
COMBINED SCIENCE**5129/21**

Paper 2 Theory

October/November 2016

MARK SCHEME

Maximum Mark: 100

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 will not enter into discussions about these mark schemes.

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Question	Answer	Marks
1(a)(i)	$0.043 \times 10 = 0.43$	1
1(a)(ii)	$0.43 \times 0.5 = 0.215$	1
1(b)	any one from <ul style="list-style-type: none"> • work is done against friction / air resistance • transferred as heat (to the surroundings) • transferred as sound 	1

Question	Answer	Mark
2(a)(i)	A = palisade / mesophyll cell B = chloroplast C = nucleus D = cuticle	4
2(a)(ii)	any one from <ul style="list-style-type: none"> • to waterproof the leaf • prevent loss of water from the leaf • reduce evaporation 	1

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Question	Answer	Mark												
2(b)	<table border="1"> <thead> <tr> <th colspan="2">net movement in dark conditions</th> <th colspan="2">net movement in bright light conditions</th> </tr> <tr> <th>into leaf</th> <th>out of leaf</th> <th>into leaf</th> <th>out of leaf</th> </tr> </thead> <tbody> <tr> <td>oxygen</td> <td>carbon dioxide OR water</td> <td>carbon dioxide</td> <td>oxygen water</td> </tr> </tbody> </table>	net movement in dark conditions		net movement in bright light conditions		into leaf	out of leaf	into leaf	out of leaf	oxygen	carbon dioxide OR water	carbon dioxide	oxygen water	5
net movement in dark conditions		net movement in bright light conditions												
into leaf	out of leaf	into leaf	out of leaf											
oxygen	carbon dioxide OR water	carbon dioxide	oxygen water											
2(c)	<p>xylem any two from</p> <ul style="list-style-type: none"> • transports water • transports minerals • only upwards • supports plant <p>phloem any one from</p> <ul style="list-style-type: none"> • transports glucose • upwards and downwards 	2 1												

Question	Answer	Mark
3(a)(i)	80	1
3(a)(ii)	32 160 4	3
3(b)	SO ₃ + H ₂ O \longrightarrow H ₂ SO ₄	1

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Question	Answer	Mark
3(c)	any one from <ul style="list-style-type: none"> • copper carbonate • copper hydroxide • copper oxide 	1
3(d)	fossil fuels contain sulphur compounds (which burn)	1

Question	Answer	Mark
4(a)	1.46 cm	1
4(b)	start timer as it passes X stop timer as it passes Y	2

Question	Answer	Mark
5(a)	any two from <ul style="list-style-type: none"> • urea • bile • glycogen 	2
5(b)	any two from <ul style="list-style-type: none"> • amino acids • alcohol • hormones; • drugs / toxic chemicals 	2

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Question	Answer	Mark
6(a)	carbon monoxide	1
6(b)	nitrogen	1
6(c)	ammonia	1
6(d)	hydrogen	1
6(e)	argon	1

Question	Answer	Mark
7(a)	any one from <ul style="list-style-type: none"> • higher temperature • lower density 	1
7(b)(i)	any one from <ul style="list-style-type: none"> • good conductor of heat • resistant to corrosion / does not react with water 	1
7(b)(ii)	good absorber of heat	1
7(c)	any one from <ul style="list-style-type: none"> • hot water lower density • heated water rises • by convection 	2

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Question	Answer	Mark
8	both rays correct refraction inside the lens both rays correct refraction leaving the lens	2

Question	Answer	Mark
9(a)(i)	farm worker	1
9(a)(ii)	10 000	1
9(b)	any two from <ul style="list-style-type: none"> • energy intake is more than energy used / 3750 kJ more than is required • excess food converted to fat • fat stored in body increasing weight 	2
9(c)	any two from <ul style="list-style-type: none"> • age • gender / sex • occupation 	2

Question	Answer	Mark
10(a)	8 2,5 17 40	4
10(b)	S and V	1
10(c)(i)	TU ₂	1
10(c)(ii)	ionic	1

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Question	Answer	Mark
11(a)(i)	visible light	1
11(a)(ii)	3×10^8 m/s	1
11(b)	frequency	1
11(c)	water wave	1

Question	Answer	Mark
12	<u>glands</u> <u>plasma</u> <u>target</u>	3

Question	Answer	Mark
13(a)(i)	produces energy	1
13(a)(ii)	carbon dioxide water	2
13(b)	<u>same general formula</u>	1
	any one from <ul style="list-style-type: none"> • gradation in physical properties • same chemical properties • formula differs by CH₂ • same functional group 	1

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Question	Answer	Mark
13(c)	$ \begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array} $	1

Question	Answer	Mark
14(a)	the voltage increases then returns to <u>zero</u>	2
14(b)	any one from <ul style="list-style-type: none"> • strength of magnet • speed of movement 	1
14(c)	$V = I R$ or $I = V/R$ or $I = 0.0003/9$ 3.33×10^{-5} A/Amps	3

Question	Answer	Mark
15(a)	light	1
15(b)	<u>grass</u> 2 4	3

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Question	Answer	Mark
16(a)	Y X Z W	2
16(b)(i)	removal of oxygen	1
16(b)(ii)	hydrogen more reactive (than W)	1
16(c)	any one from <ul style="list-style-type: none"> • conduct electricity • malleable • high melting point • shiny 	1

Question	Answer	Mark
17(a)(i)	neutral	1
17(a)(ii)	any one from <ul style="list-style-type: none"> • if appliance casing becomes live • current exceeds fuse rating / current is too high it melts	1
17(b)	casing cannot become live	1
17(c)	7A chance of damage to appliance is small up to this amount	2

Question	Answer	Mark
18	E E D	3

Question	Answer	Mark
19(a)		2
19(b)(i)	hydrogen	1
19(b)(ii)	pH = 3 – 5	1

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Question	Answer	Mark
20(a)	Lead	1
	gamma radiation cannot penetrate	1
20(b)(i)	20 000	1
20(b)(ii)	5.25 years	1