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**CO-ORDINATED SCIENCES**

**0654/33**

Paper 3 Theory (Core)

**May/June 2018**

MARK SCHEME

Maximum Mark: 120

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**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 International will not enter into discussions about these mark schemes.

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This document consists of **16** printed pages.

**PUBLISHED****Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer			Marks															
1(a)(i)	thick wall ; thick muscle / elastic layer ; narrow lumen ;			<b>max 2</b>															
1(a)(ii)	thinner wall ; thinner muscle / elastic layer ; larger lumen ; presence of valves ;			<b>max 2</b>															
1(b)	<table border="1" data-bbox="456 520 1816 839"> <thead> <tr> <th data-bbox="456 520 911 603">organ</th> <th data-bbox="911 520 1364 603">blood vessel bringing blood to the organ</th> <th data-bbox="1364 520 1816 603">blood vessel taking blood away from the organ</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 603 911 652">heart</td> <td data-bbox="911 603 1364 652">vena cava / pulmonary vein</td> <td data-bbox="1364 603 1816 652">aorta</td> </tr> <tr> <td data-bbox="456 652 911 702">kidney</td> <td data-bbox="911 652 1364 702">renal artery</td> <td data-bbox="1364 652 1816 702">renal vein</td> </tr> <tr> <td data-bbox="456 702 911 785">liver</td> <td data-bbox="911 702 1364 785">hepatic artery / hepatic portal vein</td> <td data-bbox="1364 702 1816 785">hepatic vein</td> </tr> <tr> <td data-bbox="456 785 911 839">lungs</td> <td data-bbox="911 785 1364 839">pulmonary artery</td> <td data-bbox="1364 785 1816 839">pulmonary vein</td> </tr> </tbody> </table> <p data-bbox="320 842 757 874">one mark for each correct row ;;;;</p>			organ	blood vessel bringing blood to the organ	blood vessel taking blood away from the organ	heart	vena cava / pulmonary vein	aorta	kidney	renal artery	renal vein	liver	hepatic artery / hepatic portal vein	hepatic vein	lungs	pulmonary artery	pulmonary vein	<b>4</b>
organ	blood vessel bringing blood to the organ	blood vessel taking blood away from the organ																	
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liver	hepatic artery / hepatic portal vein	hepatic vein																	
lungs	pulmonary artery	pulmonary vein																	

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)(i)	(good) conductor of electrical energy / electricity (good) conductor of thermal energy / heat malleable ductile lustrous / shiny ;	<b>1</b>
2(a)(ii)	transition ;	<b>1</b>
2(a)(iii)	high density ; reference to coloured compounds ; catalysis ;	<b>max 2</b>
2(b)(i)	copper oxide + carbon → (carbon dioxide) + copper ;	<b>1</b>
2(b)(ii)	carbon ; (carbon) gains oxygen ;	<b>2</b>
2(b)(iii)	limewater ; turns cloudy ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(a)(i)	at time = 0 s or time = 50 s ;	<b>1</b>
3(a)(ii)	somewhere between time = 20 s and time = 40 s ;	<b>1</b>
3(a)(iii)	20 s ;	<b>1</b>
3(b)	force <b>A</b> is greater than force <b>F</b> ;	<b>1</b>
3(c)(i)	wavelength correctly shown ;	<b>1</b>
3(c)(ii)	vertical distance from still water level to peak or trough / owtte ;	<b>1</b>
3(d)	chemical ; sound and thermal ;	<b>2</b>
3(e)	water molecules are moving / have a range of kinetic energies ; more energetic molecules escape ; break bonds / break forces of attraction between molecules ; ref to increased energy on a sunny day ;	<b>max 3</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	$39.4 - 36.8 = 2.6$ (°C) ;	<b>1</b>
4(a)(ii)	decrease back to original temperature ;	<b>1</b>
4(b)	sweating ; goes red ; vasodilation; / increased blood flow to skin ;	<b>max 2</b>
4(c)	(respiration) releases energy ; in the form of thermal energy ;	<b>2</b>
4(d)	more frequent muscle contraction / beating, of heart ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)(i)	green ; to blue / purple ;	<b>2</b>
5(a)(ii)	7 to >7 and 14 or less ;	<b>1</b>
5(a)(iii)	lighted splint / flame causes pop / explosive burn ;	<b>1</b>
5(a)(iv)	measure temperature change / place thermometer in mixture ; temperature increases ;	<b>2</b>
5(b)(i)	ionic / electrovalent ;	<b>1</b>
5(b)(ii)	electrolysis ;	<b>1</b>
5(b)(iii)	label line to positive electrode ;	<b>1</b>
5(b)(iv)	<u>chlorine</u> ;	<b>1</b>

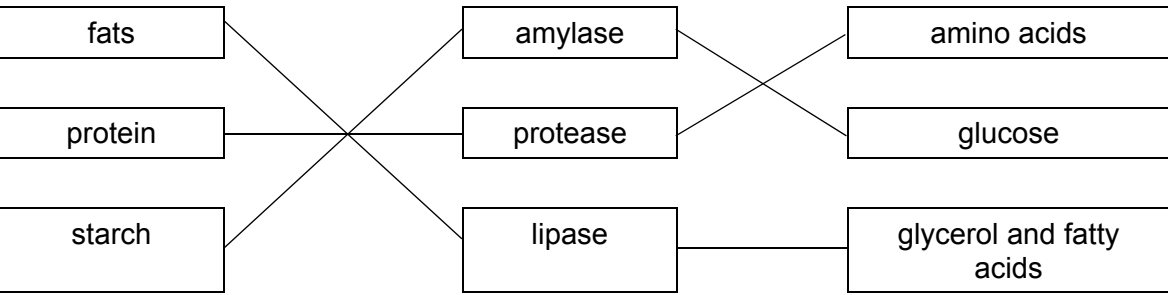


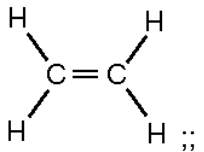
<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)(i)	10 (cm) ;	<b>1</b>
6(a)(ii)	principal focus / focal point ;	<b>1</b>
6(b)(i)	<b>A</b> X-rays ; <b>B</b> infra-red ;	<b>2</b>
6(b)(ii)	gamma rays / left-hand side ;	<b>1</b>
6(c)(i)	time = distance / speed or $400 / 300\,000$ ; = 0.0013 (s) ;	<b>2</b>
6(c)(ii)	sound needs a medium / sound needs air / there is no air / there is a vacuum ;	<b>1</b>
6(d)(i)	wind / geothermal / tidal / HEP / waves ;	<b>1</b>
6(d)(ii)	coal / petroleum / gas ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7(a)	<b>A ; E ; C ; D ;</b>	<b>4</b>
7(b)(i)	(pollen transferred by) wind ;	<b>1</b>
7(b)(ii)	involves gametes ticked ; involves fusion of nuclei ticked ; produces genetically dissimilar offspring ticked ;	<b>3</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
8(a)(i)	alloy ;	<b>1</b>
8(a)(ii)	strength / malleability / density / conductivity / colour ;	<b>1</b>
8(b)	provides barrier / owtte ; between oxygen / air and water (and iron) ;	<b>2</b>
8(c)(i)	$25 \div 50 = 0.5 \text{ (cm}^3\text{)}$ ;	<b>1</b>
8(c)(ii)	increase temperature ; increase concentration of acid ; increased surface area / grind up magnesium ;	<b>max 2</b>
8(d)	magnesium oxide ; magnesium carbonate ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
9(a)(i)	any correct application ;	<b>1</b>
9(a)(ii)	railway tracks / bridges / roads ;	<b>1</b>
9(b)	density = mass / volume or $40.5 / 15$ ; = 2.7 ; $\text{g / cm}^3$ ;	<b>3</b>
9(c)	protons = 13 ; neutrons = 15 ;	<b>2</b>
9(d)	neutron number ;	<b>1</b>
9(e)(i)	(wire) <b>K</b> ; shortest length and largest diameter ;	<b>2</b>
9(e)(ii)	$R = V / I$ or $6 / 5000$ ; = 0.0012 ( $\Omega$ ) ;	<b>2</b>

Question	Answer	Marks
10(a)(i)	any value between 41–43 (°C) ;	<b>1</b>
10(a)(ii)	any value between 0–10 (°C) <b>OR</b> 60–80 (°C) ;	<b>1</b>
10(b)	close to / same as body temperature ;	<b>1</b>
10(c)	 <p>one mark for each correct set of links ;;</p>	<b>3</b>
10(d)	breakdown large (food) molecules to small (food) molecules ; from insoluble to soluble ; so they are easily absorbed ; reference to catalyst ;	<b>3</b>

Question	Answer	Marks
11(a)(i)	<u>fractional distillation</u> ;	<b>1</b>
11(a)(ii)	carbon and hydrogen ;	<b>1</b>
11(a)(iii)	refinery gas ; heating / cooking / other correct ;  diesel / diesel oil / gasoil ; fuel for diesel engines ;  other correct product and use ;;	<b>2</b>
11(b)(i)	substance that increases reaction rate ; but is not (permanently) chemically changed ;	<b>2</b>
11(b)(ii)	use of bromine / bromine solution ; changes from orange to colourless with alkenes / unsaturation ;	<b>2</b>
11(c)(i)		<b>2</b>
11(c)(ii)	H <sub>2</sub> O ;	<b>1</b>
11(c)(iii)	many ethene molecules join to form poly(ethene) / owtte ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
12(a)	reference to electron transfer ;	<b>1</b>
12(b)	symbols correct ; only lamps in parallel ; switch in suitable place ;	<b>3</b>
12(c)	conduction ;	<b>1</b>
12(d)	two reflections ; two correct reflections <b>and</b> ray emerges approx. parallel to original ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
13(a)(i)	46 ;	<b>1</b>
13(a)(ii)	male <b>and</b> the presence of XY chromosomes ;	<b>1</b>
13(a)(iii)	X inherited from, mother / egg / female gamete ; Y inherited from, father / sperm / male gamete ;	<b>2</b>
13(b)	<u>DNA</u> ; <u>genes</u> ;	<b>2</b>
13(c)	joining of nuclei ; (of) sperm and egg / male and female gamete / sex cells ;	<b>2</b>