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**COMBINED SCIENCE**

**0653/31**

Paper 3 Core Theory

**May/June 2017**

MARK SCHEME

Maximum Mark: 80

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**Published**

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This document consists of **7** printed pages.

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 <b>2</b> and level with stigma in <b>1</b> ;	1
1(c)	flower <b>2</b> (no mark) the stigma is higher than the anthers / anthers lower than the stigma ;	1

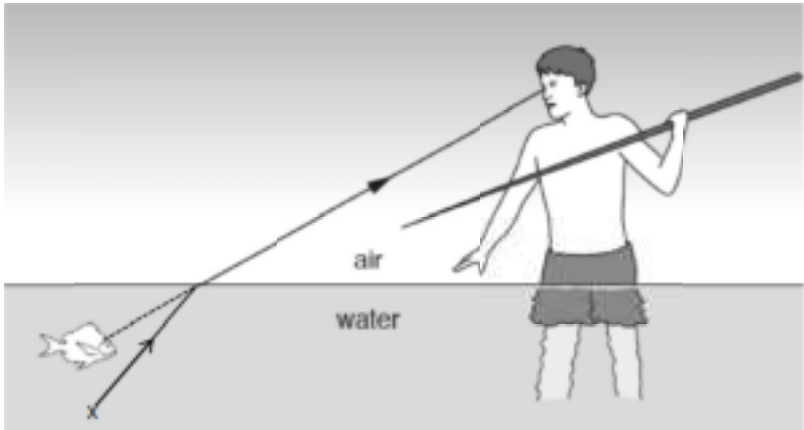
Question	Answer	Marks
2(a)(i)	covalent ;	1
2(a)(ii)	non-metal(lic) ;	1
2(b)(i)	<div style="display: flex; align-items: center; justify-content: center; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 10px;">(methane)</div> <div>+</div> <div style="border: 1px solid black; padding: 2px 10px;">oxygen</div> <div>→</div> <div style="border: 1px solid black; padding: 2px 10px;">carbon dioxide</div> <div>+</div> <div style="border: 1px solid black; padding: 2px 10px;">water</div> </div> <p>Oxygen on LHS ; RHS any order ;</p>	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 <b>and</b> 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 border="1"> <thead> <tr> <th>name of force</th> <th>letter on Fig. 1.1</th> </tr> </thead> <tbody> <tr> <td>driving force</td> <td><b>B</b></td> </tr> <tr> <td>frictional force</td> <td><b>D</b></td> </tr> <tr> <td>upthrust of water</td> <td><b>C</b></td> </tr> <tr> <td>weight</td> <td><b>A</b></td> </tr> </tbody> </table> <p>two letters correct ; two more letters correct ;</p>	name of force	letter on Fig. 1.1	driving force	<b>B</b>	frictional force	<b>D</b>	upthrust of water	<b>C</b>	weight	<b>A</b>	2
name of force	letter on Fig. 1.1											
driving force	<b>B</b>											
frictional force	<b>D</b>											
upthrust of water	<b>C</b>											
weight	<b>A</b>											
3(a)(ii)	(Force C is 1200 N) no mark no vertical motion / forces ( <b>A</b> and <b>C</b> ) must balance ;	1										
3(a)(iii)	<b>B</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 ;	<b>2</b>							
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) ;	<b>Max 2</b>							
6(a)(iii)	(line 1) (more) energetic/faster <b>and</b> (line 3) energy / speed ; (line 4) temperature ;	<b>2</b>							
6(b)(i)	 <p>(position of X implies) correct refraction at surface ; unbroken ray in a straight line from X joining with ray to eye ;</p>	<b>2</b>							
6(b)(ii)	refraction ;	<b>1</b>							
6(c)	<table border="1"> <tr> <td>gamma rays</td> <td></td> <td></td> <td>visible light</td> <td></td> <td><b>micro-waves ;</b></td> <td>radio waves</td> </tr> </table>	gamma rays			visible light		<b>micro-waves ;</b>	radio waves	<b>1</b>
gamma rays			visible light		<b>micro-waves ;</b>	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

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