2022.M44

2022L025A1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2022

Biology

Sections A and B and Answerbook

Higher Level

Tuesday 14 June Afternoon 2:00 - 5:00

290 marks

Examination Number

Day and Month of Birth

For example, 3rd February is entered as 0302

Centre Stamp

The 2022 examination papers were adjusted to compensate for disruptions to learning due to COVID-19. This examination paper does not necessarily reflect the same structure and format as the examination papers of past or subsequent years.

Instructions

Write your Examination Number and your Day and Month 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 in 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 **four** questions from this section. Each question carries 20 marks.
Section **B**	Answer any **one** question from this section. Each question carries 30 marks.
Section **C**	Answer any **three** questions from this section. Each question carries 60 marks.

Section A

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

1. Answer any **five** of the following parts (a) to (f):

(a) Name the **four** elements found in **all** proteins.

(b) Name an element that is only sometimes found in proteins.

(c) How many common amino acids are found in proteins?

(d) Fibrous proteins have structural roles in living organisms.
Name any **one** fibrous protein.

(e) Give **one** metabolic role of proteins in living organisms.

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

2. Write a brief sentence explaining **each** of the following terms.

(a) Ecology

(b) Food chain

(c) Edaphic factor

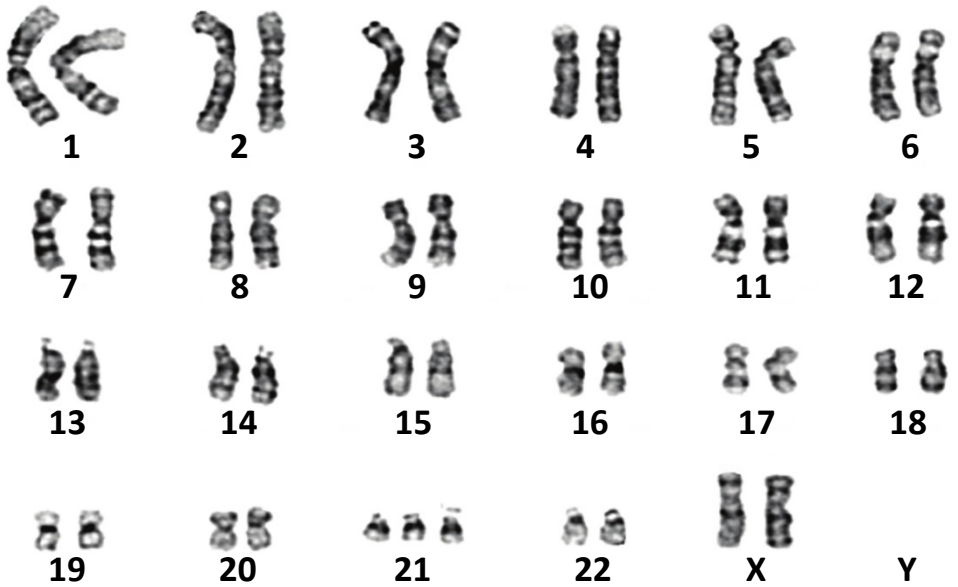
(d) Quantitative study

(e) Omnivore

(f) Contest competition

(g) Nitrogen fixation

3. Study the image below which shows a set of human chromosomes (karyotype).
The chromosomes are arranged in homologous sets for analysis (i.e. there are two of chromosome number '1', two of chromosome number '2', and so on).
The karyotype shown is from an individual with a genetic condition called Down's syndrome.



(a) Name the **two** chemical components that make up chromosomes.

1.
2.

(b) Is the karyotype shown above from a female or a male?

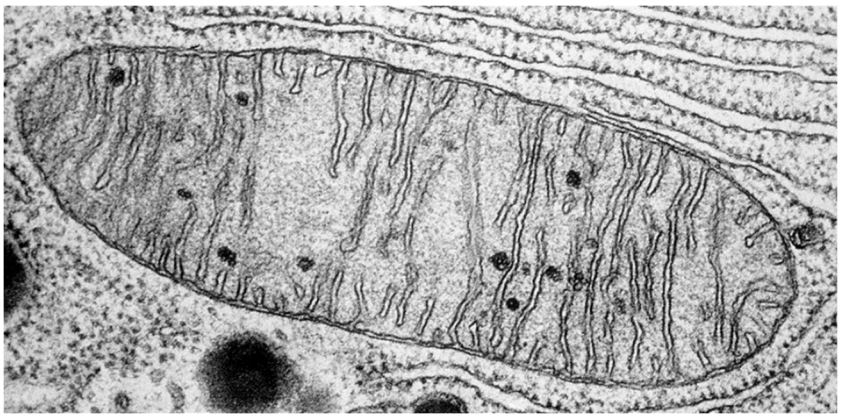
(c) Justify the answer you have given at part (b) above.

(d) What evidence is shown in the karyotype that this person has the genetic condition Down's syndrome?

(e) Sickle-cell anaemia is a condition caused by a different type of mutation than the one responsible for Down's syndrome. Name this other type of mutation.

(f) Scientific analysis of chromosome karyotypes is an application of tissue culture.
Give **one** other application (or use) of tissue culture.

4. The image shows a transverse section through a mitochondrion, produced using a transmission electron microscope.



(a) Explain why the image above cannot be produced using a light microscope.

(b) Name **one** type of animal cell that does **not** have mitochondria.

(c) Aerobic respiration involves two stages.

(i) Name **and** give the location of the stage of aerobic respiration that does **not** occur in the mitochondrion.

Name:
Location:

(ii) Name the series of chemical reactions, involving acetyl Co. A, which does occur in the mitochondrion.

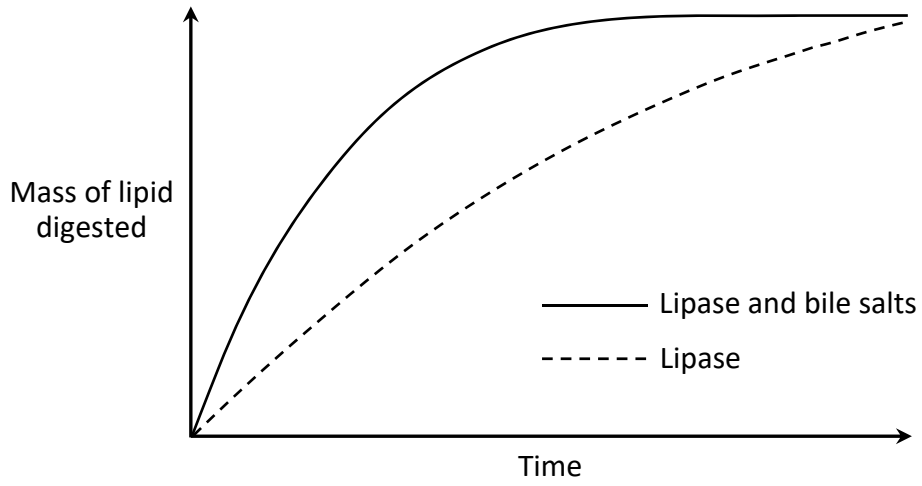
(iii) State the number of carbon atoms in a molecule of acetyl Co. A.

(d) Sometimes lactic acid is produced during respiration.
Describe a condition during which this may occur.

5. Indicate whether the following statements are true or false by placing a tick (✓) in the appropriate box in **each** case.

		True	False
(a)	Copper (Cu) is one of the common elements present in food.	☐	☐
(b)	Response is a characteristic of life.	☐	☐
(c)	An animal cell will burst if placed in a concentrated sugar solution.	☐	☐
(d)	Macrophages are white blood cells that secrete perforin.	☐	☐
(e)	Organs are groups of tissues with a shared function.	☐	☐
(f)	Ethene is used to ripen fruit.	☐	☐
(g)	All members of Kingdom Fungi are heterotrophic.	☐	☐

6. A student carried out an experiment comparing the action of lipase on its own with the action of both lipase and bile salts on lipid digestion over time.
The graph below illustrates the student's experimental results.



(a) What conclusion could the student make about lipid digestion based on the graph of results shown above?

(b) Name the **two** products of complete lipid digestion by lipase.

1.
2.

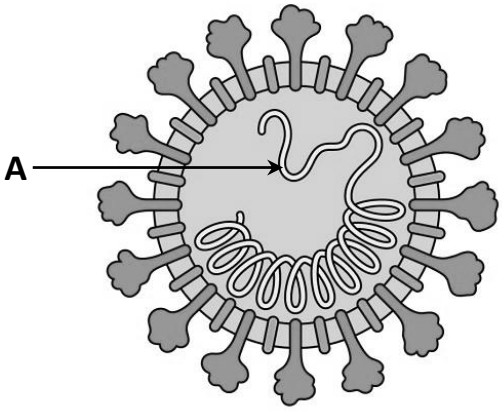
(c) Name a location in the digestive system where lipase digests lipids.

(d) Suggest an optimum pH for digestion of lipids in the location you named at part (c) above.

(e) Describe the action of bile salts on lipids.

(f) Villi are microscopic structures in the digestive system that aid the absorption of nutrients.
Name the structure inside each villus that absorbs the products of lipid digestion.

7. The diagram below shows the structure of a typical virus, such as SARS-CoV-2 (a type of coronavirus). It is one example of a harmful virus and it causes COVID-19 in humans.



X

(a) Name molecule **A**.

(b) Antigens are present in viruses. **On the diagram above**, draw an arrow from '**X**' to accurately show the location of an antigen.

(c) Explain why viruses are described as obligate parasites.

(d) Vaccination has proved to be very effective in combatting COVID-19.
Explain in detail the term *vaccination*.

(e) Name **one** harmful virus, other than SARS-CoV-2 (coronavirus).

(f) Give **one** example of a beneficial application of a virus.

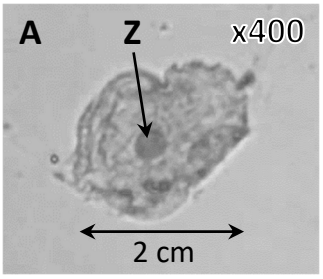
Section B

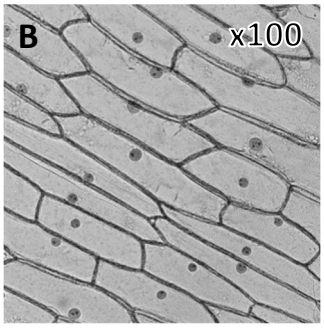
Answer any one question.
Write your answers in the spaces provided.
Part (a) carries 6 marks and part (b) carries 24 marks in each question in this section.

8. (a) Distinguish clearly between a eukaryotic cell **and** a prokaryotic cell, by writing a brief sentence on **each**.

Eukaryotic:
Prokaryotic:

(b) A student observed the following images when examining stained cells using a light microscope. Image **A** was observed at x400 and image **B** at x100.





(i) Which image, **A** or **B**, represents plant tissue?

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

(iii) Identify structure **Z**.

(iv) When examining cells with a microscope:

1. Name a stain that can be used.

2. Give **one** benefit of using a stain.

(v) The image of the cell in **A** was 2 cm wide. What is the actual width of this cell?

(vi) Image **B** shows cells at x100.
Describe the steps taken to view these cells at x400.

9. (a) (i) What is meant by the term *autotrophic*?

(ii) Explain why photosynthesis is an anabolic reaction.

(b) Answer the following questions based on an activity you carried out to investigate the effect of light intensity **or** carbon dioxide concentration on the rate of photosynthesis.

(i) Name a suitable photosynthetic organism you used for this investigation.

(ii) Why was the organism named at part (b) (i) above suitable for this investigation?

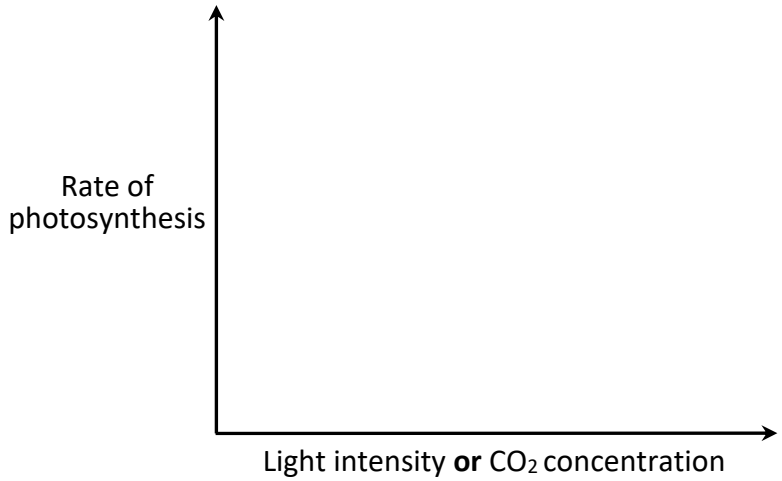
(iii) Why was it important to keep other factors, such as temperature, constant during the investigation?

(iv) How did you keep the temperature of the organism constant for this activity?

(v) Explain how you measured the rate of photosynthesis.

(vi) On the axes below, sketch **two** graphs as described below:

1. Using a solid line (——), sketch the expected result at 25 °C.
2. Using a dashed line (------), sketch the expected result if the activity had been carried out at 60 °C.



10. (a) (i) State a location in plants where growth regulators are produced.

(ii) How are growth regulators transported around a plant?

(b) Answer the following questions based on an investigation you carried out into the effect of IAA growth regulator on a plant tissue.

(i) Name a suitable plant tissue you used in this investigation.

(ii) Describe how you set up the investigation.

(iii) Describe how you measured the effect of IAA on the plant tissue.

(iv) Describe any **one** result of your investigation.

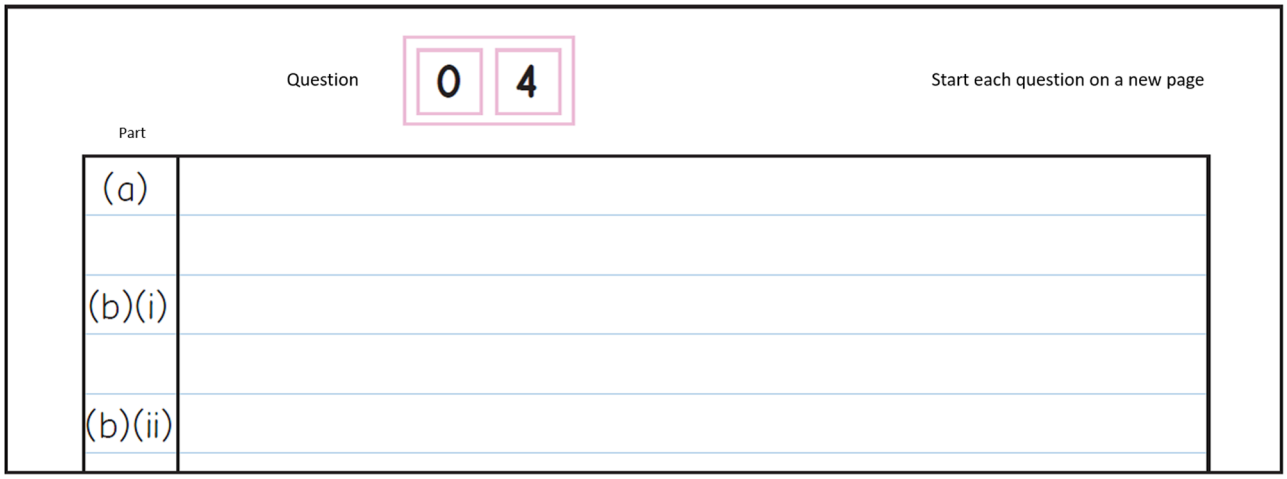
(v) Describe **one** safety precaution you took in carrying out this investigation.

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 – Higher Level

Biology Sections A and B and Answerbook

Tuesday 14 June

Afternoon 2:00 - 5:00