Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/33**

Paper 3 Theory (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 120

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 May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

PUBLISHED

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**:

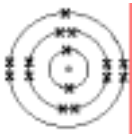
- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can 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.

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>name of part</th><th>letter in Fig. 1.1</th><th>function</th></tr>
<tr><td>cell membrane</td><td>C</td><td>control what enters and leaves the cell</td></tr>
<tr><td>cytoplasm</td><td>B</td><td>chemical reactions occur here</td></tr>
<tr><td>nucleus</td><td>A</td><td>contains genetic material</td></tr>
</table>
1 or 2 correct ;
3, 4 or 5 correct ;
6 correct ;
</td><td>3</td></tr>
<tr><td>1(b)</td><td>(photosynthesis) produces glucose / (named) carbohydrate / sugar ;
animals don’t have chloroplasts ;</td><td>2</td></tr>
<tr><td>1(c)(i)</td><td>carbon dioxide ;</td><td>1</td></tr>
<tr><td>1(c)(ii)</td><td>across the, cell / partially permeable, membrane ;
by osmosis ;
by random movement ;</td><td>3</td></tr>
</table>

Question	Answer	Marks
2(a)(i)	this is the proton number / atomic number – the number of protons (in an atom) ;	**1**
2(a)(ii)	K / Mn / Co Br / Kr Mn / Co Br Kr K 2 or 3 correct ; 4 or 5 correct ; 6 correct ;	**3**
2(b)	 inner shells 2.8 ; outer shell 5 ;	**2**
2(c)(i)	O_2 ;	**1**
2(c)(ii)	mixture – different atoms not bonded to each other ; compound – different atoms bonded together ; **or** mixture – idea that relative amounts of different atoms not fixed ; compound – has a formula / fixed ratio of atoms ;	**2**

Question	Answer	Marks
3(a)	chemical potential kinetic gravitational potential gravitational potential 1 correct ; 2 or 3 correct ; all 4 correct ;	**3**
3(b)	speed = distance/time, 12 / 0.5 ; 24 (km/h) ;	**2**
3(c)(i)	**X** at start or end of the graph ;	**1**
3(c)(ii)	**Y** on up or down diagonal sections ;	**1**
3(c)(iii)	**Z** along horizontal flat section ;	**1**
3(d)(i)	symbols correct ; cell, switch and lamp in series ;	**2**
3(d)(ii)	R = V / I **or** 1.5 / 0.75 ; 2.0 (Ω) ;	**2**

Question	Answer	Marks
4(a)(i)	32 ;	**1**
4(a)(ii)	(8 / 32) × 100 = 25 (%) ;	**1**
4(a)(iii)	sheep / herbivores only eat plant material (grass) ; (molars) grind / chew food ;	**2**
4(b)	mechanical ;	**1**
4(c)	consume less sugar ; brush teeth ;	**2**

Question	Answer	Marks
5(a)(i)	calcium chloride ;	**1**
5(a)(ii)	hydrogen carbon dioxide no gas 1 or 2 correct ; all 3 correct ;	**2**
5(b)	(positive / +) electrons are negative ; more positive charges than negative charges/fewer electrons than protons ;	**2**
5(c)(i)	<u>thermal / heat</u> energy taken in by reacting substances / a reaction ;	**1**
5(c)(ii)	<u>thermal decomposition</u> ;	**1**
5(c)(iii)	calcium carbonate → calcium oxide + carbon dioxide ;	**1**
5(c)(iv)	reference to nitrogen entering kiln in air / idea that nitrogen passes through unchanged ;	**1**
5(d)	waste is acidic ; waste is neutralised ;	**2**

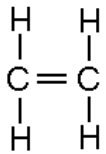
Question	Answer	Marks
6(a)(i)	right hand box ;	**1**
6(a)(ii)	from centre of compression to next centre of compression **or** rarefaction to rarefaction **or** corresponding points on successive compressions ;	**1**
6(a)(iii)	electromagnetic waves travel at the speed of light / electromagnetic or radio waves travel at high speed ;	**1**
6(b)(i)	top and bottom rays parallel to middle ray ; top and bottom rays from lens to focal point on camera sensor ;	**2**
6(b)(ii)	focal length ;	**1**
6(c)(i)	0 (^{o}C) ;	**1**
6(c)(ii)	correct label on 1 diagram ; correct label on all 3 diagrams ;	**2**

Question	Answer	Marks
7(a)	evaporation ; mesophyll ; diffusion ;	**3**
7(b)	as humidity increases the rate of transpiration decreases ;	**1**
7(c)	y axis labelled rate of transpiration, x axis labelled temperature ; initial positive correlation ;	**2**
7(d)	xylem ;	**1**

Question	Answer	Marks
8(a)	electrolyte ; ions ; anode **and** cathode ;	**3**
8(b)(i)	**P** oxygen / O^2 ; **Q** hydrogen / H^2 ;	**2**
8(b)(ii)	10 (cm^3) ;	**1**
8(b)(iii)	**Q** is produced at twice the rate of **P** ;	**1**
8(b)(iv)	10 ÷ 20 / = 0.5 (cm^3 / minute) ;	**1**
8(c)(i)	aluminium ;	**1**
8(c)(ii)	recycle metal **M** / aluminium ;	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>
<table>
<tr><td>energy resource</td><td>renewable</td><td>non-renewable</td></tr>
<tr><td>coal</td><td></td><td>✓</td></tr>
<tr><td>geothermal</td><td>✓</td><td></td></tr>
<tr><td>natural gas</td><td></td><td>✓</td></tr>
<tr><td>solar</td><td>✓</td><td></td></tr>
<tr><td>waves</td><td>✓</td><td></td></tr>
</table>
2, 3 or 4 correct ;
5 correct ;
</td><td>2</td></tr>
<tr><td>9(b)</td><td>noise of blades rotating ;
no wind means no electricity produced ;</td><td>2</td></tr>
<tr><td>9(c)</td><td>during cold weather cables will contract ;
could snap cables / damage pylons ;</td><td>2</td></tr>
<tr><td>9(d)(i)</td><td>remains constant ;</td><td>1</td></tr>
<tr><td>9(d)(ii)</td><td>1000 – 600 = 400 (g) ;</td><td>1</td></tr>
<tr><td>9(d)(iii)</td><td>converted to steam ;</td><td>1</td></tr>
</table>

Question	Answer	Marks
10(a)	phenotypic variation are differences in the features we can observe ; genetic variation are differences in the genotype ;	**2**
10(b)	there are a limited number of phenotypes (and no intermediates) ;	**1**
10(c)	height ticked foot length ticked mass ticked 1 correct ; 3 correct ;	**2**
10(d)	there is variation in the length of giraffes necks ; there is competition for resources / food ; giraffes with long necks survive ; passing on their alleles (for long necks) to offspring ;	**4**

Question	Answer	Marks
11(a)	filtration / decantation ; crystallisation / (heat to) evaporate the water ;	**2**
11(b)(i)	condense ethanol vapour ;	**1**
11(b)(ii)	liquids have different boiling points ;	**1**
11(c)(i)	petroleum / <u>crude</u> oil ;	**1**
11(c)(ii)	 1 for double bond between carbons ; 1 for four single C-H bonds ;	**2**
11(d)(i)	(catalytic / thermal) cracking ;	**1**
11(d)(ii)	from orange ; to colourless ;	**2**

Question	Answer	Marks
12(a)(i)	weight (of the bridge) ;	**1**
12(a)(ii)	625 000 × 10 ; 625 0000 (N) ;	**2**
12(a)(iii)	625 0000 (N) ; upwards force = downwards force ;	**2**
12(b)(i)	causes cancer / cell mutation / damages living cells ;	**1**
12(b)(ii)	α / alpha ;	**1**
12(b)(iii)	cosmic rays / soil / living things ;	**1**
12(b)(iv)	division by 2 seen e.g. 100 0000 / 2 **or** 2 half-lives ; 500 000 / 2 = 250 000 ;	**2**

Question	Answer	Marks
13(a)(i)	semen ; urine ;	**2**
13(a)(ii)	**X** marked on prostate gland ;	**1**
13(b)(i)	fertilisation ;	**1**
13(b)(ii)	testes ;	**1**
13(b)(iii)	ovum ;	**1**
13(c)	*any two from* movement ; respiration ; sensitivity ; growth ; excretion ; nutrition ;	**max 2**