COMBINED SCIENCE **0653/41**

Paper 4 Extended Theory **May/June 2017**

MARK SCHEME

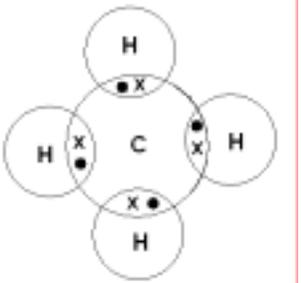Maximum Mark: 80

Published

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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)	four shared pairs between C and four H atoms ; all symbols correctly shown ;	2
2(b)(i)	carbon dioxide ; water ;	2
2(b)(ii)	releases heat / thermal energy when it reacts / burns / is used ;	1
2(c)(i)	natural gas ;	1
2(c)(ii)	coal and petroleum ;	1

Question	Answer	Marks
3(a)(i)	**D** **C**	**1**
3(a)(ii)	(Force C is 1200 N) 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 = ½ m v^2 / ½ × 120 × 3 × 3 ; = 540 (J) ;	**2**
3(c)(ii)	(90 kJ =) 90 000 J (= work done = energy transferred) ; distance moved = 3 (m / s) × 50 (s) = 150 m ; force = work done ÷ distance / 90 000 ÷ 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_2O ;	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><tr><td>gamma rays</td><td></td><td></td><td>Visible light</td><td></td><td>**micro-waves** ;</td><td>radio waves</td></tr></table>	**1**
6(c)(ii)	$v = f \lambda / f = 3 \times 10^8 \div 0.12$; $= 2.5 \times 10^9 \,(Hz)$;	**2**

Question	Answer	Marks
7(a)	energy = 37 × 11 + 17 + 13 × 17 (= 645) ; × 2 = 1290 (kJ) ;	2
7(b)	eggs (no mark) contains the most fat ;	1
7(c)(i)	$6CO_2$ and $6H_2O$;	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 *or* alloys *(other than copper)* 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**