Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

PHYSICS	**9702/23**
Paper 2 AS Level Structured Questions	**October/November 2018**
MARK SCHEME	
Maximum Mark: 60	

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.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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)	current temperature (**allow** amount of substance, luminous intensity) *any two correct answers, 1 mark each*	**B2**
1(b)(i)	$W = 2 \times (150 \times \sin 17°)$ **or** $2 \times (150 \times \cos 73°)$	**C1**
	$W = 88\,\text{N}$	**A1**
1(b)(ii)	**1.** $\sigma = F/A$	**C1**
	$= 150/(7.5 \times 10^{-6})$ $= 2.0 \times 10^{7}\,\text{Pa}$	**A1**
	2. $\varepsilon = \sigma / E$	**C1**
	$= 2.0 \times 10^{7}/(2.1 \times 10^{11})$ $= 9.5 \times 10^{-5}$	**A1**

Question	Answer	Marks
2(a)	energy (of a mass/body/object) due to motion/speed/velocity	**B1**
2(b)(i)	$E = ½mv^2$	**C1**
	480 = ½ × *m* × 80^2 so *m* = 0.15 kg	**A1**
2(b)(ii)	**1.** $E = mgh$ **or** $\Delta E = mg\Delta h$	**C1**
	= 0.15 × 9.81 × 210 = 310 J	**A1**
	2. work done = 480 – 310 = 170 J	**A1**
2(b)(iii)	work done = *Fs*	**C1**
	force = 170 / 210 = 0.81 N	**A1**
2(b)(iv)	curved line from positive value on *v*-axis to (*T*, 0)	**M1**
	magnitude of gradient decreases	**A1**
2(b)(v)	as shell rises force decreases and as shell falls force increases	**B1**
	as shell rises force is downward and as shell falls force is upward	**B1**
	or	
	as shell rises the force decreases and is downward	**(B1)**
	as shell falls the force increases and is upward	**(B1)**

Question	Answer	Marks
3(a)	(resultant) force proportional/equal to rate of change of momentum	B1
3(b)(i)	$\rho = m / V$	C1
	$V = \pi \times (7.5 \times 10^{-3})^2 \times 13 \times 0.2$ (= 4.59×10^{-4} m^3) $m = \pi \times (7.5 \times 10^{-3})^2 \times 13 \times 0.2 \times 1000 = 0.46$ kg	A1
3(b)(ii)	**1.** $(\Delta)p = (\Delta m)v$	C1
	$(\Delta)p = 0.46 \times 13$ $= 6.0$ N s	A1
	2. $F = 6.0 / 0.20$ $= 30$ N	A1
3(b)(iii)	force on water (by rocket/nozzle) equal to force on rocket/nozzle (by water)	M1
	in the opposite direction	A1
3(b)(iv)	**1.** mass = 0.40 + 0.70 – 0.46 = 0.64 kg	A1
	2. acceleration = $[30 - (0.64 \times 9.81)] / 0.64$ **or** $30 / 0.64 - 9.81$	C1
	$= 37$ m s^{-2}	A1

Question	Answer	Marks
4(a)	graph with *x*-axis labelled 'distance' and wavelength/λ correctly shown	**B1**
	graph with *x*-axis labelled 'time' and period/T correctly shown	**B1**
	graph with *y*-axis labelled 'displacement' and amplitude/A correctly shown	**B1**
4(b)(i)	wave (moves along string and) reflects at fixed point/Y/X/end/wall/boundary	**B1**
	the incident and reflected waves interfere/superpose	**B1**
4(b)(ii)	100 / 40 **or** 2.5 (cycles/periods/T)	**C1**
	1. displacement = 0	**B1**
	2. distance = 130 mm	**A1**
4(b)(iii)	**1.** $f = 1 / 40 \times 10^{-3}$ $= 25\,\text{Hz}$	**A1**
	2. $v = f\lambda$ **or** $\lambda = vT$	**C1**
	$\lambda = 30 / 25$ **or** $30 \times 40 \times 10^{-3}$ (= 1.2 m)	**C1**
	distance $= 1.2 \times 1.5$ $= 1.8\,\text{m}$	**A1**

Question	Answer	Marks
5(a)	$E = F / Q$	**M1**
	$F = ma$ **and** (so) $q / m = a / E$	**A1**
5(b)	$m = (4 \times 1.60 \times 10^{-19} \times 3.5 \times 10^{4}) / 1.5 \times 10^{12}$ (= 1.49×10^{-26} kg)	**B1**
	= $1.49 \times 10^{-26} / 1.66 \times 10^{-27}$ = 9.0 (u)	**A1**
5(c)	protons: 4 **and** neutrons: 5	**A1**
5(d)(i)	nuclei have the same charge and so same (magnitudes of) force	**B1**
5(d)(ii)	nuclei have different masses and same force and so different (magnitudes of) acceleration	**B1**

Question	Answer	Marks
6(a)	(coulomb is an) ampere second	**B1**
6(b)	8.0×10^{-19} C and 1.6×10^{-19} C both underlined (and no others underlined)	**B1**
6(c)	line drawn between (S, $1.00v_s$) and (T, $0.25v_s$)	**M1**
	line with decreasing magnitude of gradient	**A1**

Question	Answer	Marks
7(a)	<u>sum of</u> current(s) in(to) junction = <u>sum of</u> current(s) out of junction **or** (algebraic) sum of current(s) at a junction is zero	**B1**
7(b)(i)	**1.** potential difference = 0	**A1**
	2. potential difference = 9.6 V	**A1**
7(b)(ii)	for resistance in parallel: $(1/R_T) = (1/400) + (1/400)$ $R_T = 200\,(\Omega)$	**C1**
	$V/9.6 = 200/600$	**C1**
	$V = 3.2\,\text{V}$	**A1**

