



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICAL SCIENCE

0652/03

Paper 3 Theory (Core)

For examination from 2019

MARK SCHEME

Maximum Mark: 80

Specimen

This document consists of **8** printed pages.

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.

mark scheme abbreviations

;	separates marking points
/	alternative responses for the same marking point
not	do not allow
allow	accept the response
ignore	mark as if this material was not present
ecf	error carried forward
avp	any valid point
ora	or reverse argument
owtte	or words to that effect
underline	actual word given must be used by candidate (grammatical variants excepted)
()	the word/phrase in brackets is not required but sets the context
max	indicates the maximum number of marks
any [number] from:	accept the [number] of valid responses
note:	additional marking guidance

Question	Answer	Marks	Guidance
1(a)	Award 1 mark for each advantage/disadvantage. Max 3 for three advantages or three disadvantages. valid advantage/disadvantage ; valid advantage/disadvantage ; valid advantage/disadvantage ; valid advantage/disadvantage ;	4	allow e.g. advantages: low running costs/cheap electricity ; low carbon generation ; renewable energy ; can be used as alternative power source ; can sell excess energy back to the grid ; disadvantages: set up cost/time to recoup cost of turbine ; whether location/noise will cause ; nuisance to neighbours ; visual impact ; relies on a suitable amount of wind ; ora avp
1(b)	solar (photovoltaic) cell ;	1	allow: solar panels / farm ;

Question	Answer	Marks	Guidance
2(a)	Any two from: oxygen used up (by combustion) ; (oxygen) is 21% of air ; forms carbon dioxide which dissolves (in the water) ; lower pressure ;	2	max 2
2(b)	nitrogen ;	1	
2(c)	carbon monoxide formed ; poisonous/toxic/prevents haemoglobin in blood carrying oxygen ;	2	

Question	Answer	Marks	Guidance
3(a)(i)	15 (m/s) ;	1	
3(a)(ii)	0 (m/s) ;	1	

Question	Answer	Marks	Guidance
3(b)	constant speed / (it has a speed of) 30 m/s ;	1	
3(c)	area of triangle / area under graph / appropriate equation of motion ; $\frac{1}{2} \times 30 \times 5$; 75 (m) ;	3	allow: for 1 mark, $30 \times 5 = 150$ seen
3(d)	speed = distance/time in any form, letters, words, numbers ; $750 \div 30$; 25 (m/s) ;	3	allow: for 2 marks, $750 \div 30$ allow: for 3 marks, 25 m/s ignore: incorrect working

Question	Answer	Marks	Guidance
4	6, 6, 6 ; 6, 6, 8 ;	2	

Question	Answer	Marks	Guidance
5(a)	wavelength correctly marked ;	1	
5(b)(i)	reflection ;	1	
5(b)(ii)	3 (or more) wavefronts drawn ; wavefront direction so angle of incidence = angle of reflection (by eye) ; wavelength constant and equal to incident wave train ;	3	

Question	Answer	Marks	Guidance
6(a)	aqueous sodium hydroxide / ammonia ; with sodium hydroxide: (light) blue precipitate and insoluble in excess ; or with ammonia: (light) blue precipitate and soluble in excess giving a dark blue solution ;	2	
6(b)(i)	Any three from: boil / evaporate ; some of the water evaporates / evaporate to $\frac{1}{4}$ or $\frac{1}{3}$ volume ; (crystallise and) filter / pour off liquid / wash ; leave to dry / dry with filter paper ;	3	max 3

Question	Answer	Marks	Guidance
6(b)(ii)	copper sulfate ;	1	

Question	Answer	Marks	Guidance
7(a)	gamma (radiation) ; infra-red ;	2	
7(b)	S written at left end of spectrum ;	1	
7(c)	cooking / communication ; medical (diagnosis) / (airport) security ;	2	allow: other relevant uses

Question	Answer	Marks	Guidance
8(a)	Any two from: effervescence / fizzes / bubbles ; floats ; moves on the surface ;	2	max 2 ignore: gas / hydrogen formed allow: sodium gets smaller
8(b)	potassium / rubidium / caesium / francium and lithium ;	1	not: elements outside Group I
8(c)	magnesium / aluminium ; silicon / phosphorus / sulfur / chlorine / argon ;	2	
8(d)	(2,)8 for sodium / Na ; (2,8,)8 for chlorine / Cl ; charges on ions: in words or symbols (Na ⁺ or Na ¹⁺ and Cl ⁻ or Cl ¹⁻) ;	3	note: if in words must be chloride NOT chlorine

Question	Answer	Marks	Guidance
9(a)(i)	350 (Ω) ;	1	
9(a)(ii)	$I = V/R$ (in any form) ; 0.034 to at least 2 sig. figs ; A or mA as appropriate ;	3	allow: 12/ <i>their</i> (a)(i) allow: 12/350 ecf throughout
9(a)(iii)	candidate's (a)(ii) \times 200 or proportion or potential divider calculation ; 6.9 (V) to at least 2 sig. figs ;	2	

Question	Answer	Marks	Guidance
9(a)(iv)	reference to variable resistor/ <u>variable</u> power supply ;	1	ignore: change the voltage/power supply
9(b)	brighter ; p.d./voltage (across lamp) is greater ;	2	

Question	Answer	Marks	Guidance
10(a)	Any two from: diamond: covalent (molecule) ; giant structure/macromolecule ; Any two from: chlorine: (simple) molecule ; covalent ; diatomic ;	4	max 4
10(b)	C_6Cl_{12} ;	1	
10(c)(i)	chlorine: green/yellow-green/light green ; bromine: red-brown ; density: value between 1.6(0)–4.9(0) (g per dm^3) ;	3	
10(c)(ii)	increases ;	1	
10(d)(i)	KBr ;	1	
10(d)(ii)	2(KI) and 2KBr ;	1	note: both balancing numbers and KBr formula are needed
10(d)(iii)	chlorine is <u>more</u> reactive than bromine/ora/owtte ;	1	not: chloride is more reactive than bromide ignore: reference to group

Question	Answer	Marks	Guidance
11(a)(i)	only half-life ticked ;	1	
11(a)(ii)	nucleus ; neutron ;	2	

Question	Answer	Marks	Guidance
11(b)(i)	Any two from: reference to ionising radiation ; (radiation) damages cells/DNA/body tissue ; (causing) cancer/mutation/radiation sickness/damage to offspring ;	2	max 2 allow: burns
11(b)(ii)	Any two different examples from: use of gloves ; use of face masks ; tweezers/tongs ; lead/concrete ; radiation badge ; maintain distance ; minimise exposure time ;	2	max 2 allow: valid examples ignore: safety goggles

Question	Answer	Marks	Guidance
12(a)	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} \quad \text{and} \quad \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array} $ <p>6 hydrogens in ethane ; 4 hydrogens in ethene ; single bond in ethane and double bond in ethene ;</p>	3	
12(b)	bromine/bromine water ; no change with saturated/owtte ; decolourises with unsaturated/owtte ;	3	not: goes clear
12(c)	(addition) polymerisation ;	1	