



Rewarding Learning

General Certificate of Secondary Education
2021

Centre Number

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Candidate Number

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Single Award Science: Biology

Unit 1

Higher Tier



[GSA12]

GSA12

MONDAY 22 NOVEMBER, 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 1.



- 1 Recent statistics show that almost 4.7 million people are living with diabetes (Type 1 and Type 2) in the UK.

Explain what diabetes is and describe how it can affect the body.

Your answer should include:

- **two** long term effects of diabetes;
- **two** symptoms of diabetes and
- **two** differences between Type 1 and Type 2 diabetes.

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

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- 2 (a) The British honeybee is at risk of extinction in the United Kingdom. One reason for this is the increase in the number of Asian hornets.

The table below gives some information about Asian hornets and British honeybees.

	Asian hornet	British honeybee
number in colony (summer)	6000	40 000
speed of flight/mph	26–30	15–20
food source	honeybees	nectar and pollen
sting (venom)	highly toxic to humans	relatively harmless to humans
average body length/mm	30	20

Use the information provided to answer the following questions.

- (i) Give **two** advantages that the Asian hornet has when catching their food.

1. _____

2. _____
_____ [2]

- (ii) Give **one** reason why reducing the number of Asian hornets could help prevent the extinction of honeybees.

_____ [1]



Some species can be described as competitive invasive species.

(b) Give **two** features that all competitive invasive species have in common.

1. _____

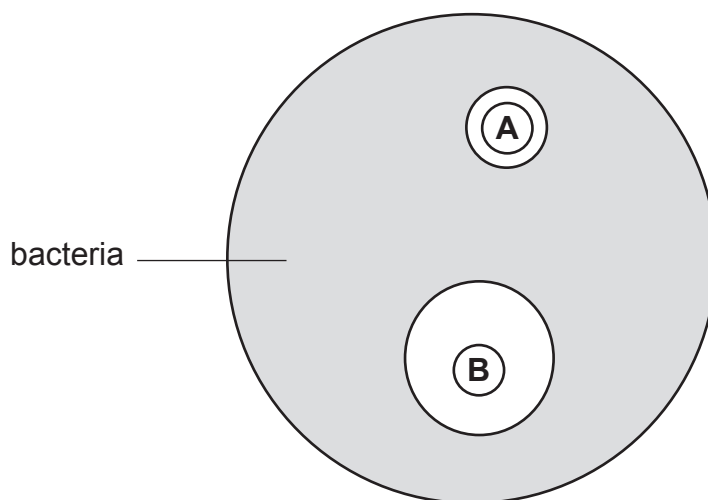
2. _____

[2]



- 3 (a) To investigate the effect of antibiotics on one type of bacteria, two discs (**A** and **B**) were soaked in different antibiotics. The discs were then placed in a Petri dish completely covered with the bacteria.

The diagram below shows the Petri dish after 2 days.



- (i) Using the diagram and your knowledge, explain why antibiotic **B** is more effective than antibiotic **A**.

[2]

- (ii) Suggest **one** thing that needed to be done to make this investigation a fair test.

[1]

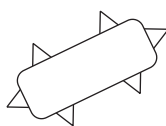
This investigation was repeated using a Petri dish containing fungus instead of bacteria.

- (b) Describe and explain the results that would be expected after 2 days.

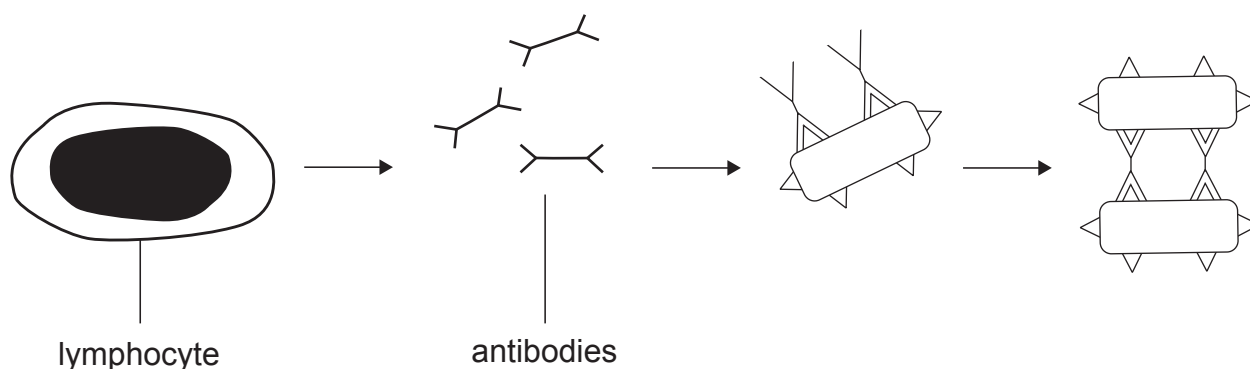
[2]



- (c) The diagram below represents a microorganism that has invaded the human body.



Shown below are antibodies produced by a lymphocyte and their effect on this microorganism.



- (i) Use the diagram and your knowledge to describe how antibodies help the body defend against this microorganism.

[2]

The diagram below shows a different microorganism.



- (ii) Explain why the same antibodies () will have no effect on this microorganism.

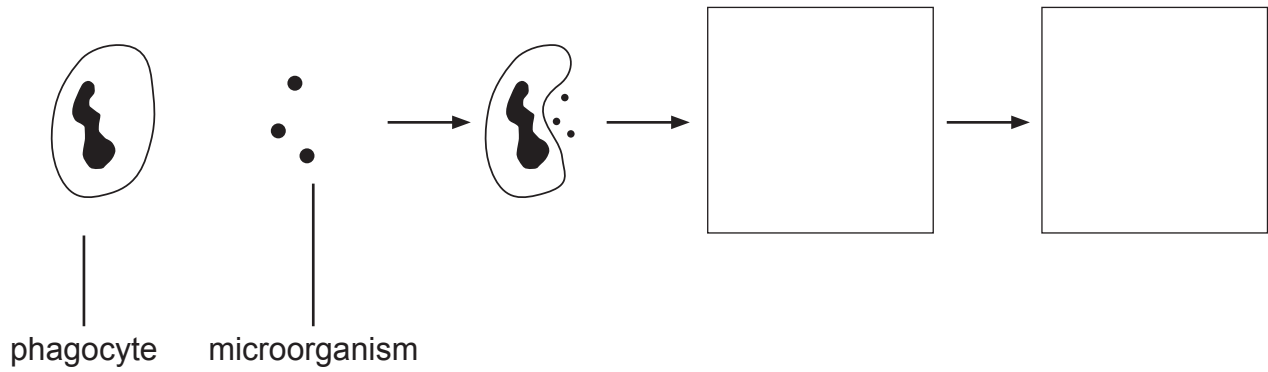
[1]

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Another type of white blood cell, called a phagocyte, helps to remove invading microorganisms from the body by a process called phagocytosis.

(iii) Complete the diagram below to show how phagocytosis takes place.



[2]





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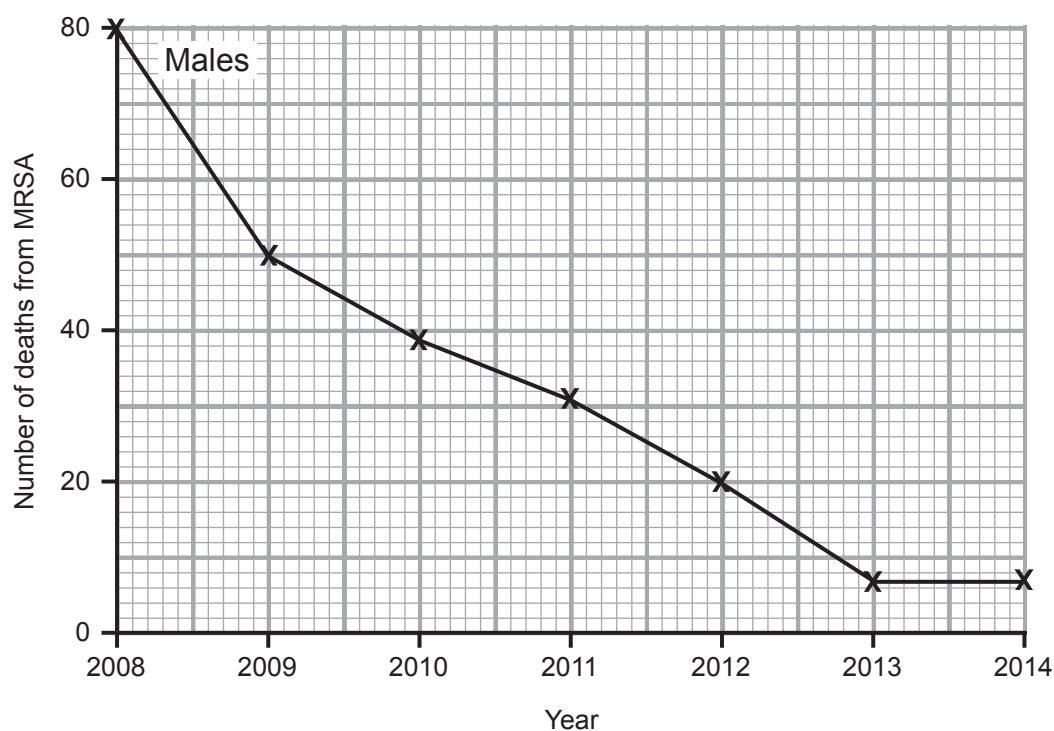
- 4 (a) The table below shows the number of male and female patients who died from MRSA in hospitals, in NI, between 2008 and 2014.

Year	Number of deaths from MRSA	
	Males	Females
2008	80	54
2009	50	34
2010	39	22
2011	31	15
2012	20	9
2013	7	7
2014	7	7

The number of male deaths have been plotted on the graph opposite.

- (i) On the same grid, plot and draw a line graph for the number of **female** deaths from MRSA.





[3]

- (ii) Give **one** difference and **one** similarity between the number of male and female deaths.

Difference _____

Similarity _____

[2]

- (iii) Suggest **one** reason why superbugs, like MRSA, are more likely to spread in hospitals than in family homes.

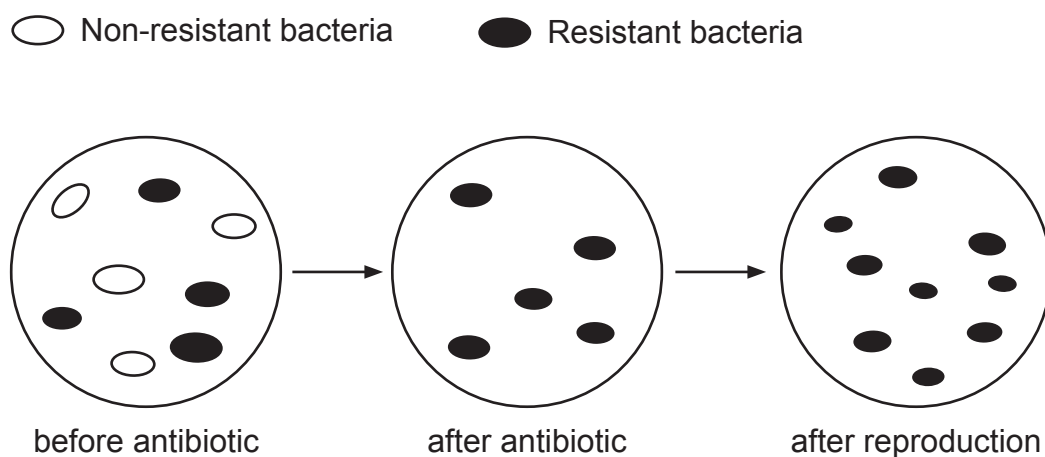
[1]

[Turn over



MRSA is caused by a type of skin bacteria becoming resistant to antibiotics.

The diagram below shows how this would have happened.



- (b) Use the diagram and your knowledge to explain how the population of skin bacteria became resistant to antibiotics.

[2]



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- 5 (a) An investigation was carried out to find the effect of caffeine on reaction time.

A student was given a fizzy drink with no caffeine and their reaction time was recorded. The same student was then given a fizzy drink with caffeine and the reaction time was recorded.

The results are shown below.

Drink	Reaction time/ms
fizzy drink with no caffeine	250
fizzy drink with caffeine	200

- (i) Calculate the percentage decrease in reaction time when the fizzy drink contained caffeine.

(Show your working out.)

_____ % [2]

- (ii) Using the information above, give **one** thing that was done to ensure this investigation was a fair test.

_____ [1]

The student concluded that caffeine will reduce reaction time.

- (iii) Give **one** reason why this conclusion is **not** reliable.

_____ [1]



Caffeine stimulates the production of a hormone which affects nerve cells in the brain.

(b) Complete the sentence below to explain what is meant by the term **hormone**.

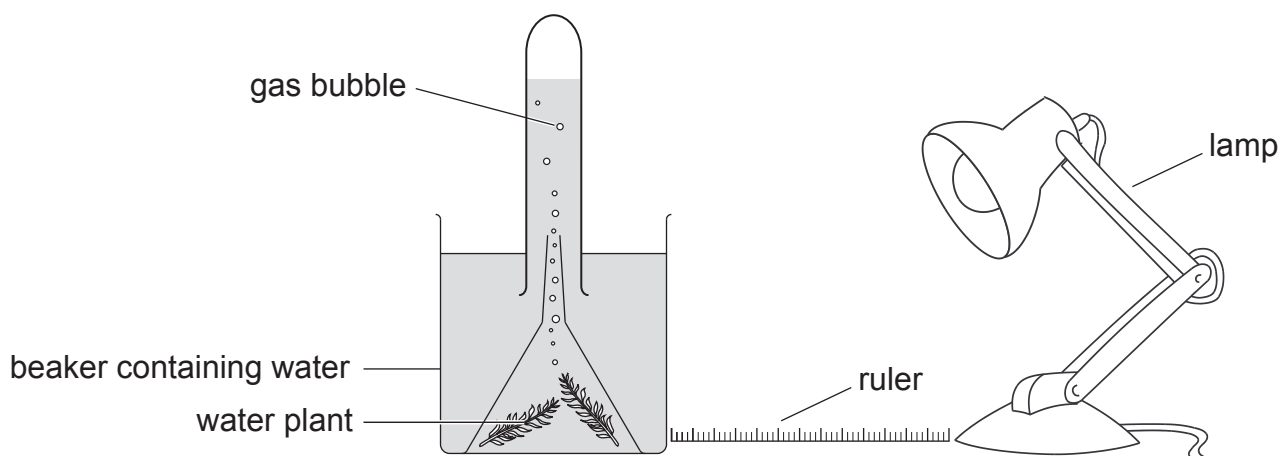
Hormones are chemical messengers _____

_____ [2]

[Turn over

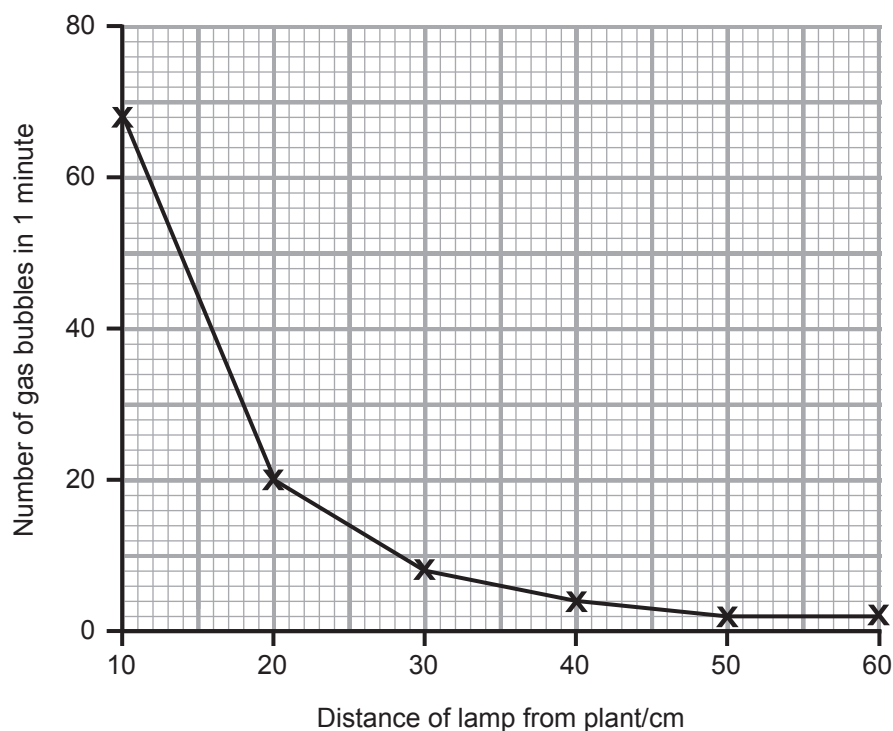


- 6 (a) Using the apparatus shown below, a student investigated the rate of photosynthesis when a lamp was placed at different distances from a plant.



The student moved the lamp and waited for 2 minutes at each distance before counting the number of gas bubbles produced in 1 minute.

The graph below shows the results of the investigation.



- (i) Describe fully the trend shown by these results.

[2]

- (ii) At what distance, from the lamp, did the plant produce 34 gas bubbles in 1 minute?

_____ cm [1]

- (iii) Suggest why the student waited 2 minutes before counting the number of gas bubbles at each distance.

[1]

- (iv) Suggest why it would be difficult for the student to accurately count the number of gas bubbles when the lamp was less than 10 cm from the plant.

[1]

- (b) Photosynthesis is the process by which plants absorb light energy.

- (i) Complete the balanced symbol equation for photosynthesis.



[3]

- (ii) Name the substance found in the chloroplast of a plant cell that absorbs light energy.

[1]

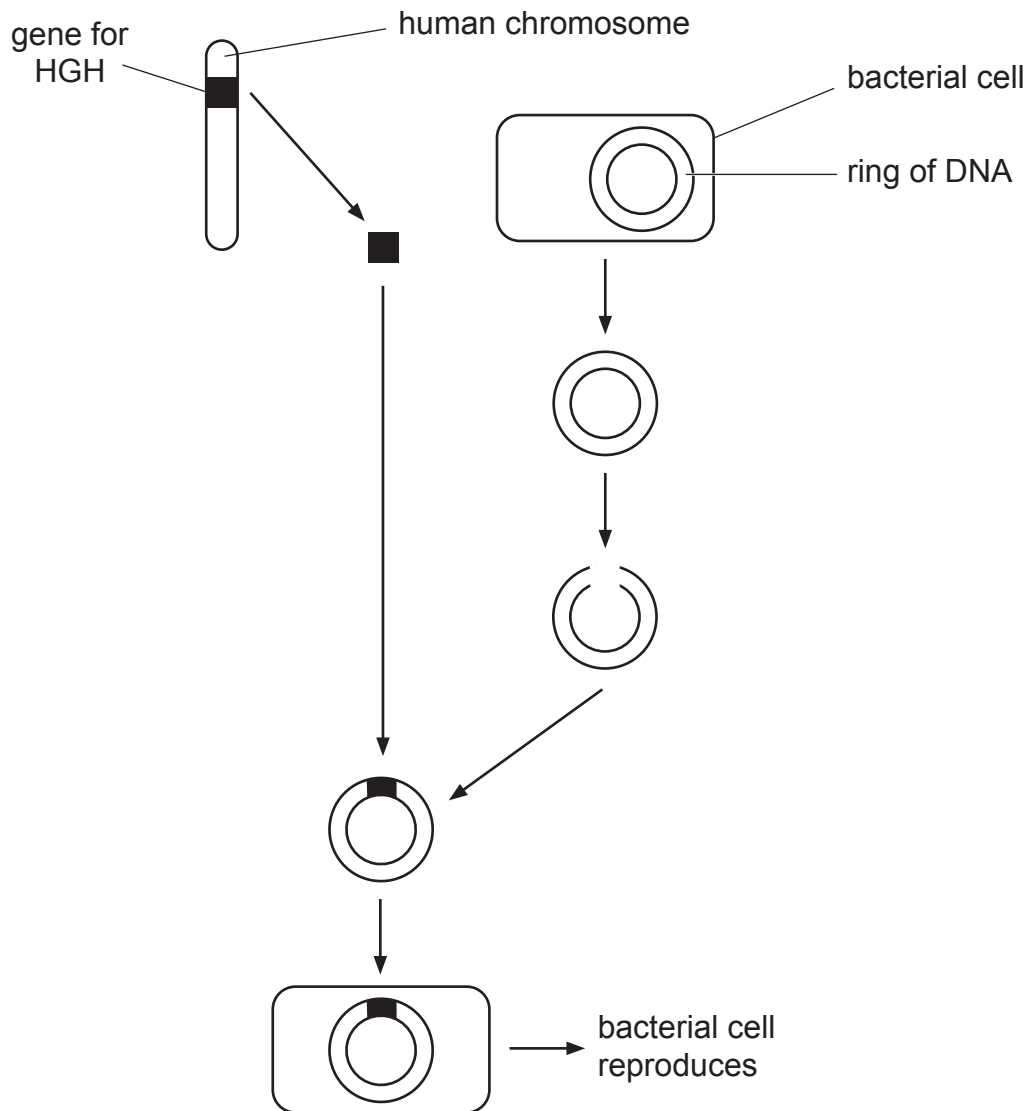
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- 7 Human growth hormone (HGH) is essential for proper growth, but some children do not produce enough HGH and need injections of it on a daily basis.

Before 1980 HGH was extracted from the body of a person who had died, but now it is produced by genetic engineering technology.

The diagram below shows some of the stages used in the genetic engineering process to produce HGH.



(a) What is meant by the term **genetic engineering**?

[2]

(b) Using the diagram opposite describe the process of genetic engineering that produces HGH.

[2]

(c) State **one** advantage and **one** disadvantage of genetic engineering.

Advantage _____

Disadvantage _____

[2]

[Turn over



- 8 (a) In some varieties of pepper plants fruit colour is controlled by a single gene. The allele for green fruit colour (G) is dominant to the allele for red fruit colour (g).



Source: © Getty Images

- (i) Give the **two** possible genotypes of a plant producing green fruit colour.

_____ and _____ [1]



A pepper plant producing only green fruit is crossed with a pepper plant producing only red fruit.
The cross results in four offspring plants, two that produce green fruit and two that produce red fruit.

- (ii) Complete the genetic diagram below to show the gametes of the parent pepper plants and the genotypes of the offspring pepper plants.

[2]

- (iii) What name is given to this type of genetic diagram?

[1]

A change in the genes of a pepper plant that produces red fruit can result in yellow fruit being produced.

- (iv) What name is given to this genetic change?

[1]

[Turn over]



(b) Explain the difference between the following genetic terms:

(i) Homozygous and heterozygous.

_____ [1]

(ii) Dominant and recessive.

_____ [2]

(c) Inherited diseases such as cystic fibrosis can be identified in the foetus.

(i) What general name is given to the process of testing a foetus for the possibility of developing inherited diseases?

_____ [1]

(ii) Name **one** other genetic condition which can be tested for in a developing foetus.

_____ [1]

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For Examiner's
use only

Question Number	Marks
1	
2	
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Examiner Number

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