



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/41

Paper 4 Extended Theory

May/June 2017

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.

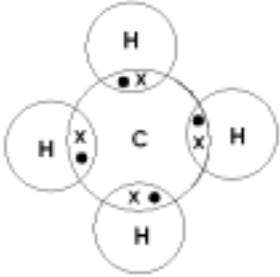
Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

© IGCSE is a registered trademark.

This document consists of **10** printed pages.

Question	Answer	Marks
1(a)	lines drawn from Flowering plants to produce haploid pollen ; use auxins to respond to light ; have root hair cells which increase water uptake ;	3
1(b)(i)	(anthers) hang outside the flower so pollen is easily picked up by wind ; (stigmas) feathery / large surface area to collect pollen ;	2
1(b)(ii)	to increase the chances of pollination between plants ;	1
1(c)(i)	the idea that fossil fuels contain sulfur / sulfur compounds ; sulfur dioxide produced ; dissolves in water in the air ;	Max 2
1(c)(ii)	reduces activity / denatures <u>enzymes</u> present in the plants ;	1

Question	Answer	Marks
2(a)(i)	covalent ;	1
2(a)(ii)	 <p data-bbox="320 624 943 691">four shared pairs between C and four H atoms ; all symbols correctly shown ;</p>	2
2(b)(i)	carbon dioxide ; water ;	2
2(b)(ii)	releases <u>heat</u> / <u>thermal</u> energy when it reacts / burns / is used ;	1
2(c)(i)	<u>natural gas</u> ;	1
2(c)(ii)	coal and petroleum ;	1

Question	Answer	Marks
3(a)(i)	D C	1
3(a)(ii)	(Force C is 1200N) no mark no vertical motion / forces (A and C) are balanced ;	1
3(b)	line starts along the speed = 2 m / s horizontal, levelling off at speed = 4.5 m / s and 10 mins ; any curved line between these points, then level after (10,4.5) ;	2
3(c)(i)	$KE = \frac{1}{2} m v^2 / \frac{1}{2} \times 120 \times 3 \times 3 ;$ $= 540 \text{ (J)} ;$	2
3(c)(ii)	(90 kJ =) 90 000 J (= work done = energy transferred) ; distance moved = 3 (m / s) \times 50 (s) = 150 m ; force = work done \div distance / 90 000 \div 150 / = 600 (N) ;	3

Question	Answer	Marks
4(a)(i)	contain chlorophyll ; trap light (energy) ; converts (light) into chemical energy ; the idea that chemical energy is contained in glucose / starch / carbohydrate ;	3
4(a)(ii)	flagellum ; the idea that the flagellum is for movement ;	2
4(b)(i)	food chain containing the following organisms phytoplankton→zooplankton→mussel→crab→seagull ; four arrows in correct direction in the chain ;	2
4(b)(ii)	fewer steps / stages / organisms in chain containing mussels / ora ; use of the term <u>trophic level</u> ; energy is lost at each stage ; by heat / movement / avp ;	3

Question	Answer	Marks
5(a)(i)	increases ; neutralisation / salt-making;	2
5(a)(ii)	CuSO ₄ ; CO ₂ and H ₂ O ;	2
5(b)	filter (to remove excess solid / copper carbonate) ; heat the solution / filtrate / mixture ; reference to evaporation ; cool / leave (to allow crystals to form) ;	2
5(c)	the idea that the gradient decreases ; the idea that the rate decreases ; the idea that the rate becomes zero ;	2
5(d)(i)	less steep initial line ; levels off at a lower volume;	2
5(d)(ii)	(decreases rate of reaction) because particles collide less frequently / owtte ;	1

Question	Answer	Marks							
6(a)(i)	infra-red / radiation ; poorly absorbed / mainly reflected by white ;	2							
6(a)(ii)	the idea that feet lose heat / thermal energy ; the idea that heat / thermal energy is lost to the water ; because the water is colder ;	2							
6(a)(iii)	(line 1) more energetic/faster and (line 3) energy / speed ; (line 4) temperature ;	2							
6(b)	ray from X refracts correctly at surface ; unbroken rays drawn with a ruler to the eye with at least one arrow on a ray ;	2							
6(c)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">gamma rays</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;">Visible light</td> <td style="width: 15%;"></td> <td style="width: 15%;">micro-waves ;</td> <td style="width: 15%;">radio waves</td> </tr> </table>	gamma rays			Visible light		micro-waves ;	radio waves	1
gamma rays			Visible light		micro-waves ;	radio waves			
6(c)(ii)	$v = f\lambda / f = 3 \times 10^8 \div 0.12 ;$ $= 2.5 \times 10^9 \text{ (Hz) ;}$	2							

Question	Answer	Marks
7(a)	energy = $37 \times 11 + 17 + 13 \times 17 (= 645)$; $\times 2 = 1290$ (kJ) ;	2
7(b)	eggs (no mark) contains the most fat ;	1
7(c)(i)	6CO_2 and $6\text{H}_2\text{O}$;	1
7(c)(ii)	in red (blood) cells ; by haemoglobin ; red cells carried in plasma ;	Max 2
7(d)	chemical digestion:- mouth, and stomach and small intestine / duodenum / ileum ; absorption:- small intestine / duodenum / ileum ;	2

Question	Answer	Marks
8(a)	2,8,3 ;	1
8(b)(i)	oxygen (gas) ;	1
8(b)(ii)	aluminium ions gain electrons ; gain 3 electrons / ions are discharged / become aluminium atoms ;	2
8(c)(i)	carbon / C / carbon monoxide / CO ;	1
8(c)(ii)	aluminium / Al is more reactive than carbon / C ;	1
8(d)(i)	Al is less reactive than Mg ;	1
8(d)(ii)	Al is more reactive than Cu ;	1

Question	Answer	Marks
9(a)	any two from one or two metals <i>or</i> alloys (<i>other than copper</i>) graphite / carbon	1
9(b)	= $2 / 0.5 = 4$; ohms / Ω ;	2
9(c)(i)	(2 A) sum of currents in parallel branches = current from source ;	1
9(c)(ii)	P and Q have different resistances / thicknesses ; P less resistance than Q / P is thicker than Q ;	2