Cambridge Assessment International Education

Cambridge IGCSE™

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 80

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

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

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level 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 'List rule' guidance (see examples below)

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.

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>any three from:
protein synthesis ;
transport in the phloem ;
cell division / mitosis / meiosis ;
active transport / absorption of ions (from the soil) ;
growth ;
movement / muscular contraction ;
sensitivity ;
nerve impulses ;
AVP ;;;</td><td>3</td></tr>
<tr><td>1(b)</td><td>one mark per correct row
<table><tr><th>function</th><th>name of structure</th><th>letter from Fig. 2.1</th></tr><tr><td>pushes food through the stomach</td><td>oesophagus</td><td>A</td></tr><tr><td>assimilation of amino acids to produce plasma proteins</td><td>liver</td><td>K</td></tr><tr><td>storage of bile</td><td>gall bladder</td><td>L</td></tr><tr><td>secretion of insulin</td><td>pancreas</td><td>C</td></tr><tr><td>absorption of fatty acids and glycerol</td><td>small intestine</td><td>H / D</td></tr><tr><td>secretion of pepsin</td><td>stomach</td><td>B</td></tr><tr><td>digestion of starch</td><td>small intestine</td><td>H / D</td></tr></table>;;;;;;</td><td>6</td></tr>
</table>

Question	Answer	Marks
1(c)	*any two from:* lactic acid is produced, in muscles / during exercise ; by anaerobic respiration ; liver absorbs lactic acid from the blood ; (aerobic) respiration / oxidation / breakdown, of lactic acid ; to carbon dioxide and water ;	**2**
1(d)	any substance taken into the body ; that modifies or affects chemical reactions in the body ;	**2**
1(e)(i)	*any two from:* depressant ; lengthens reaction time(s) ; reduces self-control ; any appropriate effect on the nervous system described ; AVP ;	**2**
1(e)(ii)	*any two from:* addiction ; liver damage ; AVP ;;	**2**
1(f)(i)	*any two from:* miscarriage ; premature birth ; low birth weight ; addiction / dependence ; fetal alcohol syndrome (FAS) ; AVP ;	**2**

Question	Answer	Marks
1(f)(ii)	*any two from:* nicotine ; pathogens / virus ; any example ; e.g. HIV / rubella (named) heavy metal(s) ; e.g. lead / mercury carcinogen(s) ; (named) toxin(s) ; e.g. pesticides (named) medicinal drugs ; (named) misused (illegal) drugs ; e.g. heroin	**2**

Question	Answer	Marks
2(a)(i)	population in 1940 = 20 million, population in 2018 = 136 million ; 580% ;;	**3**
2(a)(ii)	*any three from:* increase in birth rate / decrease death rate ; immigration ; increased food supply ; reduced poverty ; **ora** better housing / sanitation / health care / vaccination / AW ; AVP ;	**3**
2(b)(i)	by yeast ; (using) anaerobic respiration ;	**2**

Question	Answer	Marks
2(b)(ii)	*any four from:* deforestation ; loss in (variety) of, habitat / places where organisms live / described ; disruption to food chains / described ; loss of (bio)diversity / (local) extinction of species / species become endangered / AW ; soil erosion / increased risk of landslides / flooding ; disrupted nutrient cycling ; decrease in (soil) water / desertification ; outbreaks / spreading, of crop diseases ; outbreaks / spreading, of (named) pests ; overuse of herbicides ; overuse of, pesticides / insecticides / AW ; killing of non-target species ; pollution of waterways by, plant nutrients / fertilisers ; pollution of the atmosphere by NOx from fertilisers ; pollution by use of fossil fuels in machinery ; AVP ;	**4**

Question	Answer	Marks
3(a)	transmission of genetic information from generation to generation ;	**1**
3(b)(i)	**Tt** ; **tt** ; **TT** / **Tt** ;	**3**
3(b)(ii)	cats **3** and **4** are homozygous recessive / do not have the allele for polydactyly ;	**1**
3(c)(i)	*any two from:* cats with normal number of toes have AGA for bases 7, 8 and 9 ; cats with polydactyly have GGA or AGT ; bases 7 and 9 are different / base 7 is G not A in the USA cats / base 9 is T not A in the UK cats ;	**2**
3(c)(ii)	mutation ;	**1**

Question	Answer	Marks
3(c)(iii)	origin of the cat was USA ; base sequence is the same as the other cats from the USA / they have the same, mutation/base sequence, as the Oregon and Missouri cats ;	2
3(d)	T A A T A T T A G C C G G C T A G C ;	1
3(e)	distinct, phenotypes / categories ; no intermediates / phenotypes not on a continuous scale ;	2

Question	Answer	Marks
4(a)(i)	*any four from:* deep roots / AW ; to absorb water from the water table / AW ; long and spread out below the surface ; to absorb water when it rains ; root cells have low water potential ; to absorb water by osmosis ; from (very) salty soils / AW ; roots branch many times ; have many roots hairs ; to give a large surface area (for absorption of water) ;	**4**
4(a)(ii)	*any three from:* few stomata / low stomatal density ; sunken stomata ; stomata close during the day and open at night ; rolled leaves ; thick epidermis / thick cuticle ; few / no / small, leaves ; hairs on leaves ; low rates of transpiration ; AVP ;;	**3**
4(a)(iii)	*any two from:* make / store, toxins ; make / store, foul-tasting substances / AW ; spines / prickles / needles ; resins (that trap insects) ; thick (inedible) leaves ; AVP ;;	**2**

Question	Answer	Marks
4(b)	*any three from:* reduce air pollution ; reduce emissions of, sulfur dioxide ; use filters / 'scrubbers' on chimneys ; catalytic converters ; reduce use of (named) fossil fuel(s) ; example of way to reduce demand for energy ; use low-sulfur (fossil) fuels ; use alternative sources of power ; add lime to soils ; to reduce mobilisation of aluminium in soils / AW ; to raise pH of soils ; AVP ;	**4**

Question	Answer	Marks
5(a)	*any two from:* nucleus / nuclear membrane / nuclear envelope ; (linear) chromosomes ; mitochondrion ; endoplasmic reticulum ; vacuoles / vesicles ; AVP ;	**2**

Question	Answer	Marks
5(b)	*any six from:* resistance arises by mutation ; in small number of bacteria ; ref. to a random event (not related to presence of antibiotic) ; antibiotic kills bacteria that do not have the mutation / AW ; resistant bacteria have no competition ; resistant bacteria reproduce ; pass on, gene / allele, for resistance ; natural selection ; method of transmission from one person to another described ; gene transferred to other bacteria (of different type) in a plasmid ; AVP ;	**6**
5(c)	*any three from:* prescribe / use, antibiotics less often ; do not use for, viral / fungal, infections ; make sure people complete the course of antibiotics / AW ; develop new antibiotics ; do not use the same antibiotics for too long / rotate antibiotics / AW ; use combinations of antibiotics ; AVP ;; e.g. isolation of patients with antibiotic-resistant infections / good hygiene to prevent spread of infection / reduce use of antibiotics in farming	**3**

Question	Answer	Marks
6(a)	*any three from:* if crops are used as food for humans fewer trophic levels in the food chain ; energy lost at each trophic level in the food chain ; 90% energy lost / only 10% energy passed on ; energy is lost from the cattle ; any two examples of energy loss from cattle ;; therefore less energy available to humans ; AVP ;	**3**
6(b)	*any four from:* smell / visual pollution ; increase risk of water-borne disease ; increase organic content of, rivers / lakes ; increase growth of, bacteria / decomposers ; bacteria / decomposers, use up dissolved oxygen ; death of (named) organisms that rely on dissolved oxygen ; eutrophication ; adds, urea / ammonia ; increases plant growth ; AVP ;;	**4**
6(c)	*any three from:* lack of food supply / unequal distribution of food ; wars / sudden immigration, with inadequate resources for the population ; drought / floods, destroy crops / kill livestock ; disease in, food plants / animals ; poverty ; AVP ;;	**3**