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**COMBINED SCIENCE**

**5129/22**

Paper 2 Theory

**May/June 2019**

MARK SCHEME

Maximum Mark: 100

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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 **12** 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)	both points plotted to $\pm \frac{1}{2}$ small square ;	1
1(a)(ii)	<b>all</b> points on curve ;	1
1(a)(iii)	non-uniform / non-constant acceleration / increasing acceleration ;	1
1(b)	change of displacement ; per unit time ; <b>or</b> distance moved per unit time ; in a specified direction ;	2

Question	Answer	Marks
2(a)(i)	Na <sup>+</sup> ; Cl <sup>-</sup> ;	1
2(a)(ii)	full / complete outer shell of electrons ;	1
2(b)	any <b>two</b> from high melting point / boiling point ; conducts electricity <u>when molten</u> ; conducts electricity <u>in aqueous solution</u> ; soluble in water ;	2
2(c)	seven electrons in <u>outer</u> shell ;	1

Question	Answer	Marks
3		6

Question	Answer	Marks
4(a)	$180 \cdot 0.3 = F \cdot 0.9$ or $54 = F \cdot 0.9$ ; $F = 60 \text{ (N)}$ ;	2
4(b)	less force (needed to lift at handle) ; further <b>from pivot</b> ; (same force produces) greater moment ;	3

Question	Answer	Marks
5(a)(i)	44 ;	1
5(a)(ii)	88 72 ; 2.2 ;	3
5(b)	produce (heat) / (thermal) energy ;	1
5(c)	any <b>one</b> from acid rain ; kills marine life ; kills plants ;	1

Question	Answer	Marks
6(a)	pupil (much) wider than in Fig. 2.1 ;	1
6(b)(i)	<b>A</b> cornea ; <b>B</b> retina ; <b>C</b> optic nerve ;	3
6(b)(ii)	any <b>three</b> from ciliary muscles relax ; suspensory ligaments pull on the lens ; lens becomes thinner ; change in focal length ; description of diameter of ciliary body increasing ;	3

Question	Answer	Marks
7(a)(i)	<b>C</b> ; faster rate of heat transfer ;	<b>2</b>
7(a)(ii)	expansion ;	<b>1</b>
7(b)	22 (°C) ;	<b>1</b>
7(c)	resistance ;	<b>1</b>

Question	Answer	Marks
8(a)	2 2 ;	<b>1</b>
8(b)	goes milky / cloudy ;	<b>1</b>
8(c)	filtered (to remove yeast) ; (fractionally) distilled ;	<b>2</b>
8(d)	oxidation ;  pH 3–6 ;	<b>2</b>

Question	Answer	Marks
9(a)	any <b>three</b> from <i>expired air</i> contains <u>less</u> oxygen ; contains <u>more</u> carbon dioxide ; is saturated with water (vapour) ; is at body temperature / 37 °C ;	<b>3</b>

Question	Answer	Marks
9(b)	anaerobic produces lactic acid (aerobic doesn't) ; anaerobic releases less energy ; anaerobic (only) occurs when oxygen is not available ; anaerobic occurs in muscle cells ;	<b>4</b>

Question	Answer	Marks
10(a)	longitudinal ;	<b>1</b>
10(b)(i)	29 (s) ;	<b>1</b>
10(b)(ii)	6.9 (km / s) ;	<b>1</b>
10(c)	the wave has a greater <u>amplitude</u> at sensor A ; the wave has more <u>energy</u> ;	<b>2</b>

Question	Answer	Marks
11	chlorine ; methane ; ammonium chloride ; bromine ; copper carbonate ;	<b>5</b>



Question	Answer	Marks
12	toxic ; carbon dioxide ; liver ; water ;	4

Question	Answer	Marks
13(a)	tick in second box ;	1
13(b)(i)	voltmeter ;	1
13(b)(ii)	energy used / work done ; to drive charge (around the circuit) ;	2
13(c)	$V = IR$ or $0.86 \cdot 3.5$ ; 3.01 ; V ;	3

Question	Answer	Marks
14(a)(i)	any <b>one</b> from carbon dioxide ; water vapour ;	1
14(a)(ii)	argon ;	1
14(b)	(different) boiling point ;	1
14(c)	any <b>one</b> from (manufacture of) ammonia ; making fertilisers ; making nitric acid ;	1

Question	Answer	Marks
14(d)	any <b>two</b> from give off carbon dioxide ; produce energy ; give off water ;	<b>2</b>

Question	Answer	Marks
15(a)	<i>in a glass-house:</i> any <b>three</b> from plants grow taller ; each plant produces greater mass of tomato fruits ; each tomato fruit has a greater mass ; each plant produces a greater number of fruits ;	<b>3</b>
15(b)	any <b>three</b> from increased level of carbon dioxide (supplied) ; light supplied during hours of darkness ; temperature maintained (at optimum level) ; plants kept well watered ; plants not exposed to wind ; not eaten by herbivores / attacked by pests ;	<b>3</b>

Question	Answer	Marks
16(a)(i)	2.1 5.4 ;	1
16(a)(ii)	3.3 ;	1
16(b)	greater force (of attraction) ; more steel is magnetised / more magnetism is induced ;	2
16(c)(i)	any <b>one</b> from iron ; nickel ; cobalt ; NIB (neodymium iron cobalt alloy) ;	1
16(c)(ii)	induction ; of an opposite pole ;	2

Question	Answer	Marks
17(a)	any <b>three</b> from element contains atoms of <u>one</u> type ; compound contains atoms of <u>different / two</u> types ; chemically combined together ; element cannot be broken down (by chemical means) ;	3
17(b)	vibrating about a fixed point ; less energy than gas ;	2

Question	Answer	Marks
18(a)	<i>chemical digested:</i> starch ; <i>chemical produced:</i> maltose / glucose ;	<b>2</b>
18(b)	any <b>one</b> from temperature ; pH ;	<b>1</b>