GCE A Level Examiners' Report

PHYSICS

A Level

Summer 2024

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.
Become an examiner with WJEC.	We are always looking to recruit new examiners or moderators. These opportunities can provide you with valuable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Become an Examiner | Eduqas

Contents **Page**

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 but particularly so in kinematics, circular motion, electric circuits and orbits. Electric fields and free body diagrams were areas that caused issues for some.

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 the comprehension were good, but developing the comprehension skills of candidates is an area that could aid candidates in future series.

In some questions requiring qualitative responses some good physics knowledge was demonstrated, however candidates had not answered what the question was actually asking, or only some parts of the question were answered. The optical fibres question and the QER question in Component 3 are good examples of this.

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.

Areas for improvement	Classroom resources	Brief description of resource
AO1 marks requiring recall of knowledge	**TERMS, DEFINITIONS AND UNITS**	**Document containing all definitions that need to be learnt by candidates**
Practical skills e.g. uncertainties	**STUDENT PRACTICAL GUIDANCE**	**Guidance on AS and A level practical skills**
Electric fields	**ELECTROSTATIC AND GRAVITATIONAL FIELDS**	**Blended learning**
Free body diagrams	**DYNAMICS**	**Knowledge organiser**

PHYSICS

GCE A level

Summer 2024

COMPONENT 1 – NEWTONIAN PHYSICS

Overview of the Component

Questions 2, 3 and 4 provided mean marks of 65% or above. These questions covered the topics of kinematics, dynamics, energy concepts and circular motion. The mean percentage mark for the comprehension section (question 8) was 51. This question had the lowest mark on the paper. The QER question that covered the determination of acceleration due to gravity using pendulum had a percentage mean mark of 57%.

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 generally did so very well, giving, in many cases, clear and concise explanations.

The following points are areas for improvement for future series:

- When discussing uncertainties candidates should be encouraged to state whether it is an absolute or a percentage uncertainty.
- When explaining why velocity is zero, candidates should explain that if displacement is zero, velocity will be zero because $\text{velocity} = \frac{\text{displacement}}{\text{time}}$.
- Candidates should name the pollution that could be causing a risk to society.
- Free body diagrams – arrows to be drawn as straight lines.
- Candidates must continue to learn definitions – the definition for ‘work’ and the mole’ were not particularly well known.
- Candidates should further develop their understanding of phase angle in the vibrations topic.
- When considering an anticlockwise cycle on a p-V graph for a system, a net quantity of work is done and a net quantity of heat leaves the system in question.

Comments on individual questions/sections

SECTION A

Q.1 (a) (i) Nearly all candidates answered this correctly. Sporadically, we saw answers of ‘0.1’ and ‘0.005’ and these were not awarded credit.

(ii) & (iii) Many candidates answered these questions correctly. Some candidates, after stating that Jack should add 0.04 mm to the d value in (ii), did not go on to do this in (iii) when calculating the density. They lost the 2nd mark in (ii). Others who stated he should subtract the 0.04 mm were not awarded credit in (i) but generally went on to get 2 marks in (ii) with ecf.

(b) Several different approaches were seen by candidates in this AO3 question. We were looking for good comments regarding Jack and Gill's methods for obtaining the diameter (1 mark) and mass (1 mark). Responses that compared their density values were able to access the final 2 marks. Good responses included comments stating that the actual value was within Gill's error range and usually calculated the percentage uncertainty in Jack's results. Not all percentage uncertainty calculations included the factor of 3 because of the cubed term in the volume equation. Better responses would firstly comment on Gill's method reducing the percentage uncertainty and showed a consideration of apparatus resolution when measuring the diameter. The measurement of mass was too often overlooked but candidates who attempted this usually did manage to gain credit. Comments about 'uncertainty' were sometimes vague. Candidates should be encouraged to specify either 'absolute' or 'percentage' in their evaluative comments.

Q.2 **(a)** **(i)** Some candidates did mention '$u = 0$' but it was implied by the use of $v = at$. Nearly all candidates were able to calculate '12 m s^{-1}'. Some used '12 m s^{-1}' and '0.6 m s^{-2}' to check the time was '20 s' which was equally acceptable.

(ii) The 'area under graph' (including methods using triangles and rectangles or trapezia) and 'equations of motion' were both used effectively. A small number of reading errors were evident and the absence of factors of 2 when calculating the area of a triangle. Individually these would have meant a 1-mark penalty.

(b) Some candidates calculated the return distance from the graph and concluded that Charlie was wrong, either by calculating a mean speed for the whole journey, second half of the journey and comparing or simply referring to the increased time. Many candidates agreed with Lola in terms of displacement. Not as many clearly made the link to the definition of velocity. Weaker responses confused velocity with speed. Some candidates stated that Lola was correct because the scooter returns to its starting point. Without reference to displacement, this was not awarded credit.

(c) There were many good responses to this AO3 'issues' question. All points covered in the mark scheme were seen. Some responses were a little vague and did not name the type of pollutant which was needed for credit. Most were understandably concerned with the safety and lack of protection worn by users.

Q.3 **(a)** Responses for this AO1 question were more varied than anticipated. There were many responses similar to the mark scheme. Some candidates seemed to have used the data booklet and defined the terms in the work equation. These candidates often didn't get the 2nd marking point. A few less specific comments about 'energy transfer' and even some definitions of power were seen that were not awarded credit.

(b) **(i)** When marking these responses, we were looking for arrows that originated from the boulder. Any gaps between the arrows and the boulder resulted in a marking penalty. 'Gravity' was not accepted. The 'normal contact force' should have been drawn at right angles to the base of the boulder but there was some leniency in this because of the boulders shape. Some candidates that correctly added 'Friction' and 'Tension' sometimes lost the 'normal contact force' mark as it was not drawn at right angles. The use of rulers was evident in most cases. Correct letters were accepted as the named forces.

(ii) Most candidates calculated 1200 J. A correct unit was required, and this stopped a small number of candidates accessing the mark. Good unit responses included 'N m' and '$kg\,m^2\,s^{-2}$' as alternatives to 'J'. We did see some incorrect use of angles in the work equation at this stage.

(iii) Components along the slope was the most readily used approach to answering this question, however, we did see a mixture of both methods covered in the mark scheme. Those that used the energy route already had values calculated in readiness for (c).

(c) Candidates generally used the efficiency equation effectively. A few candidates used forces instead of energy. This was unusual but resulted in the same answer. There were some vague statements about heat that were not awarded credit. Many candidates produced detailed answers involving an increased kinetic energy of particles in the slope or the boulder. In some responses, internal energy and heat were sometimes confused. If a candidate described heat flow from a boulder, they first had to mention how the particles in the boulder gained that energy in order to be awarded credit.

Q.4 **(a)** Many candidates labelled the diagram correctly. θ, r, and $r\theta$ were regularly seen. There were variations in approach that were acceptable. Some candidates used values that showed the arc length was the same length as the radius. Some candidates scored the 1st mark but could not go further. ‘2π = full circle’ was not enough as many candidates thought. ‘A radian is about 57.3 degrees’ was also not enough for credit.

(b) **(i)** Nearly all candidates were able to convert from km hr^{-1} into m s^{-1}. ω was regularly calculated but occasionally an extra ‘2π’ would creep into a calculation and result in a mark being lost.

(ii) There were many excellent responses however, there were a small number of blanks for this synoptic question. Some candidates spotted the centripetal force was created by Bev but went no further. Candidates who correctly calculated the speed of the electron (3×10^7 m s^{-1}) would often go on to gain full credit. Some unsuccessfully tried to use the speed of light instead of the speed of an electron. There were also confused responses involving the pd (V) being used as velocity. These candidates were only able to access the 3rd marking point.

(iii) In part I candidates were required to name both forces for 1 mark and this proved tricky. A large number of candidates used ‘centripetal force’ and this wasn’t accepted. A centripetal force is a resultant force created by other forces. We were looking for ‘friction’ and ‘magnetic’ force. In part II it was pleasing to see many good calculations. There were occasional slips when using $\frac{mv^2}{r}$ as the squared term was sometimes missed. Some candidates were unable to calculate the forces as required. On this occasion we awarded 1 mark for the comment alone.

Q.5 **(a)** Candidates who produced good answers included acceleration proportional to distance from a fixed point and stated the acceleration was towards that said point. Some candidates did not reference the fixed point and scored 1 mark. Weaker responses involved a statement about objects oscillating and little more than this.

(b) We saw a good variation of answers here. Both methods outlined on the mark scheme were regularly seen. There were alternative responses where candidates calculated the period and used this without directly calculating ω. We awarded full credit for these responses. Some candidates clearly started down one route calculating ω, stopped abruptly, and then chose the more direct method outlined in the first two lines of the mark scheme.

(c) **(i)** Many good candidate responses were awarded the 1st, 2nd and 3rd marking points. We were generous in awarding the 14 cm amplitude mark. They had to work harder for the 2nd and 3rd marks with candidates often showing good maths skills. It was pleasing to regularly see well-structured responses. There were some excellent responses that also stated that the sign before ε should have been negative so the equation was in fact, incorrect.

(ii) Good sinusoids and reasonable time periods were regularly seen. It should be noted that triangular waves were not accepted. Candidate attempts at the 'mirror image' were regularly seen, however, some candidates did possibly overlook the starting value i.e. when $t = 0$, and this sometimes resulted in a mark penalty. Candidates did not find drawing a sinusoidal wave with such a large amplitude easy. Some candidates chose a smaller amplitude and were generally more successful.

(d) Candidates generally did well in this AO1 QER question. A small number of candidates produced bottom band responses, however, candidates produced responses mainly in the middle and top bands. All points in the indicative content were seen. The bottom band responses gave a limited description of either the method or the analysis. The middle band responses gave a comprehensive description of either the method or the analysis or a limited description of both. They often included reference to the length of pendulum being varied, oscillations being timed, period being calculated and some of the analysis techniques. The top band responses gave a comprehensive account of both often referring to 'measurement to the centre of the bob', 'small angles', 'timed from equilibrium' and detailed analysis techniques.

Q.6 **(a)** This was not particularly well answered. Some candidates quoted 1/12th of carbon-12 instead of 12 g of carbon-12. Some candidates defined Avogadro's constant. Other candidates wrote more general comments about a mole. It is the 'amount of a substance' but this is not the definition.

(b) **(i)** Most candidates equated the ideal gas equation to the equation given in the question. $pV = nRT$ and $pV = NkT$ were seen. There was plenty of good algebra witnessed. The usual 'multiply by 3' and 'multiply by ½' were regularly seen. Candidates that dropped 'N' without explanation were unable to be awarded the final marking point. The question asked for the KE of a mole, and we wanted clear reference to N_A for all 3 marks.

(ii) There was a good variation in responses and included the alternative routes outlined in the mark scheme. Those starting with $\frac{1}{2}m\overline{c^2} = \frac{3}{2}RT$ often corrected themselves with the sudden appearance of N_A somewhere in their response. They were awarded 2 marks if their reasoning wasn't clear.

Q.7 **(a)** Again, there was a good variation in approach to this question. Candidates regularly used pV = constant and calculated either 30 (or 30 000 which we also accepted). Others assumed about the number of moles (e.g. n = 1) and used $T = \frac{pV}{nR}$. Often, candidates completed 2 calculations (at A and B). A third calculation was required for the last marking point.

(b) **(i)** The key to this response was the inclusion of 'molecules' (or particles). Reference to the 'sum of potential energies' was treated as neutral when stated with the correct 'sum of kinetic energies of particles'. Candidates who referenced the 1st law of thermodynamics did not gain credit. It should be reinforced that it is not just the 'kinetic energy of a gas'. We needed reference to 'sum' or 'total'.

(ii) Candidates generally did well in part 1. Most were able to use $\frac{3}{2}nRT = \frac{3}{2}pV$ to calculate U. 45 J and 108 J (or 45 000 J and 108 000 J - again accepted) were seen and credited here. A small number of candidates used $p\Delta V$ or ½ pV and were not awarded credit. Candidates used a mixture of paths in part II. The increase of U or p were most widely seen. Those who left out the $\frac{3}{2}$ in the previous question were still rewarded with ecf.

(iii) This question produced a full range of marks. There were many excellent responses. We did need to see reference to an increased c_{rms} or $\text{KE}_{\text{molecule}}$ to award the last two marking points.

(c) We saw a good range of responses for this question. 'Same temperature at start and finish means ΔU is zero' was stated by many candidates. Not as many candidates went further. Some candidates looked at each stage individually but usually struggled to piece together a correct final comment. Some candidates tried using specific heat capacity instead of the 1st law and scored zero.

SECTION B

Q.8 **(a)** **(i)** Nearly all candidates were able to draw the correct standing wave pattern. Only a few candidates drew the incorrect number of loops but even then went on to write 'λ_0/5' in the following question.

(ii) Again, nearly all candidates gave correct responses. There were a small number who wrote incorrect responses including '5λ_0', '5f_0' and 'λ/16'

(b) Many candidates chose to calculate the frequency (2.9966) and then made a comment on how close it was to '3'. Weaker responses were more descriptive, but we did award the 2nd marking point without a calculation. Some used the equation's effect on, for example, 440 Hz and compared values which was acceptable. Some candidates moved between frequency and wavelength in their response, and these often became a little confused. There were a small number of non-attempts.

(c) Candidates responded well to this AO3 question. We required a comment about the 0.0752% being less than 0.1% and some did miss this. Some candidates clearly hadn't found what was needed in the article and tried an explanation using $pV = nRT$. This proved unsuccessful.

(d) We saw varied responses with a range of marks. Many used the wave equation,$c = f\lambda$, less made the link to the air temperature increasing although any reference to the kinetic energy of the particles increasing did gain this mark. Many candidates stated the speed of sound increases. The last mark proved too demanding for some where we looked for reference to the wavelength being constant or at least the expansion of the brass being small or insignificant.

(e) Several good approaches and a full range of marks were seen for this question. Most used $c = a\sqrt{T}$ and calculated one (or both) of the speeds. Other approaches used the equation to calculate λ. Some calculated $\frac{c}{a}$ and used ratios. We credited candidates 2 marks if they correctly used the '7%' given in the comprehension. The final mark or this approach was tougher when they tried to incorporate 0.3 Hz. Some didn't realise it was an increase. They were unable to get all 3 marks.

(f) This proved challenging for candidates. All marking points were achieved. Not many achieved all 5 marks, however, there were a good number of 3's and 4's. Weaker responses indicated that the strings were permanently magnetised. There were also some confused responses where an induced current was set up in the strings as it moved past the coil and permanent magnet. Really good responses linked a changing B-field to a changing flux linkage in the coil and hence to Faraday's law.

(g) A significant number of candidates thought that copper was magnetic, and they struggled to pick up any marks in this question part. Phrases like 'it is more difficult to magnetise than steel' were not deemed enough. 'If the strings were copper, they would likely stick to the pickup' was an example of a confused response that was not given credit.

PHYSICS

GCE A level

Summer 2024

COMPONENT 2 – ELECTRICITY AND THE UNIVERSE

Overview of the Component

Very good responses were seen for all the questions in the paper. Responses to questions testing electric circuit theory, orbits and stellar physics were encouraging with candidates scoring particularly well in the numerical questions in these areas. The question on capacitors was also generally well answered with many candidates showing a good understanding of the decay equation and energy concepts. However, it was noticeable that a few candidates were unaware of concepts related to the current decay graph. Practical analysis was generally carried out well, however many candidates lost some marks due to a lack of accuracy when taking gradients and / or not giving final answers and uncertainties to an appropriate and consistent number of significant figures. The core skills of literacy and numeracy were displayed to a good standard; however, examiners did note the lack of logical reasoning and the occasional poorly presented algebraic response this year compared to previous years. On a slightly disappointing note, and in contrast to last year, a noticeable number of candidates lost marks for confusing surface area with cross-sectional area in the question testing stellar physics. On a positive note, improvements were seen in questions testing wavelength shift and orbits, including the understanding shown of Kepler's laws and in determining the mass of Jupiter. However, some misconceptions remain which are described in more detail below. Responses to the electric field question were not as strong as expected with many candidates unable to resolve correctly and / or not able to convert grammes to Newtons. Written responses were usually well constructed and logically reasoned, though once again, definition-based questions sometimes lacked precision. The QER question was attempted very well with nearly all candidates picking up some marks, with many candidates provided enough detail to be awarded marks from the higher marking band.

Comments on individual questions/sections

Q.1 **(a)** Most candidates were able to state Ohm's law correctly. A few omitted references to 'constant temperature' and lost a mark consequently. Stating $V = IR$ gained one mark only.

(b) **(i)** Candidates were expected to comment on both the straight line and curved parts of the graph. Many candidates did not explicitly state that the line went through the origin initially and lost one mark consequently.

(ii) Many candidates used appropriate calculations, by taking pairs of readings from the graph, to show the difference in resistance at the different voltages. A minority, however, took tangents at the given voltages, which is an invalid approach and was deducted one mark. Regardless of their approach to the calculation part of the question, many correct responses were seen for the explanation part. In summary, to gain the three marks, candidates were required to:

- refer to 'collisions' between electrons (or free charges) and atoms (or equivalent)
- explain that at higher voltages the collisions became more frequent (or 'harder') or equivalent
- explain that this would lead to resistance increasing.
  Referring to 'electrons colliding with themselves' or not specifying what electrons collided with were common reasons for candidates losing marks.

(c) Many candidates were successful in applying their understanding of EMF and pd to show the required value for the internal resistance. Incorrectly reading the current from the graph was a common source of error.

(d) In part **(i)** nearly all candidates explained the term 'superconductivity' correctly. A variety of superconductivity graphs were seen in **(ii),** with a minority of candidates not including a reference temperature on the horizontal axis and losing one mark as a consequence. Reference temperatures could have included 0 K to the left of the critical temperature or 0 °C on a central vertical axis to the right of the critical temperature. Some candidates drew curves and the transition to superconductivity was not clearly vertical or labelled.

Q.2 **(a)** Nearly all candidates were able to show that $R_1 = 12.0\,\Omega$. It was commented by examiners however, that a significant number of candidates were unclear with their explanations, often giving algebraically incorrect expressions in their responses. Whilst, 'Benefit of Doubt' (bod) was applied in many cases, it was not always possible to do so when the working seen was clearly incorrect. Candidates should be encouraged to be accurate with algebraic expression.

(b) **(i)** Many candidates successfully showed that the given current was consistent with $R_1 = R_2$. Once again however, marks could not be awarded for algebraically incorrect expressions.

(ii) This was well answered with many candidates able to determine the number of resistors correctly. A variety of approaches were seen which illustrated candidates' very good understanding of parallel resistor concepts, and of their algebraic skills in this case.

(iii) Again, nearly all candidates displayed their good understanding of parallel circuits, with many stating a value for the maximum current which would be produced.

Q.3 **(a)** In part **(i)** many candidates were able to identify at least one source for the systematic error. These generally included reference to a zero error on the ohmmeter or an incorrectly measured length of test wire. Common responses which did not gain credit were: '*resistance in the wires'* (which ones?) or *'the wires would heat up'* (not with an Ohmmeter). Nearly all candidates correctly stated that the gradient would be unaffected in **(ii).**

(b) Many candidates gained most of the available marks here. Many attempted to determine both the maximum and minimum gradients, and most did so to an acceptable tolerance. Nearly all proceeded to determine the mean gradient and associated uncertainty. Nearly all were able to calculate the overall percentage uncertainty and calculate the resistivity from *mean gradient* × *cross-sectional area*. Many candidates failed to gain the final mark however, as they did not give their answer and accompanying uncertainty to an appropriate and consistent number of significant figures and / or did not include a correct unit with their answer. Error Carried Forward (ecf) was extensively applied in this part. A handful of candidates responded by determining maximum and minimum values for the resistivity and determined the uncertainty and mean value from these. This was a valid approach which was usually well presented.

Q.4 **(a)** A variety of good attempts were made to confirm the charge on the capacitor, including valiant attempts at estimating the area under the curve. Tolerance was given to final answers based on this approach. It was apparent however that a noticeable number of candidates were unaware of the link between area and charge. A few candidates drew an appropriate tangent and determined the time constant from it, and from this determined the required charge.

(b) **(i)** A very good response. Most candidates were able to determine the values of V_0, C and R correctly. Many were confident using the decay equation.

(ii) Most candidates correctly calculated the pd. Fewer were able to show clearly that their value for pd was consistent with the current value at the required time. For example, the mark could not be awarded to responses such as '*and therefore consistent'*. Additional detail was required to show that the calculated pd corresponded to the current measured at the correct time on the graph.

(c) **(i)** Nearly all candidates were able to show the key step of substituting 'CV' for 'Q' in $\frac{1}{2} QV$. That is, examiners looked for $\frac{1}{2}(CV)V$ to be able to award the marks.

(ii) Most candidates correctly determined the pd at t = 60 s and used the formula from (c)(i) to determine the energy stored. A few candidates attempted to determine Q and then use $\frac{1}{2} QV$, which they usually did successfully.

Q.5 **(a)** Good attempts were made to describe the common features and differences between electric and gravitational fields. Most candidates chose to follow the bulleted structure provided and focused their answers on 'force', 'field strength' and 'potential'. Higher scoring candidates (top band responses) were able to refer to the inverse square nature of forces and field strengths with many mentioning the direct dependency of both force and field strength on the size of the charge / mass. Some also described the vector nature of the fields. Many responses also gave appropriate definitions for potential, describing the inverse relationship between potential and distance. They also described the scalar nature of potential and equipotential surfaces. In nearly all cases, the attraction / repulsion nature of both fields were highlighted as a difference. A few very good responses described the relationship between field strength and potential gradients. Middle band responses contained some of the above points, with lower band candidates only managing to describe one or two of these.

(b) Nearly all candidates were able to show the required electric field strength in **(i).** A variety of responses were seen in **(ii).** Many candidates drew the weight and tension arrows correctly; however, a significant number drew the electric field arrow pointing to the left. In a few cases, candidates labelled the 'electrostatic' force arrow incorrectly, usually as 'electromagnetic' force. Nearly 15% of candidates did not attempt the last part. Of those that did, many were penalised for 'powers of 10' errors, failing to convert the 24 mg to the correct corresponding weight. ecf was applied in this case. Consequently 6.3 μC was a commonly seen (incorrect) answer. A significant minority also failed to resolve forces correctly, usually confusing sin with cosine.

(c) Nearly all candidates who were able to give an answer to **(b)(iii)** also gained the mark here, in many cases as ecf on the value of charge obtained in the previous part, and for giving an appropriate consequent response.

Q.6 **(a)** Nearly all candidates sketched an appropriate diagram with force arrows to illustrate the concept of necking in metals. In **(ii),** most candidates made the connection between reduced cross-sectional area and increased stress.

(b) **(i)** Examiners commented on the difficulty in sometimes awarding marks for this part. Whilst many candidates realised that l, A and e were the same for both wires, not all expressed this explicitly in their responses. Examiners had to frequently determine whether to award marks by implication, often having to interpret from other parts of the response the candidates' understanding of the key concepts. For example, $E_{\text{steel}} = kF_{\text{steel}}$ would suggest a degree of understanding, whereas $E_{\text{steel}} = F_{\text{steel}}$ would not, unless supported elsewhere. Examiners also commented on poor presentation and the lack of logical layout seen in some responses, which again made marking difficult. Incorrect or incomplete algebraic expressions were often seen.

(ii) Those candidates who understood that the given force should be divided into the ratio 2:1 succeeded in gaining full marks. About half of candidates used the full 30 N force and gained a maximum of 1 mark as ecf for subsequent working.

(iii) Encouraging responses were seen, with many candidates choosing to base their responses on $E = ½\ kx^2$, commenting that, since k is dependent on the material of the wire, that the energy stored in each of the wires must be different. Others based their answers to $E = ½\ Fx$.

Q.7 (a) A very few candidates did not answer part **(i).** Of those who did, nearly all correctly marked another location for the star. In **(ii),** nearly all candidates stated Kepler's 2nd law in terms of the time taken to sweep out the given areas. The majority also proceeded to relate this to the respective speeds to transverse both areas.

(b) In **(i)** nearly all candidates confirmed Kepler's 3rd law using $k = \frac{T^2}{r^3}$ or the reciprocal of this. A small number of candidates determined k initially for one moon and then substituted to confirm either T or r for the other Moon. All approaches were valid. The majority of candidates determined the mass of Jupiter correctly in **(ii).**

(c) (i) A minority of candidates incorrectly attempted to apply the concept of energy conservation when answering this question. Those that correctly approached the question in terms of centripetal forces usually gained full marks.

(ii) Many good, logical responses were seen here. Candidates related the increased velocity to increased mass (1st mark), which is 'unseen' or 'dark' (2nd mark), the source of which may be due to the Higgs Boson (3rd mark).

(d) This *'how Science works'* question explores the *'role of the scientific community in validating new knowledge and ensuring integrity'*. A variety of responses to the given scenario were acceptable. These included: (the same team or others) carrying out measurements of different galaxies, another team independently carrying out measurements of the same galaxy, peer reviewing the data obtained and / or proposing new theories. The same team repeating the same experiment was not accepted as this had already been carried out and stated in the article. Most candidates gained at least one mark here.

Q.8 (a) Nearly all candidates showed that the distance of the centre of mass from the star was 383 km as required.

(b) A variety of successful approaches were seen. Many candidates chose to determine the orbital speed using the red shift formula, and then determined the period from $\text{speed} = \frac{\text{distance}}{\text{time}}$. Others chose to take the 7 hours given in the question to work backwards to confirm the wavelength shift. This was acceptable if a valid conclusion was given, such as the data then confirming the wavelength shift for a period of orbit **greater** than 7 hours, as required in the question. This was not always stated, and one mark was deducted consequently.

(c) **(i)** As on previous occasions, a recurring mistake is for candidates to omit the factor ‘4’ when determining the surface area. It was no different on this occasion with a significant minority substituting an incorrect value for A into the Stefan’s equation, and hence incorrectly determining the luminosity.

(ii) Most candidates were able to recall the inverse square relationship and use it correctly to determine the intensity of radiation at the Earth’s surface. Marks were awarded as ecf where answers to **(c)(i)** were incorrect.

(iii) Nearly all candidates used Wien’s law correctly to determine the peak wavelength. Fewer candidates stated that this corresponded to infra-red radiation, which was why the star appeared red.

PHYSICS

GCE A level

Summer 2024

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 62% to a mean this year of 65%. 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.
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 one of the points in part **(a)** and part **(d).**

(a) After calculating the correct wavelength nearly all candidates noticed that it was greater than the slit separation but then proceeded to state that diffraction does not occur. The problem with this answer is that diffraction will occur but that the transmitted intensity is low. Hence, this common response could not gain the last mark.

(d) These are open-ended AO3 marks and can be tough to gain. Once candidates realised that sound is a longitudinal wave, full marks followed.

Q.2 Very well answered except for part (c) to some extent.

(a) The point that was most often omitted was that the waves travelling in the opposite directions need to be of a similar amplitude (but coherence or same frequency was accepted this year).

(b) There were many tiny little slips here for obvious reasons e.g. dividing by 26 instead of 25 or believing the nodal separation to be a whole wavelength.

(c) Not an easy QER and the mean mark was just above 50%. The question required candidates to include a number of different parts in their answer, many candidates didn't include all parts.

Q.3 Very well answered except for part **(b)(iii).**

(b) **(ii)&(iii)** Often good physics was seen in answers however candidates were not answering the questions that was asked. The clarity of answers was the key to answering this question part, sometimes partly correct answers were seen.

Q.4 A challenging photoelectric effect question but the mean mark was close to 60%.

(a) The mark scheme was made more lenient here because the candidates almost universally talked about one thing causing an increase in another. This, strictly speaking, does not answer the question! The question is asking for an explanation of proportionality – a very specific relationship. However, there is no point in setting a mark scheme that awards nearly everyone 0 marks and the mark scheme was modified so that the whole range of marks was awarded.

(b) Wavelength and pd were the correct and most frequent answers. Some candidates mentioned resistance. They could obtain a mark if they discussed this "effective resistance" but this was not usually the case.

(c) **(ii)** The assumption was the most common part to be omitted – one photon produces one electron would have sufficed (even though this quantum efficiency will never be attained). Once a candidate was able to divide the power by the photon energy, the correct answer inevitably followed. There is an alternative that leads to the correct answer involving power but this is probably better to avoid and involves explaining that the photons provide a "constant pd" of 3 V. Although the calculation is relatively simple, the explanation is not.

(d) The issues question. Quite well answered but extremely well answered once the candidates mentioned wave-particle duality.

Q.5 The practical question and well answered in general.

(a) Some omissions were seen in this practical procedure. Candidates need to check when writing a method that they have included every step that is required. Sometimes not saying to count the number of coins and / or the number of times the procedure should be repeated for example were omitted.

(b) **(i)&(ii)** Not easy but very well done. It is interesting to think how well this question would have been answered had part (b)(i) not been asked before part (b)(ii).

(c) Well answered but candidates needed to talk about the straight line, gradient and the intercept. The poorer responses involved discussing the gradient and straight line only or, sometimes, the intercepts only.

(d) **(ii)** Uncertainties in logs are difficult and always cause problems. The best method is to go back to 1st principles and work out the worst-case scenario(s) i.e. calculating 2 of these 3: $e^{\ln N + \Delta \ln N}$, $e^{\ln N}$, $e^{\ln N - \Delta \ln N}$. There are many "wrong" ways to approach this question, the most common being calculating $e^{\Delta \ln N}$ which gives completely the wrong answer (even though, at first glance, it might look correct).

(iii) Many candidates though that these error bars would increase in size.

Q.6 A challenging little question involving electron capture. The most common problem is trying to include all the other electrons (the other electrons are involved in all sorts of complicated stuff including 2 different Auger electrons). It is best to forget about all the other electrons and treat this as a nuclear reaction! Clearly setting out answers is important here to, label each of the laws and show the working for each law.

Q.7 Very well answered except part **(b)(iii).**

(a) Some candidates forget that n is the number of turns per unit length.

(b) **(i)** The direction of the force was sometimes wrong here (understandably).

(ii) Inevitably correct once the correct equation has been selected or derived.

(iii) A tough practical point. Repeat readings are taken for two reasons: to check for mistakes and to reduce random errors. The main points we were looking for here were to place probe at centre and orientate for max pd **or** orientate so that face perpendicular to B-field.

Q.8 **(a)** It was rare to award five marks for this qualitative response. Many part answers were seen that showed some understanding of why the magnet reached a low terminal velocity but in most cases one or two of the steps in the explanation were omitted.

(b) The calculation was well done. A small number of candidates used the diameter instead of the radius so they lost one mark only.

(c) If candidates realised that GPE had to be used in the question then the correct answer usually followed, a small number of candidates used mg and hence did not get awarded any marks.

SECTION B

Option A – Alternating Currents

Q.9 **(a)** **(i)** Most candidates were able to calculate the mean power dissipated in the resistor, but some went on to make incorrect unit conversions in their final answer.

(ii) The energy dissipated was correctly calculated by most candidates, with ecf applied on an incorrect power from part **(i).**

(iii) Most candidates realised that the instantaneous power reaches a maximum twice per cycle.

(b) Answers not always expressed clearly with reference to phase.

(c) **(i)** The majority of candidates were able to use a phasor diagram correctly, with X_L leading by $\frac{\pi}{2}$. Some candidates used a phasor diagram for the pd and then correctly cancelled the current to give Z.

(ii) A minority of candidates stated that the mean power dissipated in the circuit would not change, but most realised that the introduction of the inductor would affect Z and therefore affect the power. Candidates were able to access the marks using a number of valid arguments. Candidates who determined that the effect would depend on the frequency were able to access all marks.

(d) **(i)** A number of candidates incorrectly divided their answer with $\sqrt{2}$, not realising that the pd given in the question was the rms value.

(ii) Some candidates incorrectly substituted the voltage across the inductor, but subsequently calculated a correct corresponding capacitance. Credit was given for correct manipulation based on the inductor voltage of 16 V.

Option B - Medical Physics

Q.10 **(a)** Part **(i)** was surprisingly poorly done with a number of candidates not answering the question and ignoring the energy changes involved. The rest of (a) was well done with many candidates having excellent mathematical skills.

(b) Generally well done, with a wide range of answers and all candidates scoring some marks however few obtained the full five marks available.

(c) Well answered with the vast majority calculating 4800 ml or 4.8 l.

(d) **(i)** Mixed response with some candidates just repeating the question and so didn't gain any credit however others gave excellent definitions.

(ii) Generally well done however some candidates did have problems with powers of 10 and so they lost one mark and a few calculated $\frac{H}{E}$ rather than $\frac{E}{H}$.

Option C – The Physics of Sports

Q.11 **(a)** **(i)** The majority of candidates were able to state the two factors that increased the stability of the skier. Some candidates referred to the increased surface area of the skis which was not given any credit.

(ii) This part was answered well by all candidates with the steps to determine the increased drag force clearly laid out. In some cases, candidates lost marks by simply stating $1.25^2 \times 0.85$ without explaining the multiplication in detail.

(iii) This was also answered well by all the candidates with nearly all gaining full marks for this part.

(b) **(i)** Many candidates gained all the marks for this part. The common mistakes were power of 10 errors when calculating the moment of inertia or algebraic manipulation to determine the angular velocity correctly.

(ii) This part was also answered well with many candidates able to determine the correct height and conclude that the goal could not be scored.

(c) Nearly all the candidates gained a mark for stating that the moment of inertia was reduced by the ice skater pulling in her arms and reducing the distance to axis of rotation within the general equation for the moment of inertia. Most of the candidates based their approach on the conservation of angular momentum and were able to gain all the marks. A few responses were based on rotational kinetic energy which gained some credit if explained correctly. A few other answers were based on resistive forces which did not gain any marks.

Option D – Energy and the Environment

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 density $\times V_{\text{ice cube}}$ = 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 ± 3 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 two 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 3 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.

(iv) Candidates found this challenging. The 1st making 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 part 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 2024

PRACTICAL ENDORSEMENT

Overview of the Component

A number of centres were observed, all of which 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. The plan was incorporated into Scheme of Work and was often also kept as a separate document, available to all members of teaching staff. A suitable plan showed 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. Please note this plan, with these details, must be available to the monitor if you are visited.
  The plan should also allow for the development of skills within Practical Endorsement and should cover all elements of each CPAC over the two years of teaching. It is not necessary to assess CPAC in every practical performed.
- The maintenance of accurate and up-to-date Teacher and Candidate Records.
  This is vital. 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 3(a)✓* or CPAC 3(a&b)*✓).*
  Monitors will always check to ensure all elements of each CPAC are covered and will ask teachers how they ensure all aspects of the skills are achieved by each candidate.
- Candidates are aware which CPAC are assessed in a particular practical and understand what they need to do in order to succeed.
- Practical books are used in ‘real time’ at the bench by candidates when collecting experimental data.
  We do not expect to see practical books which are in immaculate condition! Candidates should **not** write on scraps of paper and later copy the work up neatly into practical books.
- There is simple annotation of the candidate work that shows where the candidate achieves or fails to achieve a CPAC, (e.g. with *CPAC 3(a)✓* or *CPAC5(b)✗).* It is good practice to give feedback to candidates in order that they can improve on their skills in future. Feedback on how to improve may be given verbally or in writing.
  Important note: Many centres now record the CPAC element assessed in a practical which helps ensure all aspects of CPAC are covered.
- Records of candidate performance show a progression in candidate attainment. It is not necessary for a candidate to succeed and obtain a CPAC every time. Early in the course there will be occasions where a candidate may struggle to achieve a skill. This should be reflected in the teacher records of candidate performance. 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 and **not**, is the candidate competent all the way through the course.’

- There is evidence of standardisation across **all** subject teachers where Practical Endorsement is delivered by a team of teachers. It is a requirement of Practical Endorsement and is recorded in the monitor's report of the centre. Standardisation 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. A number of centres write descriptors of minimum standards necessary to achieve a CPAC in a practical. This is good practice and particularly helpful in large departments where there are many teachers of the subject. See for example, CPAC Pen Portraits on the EDUQAS website.

Comments on individual questions/sections

Assessment of Practical Endorsement

Centres are reminded that in order to award a pass for Practical Endorsement, a candidate needs to 'consistently and routinely meet the criteria'. Although this does **not** mean a candidate gets a CPAC every time it is assessed, it does means that a candidate develops these skills as the course progresses. In other words, there should be evidence that the candidate gains a pass for each CPAC statement on a number of occasions particularly towards the end of the teaching programme. It is important that suitable opportunities have been built into the assessment plan which allow candidates to generate this evidence.
It is understood that some practical work will need to be carried out in small groups. If these practicals are used to assess candidates, each candidate must generate suitable evidence that he or she **independently** meets the criteria. Centres must give careful consideration to how group work is conducted so that individual candidates can be assessed on their own performance.

Notes on assessment of CPAC

The Monitor finds it difficult to expand on comments from previous years. It is important that centres read through these comments carefully to ensure they are compliant with our expectations.

As a general rule, set high standards for the achievement of CPAC skills early in the course. Be clear on what you expect from candidates and ensure they understand why they have failed to meet the standard (if they fail) and they understand what to do to achieve it next time.

CPAC 1
The assessment of this CPAC requires the candidate to correctly follow written instructions to carry out an experimental technique or procedure.
In the vast majority of cases, the monitor accepted the teacher's judgement unless there was strong evidence to suggest the CPAC was incorrectly awarded.
Please note, where a teacher feels it is necessary to intervene and correct a candidate's technique, explain the intent of an instruction etc. then the candidate should not be awarded the CPAC.

CPAC 2

This is the most difficult CPAC for candidates to evidence since it involves higher level skills. Your plan should show you know where and when you are going to assess **each element** of this CPAC. 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 CPAC2 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.
CPAC 3(a) requires candidates to identify hazards and assess the risks associated with the hazards. A simple written risk assessment is the easiest and best way of evidencing this aspect of the skill.

CPAC 3(b) should be assessed by observation of candidates' conduct during a practical session.

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 shown are borne in mind when assessing this CPAC:

- Observations should be made directly into candidate practical books / spreadsheet. Do not award this CPAC if the candidate writes results on to scraps of paper to copy up later.
- Do not award this CPAC if you provide a template table to the candidates for recording results. Templates may be useful to teach candidates a good approach to recording data early in the course but when it comes to assessment candidates **must** devise their own tables. 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. Please maintain hight standards here. It is perfectly possible for all candidates to achieve this.
- The units must be written in the table column head 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 it recorded to appropriate precision? Occasionally some centres are too lenient on this. 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 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) to draw graphs on a number of occasions. There are multiple opportunities for this in Physics and a monitor will expect to see evidence that candidates are familiar with using Excel (or similar app).

- Make sure graphs are constructed correctly, i.e. there is a title, each axis is correctly labelled, points plotted correctly, an appropriate scale used, etc. Candidates will need to be shown how to use Excel to correctly title graphs etc. It is evident that candidates do not always know how to use Excel appropriately. Very occasionally, Excel graphs are disappointing and show the candidate does not know how to use this powerful tool. However, in Physics most candidates quickly prove themselves to be very capable of using Excel.
- Processing data also involves carrying out calculations. This may involve transformation of data using mathematical equations, statistical analysis etc.

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, neither is 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.

CPAC5(b)

This is not a difficult CPAC to evidence, but it is still not getting enough attention from many centres and as a result is often poorly evidenced in candidate work. Just a few centres are to be commended for having candidates demonstrating referencing on multiple occasions; a few of these even using the Harvard System (which exceeds our requirements for this

CPAC).

Please try to get candidates in the habit of evidencing this every time they source data (e.g. the value of g, a value for h) or indeed any information, they must learn to reference their quote. This should happen from **early** in the course and you want it to become second nature to candidates. The information may come from a textbook, journal, website, EDUQAS data sheet.

Summary

- Successful delivery of Practical Endorsement needs careful thought and planning. Make sure that there are ample opportunities for candidates to evidence all elements of each CPAC statement over the two years of the course. We do **not** expect candidates to achieve each CPAC every time practical work is assessed. Where CPAC is met every time by all candidates then that is an indicator that a centre may not be appropriately assessing.
- Ensure that candidates are clearly informed which CPAC is assessed in a particular practical session.
- Make Practical Endorsement a servant of the subject. Use Practical Endorsement to make better physicists. Do not let it become an end in itself.
- Make sure that candidates are informed whether they have achieved Practical Endorsement before the final outcomes are submitted to Eduqas in accordance with JCQ requirements.

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

See other useful contacts here: Useful Contacts | Eduqas

CPD Training / Professional Learning

Access our popular, free online CPD/PL courses to receive exam feedback and put questions to our subject team, and attend one of our face-to-face events, focused on enhancing teaching and learning, providing practical classroom ideas and developing understanding of marking and assessment.

Please find details for all our courses here: https://www.eduqas.co.uk/home/professional-learning/

Regional Rep Team

Our regional team covers all areas of England and can provide face-to-face and online advice at a time which is convenient to you.

Get in contact today and discover how our team can support you and your students.
Regional Support Team | Eduqas

Eduqas Qualifications

We are one the largest providers of qualifications for schools, academies, sixth form and further education colleges across England, offering valued qualifications to suit a range of abilities. Each and every one of our qualifications is carefully designed to engage students and to equip them for the next stage of their lives.

We support our education communities by providing trusted qualifications and specialist support, to allow our students the opportunity to reach their full potential.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk