Cambridge Assessment International Education

Cambridge IGCSE™

SUBJECT **0610/42**

Paper 4 Theory **March 2024**

MARK SCHEME

Maximum Mark: 80

Pre-standardisation

Updated Post Vetting
July 2023

This document consists of **12** printed pages.

Please read the MARK SCHEME STANDARDISATION – EXPLANATORY DOCUMENT before editing your Mark Scheme, and ensure that you are using the correct template for your subject/qualification/ component. Please delete this paragraph after reading.

Cambridge Assessment International Education – 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 descriptions 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 descriptions for the question
- the specific skills defined in the mark scheme or in the generic level descriptions 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 descriptions.

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 descriptions 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.

Examples of how to apply the list rule

State **three** reasons … [3]

A	1. Correct	✓	**2**
	2. Correct	✓	
	3. Wrong	×	

B	1. Correct, Correct	✓, ✓	**3**
(4 responses)	2. Correct	✓	
	3. Wrong	ignore	

C	1. Correct	✓	**2**
(4 responses)	2. Correct, Wrong	✓, ×	
	3. Correct	ignore	

D	1. Correct	✓	**2**
(4 responses)	2. Correct, CON (of 2.)	×, (discount 2)	
	3. Correct	✓	

E	1. Correct	✓	**3**
(4 responses)	2. Correct	✓	
	3. Correct, Wrong	✓	

F	1. Correct	✓	**2**
(4 responses)	2. Correct	✓	
	3. Correct CON (of 3.)	× (discount 3)	
G	1. Correct	✓	**3**
(5 responses)	2. Correct	✓	
	3. Correct Correct CON (of 4.)	✓ ignore ignore	
H	1. Correct	✓	**2**
(4 responses)	2. Correct	×	
	3. CON (of 2.) Correct	(discount 2) ✓	
I	1. Correct	✓	**2**
(4 responses)	2. Correct	×	
	3. Correct CON (of 2.)	✓ (discount 2)	

Question	Answer	Marks	Guidance
1ai	(substance that) increase the rate of a reaction ; not (permanently) changed by the reaction / not used up in the reaction ;	**2**	
1aii	carbon **and** hydrogen **and** oxygen ; nitrogen ;	**2**	**A** C, H, O **A** N
1b	*any six from:* *description* activity, is 0 / stops, at high and low pH ; activity increases and then decreases (as pH increases) / reaches a peak ; peak / maximum / optimum / 100%, activity, at pH 7 ; steeper increase between pH 5 – 6 / steeper decrease in activity between pH 8 - 9 ; lipase / enzyme, is active between pH 3.8 and pH 10.2 ; *explanation* (change in) pH affects shape of, lipase / active site / enzyme ; at pH 7, most enzyme-substrate complexes form / AW ; (active site) complementary to shape of substrate / substrate shape fits ; at, low / high / extremes of, pH, enzyme is denatured ; ref to substrate molecules can no longer bind with enzyme (at low / high / extreme pH, so activity decreases) ; AVP ;	**6**	**A** fewer substrate molecules and enzymes bind
1ci	fats / oils ; fatty acids **and** glycerol ;	**2**	**A** lipid
1cii	*any three from:* bile ; produced by the liver / (released from) the gall bladder ; alkaline mixture ; neutralises, gastric juices / stomach acids ;	**3**	**A** pancreatic juice

Question	Answer	Marks	Guidance
2ai	**R** drawn on the right ventricle i.e. left-hand side of heart diagram on the page;	**1**	
2aii	**A** atrioventricular valve ; **B** semilunar valve ;	**2**	
2aiii	(left) ventricle ; rest of the body / AW / named organ ;	**2**	**R** lungs **I** heart
2b	*any three from:* hole in septum ; left atrium joined to right atrium / AW ; oxygenated blood mixes with deoxygenated blood ; less oxygen in blood pumped out of left ventricle ; less oxygen to tissues / AW ;	**3**	
2ci	*any four from:* both aerobic and anaerobic increase at the start ; anaerobic energy increases more rapidly ; anaerobic then decreases after 20 s ; at 60 s % energy from aerobic equals anaerobic / AW ; aerobic increases but remains high / aerobic doesn't decrease ; comparative data quote ;	**4**	e.g. sum of aerobic and anaerobic is 100% / aerobic produced 4 times more energy than anaerobic after 100 s
2cii	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$;;	**2**	one mark for correct formulae one mark for balancing
2ciii	lactic acid ;	**1**	
3ai	gravitropism / geotropism ;	**1**	

Question	Answer	Marks	Guidance
3aii	*any three from:* auxin ; made in shoot tip ; diffuses / moves, away from tip/downwards ; accumulates on lower side of the stem ; stimulates cell elongation ;	**3**	
3b	*any two from:* (water needed) for photosynthesis ; for supporting tissues ; as a solvent in cells ; as a transport medium ;	**2**	
3c	correctly identify values from graph ; complete the correct calculation ; answer expressed to 2 decimal places ;	**3**	(48 hours = 9 mm and 96 hours=25 mm) (16/9)*100 = 177.777777777 177.78(%)
4a	**R** oestrogen ; **S** LH ;	**2**	
4b	ovulation 13-16 ; menstruation 1-8 ;	**2**	**A** single number answer within the range **A** anything in range 1-11
4c	concentration of progesterone increases/ plateaus, at the peak / after day 24 ; to thicken uterine lining / to help implantation of egg / prevent ovulation ;	**2**	**A** increases / increases and plateaus **R** decreases
4d	*during a menstrual cycle* - corpus luteum / ovary ; *during pregnancy* – corpus luteum / ovary / placenta ;	**2**	**A** yellow body for corpus luteum Adrenal gland?
4e	*any one from:* stimulates ovaries to release oestrogen : stimulates eggs to mature in the ovary ;	**1**	

Question	Answer	Marks	Guidance
5ai	*any two from:* large petals ; petals form a landing platform ; spotted pattern (to attract insects) ;	**2**	**I** colour **I** anthers inside the flower / anthers not visible
5aii	*any four from:* *advantages* increases variation ; increases ability to adapt to changing environment ; ability to colonise a new habitat ; makes the population less susceptible to a, disease / pest / AW ; *idea of* seed dispersal means there is less competition for parent plant ; *disadvantages* requires two parents ; *idea of* limited success for isolated individuals ; requires, pollination / pollinators ; takes longer / cannot quickly take advantage of favourable conditions ;	**4**	
5bi	301 ; cm^2 ;	**2**	
5bii	plants in Europe have a greater leaf area than those in North America ;	**1**	**A** ecf from (b)(i)
5biii	*any five from:* natural selection ; genetic variation within the population ; struggle to survive ; competition for, resources / light ; greater chance of survival of better adapted plants ; larger leaves are a better adaptation ; these individuals pass on their alleles ; this occurs over many generations ;	**5**	

Question	Answer	Marks	Guidance
6ai	*any two from:* phytoplankton are producers / they photosynthesise; photosynthesis uses carbon dioxide ; photosynthesis requires light energy ;	**2**	
6aii	decomposer / organism that eats waste organic material / AW ;	**1**	**A** detritivore
6aiii	*any two from:* respiration ; combustion ; decomposition / decay ;	**2**	
6aiv	*any three from:* carbon dioxide is a greenhouse gas ; increases temperature of atmosphere / global warming / climate change ; enhanced greenhouse effect ; named example of effect of climate change e.g. sea level increase / flooding / drought / habitat loss / reduced biodiversity ;	**3**	
6bi	middle layer of pyramid labelled ;	**1**	**A** any unambiguous indication
6bii	*any three from:* energy is lost at each trophic level ; respiration / excretion / movement / inedible parts / egestion / (named) metabolic processes ;; *idea of* insufficient energy to support more than five trophic levels ; idea that small percentage of energy from Sun is 'fixed' by photosynthesis / most energy from Sun not available / reference to wrong wavelength; ref. to 10% energy transfer / ora (per trophic level); ref. to (small) total percentage reaching fifth trophic level (cumulative idea);	**3**	Is full explanation (e.g. MP3) needed for full marks?
6biii	*any two from:* shows actual energy transfer ; allows ecosystems to be compared ; not all, species / biomass have the same energy content ;	**2**	

Question	Answer	Marks	Guidance
6ci	produced as rapidly as it is used ; so that it does not run out ;	**2**	
6cii	*any **one** from paired method and explanation:* closed seasons ; allows fish to breed ; education ; encourages people not to overfish ; protected areas ; allows juveniles to grow / provides safe breeding grounds / provides stocks that can migrate and restock other areas ; controlled net types ; prevents overfishing ; controlled mesh size ; prevents harvesting of juveniles ; quotas ; prevents overfishing / maintains breeding stocks ; monitoring ; ensures rules are followed ;	**2**	