

GCE A Level Examiners' Report

Physics
A Level
Summer 2025

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Introduction

Our Principal examiners' report provides valuable feedback on the recent assessment series. It has been written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and details how candidates have performed in each component.

This report opens with a summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It then looks in detail at each unit, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.¹

The information found in this report provides valuable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	Eduqas offers an extensive programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.eduqas.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 12 months after the examination.	Portal by WJEC or on the Eduqas subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For linear specifications, a single grade is awarded for the subject, rather than for each component that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results and Grade Boundaries and PRS (eduqas.co.uk)

¹ Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

Exam Results Analysis	Eduqas provides information to examination centres via the WJEC Portal. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	Portal by WJEC
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.eduqas.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	Portal by WJEC or on the Eduqas subject page.
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Executive Summary

This was a high performing cohort that demonstrated an excellent knowledge and understanding of physics. The exam papers were of comparable difficulty to previous series and performance was in line with previous series.

Excellent literacy and numeracy skills were seen. Mathematical skills were particularly strong when handling equations. It is pleasing to note that qualitative responses were as good as quantitative responses, with clear and concise explanations being provided.

Candidates performed very well in many topics, kinetic theory and electric fields were two of the lower performing topic areas. Performance in the comprehension question in Component 1 was not as high as in other questions on the paper, hence, developing the comprehension skills of candidates is an area that could aid candidates in future series

Practical skills were generally very good. Areas to develop are; identifying if an uncertainty is absolute or percentage based, quoting final answers with the linked uncertainty to an appropriate number of significant figures and avoiding basic slips when calculating gradients.

Responses to AO1 questions requiring the recall of definitions were variable, it was apparent the candidates that had learnt their work and those that hadn't. The definition of the Becquerel is a particularly good example of this.

The option questions were very well answered, with the physics of sports continuing to be the most popular option.

Our digital resources website offers blended learning lessons and knowledge organisers, among other materials (link [here](#)).

PHYSICS

GCE A level

Summer 2025

COMPONENT 1 – NEWTONIAN PHYSICS

Overview of the Component

Questions 1, 2, 3 and 5 provided mean marks above 70%. These questions covered the topics of kinematics, dynamics, energy concepts and vibrations. The mean percentage mark for the 'Year 1' section (questions 1, 2 and 3) was 78; the 'Year 2' section (questions 4, 5, 6 and 7) was 72; the comprehension section (question 8) was 69. This question had the lowest mark on the paper along with question 6 (kinetic theory). The QER question that included application of forced vibrations, natural frequency, resonance and damping had a percentage mean mark of 60%.

As in previous Component 1 papers examiners were encouraged by the excellent mathematical skills shown by candidates, particularly when handling equations. Candidates also had opportunities to demonstrate their extended writing skills, and they did so very well, giving, in many cases, clear and concise explanations.

- When describing Newton's second law (in terms of momentum) candidates should refer to the resultant force (not merely the force).
- Candidates should use $\frac{(\text{maximum gradient} - \text{minimum gradient})}{2}$ when calculating the mean gradient.
- The consideration of significant figures and place values can be further developed by candidates.
- In 'show that' questions, any changing of terms should be clearly communicated e.g., a to g .
- Objects undergoing circular motion do not have balanced forces acting on them. Instead, there is a resultant force acting towards the centre of the circle.
- In simple harmonic motion, a straight line through the origin of an $a - x$ graph tells us that $a \propto x$. The negative gradient tells us that a acts in the opposite direction to x .
- $\overline{c^2}$ and $\bar{c}^2$ should not be confused. $\overline{c^2}$ is the mean square speed and $\bar{c}^2$ is the mean speed squared.

Comments on individual questions/sections

SECTION A

- Q.1 (a) This was very well answered by nearly all candidates. In some instances, candidates wrote down '18sin40' and '18cos40' but didn't calculate a final answer. They were awarded 1 mark. It should be noted that calculated final answers are required.
- (b) We saw most candidates give excellent responses. Some candidates did use phrases such as 'constant motion'. This was felt to be too vague. The 2nd marking point (MP) was awarded for reference to 'changing velocity' however there were a small number of candidates that indicated a pause in the acceleration at its highest point. We withheld the mark in these cases. The best responses involved 'constant g ' downwards.

- Q.1 (c) This was well answered, and we saw lots of variation in responses. Some candidates used an equation of motion to calculate a correct time of flight. From here they usually proceeded in calculating x (or even t again with the '38 m' given in the question) and made a suitable comment. Others started with $v = \frac{x}{t}$ and calculated t with the 38 m. They then calculated x , t or even a final vertical velocity. There was also evidence of solving quadratics, which was not covered on the mark scheme (MS) but was credited.
- Q.2 (a) Most candidates coped very well with this question. We saw either an energy or force approach as outlined in the MS. The 1st and 2nd MPs were sometimes awarded together for $\Delta PE + KE_{\text{initial}} = KE_{\text{final}} + W$. The presentation of this multistage calculation was very good. There were a few candidates who seemed confused as to what force they were calculating. The resistive force along the slope was required.
- (b) (i) This was generally well answered but there were also quite a few weaker responses where candidates had not learnt the momentum definition. Some used the equation from the data booklet. We only accepted this if it was written in words.
- (ii) This recall question was found to be a little trickier. Some candidates omitted the word 'resultant' (we did accept 'net') and were held back. More candidates missed the directional element of this. Future candidates should be advised to use the WJEC definitions booklet when preparing for these types of questions.
- (iii) This was well answered with the first two methods on the MS being used most regularly.
- Q.3 (a) Nearly all candidates correctly calculated the missing value in the table however there were some 0.03 and 0.04 responses. Error bars were well plotted and in many cases a pencil and ruler were clearly used. The scale did catch a small proportion of candidates.
- (b) When calculating gradients, we were looking for either a triangle or points that occupied at least half the line. This was generally well done with very good presentation of workings which is something that stood out. Candidates should be commended on their written communication skills. The mean gradient often followed but some candidates missed the $\frac{920}{1020}$ calculation and could not determine the % uncertainty.
- (c) We held out for a statement that $u = 0$ in this 'show that' question. Many candidates also stated that $a = g$ and $x = h$ after firstly writing down the correct equation of motion. In some cases, the a rather suddenly turned into g . Similarly for x into h . We were generous marking these on this occasion. We were often convinced by the algebra. The minimal step required by candidates was $t^2 = \frac{2h}{g}$ or $2h = gt^2$.

- (d) Here we wanted candidates to use their gradient from (b) to calculate g . Many did this. A small number did not follow this method and instead used a point from one of the lines. They were therefore unable to access the first two MPs. Candidates showed some alternative approaches for MP3 as they calculated upper and lower bounds for their g value. The last marking point was standalone. The final absolute uncertainty needed to be written to 1 or 2 significant figures. This was missed by some. When the absolute uncertainty sig figs had been chosen, candidates then had to write their value of g to the same place value. For example, 9.5 ± 2.1 shows the absolute uncertainty to 2 sig figs which is to the nearest decimal place. 9.5 has been written accordingly. Candidates should also be reminded of the need for units.
- (e) Either the time delay between the switch being pressed and the ball being released or the time delay between the ball hitting the base and the timer stopping were suggestions that gained credit. This question allowed for a good range of marks. Not all that were awarded MPs 1 and 2 completed their response, however, there were a good number of 3-mark responses. These candidates realised that the shifted values of time did not affect the gradient and hence g . The centre-to-centre sphere measurement was not relevant here. Other weaker responses simply suggested that the data had been misread or that there was a faulty stopwatch. As this is a version of a specified practical, candidates should understand how the apparatus is used.

- Q.4 (a) The definition of ω was well answered by many. There were plenty of responses that matched the MS word for word. Some candidates managed the 'angle swept out' part of the definition, but they finished with 'in a given time' rather than 'in unit time'.
- (b) (i)&(ii) Both of these questions were well done. In (i), we were looking for evidence of the multiplication of 2π and division by 60. This often came within $\omega = \frac{2\pi}{T}$ or $2\pi f$.

In part (ii), $F = \frac{mv^2}{r}$ and $mr\omega^2$ were regularly seen. Some candidates used the approximation (150 rad s^{-1}) which resulted in a final answer of 641 N. This was credited. For the 3rd MP we required more than just 'towards the centre'. Towards the centre of the drum was credited and we also accepted towards the centre of the washing machine.

- (c) It is worth noting that this question focused on the sock. The sock is accelerating so must have a resultant force acting upon it. References to the fictitious centrifugal force balancing the inward force were not given credit. For those candidates who focused on the weight acting downwards, we wanted them to clearly show an understanding that it did not affect the centripetal force at this position.

- (d) Both the quality of extended response was generally good, and the coverage of the indicative content was good. Candidates should be commended on how they applied their knowledge to an unfamiliar situation. Bottom band responses often included reference to the dampers reducing amplitude (or energy) and/or covered resonance in a limited way. Middle band responses added to this. They would often cover the relationship between driving frequency and natural frequency of the system and then go on to say the amplitude of oscillation increases leading to a comment on resonance. Top band answers usually showed additional references to the drum undergoing forced oscillations at drum rotation frequency and the force caused by rotation of unbalanced drum.

- Q.5 (a) (i) A straight line through the origin with a negative gradient was required for the 1st MP. This was generally well done with most candidates plotting points close to the values stated on the MS. There was a little tolerance given in the position of the line due to the lack of minor grid lines. A small number of candidates drew lines with positive gradient and lost the mark. An even smaller number attempted sinusoidal curves which was unexpected. The candidates were then asked to explain if their graph confirmed SHM. There were many excellent attempts. A small number thought a straight line with a negative gradient showed an inversely proportional relationship but most went for proportional. This allowed MP2 to be awarded. The 3rd MP proved a little more difficult to achieve. The candidates needed to directly link the negative gradient with the acceleration being towards the equilibrium.
- (ii) We often saw good calculations of ω using $\frac{2\pi}{T}$ or use of the gradient of the a - x graph. We were then looking for substitution into a suitable sinusoidal function. $v = A\omega \sin \omega t$ was used successfully in many cases. Some candidates used $v = -A\omega \sin (\omega t + \pi)$ which was also correct. Calculator errors, sign errors and missed units were the causes of the 3rd MP not being obtained. It was nice to see alternative approaches also used. A small number of candidates realised they could calculate the gradient of a tangent drawn at 0.32 s on the x - t graph. Most then used $\frac{\Delta x}{\Delta t}$ but some candidates thought that $v = \frac{x}{t}$ could be used for a single point on the graph. They were not awarded any credit.
- (b) (i) This was very well answered. We saw some excellent use of indices and communication was often clear. We did see candidates writing that the 2π had no units which was pleasing. We did on this occasion allow the disappearance of 2π but those that left it in place often tripped up when completing the final balancing act and were penalised.
- (ii) This was generally well answered. Very good manipulation and regular answers of 0.029 or 0.0285 [kg] were seen. There was an error carried forward on T , but it was rarely needed.

- (c) (i) This synoptic question was well answered by many candidates. Some candidates made km to m errors, but this was rare.
- (ii) This challenging 3-mark questions was handled very well by many candidates. Both methods on the MS were equally used. After some very good reasoning, some candidates stated their final fraction in an inverted fashion. They were awarded 2 marks. Unfortunately, a small number became a little lost in the algebra if using the alternative path in the MS.
- Q.6 (a) $\frac{3}{2}kT$ was used by many in this question. They were awarded the 1st MP and usually went on to produce the correct answer. Some candidates used $\frac{3}{2}RT$ and this was accepted for the 1st MP if they remembered to divide by N_A . This was not regularly the case.
- (b) The different paths through this question meant we often saw kinetic theory equations being combined in order to arrive at $\overline{c^2} = \frac{E_{k \text{ molecule}}}{m}$ or $\frac{3kT}{m}$ for the 1st MP. Candidates then had to successfully calculate the mass of one molecule to allow $\overline{c^2}$ to be calculated and hence c_{rms} . Some candidates found a way around the 2nd MP by using $\overline{c^2} = \frac{3RT}{M_r}$. They were awarded all 4 marks if they arrived at the correct c_{rms} . On a small number of occasions $\overline{c^2}$ was written as $\bar{c}^2$. We did not penalise on this occasion however it is worth noting for future candidates that $\overline{c^2}$ is the mean square speed and $\bar{c}^2$ is the mean speed squared. This should not be confused.
- (c) This was generally well answered. We were not looking for explanations in this case, but they were often given. For the 3rd MP we were holding out for Neon's c_{rms} being $\sqrt{2}$ times bigger than argon or vice versa. A good number of candidates attained 3 marks. Even though the temperature is constant at 20°, a small number of candidates incorrectly thought that the KE per molecule would be different because of the difference in their masses.
- Q.7 (a) This proved to be a demanding question. 'Q is an energy transfer due to a temperature difference' was regularly seen. We also accepted 'heat transfer' instead of 'energy transfer' here, however, to gain all 3 marks reference to heat as an energy transfer was required somewhere in the response. To gain the 2nd MP, candidates need to link the initial rate of heat flow with the initial temperature difference. Both were at their greatest value at this point. We did not hold out for a decreasing temperature difference for the 3rd MP, but candidates did need to mention that the rate of heat flow was zero when equilibrium was reached. We saw some excellent 3 mark responses and the question gave a good spread of marks.
- (b) The 1st MP was awarded for the substitution into $Q = mc\Delta\theta$ even if candidates struggled with the $\Delta\theta$ aspect. The weakest responses didn't use the equation at all. Some that did, showed little appreciation of the heat transfer between the two blocks. They did not achieve more than 1 mark. Those candidates who did achieve the 1st and 2nd MPs often did so by correctly setting up the equation on the 3rd line of the MS. (85- θ) and (θ -50) (or variants of this) were regularly seen. The 4th MP relied on good algebra to arrive at the correct final answer.

- (c) In this issues question the candidates were very creative in their responses. Benefits included references to limited CO₂ emissions. Less pollution or more eco-friendly was deemed too vague. The most popular drawback was the timescale of growing hemp affecting production. They used the information in the question and were awarded credit. Other drawbacks included the fact the hemp was flammable or that it could biodegrade and not work effectively for long. Some questioned its efficiency compared to the tried and tested fibreglass.
- Q.8 (a) The first question in the comprehension section worked well. The 4 MPs were effectively standalone marking points. Many candidates achieved the 1st MP. Some missed it because they only focused on ${}^3_1\text{H}$ and ${}^2_1\text{H}$. All 3 values were needed to be recorded. Less candidates multiplied by the nucleon number. The multiplication of e was popular and was added in many different stages of their calculations.
- (b) The presentation in responses noticeably declined in this question indicating there were sudden changes in approach. Candidates sometimes needed multiple attempts. Most spotted they needed to use $F = 9 \times 10^9 \frac{Q_1 Q_2}{r^2}$ and subbed either 200 N or 1 fm into this equation. Some could not see what charge value to use or thought that $2Q_1$ would be suitable. In these instances, they picked up the 1st MP but not the 2nd. The 3rd MP was for the correct answer and comment. For example, $200 \approx 230$ would have been credited. Unfortunately, the comment was not always seen.
- (c) This proved to be challenging for some candidates as they could not see that $\frac{3}{2}kT$ was required in this unfamiliar setting. Many candidates did use the equation. There was the occasional power of ten slip but many correct answers. A significant number of candidates did not make the correct comment as they said the two values did not agree and the statement was incorrect. We were looking for reference to $7.7 \times 10^9 \gg 10^8$ and that statement is correct.
- (d) The 1st MP was awarded for correct algebra. The 2nd was for the correct substitution of 35%. Unfortunately, on occasion 0.35 did not arrive in the equation in the correct position or it was not considered at all. For candidates that missed 0.35 entirely we generously awarded 2 marks for a final answer of 8 m s^{-1} . 38.3 m was also sometimes seen. Here a candidate had slipped up and used a $\sqrt{\quad}$ instead of a $\sqrt[3]{\quad}$. If their workings were correct up to this point, we awarded 2 marks out of the 3. Candidates achieved all 3 marks a final answer for a final answer of 11.4 m/s.
- (e) We saw some lovely answers in this demanding question. We credited end to end arrows for the 1st MP. This was sometimes left blank. General Newton third law statements were not enough on their own. We were looking for candidates to consider the two objects that were applying forces on each other. An example that did gain credit was 'force of element on outer fuel is equal and opposite to force of outer fuel on element which acts back towards the centre'. The implosion is clearly implied. It should be noted for future candidates that direct quotes will not be awarded marks on the comprehension question. There were a few examples of this here.

- (f) In this question candidates really had to show good interpretation of what was written in the article. The laser system is less than 1% efficient but to prove this, candidates had to use 400 MJ and 2.05 MJ in the efficiency equation. For candidates that did this, a final answer of 0.51% allowed for 2 marks. Those that selected 3.15 MJ did not gain credit.
- (g) Candidates found a few different paths through this question as outlined on the MS. There were also a few candidates that started down one path then changed approach often picking up all the MPs. Some converted the time to seconds and cancelled later. This was fine. Some of these candidates did not cancel later and were often stuck on two marks.

PHYSICS

GCE A level

Summer 2025

COMPONENT 2 – ELECTRICITY AND THE UNIVERSE

Overview of the Component

Most candidates attempted nearly all questions, showing solid understanding across the assessed topics. Responses to charge flow (including derivation of $I = nAve$), circuit theory, materials, orbital mechanics, and stellar physics were particularly strong, with good performance in related numerical questions. Practical analysis skills were generally well shown, though some lost marks due to inaccurate gradient calculations—often caused by using data points or triangles that were too small or closely spaced. In some cases, candidates misread the required y -axis value.

Literacy and numeracy skills were evident, but very few candidates struggled with logical reasoning and presenting algebra clearly, affecting clarity. A common error was the misapplication of Kepler's Third Law in Q7(b)(iii). In contrast, Q7(c), involving a gravitational field strength ratio, was generally well answered. The momentum-based synoptic question (rifle pellet speed) was also handled well.

Electric field questions remained a weaker area; many candidates had difficulty calculating work done when moving a charge between points. Written answers were usually well structured, though definitions often lacked precision—particularly for “hysteresis.” The QER question on capacitor charging was attempted satisfactorily, with only a few responses showing enough depth for top marks.

A detailed question-by-question analysis follows.

Comments on individual questions/sections

- Q.1 (a) (i) and (ii) Nearly all candidates correctly referenced the flow of charge when explaining why copper is an electrical conductor. Responses to part (ii) were generally strong, with most candidates providing clear, logical, and accurate derivations of the equation $I = nAve$. However, in a few cases, the term ' n ' was either not defined or incorrectly defined, which resulted in the loss of marks.
- (iii) Almost all candidates correctly recognised that I , n , and e were the same for both wires, and used this understanding to produce valid algebraic calculations to determine the required drift velocity.
- (b) (i) and (ii) Candidates demonstrated a solid understanding of emf and potential difference, with nearly all giving the correct units as either volts (V) or joules per coulomb (J C^{-1}). In a few instances, candidates did not clearly specify which value referred to emf and which to potential difference, resulting in the loss of one mark. In part (ii), nearly all candidates successfully calculated the battery's internal resistance.

- Q.2 (a) A surprising number of candidates failed to include either the voltmeter, the ammeter, or both in their circuit diagrams.
- (b) Nearly all candidates successfully took logarithms of the given equation and correctly expressed it in the form $y = mx + c$.
- (c) (i) Lines of best fit intersecting the second and third plotted points were accepted. When determining the gradient, candidates were expected to use points that were widely spaced or, if using a triangle, to ensure it occupied at least half of the graph grid—considered good experimental practice. While most candidates followed this guidance, a significant minority did not. Almost all candidates obtained the y -intercept successfully. However, a few failed to retain the negative sign of the intercept value, incorrectly converting it to a positive value. This error led to incorrect results when taking the antilogarithm. Nevertheless, nearly all candidates correctly used their calculated gradient and intercept to write the final equation, sometimes as ecf .
- (c) (ii) Most candidates earned at least one mark, typically by noting that the data points were widely scattered or not closely aligned with the line of best fit. Fewer candidates gained the second mark, which required a valid approach to increase confidence in the results. Many simply suggested repeating the experiment, which was not accepted. Acceptable responses included taking a greater range of readings, averaging multiple results, or adding error bars to indicate uncertainty (and which implied taking means and multiple readings).
- (d) This part asked candidates to consider how values of k and n would be affected when the experiment was repeated using three identical lamps in parallel. Two marks were awarded for stating the correct values (one for each of k and n), and two marks for valid explanations. A common error involved assuming the current would decrease by a third rather than increase threefold, leading to an incorrect value of $\frac{k}{3}$ instead of $3k$, and the loss of both associated marks. Most candidates correctly noted that n would remain unchanged but often failed to provide a valid reason. A simple explanation such as "because the voltage remains constant" would have sufficed.
- Q.3 (a) Nearly all candidates correctly explained how the ohm (Ω) could be expressed in base units as V A^{-1} . Many also gave good explanations of how Ω could alternatively be expressed as J s C^{-2} , often deriving this through the relationship between volts and amps. A significant number of candidates opted to derive this via a power-based approach, which, though slightly more complex, was valid and generally well executed.
- (b) (i) and (ii) In part (i), nearly all candidates correctly calculated the voltage across the LDR in the dark. In part (ii), a wide range of excellent responses were seen. It was clear that most candidates had a strong understanding of potential divider circuits and applied this effectively. Common methods included:
- Using the potential divider equation to find the combined resistance of R and the $400\ \Omega$ resistor, followed by use of the parallel resistors formula to determine R .

- Working backwards from the given $100\ \Omega$ value to confirm V_{LDR} .

A minority of candidates approached the problem by calculating the current in the circuit—a more concise but equally valid method.

- (c) Most responses involved determining the new required length of nichrome wire using the resistivity formula. In some cases, candidates first calculated the resistance of 2 m of wire ($109\ \Omega$), then used this in ratio with the target resistance ($100\ \Omega$) to calculate the required length, i.e. $\frac{100}{109} \times 2$

- Q.4 (a) This QER (Quality of Extended Response) question was answered satisfactorily. Stronger responses clearly explained the mechanism of charge flow to and from plates X and Y, described the resulting changes in potential difference and current within the circuit, and related these to what would be observed on the meters. Some candidates also addressed how the potential difference across resistor R would be affected. A number of responses included discussion of how the rates of change of current, charge, or potential difference varied over time.

Weaker or lower-band responses tended to be limited or superficial, often mentioning charge or electron flow to and from the plates without referencing the behaviour of the meters, which limited the depth and relevance of their answers.

- (b) (i) and (ii) Nearly all candidates correctly used an exponential decay equation—based on either given voltage values or calculated charge values—to determine the time taken for the pellet to travel the specified distance. Most then correctly calculated the speed of the pellet.

In part (ii), candidates showed strong understanding of the principle of conservation of momentum and successfully applied it to validate their answers to part (i), which was encouraging.

- Q.5 (a) Candidates were asked to describe a method for investigating the force–extension characteristics of rubber, using an elastic band under load. Space was provided for a diagram, though not all candidates made use of it, instead opting for written descriptions.

The key marking points were:

- A suitable diagram (or accurate description) of the apparatus.
- A brief method referencing the incremental addition of weight/mass and use of a ruler to take readings (these could be included in the diagram).
- A detailed explanation of how extension is measured, e.g., stretched length minus original length.

While most candidates addressed the first two points, many failed to gain the third mark due to vague or incomplete descriptions of how extension was measured.

- (b) (i) Nearly all candidates successfully read values from the graph and used them appropriately to confirm the Young modulus.

- (b)
 - (ii) Not all candidates recognised that in region BC, molecular chains were unravelling or undergoing alignment. Most, but not all, referenced interatomic forces in region CD.
 - (iii) While most candidates understood that the area under the graph represents work done, many struggled to apply the trapezium rule (or triangle + rectangle method) accurately. A frequent issue was a power-of-ten error, resulting in a penalty for answers that were off by a factor of 10.
 - (c) This 'How Science Works' question asked candidates to evaluate how science informs decision-making. A correct definition of 'hysteresis' was expected but rarely given. Two marks were awarded for identifying that under-inflated tyres undergo large hysteresis cycles (e.g. extensive stretching and relaxing), and that this causes heat generation or leads to energy loss, damage, or excessive wear. Few responses achieved all three available marks.
- Q.6
 - (a) Many, but not all, candidates correctly identified the two required conditions: that the electric potential is defined for a unit positive charge, and that the charge must be brought to the point in the field from infinity.
 - (b)
 - (i) Most candidates correctly calculated the magnitude of the electric field strength at point R. However, fewer stated the direction of the resultant field (or gave the incorrect direction), which led to the loss of one mark.
 - (ii) The majority of candidates recognised that the electric potential at points R and S was the same—often expressed as $\Delta V = 0$. Fewer linked this to the work done using the formula $W = Q\Delta V$ to conclude that $W = 0$.
 - (iii) Fewer correct responses were seen than expected. Many candidates failed to account for both charges when determining the net potentials at the required points, resulting in the loss of the first two marks. Error carried forward (ECF) was applied for the subsequent calculation of the potential difference and the work done in moving a proton. Only a small number of candidates approached the problem by calculating the net electric potential energy at each point and then finding the difference.
- Q.7
 - (a) This question was generally well answered. Most candidates successfully linked the observed change in wavelength to the respective positions of the star at points A and B in its rotation. However, some responses did not reference these positions explicitly. Unless the explanation was clearly and unambiguously phrased, candidates did not receive full marks.
 - (b)
 - (i) and (ii) In part (i), most candidates were able to interpret the challenging scale on the graph correctly and determine the value of $\Delta\lambda$. Nearly all then used the appropriate equation successfully to confirm the orbital speed of the star.
 - In part (ii), nearly all candidates accurately calculated the star's orbital radius.

- (b) (iii) Fewer candidates than expected gained all 5 marks in this part. A significant number struggled with substituting into and rearranging the relevant form of Kepler's Third Law to solve for d . Common mistakes included omitting G , failing to square 2π , or making other algebraic errors. The first two marks were awarded for correctly calculating d . A third mark, which many overlooked, was awarded for determining the planet's orbital radius by subtracting the star's orbital radius (from part (ii)) from d . Few candidates completed this step and thus lost the mark. The final two marks were for applying the mass-to-radius ratio correctly. ECF (error carried forward) was applied, and many candidates gained these marks.
- (c) This part was answered well. Most candidates applied the density equations correctly to derive a relationship between the planets' radii and then used this to determine the correct ratio of gravitational field strengths. A few highly concise but logically sound solutions were awarded full marks, reflecting strong conceptual understanding.
- Q.8 (a) (i) Some candidates failed to include the term '*electromagnetic*' (or em) in their responses, which was required to gain the mark.
- (ii) Candidates adopted a range of valid methods to confirm consistency between the values provided. Typically, Wien's Law was used to determine the temperature T , which was then cross-verified using the Stefan–Boltzmann Law, with power P often derived from the inverse square law. An alternative and quite common approach involved confirming the intensity at Earth's surface. Exemplar methods are outlined in the provided reference materials.
- (b) (i) and (ii) In part (i), candidates were required to explain *multiwavelength astronomy* by referencing both *astronomy* (e.g. the study of celestial objects or the universe) and *multiwavelength* (i.e. using many parts of the electromagnetic spectrum). Many responses lacked a clear reference to '*electromagnetic*', which meant that the mark could not be awarded. In part (ii), nearly all candidates correctly identified GALEX as the appropriate telescope and gave a valid justification based on its ability to detect ultraviolet radiation.

PHYSICS

GCE A level

Summer 2025

COMPONENT 3 – LIGHT, NUCLEI AND OPTIONS

Overview of the Component

The general standard of performance of candidates was superb and even higher this year compared with last year – from a mean last year of 65% to a mean this year of 69%. This was a difficult paper, but the vast majority of candidates coped well. The statistics indicate that the paper, despite its high mean mark, provided good differentiation for the cohort of applicants. There was no evidence of candidates struggling with time restrictions again this year – 97% attempted Q8(e) and 102% attempted the options (meaning that 2% tried more than one option).

None of the topics are a cause for concern this year but there are some minor points that can be highlighted.

Comments on individual questions/sections

SECTION A

- Q.1 The whole of this question was well answered with the exception of two of the parts - (c)(i) and (c)(iii). It is slightly strange that part (c)(i) caused so many problems - candidates were unable to pick up on the point that the number in front of t was the angular frequency. On the other hand, part (c)(iii) was meant to be demanding and the low mean mark was expected.
- Q.2 The main calculation (b)(i) was not easy but had a mean mark of 93%!! However, all other parts caused slight problems.
- Q.3 Not an easy optical fibre question but very well answered in general. In part (b), not many candidates mentioned the 2nd condition for total internal reflection - light attempting to pass from dense to less dense. In part (c), many candidates forgot to use the speed of light of the core and simply used $3 \times 10^8 \text{ m s}^{-1}$.
- Q.4 Parts (b) and (c) were very well answered.
- Q.5 This practical question was well answered in general but there were problems with the definition of the Becquerel ((a)(ii)), part (c)(ii) and (d).
- Q.6 This question was well answered except for part (b)(i). This was just a standard rotating coil in a B -field and one would have expected better answers.
- Q.7 Part (a) was the extended writing question and was answered well. Part (b) was also answered well.

- Q.8 This was a difficult particles question but the mean mark is very impressive. The part with the lowest mean mark was part (e), the issues question. The mark scheme this year was quite narrow. When the numbers do not agree with theory, there's only two things that you can do - further research/experiments, modify/improve the theory/model. Hence, a mean mark on this part of 58% was rather encouraging.

SECTION B

Alternating Currents – Question 9

- Q.9 (a) (i) The majority of candidates answered this correctly but some suggested changes to the magnetic field instead of the coil.
- (ii) The majority of the candidates answered this correctly, but some gave the full equation rather than the equation for the peak emf.
- (iii) Most candidates calculated the peak emf from the rms value and the period from the frequency and went on to sketch a correct trace.
- (b) Most candidates realised that the reactance of the inductor increased with increased frequency. Some candidates deduced the effect of this on the current and therefore V_{out} . Others used a ratio argument.
- (c) (i) Most candidates recognised that the power dissipated in the inductor is zero, but a minority used the power equation with the reactance in place of R .
- (ii) Most candidates recognised that the circuit was at resonance and calculated accordingly.
- (iii) The majority of candidates were able to calculate Q using either their value of L or the capacitance given in the question.
- (iv) The effect on the resonance curve was well answered.

Medical Physics – Question 10

- Q.10 (a) (i) The rearrangement of the equation was generally well done, unfortunately some candidates didn't include units with their final answer and so lost the second mark.
- (ii) Mixed responses, many didn't realise the line spectra would be in the same place or could be missing. If they notably changed the position of the line spectra they lost one mark.
- (iii) Both parts were generally well done, however a few candidates missed out the units so losing the last mark in II.
- (b) This was well answered by the majority of candidates. Some failed to state that ultrasound B scans wouldn't be able to penetrate the skull and a few didn't state that radioactive tracers are not effective in locating bleeds. Most candidates realised that MRI or CT scans would be the most effective.

- (c) (i) Some candidates were confused by this question and described a PET scan rather than the gamma camera asked for in the question. The need for the use of a collimator was also often omitted.
- (ii) Some excellent answers were given. However a number understandably gave an answer of 1.76×10^{-13} and this was awarded 2/3 marks.

The Physics of Sports – Question 11

Q.11 The context of the Physics of Sports was based on golf with rotational mechanics as well as projectile motion being tested as part of the option.

In general, the candidates performed very well and were able to provide answers for all the sections of the paper. The discussion on how angular momentum is conserved as well as how the golfer achieves stability was answered poorly. The projectile motion part was well answered with many candidates scoring full marks and concluding that the tree would be cleared. However, a surprising number of candidates did not determine the linear kinetic energy correctly when considering the relative magnitude of linear and kinetic energy.

- (a) (i) Many candidates were able to discuss how the centre of gravity or mass makes the golfer stable but did not further explain that this means that there is no net moment or that a greater moment is required to topple the golfer.
- (ii) Most candidates were able to give the answers in relation to the ratio of the speeds but frequently omitted that these speeds are relative in order to gain the full marks for this part.
- (iii) This was well answered with many candidates gaining full marks. The most common error was to use the diameter instead of the radius in order to determine the moment of inertia.
- (iv) This was answered poorly with many answers not referring to the principle of conservation of angular momentum and applying the principle to the case of the golfer hitting the ball. Credit was given if candidates referred to no external forces acting and the sources of these external forces.
- (b) (i) This was answered well by several candidates with many gaining full marks for this part. Many candidates took the approach to determine the time taken to travel 68 m and then used the equation $x = ut + \frac{1}{2}at^2$ to determine the height gained. All candidates used the 1.7 m correctly to determine that the ball cleared the tree.
- (ii) Many candidates determined the rotational kinetic energy correctly and were able to gain credit for the moment of inertia if diameter was used in part (a)(iii) to determine the torque. However, the linear kinetic energy was poorly understood with many candidates not using the horizontal speed or simply stating that the linear kinetic energy at maximum height is equal to zero.

- (c) This was answered well by nearly all candidates. They were able to discuss at least one factor that could be changed and then explain the physics principle that enabled the horizontal range to be reduced. The most common approach was to use the drag force equation and explain how the factors in this equation could be changed. Some candidates did discuss changing the density of the golf ball in the context of this equation which was not correct.

Energy and the Environment – Question 12

- Q.12 (a) (i) This AO1 type question scored full marks several times but it was not answered as well as anticipated. The 1st marking point was most commonly awarded. 'Wholly or partially' was often added. Some candidates replaced 'wholly' with 'partially' which didn't help their cause. The 2nd marking point was tougher. Many candidates did not reference an 'upthrust' or 'upwards force'. We accepted 'buoyancy force' as a correct alternative. There was some confusion where mass was not replaced by weight. Also, 'dispersed' was not always replaced by 'displaced'. That was a little disappointing.
- (ii) The question did say to start with the Archimedes principle and show workings clearly. To get three marks candidates did have to do this. Good responses included: $\text{density} \times V_{\text{ice cube}} = \text{density} \times V_{\text{displaced liquid}}$ for the first two marks. Most candidates were then able to follow this up with a fraction, decimal or even percentage. A standalone calculation of $\frac{920}{1020} = 0.902$ scored two marks. Weaker responses confused the two volumes. Some incorrectly wrote 'volume of iceberg = volume of water displaced'.
- (b) (i) Candidates produced a good range of responses for this question. A tolerance of $\pm 3 \text{ kW}$ was used when reading from the graph. Only a few candidates fell outside of this. Some used '155' but didn't consider the efficiency. They were awarded 2 marks. These were the 2nd and 4th with ecf. Some multiplied 155 by 0.42 to get an 11.8 m diameter. They were awarded three marks. Some only went as far as the radius. Some (not many) couldn't find the power equation in the data booklet and either scored 1 or zero. Power of 10 slips were rare but only resulted in a 1-mark penalty.
- (ii) There were some very good two-mark responses covering the points on the mark scheme. We were generous and allowed reference to 'wind/air velocity' as reference to kinetic energy. There were some vague comments about 'heat loss' but they didn't say enough for credit. There was some misinterpretation of the question in places where candidates tried to recalculate the efficiency of the wind turbine or similar which didn't score any marks.
- (iii) Nearly all candidates managed this. A small number either made an error with the powers or they didn't use the maximum power output in their calculation.

- (b) (iv) Candidates found this challenging. The 1st marking point was awarded for reference to high temperature required to 'overcome repulsion' or 'to allow a strong force interaction'. This was the most common mark to be achieved. With regards to 'high particle density for large number of collisions', we did not need to see 'rate' or 'per second' to award the mark. 'Maintaining internal energy' or 'maintain required temperature' or 'stay above ignition temperature' were accepted for the third marking point. We did see a small number of 3-mark responses. We saw lots of reference to 'high temperature and pressure needed' but this was not deemed enough for credit. Some mentioned the three components of the triple product, but no explanation followed and they weren't given any marks. Surprisingly, a number of candidates incorrectly described issues with nuclear fission.
- (c) The final question allowed for many different paths by design and was a good discriminator. Candidates who indicated heat flow was the same throughout picked up the first mark. There were some excellent responses, however, a small number of candidates struggled with the algebra. There was a less algebraic method as outlined as alternative 2 in the mark scheme. Some candidates made good use of this method. This method was sometimes seen to be used as a second attempt for candidates. Some candidates thought that subtracting '0.18' from '0.55' resulted in an R value but they were not awarded any more than the 1st marking point.

PHYSICS

GCE A level

Summer 2025

COMPONENT 4 – PRACTICAL ENDORSEMENT

Overview of the Component

The centres monitored during 2024/25 all demonstrated a good understanding of the requirements of Practical Endorsement.

Aspects of good practice seen during the visits include:

- A suitable plan of practical work which was available to all members of teaching staff. The plan was often incorporated into the Scheme of Work but was also kept as a separate document in a few centres. The plan allowed for the development of skills within Practical Endorsement and covered all elements of each CPAC over the two years of teaching.

Note: A suitable plan should contain the following details: the specified practical; the CPAC to be assessed in the practical and the proposed time in the teaching year where it would be carried out.

Centres are reminded that this plan must be available to the monitor during visits. Failure to produce one will always lead to a second visit!

- Accurate and up-to-date Teacher and Candidate Records were maintained.
Note: Most centres now record their outcomes in an Excel Spreadsheet, often showing the CPAC element. However, if teacher records do not show this level of detail (i.e., the element assessed) then teachers should annotate the candidate work showing the element achieved (e.g., CPAC 4(a) or CPAC 4(a&b)).

- Candidates were informed of the CPAC assessed in each practical and understand the criteria for success.

Note It is also good practice to give feedback (either verbally or in writing) so that candidates can improve their skills in future assessments,

- Set high standards for CPAC skills early in the course. Clearly communicate expectations, explain any failures, and provide guidance for improvement.
- Practical books were used in 'real time' at the bench by candidates when collecting experimental data. Practical books do not need to be in immaculate condition.
Note: Candidates should avoid using scraps of paper to later transcribe neater versions into practical books.

- Records of candidate performance show a progression in candidate attainment.

Note: We do **not** expect to see every candidate getting every criterion each time they are assessed. Indeed, when this happens there will be legitimate concerns about whether the work has been appropriately assessed. We expect to see that there are places where candidate work is marked 'not achieved'. The key question is, 'Is the candidate competent at the end of the course?'. It is not, 'Is the candidate competent all the way through the course?'

- There was evidence of standardisation across **all** subject teachers when Practical Endorsement is delivered by a team of teachers.

Note: Standardisation is a requirement of Practical Endorsement and is recorded in the monitor's report of the centre. It must be implemented for a centre to pass the monitoring visit. This standardisation may be carried out by cross-marking of candidate work or by meetings in which some candidate work is discussed. Please expect questions on how you do this if visited by a monitor.

- Descriptors of minimum standards necessary to achieve a CPAC in a practical were available to all teachers on the course. This is good practice and particularly helpful in large departments where there are many teachers of the subject.

Note: See for example, [CPAC Pen Portraits](#) on the EDUQAS website

Comments on individual questions/sections

Assessment of Practical Endorsement

Centres should ensure candidates pass the Practical Endorsement 'by consistently and routinely' meeting the criteria. Candidates don't need to achieve a CPAC every time, but they should show skill development throughout the course. Evidence of passing each CPAC statement should increase, especially towards the end. It is important that assessment plans provide opportunities for candidates to demonstrate progress.

Some practical work will likely be done in small groups. When used for assessment, each candidate must provide evidence of meeting the criteria independently. Centres should ensure that group work allows for individual performance to be assessed.

Notes on assessment of CPAC

Centres should review the following comments closely to meet the expectations of PE.

CPAC 1

This CPAC assesses the candidate's ability to follow written instructions accurately. The monitor will respect the judgment of the teacher unless there is clear evidence of incorrect assessment.

If a teacher needs to intervene or interpret instructions for a candidate, then this CPAC should not be awarded.

CPAC 2

Your plan should show you know where and when you are going to assess **each element** of this CPAC. This CPAC involves higher-level skills and requires careful planning to ensure sufficient development time before assessment. Generally, the monitors find that centres find sufficient and suitable opportunities in physics to assess each element of this CPAC without too much trouble.

It is also important that sufficient time is given to candidates to develop the necessary skills before assessment occurs. **Generally, we do not expect to see this CPAC assessed in the first two terms of an A level course.** However, we do expect to see evidence of some assessment of this criterion by the end of the first year of the A level course. This skill may be evidenced by a candidate planning to carry out a procedure and then adapting their approach, as necessary. It is **not** necessary to assess every element of CPAC2 each time this CPAC is assessed. However, it is a requirement that each element of CPAC 2 is met during the course. If you are monitored, the monitor will look at the coverage of each element.

CPAC 3

Please select practicals where there are some significant safety issues for candidates to comment upon when assessing this CPAC. Do **not** use practical work to assess this where hazards are minimal. It is not necessary to assess this skill every time a practical is completed.

CPAC3(a) A simple written risk assessment is the most effective method of assessing 3(a). Before candidates are assessed, make sure they have been instructed in what makes a good risk assessment. Please read risk assessments produced by candidates carefully. Ask yourself the question, do you think that the risk assessment meaningfully identifies the main hazards and risks? Are all the significant risks identified and have suitable controls been considered? If not, do not award the risk assessment.

CPAC3(b) Direct observations of candidates working safely by the teacher working during practical sessions or fieldwork will be accepted by the monitor for 3(b).

CPAC 4

This CPAC deals with both qualitative and quantitative data. There are multiple opportunities in physics to both develop and assess this skill.

CPAC4(a) making accurate observations.

Ensure that the following points are borne in mind when assessing this CPAC:

- Observations should be made directly into candidate practical books. Do not award this CPAC if the candidate writes results onto scraps of paper and copies them up later.
- Do not award this CPAC if you provide a template table to the candidates for recording results. Where necessary, remove table templates to allow candidates to construct their own.
- The tables which candidates construct **must** have appropriate headings and units, where relevant. The units must be written in the table column heading and not in the body of the table. If units are missing, do **not** award criteria.

CPAC4(b) obtaining accurate, precise and sufficient data

Please carefully check candidates' data.

- Is the data recorded to appropriate precision? If data readings are not consistently recorded by a candidate, then do **not** award the criteria. Make sure that recordings are to the correct number of decimal places.
Be particularly careful to check that candidates are recording readings from an instrument correctly. You should be walking around the classroom checking on candidates as they record some of their values.
- Is there sufficient data? Is the data what you expect? Please set suitable standards at the beginning of the course. It does not matter if a candidate did not always achieve the criterion.

CPAC 5

This important higher-level skill should be assessed from early in the course. There is no shortage of suitable assessment opportunities. CPAC 5 has two elements:

- (a) Uses appropriate software and/or tools to process data, carry out research and report findings.
- (b) Sources of information are cited demonstrating that research has taken place, supporting planning and conclusions.

CPAC5(a) There should be evidence of candidates processing data using graphs and calculations. Centres should require candidates to use software (e.g. Excel, graphical programmes) to generate graphs on a number of occasions. There are many opportunities to do this in physics, and it is expected that candidates will demonstrate familiarity with using Excel or similar applications. Although not a requirement, examples were also seen of centres using python to code for tabulating and graphing. It is encouraging to see centres challenging their candidates with these skills.

Ensure graphs drawn on paper or with Excel meet the minimum standards expected i.e. have a title, labelled axes, correctly plotted points, and an appropriate scale.

Processing data also involves carrying out calculations. This may involve transformation of data using mathematical equations etc. Once again suitable computational methods may be used (e.g. coding or spreadsheets)

CPAC5(a) also includes 'carry out research and report findings'. The report does not need to be long; it may simply be the conclusion they draw from their data. However, it is not appropriate to award this CPAC for a one-word answer. A conclusion requires a reasoned response to the data observed. The research maybe internet or book based. Any reference used should be properly cited (see CPAC5(b)).

CPAC5(b)

This is not a difficult CPAC to evidence, but it is often the most poorly evidenced skill in candidate work. It is important that candidates understand why this is an important skill to develop and the consequences of failing to do this in PE. Please stress to candidates why referencing is an important skill.

Just a few centres are to be commended for having candidates demonstrating referencing on multiple occasions with some requiring the Harvard System (which exceeds our requirements for this CPAC).

Please try to get candidates in the habit of evidencing research by giving references every time they source information. This should happen from **early** in the course. Make it become second nature to candidates. The information referenced may be, for data or a quote; the information may come from a textbook, journal, website EDUQAS data sheet.

Supporting you

Useful contacts and links

Our friendly subject team is on hand to support you between 8.30am and 5.00pm, Monday to Friday.

Tel: 029 2240 4252

Email: science@eduqas.co.uk

Qualification webpage: [AS/A level Physics](#)

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