Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

BIOLOGY **5090/22**

Paper 2 Theory **May/June 2018**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Mark schemes will use these abbreviations:

;	separates marking points
/	alternatives
()	contents of brackets are not required but should be implied
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
Ig	ignore (for incorrect but irrelevant responses)
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by candidate
+	statements on both sides of the + are needed for that mark

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>letter</th><th>name of structure</th><th>function</th></tr>
<tr><td>(A)</td><td>sepal / calyx ;</td><td>protect ;</td></tr>
<tr><td>(B)</td><td>petal / corolla ;</td><td>attract / landing platform ;</td></tr>
<tr><td>(C)</td><td>stamen / anther ;

or

filament ;</td><td>produces / contains AW +
pollen / male gamete / male nucleus ;

support anther ;</td></tr>
<tr><td>(D)</td><td>ovary / carpel / pistil ;</td><td>produces / contains AW +
ovum / ovule / egg / female gamete ;

or

forms AW fruit / site of fertilisation ;</td></tr>
</table>
</td><td>8</td><td></td></tr>
<tr><td>1(b)(i)</td><td>1 one or more vascular bundles + each oval shaped + location correct ;

2 ‘xylem’ labelled on inside + ‘phloem’ labelled separately on outside of at least one oval vascular bundle ;</td><td>2</td><td></td></tr>
<tr><td>1(b)(ii)</td><td>1 transports / carries AW + water / ions / minerals ;

2 support ;</td><td>1</td><td>A named ion</td></tr>
</table>

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Question	Answer	Marks	Guidance
2(a)(i)	coronary artery ;	1	
2(a)(ii)	coronary heart disease / heart disease / CHD / atherosclerosis / cardiac disease / arteriosclerosis / angina ;	1	
2(a)(iii)	**1** fat / oil / cholesterol **+** diet **AW** ; **2** stress **AW** ; **3** smoking ; **4** genetics / inheritance **AW** ; **5** lack of exercise ; **6** old age ; **7** obesity ;	3	**A** 'anxiety' / 'depression' for point **2**
2(a)(iv)	**1** heart attack **AW** / heart stops / angina **AW** / breathlessness ; **2** less blood **+** to body / tissues / organs or any named ; **3** less oxygen/ glucose **+** to body / tissues / organs or any named ; **4** less aerobic respiration **or** more anaerobic respiration ; **5** production of lactic acid ; **6** less ability **AW** **+** of heart to contract / pump blood ; **7** less ability **AW** **+** to carry out physical activity ;	5	

Question	Answer	Marks	Guidance
2(b)	*(inflating the balloon)* **1** opens metal mesh **AW ;** **2** push / compress **+** blockage / fat **;** **3** widen **AW** **+** blood vessel / lumen **AW ;** *(leaving the hollow metal mesh in the blood vessel)* **4** maintain **AW** **+** wider lumen **AW ;** **5** increase **AW** **+** blood flow **;**	**3**	

Question	Answer	Marks	Guidance
3(a)(i)	**1** distance from eye increases **+** thickness / width of lens decreases **or** inverse **;** **2** up to 150 **+** cm **or** up to 2.6 **+** mm **or** then constant **AW ;**	**2**	**A** distance from eye decreases **+** thickness / width of lens increases
3(a)(ii)	**1** ciliary **;** **2** muscles **+** relax **;** **3** suspensory ligaments **;** **4** ligaments **+** tighten / taut **AW ;** **5** lens **+** pulled / stretched **;**	**4**	
3(b)	(*if convex stated*) **no mark for convex** **1** light **+** rays **;** **2** increased / more **+** refraction / bending **;** **3** before entering eye **;** **4** converge / meet **+** on retina / fovea **;** **5** object / image **+** clear / in focus **;** **OR** (*if concave, i.e. incorrect,* ***or*** *no type of lens stated*) **6** reference to light rays **+** refraction **AW +** before entering eye **;**	**3**	

Question	Answer	Marks	Guidance
4(a)(i)	**1** no fertiliser **+** yield is 200 (kg / hectare crop yield) **;** **2** increased / more crop yield **;** **3** reference to 150 (kg / hectare fertiliser) **or** 5600 (kg / hectare crop yield) **;** **4** high fertiliser / above 150 **+** no increase in crop yield **;**	**3**	
4(a)(ii)	**1** root hair **;** **2** active transport / against concentration gradient / diffusion / down concentration gradient **;** **3** production **AW** of **+** amino acids / protein **;** **4** increased **AW** **+** growth **;**	**3**	
4(a)(iii)	**1** run-off / leaching **AW** **;** **2** eutrophication **or** correct description of process **;** **3** harm to animals **;** **4** high cost / expensive **;** **5** possible economic return not beneficial over increased cost **AW** **;**	**3**	**A** harm to named animal / 'aquatic life'

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4(b)</td><td>
<table>
<tr><th>1 (ion)</th><th>2 (importance)</th></tr>
<tr><td>magnesium ;</td><td><u>chlorophyll</u> ;</td></tr>
<tr><td>phosphate ;</td><td>DNA / RNA / membranes ;</td></tr>
<tr><td>sulfate ;</td><td>amino acids / proteins ;</td></tr>
<tr><td>calcium ;</td><td>cell walls ;</td></tr>
<tr><td>iron ;</td><td><u>chlorophyll</u> ;</td></tr>
<tr><td>potassium ;</td><td>enzymes ;</td></tr>
</table>
</td><td>2</td><td>note point 2 is to be awarded only if point 1 has been awarded credit

note importance in point 2 must be correct for ion named in point 1</td></tr>
<tr><td>5</td><td>
<table>
<tr><th>contains an organ which</th><th>region or regions</th></tr>
<tr><td>… produces an acidic secretion</td><td>(R)</td></tr>
<tr><td>… contains villi</td><td>R / S ;</td></tr>
<tr><td>… digests protein</td><td>R / S ;</td></tr>
<tr><td>… produces insulin</td><td><u>R</u> ;</td></tr>
<tr><td>… contains bronchi</td><td><u>Q</u> ;</td></tr>
<tr><td>… secretes amylase</td><td><u>P + R</u> ;</td></tr>
<tr><td>… ingests food</td><td><u>P</u> ;</td></tr>
</table>
</td><td>6</td><td>R incorrect letter in any box</td></tr>
</table>

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Question	Answer	Marks	Guidance
6	*(**T**)* **1** palisade ; **2** chloroplasts / chlorophyll ; **3** absorb **AW** **+** light ; *(**U**)* **4** phloem ; **5** transport **AW** / translocate **+** sugars / sucrose / amino acids ; **6** from source to sink **ORA** **or** from named location to named location ; *(**V**)* **7** spongy ; **8** air / intercellular **+** spaces ; **9** gas exchange / diffusion **AW** ; **10** carbon dioxide **+** in **or** oxygen **+** out ; **11** chloroplasts / chlorophyll ; **12** absorb **AW** **+** light ; *(**W**)* **13** stoma / stomata ; **14** guard cell ; **15** open / close ; **16** transpiration **+** supply of water ;	**10**	**Note** marking points must **not** be transferred between the sections of this question **R** xylem in point **4** **A** marking points **9** and **10** under *(**W**)*

Question	Answer	Marks	Guidance
7(a)	**1** inherited / genetic **AW ;** *(Down's syndrome)* **2** mutation **+** chromosome **;** **3** reference to chromosome 21 **;** **4** one extra **or** 3 instead of 2 **or** 47 not 46 **or** 24 not 23 in **+** gamete/egg/sperm **;** *(sickle cell anaemia)* **5** mutation **+** gene **;** **6** homozygous recessive / two recessive alleles **;**	**3**	
7(b)(i)	**1** I^BI^O **+** I^AI^O **or** BO **+** AO **;** **2** I^B **+** I^O **+** I^A **+** I^O **or** B **+** O **+** A **+** O **or** gametes correct for stated parent genotypes **;** **3** I^AI^B **+** I^BI^O **+** I^AI^O **+** I^OI^O **or** AB **+** BO **+** AO **+** OO **or** possible genotypes of child correct for stated gametes **;** **4** AB **+** B **+** A **+** O **or** possible blood groups of child correct for stated genotypes **;**	**4**	**Allow** any order within each marking point
7(b)(ii)	*(same sex)* 50% / half / ½ / 0.5 / 2 in 4 / 1 in 2 / 1:1 **;** *(same blood group)* 25% / quarter / ¼ / 0.25 / 1 in 4 / 1:3 **;**	**2**	
7(b)(iii)	codominance / codominant **;**	**1**	**R** incomplete dominance

Question	Answer	Marks	Guidance
8(a)	**1** enzymes ; *(yoghurt)* **2** bacteria / *Lactobacillus* / *Streptococcus* ; **3** sugar / lactose **+** milk ; **4** production **AW +** of acid **or** reduction in pH ; **5** thickens / curdles / coagulates / reference to taste ; *(bread)* **6** fungus/ yeast / *Saccharomyces* ; **7** anaerobic **+** respiration **or** fermentation ; **8** production **AW +** carbon dioxide ; **9** rising ;	**6**	**A** once for **either** *yoghurt* **or** *bread*
8(b)	**1** genetic **+** engineering / modification ; **2** bacteria / fungus / named bacteria / named fungus ; **3** reference to insulin <u>gene</u> ; **4** from human **+** DNA / chromosome / genome ; **5** to bacterial / fungal **+** DNA / chromosome / genome / plasmid ; **6** <u>fermenter</u> ; **7** reproduce / multiply / divide / mitosis / binary fission ;	**4**	

Question	Answer	Marks	Guidance
9(a)	**1** broken down / hydrolysed **;** **2** (to) small / smaller / simpler **+** molecules **;** **3** soluble / dissolve **;** **4** (to enable) absorption **;** **5** (by) diffusion / active transport **;** **6** into **+** blood / capillaries **;** **7** into **+** lymph/ lacteal **;** **8** (to enable) assimilation **or** named small to named large molecule **;**	**4**	

Question	Answer	Marks	Guidance
9(b)	*(**either** liver **or** pancreas)* **1** neutralisation **;** **2** optimum **AW** pH for enzyme activity **or** avoid denaturation of enzymes **;** *(liver **only**)* **3** bile **;** **4** emulsification **+** fats **or** large fat droplets into smaller droplets **AW ;** **5** increased surface area **;** **6** lipase **+** production **AW** of fatty acids **and** glycerol **;** *(pancreas **only**)* **7** production / release **+** enzymes **;** **8** protease / trypsin / lipase/ amylase **;** **9** named substrate **+** named products for a correct named enzyme **;** **10** production of **+** alkali / hydrogencarbonate / bicarbonate **;**	**6**	**maximum** 4 marks for *liver* **maximum** 4 marks for *pancreas*

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