Cambridge Assessment International Education

Cambridge IGCSE™

BIOLOGY **0610/41**

Paper 4 Theory (Extended) **October/November 2020**

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.

Cambridge International is publishing the mark schemes for the October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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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.

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.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	<u>'List rule' guidance</u> For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Abbreviations used in the Mark Scheme

- **;** separates marking points
- / separates alternatives within a marking point
- **R** reject
- **I** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- AW alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- max indicates the maximum number of marks that can be awarded
- ecf credit a correct statement that follows a previous wrong response
- ( ) the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- AVP any valid point

Question	Answer	Marks	Guidance
1(a)	osmosis **;** solvent **;**	**2**	
1(b)	*drawing with:* arrow showing water movement into cell **;** *max. two from:* no space between cell membrane and cell wall **;** cell wall, slightly bent outwards / straight **;** vacuole larger in proportion than in Fig 1.1 **;**	**3**	
1(c)	wilting **;** lack of turgor pressure (at the end of the week) **; ora** no longer a push against cell wall **/** AW **; ora** (mesophyll) cells not providing support / cell collapses / AW **;** (lack of water means cells become) <u>flaccid</u> / <u>plasmolyse</u> **;**	**3**	

Question	Answer	Marks	Guidance
2(a)	**Q /** pathogen, are recognized as foreign **;** **Q /** pathogen, will have specific / unique / AW, antigen **;** **S** and **R** are white (blood) cells **;** **S** / lymphocytes, make antibodies **;** **T** are antibodies **;** **T** / antibodies are as specific shape / complementary to, antigen / pathogen / Q **;** **T** / antibodies bind to, antigen / pathogen / Q **;** ref. to forming memory cells **;** ref. to, active / long-term, immunity **;** **R /** phagocytes, engulf, pathogens / antigens **;** **R /** phagocytes, have enzymes / digest pathogens OR antigens **;** **AVP ;**	**6**	
2(b)	*support of conclusion:* general decrease, from 1942 / vaccination **;** cases do not return to pre-vaccine levels / AW **;** no cases from 1974 **;** *against conclusion:* number of cases increased, (during the 2 years) after the vaccine was introduced / until government made its conclusion **;** took 32 years after vaccine introduced before no cases of disease **;** but there are (small) peaks (in cases) / fluctuation (in cases) **;** comparative data quote **;**	**4**	
3(a)(i)	*any one from:* nucleus **;** membrane-bound (named) organelle / has internal membranes **;** vesicles **;** no cell wall **;**	**1**	
3(a)(ii)	(cell) membrane **;** controls what, enters / leaves, the cell **;**	**2**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3(a)(iii)</td><td>diffusion (through cell membrane / A) ;</td><td>1</td><td></td></tr>
<tr><td>3(b)</td><td>any three from:
breakdown of (excess) amino acids ;
(by) deamination ;
removal of nitrogen containing part (of amino acid) ;
in the liver ;</td><td>3</td><td></td></tr>
<tr><td>3(c)(i)</td><td>X marked on either kidney in the outer / edge region ;</td><td>1</td><td></td></tr>
<tr><td>3(c)(ii)</td><td>
<table>
<tr><th>function</th><th>name of structure</th><th>letter from Fig. 3.2</th></tr>
<tr><td>organ that stores urine</td><td>bladder</td><td>G ;</td></tr>
<tr><td>tube that carries urine out of the kidney</td><td>ureter</td><td>F ;</td></tr>
<tr><td>blood vessel with the lowest concentration of urea</td><td>renal vein</td><td>D ;</td></tr>
<tr><td>blood vessel with the lowest concentration of carbon dioxide</td><td>renal artery</td><td>E ;</td></tr>
<tr><td>tube that carries urine out of the body</td><td>urethra</td><td>H ;</td></tr>
</table>
</td><td>5</td><td>one mark per correct row</td></tr>
<tr><td>3(d)(i)</td><td>any two from:
sweat more / lost more water (while running) ;
do not drink as much / reduced intake of water (while running) ;
ref. to homeostasis / negative feedback ;
AVP ;</td><td>2</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
3(d)(ii)	9(%) **;;;**	**3**	MP1 correct values selected i.e. 78.2 and 85.6 MP2 correct calculation MP3 correct rounding to one significant figure **ecf** for MP2 and MP3 for incorrect MP1
3(d)(iii)	*any three from:* salts are in the blood / move from the blood into the tubule / AW **;** ref. to glomerulus **;** (ultra)filters / allows through **;** pores / gaps, in capillary wall / narrow capillaries **;** small molecules are filtered / large are not filtered / AW **;** (some salt) reabsorption **;** ref. to active transport / diffusion **;** excess (salt) remains in the, urine / filtrate **;** AVP **;**	**3**	
3(e)	*any one from:* fibrinogen / fibrin **;** (named) hormone **;** antibodies **;**	**1**	

Question	Answer	Marks	Guidance
4(a)(i)	*any three from:* large / obvious / AW, petals / sepals **;** anthers / stigmas, inside flower **;** filaments are stronger / thicker / AW **;** pollinators must touch anthers, to reach nectar / AW **;** sticky stigma **;** pollen, large **;** pollen, sticky **/** spiky **;** AVP **;** honey guides / landing platforms / mimic insects	**3**	
4(a)(ii)	anther **;**	**1**	**A** stamen
4(a)(iii)	meiosis / reduction division **;**	**1**	
4(a)(iv)	*any one from:* so that diploid number restored (after fertilisation) / AW **;** to enable sexual reproduction **;** (so that the offspring) are genetically different / to allow variation **;**	**1**	
4(b)(i)	*any five from:* pollen transferred to stigma **;** ref to (pollen) <u>tube</u> **;** (pollen) tube, growth / germination **;** (pollen tube grows) down style **;** (pollen tube) enters ovule **;** (ovule is) in the ovary / carpel **;** pollen / male, <u>nucleus</u> fuses with ovule / female, <u>nucleus</u> **;** ref. to fertilisation **;** to form zygote **;** (zygote divides by) mitosis to form an embryo **;** AVP **;** e.g. (fertilised) ovule becomes the seed	**5**	MP4 **A** pollen nucleus moves down style

Question	Answer	Marks	Guidance
4(b)(ii)	*any two from:* allows, variation / genetic diversity **;** plant more likely to survive (named) environmental change **;** resistance to disease **;** (ability to) evolve **;** ref. to fitness **;** AVP **;**	**2**	
4(c)(i)	*any one from:* grow, GM / wild varieties, in glasshouses **;** cover flowers **;** remove stamens **;** plant another species around the crop **;** make a large, gap / wall, around the field **;** use sterile GM plants **;** grow female plants (only) **;** AVP **;**	**1**	MP1 **A** isolate plants
4(c)(ii)	*any two from:* confer resistance, to a (named) factor **;** provide additional, nutrients / AW (to humans) **;** improved, shelf life / flavour **/** yield / AW **;** environmental protection idea **A** less use of pesticides / pollution **;** AVP **;**	**2**	

Question	Answer	Marks	Guidance
5(a)	*calcium:* (formation of) bones **;** (formation of) teeth **;** prevents rickets **;** **AVP ;** *protein:* repair, cells / tissues **;** growth **;** used to make, muscle / enzyme / antibodies / protein, channels / carrier **;** prevents marasmus **;** **AVP ;**	**4**	max. three from either section
5(b)	*any two from:* salivary glands **;** stomach **;** pancreas **;** small intestine / named part of small intestine **;**	**2**	
5(c)(i)	kills, bacteria / microorganisms / pathogens **;**	**1**	
5(c)(ii)	*any two from:* (heat) denatures enzymes **;** so lactose, not broken down / not digested **;** changes shape of active site **;** enzyme will not fit substrate **;**	**2**	MP2 **A** not optimum temperature, for digestion / AW
5(c)(iii)	lactase **;**	**1**	

Question	Answer	Marks	Guidance
5(c)(iv)	*any one from:* can reuse the enzyme ; cheaper ; no enzymes left in milk ; so milk does not need to be purified ; AVP ; e.g. enzymes more stable / less likely to denature / affects taste / drinking the enzyme might trigger allergies	**1**	**ora** throughout
5(d)(i)	*any four from:* contains antibodies / ref. to colostrum / provides protection against, pathogens / diseases / microorganisms ; provides passive immunity ; nutrient requirements met / change with age / change with development ; easy to digest / AW ; no additives / less risk of allergies ; sterile / less risk of infection / AW ; is at, body / correct, temperature ; no preparation / always available / convenient ; bonding with mother / AW ; free / cheap ; idea of volume is controlled / no over-feeding ; AVP ;	**4**	
5(d)(ii)	*any two from:* water needed to, produce breast milk / stay hydrated / AW ; alcohol can pass to the baby in breast milk / AW ; alcohol can harm / delay development of, baby / AW ; AVP ;	**2**	
6(a)	(the ability to) detect <u>stimuli</u> (in the internal / external environment) ; to make (appropriate) responses ;	**2**	
6(b)(i)	groups of receptor cells ; responding to specific stimuli ;	**2**	

Question	Answer	Marks	Guidance
6(b)(ii)	action / structure relaxes / circular muscles (of the iris) ; contracts / radial muscles (of the iris) ; widens / pupil ;	3	