

Cambridge IGCSE™

COMBINED SCIENCE**0653/41**

Paper 4 Theory (Extended)

May/June 2025**MARK SCHEME**Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	lipase ;	1
1(a)(ii)	glycerol ;	1
1(b)(i)	increases ;	1
1(b)(ii)	130 and 370 ; $\frac{240 \times 100}{130}$ OR $(370 \div 130) \times 100$) – 100 ; 185 (%) ;	3
1(c)	active transport is against a concentration gradient and diffusion is down a concentration gradient OR active transport is movement from a low to high concentration and diffusion is movement from high to low concentration / AW ; <i>then any one from:</i> active transport requires energy / diffusion does not require energy ; both transport (food) molecules across a cell membrane ;	2

Question	Answer	Marks
2(a)(i)	anther ;	1
2(a)(ii)	pollen is transferred (by wind) ; (pollen moves) from anther to stigma ;	2
2(b)	enzyme denatures ; active site changes shape ; active site no longer complementary to substrate / substrate no longer fits active site ;	3

Question	Answer	Marks
2(c)(i)	(tube A) light not needed for germination (so indicator turns yellow) ; (tube C) water is required for germination (so indicator stays red) ;	2
2(c)(ii)	respiration ; oxygen ; $C_6H_{12}O_6$;	3

Question	Answer	Marks
3(a)(i)	plasmid labelled ;	1
3(a)(ii)	<i>any two from:</i> cell wall ; ribosomes ; cell membrane ; cytoplasm ;	2
3(b)(i)	<i>idea that it helps prevent antibiotic resistance in bacteria ;</i> <i>idea that antibiotic becomes less effective (due to over use) / owtte ;</i>	2
3(b)(ii)	(defence against a pathogen by) production of antibodies ;	1
3(c)(i)	decomposer ;	1
3(c)(ii)	<i>any one from:</i> hygienic food preparation ; personal hygiene / good hygiene ; clean water supply ; waste disposal ; AVP, e.g. vaccination ;	1

Question	Answer	Marks
4(a)	evaporation ; freezing ;	2
4(b)	(changing arrangement) from regular / fixed, to irregular / random ; (changing movement) from (particle) vibration to idea of, moving / sliding over each / move more freely ;	2
4(c)(i)	chromium / nickel / carbon ;	1
4(c)(ii)	different sized atoms ; (layers/atoms) can no longer slide over each other (in an alloy) / owtte;	2
4(d)	(Fe ₂ O ₃) loses oxygen ;	1

Question	Answer	Marks
5(a)(i)	red-brown ;	1
5(a)(ii)	<i>melting point:</i> from –100 to +24 (°C) inclusive ; <i>physical state:</i> solid ;	2
5(b)(i)	displacement ;	1
5(b)(ii)	chlorine + potassium bromide → potassium chloride + bromine ;	1
5(b)(iii)	(chlorine is) less reactive than fluorine ;	1
5(c)	$3\text{I}_2 + 2\text{Fe} \rightarrow 2\text{FeI}_3$;	1
5(d)(i)	addition ;	1
5(d)(ii)	orange / orange brown to colourless ;	1

Question	Answer	Marks
6(a)	add excess copper oxide (to the acid) ; filter (to remove the excess copper oxide) ; evaporate (some) water ; filter crystals / separate crystals / method of drying crystals slowly (e.g. warm oven / between filter paper / leave in an open space) ;	4
6(b)	sodium with 8 crosses in outer shell ; chloride with 7 dots and 1 cross in outer shell ; (1)+ and (1)- charges ;	3
6(c)	(giant) lattice / regular ; (ions are) alternating ;	2

Question	Answer	Marks
7(a)(i)	chemical ;	1
7(a)(ii)	(efficiency =) $\frac{\text{useful (energy) output}}{\text{total (energy) input}} (\times 100\%)$	1
7(b)	$a = \Delta v \div \Delta t / 18 \div 4.0$; $4.5 (= \sim 5 \text{ m/s}^2)$;	2
7(c)	$F = ma / 2000 \times 4.5$; 9000 ; N ;	3
7(d)	$E_k = \frac{1}{2} mv^2 / \frac{1}{2} \times 2000 \times (23^2 - 5.0^2) / 529\,000$ or $25\,000$ (evidence of use of formula) ; 504 000 (J) ;	2

Question	Answer	Marks
8(a)(i)	tyre A (<i>no mark</i>) same force (on both tyres due to shared weight of motorcycle) ; (over) smaller area (so greater pressure on road) / ORA ;	2
8(a)(ii)	moving particles colliding with, tyre / wall / owtte ; (particle / they) create / exert, a force and reference to area ;	2
8(b)(i)	radio waves ;	1
8(b)(ii)	3.0×10^8 (m/s) ;	1
8(b)(iii)	$v = f\lambda / 3.0 \times 10^8 \div 3.5 \times 10^8$; 0.86 (m) ;	2

Question	Answer	Marks
9(a)(i)	 AND current only flows in one direction in LED / current only able to flow in this direction through LED ;	1
9(a)(ii)	current in motor = $6.6 - 0.30 = 6.3$ A ; $R = V \div I / 9.0 \div 6.3$; 1.4 (Ω) ;	3
9(b)(i)	generator ;	1
9(b)(ii)	work ; charge ;	2
9(c)(i)	$v = 2\pi r \div T$ (<i>in any form</i>) / $2 \times \pi \times 15\,000 \div 17$; 5500 or 5.5×10^3 (s) ;	2
9(c)(ii)	13.8 billion years ;	1