GCE

Physics B

H557/03: Practical skills in physics

A Level

Mark Scheme for June 2025

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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 should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM 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 available in RM Assessor

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

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 RM Assessor 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 RM Assessor messaging system, or by email.

5. **Crossed Out Responses**
   Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

   Rubric Error Responses – Optional Questions
   Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses
When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

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 is not an attempt at the question.

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

8. The RM Assessor **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 RM Assessor messaging system, or e-mail.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:
    a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
    b. **To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. **Annotations**

Annotation		Meaning
	Correct response	Used to indicate the point at which a mark has been awarded (**one tick per mark awarded**).
	Incorrect response	Used to indicate an incorrect answer or a point where a mark is lost.
AE	Arithmetic error	Do not allow the mark where the error occurs. Then follow through the working/calculation giving full subsequent ECF if there are no further errors.
BOD	Benefit of doubt given	Used to indicate a mark awarded where the candidate provides an answer that is not totally satisfactory, but the examiner feels that sufficient work has been done.
BP	Blank page	Use BP on additional page(s) to show that there is no additional work provided by the candidates.
CON	Contradiction	No mark can be awarded if the candidate contradicts himself or herself in the same response.
ECF	Error carried forward	Used in numerical answers only, unless specified otherwise in the mark scheme. Answers to later sections of numerical questions may be awarded up to full credit provided they are consistent with earlier incorrect answers. Within a question, ECF can be given for AE, TE and POT errors but not for XP.
L1	Level 1	L1 is used to show 2 marks awarded and L1^ is used to show 1 mark awarded.
L2	Level 2	L2 is used to show 4 marks awarded and L2^ is used to show 3 marks awarded.
L3	Level 3	L3 is used to show 6 marks awarded and L3^ is used to show 5 marks awarded.
POT	Power of 10 error	This is usually linked to conversion of SI prefixes. Do not allow the mark where the error occurs. Then follow through the working/calculation giving ECF for subsequent marks if there are no further errors.

Annotation		Meaning
SEEN	Seen	To indicate working/text has been seen by the examiner.
SF	Error in number of significant figures	Where more SFs are given than is justified by the question, do not penalise. Fewer significant figures than necessary will be considered within the mark scheme. **Penalised only once in the paper.**
TE	Transcription error	This error is when there is incorrect transcription of the correct data from the question, graphical read-off, formulae booklet or a previous answer. Do not allow the relevant mark and then follow through the working giving ECF for subsequent marks.
XP	Wrong physics or equation	Used in numerical answers only, unless otherwise specified in the mark scheme. Use of an incorrect equation is wrong physics even if it happens to lead to the correct answer.
^	Omission	Used to indicate where more is needed for a mark to be awarded (what is written is not wrong but not enough).

Annotation	Meaning
/	Alternative and acceptable answers for the same marking point
✓	Separates marking points
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

12. **Subject Specific Marking Instructions**

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Significant figure penalties

Significant figure penalties will be shown on the markscheme. There is a maximum of one significant figure penalty on each paper. Not all papers will include such penalties – this depends on the particular questions given in the paper. The question that attracts a significant figure penalty (if one do so) will be decided by the examiners at the standardisation meeting. You must not penalize such errors unless clearly stated in the markscheme.

Annotation on scripts
Each markworthy point should be registered with a tick – the total number of ticks on the paper should equal the number of marks awarded for non-LOR questions. Mark errors in physics with a cross and omissions with a carat. Centres and candidates who request scripts back find such annotations extremely useful.
LOR questions do NOT have ticks on the papers. These questions should only be annotated with L1, L2, L3.

Question			Answer	Mark	Guidance
1	(a)	(i)	Absolute uncertainty = half range = ±0.03 s ✓	1	**ALLOW** ±0.02, ±0.022, ±0.025, ±0.028 **ALLOW** ±0.01 s (a whole interval of the timer)
1	(a)	(ii)	Calculation of velocity; ✓ (v_{mean} = 2÷1.702 =) 1.175 ms^{-1} (v_{max} = 2.005÷1.68 =) 1.193 ms^{-1} (v_{min} = 1.995÷1.73 =) 1.153 ms^{-1} finding the spread of velocity values or for finding the % uncert ✓ Range of v = 0.04, spread 0.02 **OR** $\%U = \%U_d + \%U_t = \frac{0.005}{2} + \frac{0.03}{1.70}$ $= 0.25\% + 1.76\% = 2\%$ Final answer to appropriate SF ✓ 1.17 OR 1.18 ± 0.02 ms^{-1}.	3	**ALLOW** calculated values of velocity to a minimum 2sf for first mark point. **NOT** mean – min **NOR** max – mean. **ALLOW ECF** from their value of uncert in part (i) but not if it is 0.01 or 0.005. **ALLOW** $U_t = 0.025$; gives $\%U_t = 1.47\%$ and $\%U = 1.72\%$ **ALLOW ECF** from incorrect %uncert or spread. Uncertainty to 1SF and value given to corresponding no of decimal places.

1	**(b)**		**ANY 3** from: ✓✓✓ • v_{ave} will be smaller than v_{term}..AW • for large $v_{term,;,}$ v_{ave} will also be large. • Both velocities are in the same direction • (If the drop is sufficiently long), v_{ave} will be close to $v_{term.}$ • Calculation of v_{ave} includes the period of (non-constant) acceleration (from rest to v_{term})	3	**NOT** just v_{ave} is half v_{term}, unless clearly justified.
1	**(c)**		(percentage/relative uncertainty in velocity) increases ✓ t decreases hence, percentage / relative uncertainty in <u>time</u> increases ✓	2	**ALLOW** absolute uncert in <u>time</u> becomes a larger proportion of the total time for second mark.
1	**(d)**	**(i)**	Drag force = Weight OR Mg OR $NmgN$ ✓ Rearrangement for v^2 ✓ $\frac{1}{2}\rho A v^2 = Nmg$ $v^2 = \frac{2Nmg}{\rho A}$ (SO $v^2 \propto N$)	2	**IGNORE** use of numerical values from the table. **ALLOW** for second mark point. Drag force $\propto v^2$; hence $Nmg \propto v^2$ (SO $v^2 \propto N$) **IGNORE** $\rho = \frac{m}{V}$, where V = volume of cup cake

<table>
<tr>
<td>1</td>
<td>(d)</td>
<td>(ii)</td>
<td>
Level 3 (5-6 marks) ✓✓
Correct calculation of v^2 in table, and appropriate quantitative analysis to determine whether v_{ave} is close enough to v_{term} including a reasoned conclusion.
AND detailed rationale for 1 or 2 suggested practical improvement(s).

There is a well-developed line of reasoning which is clear and logically structured. The information presented is clear relevant and substantiated.

Level 2 (3-4 marks) ✓✓
Calculation of v^2 in table with attempted quantitative analysis to determine whether v_{ave} is close enough to v_{term}.
AND description of workable practical improvement(s)

There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.

Level 1 (1-2 marks) ✓✓
Completion of most values in the table. Qualitative comment relating v_{ave} and v_{term}.
AND/OR description of workable practical improvement(s)

There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.

0 marks
No response or no response worthy of credit.
</td>
<td>6</td>
<td>
Indicative scientific points may include:
• Relationship with terminal velocity
○ Calculation of average velocity and average velocity squared.
<table>
<tr><th>Number of cup cases</th><th>Average time t/s</th><th>Average velocity v_{ave}/ms^{-1}</th><th>v_{ave}^2 / m^{2}s^{-2}</th></tr>
<tr><td>1</td><td>1.70</td><td>1.18</td><td>1.39</td></tr>
<tr><td>2</td><td>1.27</td><td>1.57</td><td>2.48</td></tr>
<tr><td>3</td><td>0.97</td><td>2.06</td><td>4.25</td></tr>
<tr><td>4</td><td>0.81</td><td>2.47</td><td>6.10</td></tr>
<tr><td>5</td><td>0.70</td><td>2.86</td><td>8.16</td></tr>
</table>
○ $v^2 \propto N$ if close to terminal velocity.
○ Calculation of $\frac{N}{v^2}$ OR $\frac{v^2}{N}$ for more than one set of data.
○ conclusion based on data.
<table>
<tr><th>Number of cup cases n</th><th>v_{ave}^2 / m^{2}s^{-1}</th><th>n / v_{ave}^2 (m^{-2}s^2)</th><th>v_{ave}^2 / n (m^{2}s^{-2})</th></tr>
<tr><td>1</td><td>1.38</td><td>0.72</td><td>1.38</td></tr>
<tr><td>2</td><td>2.48</td><td>0.81</td><td>1.24</td></tr>
<tr><td>3</td><td>4.25</td><td>0.71</td><td>1.42</td></tr>
<tr><td>4</td><td>6.10</td><td>0.66</td><td>1.53</td></tr>
<tr><td>5</td><td>8.16</td><td>0.61</td><td>1.63</td></tr>
</table>
• Experimental technique.
○ Use longer/higher drop to give larger time to fall, hence less uncertainty in time value.
○ longer fall also means that cup case will be travelling at terminal velocity for more of the time.
○ Only start recording time a short distance from the release point so cup case more likely to be travelling at terminal velocity at that time.
○ Use cases with large surface area (same mass) to increase time to fall. Ignore flattening cupcake case.
○ Use position sensor (wtte) below drop (need reasonable detail).
○ Use video recording and frame by frame analysis (need reasonable detail)
</td>
</tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td>(i)</td><td>Weigh mass of a (known) number of staples (on the laboratory balance) and divide the total mass by the number ✓

Reasoning for number of staples: ✓
e.g.
0.0325 g implies uncertainty is ±0.0005 g, so need about 200 staples.
OR
Total mass should be at least 10.0 g for 3 sf so about 300.
OR
Using full range of balance implies 10^4 staples which is not possible to count.</td><td>2</td><td>NOT using the current balance to weigh the staples XP</td></tr>
<tr><td>2</td><td>(a)</td><td>(ii)</td><td>Uncertainty in mass of staple = 0.1 ÷ no of staples ✓
Evaluation of uncertainty. ✓

OR
%Uncertainty in total mass ±0.1 ÷ total mass OR ±0.1g ≈ ±3 staples so %uncert = 3÷total number of staples. ✓
Evaluation of abs uncert in single mass = % uncert × 0.0325 ✓</td><td>2</td><td>The number or mass of staples may be as specified in part (i).
ALLOW 100 ≤ n ≤ 61538 or 3.3g ≤ n ≤ 2000g.
e.g.
<table>
<tr><th>No of staples</th><th>Mass / g</th><th>Uncertainty</th></tr>
<tr><td>61500</td><td>2000</td><td>1.6×10^{-6}</td></tr>
<tr><td>2000</td><td>65</td><td>5×10^{-5}</td></tr>
<tr><td>1000</td><td>32.5</td><td>1×10^{-4}</td></tr>
<tr><td>100</td><td>3.25</td><td>1×10^{-3}</td></tr>
</table>
IF uncertainty in mass = 0.05g; 1 mark MAX for calculation.
Need to see method for any marks to be awarded.</td></tr>
</table>

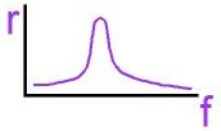
2	**(b)**		Calculation of mean mass of staples = 4.5 × 0.0325 = 0.146 g or 1.46×10^{-4} kg ✓ (Force = mg = 1.46×10^{-4} × 9.8 =) 1.43×10^{-3} N ✓	2	
2	**(c)**	**(i)**	Gradient calculated from coordinates of 2 points on the line at least half the length of the line apart. e.g. (3.2, 2.4) and (0.5, 0.4) ✓ Gradient = 0.74 ✓	2	**IGNORE** POT for gradient calculation. POT must be consistent for both sets of coordinates ΔI > 1.7. **IGNORE** units **ACCEPT** any value which rounds to 0.74 or 0.75 to 2SF. Award one mark for: • Gradient calculation shown from coordinates too close together resulting in final value within range. • Gradient calculation shown but with mis-read coordinates or arithmetic error giving final value out of range.
2	**(c)**	**(ii)**	Use of $F=BIL$ and gradient = $\frac{F}{I}$ ✓ B = 0.74 ÷ 5 (ignoring POT) = 1.48×10^{N} ✓ B = 0.0148 T ✓ Final answer to correct POT.	3	**ALLOW** ECF of gradient value. ($0.74\times10^{-3} \div 5\times10^{-2} = 1.48\times10^{-3}$) **ALLOW** answer given to 2sf.
2	**(d)**		Force on the (moving) charge carriers (in the semiconductor). ✓ (Force) at right angles to the motion and at right angles to the magnetic field (Fleming's Law). ✓ Charged particles builds up on side A or side B of semiconductor (hence potential difference) ✓	3	**ALLOW** Force direction is A → B or B → A. **ALLOW** charge moves towards side A or side B for the third marking point.

Question			Answer	Mark	Guidance
3	(a)	(i)	Distance from centre line and one first order max = 95.5mm. ✓ $\tan\theta = \frac{95.5}{225}$; hence θ = 23° ✓	2	**NOT** slit separation = 95.5 mm **ALLOW** one mark for using the distance between the two first order max 191 mm. (θ = 40°)
	(a)	(ii)	$d = \frac{\lambda}{\sin 23} = \frac{650\times10^{-9}}{0.391} = 1.66\times10^{-6}$ (m) ✓ No of slits per mm = $\frac{1\times10^{-3}}{1.66\times10^{-6}} = 601 \pm 1$ ✓	2	**NOT** Use of double slit equation ($d = \frac{\lambda L}{x}$)? **XP** **ALLOW** ECF of angle calculated in part (i).
3	(b)		**EITHER** two methods.stated ✓✓ **OR** one method with explanation ✓✓ • Use a larger distance between the grating and the bench • To increase fringe separation • Measure distance between higher order maxima rather than just the first order maxima. • Increase measured distance • Using brighter light / more powerful laser or dimmer room • To make fringes clearer	2	**IGNORE** travelling microscope. **IGNORE** change wavelength of laser

3	**(c)**		Majority (13) are from the 600 slits/mm box. ✓ 567 is an outlier **OR** use of only values between 610 and 588. ✓ Uncertainty = ½(610 – 588) **OR** range = 610 – 588 (Hence 600) ± 11 mm^{-1} ✓	3	If candidates find uncertainty or range including outlier (567) then **ALLOW** ecf on uncertainty. Spread = 43 and uncertainty = ± 21.5 or 22 mm^{-1}. **ALLOW** uncertainty rounded to 1SF if calculation is shown. **DO NOT ALLOW** ecf if candidate includes 144, 156, 299. 310 and/or 370 in range calculation.

Question			Answer	Mark	Guidance
4	(a)		Reduces uncertainty. ✓	1	
4	(b)		Calculation of **BOTH** % uncertainties ✓ Uncert in t: $\frac{0.5}{10.4}$ = 0.048 = 4.8 % OR 5% Uncert in m: $\frac{0.01}{0.5}$ = 0.02 = 2% Answer may be in agreement or disagreement but must be backed up with an argument. ✓	2	**ALLOW** correct calculations of max and min value of k involving uncertainties in both quantities. Argument must compare the two uncertainties. e.g. agree as the uncertainty in T is more than double that in m. e.g. disagree as the uncertainty is still a significant proportion (approx. 30%) of total % uncertainty.
4	(c)	(i)	Values 1.20 and 1.440 in table ✓ Point plotted ✓	2	**DO NOT ALLOW** 1.2 or 1.44 Within 0.5 small square.

		(ii)	**EITHER** Percentage uncertainty method $\frac{(0.5/10)}{1.2}$ OR $\frac{0.5}{12}$ = 4.17 % (*T*) so 4.17 % * 2 = 8.34 % for T^2 ✓ Abs uncert (in T^2 = 0.0834 x 1.44 =) 0.12 ✓ **OR** Upper and lower bound method: Upper bound = $(12.5/10)^2$ = 1.563 ✓ Lower bound = $(11.5/10)^2$ = 1.323 ✓ Draw the error bar on the graph (from 1.32 to 1.56) ✓	3	Special case. **IF** %uncert (for *t*=10.4 from 4(b)) = 4.8%. %uncert in T^2 = 9.6% and abs uncertainty will be 0.14. This gets one mark for the calculation and allow **ECF** for the error bars (± 7 squares). [2 marks max.] **ECF** of a wrong value of T^2 as long as uncertainty bars can still be drawn on the graph grid. **ACCEPT** correctly plotted range bars on graph, plotted to within 0.5 small square **ALLOW** ECF for uncertainty bar ±3 squares if doubling %uncert in time is omitted [1 mark max]
	(c)	**(iii)**	Straight line of best fit (by eye) ✓	1	**ALLOW** reasonable LOBF that goes through **all** the error bars ± 0.5 square. **NOT** thick (> half a square) or hairy lines. Check 0.1, 0.2 and 0.5 kg error bars. Tolerance on m=0.2kg is at (0.2, 0.42)
		(iv)	$T = 2\pi\sqrt{\frac{m}{k}}$ OR $T^2 = 4\,\pi^2\,\frac{m}{k}$ AND some rearrangement or comparison with $y = mx\ (+c)$. ✓ e.g. $k = \frac{4\pi^2 m}{T^2}$ OR $\frac{T^2}{m} = \frac{4\pi^2}{k}$ OR gradient = $\frac{4\pi^2}{k}$ hence $k = \frac{4\pi^2}{gradient}$ = $\frac{4\pi^2}{2.05}$ (= 19.3) ✓	2	

4	**(d)**	**(i)**	**Level 3 (5-6 marks)** Detailed description of the experimental method including technique(s) to obtain precise value of f_0 AND clear labelled graphs / detailed description of relationship between • amplitude and frequency, AND • f_0 and m *There is a well-developed line of reasoning which is clear and logically structured. The information presented is clear relevant and substantiated.* **Level 2 (3-4 marks)** Workable experimental method varying f and m; AND sketch graphs / description of relationship between either • amplitude and frequency for one mass • f_0 and m. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* **Level 1 (1-2 marks) ;** Basic experimental method; OR sketch of graph of r:f ; OR qualitative relationship between f_0 and m stated. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** No response or no response worthy of credit.	6	**Indicative scientific points may include**: Experimental Process: • f_0 is when amplitude is maximum • For each mass, vary f either side of f_0, measure amplitude • Repeat for other values of m • Plot graph of amplitude against f to find f_0 • Plot graph of f_0:m Gaining precise values for resonant frequency: • When suspected resonant f is found go back and forth over the f range to confirm value. • Use highest resolution scale on sig gen for f. • Use calibrated sig gen with fine scale for f values. • Add a pointer to the mass to make it easier to measure amplitude. Describe and explain the relationship: • sketch of graph of amplitude-frequency  • description of the shape of the graph • f_0 reduce with increasing m. • $f_0 = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$ so $f_0 \propto \frac{1}{\sqrt{m}}$ • Straight line graph between f_0 and $\frac{1}{\sqrt{m}}$.

4	**(d)**	**(iii)**	Estimate of astronaut mass in range 50-100 kg ✓ Calculation of k using $T = 2\pi\sqrt{\frac{m}{k}}$; $k = 4\pi^2\frac{m}{T^2}$ ✓ Use a known value of k, measure T for a freely oscillating astronaut. ✓	**3**	<table><tr><th>mass / kg</th><th>k / Nm^{-1}</th></tr><tr><td>50</td><td>490</td></tr><tr><td>60</td><td>590</td></tr><tr><td>70</td><td>690</td></tr><tr><td>80</td><td>790</td></tr><tr><td>90</td><td>890</td></tr><tr><td>100</td><td>990</td></tr></table>

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