
COMBINED SCIENCE

5129/21

Paper 2 Theory

May/June 2019

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 International will not enter into discussions about these mark schemes.

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This document consists of **13** 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:

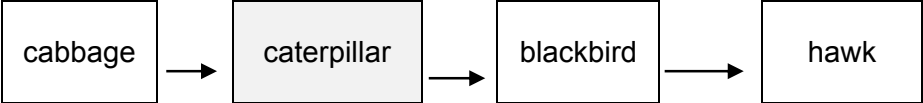
Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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)	 <p data-bbox="342 368 1240 467">all 3 arrows going in direction shown ; cabbage in box to the left of the caterpillar ; black bird and hawk in successive boxes to the right of the caterpillar;</p>	3
1(b)	decomposer ;	1
1(c)	sun / sunlight ;	1

Question	Answer	Marks
2(a)	change of velocity ; (change of velocity) per unit time ;	2
2(b)(i)	curve of best fit line through all points $\pm \frac{1}{2}$ small square ;	1
2(b)(ii)	7.7 ;	1
2(b)(iii)	decreases ;	1

Question	Answer	Marks
3(a)(i)	1–3 ;	1
3(a)(ii)	any one from <ul style="list-style-type: none"> • acid rain ; • kills marine life ; • kills plants ; 	1
3(b)(i)	28 ;	1
3(b)(ii)	112 28 ; 0.56 ;	3

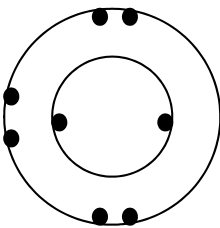
Question	Answer	Marks
4	gland ; plasma ; target ; liver ;	4

Question	Answer	Marks
5(a)(i)	13 ; Nm ;	2
5(a)(ii)	2.6 ;	1
5(b)	extends ; returns to original length ;	2

Question	Answer	Marks
6(a)	lighted splint ; explodes / burns with pop sound ;	2
6(b)	most reactive A C least reactive B ;;	2
6(c)(i)	2 CO ₂ ;	1
6(c)(ii)	any two from <ul style="list-style-type: none"> • copper oxide ; • copper hydroxide ; • copper hydrogencarbonate ; 	2

Question	Answer	Marks
7(a)(i)	28 (breaths per minute) ;	1
7(a)(ii)	any two from <ul style="list-style-type: none"> • more respiration ; • more muscle contraction; • more energy needed ; • more oxygen required ; • more carbon dioxide excreted ; 	2
7(b)(i)	any two from <ul style="list-style-type: none"> • student A's breathing rate increased more / faster ; • student A's breathing rate took longer to return to normal ; • comparison between shapes of curves during recovery period ; 	2
7(b)(ii)	any one from <ul style="list-style-type: none"> • A was less physically fit (than B) ; • A was ill ; 	1
7(c)	any one from <ul style="list-style-type: none"> • pulse rate / heart rate ; • sweating ; • production of lactic acid ; • volume of urine produced ; 	1

Question	Answer	Marks
8(a)	put each material between ice cube and heater ; measure time taken for ice to melt ; least time for ice to melt is best conductor ;	3
8(b)	y-axis : rate of thermal energy transfer ; negative gradient ;	2

Question	Answer	Marks
9(a)	same number of protons ; different number of neutrons ;	2
9(b)		1
9(c)	oxygen ;	1

Question	Answer	Marks
10(a)	<p>chloroplast</p> <p>absorbs water</p> <p>root hair cell</p> <p>gaseous exchange</p> <p>stomata</p> <p>transports water in leaves</p> <p>xylem</p> <p>traps light energy</p>	4
10(b)	<p>any two from</p> <ul style="list-style-type: none"> • plants produce oxygen ; • plants remove carbon dioxide ; • plants produce food / named food ; 	2

Question	Answer	Marks
11(a)	same <u>general</u> formula ;	1
	any one from <ul style="list-style-type: none"> • same functional group ; • similar chemical properties ; • gradation in physical properties ; • each member differs from next by CH₂ ; 	1
11(b)(i)	C ₃ H ₈ ;	1
11(b)(ii)	cracking ;	1
11(c)	bromine water ; (changes from brown) to colourless ;	2

Question	Answer	Marks
12(a)	($t = 1 / 340$) 0.0029(41176 ...) ;	1
12(b)(i)	($340 \div 485 =$) 0.7 (m);	1
12(b)(ii)	any one from <ul style="list-style-type: none"> • they travel at same speed ; • higher frequency waves have shorter wavelengths ; 	1
12(c)	any two from <ul style="list-style-type: none"> • the wire moves ; • (near to a) magnet / magnetic field ; • changing magnetic field ; 	2

Question	Answer	Marks	
13(a)	structure	letter	4
	anus	X ;	
	colon	W ;	
	liver	T ;	
	oesophagus	R ;	
	pancreas	U	
13(b)	any two from <ul style="list-style-type: none"> • amylase is an enzyme ; • pH is below optimum for amylase (in stomach) ; • action of amylase slowed down / stops working / denatured ; 	2	

Question	Answer	Marks
14(a)	flow / movement of charge ; (flow of charge) per unit time ;	2
14(b)	tick in fourth box ;	1
14(c)(i)	voltmeter;	1
14(c)(ii)	5.5 ; V	2

Question	Answer	Marks
15(a)	any one from <ul style="list-style-type: none"> • pencil is insoluble / does not dissolve in water ; • does not contaminate the chromatogram ; • does not mix with the dyes ; 	1
15(b)	R ; colour stayed on base line ;	2
15(c)(i)	3 ;	1
15(c)(ii)	6 ;	1

Question	Answer	Marks
16(a)(i)	haematite ;	1
16(a)(ii)	removal / loss of oxygen ;	1
16(b)	oxygen ; water ;	2
16(c)	galvanising ; zinc ;	2

Question	Answer	Marks
17(a)(i)	<i>dish Y</i> : peas seeds had no water / water needed for germination ; <i>dish Z</i> : pea seeds at too low a temperature for germination ;	2
17(a)(ii)	any one from <ul style="list-style-type: none"> • 30 seeds would give more reliable results ; • some of the peas seeds could have been infertile / diseased ; 	1
17(b)	<i>prediction</i> : seeds germinate ; <i>explanation</i> :	1
	any one from <ul style="list-style-type: none"> • light is not necessary for germination ; • had all necessary conditions for germination ; 	1

Question	Answer	Marks
18	transverse radio 3×10^8 ;;	2

Question	Answer	Marks
19(a)	4.6 ;	1
19(b)	(the magnets) repel ; more force as they get closer together ;	2
19(c)	work = Fd ; 0.011 (J) ;	2