

OCR

Oxford Cambridge and RSA

Practice paper – Set 1

A Level Biology B (Advancing Biology)

H422/03 Practical skills in biology

MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 60

FINAL

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, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content 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 science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, **best** describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme.

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 middle mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

The lower mark should be awarded where the level descriptor has been evidenced but the communication statement (in italics) has not been met.

In summary:

- **The science content determines the level.**
- **The communication statement determines the mark within a level.**

Level of response questions on this paper are **2(a)** and **5(c)**.

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.

Question			Answer	Marks	Guidance
1	(a)	(i)	0.22 ✓✓	2	If answer incorrect ALLOW 1 mark for correct working 62 705 / 28 000 000 x 100 If answer is correct but not given to 2 d.p. ALLOW 1 mark for 0.2239, 0.224
		(ii)	energy 'losses' occur at each trophic level and there are more trophic levels in the sheep food chain ✓ correct example of energy 'losses' ✓	2	e.g. respiration/egestion/excretion/heat DO NOT ALLOW waste unqualified
	(b)		<u>anaerobic respiration</u> ✓	1	ALLOW fermentation Some candidates may recognise that a small volume of dissolved oxygen will be introduced during the bottling process and that the yeast will use this oxygen to start with and then change to <u>anaerobic respiration</u> .
	(c)	(i)	281 250 (cell count) ✓ ✓ ✓	3	Allow marks for working as follows: 1 mark for correctly calculating the volume of the chamber $0.4 \text{ (mm)} \times 0.4 \text{ (mm)} \times 0.2 \text{ (mm)} = 0.032 \text{ mm}^3$ 1 mark for correctly calculating the proportion of the sample in 1cm^3 $1 \text{ (cm}^3\text{)}/0.032 \text{ (mm}^3\text{)} = 1000/0.032 \text{ (mm}^3\text{)} = 31 \text{ 250}$ 1 mark for correctly calculating the number of cells in 1cm^3 based on the cell count visible $31 \text{ 250} \times 9 \text{ cells} = 281 \text{ 250 (yeast cells)}$
		(ii)	yes because 281 250 is between 250 000 and 500 000 ✓	1	IGNORE yes alone ALLOW yes because (the cell count) is within/lies in the stated range ALLOW ECF from (c)(i)

	(d)	<p><i>marks only awarded for comparative statements</i></p> <ul style="list-style-type: none"> • haemocytometer is simpler/cheaper equipment ORA ✓ • haemocytometer requires less training for operative ORA ✓ • repeats easier to carry out to find mean/average with haemocytometer ORA ✓ • haemocytometer takes a shorter time to prepare sample for counting ORA ✓ • haemocytometer any mistakes in counting magnified many times ORA ✓ • haemocytometer each count must be completed manually/no way to speed up counting and flow cytometer once prepared is automated process ✓ • haemocytometer can differentiate between living and dead cells once stained and flow cytometer cannot differentiate between living and dead cells/cell count would be too high because dead cells counted ✓ 	<p>3</p>	<p>IGNORE references to hazards/safety as both methylene blue and fluorescent stains have similar hazards and risk assessments</p> <p>ALLOW gives a large standard error (or S.E.M.)</p> <p>2 ALLOW flow cytometer counts dead cells/doesn't only count living cells unlike haemocytometer when cells stained</p>
		Total	12	

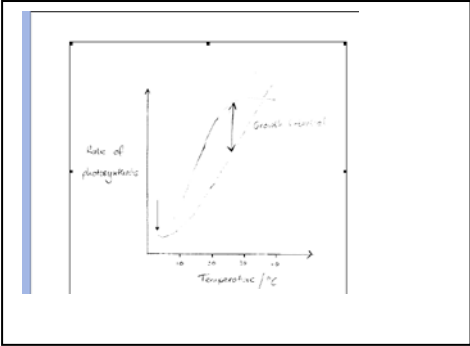
Question	Answer	Marks	Guidance
2 (a) *	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>In summary: Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.) Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Then, award the higher or lower mark within the level, according to the Communication Statement (shown in italics):</p> <ul style="list-style-type: none"> ○ award the higher mark where the Communication Statement has been met. ○ award the middle mark where aspects of the Communication Statement have been missed ○ award the lower mark where the Communication Statement has not been met. <ul style="list-style-type: none"> • The science content determines the level. • The Communication Statement determines the mark within a level. 		
	<p>Level 3 (7-9 marks) Details of apparatus and a method to produce bacterial colonies are provided. A thorough risk assessment is written which includes most of the high risk hazards and suitable control methods. The importance of aseptic technique is evident and most examples are given.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.</i></p> <p>Level 2 (4-6 marks) The apparatus and a method to produce bacterial colonies are provided although some details may be missing. There is an outline risk assessment including some control measures. Aseptic technique is evident and some examples are given.</p> <p><i>There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.</i></p>	9	<p>Indicative scientific points may include:</p> <p>Equipment correctly identified with a reason</p> <ul style="list-style-type: none"> • container/named container (e.g. Petri dish, flask, bottle, flat) because sterile/easily sterilised/lidded • culture medium because provides food/nutrients//water IGNORE moist • incubator because gives controlled optimum temperature • inoculating loop because allows for, accurate transfer/transfer of a small number/one colony, of bacteria • spreader because enables bacteria to be dispersed across/through medium • nutrient agar plates / broth because supplies the nutrients for bacterial growth <p>ALLOW references to different nutrient agars</p>

	<p>Level 1 (1–3 marks) The apparatus and an outline method are suggested which will allow for bacterial culture. A risk assessment is present but incomplete. Information about aseptic technique is limited.</p> <p><i>There is a logical structure to the answer. The explanation, though basic, is clear.</i></p> <p>0 marks No response or no response worthy of credit.</p>	<p>Aseptic technique</p> <ul style="list-style-type: none"> • flaming of flask/bottle neck • flaming of inoculation loop/spreader • keeping lids on culture dishes/flasks (when not in use) • keeping Petri dishes upside down • work next to Bunsen flame to carry away contaminating bacteria in convection current/rising hot air OR to stop bacteria in air from falling onto/contaminating plates <p>Method</p> <ul style="list-style-type: none"> • detail of removal of fluid from bottle and transfer to nutrient plate / broth • detail of streak plating after initial culture • incubation of sample/kept at constant optimum temperature • detail of selecting bacteria with differing colony morphology to separate bacterial species <p>Hazards identified with an appropriate control measure</p> <ul style="list-style-type: none"> • (zoonotic) bacteria (on surfaces/from fluid touched by hands – wear gloves • (zoonotic) bacteria (on surfaces/from fluid transferred to clothes – wear a lab coat/remove lab coat before exiting lab • flammable liquids/ethanol used (e.g. in irrigating during Gram staining/flaming) – ensure bottles/flasks kept away from ignition sources/Bunsen burner/flame • 100% ethanol used risks intoxication – use at arm’s length / use in a well-ventilated space
--	--	--

Question			Answer	Marks	Guidance
2	(b)	(i)	bacteria very small/too small to be seen with low power lens ✓	1	ALLOW because the bacteria are <u>only</u> 5 µm wide / shape of individual bacterium cannot be seen with LP IGNORE bacteria are small/bacteria can't be seen with a low power, lens/microscope
		(ii)	cells have <u>thin(ner)</u> (peptidoglycan) <u>cell walls</u> ✓	1	
2	(c)	(i)	Bacteria do not have a nucleus/nuclear membrane ✓	1	ALLOW bacteria only have a single/one chromosome (plus plasmids)
		(ii)	x 3000 ✓ ✓	2	ALLOW one mark for correct working [15 mm x 1000] / 5 µm
	(d)		D is largest clear zone (diameter) indicates more bacteria killed is not selected because this antibiotic is used as a last resort/with resistant strains ✓ (so) A is selected as next largest clear zone (diameter) / next largest number of bacteria killed, and inhibits protein synthesis / prevents bacteria, dividing/reproducing, without risk of selecting antibiotic resistant strains ✓	2	Candidates may describe A being tried and, if found not to work, vet has another antibiotic to choose. ALLOW if correct ref is also given to mode of action (second mark point only)
			Total	16	

Question			Answer	Marks	Guidance
3	(a)	(i)	Islet of Langerhans ✓	1	ALLOW Islets of Langerhans
		(ii)	<p><i>LP plan must only show regions of tissues with no cell detail</i></p> <p><i>In addition there should not be any shading or other detail within the plan</i></p> <p>sharp pencil AND straight label lines AND lines touch structures ✓</p> <p>ratios approx correct (islet should occupy approx 40-50% of width & 60-70% of height) AND shape of islet ✓</p> <p>Islet of Langerhans labelled and annotated AND non-endocrine tissue labelled and annotated ✓</p>	3	<p>DO NOT ALLOW if cells have been drawn (ONLY areas of tissue to be drawn)</p> <p>ALLOW Islets – though only one is visible, candidates may not appreciate that the word is a plural</p> <p>Examples of annotations may include: e.g. blue, many distinct circular nuclei e.g. brown, regions of non-cellular material, ducts visible</p>
	(b)	(i)	5.90 ✓	1	<p>IGNORE 5.9</p> <p>All other means in the table are given to 2 d.p. and candidates should be aware of this guidance (maths skills and practical skills handbooks)</p>
		(ii)	<p><i>idea of mean shows the central tendency of a data set ✓</i></p> <p><i>idea of blood glucose concentrations vary constantly ✓</i></p>	2	<p>ALLOW data needs to show variation</p> <p>ALLOW full range of figures needs to be shown</p> <p>IGNORE mean is an average</p> <p>ALLOW the purpose of insulin is to reduce variation rather than lower a mean</p>
		(iii)	<p>missed meal AND excessive exercise ✓</p>	1	<p>ALLOW <i>an idea of excessive exercise</i>, e.g. very long run, prolonged vigorous activity</p> <p>IGNORE exercise unqualified</p>

Question		Answer	Marks	Guidance
	(c)	biosensor ✓ reagent strips ✓	2	ALLOW blood glucose meter/glucometer ALLOW clinistrips/Clinistix/Diastix IGNORE references to glycosylated or glycolated haemoglobin / HbA1c
Total			10	

Question		Answer	Marks	Guidance
4	(a) (i)	compensation point clearly shown with an arrow ✓	1	point indicated where two graph lines touch at bottom left or top right e.g. 
	(ii)	rate of photosynthesis <u>limited</u> by low temperature AND cost of lighting uneconomic ✓	1	ALLOW symbols other than an arrow ALLOW (for second part of mp) cost of lighting / electricity / energy greater than profits made by crop production
	(iii)	to check that the temperature measured by the control system is accurate OR to ensure that the system switches off the light at the correct temperature ✓	1	ALLOW <i>idea of</i> matching actual data with measurements made by control system

Question	Answer	Marks	Guidance												
(b) (i)	expected results correctly calculated ✓ <table border="1" data-bbox="349 268 1113 411"> <thead> <tr> <th>F₁ phenotype</th> <th>Observed results</th> <th>Expected results</th> </tr> </thead> <tbody> <tr> <td>Smooth</td> <td>547</td> <td>549</td> </tr> <tr> <td>Wrinkled</td> <td>185</td> <td>183</td> </tr> <tr> <td>Total</td> <td>732</td> <td>732</td> </tr> </tbody> </table> Chi squared value correctly calculated ✓	F ₁ phenotype	Observed results	Expected results	Smooth	547	549	Wrinkled	185	183	Total	732	732	2	$\chi^2 = \frac{(547-549)^2}{549} + \frac{(185-183)^2}{183}$ $= 0.007 + 0.022$ $\chi^2 = 0.029$ <p>ALLOW one mark for correct working if Chi squared value is incorrect</p> $\chi^2 = \frac{(547-549)^2}{549} + \frac{(185-183)^2}{183}$ <p>ALLOW one mark for incorrect expected results used correctly in the equation to give a Chi squared value</p>
F ₁ phenotype	Observed results	Expected results													
Smooth	547	549													
Wrinkled	185	183													
Total	732	732													
(ii)	no significant difference between the observed and expected results / do not reject null hypothesis ✓ test/chi squared value is smaller than the critical value at p=0.05 ✓	2	To one degree of freedom ALLOW accept null hypothesis ALLOW ecf from 4(b)(i) at correct degree of freedom												
(iii)	heterozygote / heterozygous ✓ presence of wrinkled seeds in F1 ✓	2	ALLOW contains both dominant and recessive <u>alleles</u> IGNORE any letters used in place of alleles												
	Total	9													

Question			Answer	Marks	Guidance
5	(a)	(i)	the greater the body mass of the mammal the lower the VO_2 max/AW ORA ✓	1	
		(ii)	otter AND (otter is terrestrial but) spends much time underwater hunting prey so needs to use oxygen efficiently ✓	1	ALLOW because other similar sized mammals have much lower VO_2 max OR VO_2 max of that value should be smaller / lighter / lower mass ALLOW highly active ALLOW diving animal
		(iii)	range of values (of body mass), very large/too large to fit on (non-log) x-axis ✓	1	ALLOW will give a straight line (of best fit/graph)
	(b)		bar chart drawn with equal width bars, not touching AND x axis labelled as "Treatment" AND y axis labelled as " <u>Mean</u> VO_2 max ($cm^{-3} kg^{-1} min^{-1}$)" ✓ equidistant vertical scale used so that plot area covers at least 50% of the y axis space ✓ both means plotted accurately ✓ range bars plotted accurately ✓	4	IGNORE labels on bars showing "normal diet" or "carbohydrate loading" ALLOW units shown in brackets or with solidus ALLOW +/- 1 mm Normal diet mean = 39, range 37-41 Carb loading diet mean = 41, range 39-44
	(c)	*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><i>In summary:</i> <i>Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.) Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.</i> <i>Then, award the higher or lower mark within the level, according to the Communication Statement (shown in italics):</i></p> <ul style="list-style-type: none"> o <i>award the higher mark where the Communication Statement has been met.</i> o <i>award the lower mark where aspects of the Communication Statement have been missed.</i> <ul style="list-style-type: none"> • The science content determines the level. • The Communication Statement determines the mark within a level. 		

Question	Answer	Marks	Guidance
	<p>Level 3 (5–6 marks) Provides a comprehensive evaluation of the method used for obtaining the data. Most of the variables are considered, reproducibility and repeatability are commented on and validity is questioned.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.</i></p> <p>Level 2 (3–4 marks) Provides some evaluation of the method used for obtaining the data. Some of the variables are considered, reproducibility or repeatability is commented on and validity is considered.</p> <p><i>There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.</i></p> <p>Level 1 (1–2 marks) Provides a limited evaluation of the method used for obtaining the data. Some variables are omitted. A consideration is made of confidence and validity.</p> <p><i>There is a logical structure to the answer. The explanation, though basic, is clear.</i></p> <p>0 marks No response or no response worthy of credit.</p>	6	<p>Indicative scientific points may include</p> <p>Variables:</p> <ul style="list-style-type: none"> • sex of athlete • mass of athlete • training regime • fitness of athlete <p>Confidence</p> <ul style="list-style-type: none"> • only one athlete • lacks reproducibility • has limited repeatability • small number of data points (for stats test) <p>Validity</p> <ul style="list-style-type: none"> • only one athlete, extrapolation unjustified • sex of athlete, extrapolation unjustified • mass of athlete may not be constant • training regime not detailed • limited detail of carbohydrate- loading regime • method may not be appropriate to reach expected outcomes
	Total	13	