

Specimen Paper

GCE A LEVEL

MARK SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 9702/05

PHYSICS

Paper 5 (Planning, Analysis and Evaluation)

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Question 1

Planning (15 marks)

Defining the problem (3 marks)

- p is the independent variable OR vary p 1
- f is the dependent variable OR measure f and p 1
- Variable to be controlled 1
e.g. temperature, frequency of sound source

Methods of data collection (5 marks)

- Workable arrangement 2
Should include container, source of sound, pump, microphone, CRO
Doubtful arrangement, poor diagram or one missing detail scores one mark
- Method of varying p 1
e.g. use of pump to remove air or valve to allow air in
- Method of measuring p 1
e.g. Bourdon gauge/pressure gauge/manometer
- Method of measuring f 1
Should include reference to CRO timebase and $f = 1/\text{period}$

Method of analysis (2 marks)

- Plot f against p^2 1
- Equation is correct if graph is a straight line through the origin 1

Safety considerations (1 mark)

- Safety precaution, e.g. screen/goggles/fuses 1

Additional detail (4 marks)

- Additional details 4
- Relevant points might include:
- Second variable to be controlled
 - Method of controlling variables
 - Specified sound source (e.g. electric bell/buzzer/speaker)
 - Use of signal generator with speaker
 - Difficulty of detecting quiet sounds at low pressures
 - Using CRO y -sensitivity to adjust for sound levels
 - Need to seal points where wires pass through bell jar
 - Monitor temperature with thermometer

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Question 2

Analysis, conclusions and evaluation (15 marks)

Approach to data analysis (1 mark)

- (a) $R^2 = c^2 E^3$, so expect a straight line through the origin 1

Table of results (2 marks)

- Table Column headings 1
 R^2 / cm^2 and E^3 / MeV^3
 Allow $R^2 (\text{cm}^2)$ and $E^3 (\text{MeV}^3)$

- Table Values of R^2 and E^3 1
 16.0 156
 18.9 183
 23.0 221
 25.5 248
 32.5 310
 All correct for one mark.
 3 significant figures required (allow 4 s.f.)

Graph (3 marks)

- Graph Points plotted correctly 1
 All five required for the mark
- Graph Line of best fit 1
 Must be within tolerances.
- Graph Worst acceptable straight line 1
 Must be within tolerances.

Conclusion (4 marks)

- (c)(iii) Gradient of best-fit line 1
 The hypotenuse of the Δ must be greater than half the length of the drawn line.
 Read-offs must be accurate to half a small square.
 Check for $\Delta y / \Delta x$ (i.e. do not allow $\Delta x / \Delta y$).
- (d) Gradient = c^2 (= 0.107) 1
 Does not have to be explicitly stated: may be implicit from working
- (d) Value of c 1
 = 0.327 (allow 0.320–0.350)
- (d) Unit of c 1
 $\text{cm MeV}^{-3/2}$

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Treatment of errors (5 marks)

Table	Errors in R^2	1
	0.4	
	0.4 allow 0.5	
	0.5 allow 0.4	
	0.5	
	0.6	
Graph	Error bars plotted correctly	1
(c)(iii)	Error in gradient	1
	Must be calculated using gradient of worst acceptable straight line	
(d)	Method of finding error in c	1
	i.e. limit of error range in c from square root of limit of error range in gradient	
	Allow 0.5 x percentage error in gradient	
(d)	Value for error in c	1
	0.009 (allow ± 0.007 – ± 0.011)	