

**GCSE (9–1) Combined Science
(Biology) A (Gateway Science)
J250/01 Paper 1 (Foundation 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

Answer **all** the questions.

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

1 Which structures are found in both plant and animal cells?

- A** Cell membrane, chloroplast, nucleus
- B** Cell membrane, cytoplasm, mitochondria
- C** Cell wall, cytoplasm, mitochondria
- D** Cell wall, cytoplasm, nucleus

Your answer ☐

[1]

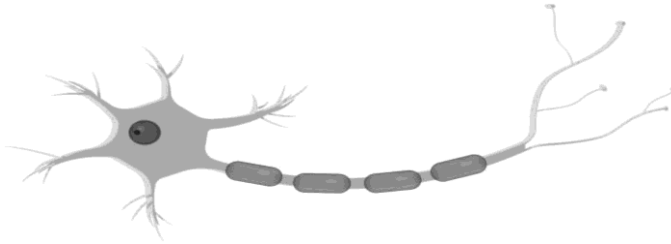
2 Which structure controls the movement of substances into or out of the cell?

- A** Cell membrane
- B** Chloroplast
- C** Mitochondria
- D** Nucleus

Your answer ☐

[1]

- 3 Neurones are specialised cells.
They can be over a metre in length.



Which statement best explains why some neurones are over a metre long?

- A Neurones carry digested food from the gut to all the different parts of the body.
- B Neurones join synapses together.
- C Neurones pull on muscles to make them contract.
- D Neurones transmit nerve impulses from one part of the body to another.

Your answer

[1]

- 4 Look at the table of data.

It shows the effectiveness of different types of contraception.

Method	Pregnancies per 100 couples each year
Condom	18
Diaphragm	16
IUD	1
The pill	8
Withdrawal	27

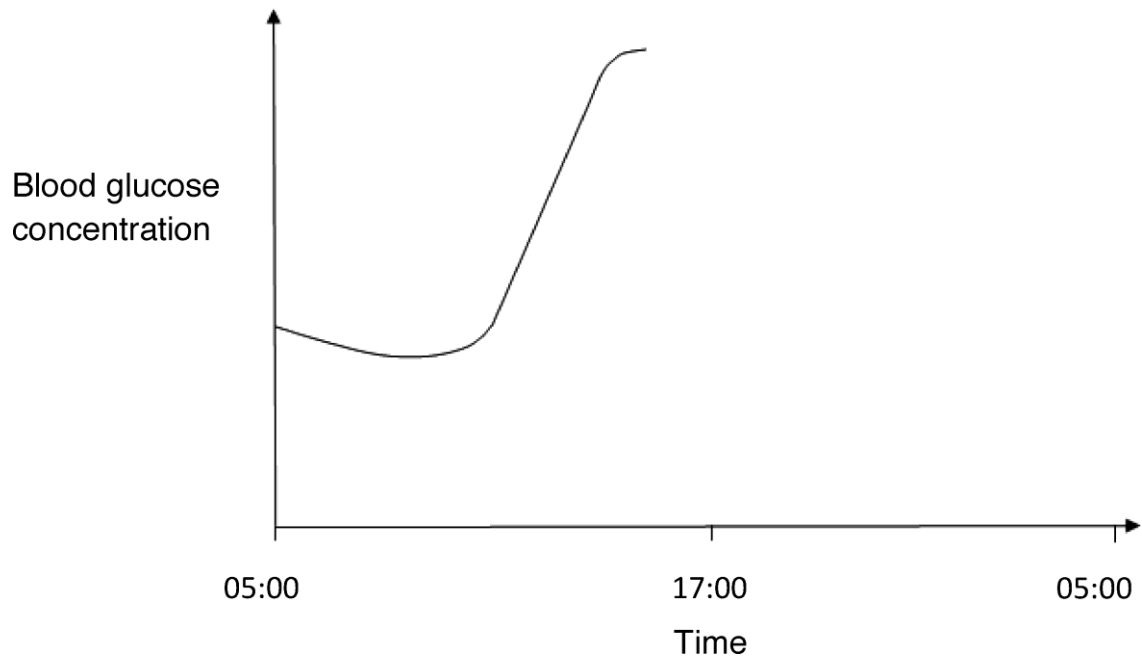
Which statement is correct?

- A IUD is 100% effective in birth control.
- B The condom is 10% more effective than the pill.
- C Using a diaphragm gives a 16% chance of pregnancy each year.
- D Withdrawal is the most effective method of birth control.

Your answer

[1]

- 5 The graph below shows the changes in blood glucose level of a diabetic.



At 17:00, the diabetic injects insulin.

What would happen to the blood glucose level immediately after injecting insulin?

- A** It would decrease noticeably.
- B** It would increase and then immediately decrease.
- C** It would increase gradually.
- D** It would remain constant.

Your answer

[1]

- 6 A tomato grower investigates how his tomato crop is affected by changing the percentage of carbon dioxide in the air inside a glasshouse.

Look at the table of results.

Carbon dioxide in glasshouse air (%)	0.06	0.08	0.10	0.12
Mass of tomatoes (kg)	105	125	150	150

Adding carbon dioxide to the glasshouse costs the grower money.

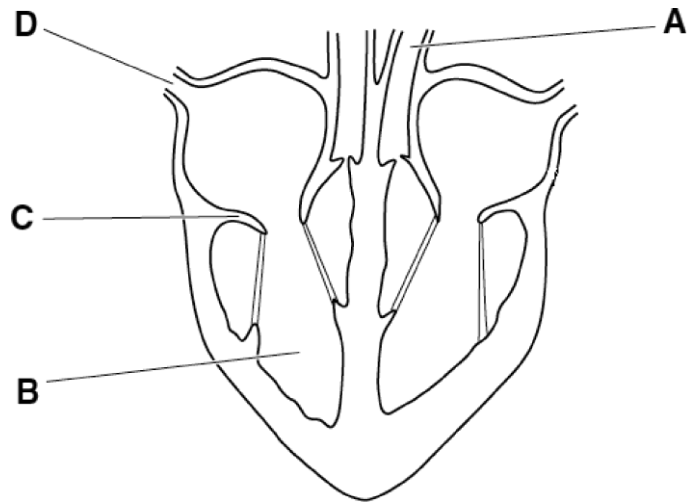
What would be the **best** percentage of carbon dioxide for the grower to use in his glasshouse?

- A 0.06%
- B 0.08%
- C 0.10%
- D 0.12%

Your answer

[1]

7 Look at the diagram of the heart.

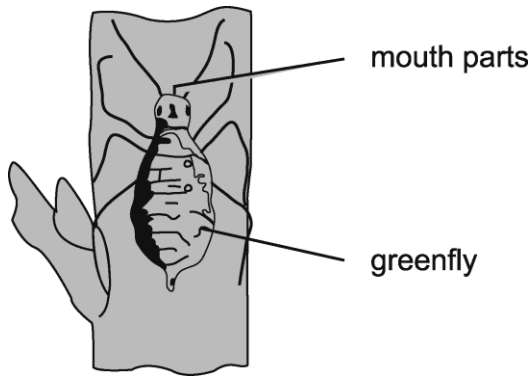


Which part **A**, **B**, **C** or **D** prevents backflow of blood?

Your answer

[1]

- 8 The picture shows a greenfly feeding from the stem of a tomato plant.



The greenfly has piercing mouth parts.

It pierces a tissue inside the plant and removes a sugary substance from this tissue during feeding.

What is the name of the tissue?

- A Cuticle
- B Epidermis
- C Phloem
- D Xylem

Your answer

[1]

- 9 Animals can respire by anaerobic or aerobic respiration.

Which row in the table correctly describes aerobic and anaerobic respiration?

	An exothermic reaction	Makes lactic acid
A	aerobic only	anaerobic only
B	anaerobic only	both
C	both	aerobic only
D	both	anaerobic only

Your answer

[1]

- 10 The table shows the number of mitochondria in different types of cell.

Type of cell	Number of mitochondria
heart muscle	5000
liver	1500
skin	100

Which statement best explains the data in the table?

- A** Heart muscle cells produce more protein than other types of cell.
B Liver cells only respire using anaerobic respiration.
C Muscle contraction requires large amounts of energy.
D Skin cells need large amounts of energy.

Your answer

[1]

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TURN OVER FOR THE NEXT QUESTION

SECTION B

Answer **all** the questions.

11 (a) Insulin is a hormone.

What is the job of insulin?

..... [1]

(b) Hormones are involved in an important process called homeostasis.

What is homeostasis?

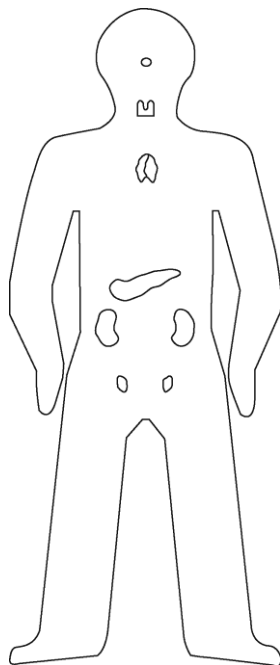
.....
.....
..... [2]

(c) Changes happen in a female during the menstrual cycle.

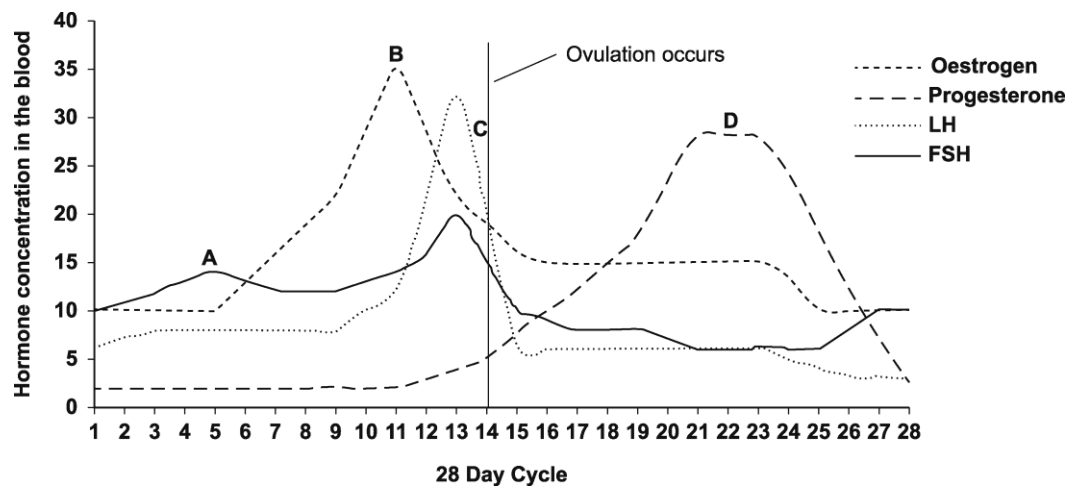
The changes happen because of hormones.

(i) Label the diagram to show where follicle stimulating hormone (FSH),
oestrogen and progesterone are made.

[3]



(ii)* The graph shows changes that occur in a female during the menstrual cycle.



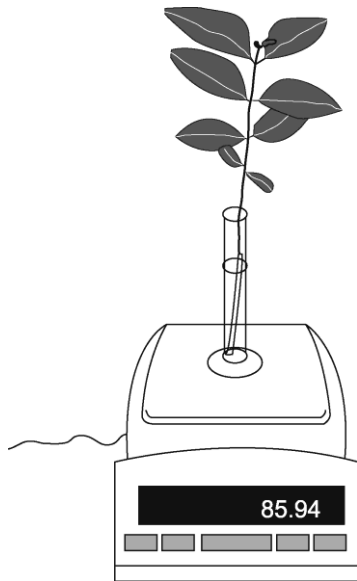
- Describe the main stages of the menstrual cycle.
- Explain how follicle stimulating hormone (FSH), oestrogen and progesterone control the changes that occur.

You may find it helpful to use the days of the menstrual cycle as a reference.

[6]

- 12 Four groups of students investigate the rate of transpiration from a plant cutting.

The picture shows the equipment that they use.



Method

1. Take a cutting which has several leaves from a plant, and place in a measuring cylinder.
 2. Adjust the water volume to 6 cm^3 .
 3. Add about 1 cm^3 of oil to the measuring cylinder, so that the oil sits on top of the water.
Record the mass.
 4. Repeat for two other cuttings from the same plant.
Take readings at timed intervals over the next two days.
- (a) Why is the water volume in the measuring cylinder adjusted to 6 cm^3 each time?

.....

..... [1]

- (b) Suggest **one** reason why oil is added to the measuring cylinder.

.....

..... [1]

- (c) It is important to have a table to record the results of the investigation.

Suggest the measurements that should be recorded in the table.

.....

.....

.....

.....

.....

..... [3]

- (d) The table shows the results obtained by four different groups after **two** days.

Group	Volume of water lost (mm ³)
1	117
2	174
3	232
4	225

- (i) The actual rate of transpiration for this plant should be 115.2 mm³ **per day**.

Group 3 has the most accurate result.

How can you tell?

.....
 [1]

- (ii) The groups all did their investigations at the same time, in the same conditions.

Suggest reasons why some results are not as accurate as others.

.....

 [2]

- (iii) Suggest **one** change that could improve the experiment.

Explain why this change would be an improvement.

.....

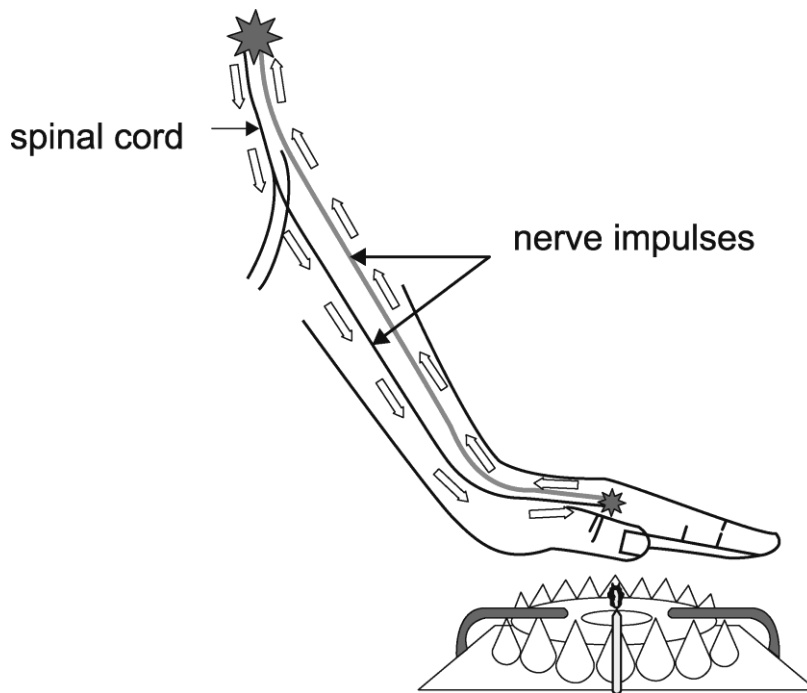
 [2]

15
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TURN OVER FOR THE NEXT QUESTION

- 13** If a person's hand touches a hot object, the hand automatically pulls quickly away.

This is caused by a flexor (withdrawal) reflex.



- (a)** What is a reflex?

..... [1]

- (b)** Describe the path that a nerve impulse takes through the nervous system during the flexor (withdrawal) reflex.

Suggest why this reflex would **not** happen in a person with an artificial hand.

.....

.....

.....

.....

.....

..... [4]

(c) Nerve impulses can travel at speeds of between 0.5 and 120 m/s.

(i) A nerve impulse travels a distance of 1.2 metres in 0.01 seconds.

Calculate the speed of impulse in the flexor reflex.

Answer =m/s **[2]**

(ii) Why is it important that the impulse travels at this speed in the flexor reflex?

.....

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

- 14 The graph in Fig 14.1 shows how two different enzymes are affected by temperature.

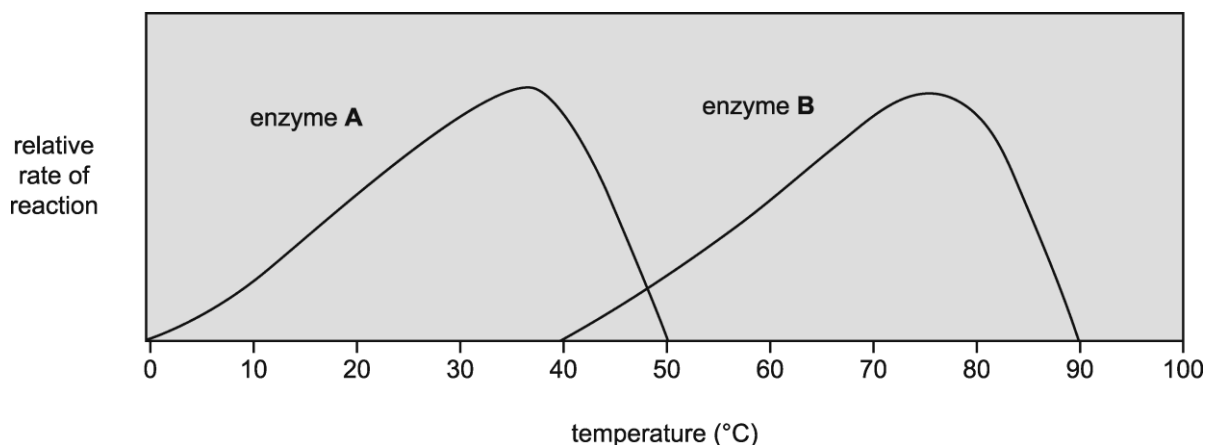


Fig 14.1

- (a) At what temperature does enzyme **A** stop working?

..... [1]

- (b) Enzyme **A** and enzyme **B** both digest protein.

- Enzymes can be added to washing powder to help clean stains from clothes.
- Washing instructions advise a temperature of 45°C.
- Describe what happens to the rates of reaction of enzyme **A** and enzyme **B** between 40°C and 50°C.
- Use the shape of the graph and values from the X axis to suggest why enzyme **A** would be the best to use in washing powder at 45°C.

Give reasons for your answer.

.....

.....

.....

.....

..... [4]

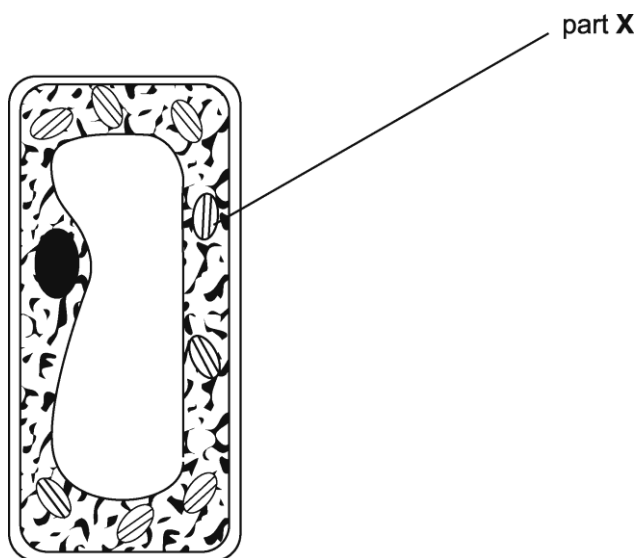
(c) Which enzyme (**A** or **B**) could work inside the human body?

Explain why.

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

15 Look at the palisade cell from a leaf.

This cell is important for photosynthesis.



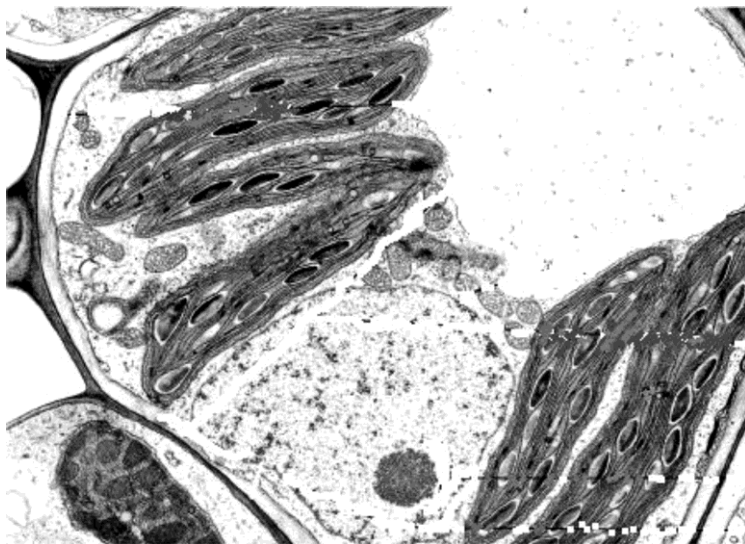
(a) The chemical reactions of photosynthesis take place at part X.

What is the name of part X?

..... [1]

(b) Look at the picture.

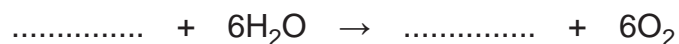
It is an electron micrograph of another cell found in the leaf.



Explain how using electron microscopy has improved the understanding of structures inside cells.

.....
 [2]

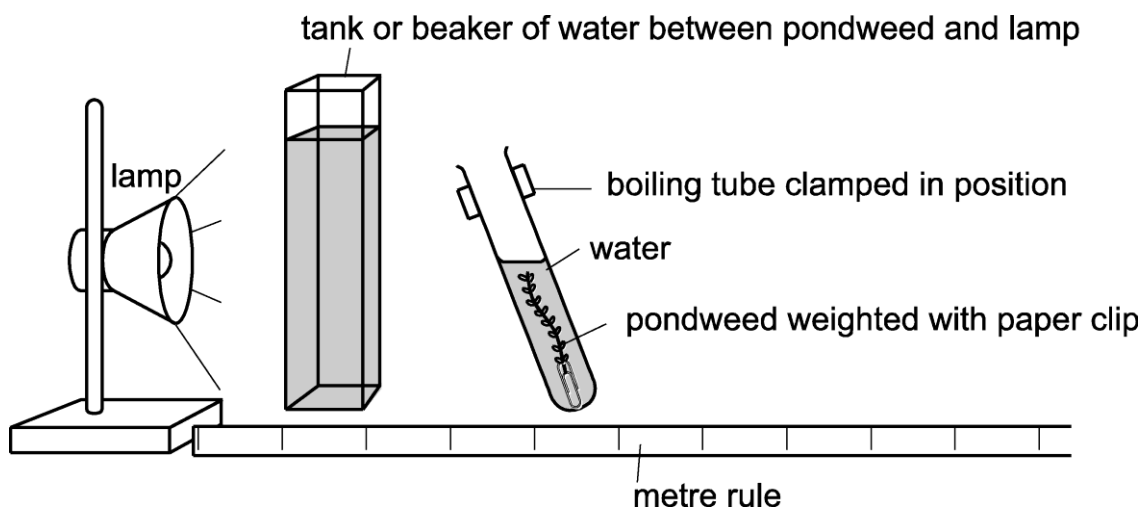
(c) Complete the chemical equation for photosynthesis.



[2]

(d) Look at the diagram.

It shows a set of apparatus that can be used to investigate the rate of photosynthesis.



Method

Step 1 Set up the apparatus and look for a stream of bubbles coming from the cut end of the pond weed.

Step 2 Count the number of bubbles produced in 1 minute.
Repeat for a second minute.
Repeat for a third minute.

Step 3 Change the distance of the lamp from the pondweed to investigate the effect on the rate of photosynthesis.

Step 4 Leave for 2 minutes, then count the number of bubbles produced in one minute.
Repeat for a second minute.
Repeat for a third minute.

Step 5 Change the distance again, and repeat **step 4**.

Students followed this method to investigate the effect of light intensity on photosynthesis.

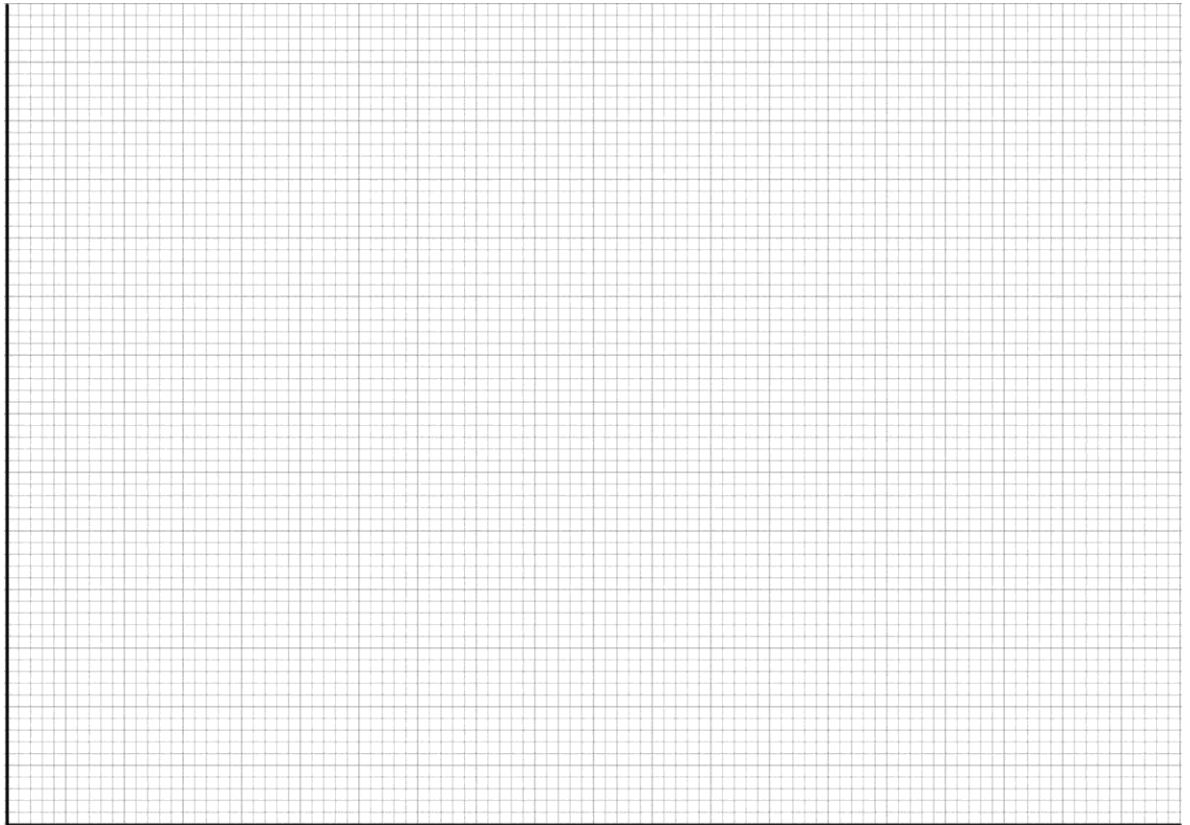
The table shows results from this experiment.

Distance of light from the pondweed (in metres)	Number of bubbles counted in 1 minute			Mean
	Trial 1	Trial 2	Trial 3	
1.0	8	6	7	7
0.5	28	32	30	30
0.25	105	106	104	105
0.125	105	104	109

- (i) Calculate the mean for the distance 0.125 metres and write it in the table.

[1]

- (ii) Plot a graph to show the effect of the **distance of light from the pondweed** on the **mean number of bubbles** produced.



[3]

(iii) Describe the effect of light intensity on photosynthesis.

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

(iv) Suggest **one** source of error in the method for measuring the amount of gas given off.

Explain how this method could be improved.

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

END OF QUESTION PAPER

Summary of updates

Date	Version	Details
October 2021	2.1	Updated copyright acknowledgements.

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...day June 20XX – Morning/Afternoon

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

J250/01 Paper 1 (Foundation 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	B	1	1.1	
2	A	1	1.1	
3	D	1	1.1	
4	C	1	2.1	
5	A	1	2.1	
6	C	1	2.2	
7	C	1	1.1	
8	C	1	2.1	
9	D	1	1.1	
10	C	1	2.1	

SECTION B

Question			Answer	Marks	AO element	Guidance
11	(a)		control <i>blood</i> sugar / control glucose in the blood (1)	1	1.1	
	(b)		maintaining a constant internal environment (2) BUT balancing bodily inputs and outputs (1)	2	1.1	ALLOW in response to internal and external changes (1)
	(c)	(i)	follicle stimulating hormone (FSH) correctly labelled on the pituitary gland (1) oestrogen correctly labelled on the ovary (1) progesterone correctly labelled on the ovary (1)	3	1.2	ALLOW correctly labelled arrows pointing to or word written over correct organ ALLOW correctly labelled arrows or word written over either/both ovaries

Question			Answer	Marks	AO element	Guidance
		(ii)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) identifies more than two correct stages of the menstrual cycle and correctly links these to the hormones involved and their relative levels during the cycle.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) identifies two correct stages of the menstrual cycle and correctly links these to the hormones involved.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) identifies at least two correct stages of the menstrual cycle and the day they occur.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>	6	<p>2 x 2.2</p> <p>4 x 1.2</p>	<p>AO2.2: Apply knowledge and understanding of the menstrual cycle to identify from the graph the relative levels of hormone and their effects</p> <ul style="list-style-type: none"> menstruation occurs due to low levels of oestrogen and progesterone lining of the uterus starts to thicken as the levels of oestrogen rise maintaining thickened lining due to high levels of progesterone <p>AO1.2: Demonstrates knowledge about menstruation and also the role of the female sex hormones in the cycle</p> <ul style="list-style-type: none"> oestrogen also inhibits FSH to ensure only one egg is released per cycle ovulation occurs due to FSH causing the ovary to develop a mature egg / ovum - which is usually released around day 14 FSH also stimulates ovaries to produce oestrogen ALLOW oestrogen stimulates the pituitary gland to release LH (luteinising hormone) that stimulates egg release

Question			Answer	Marks	AO element	Guidance
12	(a)		to make sure each measuring cylinder had the same amount of water at the start (1)	1	2.2	ALLOW so it is a fair test
	(b)		prevent water evaporating from the measuring cylinder (1)	1	2.2	
	(c)		<p>max one from: when the cutting was set up (1) how long each cutting has been in the water (1)</p> <p>max two from: the start and finish volumes of water (1) calculation of the change in volume (1) the start and finish masses of the cylinders (1) calculation of the change in mass (1)</p>	1 2	3.2a 2 x 3.3a	<p>ALLOW correct labels in table headings</p> <p>ALLOW volume of water at timed intervals ALLOW masses at timed intervals</p>
	(d)	(i)	(group 3's value of) 232 is similar/closest to 230.4 (1)	1	2.1	
		(ii)	any two from: different number of leaves on cuttings (1) leaves of different surface area (1) unhealthy plants may not work so well (1)	2	2 x 3.1a	ALLOW there may be slight differences in humidity of the air / any breezes in the room could affect the rate of water loss from the cuttings

Question			Answer	Marks	AO element	Guidance
		(iii)	<p>take more cuttings as samples (1) repeating the procedure will improve accuracy(1)</p> <p>OR</p> <p>more accurate measurements of mass/volume (1) will improve the precision of answer (1)</p> <p>OR</p> <p>measuring the mass of the cutting before and after (1) could eliminate any error due to cutting growth (1)</p>	2	2 x 3.3b	

Question			Answer	Marks	AO element	Guidance
13	(a)		fast / automatic / protective (response) (1)	1	1.1	ALLOW unconscious response
	(b)		<p>max three from: the pathway involves detection by a receptor (1) transmitted through neurones (1) sensory/relay/motor neurone (1) to an effector / muscle (1)</p> <p>AND</p> <p>missing receptor in artificial hand / pathway incomplete (1)</p>	3	3 x 1.1	ALLOW a correctly labelled pathway diagram
	(c)	(i)	$\frac{1.2}{0.01}$ (1) but 120 (2)	2	2 x 2.1	
		(ii)	needs to be very fast (1) for protection (from burning) / avoid damaging hand (1)	2	2 x 2.1	ALLOW to remove hand quickly

Question			Answer	Marks	AO element	Guidance
14	(a)		50 (°C) (1)	1	2.1	
	(b)		enzyme A rate is decreasing enzyme B rate is increasing (1) values to be added from the graph measurement from graph to show rate of enzyme A and B at 45 (°C) (2) rate of reaction for A is greater at 45 (°C)/twice as fast (1)	4	4 x 2.1 3.1a	
	(c)		enzyme A (no mark) fastest rate /optimum temperature is around 37 (°C) (1) which is human body temperature 37 (°C) (1)	2	3.2b 3.1b	

Question			Answer	Marks	AO element	Guidance
15	(a)		chloroplast (1)	1	1.1	IGNORE cytoplasm
	(b)		increased resolution of EM (ORA) (1) greater detail seen / can see smaller objects more clearly (1)	2	2 x 1.2	ALLOW greater magnification
	(c)		6CO ₂ (1) C ₆ H ₁₂ O ₆ (1)	2	2 x 1.1	must be on correct side of equation
	(d)	(i)	106 (1)	1	2.1	
		(ii)	suitable scale on correctly chosen axes (1) plotting accurate (1) suitable line of best fit (1)	3	3 x 2.2	DO NOT ALLOW scales that use less than half the graph ALLOW +/- half a square DO NOT ALLOW dot to dot line
		(iii)	increase in light intensity increases the rate of photosynthesis (1)	1	2.1	ALLOW the more light the more photosynthesis
		(iv)	source of error bubbles of differing size (1) miscounting bubbles (1) improvement collect volume of gas / use a measuring cylinder/gas syringe to collect gas (1) use a clicker / electronic device to count (1)	2	3.2a 3.3b	improvement must match the source of error

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