



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/31

Paper 3 Core Theory

May/June 2017

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	three lines drawn to produce haploid pollen ; need oxygen for germination of seeds ; have root hair cells for water uptake ;	3
1(b)(i)	any two from (large) petals ; (bright) colour ; scented ; nectar ;	Max 2
1(b)(ii)	anthers / stamens are below stigma in 2 and level with stigma in 1 ;	1
1(c)	flower 2 (no mark) the stigma is higher than the anthers / anthers lower than the stigma ;	1

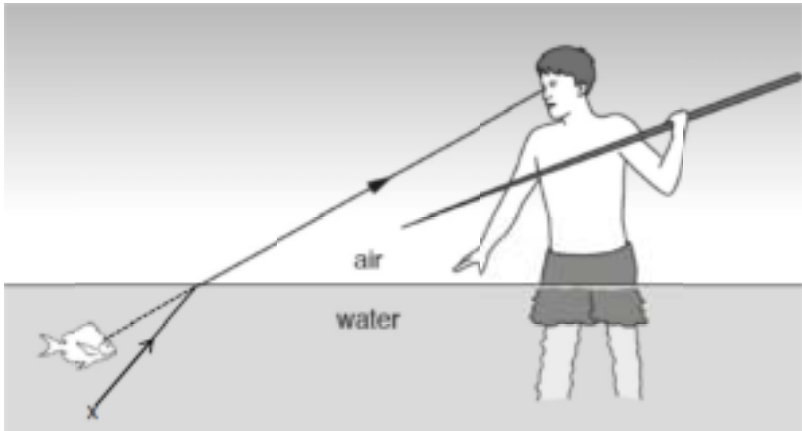
Question	Answer	Marks
2(a)(i)	covalent ;	1
2(a)(ii)	non-metal(lic) ;	1
2(b)(i)	(methane) + oxygen → carbon dioxide + water Oxygen on LHS ; RHS any order ;	2
2(b)(ii)	releases <u>heat</u> / <u>thermal</u> energy when it reacts / burns / is used ;	1
2(c)(i)	<u>natural gas</u> ;	1
2(c)(ii)	coal and petroleum (either order) ;	1
2(d)(i)	<u>fractional distillation</u> ;	1

Question	Answer	Marks
2(d)(ii)	heating / cooking ;	1

Question	Answer	Marks										
3(a)(i)	<table><tr><th>name of force</th><th>letter on Fig. 1.1</th></tr><tr><td>driving force</td><td>B</td></tr><tr><td>frictional force</td><td>D</td></tr><tr><td>upthrust of water</td><td>C</td></tr><tr><td>weight</td><td>A</td></tr></table>	name of force	letter on Fig. 1.1	driving force	B	frictional force	D	upthrust of water	C	weight	A	2
	name of force	letter on Fig. 1.1										
	driving force	B										
	frictional force	D										
	upthrust of water	C										
	weight	A										
two letters correct ; two more letters correct ;												
3(a)(ii)	(Force C is 1200 N) no mark no vertical motion / forces (A and C) must balance ;	1										
3(a)(iii)	B / driving force ;	1										
3(b)	12 km / h (= 12 000 m / h = 200 m / min) = 3.3 m / s ;	1										
3(c)(i)	(magnitude of) force ; distance (moved) ;	2										
3(c)(ii)	kinetic (energy) / KE ;	1										
3(c)(iii)	transferred to other forms of energy ;	1										

Question	Answer	Marks
4(a)	an animal that gets its energy / eats (only) plants ; an animal that gets its energy / eats (only) animals ;	2
4(b)(i)	(amount of) light / light intensity ; (amount of) carbon dioxide / concentration of carbon dioxide ;	2
4(b)(ii)	food chains, any one from seaweed→limpet→crab→seagull / phytoplankton→mussel→ crab→seagull / phytoplankton→zooplankton→mussel →crab→seagull ; arrows in correct direction ;	2
4(b)(iii)	(increase) crabs no longer feeding on the mussels ; (decrease) seagulls have fewer crabs to feed on ; so they eat more mussels instead ;	3

Question	Answer	Marks
5(a)(i)	carbon dioxide ; copper sulfate ;	2
5(a)(ii)	increases ; salt making / neutralisation ;	2
5(b)	runs out of / no more (sulfuric) acid / copper carbonate / powder ;	1
5(c)	higher temperature / more concentrated (acid) / decrease particle size (of powder) / agitate the flask ;	1
5(d)(i)	three / 3 ; seven / 7 ;	2
5(d)(ii)	(acidified) barium ions / barium nitrate (soln) ; (result) white ppt / white solid ;	2

Question	Answer	Marks							
6(a)(i)	(transfer by) radiation ; infra-red ;	2							
6(a)(ii)	idea of feet lose heat / thermal energy ; heat / thermal energy lost to water ; water is colder (than the feet of the man) ;	Max 2							
6(a)(iii)	(line 1) (more) energetic/faster and (line 3) energy / speed ; (line 4) temperature ;	2							
6(b)(i)	 (position of X implies) correct refraction at surface ; unbroken ray in a straight line from X joining with ray to eye ;	2							
6(b)(ii)	refraction ;	1							
6(c)	<table border="1"><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>	gamma rays			visible light		micro-waves ;	radio waves	1
gamma rays			visible light		micro-waves ;	radio waves			

Question	Answer	Marks
7(a)	vitamins ; mineral salts / minerals ;	2
7(b)	energy from eggs = $37 \times 11 + 17 + 13 \times 17$; = 645 (kJ) ;	2
7(c)(i)	carbon dioxide and water ; <i>either order</i>	1
7(c)(ii)	carried by haemoglobin ; in <u>red</u> blood cells ; red cells carried in plasma ;	Max 2
7(d)	in any order mouth ; stomach ; small intestine duodenum / ileum ;	3

Question	Answer	Marks
8(a)(i)	transition ;	1
8(a)(ii)	copper oxide / CuO ;	1
8(a)(iii)	ductile / high melting point ;	1
8(a)(iv)	Iron / Fe is too reactive / reacts / rusts (with water) / copper is less reactive (than iron);	1
8(a)(v)	stronger / does not get damaged ;	1
8(b)	(metal) magnesium ; (gas) hydrogen ;	2

Question	Answer	Marks
9(a)(i)	any two from one or two metals <i>or</i> alloys (other than copper) ; graphite / carbon ;	1
9(a)(ii)	any two non-metallic materials (other than carbon / graphite) ;	1
9(a)(iii)	<u>insulators</u> ;	1
9(b)	to limit the current / protect the circuit ;	1
9(c)(i)	voltmeter symbol ; parallel connection ;	2
9(c)(ii)	$R = V / I$; $= 2 / 0.5 = 4$; ohms / Ω ;	3



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Question	Answer	Marks
1(a)	lines drawn from Enzymes to are biological catalysts ; are usually not active at low temperatures ; are protein molecules ;	3
1(b)	large / insoluble / food <u>molecules</u> are broken down ; into small / soluble molecules / so they can be absorbed ;	2
1(c)	glycogen ; starch ;	2
1(d)(i)	Benedict's (test) ; red colour produced ;	2
1(d)(ii)	no reaction ; because enzymes become inactive at high temperatures ;	2
1(e)	chlorophyll ; light ;	2

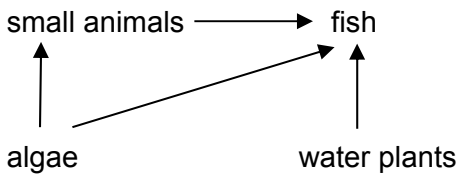
Question	Answer	Marks
2(a)(i)	potassium / K lithium / Li sodium / Na ;;	2
2(a)(ii)	hydrogen / H ₂ ;	1
2(a)(iii)	turns blue and stays blue / no change ;	1
2(b)(i)	magnesium / Mg ;	1
2(b)(ii)	copper / Cu ;	1
2(b)(iii)	(too) dangerous / (risk of) explosion ;	1
2(c)(i)	resists corrosion / does not rust ;	1
2(c)(ii)	stronger / does not get damaged ;	1

Question	Answer	Marks										
3(a)(i)	<table><tr><th>name of force</th><th>letter on Fig. 1.1</th></tr><tr><td>driving force</td><td>A</td></tr><tr><td>frictional force</td><td>C</td></tr><tr><td>lifting force</td><td>B</td></tr><tr><td>weight</td><td>D</td></tr></table> one mark for each two correct ;;	name of force	letter on Fig. 1.1	driving force	A	frictional force	C	lifting force	B	weight	D	2
name of force	letter on Fig. 1.1											
driving force	A											
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weight	D											
3(a)(ii)	(Force B is 500 000 N) no mark constant height; forces (B and D) are balanced ;	1										
3(a)(iii)	1. A / driving force ; 2. B / lifting force ;	2										
3(b)(i)	600 km / h = 600 000 / 3600 m / s = 167 m / s ;	1										
3(b)(ii)	time (= distance / speed) = 2700 / 600 = 4.5 h	1										
3(c)	loss of kinetic energy ; loss of (gravitational) potential energy ;	2										
3(d)	any variation on this shape that goes from the origin to a maximum and returns to speed = 0 ; horizontal section at constant maximum speed ;	2										

Question	Answer	Marks
4(a)(i)	A closes and B opens ;	1
4(a)(ii)	to prevent backflow of blood ;	1
4(b)(i)	any suitable flight or fight situation described ;	1
4(b)(ii)	destroyed by the liver ;	1
4(c)	transport of oxygen / haemoglobin ; transport of blood cells / ions / soluble nutrients / named soluble nutrient / hormones / carbon dioxide ;	2

Question	Answer	Marks
5(a)(i)	Fractional distillation ;	1
5(a)(ii)	no new substance made / involves only changes of state ;	1
5(a)(iii)	cooking / heating allow bottling / bottled gas ;	1
5(b)(i)	methane ;	1
5(b)(ii)	(atoms) five / 5 and (elements) two / 2 ;	1
5(b)(iii)	C atom joined to 4 H atoms by single bonds ; allow correct dot-and-cross diagrams	1
5(c)	coal ;	1

Question	Answer	Marks							
6(a)(i)	conduction ;	1							
6(a)(ii)	insulation (in outer layer of aircraft) / make aircraft out of bad (thermal) conductor / owtte ;	1							
6(b)(i)	(Z – no mark) gas molecules far apart / not touching ;	1							
6(b)(ii)	ice / (frozen) water ; water from fuel combustion freezing / condensing in very cold air ;	2							
6(c)	<table border="1"><tr><td>gamma radiation</td><td></td><td></td><td>visible light</td><td></td><td>micro-waves ;</td><td>radio waves ;</td></tr></table>	gamma radiation			visible light		micro-waves ;	radio waves ;	2
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6(d)	(pitch) low ; (amplitude) (very) high ;	2							

Question	Answer	Marks
7(a)(i)	for <u>respiration</u> ;	1
7(a)(ii)	diffusion ;	1
7(a)(iii)	from the (water) plants ;	1
7(b)(i)	food web completed as shown ;  arrows in the correct direction ;	2
7(b)(ii)	small animals ; water plants / algae ;	2

Question	Answer	Marks
8(a)(i)	filtration ;	1
8(a)(ii)	kill microbes / sterilise (water) ;	1
8(a)(iii)	(damp)-litmus (paper) ; turns white / bleached ;	2
8(b)(i)	chlorine + hydrogen → hydrogen chloride ; LHS either order	1
8(b)(ii)	covalent ; share (pair of) electrons ;	2
8(b)(iii)	HCl ;	1
8(c)(i)	anode ;	1
8(c)(ii)	copper ;	1
8(c)(iii)	copper chloride solution / aqueous copper chloride ;	1

Question	Answer	Marks
9(a)	correct symbols for ammeter and lamp ; correct symbol for variable resistor ; all shown components connected in series, any order ;	3
9(b)	resistance = V / I ; (total resistance) = $2.4 / 0.6$ (= 4Ω) ; resistance of one lamp = $2 (\Omega)$;	3
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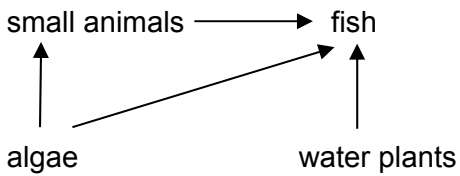
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