



Rewarding Learning

General Certificate of Secondary Education
2021–2022

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Single Award Science: Biology

Unit 1

Higher Tier



[GSA12]

GSA12

WEDNESDAY 23 FEBRUARY 2022, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eight** questions.

INFORMATION FOR CANDIDATES

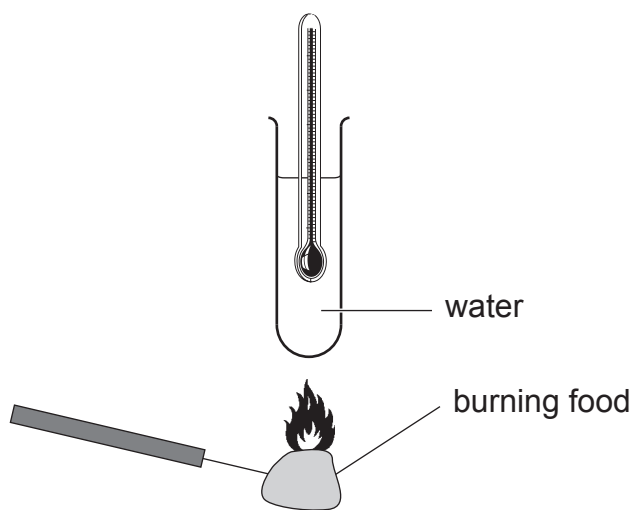
The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 3.



- 1 (a) A student investigated the energy content in different foods using the apparatus shown below.



Source: Principal Examiner

- (i) Give **two** ways the student can ensure that this is a fair (valid) investigation.

1. _____
2. _____ [2]

- (ii) Suggest **one** reason why **not** all the energy in the food will heat the water.

_____ [1]



(b) The table below shows the energy content in two meals **A** and **B**.

Meal A		Meal B	
Food	Energy/kJ	Food	Energy/kJ
brown rice	220	bread and butter	600
chicken curry	350	sausages	500
salad	30	chips	1000
fruit juice	150	cup of tea with milk	200
Total	750	Total	

(i) Calculate the total energy in meal **B**.

_____ kJ [1]

(ii) Calculate the percentage of energy provided by the fruit juice in meal **A**.

(Show your working out.)

_____ % [2]

(c) Which of the meals, (**A** or **B**) would be best if you did **not** want to gain weight?
Give **one** reason for your answer.

_____ [1]

[Turn over]



- 2 (a) Explain fully what is meant by the term **hormone**.

[2]

- (b) Hormones control sexual development during puberty. The table below shows how the levels of these hormones change between the ages of 10 and 16 for females and males.

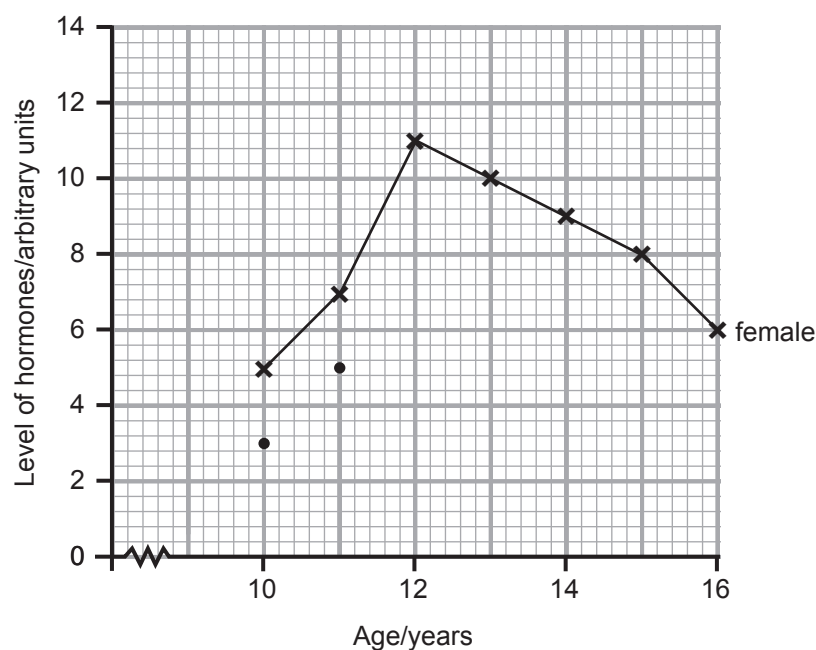
Age/years	Level of hormones controlling puberty/arbitrary units	
	Female	Male
10	5	3
11	7	5
12	11	8
13	10	9
14	9	12
15	8	10
16	6	9



The values for the level of hormones in females have been plotted on the graph below.

- (i) Plot and draw a line graph for the **male** hormone levels.

The first two points have been plotted for you.



[3]

- (ii) Describe fully the trend shown by the **female** hormone levels.

[2]

- (iii) Give **two** differences between the hormone levels of males compared to females.

1. _____

2. _____

[2]

[Turn over



3 Name and describe the **two** types of variation in living things, giving **one** example of each.

Your answer should also include:

- the name of the type of graph used to display data on each type of variation.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[illegible]

[6]



- 4 (a) Competitive invasive species pose a threat to the economy and ecology of Northern Ireland. They can alter habitats and food webs or introduce diseases to an area.

Two examples of competitive invasive species found in Northern Ireland are giant hogweed and floating pennywort.

Giant hogweed is a plant that can produce thousands of seeds every year. Floating pennywort is a plant that lives in freshwater ponds and can grow at a rate of 20 cm per day covering the surface of a pond.

- (i) Using this information and your knowledge, explain why floating pennywort and giant hogweed are considered to be competitive invasive species.

Floating pennywort _____

Giant hogweed _____

_____ [2]

- (ii) Suggest what effect, if any, giant hogweed will have on biodiversity.

_____ [1]

- (b) Human activities can promote biodiversity, for example, nature reserves and brown-field building sites.

- (i) Describe and explain the effect that nature reserves have on biodiversity.

_____ [2]

- (ii) Describe what is meant by the term **brown-field building site**.

_____ [1]

[Turn over



- 5 (a) A gardener crosses a heterozygous purple-flowered pea plant with a white-flowered pea plant.

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

_____ [1]

In pea plants the allele for purple flowers (F) is dominant over the allele for white flowers (f).

(ii) Complete the Punnett square below to show the possible offspring of a cross between a heterozygous purple-flowered pea plant and a white-flowered pea plant.

[2]

(iii) What is the percentage probability of producing a pea plant with purple flowers from this cross?

_____ % [1]

(b) Alleles are alternative forms of a gene. Explain fully what is meant by the term **gene**.

_____ [2]





BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)



- 6 (a) To investigate the effect of planting density on the growth of onions, two gardeners planted the same variety of onion seeds in equal-sized areas of the same garden.



© Getty Images

Paul planted his seeds 1 cm apart and Linda planted her seeds 10 cm apart. After a few months the onions were ready to be picked. The onions Paul produced were very small whereas Linda produced much larger onions.

Use this information and your knowledge to answer the following questions.

- (i) Explain fully why the onions that Paul produced were smaller than the onions that Linda produced.

[3]

- (ii) Complete the following sentence to give a conclusion based on this information.

As planting density _____

[1]



(b) Give **two** reasons why a valid comparison can be made about the size of the onions produced by the gardeners.

1. _____

2. _____ [2]

[Turn over

13449



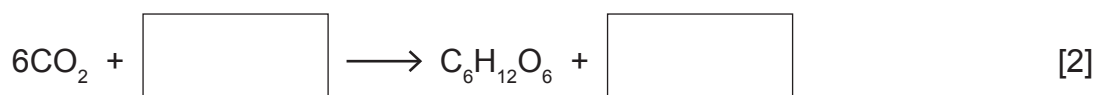
20GSA1211

- 7 (a) Photosynthesis is the process by which plants use energy from sunlight to make glucose ($C_6H_{12}O_6$).

- (i) Complete the following sentence.

Photosynthesis is described as an _____ process
because it takes in energy. [1]

- (ii) Complete the balanced symbol equation below for photosynthesis.



- (b) To investigate if light is needed for photosynthesis a student first placed a plant in a dark cupboard for 24hrs to destarch it.
He then covered one leaf with black card and left the plant in bright light for 24hrs.
Finally he tested the leaf that had been covered and a leaf that had not been covered for the presence of starch.

- (i) Explain why it is necessary to destarch the plant.

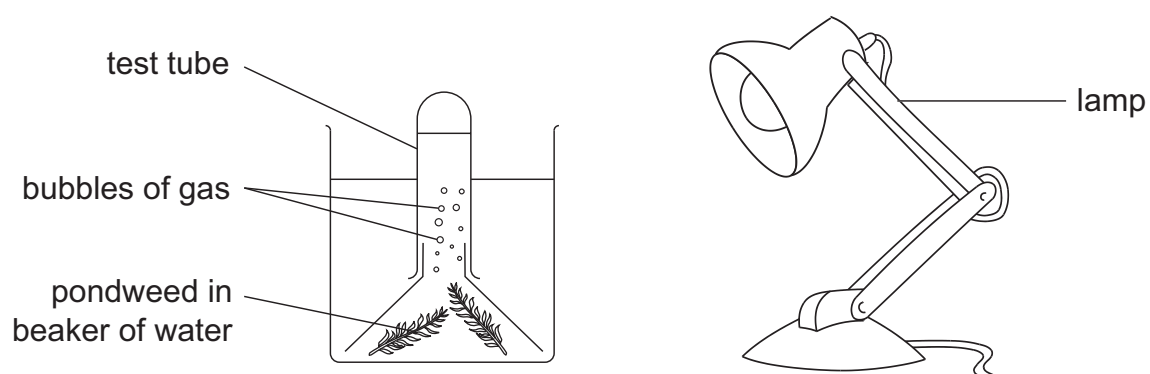
_____ [1]

- (ii) Why did the student test the uncovered leaf as well as the covered leaf for the presence of starch?

_____ [1]



- (c) The student used the apparatus below to investigate how the rate of photosynthesis depends on light intensity.



Source: Principal Examiner

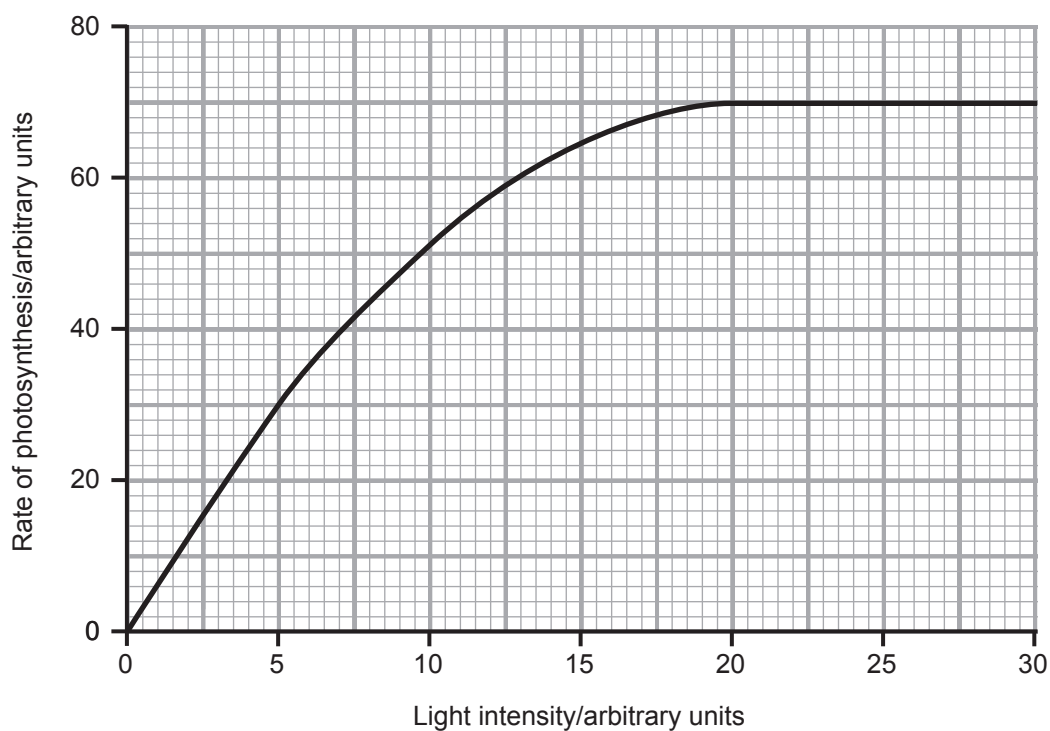
- (i) The student counted the number of bubbles made by the plant to find the amount of gas produced.
Name one other piece of apparatus he will need to use to find the **rate** of photosynthesis.

[1]

[Turn over]



The results of the investigation are shown in the graph below.



- (ii) Describe fully the relationship between the rate of photosynthesis and light intensity.

_____ [2]

- (iii) Suggest **one** reason why a gardener might use artificial lights in a greenhouse during the hours of darkness.

_____ [1]



BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

13449

[Turn over



20GSA1215

- 8 Antibiotics can be used to treat illnesses caused by bacteria. Mutations in bacteria can lead to antibiotic resistance.

(a) What is meant by the term **mutation**?

[2]

(b) A mutation has caused some bacteria to become resistant to the antibiotic used to treat it.

(i) Describe the effect, if any, of this mutation on the population of resistant bacteria over time.

[1]

(ii) Explain why the development of antibiotic resistant bacteria is an example of natural selection.

[3]

(c) Charles Darwin developed a theory that describes changes in a species over time.

(i) Name this theory.

[1]

Fossils provide evidence for this theory.

(ii) Explain fully what is meant by the term **fossil**.

[2]



(iii) Explain fully how fossils provide evidence for Darwin's theory.

[2]

THIS IS THE END OF THE QUESTION PAPER



BLANK PAGE
DO NOT WRITE ON THIS PAGE

13449



20GSA1218



BLANK PAGE

DO NOT WRITE ON THIS PAGE

13449



20GSA1219

DO NOT WRITE ON THIS PAGE

For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

Total Marks	
----------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.

