Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/43**

Paper 4 Theory (Extended) **May/June 2023**

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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

[Turn over

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>letter</th><th>name</th><th>function</th></tr>
<tr><td>D</td><td>(scrotum)</td><td>hold testes outside body</td></tr>
<tr><td>(B)</td><td>testes</td><td>(produce male)
gametes / sperm</td></tr>
<tr><td>C</td><td>urethra</td><td>(carries urine and
semen out of the body)</td></tr>
</table>
;;;
one mark for each correct row</td><td>3</td></tr>
<tr><td>1(b)</td><td>jelly ;

nuclei ;</td><td>2</td></tr>
<tr><td>1(c)</td><td>any two from:
allows nutrients / oxygen, to pass to fetus ;

allows toxins / excretory products, to pass from fetus ;

provides barrier for toxins ;</td><td>2</td></tr>
</table>

Question	Answer	Marks
2(a)(i)	hydroxide (ions) ; lose electrons ; to form (water and) oxygen ;	**3**
2(a)(ii)	+ 2e ; →H_2 ;	**2**

Question	Answer	Marks
2(b)	*any two from:* (molten or aqueous solution of) an **ionic** compound / a liquid (molten or solution) that contains ions ; the idea that an electrolyte, conducts electricity / contains mobile ions ; the idea that the compound in the electrolyte is broken down (into elements) ;	**2**
2(c)	(aqueous) sodium chloride / other correct ;	**1**

Question	Answer	Marks
3(a)(i)	25 (m / s) ;	**1**
3(a)(ii)	**X** marked at any point between t = 0 s and t = 0.3 s ;	**1**
3(a)(iii)	*any two from:* air resistance ; kinetic energy is transferred into gravitational potential energy ; reference to gravitational force (downwards as ball is going upwards) ;	**2**
3(b)(i)	gravitational force on ball / weight of ball = mg / 0.4 × 10 ; 4(.0) (N) ;	**2**
3(b)(ii)	forces are balanced / no resultant force (when ball is not moving) ;	**1**
3(c)	unit conversions: 0.45 kg or 0.0041 m^3 ; (density =) mass ÷ volume / (=) 0.45 ÷ 0.0041 ; 110 (kg / m^3) ;	**3**

Question	Answer	Marks
4(a)(i)	*any **two** from:* (large) vacuole ; cell membrane ; cell wall ; nucleus ; cytoplasm ;	**1**
4(a)(ii)	large surface area ; increases (rate of) absorption of, water / mineral ions ;	**2**
4(a)(iii)	ref to (large numbers of) chloroplasts ; that contain chlorophyll ; transfers light energy to chemical energy ;	**3**
4(b)(i)	170 – 54 / 116 ; (170 – 54) ÷ 54 × 100 / 116 ÷ 54 × 100 / (170 ÷ 54 × 100) – 100 / 214.814 ; 215 (%) ;	**3**
4(b)(ii)	*any three from:* rate of transpiration decreases ; (idea of higher humidity causes) increased concentration of water surrounding leaves / lower concentration gradient ; decrease in evaporation (from mesophyll cells) ; decrease in diffusion from, **stomata** / **leaves** ;	**3**

Question	Answer	Marks
5(a)	(solute) ammonium nitrate ; (solvent) water ;	2
5(b)(i)	endothermic / energy taken in ; the idea expressed that the energy of products is greater than reactants / products at higher energy level ;	2
5(b)(ii)	**A** bonds are breaking ; **B** bonds are forming ; **A** energy is taken in / **B** energy is given out ;	3
5(c)	all non-metals ; atoms in one molecule: 2,4,3 ;	2

Question	Answer	Marks
6(a)	parallel ;	1
6(b)	kinetic energy (of rotating blades / blown air) ;	1
6(c)(i)	power (rating of lamp) = $V \times I$ / (I =) 11 ÷ 12 ;	1
6(c)(ii)	(power rating of whole circuit = $V \times I$ =) 12 × 8.0 / 96 ; (power rating of fan = (12 × 8) – 11 =) 85 (W) ; **OR** (current in fan circuit =) 8.0 – 0.92 / 7.1 ; (power rating of fan = 12 × 7.1 =) 85(.2) (W) ;	2

Question	Answer	Marks
6(d)	rating of fuse (10 A) much higher than lamp current but closer to the fan current **OR** fuse allows (up to) 10 A to flow with no damage to fan but causes damage to lamp ;	**1**
6(e)	second lamp in series ; two fuse symbols correct, **and** one in each branch ; battery symbol and connecting wiring complete with no short circuits ;	**3**

Question	Answer	Marks
7(a)(i)	either atrium labelled ;	**1**
7(a)(ii)	*any two from:* mixing of blood from lungs and body ; less oxygen transported (to body) ; decrease in blood pressure (to body) ; AVP, e.g. reduction in (aerobic) respiration in cells ;	**max 2**
7(b)(i)	blockage of **coronary** artery ;	**1**
7(b)(ii)	*any two from:* stress ; smoking ; genetic predisposition ; age ; gender / sex ; AVP, e.g. lack of exercise ;	**2**

Question	Answer	Marks
7(c)	(respiration is a) reaction with oxygen ; breakdown of nutrient (molecules) to release energy ;	**2**

Question	Answer	Marks
8(a)	ethene **and** butene ; they both contain a double bond / are unsaturated / are alkenes ;	**2**
8(b)	*either order:* carbon dioxide CO_2 ; water H_2O ;	**2**
8(c)	alkanes ;	**1**
8(d)	cannot be reversed by physical means ; new products formed ;	**2**
8(e)(i)	butane has weaker forces **between its molecules** ;	**1**
8(e)(ii)	similar boiling points ;	**1**

Question	Answer	Marks
9(a)(i)	(peaks represent) particles closer together ; (troughs represent) particles further apart ;	**2**
9(a)(ii)	(transferred to) thermal energy ;	**1**

Question	Answer	Marks
9(b)	*any two from, and in any order:* shorter wavelength ; higher frequency ; electromagnetic (as opposed to pressure waves) ; transverse ; can travel in a vacuum ;	**2**
9(c)	speed = frequency × wavelength / $v = f\lambda$ **OR** $f = 3 \times 10^8 \div 0.030$; 1.0×10^{10} ; Hz ;	**3**