…day June 20XX – Morning/Afternoon

AS Level Physics A
H156/01   Breadth in physics

PRACTICE MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK   70

Version: Final
Last updated: 23/12/2015
This mark scheme matches paper H156/01 v1.1 updated 10/02/16
(FOR OFFICE USE ONLY)

This document consists of 9 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

SECTION A

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

SECTION B

Question			Answer	Marks	Guidance
21	(a)		3000 x 9.8 x 12 / 0.60	C1	
			= 588 kJ	A1	
	(b)	(i)	(230 ± 40) MPa	B1	
		(ii)	Stress = 1.1 x 10^6 / (π x 0.045^2) = 173 MPa	C1	
			173 MPa < 230 MPa	A1	AW (ecf)
			So will not stretch too much in use	B1	Allow any sensible contextual suggestion
			Less chance of permanent deformation or fatigue	B1	
			Total	**7**	

22	(a)		GPE loss = mgh = 0.60 x 9.81 x 0.050 = 0.29 J	A1	
	(b)		EPE = ½ F x = 0.50 x 5.88 x 0.05	M1	**Allow** answers to 2 s.f.
			= 0.147 J	A1	
			(or k = F / x = 5.88 / 0.050 = 118 N/m, EPE = ½ k x^2 = ½ x 118 x 0.050^2 = 0.147 J)		
	(c)		GPE → EPE + KE (when falling)	B1	
			EPE → GPE + KE (when rising)	B1	
			Some energy dissipated as heat as oscillates (because of air resistance / friction)	B1	
			Total	**6**	

23	(a)		No sideways momentum before hits ground	B1	AW
			Movement in opposite sideways directions needed to conserve momentum	B1	
	(b)	(i)	Transverse wave	B1	Full credit for clear, annotated diagram
			Vibration in a fixed direction / plane	B1	
		(ii)	Rotate polaroid	B1	
			Look for dim / bright light	B1	
			Alternating every 90°	B1	
			Total	**7**	

Question			Answer	Marks	Guidance
24	(a)		Any 2: Same mass / weight / sheet of paper Same catapult angle / firing speed Same height of catapult	B1 B1	Credit any other sensible suggestion
	(b)		min: 1.6 s ; max: 2.2 s	B1	Need both for mark
	(c)		Ignore 1.8 anomaly Average (any) e.g. mean 3.75 Spread 0.4 **or** s.d. 0.37 correct sf **and** dp agreement: 3.8 ± 0.4	B1 C1 C1 A1	Allow ecf if anomaly included 3.36 with anomaly 1.2 with anomaly 0.9 with anomaly Allow 3.4 ± 1.2
	(d)		**Anticipated answers, statement/data/outcome :** • Student right - d = vt so longer t means travels further • Student wrong - piranha has shorter flight time but might travel faster, so further in less time • Student wrong - overlap within range of values / sample too small to show clear differences in flight time	B1 B1 B1	Any other suitable statement with supporting data and outcome.
			Total	10	

25	(a)		Spread of <u>several</u> micrometer/Vernier calipers readings	B1	Apparatus and method must be linked Allow ruler and thickness of 20 samples
	(b)	(i)	Manipulate R = V/I and R = ρ t / L^2 Rearrangement	M1 M1	
		(ii)	0.13 x (25 x 10^{-3})^2 / 32 x 10^{-3} x 0.60 x 10^{-3} = 4.2 Ω m	C1 A1	Watch for attention to units
	(c)		Relate current to energy transfer / temperature increase More free electrons	B1 B1	AW
			Total	7	

Question			Answer	Marks	Guidance
26	(a)		Weight, drag, upthrust (correct direction and labelled)	B1	
			Correct relative length (upthrust must be longer than sum of other two forces)	B1	
	(b)	(i)	Any 3:	B1	
			Initially accelerates / velocity increases	B1	
			Initially upthrust > drag + weight	B1	
			Drag increases (as speeds up)		
			Then constant velocity / no acceleration		
			Forces balanced / resultant force = 0 / upthrust = drag + weight		
		(ii)	Tangent / gradient near t = 0 s	M1	only penalise one mark for unit error
			e.g. 0.004 m s^{-1} / 0.25 s = 0.016 m s^{-2}	A1	
		(iii)	net F = $6.7 \times 10^{-9} \times 0.016 = 1.072 \times 10^{-10}$ N	C1	
			U = net F + W = 6.6×10^{-8} N	A1	
			Total	**9**	

27			Quieter than average (and/or louder)	B1	AW
			Regions of destructive interference (and/or constructive interference)		
			Calculation of fringe spacing (x = 330x30/(1200x5.0) = 1.65 m)	B1	
			Effect is less noticeable further from the centre owing to different		
			amplitudes received from each speaker	B1	
				B1	
			Total	**4**	