OCR
Oxford Cambridge and RSA

Accredited

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

J247/01 Paper 1 (Foundation Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2.2

Time allowed: 1 hour 45 minutes

You must 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 **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document consists of **24** pages

SECTION A

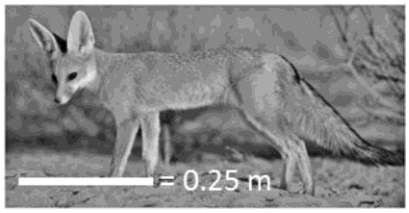
Answer **all** the questions.

You should spend a maximum of 30 minutes on this section.

1 The pictures show four foxes.

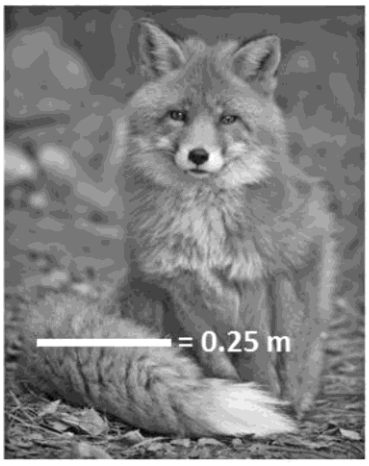
Which fox has the largest surface area : volume ratio?

A

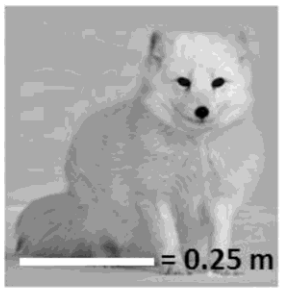


B

C

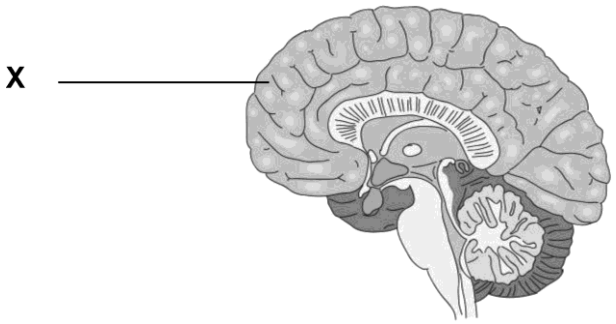


D



Your answer ☐ **[1]**

2 The diagram shows the brain.



What is the name of part **X**?

A Cerebellum

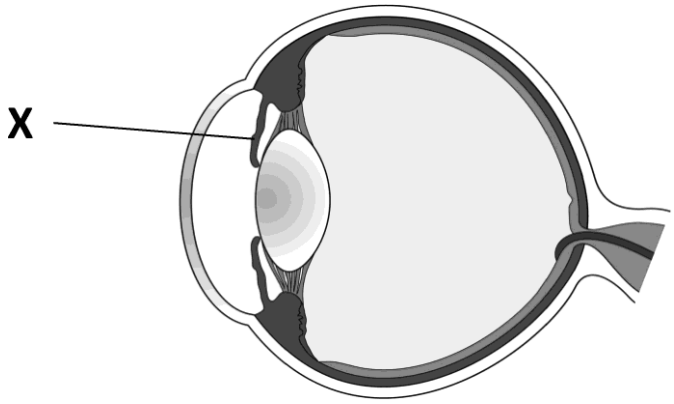
B Cerebrum

C Hypothalamus

D Medulla

Your answer ☐ **[1]**

3 The diagram shows the eye.



What is the name of part **X**?

A Cornea

B Iris

C Lens

D Pupil

Your answer ☐ **[1]**

4 A student uses a microscope.

- The magnification on the eyepiece lens is ×10.
- The magnification on the objective lens is ×4.

What is the total magnification?

A 2.5

B 6

C 14

D 40

Your answer ☐ **[1]**

5 What are proteins made of?

A Amino acids

B Fatty acids

C Nucleotides

D Sugars

Your answer ☐ **[1]**

6 Which hormone is involved in controlling the menstrual cycle?

A Auxin

B Insulin

C Progesterone

D Testosterone

Your answer ☐ **[1]**

7 What is the word equation for aerobic respiration?

A Carbon dioxide + water → glucose + oxygen

B Glucose + carbon dioxide → oxygen + water

C Glucose + oxygen → carbon dioxide + water

D Oxygen + water → glucose + carbon dioxide

Your answer ☐ **[1]**

8 What type of reactions are photosynthesis and respiration?

	photosynthesis	**respiration**
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

Your answer ☐ **[1]**

9 Which type of plant cell takes in water?

A Guard cell

B Phloem cell

C Root hair cell

D Xylem cell

Your answer ☐ **[1]**

10 Which process takes water out of plant leaves into the air?

A Osmosis

B Photosynthesis

C Translocation

D Transpiration

Your answer ☐ **[1]**

11 Plant shoots grow towards sunlight.

Which term describes this behaviour?

A Negative gravitropism

B Negative phototropism

C Positive gravitropism

D Positive phototropism

Your answer ☐ **[1]**

12 How many strands are there in a DNA molecule?

A 1

B 2

C 3

D 4

Your answer ☐ **[1]**

13 In DNA, which base does A (adenine) pair with?

A A

B C

C G

D T

Your answer ☐ **[1]**

14 Which substance gives a positive test with Benedict's reagent?

A Lipid

B Protein

C Starch

D Sugar

Your answer ☐ **[1]**

15 Which molecule is **not** a polymer?

A DNA

B Lipid

C Protein

D Starch

Your answer ☐ **[1]**

SECTION B

Answer **all** the questions.

16 A student prepares onion cell slides to view under a microscope.

(a) Put the stages in the correct order by writing the numbers **1** to **5** in the boxes.

	add a drop of iodine solution
	cut the onion into pieces
	peel off a thin layer of onion tissue
	put on a cover slip
	put the onion tissue on a slide

[2]

(b) Explain why the iodine solution is used.

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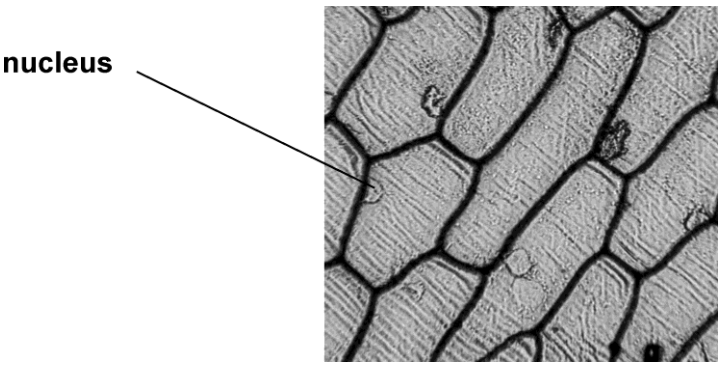
..... **[2]**

(c) Look at the image of some onion cells.



(i) Explain how the contents of the nucleus allow it to carry out its function.

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

(ii) Explain why there are **no** chloroplasts in these onion cells.

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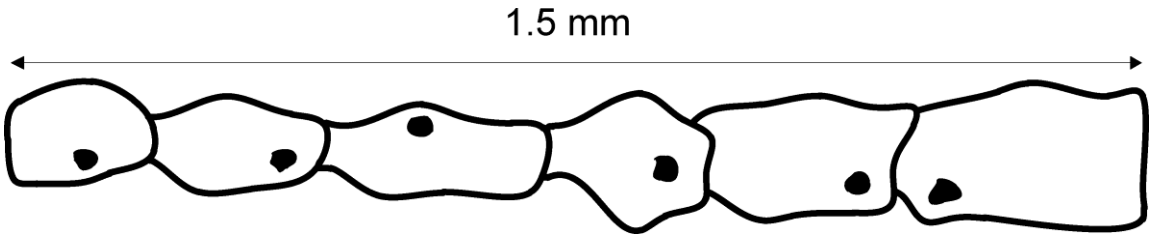
..... **[2]**

(d) The diagram shows a layer of onion cells.



The actual length of the layer is 1.5 mm.

Calculate the average length of one onion cell.

Answer = …… mm **[2]**

(e) A student thinks that using the highest magnification of a microscope is always best.

Explain why this may **not** be true.

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

17 A boy picks up a hot plate and quickly drops it.

This is a reflex action.

(a) Describe the sequence of events that happens in his nervous system during this reflex action.

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..... **[5]**

(b) Explain why it is important that this action is a reflex and **not** controlled consciously by the brain.

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..... **[3]**

18 A student wants to compare the transpiration rates of two plants.

The plants have different sized leaves.

Fig. 18.1 shows how she sets up her experiment.

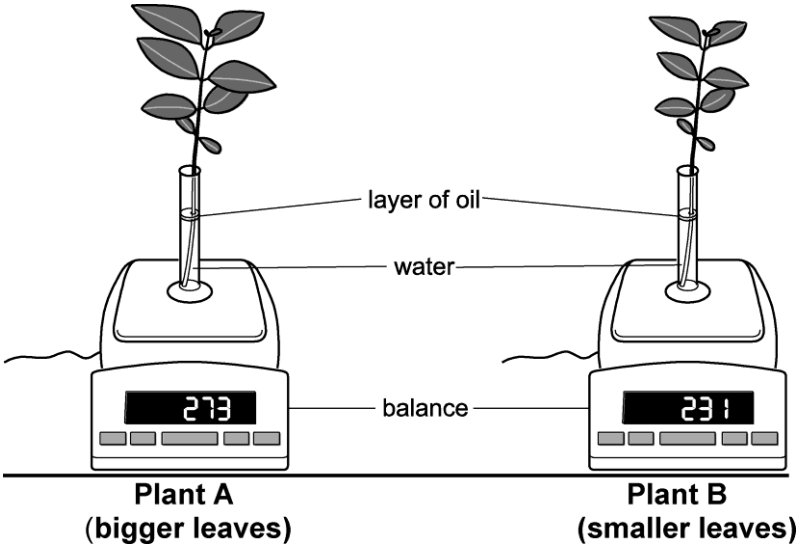

Fig 18.1

(a) Suggest why the student put a layer of oil on top of the water.

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

(b) The student makes sure that each plant has the same number of leaves.

Which other experimental conditions should she keep the same?

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..... **[3]**

(c) * The table shows the results of the experiment shown in **Fig. 18.1**.

	Plant A (bigger leaves)	**Plant B (smaller leaves)**
Mass at start (g)	261	273
Mass after 24 hours (g)	228	231

Write a conclusion with an explanation about this experiment.

Use the results and calculations in your answer.

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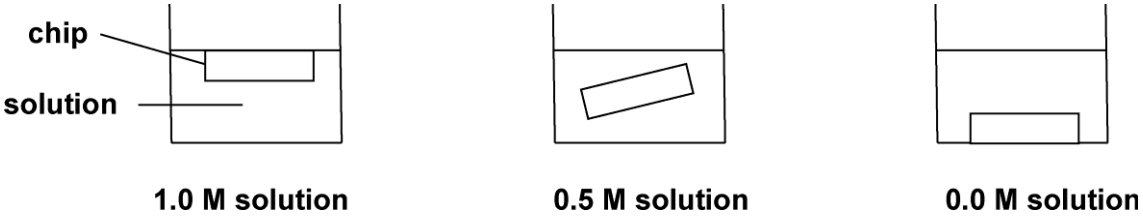
..... **[6]**

19 A student investigates how different concentrations of sucrose solutions affect potatoes.

Three chips are cut from a potato.

Each chip is 5.0 cm long.

Each chip is left in a different concentration of sucrose solution for two hours.



These are the results.

Concentration of sucrose solution	Length of potato chip	
	Start (cm)	After two hours (cm)
1.0 M	5.0	4.5
0.5 M	5.0	5.0
0.0 M	5.0	5.5

(a) What process causes some of the chips to change length in this experiment?

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

(b) Explain why the length of the chip increases in the **0.0 M solution**.

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

(c) Explain why the length of the chip stays the same in the **0.5 M solution**.

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

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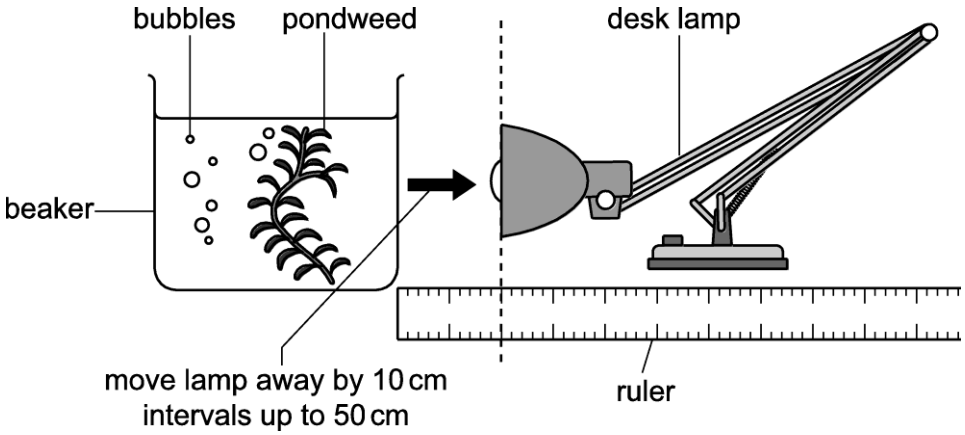
TURN OVER FOR THE NEXT QUESTION

20 A student investigates how light intensity affects the rate of photosynthesis in pondweed.

The diagram shows how he sets up his investigation.



He plans to place the lamp at distances of 10 cm, 15 cm and 20 cm from the beaker.

He plans to measure how much gas is given off from the pondweed in 10 seconds.

(a) His teacher says he could improve his plan.

Write down **two** improvements he could make to his plan.

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

(b) The student counts the number of bubbles to get a measure of the amount of gas given off in photosynthesis.

Give **two** reasons why counting bubbles is **not** an accurate way of measuring **t**he amount of gas given off.

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

(c) What is the gas given off in photosynthesis?

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

(d) Explain why the amount of this gas given off is **not** a true measure of the rate of photosynthesis.

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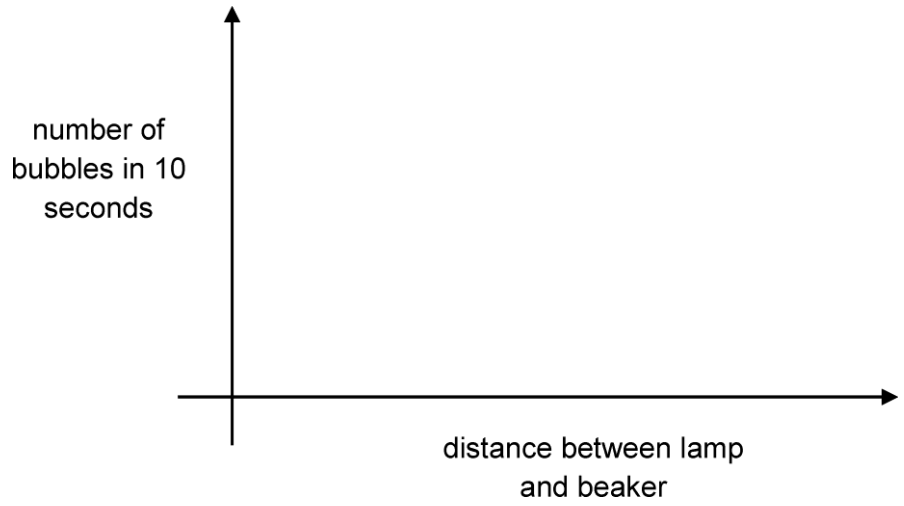
..... **[2]**

(e) **(i)** Sketch a line on the axes below to show the results you would expect.



[2]

(ii) Explain the shape of the graph. **Two** explanations are required.

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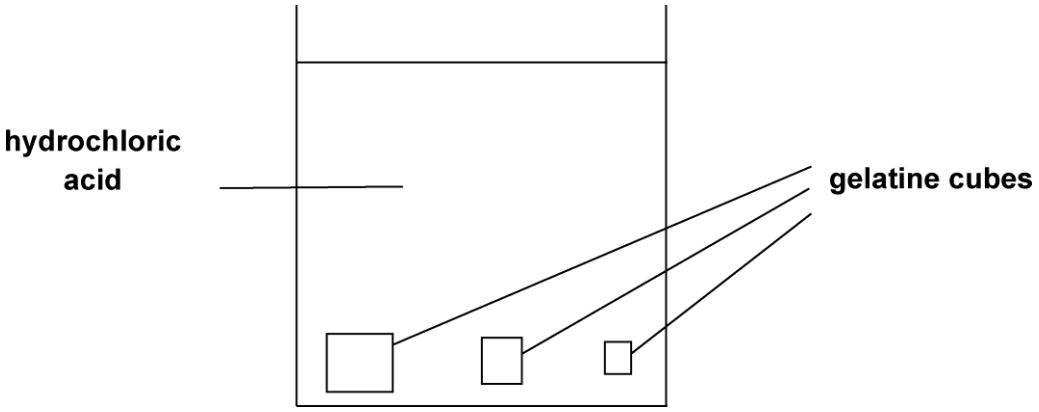
..... **[2]**

21 Some students investigate the effect of the ratio of surface area : volume on the rate of diffusion in animal cells.

1. They use three different sized gelatine cubes stained blue with pH indicator.
2. They put the cubes into a beaker of hydrochloric acid.
3. They measure the time for each cube to completely change colour.



The table shows their results.

length of 1 side of cube (cm)	surface area : volume ratio	time to completely change colour in seconds
1	……	132
2	3:1	328
3	2:1	673

(a) (i) Calculate the surface area : volume ratio for the cube with sides of 1 cm.

Answer =.....**[1]**

(ii) Calculate the rate of colour change for each of the three cubes.

Write your answers in the table below.

Show your answers in standard form.

Length of 1 side of cube (cm)	Rate of colour change (s^{-1})
1	.....
2	.....
3	.....

[2]

(iii) Use the results and your calculations in parts **(i)** and **(ii)**.

Explain why most single celled organisms do **not** need a transport system (e.g. the circulatory system of multi-cellular organisms).

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

(b) Oxygen enters red blood cells by diffusion.

Describe and explain how red blood cells are adapted for the efficient uptake and transport of oxygen.

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..... **[5]**

22 The fat in milk is broken down by the enzyme lipase.

A group of students investigate the effect of temperature on this breakdown of fat.

In their investigation they use an indicator called phenolphthalein.

Phenolphthalein is pink in alkali conditions but colourless in pH values below 8.

Step 1 One student puts 5 drops of phenolphthalein and 5 ml of full fat milk into a test tube.

Step 2 She adds 1 ml of lipase and stirs the mixture.

Step 3 She measures the time for the pink indicator colour to disappear.

The other students repeat these three steps but at different temperatures.

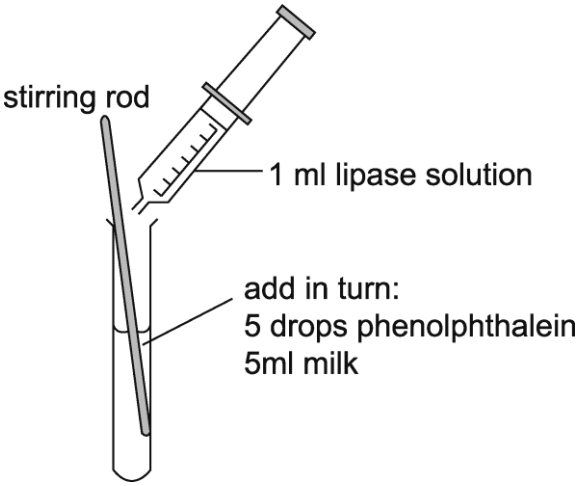

Table 22.1 shows the group's results.

Temperature (°C)	Time for pink colour to disappear (s)
20	480
40	240
60	270
80	960

Table 22.1

(a) The pH falls as the fat in milk breaks down.

Explain why.

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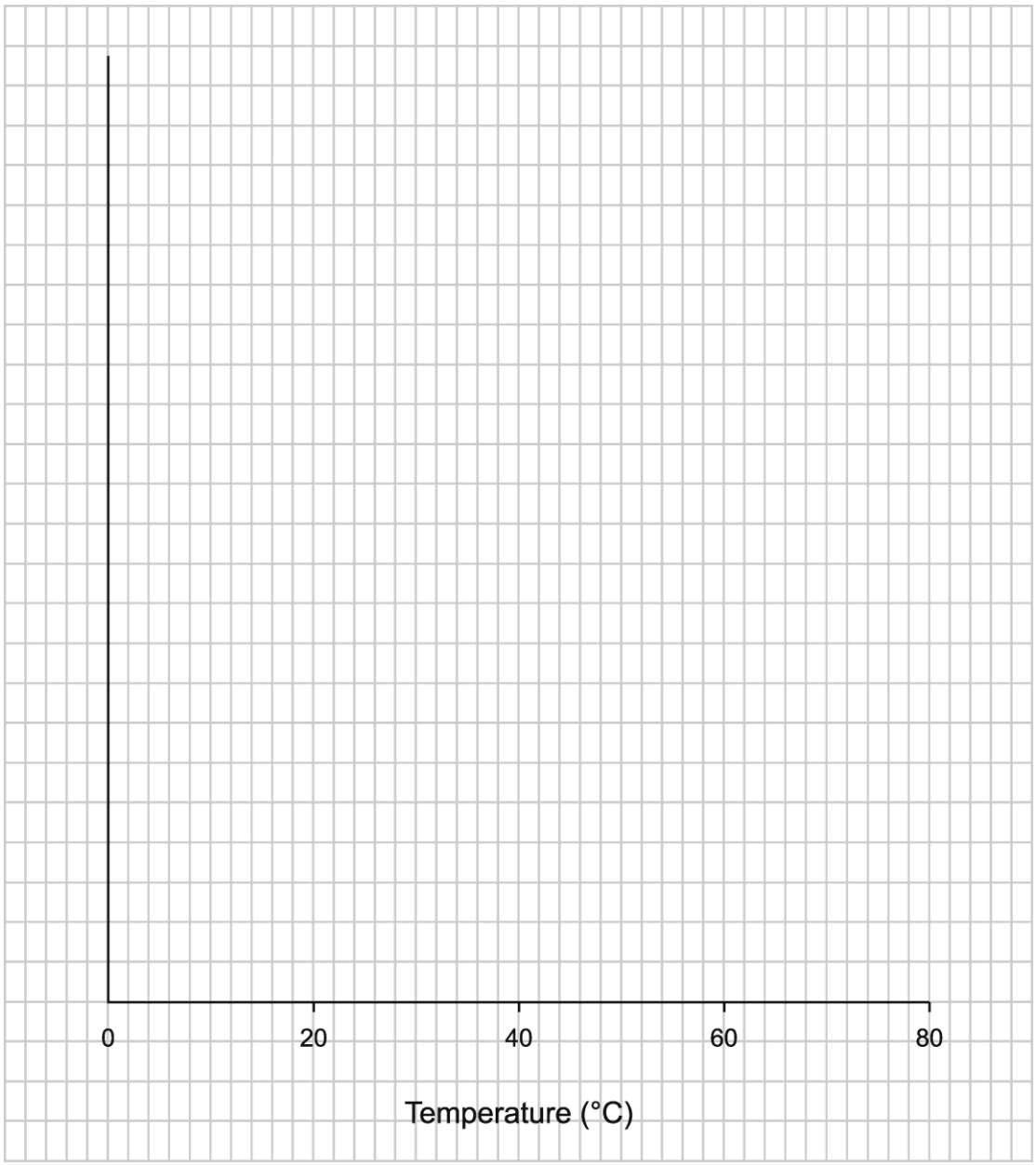
..... **[2]**

(b) Plot a graph of the results in **Table 22.1** and draw a line of best fit.



[5]

(c) Explain why the results at 20°C and 40°C are different.

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..... **[3]**

(d) Explain why the results at 80°C and 40°C are different.

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..... **[3]**

(e) **(i)** One student says that the results show that the optimum temperature for lipase is 40°C.

The teacher says that she **cannot** say for certain that it is 40°C.

Explain why.

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

(ii) Give **two** modifications that the students could make to their method to find a more accurate value for the optimum temperature.

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

(f) The students rounded each time to the nearest 10 seconds.

They rounded the times because they found it difficult to judge exactly when the pink colour had disappeared.

Describe and explain **two** ways the method could be improved to give more accurate measurements.

1 .....

.....

2 .....

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

END OF QUESTION PAPER

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Summary of updates

Date	Version	Details
October 2021	2.2	Updated copyright acknowledgements.

OCR
Oxford Cambridge and RSA

…day June 20XX – Morning/Afternoon

GCSE (9–1) Biology A (Gateway Science)
J247/01 Paper 1 (Foundation Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 90

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 Biology A:

	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	A	1	2.1	
2	B	1	1.1	
3	B	1	1.1	
4	D	1	2.2	
5	A	1	1.1	
6	C	1	1.1	
7	C	1	1.1	
8	B	1	1.1	
9	C	1	1.1	
10	D	1	1.1	
11	D	1	1.1	
12	B	1	1.1	
13	D	1	1.1	
14	D	1	1.2	
15	B	1	1.1	

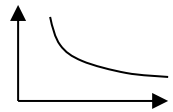
SECTION B

Question			Answer	Marks	AO element	Guidance
16	(a)		4 1 2 5 3 all correct = 2 one out of sequence = 1	**2**	**2 x 1.2**	
	(b)		as a stain (1) so can see organelles (1)	**1** **1**	**1.2** **1.2**	 **allow** to increase contrast
	(c)	(i)	contains genes / genetic material / DNA (1) controls cell (functions) (1)	**1** **1**	**1.1** **1.1**	 **allow** protein synthesis
		(ii)	(onion cells) do not photosynthesize (1) (because) they are underground / in the dark (1)	**1** **1**	**2.1** **2.1**	
	(d)		0.25 (mm) (2)	**2**	**2 x 1.2**	**allow** 1.5 ÷ 6
	(e)		more difficult to focus (1) smaller field of view (1)	**1** **1**	**2.2** **2.2**	

Question			Answer	Marks	AO element	Guidance
17	(a)		detected by receptors in skin (1) impulse sent along sensory neurone (1) to spinal cord / CNS (1) impulse sent along motor neurone (1) to (hand/arm) muscles / effectors (1)	**1** **1** **1** **1** **1**	**2.1** **1.1** **1.1** **1.1** **2.1**	To gain marks these need to be in correct sequence **ignore** brain
	(b)		to avoid (further) damage (1) The reaction needs to be rapid (1) The brain would slow down the reaction time (1)	**1** **1** **1**	**2.1** **2.1** **2.1**	**allow** ora
18	(a)		stop evaporation of water (1) so any loss in mass/water is from the plant (1)	**1** **1**	**2.2** **2.2**	
	(b)		same temperature (1) same light intensity (1) same windspeed / air movement (1)	**3**	**3.3a**	**allow** same humidity

Question			Answer	Marks	AO element	Guidance
	(c) *		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)** **Concludes whether this result would be expected in this experiment and includes scientific reasons in their answer** *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2** **(3–4 marks)** **Draws a conclusion from the data supported with suitable calculations** *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)** **Draws a conclusion from the data without the use of calculations** *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.*	**6**	**2 x 2.2** **2 x 3.1a** **2 x 3.2a**	**AO3.2a: Analyse the information from the experiment and use judgement to ascertain if the result is as expected** • Bigger plants would be expected to lose more mass – because of their larger surface/ora • Smaller plants could have lost more mass in • this experiment – because they may have a higher number of stomata per unit area/ora • Results may be inconclusive as the experiment has not been repeated/there are an insufficient number of repeats **AO3.1a: Apply knowledge and understanding of the experiment with respect to the data** • Convert from water loss to percentage water loss plant A 12.6% plant B 15.4% and explained • Plant A lost more water / lost water more slowly • Plant A lost 261-228 = 33g, • Plant A rate of water loss - 33/24 = 1.38 g/hr • Plant B lost 273-231 = 42g

Question			Answer	Marks	AO element	Guidance
						• Plant B rate of water loss - 42/24 = 1.75 g/hr • Plant B lost 5g more mass that plant A **AO2.2: Apply knowledge of transpiration to the different leaf sizes** • both experiments lose mass • that mass can be because of water loss • that water loss is due to transpiration

Question			Answer	Marks	AO element	Guidance
19	(a)		osmosis (1)	1	1.1	
	(b)		absorbed water (1) Higher water potential/water concentration outside ORA (1)	1 1	2.1 3.1a	**allow** (movement) from higher to lower water potential / from higher to low water concentration
	(c)		(potato has) same water potential / water concentration (as solution) (1) no (net) water loss or gain (1)	1 1	3.1a 2.1	
20	(a)		do more repeats/ more distances / greater range of distances (1) longer than 10 seconds (1)	1 1	3.3b 3.3b	**allow** specific values if they match the marking points **ignore** simply do more measurements
	(b)		bubbles may be different sizes (1) may miscount / difficult to count (1)	1 1	2.2 2.2	
	(c)		oxygen (1)	1	1.1	
	(d)		respiration (is also occurring) (1) some oxygen is used up (in respiration) / AW (1)	1 1	2.1 2.1	 **allow** idea that oxygen given out is the net production
	(e)	(i)	 as the light intensity decreases (1) there are fewer bubbles in 10 seconds (inverse proportional relationship) (1)	2	2 x 2.1	

Question			Answer	Marks	AO element	Guidance
		(ii)	**any two from** as the distance increases, the light intensity decreases (1) as the light intensity decreases, there is less light/energy for photosynthesis (1) the line curves because the light will not decrease to zero / AW (1)	**2**	**2 x 1.1**	
21	**(a)**	**(i)**	6 (cm^{-1}) (1)	**1**	**1.1**	
		(ii)	7.6×10^{-3} 3.0×10^{-3} 1.5×10^{-3} correct calculation of 1/time (1) answer in standard form (1)	 **1** **1**	 **1.2** **1.2**	
		(iii)	Comment on the rate of colour change / smaller block changed faster (1) Diffusion alone is sufficient in smaller organisms / smaller organisms have a larger surface area to volume ratio / diffusion alone may not be effective in multi cellular organisms (may require circulatory system) (1)	**1** **1**	**2.2** **2.2**	**ORA**
	(b)		small size (1) • to travel through capillaries (1) • to get in to small vessels/capillaries (1) biconcave disc shape (1) • large surface area :volume (1)	**5**	**5 x 1.1**	can only gain explanation marks (bullet points) if correctly linked to a feature max 4 marks if only given features without explanations

Question			Answer	Marks	AO element	Guidance
			haemoglobin (1) • to carry oxygen (1) lack of nucleus (1) (so) more room (for haemoglobin) (1)			
22	**(a)**		produces acids (1) but produces fatty acids (2)	**2**	**2 x 2.2**	
	(b)		Y axes correctly labelled, including units (1) Y axis even scales occupying more than half of the page (1) all points correctly plotted = 2 marks but at least 3 points correctly plotted = 1 mark line of best fit (1)	**1** **1** **2** **1**	**2.2** **2.2** **2 x 2.2** **2.2**	
	(c)		at 20°C: slower reaction (1) particles moving more slowly (1) less frequent collisions (1)	**1** **1** **1**	**3.1a** **2.1** **2.1**	**allow** reverse argument referring to 40°C
	(d)		At 80°C: slower reaction (1) enzyme denatured (1) shape of active site changed / cannot bind to substrate (1)	**1** **1** **1**	**3.1a** **2.1** **2.1**	**allow** reverse argument referring to 40°C

Question			Answer	Marks	AO element	Guidance
	(e)	**(i)**	(optimum) could be either side of 40°C / could be anywhere between 40°C and 60°C (1)	**1**	**3.1a**	
		(ii)	Do more repeats (1) Idea of narrower intervals around 40°C (1)	**2**	**2 x 3.3b**	 **allow** 30-50°C
	(f)		**any two from** use a colorimeter – so it's objective / AW (1) have the same student doing all observations – so there is a consistent judgement / AW (1) repeat the experiment at each temperature – can take mean/average (1)	**2**	**2 x 3.3b**	**allow** light meter **allow** colour chart / serial dilution

Summary of updates

Date	Version	Change
May 2018	2	Revised with accessibility principles applied.
October 2019	2.1	Question 21(a) Mark scheme correction to 6:1

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