OCR
Oxford Cambridge and RSA

Accredited

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

H

J250/08 Paper 8 (Higher Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2.1

Time allowed: 1 hour 10 minutes

You may use:
- a scientific or graphical calculator
- a ruler

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **24** pages.

SECTION A

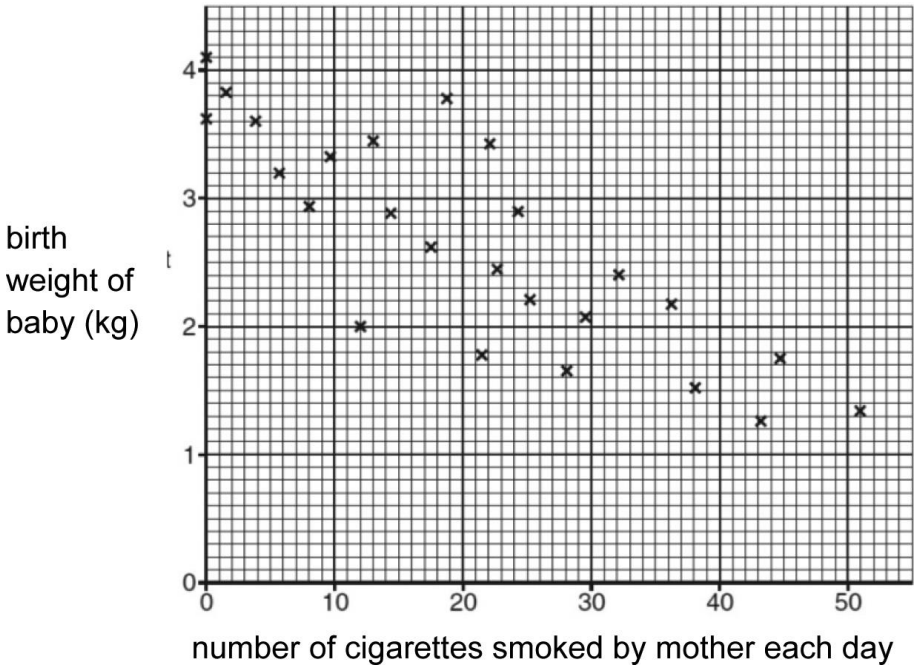
You should spend a maximum of 20 minutes on this section.

Answer **all** the questions.

1 Scientists recorded the birth weights of some babies.

They also recorded how many cigarettes each baby's mother smoked each day.

The results are shown on the graph.



Which statement is true?

A All mothers who smoke 12 cigarettes a day will have babies that weigh 2 kg.

B Birth weight increases as the number of cigarettes smoked increases.

C The data only represents a small percentage of births per year.

D The trend in the data shows a positive correlation.

Your answer ☐ **[1]**

2 The number of daisies on a school field is investigated.

A square frame is used to count the number of daises in six different areas of the field.

The table shows the results.

Frame	**Number of daisies counted in each square**
1	10
2	22
3	14
4	7
5	12
6	7
mean	

Calculate the **mean** number of daises.

A 7

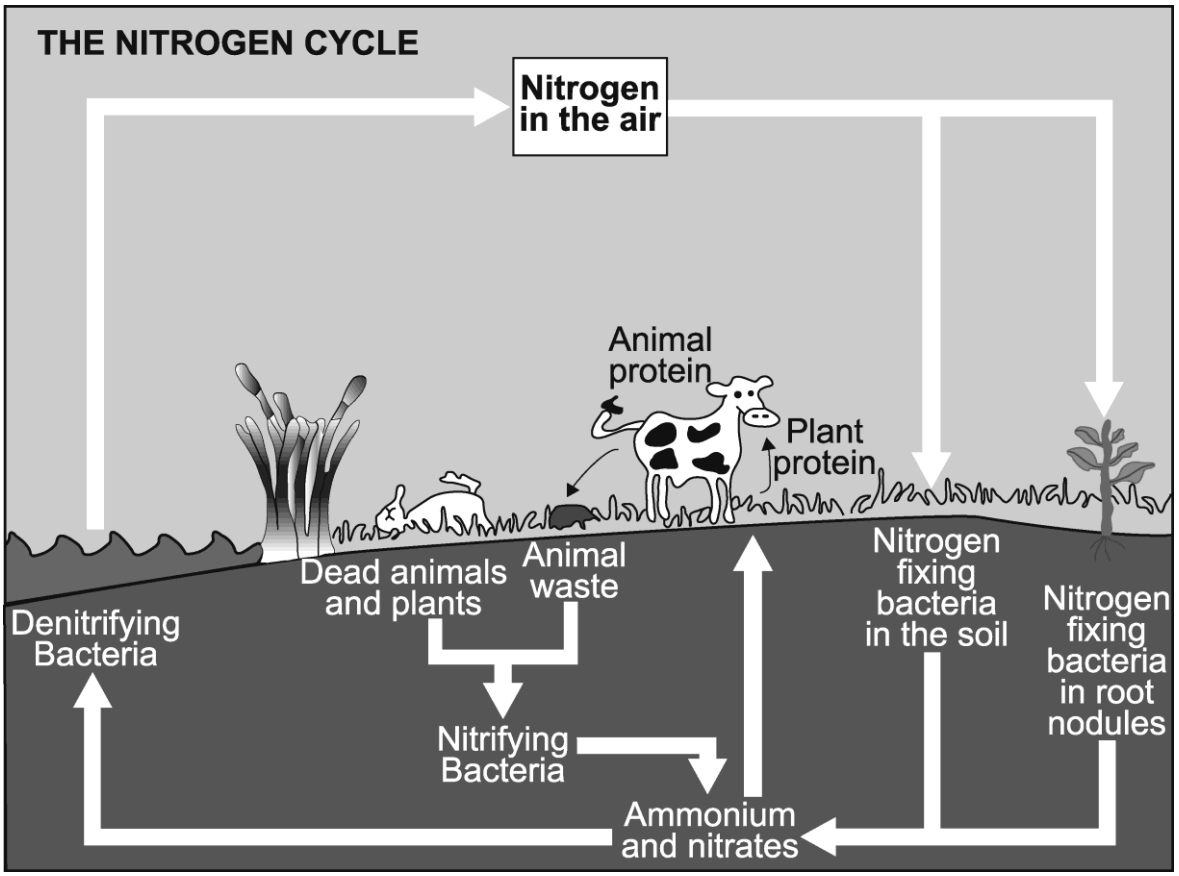
B 12

C 36

D 72

Your answer ☐ **[1]**

3 Look at the diagram of the nitrogen cycle.



Which statement explains why large numbers of **denitrifying bacteria** in the soil results in poor plant growth?

A Denitrifying bacteria convert nitrates into nitrogen.

B Denitrifying bacteria produce ammonium compounds.

C Denitrifying bacteria produce nitrates needed for growth.

D Denitrifying bacteria release nitrates into the soil.

Your answer ☐ **[1]**

4 Which statement best describes an ecosystem?

A A community of organisms and the abiotic factors affecting them.

B A group of organisms of the same species living together in the same habitat.

C The position occupied by an organism within a community.

D The total population of organisms living in a habitat.

Your answer ☐ **[1]**

5 What is the best way to **estimate** the population of mammals in a habitat?

A Count individuals seen in 1 m^2 of habitat use

B Use pitfall traps to collect all the animals

C The method of capture-recapture

D Use the method of random sampling

Your answer ☐ **[1]**

6 Huntington's disorder is caused by a dominant allele (H).

A boy has a 75% chance of inheriting the disorder.

This is based on the genotypes of his parents.

Which of the following combinations could be the genotype of his parents?

A HH × Hh

B Hh × hh

C Hh × Hh

D HH × hh

Your answer ☐ **[1]**

7 Which technique uses DNA sequencing to obtain information about an organism's evolutionary relationships?

A Artificial classification

B Gene mapping

C Homozygous test cross

D Molecular phylogenetics

Your answer ☐ **[1]**

8 New drugs are sometimes tested using a double blind trial.

Which statement describes a double blind trial?

A All patients are given placebos.

B Drugs are tested on animals and humans at the same time.

C Patients and their doctors do not know who is getting the new drug.

D Some patients are given placebos with the knowledge of their doctor.

Your answer ☐ **[1]**

9 What is the advantage of using an electron microscope compared to a light microscope.

A Can be used on living tissue

B Increased resolution

C Inexpensive

D Portable

Your answer ☐ **[1]**

10 In guinea pigs, the allele for black fur is dominant to the allele for white fur.

- A student has two black male guinea pigs and two female guinea pigs.
- The student decides to breed his guinea pigs.
- He wants half the offspring to be black and half to be white.

Which cross would result in half the offspring to be black, and half to be white?

A Female bb × male Bb

B Female Bb × male Bb

C Female bb × male BB

D Female BB × male Bb

Your answer ☐ **[1]**

SECTION B

Answer **all** the questions.

11 **(a)** White blood cells produce antibodies.

Describe the role of white blood cells and antibodies in the defence against pathogens.

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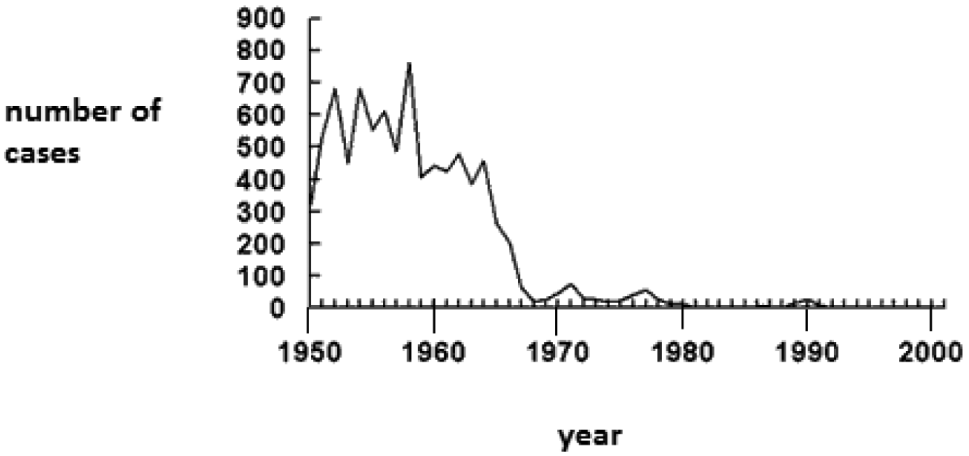
(b) Measles is a disease caused by a pathogen.

The graph shows the number of measles cases in one country between 1950 and 2001.



Suggest which year a measles vaccination was introduced to the country.

Explain your answer.

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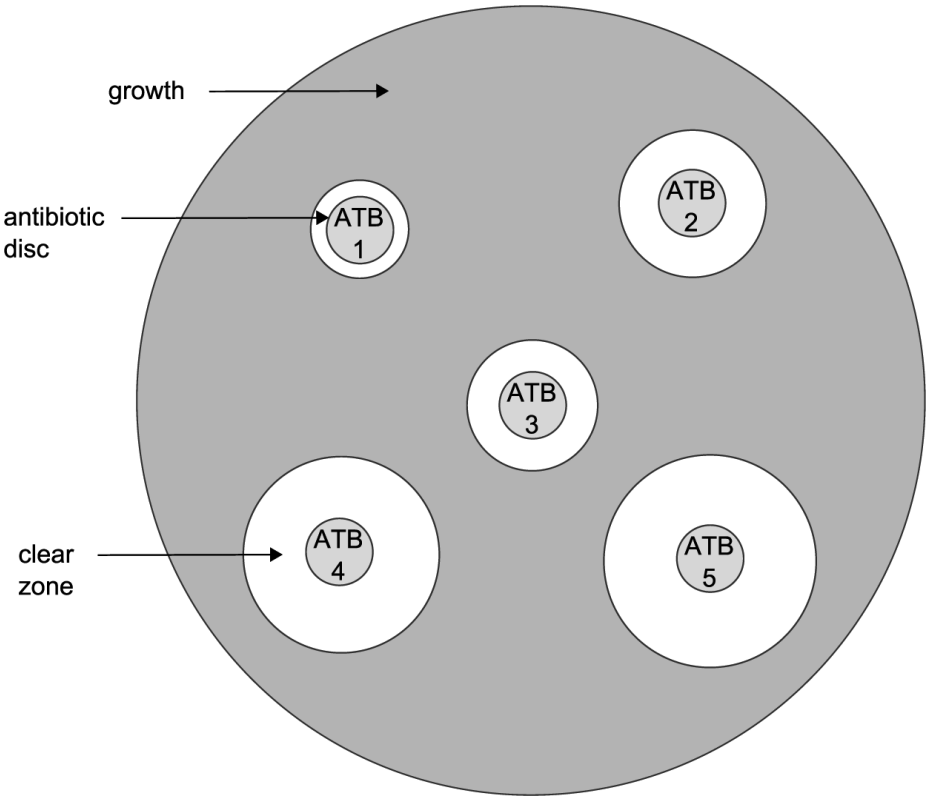
..... **[2]**

(c) A student investigates different antibiotics.

- He puts antibiotic (ATB) discs onto agar containing bacteria.
- The bacteria are left to grow.
- The diagram shows his results.

The larger the clear zone around the antibiotic disc the more effective the antibiotic.



The table shows the cross-sectional areas for the antibiotic discs tested.

Antibiotic	Cross-sectional area (mm^2)
ATB1	79
ATB2	154
ATB3	122
ATB4	
ATB5	314

(i) Calculate the cross sectional area of the clear zone for ATB4.

Show your working.

Answer = ……mm^2 **[3]**

(ii) A student concludes that ATB5 is the best antibiotic for treating bacterial infections.

Evaluate his conclusion.

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TURN OVER FOR THE NEXT QUESTION

12 Two students investigate the effect of light intensity on plant growth.

- They collect leaves from nettle plants growing in two different light intensities.
- They then measure the surface area of each leaf.

Fig 12.1 shows a tally chart of their results.

Surface area (cm^2)	**Light intensities (lux)**	
	989	**1249**
<6.1	///	/
6.1–7.0	/	///
7.1–8.0	/	//
8.1–9.0	////	/
9.1–10.0	///	/
10.1–11.0	////	/
11.1–12.0	/	/
>12.0	/	/

Fig 12.1

(a) Which type of variation is shown by the results?

Explain your answer.

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(b) One student concludes that there are two varieties of nettle plants:

- Nettles with large leaves
- Nettles with small leaves.

He predicts this may be due to both the genome and the environment.

(i) Explain how the genome and the environment could account for the differences observed in the measured leaf sizes.

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(ii) Looking at the results in Fig 12.1, there might be **no** relationship between light intensity and leaf size.

Suggest why.

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..... **[1]**

(iii) Explain **two** ways in which the method could be improved to provide more evidence for a relationship between light intensity and leaf size.

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..... **[2]**

13 Two students investigate the species living on a rocky shore.

(a) The students use a belt transect as part of their investigation.
They start the belt transect near the cliff and work their way towards the sea.

Explain how they should set up and collect data from the belt transect.

Include the apparatus they will need and how they could record abundance of species.

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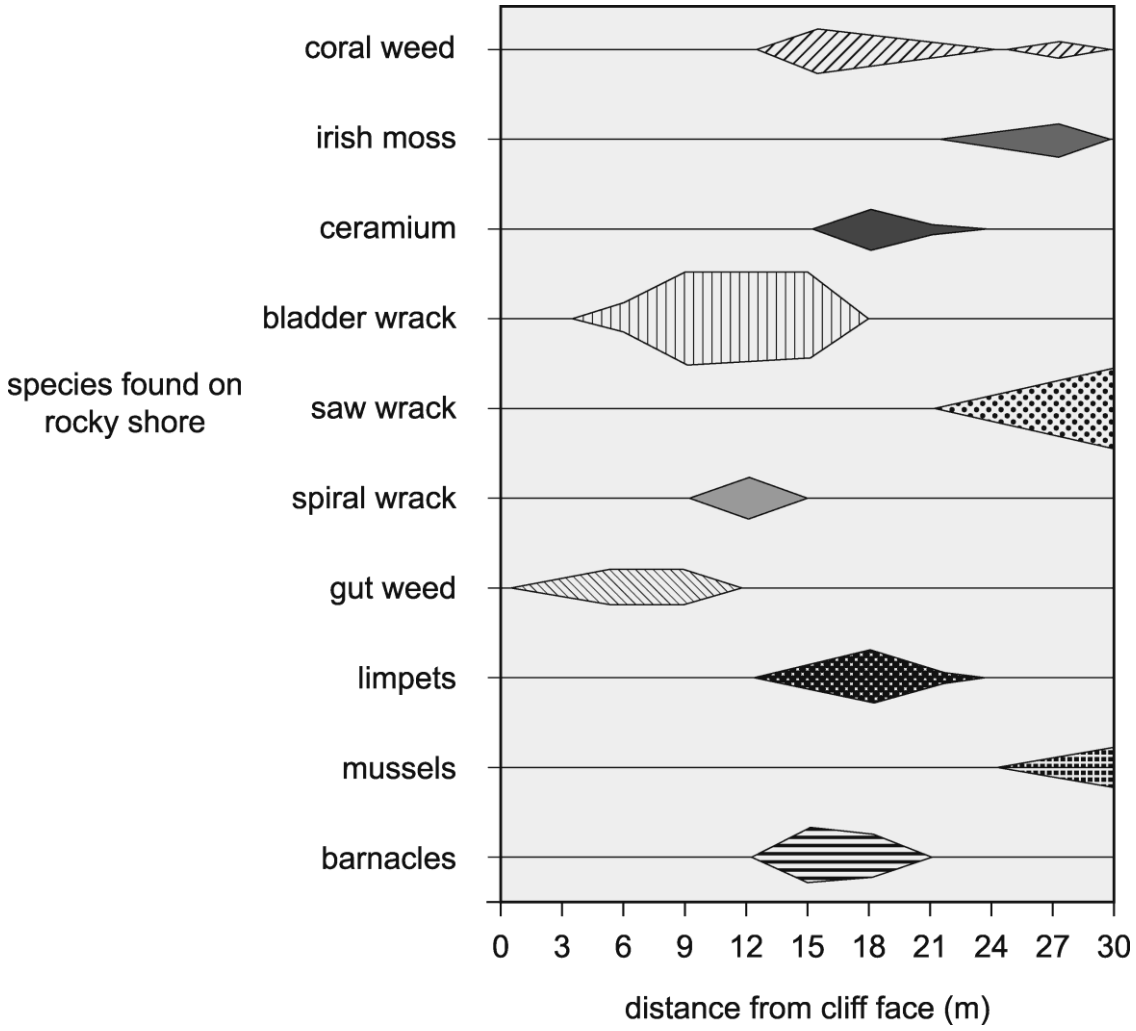
(b) The kite diagram shows the students' results.



(i) Which species is the **most** abundant 12 m from the cliff face?

..... **[1]**

(ii) Compare the distribution of limpets, mussels and barnacles on the rocky shore.

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(c) Explain how **abiotic** factors may affect the distribution of the organisms on a rocky shore.

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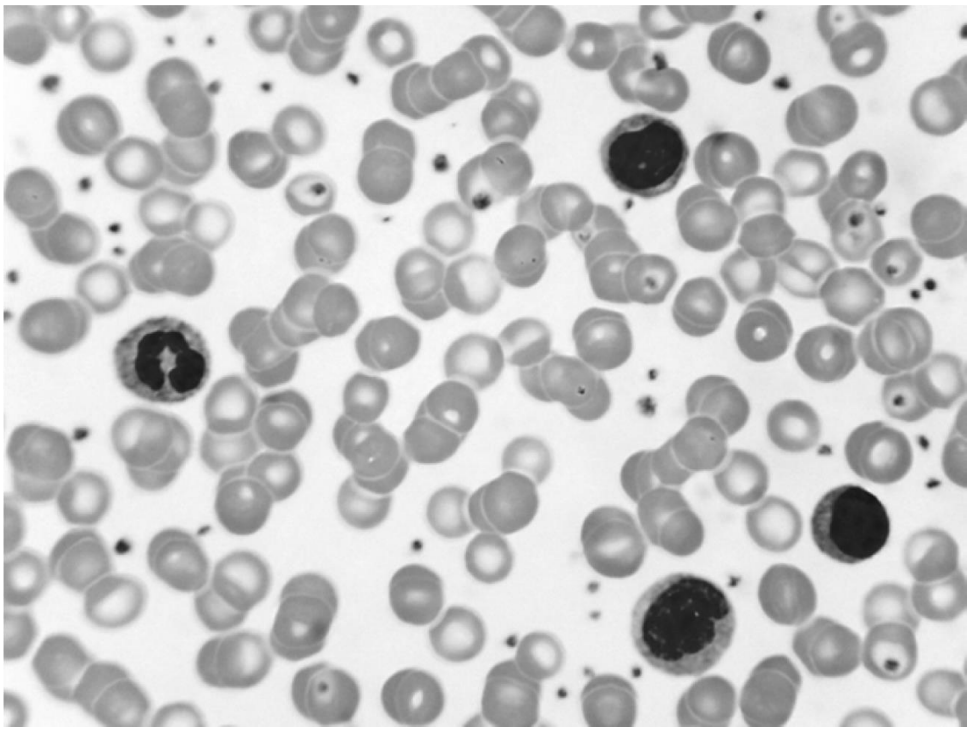
TURN OVER FOR THE NEXT QUESTION

14 A complete blood count (CBC) is a common blood test used to help diagnose some blood cancers.

The CBC provides information about the number of white blood cells, red blood cells and platelets.

- Blood counts are done by looking at the cells using a microscope.
- The picture shows blood cells seen using a light microscope.
  The darker areas have been stained.



(a) Describe how you would use a light microscope and stains to view **white blood cells.**

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(b) The magnification of the cells is ×200.

Explain how magnification is calculated when using a microscope.

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..... **[1]**

(c) The table shows the acceptable ranges for different blood cells in women.

	Number of cells per litre of blood
Red blood cells	3.8×10^{12} to 5×10^{12}
White blood cells	4×10^{12} to 11×10^{9}
Platelets	150×10^{12} to 440×10^{9}

Some cancers can cause a decrease in white blood cell count.

Look at the information. It shows the blood count results for a female patient.

	Number of cells per litre of blood
Red blood cells	4.2×10^{12}
White blood cells	
Platelets	300×10^{9}
Complete blood count	4.503×10^{12}

Do the results suggest that the patient has a cancer that causes a low **white blood cell** count?

Calculate the result for **white blood cells** to help you explain your answer.

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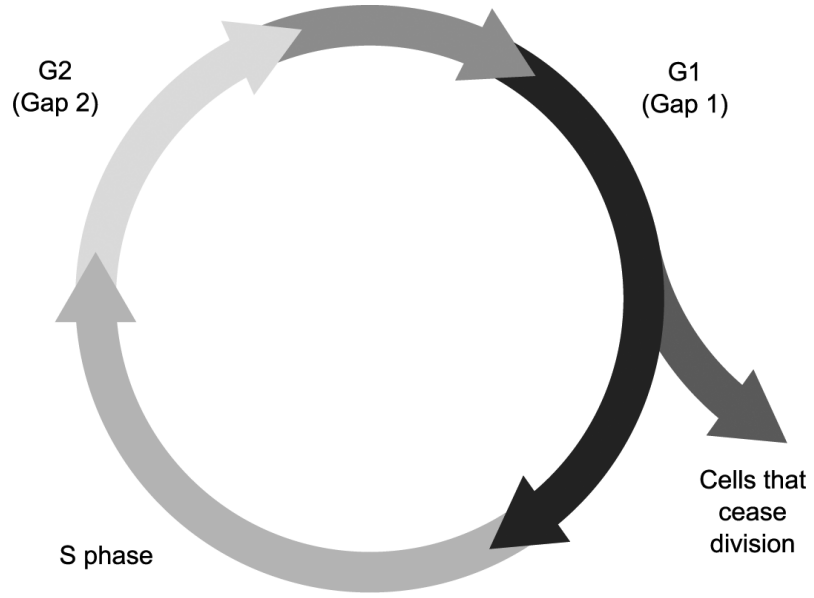
(d) The diagram shows an image of the cell cycle.



Explain how the cell cycle would be different for cancer cells.

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TURN OVER FOR THE NEXT QUESTION

15 Read the information about Bt-corn, an example of a genetically modified (GM) crop.

Bt-corn

Bt-corn is a genetically modified sweet corn plant. The plant produces a poison which kills insects. This means the farmer no longer needs to use insecticides. The genetically modified sweet corn is called Bt-corn because the insect-killing gene in the plant comes from the bacteria *Bacillus thuringiensis.*

(a) (i) Which **two** types of enzymes are used in genetic engineering?

1 .....

2 ..... **[2]**

(ii) Describe how the enzymes in **(i)** are used to produce genetically engineered Bt-corn.

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(b)* Some people are concerned that insects may become resistant to the poison.

Explain how the insects may become resistant and discuss whether Bt-corn should be produced or not.

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END OF QUESTION PAPER

Summary of updates

Date	Version	Details
November 2021	2.1	Updated copyright acknowledgements.

OCR
Oxford Cambridge and RSA

…day SAMs – Morning/Afternoon

GCSE (9–1) Combined Science (Biology) A (Gateway Science)
J250/08 Paper 8 (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 10 minutes

MAXIMUM MARK 60

This document consists of 16 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca.

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks.
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.
The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.
The communication statement determines the mark within a level.

11. **Annotations**

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9–1) in Combined Science A (Gateway Science):

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

SECTION A

Question	Answer	Marks	AO element	Guidance
1	C	1	2.1	
2	B	1	2.2	
3	A	1	2.1	
4	A	1	1.1	
5	C	1	2.1	
6	C	1	2.1	
7	D	1	1.1	
8	C	1	2.1	
9	B	1	1.2	
10	A	1	2.2	

Question			Answer	Marks	AO element	Guidance
11	(a)		antibodies attach to antigens (on pathogens) (1) idea that antibodies on pathogens help the white blood cells to identify the pathogens (1) white blood cells *engulf* the pathogens (1)	3	1.1	for extra marking points **ALLOW** idea that antibodies are specific to antigens (1) **ALLOW** higher level ideas of white blood cells being memory cells / multiplying quickly (1)
	(b)		1958 or 1965 (1) big drop in the number of cases / initial drop followed by fewer cases over time (1)	1 1	3.1b 3.2a	**ALLOW** 1965
	(c)	(i)	415 (3)	3	1.1 2.2 2.1	if incorrect then **ALLOW**: πr^2 (1) or identifying radius as 11.5 (1) π x11.5x11.5 (2)
	(c)	(ii)	correct in that it does have the largest area / clear zone (1) but only correct for the antibiotics tested (1) idea that results are not valid as very close together or idea that results are not valid because he has only tested them once /not done any repeats (1)	3	3.2b 3.3a 3.3a	**ALLOW** comment on specific bacterial infections / don't know which bacteria were used in this test / may get different results for different bacteria

Question			Answer	Marks	AO element	Guidance
12	(a)		continuous (1) as complete range of measurements from one extreme to the other or gradual changes over a range of values (1)	2	2.2	
	(b)	(i)	plant may have slightly different genes/alleles that control size of leaves (1) idea that higher light intensity results in smaller leaves (1) low light intensity means that the leaves need larger surface area to absorb more light (1) needs to absorb enough light as light is a limiting factor / need enough light for sufficient rate of photosynthesis (1)	3	2.1	**IGNORE** just 'different genes / genome'
	(b)	(ii)	both areas have leaves in all the ranges (1)	1	3.1a	
	(b)	(iii)	**any two from:** collect more leaves from each area because this enables a calculation of mean to increase accuracy / validity (1) they could look at more areas with more extreme differences in light intensities as they have only looked at two areas where the difference is not great (1) they should record light intensities in both places over a period of time to see if there is always a difference (1)	2	3.3b	

Question			Answer	Marks	AO element	Guidance
13	(a)		place a line / tape measure from the cliff down towards the sea in a straight line (1) place a quadrat next to the start of the line (1) record the species inside the quadrat (1) how to record abundance e.g. percentage cover of seaweeds or number of animals (1) repeat at certain distances along the line (1)	5	2.2 1.2 1.2 2.2 1.2	**ALLOW** use a key to identify species
	(b)	(i)	bladder wrack (1)	1	2.2	
	(b)	(ii)	limpets and barnacles are found in the same area (1) mussels are found further down the shore (1)	2	2.2	**ALLOW** data quotes e.g. 12–21 m from the cliff face ALLOW quotes e.g. 24–30 m
	(c)		**Any three from:** species higher up the shore left uncovered by the sea for longer periods of time / **ORA** (1) higher up the shore there is more chance of desiccation / more moisture loss / **ORA** (1) idea that some species have to cope with more wave action (1) some species may have to cope with higher salt concentration if they are found in rock pools (1) those exposed for longer times may have to cope with extreme temperature change (1)	3	2.1	

SECTION B

Question			Answer	Marks	AO element	Guidance
14	(a)		**any four from:** blood is placed onto a microscope slide (1) use of cover slip (1) use of stains so that the **nucleus** stands out (1) idea of using low power first (1) any safety measure (1)	4	1.2	e.g. always move objective lens away from slide when looking down the eye piece / safely disposing of the slide in disinfectant
	(b)		multiply the objective lens by the eyepiece lens (1)	1	1.2	
	(c)		yes value for white blood cells is $3x10^9$ (1) which is below the acceptable range (1)	2	3.2b	No mark for yes
	(d)		the cells would not cease division (1) the growth stages (G2/G1) would be larger / the cells would continue to grow out of control (1)	2	1.1	

Question			Answer	Marks	AO element	Guidance
15	(a)	(i)	ligase (1) restriction enzyme (1)	2	1.1	either order
	(a)	(ii)	gene to make poison is cut out of the bacteria (using restriction) enzyme (1) **Same** enzyme used to cut open corn DNA (1) **Then any one from:** idea of sticky ends matching (1) gene to make poison is stuck into corn DNA using (ligase) enzyme (1)	3	2.1 2.1 1.1	**IGNORE** incorrect names of enzymes as this is tested in part **(i)** **ALLOW use of a plasmid** **Same** enzyme used to cut open plasmid Idea of sticky ends matching gene to make poison is stuck into plasmid using (ligase) enzyme Plasmid is added to cells of corn plant
	(b)*		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3** **(5–6 marks)** **An explanation as to how insects become resistant.** **Provides a balanced argument with more than 1 reason for both being produced and not being produced AND concludes an answer backed up with scientific reasoning.** *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.*	6	2 x 3.2b 2 x 2.1 2 x 1.1	**AO3.1a: Analyse the information and conclude whether the data favours the production of Bt-corn or not** • A suitable interpretation as to whether the science associated with Bt-corn favours its production or not which is backed up by a suitable scientific explanation **AO2.1: Apply scientific knowledge to identify the pros and cons for the production of Bt-corn** Cons:

Question			Answer	Marks	AO element	Guidance
			Level 2 **(3–4 marks)** **An explanation as to how insects become resistant.** **Identifies suitable reasons for the production of Bt corn and a reason why it should not be.** *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1** **(1–2 marks)** **An explanation as to how insects become resistant.** *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*			• the poison could still get into animals higher up the food chain / Bioaccumulation • gene may get into other plants that could result in the death of insects not feeding on crops • gene may get into other plants that could result in more growth of weeds Pros: • reduces the use of insecticides • less insecticides getting into the environment • less chance of bioaccumulation / harm to animals higher up the food chain by general insecticides • farmer is less likely to be harmed as he does not need to spray insecticides • more crops could be grown in places that can't afford insecticides / improves yield of corn **IGNORE** reference to cost unqualified **AO1.1: Demonstrate scientific knowledge as to how resistance to Bt may develop in a population** • idea of a mutation that makes them resistant mention of natural selection • variation in a population

Question			Answer	Marks	AO element	Guidance
						• some may be resistant • these outcompete the non-resistant • survive • reproduce

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website