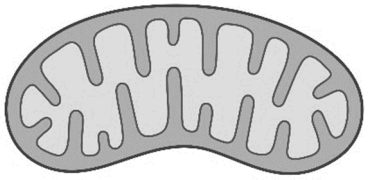
(i) **In your answerbook**, write out **and** complete the following balanced equation for aerobic respiration:

$C_6H_{12}O_6$ + $6O_2$ → 6 _____ + 6 _____ + energy

(ii) What is the name given to the substance with the formula, **$C_6H_{12}O_6$**?

(iii) Where in a cell does stage 1 occur?

(iv) What is the name of the organelle shown in the diagram in which stage 2 of aerobic respiration occurs?



(v) Describe the differences between stage 1 **and** stage 2 of aerobic respiration using the following headings:

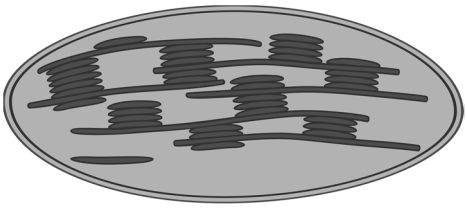
1. Relative amount of energy released in stage 1.

2. Relative amount of energy released in stage 2.

3. Oxygen requirement of stage 1.

4. Oxygen requirement of stage 2. **(27)**

(c) Photosynthesis is a process that occurs in the plant cell organelle shown in the diagram.



(i) What is the name of the organelle shown?

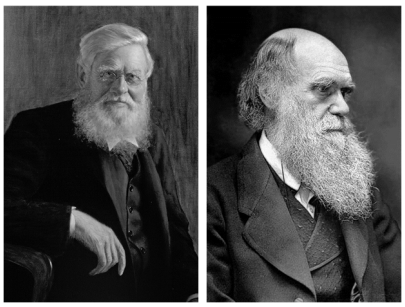
(ii) What is the name given to the green pigment present in the organelle you named at part (c) (i) above that traps sunlight energy?

(iii) The energy in sunlight is used by the pigment you named above to split water. Name the **three** components that result from the splitting of water.

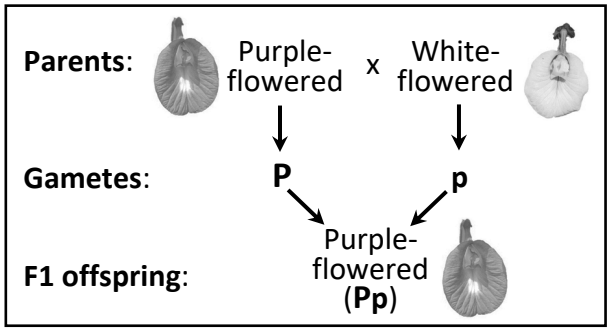
(iv) State what happens to **each** of the components you named at part (c) (iii) above. **(24)**

13. **(a)** **(i)** Explain in detail the term *evolution*.

(ii) Name **either one** of the 19th century British biologists who introduced the theory of evolution by natural selection. **(9)**



(b) Study the diagram of a cross between two pea plants and answer the following questions.

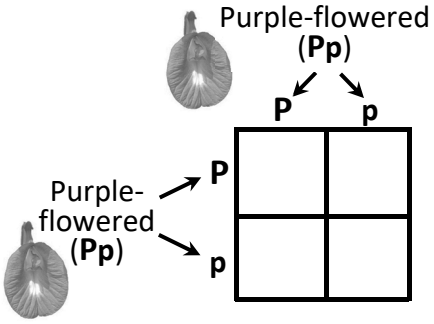


(i) Both parents were <u>homozygous</u> and the F1 (first generation) offspring were <u>heterozygous</u>. Explain the underlined terms.

(ii) Give the genotypes of **both** parents.

Two of the F1 offspring were then self-fertilised.

The F2 (second generation) offspring were **not** all purple-flowered.



(iii) Copy the Punnett square **into your answerbook and** complete it to show the genotypes of the F2 offspring.

(iv) What fraction **or** percentage of the F2 offspring is white-flowered? **(27)**

(c) Variation in offspring can result from sexual reproduction (gamete production) and mutations.

(i) Which type of cell division (**mitosis** or **meiosis**) is directly involved in producing gametes?

(ii) Give **two** agents **or** substances that can increase the rate of DNA mutations and can potentially cause cancer.

(iii) Variation exists within all species. What is meant by the term *species*?

(iv) DNA profiling is a laboratory technique where a unique pattern of bands of DNA is made. Give **two** applications (or uses) of DNA profiling.

(v) Genetic screening is also a laboratory technique.
Give **one** application (or use) of genetic screening. **(24)**

14. **(a)** Three kingdoms of organisms include: **Fungi**, **Monera** and **Protista**.
Match **each** of these kingdoms to the following named organisms below:

(i) Bacteria

(ii) *Amoeba*

(iii) *Rhizopus* **(9)**

(b) Bacteria are very small cells and are found in all habitats.

(i) Draw a diagram of a bacterial cell **and** label the following parts:
Cell wall; **DNA**; **Cytosol**

(ii) Bacteria can be classified based on their shape.
Name any bacterial shape.

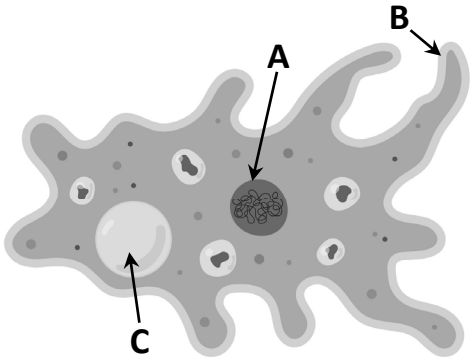
(iii) Some bacteria are pathogenic.
Explain the underlined term.

(iv) Some bacteria can be beneficial.
Give **one** example of a beneficial bacterium.

(v) Bacterial cells undergo binary fission.
What is binary fission?

(vi) State any **one** factor that influences the growth of bacteria. **(27)**

(c) *Amoeba* is a single-celled micro-organism as shown in the diagram.



(i) **In your answerbook**, match **each** of the parts labelled **A**, **B** and **C** with the following terms:

1. **Pseudopod**
2. **Nucleus**
3. **Contractile vacuole**

(ii) Which of the above-mentioned parts does *Amoeba* use to move around?

(iii) Which of the above-mentioned parts does *Amoeba* use to control the amount of water inside the cell?

Care must be taken when handling micro-organisms.
Asepsis and sterility are two techniques often used.

(iv) Match **each** of the sentences below to the terms *asepsis* **and** *sterility*.

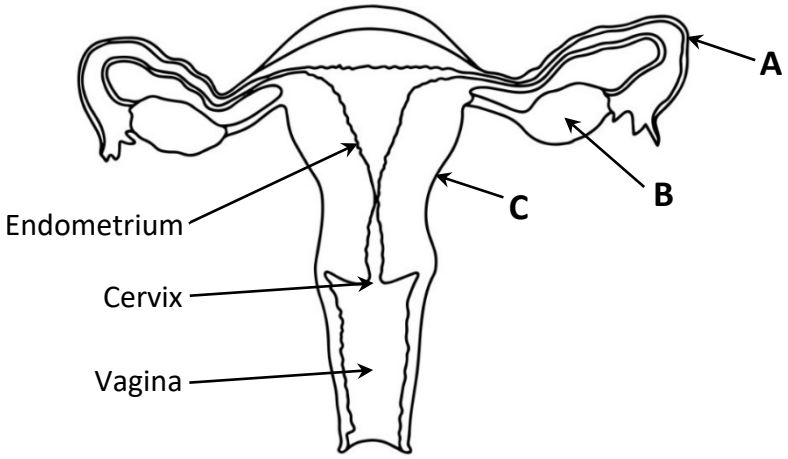
1. **Absence of pathogens**
2. **Absence of all microorganisms**

(v) Describe how you would dispose of micro-organisms safely at the end of a laboratory activity. **(24)**

15. **(a)** **(i)** Explain the term *secondary sexual characteristics*.

(ii) Give **one** example of a secondary sexual characteristic in humans. **(9)**

(b) The diagram shows the human female reproductive system.



(i) **In your answerbook**, match **each** of the parts labelled **A**, **B**, and **C** with the following terms:

1. **Uterus**

2. **Fallopian tube**

3. **Ovary**

(ii) In which labelled part are egg cells produced?

(iii) Fertilisation is where the sperm cell and egg cell fuse.
In which labelled part does fertilisation occur?

(iv) Sperm cells and egg cells are gametes.
Which gamete is larger, a sperm cell or an egg cell?

(v) Sketch the structure of a sperm cell.

(vi) The vagina and endometrium are shown in the diagram.
Give **one** function for **each**. **(27)**

(c) Answer the following questions in relation to human reproduction.

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

(ii) Give **one** cause of infertility in the human.

(iii) Give a possible corrective measure for infertility.

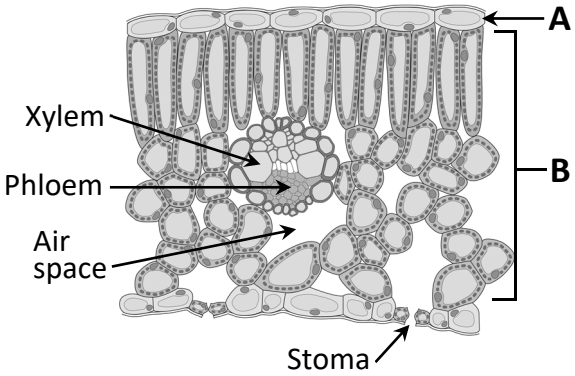
(iv) **1.** What is meant by the term *birth control*?

2. Give **two** methods of birth control.

(v) Breastfeeding has many biological benefits for mother and baby.
Give any **two** biological benefits. **(24)**

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

(a) The diagram shows a transverse section through a leaf.



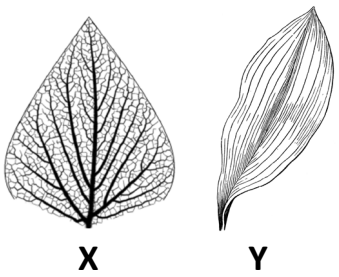
(i) **In your answerbook**, match tissues **A** and **B** to the following terms:
1. **Ground**
2. **Dermal**

(ii) Xylem and phloem are shown in the diagram.
1. Give **one** function of xylem.
2. Give **one** function of phloem.

(iii) Which of the following terms describes the evaporation of water into the airspaces of the leaf?
Transpiration; **Respiration**

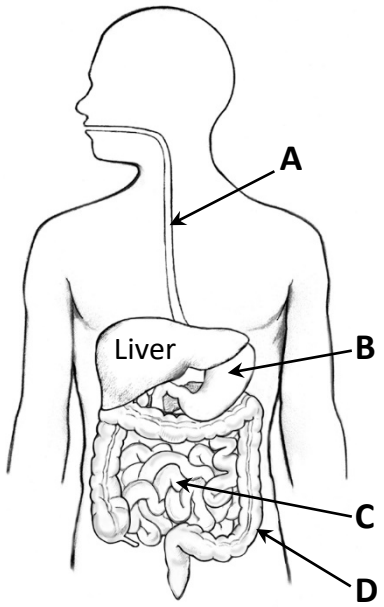
(iv) When the water evaporates into the airspaces, through which labelled structure does it exit the leaf?

(v) Veins in leaves can be arranged in a parallel pattern or a net (reticulate) pattern. Match **each** of the leaves **X** and **Y** to the following terms:
1. **Parallel venation**
2. **Net venation**



(vi) The type of leaf venation usually indicates whether a plant is monocotyledonous (monocot) or dicotyledonous (dicot). Match **each** of the types of leaf venation (**parallel** and **net**) to the following terms:
1. **Monocotyledonous**
2. **Dicotyledonous**

(b) The diagram shows the human digestive system.



(i) **In your answerbook**, match **each** of the parts labelled **A**, **B**, **C** and **D** with the following terms:
1. **Stomach**
2. **Large intestine**
3. **Oesophagus**
4. **Small intestine**

(ii) Explain the following terms:
1. *Ingestion*
2. *Digestion*

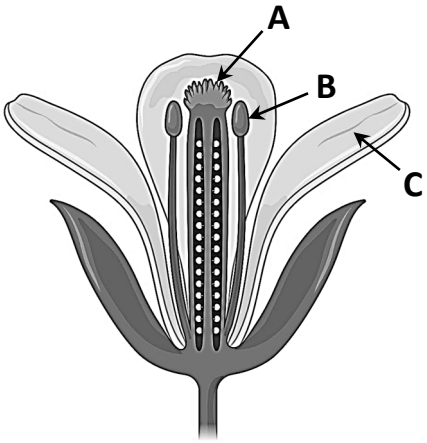
(iii) Why is digestion important in the body?

(iv) The liver has many functions. Give any **one**.

(v) Symbiotic bacteria are found in the human digestive system.
Give any **one** function of these bacteria.

(vi) Why is fibre an important part of the diet?

(c) The diagram shows the structure of a flower.



(i) **In your answerbook**, match **each** of the parts labelled **A**, **B** and **C** with the following terms:

1. **Petal**
2. **Stigma**
3. **Anther**

(ii) **In your answerbook**, match **each** of the parts of the flower (**petal**, **stigma** and **anther**) with the following functions:

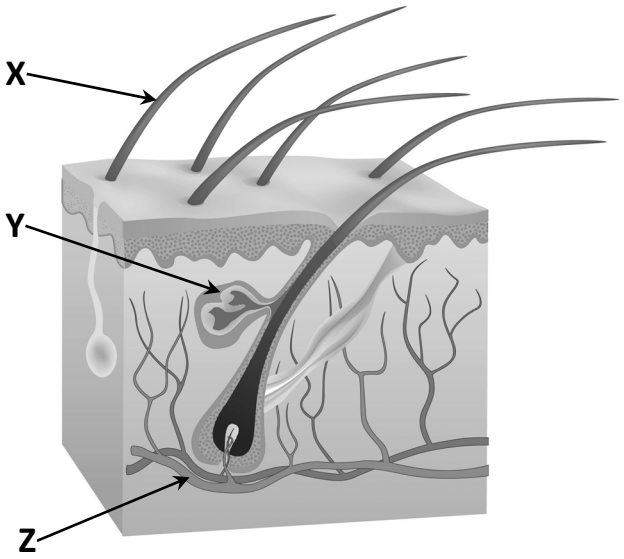
1. Traps pollen
2. Attracts pollinators (e.g. insects)
3. Produces pollen

(iii) What is meant by the term *pollination*?

(iv) State **two** types of pollination.

(v) Is part **B** the female **or** male part of the flower?

(d) The diagram shows a section through the human skin.



(i) **In your answerbook**, match **each** of the parts labelled **X**, **Y** and **Z** with the following terms:

1. **Blood vessel**
2. **Hair**
3. **Sebaceous gland**

(ii) The skin is a part of the excretory system in humans. Name **one** substance that the skin excretes.

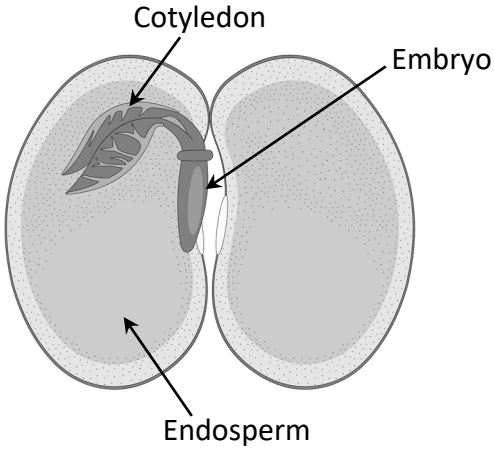
(iii) The skin is also part of the general defence system. Explain its role in the general defence system.

(iv) Using information in the diagram, or otherwise, briefly describe **one** way the skin can help regulate body temperature.

(v) Name **two** other excretory organs in the human body **and** name a substance that **each** organ excretes.

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

(a) Answer the following questions in relation to seeds and germination.



(i) The diagram shows the internal structure of a seed.

1. Which of the labelled structures contains food?

2. Which of the labelled parts consists of a radicle and plumule?

(ii) The testa is also part of the seed, but it is not indicated on the diagram.

1. Where is the testa located?

2. What is the function of the testa?

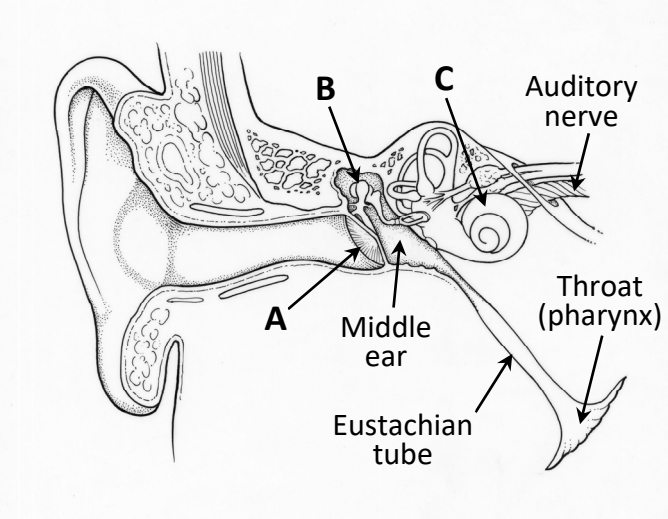
(iii) Seeds usually go through a period of dormancy before germinating.

1. What is meant by the term *dormancy*?

2. Give **two** advantages of dormancy.

(iv) Germination often follows dormancy.
List the **three** factors that are essential for germination.

(b) The diagram shows the structure of the human ear.



(i) The human ear senses sound and sets up nerve impulses.
To which major organ are these impulses sent?

(ii) **In your answerbook**, match **each** of the parts labelled **A**, **B** and **C** with the following terms:

1. **Ossicle**

2. **Eardrum**

3. **Cochlea**

(iii) **In your answerbook**, match **each** of the parts of the human ear (**ossicle**, **eardrum** and **cochlea**) with the following functions:

1. Transfers sound vibrations through the middle ear

2. Receives sound waves from the auditory canal

3. Generates nerve impulses

(iv) The Eustachian tube is shown in the diagram.
Why is the middle ear connected to the throat by the Eustachian tube?

(v) Hearing is one of the five senses. Name any other **two** senses.

(c) Answer the following questions in relation to vegetative propagation.

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

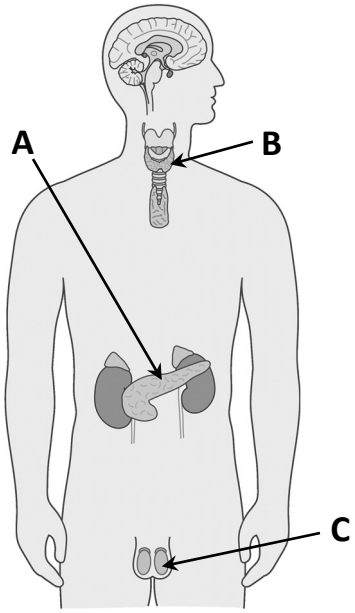
(ii) Give **two** examples of plants that undergo vegetative propagation.
For **each**, state which organ (**stem**, **root**, **leaf** or **bud**) the plant uses.

(iii) **1.** Give **one** advantage that vegetative propagation has over reproduction by seed.

2. Give **one** advantage that reproduction by seed has over vegetative propagation.

(iv) Artificial propagation methods are widely used in horticulture.
Name any **three** of these methods.

(d) The diagram shows some parts of the human male endocrine system.
The endocrine system produces hormones.



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

(ii) **In your answerbook**, match **each** gland labelled **A**, **B** and **C** with the following terms:

1. **Thyroid**

2. **Pancreas**

3. **Testis**

(iii) **In your answerbook**, match **each** gland labelled **A**, **B** and **C** with the following hormones:

1. **Insulin**

2. **Thyroxine**

3. **Testosterone**

(iv) Some glands in the body have both endocrine and exocrine functions.
Name **one** gland in the body that has an endocrine **and** exocrine function.

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

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Leaving Certificate – Ordinary Level

Biology Section C

Tuesday 11 June

Afternoon 2:00 - 5:00