Oxford Cambridge and RSA

June 20XX – Morning/Afternoon
AS Level Physics B (Advancing Physics)
H157/01 Foundations of physics

PRACTICE MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 70

Version: Final
Last updated: **08/12/2015**

(FOR OFFICE USE ONLY)

This document consists of 10 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the 10 practice responses ("scripts") and the 10 standardisation responses

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.

5. Work crossed out:

a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)

- if there is nothing written at all in the answer space
- OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
- OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question)

8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.

9. Assistant Examiners will send a brief report on the performance of candidates to your Team Leader (Supervisor) by the end of the marking period. The Assistant Examiner's Report Form (AERF) can be found on the RM Cambridge Assessment Support Portal (and for traditional marking it is in the *Instructions for Examiners*). Your report should contain notes on particular strength displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. Annotations available in Scoris

Annotation	Meaning
BOD	Benefit of doubt given
CON	Contradiction
	Incorrect response
ECF	Error carried forward
FT	Follow through
NAQ	Not answered question
NBOD	Benefit of doubt not given
POT	Power of 10 error
^	Omission mark
RE	Rounding error or repeated error
SF	Error in number of significant figures
	Correct response
AE	Arithmetic error
	Wrong physics or equation

11. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	Separates marking points
reject	Answers which are not worthy of credit
not	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ecf	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Question			Answer	Marks	Guidance
1			A	1	
2			D	1	
3			C	1	
4			B	1	
5			A	1	
6			D	1	
7			B	1	
8			A	1	
9			B	1	
10			C	1	
11			A	1	
12			C	1	
13			C	1	
14			C	1	
15			A	1	
16			C	1	
17			D	1	
18			D	1	
19			D	1	
20			C	1	
			Total	**20**	

Question			Answer	Marks	Guidance
21			sin r = 2.0 x 10^8 x sin 40^o/ 3. 0 x 10^8 (1) r = 25^o (1)	2	Can calculate refractive index independently. Full marks for bald correct answer.
22			data = 5 x 10^6 x 90 x 60 = 27 (1) Gbits (1)	2	Alternative correct value and unit combinations acceptable. (e.g. 3.375 Gbytes, 2.7 x 10^{10} bits)
23	**(a)**		a = 20/30 (1) = 0.67 m s^{-2} (1)	2	Full marks for bald correct answer.
	(b)		Use of area under graph clearly shown (1) answers in range 370 – 410 m (1)	2	Allow use of s = ½ a t^2 with answer to (a), using 0.67 m s^{-2} gives 3.0 x 10^2 m (2 sf)
24	**(a)**		V = 4.5 x (1000/1200) (1) = 3.8 V (2 sf) (1)	2	
	(b)		The reading would go down because the combined resistance of the meter and fixed resistor falls (1) So the proportion of the total resistance of the meter and resistor also falls AW (1)	2	No marks for simply stating 'reading falls'. Two marks for calculating new pd as 3.5 V (3.46 V)
25	**(a)**		The conductance of the diode is zero until a p.d. of 1.2 V is placed across it (1) After this p.d. the conductance rises and reaches a steady value (1)	2	
	(b)		G = 5.0 x 10^{-3}/1.5 (1) = 3.3 x 10^{-3}(S) (1)	2	One mark for 3.3 S (POT error) Full marks for bald correct answer.
26	**(a)**		Power = 250 x 25 (1) = 6300 W (2 sf) (1)	2	Accept 6250 W Full marks for bald correct answer.
	(b)		Total mass = 2x 50000/25^2 = 160 kg (1) Mass of rider = 70 kg (1)	2	Full marks for bald correct answer.
			Total	**20**	

Question			Answer	Marks	Guidance
27	**(a)**		$v = (2 \times 9.8 \times 1.5)^{1/2}$ (1) = 5.42….(1) p = 0.055 x 5.42…= 0.30 kg m s^{-1} (1)	3	Full marks for bald correct answer. Penalise (SF) more than 3 sf
	(b)	**(i)**	F = 0.30/0.04 (1) = 7.5 N (1)	2	Full marks for bald correct answer. Accept e.c.f. 27(a)
		(ii)	Suggestion/explanation linked. *Either:* Force higher on impact (1) Because shell initially cracks and then crumples(1) *Or:* Fragments are not at rest after impact/bounce back (1) So change of momentum greater (1)	2	
	(c)		Momentum change of egg same in both cases (1) Longer deceleration time (1) Reduced force (1)	3	3rd mark dependent on first two marks
			Total	**10**	

28	**(a)**	**(i)**	Energy of incident photon AW (1)	1	
		(ii)	Work function = $4.7 \times 10^{14} \times 6.6 \times 10^{-34} - 0.18 \times 1.6 \times 10^{-19}$ (1) = 2.8×10^{-19} J (1)	2	Full marks for bald correct answer.
	(b)	**(i)**	Intensity is the energy per unit area incident on a surface in unit time AW (1) Wave model suggests that energy is evenly incident across all surface AW (1) The resulting low intensity would deliver far less energy than work function (in short time) (1)	3	Allow m^2 for unit area, s for unit time Alternative approach: In the wave model, increasing the intensity delivers more energy to all electrons AW (1) so the wave model would expect the electrons to be released with more K.E. AW (1)
		(ii)	Intensity is proportional to number of photons incident on surface per second (1) Photoelectrons are emitted when a single photon interacts with an individual electron (1)	2	
			Total	**8**	

Question			Answer	Marks	Guidance
29	**(a)**		Calculated answer to 2 sf: 4.1^{o} (1)	1	No sf penalty but penalise rounding errors
	(b)		Evidence of using tangent to find gradient (1) Gradient at 1.0 s in range 0.48 – 0.60 m s^{-1} (1) Gradient at 2.0 s in range 0.96 – 1.04 m s^{-1} (1) Acceleration in range 0.40 m s^{-2} - 0.56 m s^{-2} (1)	4	
	(c)	**(i)**	component = 9.8 x cos 86^{o} (1) = 0.68 m s^{-2} (1)	2	Or 9.8 x sin 4^{o} One mark for bald correct answer to more than 1 sf
		(ii)	time = $(2 \times 1.4/0.68)^{1/2}$ (1) = 2.1 s (1)	2	If 0.7 s used, time = 2.0 s
		(iii)	Experiment result = 2.25 s (1) (which is longer) Acceleration of ball less than acceleration parallel to slope from calculation (1) Time taken to travel 1.4m is greater in practice Explanation for difference: e.g. friction, rolling of ball (1)	3	
			Total	**12**	