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**CO-ORDINATED SCIENCES**

**0654/32**

Paper 3 Theory (Core)

**October/November 2017**

MARK SCHEME

Maximum Mark: 120

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**Published**

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

Question	Answer	Marks
1(a)(i)	<b>C</b> ; <b>A</b> ; <b>D</b> ;	<b>3</b>
1(a)(ii)	where fetus / baby, develops ;	<b>1</b>
1(b)(i)	<u>joining of</u> male and female gamete / sperm and egg ; joining / fusion, of <u>nuclei</u> ;	<b>2</b>
1(b)(ii)	<u>zygote</u> ;	<b>1</b>
1(c)	requires two parents ; produces genetically dissimilar offspring ; involves haploid cell / gametes / sex cells ;	<b>max 2</b>

Question	Answer	Marks
2(a)	nucleus <i>then</i> protons and neutrons ; negative ; positive ;	<b>3</b>
2(b)(i)	lithium, sodium, potassium ; copper, potassium ;	<b>2</b>
2(b)(ii)	potassium sodium lithium copper ;	<b>1</b>
2(b)(iii)	burning / lighted splint ; pops ;	<b>2</b>

Question	Answer	Marks
2(c)	no change / no reaction AND argon is unreactive / is an inert gas ;  solution becomes orange ; bromine is released / chlorine displaces bromine / chlorine more reactive than bromine ;	<b>3</b>

Question	Answer	Marks
3(a)(i)	angle of incidence correctly labelled ;	<b>1</b>
3(a)(ii)	30° ; angle of incidence = angle of reflection ;	<b>2</b>
3(a)(iii)	electrical energy to light energy ;	<b>1</b>
3(b)(i)	GM tube etc. ;	<b>1</b>
3(b)(ii)	Electron ;	<b>1</b>
3(b)(iii)	reference to background radiation / decay is a random process ;	<b>1</b>
3(b)(iv)	( $\beta^-$ )radiation cannot penetrate lead ;	<b>1</b>
3(c)(i)	54 (N) ;	<b>1</b>
3(c)(ii)	change in speed / direction of motion ;	<b>1</b>

Question	Answer	Marks
4(a)(i)	(thorn) acacias → (desert) mice → snake → hawk  organisms in correct order ; arrows in the correct direction ;	2
4(a)(ii)	(thorn) acacias ;	1
4(a)(iii)	(desert) mice ;	1
4(b)	Sun ;	1
4(c)	greater chance of passing on genes ; by the best adapted organisms / AW ;	2

Question	Answer	Marks																									
5(a)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>substance</th> <th>element</th> <th>ionic compound</th> <th>covalent compound</th> <th>mixture</th> </tr> </thead> <tbody> <tr> <td>air</td> <td></td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>bromine</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>carbon dioxide</td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>iron oxide</td> <td></td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table> 1 or 2 ticks correct ; 3 ticks correct ; 4 ticks correct ;	substance	element	ionic compound	covalent compound	mixture	air				✓	bromine	✓				carbon dioxide			✓		iron oxide		✓			3
substance	element	ionic compound	covalent compound	mixture																							
air				✓																							
bromine	✓																										
carbon dioxide			✓																								
iron oxide		✓																									
5(a)(ii)	contains carbon hydrogen and oxygen ; shows 6 × C 12 × H 6 × O <u>atoms</u> ;	2																									
5(b)(i)	electrolysis ;	1																									

Question	Answer	Marks
5(b)(ii)	anode – bubbles / gas released ; cathode – colour change / coloured layer forms / pink / orange layer forms ;	2
5(b)(iii)	lead oxide + carbon → (lead) + carbon dioxide / monoxide  LHS correct ; RHS correct ;	2
5(b)(iv)	(lead oxide) oxygen removed ;	1

Question	Answer	Marks
6(a)(i)	small amplitude because quiet noise / amplitude determines loudness ;	1
6(a)(ii)	high frequency because high pitch / frequency determines pitch ;	1
6(b)(i)	<b>B</b> anywhere from 2 minutes to 5 minutes ; temperature is constant when boiling / water boils at 100 °C ;	2
6(b)(ii)	<u>temperature</u> at which a liquid boils / turns into a gas ;	1
6(b)(iii)	water – <b>B</b> <b>AND</b> particles are close together / touching and randomly arranged ; steam – <b>C</b> <b>AND</b> particles are widely spaced / spread out (and randomly arranged) ;	2
6(c)	cable broken / no insulation / wire exposed ; danger of electrocution / short circuit / electric shock / fire ;	2
6(d)	visible light is missing ; microwaves and / or infra-red in wrong place / in each other's place ;	2

Question	Answer	Marks
7(a)(i)	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> <p><b>type of tooth</b></p> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">canine</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">incisor</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">molar</div> </div> <div style="text-align: center;"> <p><b>function</b></p> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">biting and cutting</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">grinding and chewing</div> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">piercing and tearing</div> </div> </div> <p>1 or 2 correct ; 3 correct ;</p>	<b>2</b>
7(a)(ii)	<i>(molar is)</i> flatter / broader / larger surface area / has cusps / uneven surface / more than one root ;	<b>1</b>
7(b)	<u>bacteria</u> ;	<b>1</b>
7(c)(i)	ref to no consumer choice ; side effects / long term effects not known ; fluorosis / discolouration of teeth ;	<b>max 1</b>
7(c)(ii)	brushing teeth ; avoid sugary, food / drinks ; visiting dentist / regular checkups ;	<b>max 2</b>

Question	Answer	Marks
8(a)(i)	7 ;	1
8(a)(ii)	salt ; water ;	2
8(a)(iii)	soil too acidic / calcium oxide is a base ; calcium oxide neutralises / reacts with the acid in the soil ; improves conditions for plant growth ;	max 2
8(b)(i)	burning fossil fuels (that still contain sulfur) ; reference to volcanism / hot springs ;	2
8(b)(ii)	reference to the formation of acid rain / example of a consequence of acid rain ;	1

Question	Answer	Marks
9(a)(i)	accelerating / increasing speed ;	1
9(a)(ii)	speed = distance / time / = 560 / 60 ; = 9.33 (m / s) ;	2
9(a)(iii)	kinetic energy to thermal / sound ;	1
9(b)	volume = $15 \times 15 \times 12$ / = 2700 cm <sup>3</sup> ; density = mass/volume or 7500 / 2700 ; = 2.78 (g / cm <sup>3</sup> ) ;	3
9(c)	first reflection ; second reflection parallel to incident ray ;	2
9(d)(i)	Parallel ;	1
9(d)(ii)	$I = V / R$ or 12 / 5 ; = 2.4 (A) ;	2

Question	Answer	Marks
10(a)	geotropism ;	1
10(b)(i)	respiration ;	1
10(b)(ii)	moisture / water ; warm (temperature) / suitable temperature ;	2
10(c)(i)	(seedling is) underground / no light ;	1
10(c)(ii)	LHS carbon dioxide + water ; RHS glucose + oxygen ;	2
10(d)	magnesium ;	1

Question	Answer	Marks
11(a)(i)	ethane ;	1
11(a)(ii)	$  \begin{array}{cc}  \text{H} & \text{H} \\    &   \\  \text{C} & = & \text{C} \\    &   \\  \text{H} & \text{H}  \end{array}  $ double bond shown ; four hydrogen atoms – two on each carbon atom ;	2
11(b)(i)	CO <sub>2</sub> and H <sub>2</sub> O from the (complete) combustion of propane / the fuel / the hydrocarbon ;	1
11(b)(ii)	nitrogen and argon from / in the air (taken in with the fuel) ; nitrogen and argon are inert / do not react / burn ;	2
11(c)(i)	calcium carbonate / CaCO <sub>3</sub> ; calcium oxide / lime / CaO / carbon dioxide / CO <sub>2</sub> ;	2



Question	Answer	Marks
11(c)(ii)	cobalt oxide / CoO and copper oxide / CuO ; reference to transition metals ;	2

Question	Answer	Marks
12(a)	Friction / description of friction ; transfer of electrons ;	2
12(b)	low a magnetic iron switch high  2 correct ; 4 correct ;	2
12(c)	coal / gas ; solar / wind / waves / tides / geothermal / hydroelectricity ;	2
12(d)	use a magnet (no mark) steel is magnetic / will attract magnet or aluminium is not magnetic / will not attract magnet ;	1

Question	Answer	Marks
13(a)	70 ;	1
13(b)(i)	poaching / hunting / animal predators ; disease ; pollution ; competition ;	max 2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
13(b)(ii)	soil erosion / loss of soil ; flooding ; carbon dioxide build-up ; species extinction / endangerment ;	<b>max 2</b>
13(c)	creating national parks / protected areas ; legislation / banning hunting ; breeding programmes ; eco-tourism / ref to raising awareness / education ;	<b>max 2</b>
13(d)	water ; fossil fuels ;	<b>2</b>