

Cambridge IGCSE™

COMBINED SCIENCE**0653/42**

Paper 4 Theory (Extended)

October/November 2025**MARK SCHEME**Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	C ; B ; E ;	3
1(b)	$6\text{CO}_2 + 6\text{H}_2\text{O} ;$ $\rightarrow$ $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 ;$	2
1(c)(i)	32 – 2 or (max rate =) 32 seen or (min rate =) 2 seen ; (max difference =) 30 (arbitrary units) ;	2
1(c)(ii)	increasing temperature / from 10 °C to 15 °C and linked to any three ; • increasing rate of photosynthesis • increasing enzyme activity ; • increasing kinetic energy / enzymes move faster ; • more frequency of (enzyme-substrate) collisions ; • more / faster formation of enzyme-substrate complexes ;	3

Question	Answer	Marks
2(a)(i)	one of the small dots labelled ; ribosome ;	2
2(a)(ii)	energy ; nutrient ;	2
2(a)(iii)	mitochondria ;	1
2(b)(i)	idea of involved in blood clotting ; clot prevents entry of bacteria / clotting forms a barrier to bacteria ;	2

Question	Answer	Marks
2(b)(ii)	<u>antibiotics</u> and overuse / increased use / incorrect use / non-essential use resulted in <u>bacteria</u> become <u>resistant</u> to (antibiotics) ;	2
2(c)	any two from : hygienic food preparation ; personal hygiene / good hygiene; waste disposal ; sewage treatment ; AVP, e.g. vaccination ; ;	2

Question	Answer	Marks
3(a)(i)	arrow from mouse to hawk AND arrow from rabbit to hawk ;	1
3(a)(ii)	mouse / rabbit / topi ;	1
3(b)(i)	lion's prey have less food / move to new habitats ; (so) reduced number of prey / less food for lions ;	2
3(b)(ii)	idea of keeping biological species in a controlled environment such as a zoo, wildlife reserve, sanctuary, botanic garden, OR isolated from their natural habitat OR away from predators etc. ; for the purposes of reproduction / increasing populations ;	2

Question	Answer	Marks
4(a)(i)	$\text{NaOH (aq)} + \text{HCl (aq)} \rightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$ fully correct equation ; correct state symbols ;	2
4(a)(ii)	yellow ; orange ;	2
4(a)(iii)	<i>ticks for:</i> turns universal indicator purple ; reacts with dilute sulfuric acid ;	2
4(b)(i)	energy (released by) bond making is greater than needed/absorbed for bond breaking OR energy involved in bond making is greater than energy involved in bond breaking ;	1
4(b)(ii)	<i>labelling:</i> reactants or $\text{NaOH} + \text{HCl}$ and products or $\text{NaCl} + \text{H}_2\text{O}$; pathway shows activation energy peaking and products at a lower energy level than the reactants ; overall energy change shown as difference between reactants and products and downward arrow ;	3

Question	Answer	Marks
5(a)(i)	carbon / coke, is combusted or coke / C reacts with oxygen ; carbon dioxide is formed / produced (during the extraction) ; carbon reacts with (reduces) carbon dioxide ;	3
5(a)(ii)	$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ correct formulae ; correct balancing ;	2

Question	Answer	Marks
5(b)(i)	two bonding pairs between each oxygen and the carbon ; 4 non-bonding electrons / 2 lone pairs, on each oxygen ;	2
5(b)(ii)	any two from: use of renewable energy, e.g. wind, solar ; decreasing use of <u>fossil</u> fuels ; planting trees ; reduction in livestock farming ; AVP;	2

Question	Answer	Marks
6(a)(i)	C_nH_{2n+2} ;	1
6(a)(ii)	(ethene) alkene and (ethane) alkane ;	1
6(b)	hydrogen ; addition ; nickel / Ni ;	3
6(c)	<i>boiling point</i> any temperature higher than $-88\text{ }^{\circ}\text{C}$; <i>reason</i> idea of, longer chain length / larger molecule ;	2

Question	Answer	Marks
7(a)(i)	chemical ;	1
7(a)(ii)	kinetic ;	1

Question	Answer	Marks
7(a)(iii)	(feature) gradient ; (explanation) (gradient is) change in speed per unit time ;	2
7(a)(iv)	evidence of understanding that distance travelled = area under graph e.g. or $\frac{1}{2} \times 3 \times v$ (seen) or $5.6 = (\frac{1}{2} \times 3 \times v) + (2 \times v)$ or $5.6 \div 3.5$; 1.6 (m / s) ;	2
7(b)	(unit conversion) 0.072 seen (kg) ; $GPE = mg\Delta h$ or $0.072 \times 9.8 \times 0.46$; 0.32 (J) ;	3

Question	Answer	Marks
8(a)	use same initial temperature and volume of water in containers ; AND either record final temperatures (of water in both containers) after a fixed time ; container that has greater temperature decrease is better emitter ; OR measure time take for a <u>fixed temperature decrease</u> ; takes least time for the temperature decrease is better emitter ;	3

Question	Answer	Marks
8(b)(i)	no particles / medium in space / space is a vacuum ; AND either conduction / convection need particles / a medium (to transfer energy) ; OR radiation does not need a medium / particles ;	2
8(b)(ii)	protostar ; red giant ;	2
8(b)(iii)	new stars (with orbiting planets)	1

Question	Answer	Marks
9(a)	generator ; fuse;	2
9(b)(i)	(electrical) work done (by a source) moving charge around a (complete) circuit ; per <u>unit</u> charge / per coulomb ;	2
9(b)(ii)	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} / \frac{1}{12} + \frac{1}{24}$ OR $\frac{R_1 \times R_2}{R_1 + R_2}$ OR $\frac{12 \times 24}{12 + 24}$ OR $\frac{288}{36}$; ($R_{\text{parallel}} =$) 8.0 (Ω) ; (combined resistance = 8.0 + 15 =) 23 (Ω) ;	3

Question	Answer	Marks
9(c)	evidence that reflection must occur at halfway point between eyes and point P / $130 \div 2$ / 65 ; adjustment for length of mirror / subtraction of 40 ; ($x =$) 25 (cm) ;	3