OXFORD AQA
INTERNATIONAL QUALIFICATIONS

INTERNATIONAL A-LEVEL
PHYSICS
PH05

Unit 5 Physics in practice

Mark scheme

June 2025

Version: 0.1 Pre-Standardisation

256XPH05/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from www.oxfordaqa.com

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Additional comments/Guidelines	Mark	AO
01.1	Use of $w = \frac{\lambda D}{s}$ ✓ $\lambda = 4.47 \times 10^{-7}(\text{m})$ to 2 or 3 sf only ✓ Adding % uncertainties or 7% or 7.2% seen ✓$_3$ Convert % to absolute uncertainty for their λ and percentage to 1 or 2 sf only ✓	Allow > 2 sf for intermediate value in ✓$_3$ Expect 0.32×10^{-7} m	4	AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
01.2	Idea of measuring multiple fringes to reduce the percentage uncertainty in fringe spacing ✓		1	AO4

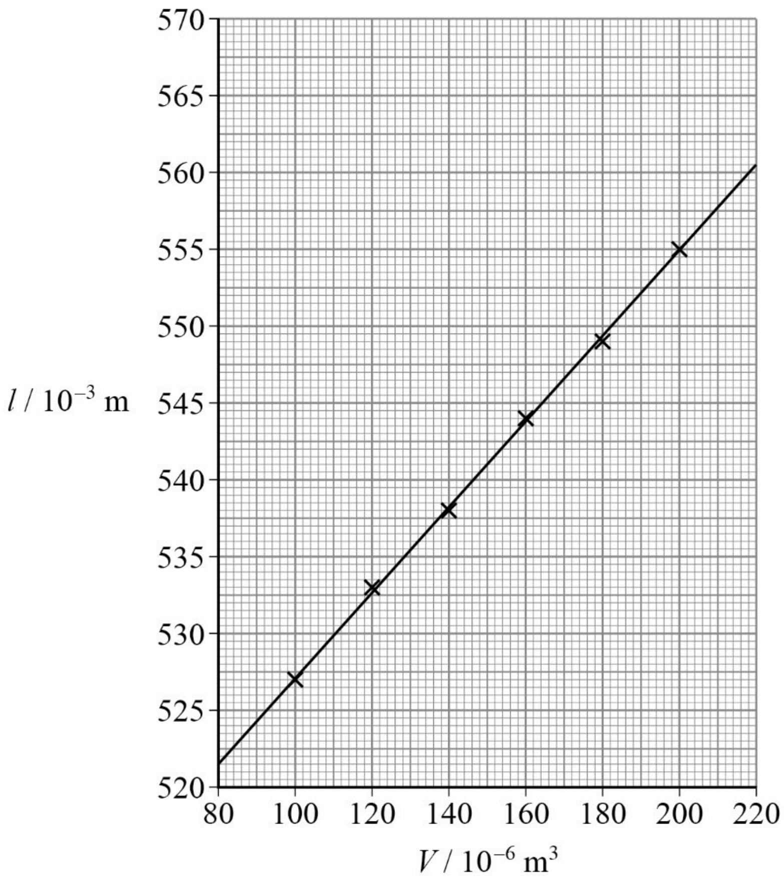
Question	Answers	Additional comments/Guidelines	Mark	AO
01.3	Use of easily identifiable point eg dark fringes or edge of white fringe **AND** using ≥ 12 fringes in one measurement ✓ 5.20 to 5.30 (mm), must be 2 or 3 sf ✓		2	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
01.4	Uncertainty $\pm (0.5 \times 2)$ mm ✓ $\frac{\text{uncertainty}}{\text{measurement}} \times 100\%$ ✓	Condone 2 mm eg $\frac{1}{154} \times 100 = 0.7\%$ $\frac{1}{w}(\times 100)$ scores MP1 but not MP2	2	1 × AO3 1 × AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
01.5	**Max 3** Determination of angle of first, second or third order ($\theta_1 = 6.3°,\ \theta_2 = 13°,\ \theta_3 = 19°$) ✓$_1$ Determination of max angle of width of paper $= \tan^{-1}\left(\frac{0.160}{2 \times 0.503}\right) = 9.0°$ **OR** Use of diffraction angle to calculate max pattern width ✓$_2$ Idea that the diffraction-grating pattern (W_2) does not take up the full width of the paper ✓$_3$ Double-slit pattern (W_1) uses all the paper so diffraction grating pattern (W_2) has a larger percentage uncertainty ✓$_4$	✓$_3$ can be justified by comparing angles of pattern with angle to edges of paper **OR** width of pattern with width of paper **Alternative for ✓$_3$ and ✓$_4$** ✓$_3$ calculate the % uncertainty in W_2 from an uncertainty of 1 or 2 m ✓$_4$ calculate the % uncertainty in W_1 from an uncertainty of 1 or 2 mm, so diffraction grating increases the % uncertainty	3	AO4

Total			**12**

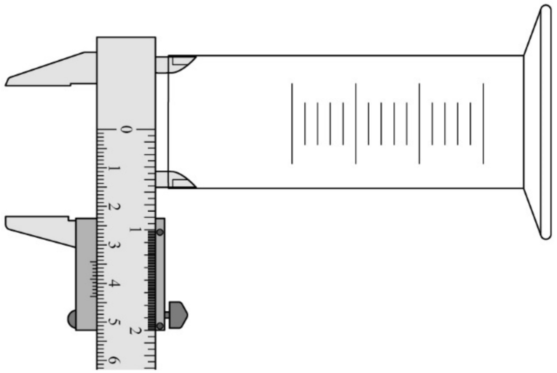
Question	Answers	Additional comments/Guidelines	Mark	AO
02.1	Light slows down in water so it takes a longer time ✓ The range finder assumes it always travels at speed of light in air so ct is larger ✓		2	AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
02.2	Suitable scale ✓ Points plotted correctly: check 2nd and 3rd points (or any points obviously not on the line) ✓✓ Suitable straight line ✓		4	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
02.3	Triangle with smallest side ≥ 8 cm ✓ Gradient = 277 ✓ (allow 274–280)	Ignore PoT Ignore any unit given	2	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
02.4	$y \quad = \quad m \quad x \quad + \quad c$ $l \quad = \quad \dfrac{4\left(\frac{c}{c_w}-1\right)}{\pi d^2} \quad V \quad + \quad h$ Align $y = mx + c$ with equation ✓ Use of $\dfrac{4\left(\frac{c}{c_w}-1\right)}{\pi d^2}$ = gradient ✓ $c_w = 2.25 \times 10^8$ (m s^{-1}) ✓	Penalise PoT in **02.3** in MP2 here MP2 implies MP1 Allow ecf from **02.3**, provided $c_w < 3 \times 10^8$	3	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
02.5	Read a point from the graph and substitute into $y = mx + c$ **OR** use of similar triangles ✓ $h = 0.499$ (m) ✓	Allow ecf from **02.3**	2	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
02.6	Cylinder drawn around and touching right-hand jaws ✓		1	AO4

Question	Answers	Additional comments/Guidelines	Mark	AO
02.7	34.3 (mm) ✓		1	AO3

Total			**15**

Question	Answers	Additional comments/Guidelines	Mark	AO
03.1	Correct use of set squares / plumb line with ruler ✓ to ensure vertical distance is measured ✓ **OR** Placing eye level at the level of the amplitude / correct use of mirror ✓ to avoid parallax error ✓		2	AO4

Question	Answers	Additional comments/Guidelines	Mark	AO
03.2	Any **two** from: ✓✓ • trials to get approximate height then move eye to height to avoid parallax error • mark height using eg sticker and then measure afterwards • use a fixed scale behind the track • film and watch back using 'freeze frame' or slow motion to make measurements	Information may come from a diagram or text	2	AO4

Question	Answers	Additional comments/Guidelines	Mark	AO
03.3	Calculates the ratio for heights for at least 2 sets of data ✓ Calculates all 3 ratios and states that the ratios are the same / close to each other so the height does decrease exponentially ✓	$\frac{h_0}{h_1} = 1.17,\ \frac{h_1}{h_2} = 1.18,\ \frac{h_2}{h_3} = 1.15$ $\frac{h_1}{h_0} = 0.855,\ \frac{h_2}{h_1} = 0.849,\ \frac{h_3}{h_2} = 0.870$	2	AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
03.4	**Valid measurement technique** ✓$_1$ • Measure the time taken between oscillations for 1 half or whole oscillation eg about **O** from max height to max height on same or opposite sides • Time different multiple full or half oscillations eg ($1T$, $2T$, $3T$, …) **Detail / accuracy point** ✓$_2$ • Use of lap timer function • Make measurements from **O** (as moving fastest) • Repeat and remove anomalies • Repeat and average **Valid way of drawing conclusion** ✓$_3$ • Time for whole or half oscillations is constant • For multiple oscillations, calculate $\frac{nT}{n}$ and check if constant for all n	Information may come from a diagram or text For ✓$_1$ it must be clear where the oscillations are measured from	3	AO4

Total			**9**

Question	Answers	Additional comments/Guidelines	Mark	AO
04.1	Use of / reference to inverse-square law or $I = \frac{P}{4\pi r^2}$ ✓ Correct drop in power as a fraction or percentage ✓ Suitable conclusion eg drop in power provided too much / solar cells would need to be unfeasibly large ✓		3	1 × AO1 2 × AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
04.2	Use of $\lambda = \frac{\ln 2}{t_{0.5}}$ $(= 7.90 \times 10^{-3}\ \mathrm{yr}^{-1})$ ✓ Use of $N = N_0 e^{-\lambda t}$ or $A = A_0 e^{-\lambda t}$ (with power) or recognition that $P \propto N$ or $P \propto A$ ✓ $P = 327$ (W) ✓	Allow MP1 in any unit of time Condone any time for t in MP2	3	AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
04.3	Any **two** from: ✓✓ • use of $pV = nRT$ (or $pV = NkT$) (expect $V = 1\ \mathrm{m}^3$) (100 mol) • use of $V = 1\ \mathrm{m}^3$ or divide by V or use of $\rho = \frac{m}{V}$ • $0.002 \times 0.75n + 0.004 \times 0.25n$ Correct answer $= 0.25\ (\mathrm{kg\ m^{-3}})$ ✓	$\frac{n}{V} = \frac{p}{RT}$ or $\frac{N}{V} = \frac{p}{kT}$ scores MP1 and MP2	3	AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
04.4	Use of $E_p = \frac{-GMm}{r}$ ✓ Use of $\Delta E_k = \Delta E_p$ ✓ $v = 1.67 \times 10^4\ (\mathrm{m\ s^{-1}})$ ✓	Allow the mass of Voyager 2 to be cancelled in the calculation $0.5v_2^2 - 0.5v_1^2 = -GM\left(r_2^{-1} - r_1^{-1}\right)$ $v_1 = \sqrt{v_2^2 + 2GM(r_1^{-1} - r_2^{-1})}$	3	AO2

Total			**12**	

Question	Answers	Additional comments/Guidelines	Mark	AO
05.1	The moving magnet creates a changing magnetic flux in the coil ✓ An application of the idea of Faraday's law eg the induced emf is equal to the rate of change of flux linkage ✓		2	AO1

Question	Answers	Additional comments/Guidelines	Mark	AO
05.2	Use of the peak-to-peak potential difference ✓ Correct use of the voltage sensitivity with any number of boxes ✓ 67 to 68 (mV) ✓		3	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
05.3	Use of $T = 2\pi\sqrt{\frac{m}{k}}$ ✓ $T = 0.580$ (s) ✓ $\frac{T}{\text{number of boxes}} = 0.2 \text{ s / div}$ (allow ecf) ✓	Allow unit given as s div^{-1}, s cm^{-1} or s / cm	3	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
05.4	Evidence of reading T or $\varepsilon_{\text{peak}}$ from oscilloscope ✓1 T increases by $\sqrt{2}$ and $\varepsilon_{\text{peak}}$ increases (by $\sqrt{2}$) and evidence of reading both from oscilloscope ✓2 Application of $\varepsilon = \frac{\Delta BAN}{\Delta t}$ eg $\varepsilon \propto \frac{B}{T}$ ✓3 T is directly proportional to $\sqrt{m}$ or $\frac{f}{w}$ is inversely proportional to $\sqrt{m}$ ✓4	Condone in terms of $\varepsilon = BAN\omega \sin \omega t$	4	AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
05.5	The resistance of an ammeter is lower than the resistance of a voltmeter/oscilloscope ✓ The induced emf is in a direction to oppose the change that caused it ✓ Ammeter has a low resistance so there will be a large current in the coil ✓ Creates a larger magnetic field in the coil which slows **Q** down more (due to Lenz's law), so **Q** takes less time to come to rest ✓		4	2 × AO1 2 × AO2
Total			**16**	

Question	Answers	Additional comments/Guidelines	Mark	AO
06.1	There is a perpendicular distance to the pivot from the line of action of the force (= width of the pillar)		1	AO1

Question	Answers	Additional comments/Guidelines	Mark	AO
06.2	Use of $74\ (\times 10^3)\sin 42°$ or $9\sin 42°$ ✓ Apply principle of moments ✓ 9.5×10^4 (N) ✓	In MP2 ignore PoT, missing horizontal component, wrong trig or no trig In MP3 allow ecf for use of $\cos$ but not for missing horizontal moment	3	2 × AO2 1 × AO3

Question	Answers	Additional comments/Guidelines	Mark	AO
06.3	Any **three** from: ✓✓✓ • force decreases (to zero at position shown in **Figure 13**) • as the pillar is raised the horizontal distance between the pivot and the centre of mass decreases • smaller moment/torque required to lift the pillar • component of the tension in the rope perpendicular to the distance between the rope and pivot increases / correct statement about the angle between the rope and the distance to pivot • use of work = Fs or work = $T\theta$ So the power reduces as the pillar rises ✓	Do not allow unsupported conclusion	4	3 × AO1 1 × AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
06.4	Any **two** from: ✓✓ • use of $0.2 \times 699\ (\times 10^6)$ • use of stress = $\frac{F}{A}$ • use of $A = \frac{\pi d^2}{4}$ or $A = \pi r^2$ Correct answer = 0.028 (m) ✓	Ignore PoT for first 2 marks Use of $d = \sqrt{\frac{4F}{\pi \times \text{stress}}}$ or $r = \sqrt{\frac{F}{\pi \times \text{stress}}}$ scores MP1 and MP2	3	AO2

Question	Answers	Additional comments/Guidelines	Mark	AO
06.5	Use of $T = Fr$ ✓ 0.21 (m) ✓		2	AO1

Question	Answers	Additional comments/Guidelines	Mark	AO
06.6	Use of $P_{out} = T\omega$ ✓ (666 W) Use of $P_{in} = IV$ ✓ (936 W) Use of $\frac{\text{useful } P_{out}}{P_{in}} \times 100$ ✓ (expected answer 71%)	allow ecf	3	2 × AO2 1 × AO1

Total			Mark
Total			**16**