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# 9702 PHYSICS

9702/05

Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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CIE is publishing the mark schemes for the October/November 2007 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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	GCE A/AS LEVEL – October/November 2007	9702 23
uestion 1		am
anning (15 n	narks)	Syllabus 9702 Bhacanne
fining the p	roblem (3 marks)	
<i>p</i> is the in	dependent variable <u>or</u> vary <i>p.</i>	
A is the de	ependent variable <u>or</u> determine A for different <i>p.</i>	
Keep the	incident amplitude constant (allow volume of sound	d or power/intensity outpu
thods of da	ta collection (5 marks)	
l abelled (	tiagram of a workable arrangement including sour	ion of cound alone wind

- M1 <u>Labelled</u> diagram of a workable arrangement including source of sound glass window detector of sound. [1]
  Allowed sources: loudspeaker, bell, buzzer, siren but not musical instruments. Allowed detectors: microphone, sound meter, sound detector.
- M2 Method of measuring pressure. Use bourdon gauge/manometer or pressure gauge [1] Do not allow barometer or pressure meter.
- M3 Method of <u>reducing</u> pressure. Use (vacuum) pump to withdraw air from glass window. [1]
- M4 Method of measuring amplitude. Measure amplitude from oscilloscope. [1]

[1]

M5 Perform experiment in quiet room.

# Method of analysis (2 marks)

- A1 Appropriate quantities plotted i.e.  $A^2$  against *p*; or lg *A* against lg *p* or *A* against  $\sqrt{p}$ . [1]
- A2 Relationship to be correct i.e. graph is a straight line <u>through the origin</u>. [1] Gradient should equal 0.5 if lg *A* against lg *p* plotted. An explicit statement is required.

# Safety considerations (1 mark)

S1 Relevant safety precaution related to either the use of glass or intensity of sound, [1] e.g. wear ear defenders, switch on sound source for short period of time.
 Protection (goggles/safety screen) in case glass breaks.
 Awareness of low pressures in glass.
 Do not allow gloves because glass is sharp.

		2
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		°S.
dditiona	l detail (4 marks).	7161.140
01/2/3/4	Relevant points might include: Method of ensuring that output from speaker is consta	ant.
	Method of reducing sound reflections from e.g. foam/	

#### Additional detail (4 marks).

Method of reducing sound reflections from e.g. foam/speaker & microphone close to glass.

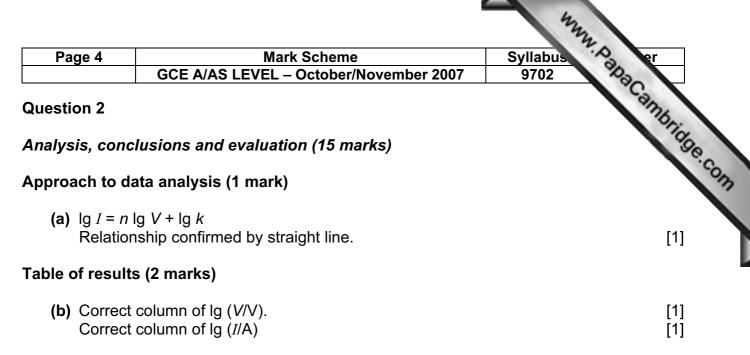
Window perpendicular to sound source.

Detail explaining use of oscilloscope to measure amplitude.

Difficulty in measuring amplitude at small pressures/use a loud incident source. Control (or monitoring) of one additional variable e.g. temperature, frequency, distances.

Allow time for the temperature/pressure between the glass to stabilise. Discussion of attenuation in air/frame/glass.

[Total: 15]



lg (V/V)	lg (I/A)
0.301 or 0.30	0.079 or 0.08
0.602 or 0.60	0.230 or 0.23
0.778 or 0.78	0.322 or 0.32
0.903 or 0.90	0.380 or 0.38
1.000 or 1.00	0.431 or 0.43
1.079 or 1.08	0.477 or 0.48

2 or 3 dp needed (except allow 4 dp for last two rows in lg V). Allow small rounding errors in the 3 dp. Must be exact for 2 dp.

### Graph (3 marks)

(c) (i)	Points plotted correctly.	All six required for this mark.	Circle error(s).	[1]
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(ii) Line of best-fit. Must be within tolerances.
 Worst acceptable straight line. Line should be clearly labelled.
 [1]

#### **Conclusion (4 marks)**

- (iii) Gradient of best-fit line (range 0.500 to 0.525 or check substitution). [1] If points incorrect, then check size of  $\Delta$  and substitution within half a small square.
- (iv) y-intercept. Must be negative. Check substitution from point on best-fit line. [1]
- (d) Method of determining k (=  $10^{\text{candidate's y-intercept}}$ ). [1] Value of n = candidate's gradient value and in the range 0.500 to 0.525. [1] Answers to k and n should be to 2 or 3 sf.

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tment	of errors (5 marks)	Syllabus 9702 BARCambridge
(b) Erro	ors in lg <i>I</i> allow 2 or 3 dp.	19
• •	ues should descend from 0.04 to 0.01.	
(c) (i)	Error bars in lg <i>I</i> plotted correctly	[1]
( ) ( )		
(iii)	Error in gradient	[1]
	Method of determining absolute error	
(iv)	Error in y-intercept	[1]
( )	Method of determining absolute error	
(d) <u>Me</u> i	thod for error in <i>k</i> and error in <i>n</i> (same as error in gradie	nt) [1]
. /		
		[Total: 15]