Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/31**

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>A</td><td>control what enters and leaves the cell</td></tr>
<tr><td>chloroplast</td><td>D</td><td>site of photosynthesis</td></tr>
<tr><td>cell wall</td><td>F</td><td>stops cell from bursting</td></tr>
<tr><td>nucleus</td><td>C</td><td>contains genetic material</td></tr>
</table>
1 correct ;
2 or 3 correct ;
4 or 5 correct ;
6 correct ;
</td><td>4</td></tr>
<tr><td>1(b)(i)</td><td>water ;</td><td>1</td></tr>
<tr><td>1(b)(ii)</td><td>across the cell membrane ;
by diffusion ;
from high concentration to low concentration ;
by random movement ;</td><td>max 3</td></tr>
</table>

Question	Answer	Marks
2(a)	ref. to sterilisation of (drinking) water ;	**1**
2(b)(i)	2,8,8 ;	**1**
2(b)(ii)	outer shell is full / all shells complete / the idea that electrons do not need to be lost or gained for stability ;	**1**
2(b)(iii)	(J contains) more electrons than protons / has one extra electron/has extra electrons ; electrons are negative ;	**2**
2(c)(i)	(Cl_2 + H_2 →) 2 HCl ;	**1**
2(c)(ii)	two / one pair ;	**1**

Question	Answer	Marks
3(a)(i)	symbol for resistor ; symbol for switch ; two resistors, switch, supply and motor all in series ;	**3**
3(a)(ii)	(4 + 6) = 10 (Ω) ;	**1**
3(a)(iii)	I = V / R or 50 / 10 ; 5 (A) ;	**2**
3(a)(iv)	connected in series ;	**1**
3(a)(v)	correct symbol for ammeter ;	**1**
3(b)(i)	image of spider at same level <u>and</u> distance from mirror ;	**1**
3(b)(ii)	laterally inverted ; same size ;	**2**
3(b)(iii)	ray from spider in the room, reflected in mirror to eye ; angle of incidence equal to angle of reflection ;	**2**

Question	Answer	Marks
4(a)(i)	31 (days) ;	**1**
4(a)(ii)	days 1, 2, 3, 4–7 ticked ;	**1**
4(a)(iii)	X placed in any day 12–16 ;	**1**
4(b)	uterus lining, builds up / increases, in thickness ; and stays / maintains, thickness ;	**2**
4(c)	ovum ; nuclei ; zygote ;	**3**
4(d)	*any two from* vagina ; cervix ; uterus ;	**max 2**

Question	Answer	Marks
5(a)(i)	coal ; natural gas ; petroleum / **crude** oil ;	**max 2**
5(a)(ii)	(fossil fuels) contain sulfur / sulfur compounds ; which oxidise / combine with oxygen ;	**2**
5(a)(iii)	solution (of sulfur dioxide) is acidic / is an acidic oxide ;	**1**
5(a)(iv)	dissolve in / react with rain / causes acid rain ; (acid rain) reacts with buildings / damages vegetation / acidifies rivers / lakes / damages or kills aquatic life ; **or** pollutes or mixes with air / may be inhaled ; damages gas exchange system / triggers asthma ;	**2**
5(b)(i)	NH_3 ;	**1**
5(b)(ii)	acts as fertiliser ; increases crop yields / crops grow faster ; supply nitrogen (compounds) / nitrate ions / mineral ions ;	**max 2**

Question	Answer	Marks
6(a)(i)	speed = distance / time **or** 30 / 35 ; 0.86 m / s ;	**2**
6(a)(ii)	20 seconds ;	**1**
6(b)(i)	microwaves next to radio waves ; visible light in the middle ;	**2**
6(b)(ii)	infra-red to TV remote control radio waves to television signal transmission X-rays to airport security bag checking 1 correct ; 3 correct ;	**2**
6(c)	magnetic material is attracted to the magnet (or) force of attraction ;	**1**

Question	Answer	Marks
7(a)	rate of transpiration increases, then levels out with increasing temperature ; rate of transpiration is greater in the lower epidermis than upper epidermis ;	**2**
7(b)	lower epidermis has more stomata (than upper epidermis) ;	**1**
7(c)	y axis labelled rate of transpiration, x axis labelled humidity ; negative correlation ;	**2**
7(d)	root hair cells root cortex cells xylem mesophyll cells root hair cells correct ; rest correct ;	**2**

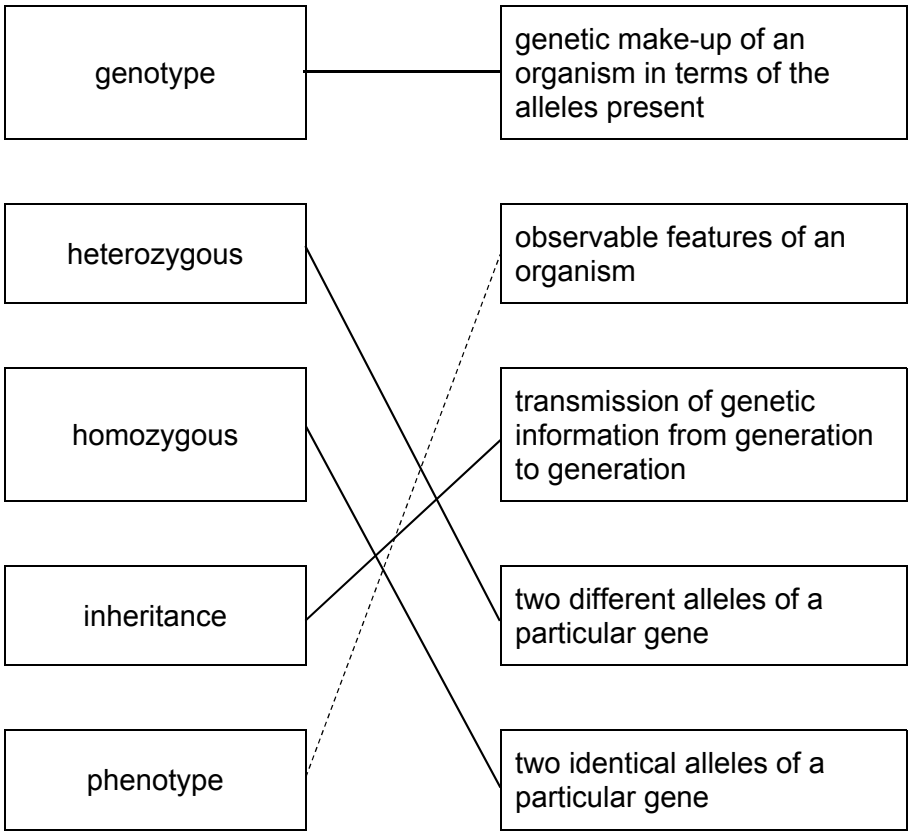
Question	Answer	Marks
8(a)	suitable test for electrical conductivity / thermal conductivity / malleability ; metals conduct electricity / metal conduct thermal energy / metals are malleable ;	**2**
8(b)(i)	alloy ;	**1**
8(b)(ii)	**X** is a pure metal and **Z** is a mixture / alloy ; pure metal has unique melting point / a mixture melts over a range of temp ;	**2**
8(c)(i)	carbon dioxide / CO_2 ; limewater / aqueous calcium hydroxide ;	**2**
8(c)(ii)	redox / reduction / oxidation ; copper oxide is reduced / loses oxygen / carbon oxidised / gains oxygen ;	**2**
8(c)(iii)	**calcium** is more reactive than carbon ;	**1**
8(d)(i)	bauxite ;	**1**
8(d)(ii)	saves energy / saves bauxite;	**1**

Question	Answer	Marks
9(a)	negative ; positive ; unlike / opposite ;	**Max 3**
9(b)(i)	(distance =) speed × time **or** 330 × 10 ; 3300 ; m ;	**3**
9(b)(ii)	sound travels slower than light ;	**1**
9(c)(i)	5500 N ;	**1**
9(c)(ii)	6000 N ;	**1**

Question	Answer	Marks
10(a)(i)	carbohydrate ;	**1**
10(a)(ii)	vitamins ; minerals ;	**2**
10(b)	test add ethanol ; add water ; positive result emulsion ;	**3**

Question	Answer	Marks
11(a)	**B C D** ; **B D** ; **C** ; **A** ;	**4**
11(b)(i)	(decrease of) **3** (g) ;	**1**
11(b)(ii)	3 ÷ 15 / 0.2 (g / min) ;	**1**
11(b)(iii)	the idea that material / compounds / substances / gases **escape** from the burner (into the air) ; carbon dioxide / water vapour produced ;	**2**
11(c)(i)	ethene ; + water / steam ;	**2**
11(c)(ii)	fermentation ;	**1**

Question	Answer	Marks
12(a)(i)	(the generator), it is has greatest weight ;	**1**
12(a)(ii)	moment = force × perpendicular distance from pivot **or** 40 × 100 000 ; 4 000 000 (Nm) ;	**2**
12(a)(iii)	no resultant turning effect ;	**1**
12(b)(i)	kinetic ; electrical ;	**2**
12(b)(ii)	advantage: wind is a renewable energy source ; disadvantage: if no wind means no energy produced ;	**2**
12(c)(i)	increases ;	**1**
12(c)(ii)	20 Hz to 20 000 Hz ;	**1**

Question	Answer	Marks
13(a)	 one correct ; two or three correct ; four correct ;	**3**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>13(b)</td><td>
<table>
<tr><td></td><td>found in nucleus</td><td>contains genetic material</td><td>codes for a single protein</td></tr>
<tr><td>gene</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>chromosome</td><td>✓</td><td>✓</td><td></td></tr>
</table>
1 column correct ;
2 columns correct ;
3 columns correct ;
</td><td>3</td></tr>
<tr><td>13(c)</td><td>
<table>
<tr><td colspan="2"></td><td colspan="2">male gametes</td></tr>
<tr><td colspan="2"></td><td>X</td><td>Y</td></tr>
<tr><td rowspan="2">female gametes</td><td>X</td><td>XX</td><td>XY</td></tr>
<tr><td>X</td><td>XX</td><td>XY</td></tr>
</table>
male gamete Y, female gamete X ;
offspring XX, XY, XX, XY ;
ratio 1 male: 1 female ;
</td><td>3</td></tr>
</table>