GCSE

Physics A

Twenty First Century Science Suite

General Certificate of Secondary Education **J245**

OCR Report to Centres

June 2013

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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General Certificate of Secondary Education

Physics A (Twenty First Century) (J245)

OCR REPORT TO CENTRES

Overview

Candidates were much better prepared for the six mark-extended writing questions than last year, with even weak candidates able to access questions and gain Level 1 marks. However some candidates are spending time repeating information from the stem of the question or writing long, repetitive answers, for little credit. Candidates who highlighted significant words in the question to enable them to structure their answer around those points scored better marks. The strongest candidates were aware that the six-mark extended-writing questions often demand that they consider more than one aspect of a problem, and that Examiners usually reserve the highest level marks for those answers which clearly address all the required aspects.

Candidates should be reminded that if they wish to change their answer, the old answer should be crossed out and a new one written in its place. There were instances of alterations (e.g. from a 5 to a 6) that created a completely ambiguous response. Where a response is ambiguous, examiners have little option but to give zero credit.

With regard to objective tick-box questions, it is always worth reminding candidates that, irrespective of whether or not the number of ticks required is stated in the question, the number of marks allocated to the question does not necessarily equal the number of ticks required. This principle also applies to the number of lines drawn in a 'join the boxes' type question.

This was the first year of the new controlled assessment for this specification. The proportion of centres having marks adjusted was high. It is strongly recommended that centres read the principal moderators report in detail.

A181/01 – Physics A Modules P1, P2, P3 (Foundation Tier)

General comments

Generally the paper gave candidates the opportunity to demonstrate their knowledge and to apply it. The paper was well attempted with relatively few questions with no response.

Comments on individual questions

Q1 This was a six-mark extended writing question asking for details about the solar system. It was generally well answered with most candidates able to score some marks. Good answers listed the different objects in the solar system and went on to explain their motion, for example that planets rotate on their axis, moons orbit a planet whilst all other objects orbit the Sun. Some candidates linked the motion of the earth with day and night and the seasons. Very good answers then went on to describe in more detail some of the different planets and asteroids as rocky or gaseous and also correctly stated the age the solar system. Unfortunately there were also many answers that had other suns, galaxies and even the Universe inside the solar system.

Q2(a)(i) A few strong candidates described how the astronomers may have had different backgrounds or experiences but the majority ignored the wording of the question and stated that the astronomers had different data from different telescopes or at different times/day/places.

Q2(a)(ii) Whilst there were many correct answers some candidates gave two letters for each answer and hence lost the marks.

Q2(b)(i) Many candidates answered correctly with brightness, and a smaller number with parallax. The most common wrong answers were light years (with candidates confusing method with unit), or 'by using telescopes or lasers'.

Q2(b)(ii) Conferences, meetings and journals were all mentioned but there were many disappointing answers along the lines of 'tell them' or 'send it to them'. Some candidates misinterpreted the question as being what was being said.

Q3(a) Whilst some candidates scored all three marks on this question. the majority scored two. In general the most common correct answer was disturbance and the most incorrect answer was for matter.

Q3(b) The majority of candidates knew the earth's crust was solid but the answers to the other three parts were far less known.

Q4 This was the second six mark extended writing question, it was also a common question with the Higher tier paper and it proved very challenging for Foundation candidates. For high marks it was expected that candidates could distinguish between analogue and digital signals and state that before transmission analogue sound waves had to be converted to digital radio waves and then converted back by the radio. There were many misconceptions eg sound travels from transmitter to radio or radio waves could be heard.

Q5(a) Many candidates scored one mark for both types of radiation being electromagnetic but after that all responses were seen with the most common incorrect answer being they had lower frequencies than microwaves.

Q5(b)(i) Many candidates scored two marks by explaining that X-rays can travel though soft tissue but not through bone but few could explain that ultraviolet cannot pass further than the skin. Many candidates incorrectly concentrated on the danger from ultraviolet radiation to the exclusion of X-rays or stating that ultraviolet was more dangerous than X-rays.

Q5(b)(ii) This proved a good differentiator with stronger candidates addressing the issues such as small or biased sample and many things being the cause of cancer whilst others thought the figures were conclusive proof of X-rays causing cancer.

6(a) The full range of possible answers were seen with the most common error being transmitted instead of emitted.

6(b)(i) White or red were the most popular incorrect answers.

6(b)(ii) All possible responses were seen with an even distribution of answers.

6(c) This was well answered but there was a common misunderstanding that it was the lack of heat from moonlight that stopped the tan.

Q7(a)(i) Many candidates did well on this question, most scoring the mark for having three output arrows. Many candidates correctly labelled heat and sound though not quite as many drew them to the correct scale. The least scored mark was the 500J input. There was some evidence that certain candidates had never met or used Sankey diagrams

Q7(a)(ii) The majority of candidates correctly calculated the amount of light energy produced.

Q7(b) A considerable number of candidates understood that 300J of useful energy was used and many could then go on to calculate the correct efficiency although it was surprising how many candidates performed the calculation ‘upside down’ and came out with an answer greater than 100%.

Q7(c) This was a well answered question. The most common error was to say ‘turn it off’, even though this was negated by the question.

Q7(d)(i) This was a low scoring question with most incorrect answers involving the fact that the energy was made elsewhere or in the power station rather than made from another energy source. Other incorrect answers involved secondary being a backup power source.

Q7(d)(ii) A considerable number of candidates answered correctly with the most common errors being power station or wind turbine or solar panel ie a producer of energy not the actual source.

Q7(d)(iii) The majority of candidates realised that electricity is easy to transmit but unfortunately many think it is easy to store.

Q7(d)(iv) Only a minority understood that a kilowatt hour was the same quantity as, but much greater than, a joule. Many candidates stated that the kWh was as unit of time.

Q8 This was the third six-mark extended writing question. It was fairly well answered with the majority of candidates understanding the importance of low emission of carbon dioxide and high efficiency of diesel and petrol. Fewer candidates understood the term sustainability and many interpreted it to mean viable. Candidates have obviously had practice at interpreting data and scored well, mentioning all three fuels and two of the factors using the data provided.

A181/02 – Physics A Modules P1, P2, P3 (Higher Tier)

General comments

Overall this paper proved challenging to candidates with few scoring very high marks. There was no evidence of candidates running out of time.

The six-mark extended writing questions are in general being attempted by all candidates. They are being answered better than last summer. However In many cases the quality of written communication is poor. Candidates did not appear to have had much practice in planning their responses; the structure was often poor, with much repetition of the question and muddled presentation of ideas.

In the questions involving “tick boxes” several candidates lost marks because they indicated too many responses. At this level they are often not told how many boxes to tick and this requires them to read the question and responses carefully.

Comments on individual questions

Q1(a) Most candidates were able to make good use of data and present their answers in a clear, well organised way. A few forgot to make a recommendation as asked in the question. A good number of candidates were able to make use of relevant science knowledge in addition to the data given in the question. The most common error was not to adequately describe or include sustainability in their answers. Few candidates used scientific terms such as renewable and non-renewable. Some candidates attempted to relate sustainability with the amount of carbon dioxide produced and global warming but this was generally done badly.

Q1(b) This was answered incorrectly by more than half the candidates. The most common incorrect answer was ' she wants carbon dioxide equivalent emissions to be as low as possible' suggesting that candidates had not read the question carefully.

Q2(a) It was disappointing to see that many candidates did not realise that a Sankey diagram should be drawn to scale. Weaker candidates presented their diagram with only two arrows: one for the useful energy and one for the wasted energy as if they were considering efficiency.

Q2(b) Very few candidates successfully calculated the energy wasted, even in one of the units, though a few did manage to convert an incorrect value in joules into a correct equivalent value in kWh. Surprisingly many candidates failed to circle two answers.

Q2(c)(i) The question, which is a variation on a common themed question for this paper on the sequence of operations in a power station, was not answered well. The most common errors involved some confusion around turbines, magnets and coils.

Q2(c)(ii) Only the stronger candidates scored this mark, with many suggesting nuclear or 'electrical power station'.

Q3(a). Most candidates appeared to answer from their previous knowledge rather than responding to the information in the question. This was seen when most 2 mark answers lost the inner core/cannot tell mark.

Q3(b)(i) A reasonable number of candidates identified P and S waves as longitudinal and transverse respectively but their communication skills let them down when trying to explain the different movement of the ground in each situation. Many weaker candidates simply repeated information given in the question.

Q3(b)(ii) The few marks awarded here were mainly for stating that s-waves transfer more energy.

Q3(c). Most candidates successfully completed the calculation. A common error was confusion in manipulating the equation 'wave speed x time'.

Q4 This was generally answered poorly, with a surprising number of candidates ticking more or less than two boxes, despite the clear instruction for two answers. The most common errors were 'The weight of sediments pushes the continents down' and 'The movement of the sea floor stirs up sediments'.

Q5(a) This question gave the strongest candidates an opportunity to demonstrate their understanding while most candidates simply repeated information from the question stem. Only a few candidates understood that a prediction had to be measurable/falsifiable.

Q5(b)(i). Candidates who did not understand the scientific method tended to hedge their bets with multiple ticks; 5 ticks was not uncommon.

Q5(b)(ii) Most candidates were able to score at least one mark here, usually for mentioning that the new data might be incorrect, or for suggesting that more data was needed.

Q6 This question proved very challenging for many students who struggled to remember two methods never mind describe or explain how they work. Apparent brightness was the most commonly correctly described. Parallax was well known but not well understood. Redshift was often mentioned but how this was related to distance was very rarely adequately explained. Many answers included light pollution or atmospheric distortion etc. for causes of uncertainty but these were rarely connected convincingly to the appropriate method being described. There were a significant number of candidates who gave two methods but then mixed up the descriptions of each one

Q7(a). One mark was most commonly given for ‘they are electromagnetic radiation’. But far fewer recognised that all were ionising and hence 'remove electrons from atoms’.

Q7(b)(i) Most candidates stated that an X-ray could travel through parts of the body and was stopped by bones but few realised that reason UV was not used because it was unable to travel through the skin. A rather alarming proportion of candidates seem to think that ultraviolet is not used because it is more dangerous than X-rays, specifically it is more likely to cause cancer.

Q7(b)(ii) A good number of candidates were able to score 1 mark here, usually either noting the small sample size or bias, but it was disappointing to see so few who picked up both these problems with Joel’s survey. Some candidates did mention the correlation of data.

Q8 This question was well answered by candidates who organised their ideas before starting to write. Few answers mentioned the steps in transmission of a recorded signal. Most candidates identified that an advantage of digital was something to do with noise. However, many candidates were not clear as to whether digital picked up less noise or was easier to recognise the original signal. Few candidates overtly described both waves although many clearly understood their differences. Few mentioned further advantages than just clarity.

Q9(a) Few candidates were able to use terms from the general model correctly throughout this question. The idea of light reflecting off the moon was the marking point most frequently scored but there were quite a few candidates who, while knowing that the sun emits radiation, thought that it was ultraviolet radiation that allowed us to see the moon. 'Transmitted' was the least used term.

Q9(b)(i) Only a handful of candidates recognised that the ratio of cross-sectional areas was key here. A number of candidates did recognise that a ratio was needed but simply calculated the ratio of the two diameters. Some candidates tried to use energy transferred = power x time.

Q9(b)(ii) Less than half of candidates correctly identified the role of Earth's atmosphere in retaining heat there were a range of incorrect answers e.g. the core of the earth, the ozone layer, that the moon was further away, in the shadow of the earth or that human activity was to blame.

A182/01 – Physics A Modules P4, P5, P6 (Foundation Tier)

General comments

The paper examined knowledge and understanding of Physics modules P4, 5 and 6.
The paper was generally well attempted.

Candidates demonstrated a range of skills in their responses. In particular, given the range of graphs, tables and diagrams on this paper, candidates were required to analyse, interpret and evaluate a range of quantitative and qualitative sources of information. Candidates seemed well prepared for the calculations with evidence that the majority made good use of the formulae at the front of the paper.

Most candidates are showing greater confidence with the six mark-extended writing questions with evidence of extended writing across the mark range. The strongest candidates are expressing themselves efficiently and blending different ideas into their response. These candidates more often attempt to make links between their ideas and they are also more likely to follow the prompts to draw and label diagrams where necessary.
Weaker candidates have a tendency to repeat much of the information provided before introducing an idea of their own. These questions differentiate well.

Comments on individual questions

Q1 This question was about radioactivity. Candidates were expected to recall and use ideas about ionising radiation, interpret a graph to justify a choice of radioactive substance and use ideas about benefit and risk. Overall this question differentiated well.
In part (a)(i) most candidates were able to select at least one correct definition from the article. The common error here was to quote too much.
The common error in part (a)(ii) was to put beta as having a shorter traveling distance than alpha radiation.
The objective questions in part (b)(i, ii) and (c) were also answered quite well. The common error in part (c) was to identify food sterilisation as not a use for ionising radiation.
In part (d) candidates were presented with a graph of the activity of three substances over a number of months. Candidates were given two criteria for selecting the most appropriate substance. The commonest error was to choose substance 1 with the associated misconception that its rapid decay implied a faster cure. Candidates who selected the correct substance often only gained one mark as their responses did not show consideration of why the other substances were not suitable.
In part (e)(i), candidates were prompted to use two pieces of information to explain why a patient would undertake a type of cancer therapy. The common error here was to simply restate the information. The stronger candidates rephrased the information to introduce ideas about risk and chance in their answers as well as realising that the treatment was a potential cure.
The objective (tick-box) question in part (e)(ii) was generally well answered.

Q2 This was the first six-mark extended writing question. Candidates were expected to use the model of the atom to explain the phenomenon of nuclear fusion. This question proved to be very challenging to candidates at this level with quite a few candidates making no attempt at an answer. Only the strongest candidates could either recall and label an atom or describe fusion in the simplest terms of hydrogen nuclei joining to make helium. Very few candidates were able to blend both aspects of the explanation. There was general confusion between fusion and fission and also with chemical reactions.

Q3 This question was about electrical components, their symbols and how they can be identified from their resistance characteristics. Candidates were expected to recognise and use conventions appropriately and interpret data. Overall this question differentiated well. In part (a)(i) candidates looked at graphs displaying the resistance characteristics of three components against light intensity and temperature. They had to match each component to the correct resistor type and select the correct symbol. The majority of candidates performed well on this question and on part (a)(ii) also.
The calculation of resistance in part (b)(i) and the interpretation of the graph to determine temperature at a given resistance were also answered generally very well.

Q4 This six-mark extended writing question looked for an explanation of how a motor works with additional details of adding labels to a diagram. Candidates were expected to link ideas of current flow in a magnetic field to the movement of the motor. Overall this question differentiated well, although a small minority made no attempt at an answer. The strongest candidates labelled the magnet, coil and cell in the diagram and just occasionally the magnetic field. Very few could identify the brushes or the commutator. They then made a link between electricity or current causing the coil to move or spin. However, many of these higher level responses indicated some confusion between motors and generators. Many candidates gained Level 2 marks as they could provide sufficient labels but could only link the force between the magnets as the cause of movement. Many of the weaker responses to this question simply repeated the stem 'how a motor works' without providing any indication that the coil would move.

Q5 This question was about static electricity. Candidates were expected to recall and use ideas about charges to explain the movement of an electrostatic toy. Overall this question differentiated well. In part (a) most candidates were unable to access any marks for the explanation. The stronger candidates generally gained marks for ideas about the movement of electrons. The idea of the objects becoming charged or gaining charge was less well expressed. Similarly the ideas that both objects have the same charge and therefore repel were rarely seen. In part (b), the objective question was generally well answered.

Q6 This question was about the relationship between shoe size and slide-time along a ramp. Candidates were expected to interpret and evaluate data and draw conclusions using the available evidence. Overall this question differentiated well. In part (a) most candidates showed evidence of calculating the average time. A common error however was to assume that this was the speed. Hence the distance measurement given was ignored by a significant number of candidates. A majority of responses were unable to determine the unit in the conventionally written way while a minority showed clear uncertainty as to the meaning of the term 'unit' in this context.
In part (b)(ii) the majority of candidates were able to explain the anomalous data in terms of differences in the apparatus used or they explained that the anomalous results were too high or should be lower. A minority of candidates were able to make arguments about both the apparatus and the data.
Part (c) was generally answered well.
The responses to part (d)(i) linking two features of the experiment to their correct reasons indicate that this question was too challenging for the majority of candidates. By contrast candidates found interpreting the graphs of distance-time and speed-time to determine the tread pattern, far easier.

Q7 This six-mark extended writing question looked for an explanation of the motion of a roller coaster using ideas of energy. Candidates were expected to make links between height changes and GPE and/or make links between speed changes and KE. Candidates could also describe the transfer of energy GPE to KE to work done against friction to explain why the roller coaster eventually stops. This question proved to be very challenging to Foundation candidates. Many responses simply repeated the information about the movement given in the stem of the question. For the candidates who gained marks in this question, most did so for making a link between friction and the loss of speed. Very few candidates described the transfer of GPE to KE and fewer still explained the transfer to heat.

A182/02 – Physics A Modules P4, P5, P6 (Higher Tier)

General comments

This summer was the first session for awarding on this specification. There is evidence that Centres have prepared candidates well for this style of paper, as the amount of questions which generated no response was low. Most candidates followed the rubric well and there was little evidence that time was an issue in terms of completion of the paper. This included the six-mark extended writing questions, where most candidates were able to access the available marks at a lower level, although significant numbers wrote overly lengthy responses which resulted in contradictory statements and/or errors in the Physics being expressed.

Comments on individual questions

Q1(a)(i) This objective style question was well answered, although weaker candidates seemed unsure of the meaning of the term 'ionising radiation'.

Q1(a)(ii) Most candidates could identify alpha as the source, and therefore that it is least penetrating and that it would not pass out of the body. Candidates who failed to identify the source correctly for the first mark usually failed to score the second mark too, although the mark scheme did treat these as independent marking points.

Q1(b) Knowledge that ionising radiation kills living cells was secure for almost all candidates. Very few candidates seemed to relate this to causing chemical reactions to take place, which was required to explain how a tumour would be 'broken down'. Many candidates incorrectly selected the statement 'can cause cells to become cancerous', which is not relevant to this explanation.

Q1(c) This question proved difficult for most candidates, with only a minority attempting to use the data regarding half-life to calculate the activity after one year. Significant numbers of candidates over-counted the number of half-lives to go from an activity of 32 to 4 e.g. 4 half-lives instead of 3. They seemed to count the values rather than the number of times halved i.e. 32, 16, 8, 4 giving 4 half-lives was a common response. These candidates could gain partial credit for the idea of repeatedly halving the activity, although they would get the incorrect value for the half life after 12 months.

Q1(d)(i) The idea of benefit outweighing risk was often clearly stated, although weaker candidates failed to evaluate the low risk compared to the considerable benefit. The figure of 2 out of 125 patients developing secondary cancer was often misquoted as being the chance of the success of the treatment e.g. 123 out of 125 were cured.

Q1(d)(ii) The wording for this question meant that candidates often referred to medical dosage i.e. of a prescribed drug, as opposed to dose as the measure of possible harm to the body i.e. due to exposure to ionising radiation. Both approaches were deemed acceptable in this context and were therefore rewarded appropriately in the application of the mark scheme.

Q2 This was a challenging six-mark extended writing question. Consequently, only the strongest candidates successfully accessed the higher levels of marks on this question. The best responses were logically presented, with a clear discussion of the process of fission separated from a clear discussion of the process of fusion before comparative statements relating the amount of energy released from each. Such answers were relatively rare. Many candidates recognised that fusion involved the joining of small nuclei and fission involved the splitting of a

larger nucleus into smaller fragments. Many candidates then added confusing and often incorrect detail involving electrons being released in fission, ionisation of nuclei to split them apart etc. Only a minority of candidates discussed each idea separately before drawing comparisons.

Q3(a) Most candidates correctly identified component C as a resistor, but only the strongest candidates successfully identified A as a thermistor and B as an LDR. A large number of candidates got A and B the wrong way round and no credit was given in such cases. A significant number of the weakest candidates seemed to write words with no relation to the question asked, but words which cropped-up elsewhere in the paper e.g. alpha, beta, gamma or motor, generator etc.

Q3(b) This multiple choice question probing understanding of data proved very challenging, as the data was quite complex. Most candidates scored a mark for one or two of the first three statements correctly identified. The last two statements were rarely correctly chosen, reflecting the complex processing required to ascertain the correct answer; the most common response for both of these was 'cannot tell'.

Q4(a) Candidates usually either scored all 3 marks or 0 marks on this question. A significant minority of answers were well presented, with working clearly shown and appropriate use made of the formulae at the front of the paper. Weaker candidates showed no working and therefore if, as was often the case, the obtained the wrong final answer, no partial credit could be given.

Q4(b) The standard of circuit drawing seen across the ability range on this paper was, on the whole, poor. Even if correctly selected, most circuit symbols were roughly drawn, with gaps often present in wiring, incorrect/partially complete battery symbols and lots of examples of short-circuiting.

Q5 This question was well answered by a minority of candidates, who made good use of the formulae provided and showed evidence of their working out. Rounding errors were not penalised where it was possible to see how the answer was derived. The small number of candidates that calculated the correct values but wrote them in the wrong places were allowed 1 mark.

Q6 This was a challenging six-mark extended writing question. The majority of candidates scored 0 marks on this question. The best responses took time to carefully describe how a motor works, using appropriate technical terms, before doing the same for a generator, then finally comparing the two. The majority of the candidates that scored any marks did so for a basic description of a generator as a rotating/moving coil (or magnet) producing electricity in the coil, although many also confusingly described a motor as a generator, therefore restricting their performance to level one. Even basic knowledge of the workings of a motor, as demonstrated here was extremely limited, and technical details such as the commutator for the motor and/or slip rings for the generator were seen in only a minority of responses. The correct use of the term induction was occasionally seen in reference to the generator, but also incorrectly in reference to the motor.

Q7(a)(i) +(ii) Part (a) of question 7 required the candidate to analyse some experimental data involving sliding different size shoes down a ramp. Candidates showed great familiarity with this type of exercise and most were able to arrive at an appropriate conclusion and justify it. The majority also suggested reasons why the additional data may not fit the trend, although many did not describe how the new result did not fit i.e. the mean time obtained was significantly higher than you might expect.

Q7(b)(i) This question on interaction pairs proved to be the most difficult question on the paper. Almost no correct responses were seen. Very few candidate could demonstrate that to describe any single force they must;
(a) state the **two** objects involved in the force and (b) state the direction the force acts in.
e.g. **object X** exerts a force on **object Y**.
Almost all candidates referred to a single object (or indeed, no object at all) in their responses. The majority of candidates treated the question as multiple choice, choosing from the 3 forces listed.

Q7(b)(ii) Relatively few candidates demonstrated good understanding of resultant force in relation to change in motion, in this case resulting in acceleration down the slope in the first instance. A common response involved discussing all of the forces, but with no conclusion, or simply stating that 'it moved down because of gravity', which was insufficient to score a mark.

Q7(c) Most candidates accessed this question well, with the majority picking up marks for the average speed along the slope and/or the change in gravitational potential energy. Very few candidates picked up the mark for calculating average momentum, with no real pattern to incorrect responses. The weakest candidates only ticked one box in each row, perhaps misunderstanding the requirements of the task.

Q7(d) A wide range of graph sketching skills were seen, with some excellent practice. Significant numbers of candidates did not take sufficient care to ensure that their sketch graph passed through the origin. In such cases, full marks were not awarded. A vast array of shapes was accepted, provided that an upward trend was shown, with no doubling back. Overdrawn or multiple graph lines were penalised.

Q8 In this six-mark extended writing question the majority of candidates produced creditworthy answers involving appropriate identification of gravitational potential energy and kinetic energy. Most candidates were able to extend their answers by appropriate discussion of energy transfer, although some candidates 'muddied the water' by trying too hard to force a discussion of momentum into their response. The best answers clearly accounted for the reduction in maximum height reached over time to the dissipation of energy due to the action of resistive forces, such as friction between the vehicle and the track. Weaker responses often only discussed one cycle, and stated that a combination of 'friction and gravity' stopped the vehicle from rising any further on the other side. Only a minority of candidates made correct reference to work done by the resistive forces.

A183/01 – Physics A Module 7 (Foundation Tier)

General comments

The paper examined knowledge and understanding of Physics module P7.

The paper was generally well attempted and candidates demonstrated a range of skills in their responses. Most candidates were able to show a good understanding of the way science influences society. They were able to select and apply data appropriately in calculations and comparisons. The stronger candidates were also able to recall correct scientific terminology and some aspects of the debate between scientists that led to a change in our understanding of the Universe.

Most candidates are showing greater confidence with the six-mark extended writing questions. The stronger candidates are expressing themselves efficiently and blending different ideas into their response. These candidates are also more likely to use comparative words such as 'most' and 'best' in their answers. Weaker candidates have a tendency to repeat much of the information provided before introducing an idea of their own.

Comments on individual questions

Q1 This six-mark extended writing question looked for an explanation of how the Moon causes a solar eclipse. Candidates were expected to communicate in writing and diagrams their knowledge and understanding. Most candidates were able to provide a diagram with some added detail such as relative sizes, distances, light rays or orbital paths, and they were also able to explain the Moon's orbit of the Earth and blocking of sunlight. Very few candidates referred to the tilted orbit of the Moon or the umbra and penumbra of the eclipse. Quite a significant number of candidates did not include a diagram.

Q2 This question was about the use of lenses in telescopes. Overall the question differentiated well, however in part (a)(i) only a small majority of responses gained one or both marks for showing refraction of rays through a convex lens. A similarly small majority were able to identify the most powerful lens in part (b)(i) but most candidates were able to calculate the power of the lens in (b)(ii).

Part (c) proved to be most problematic for candidates at this level. There is clearly a lot of confusion about the requirements of the eyepiece compared with the objective lens. One mark mark was allowed for associating the chosen lens with a correct justification *for that lens* but many candidates were too vague in the reasons they gave. For example the rubric prompts with 'the best to use' but only the strongest candidates were able to respond with 'because it has the most power / the largest diameter'. Many candidates simply described the lenses as wide or high powered.

Q3 This six-mark extended writing question looked for an explanation of why computer control of the Hubble Space Telescope (HST) is so useful for astronomers. Candidates were expected to apply their knowledge and understanding of science in this novel context. The strongest candidates were able to recall the general advantages of computer control – such as the ability to point the telescope, to work remotely and to track stellar objects. They were able to give qualifying details such as precision, ease and convenience. They were also able to give advantages that were specific to a telescope in space, although this was generally limited to the idea of not needing to have astronomers in space. Many of the weaker responses to this question failed to address the qualifying condition of computer control and simply described the advantages of the HST over ground based telescopes.

Q4 This question was about labelling and interpreting the Hertzsprung-Russell diagram. Candidates were expected to recall the names of four different star types in regions of the diagram, to locate the position of the Sun and to indicate with an arrow the direction of cooling down and becoming less bright. Overall the question differentiated well. In part (a) only the strongest candidates correctly recalled two or more star labels while a larger number, still in the minority, were able to locate the Sun correctly. Most candidates gained at least one mark for showing cooling/dimming and for the candidates who did not gain a mark, many drew arrows somewhere on the diagram but did not relate it to the star on the diagram as instructed.

Q5 This question was about a discussion regarding the location of a new telescope. Candidates were expected to demonstrate understanding of the influences of science on society. The majority of candidates performed well on this question. In part (a)(i – iii) they were able to identify the types of arguments being put forward in a meeting. In part (b) however the common error was to identify astronauts rather than politicians as attendants. In part (c) most candidates were able to identify objections on the grounds of cost and/or environmental impact.

Q6 This six-mark extended writing question looked for recall of the debate between Curtis and Shapley and an explanation of how the debate was resolved with further data from Hubble. Overall, very few candidates scored any marks on this question as they were clearly unable to recall anything of the debate. Candidates were expected to recount the arguments put forward by the scientists from the limited evidence they had. The strongest candidates were able to recall that Curtis and Shapley had disagreed over the position of the Sun in the galaxy and that they had also disagreed over the nature of the nebulae they had observed and the different interpretations that this led to. Very few of the responses that gained marks accurately described Hubble's distance measurement as the 'additional evidence' hinted at in the stem of the question.

Q7 This question was about the physics of stars. Candidates were expected to recall and use appropriate terminology, sources of data, perform a calculation and in the last two parts of the question, to explain some relationships. In part (a) most candidates knew that gravity is the force holding the gas in a star. The answers to part (b)(i) could be obtained by reference to the list of useful relationships at the start of the exam paper and by quoting the relevant formulae from the section Observing the Universe. Most candidates did not do this. In (b)(ii) most candidates correctly identified the core as the hottest part of the star. In part (b)(iii) most candidates gained at least one mark, usually for 'radiation'. In part (c)(i) only the strongest candidates could convert a temperature in Kelvin into the correct temperature in Celsius but many more correctly identified the red giant having a cooler surface temperature than the Sun in part (c)(ii). Part (d) was a very challenging question.. However, a minority of candidates gained credit for recalling that hydrogen was fused in the Sun. Most candidates also found part (e) very difficult. A minority of candidates were able to explain that dimmer stars were further away. Many responses indicate that the term 'luminosity' is not well understood.

A183/02 – Physics A Module 7 (Higher Tier)

General comments

Overall the demand of this paper was appropriate. There was no evidence of candidates running out of time.

The six-mark extended writing questions are in general being attempted by all candidates. However In many cases the quality of written communication is poor. Candidates did not appear to have had much practice in planning their responses. The structure was often poor, with much repetition of the question and muddled presentation of ideas.

In the questions involving “tick boxes” several candidates lost marks because they indicated too many responses. At this level they are often not told how many boxes to tick and this requires them to read the question and responses carefully.

In questions which require a calculated answer candidates must set out their working carefully. An incorrect answer with no working automatically scores zero, whereas the candidate who sets their answer out can possibly get credit for intermediate steps, for example Question 9a(i) and (ii).

Comments on individual questions

Q1(a) The most common correct answer was ‘frequency’. Many candidates placed ‘wavelength’ in the first box and so lost the second mark.

Q1(b)(i) There were a whole range of combinations with many candidates only selecting one correct lens.

Q1(b)(ii) Most candidates were able to correctly calculate this, many were awarded an allowed error carried forward from part bi). A minority of candidates incorrectly used focal length of eyepiece/focal length of objective. Many weaker candidates selected data from the diameter column.

Q1(c) Despite the question stating that the lenses were the same shape and size, many candidates offered incorrect responses relating to curvature, thickness or size. The most common correct response was different materials.

Q1(d) The quality of diagrams was poor; very few 'good' dispersion diagrams were seen and many candidates referred to diffraction or gave comments about light refracting rather than the effect of different wavelengths.

Q2This was the first six-mark extended writing question. In general, candidates provided good quality diagrams but were not able to add to this with quality written statements. Indeed candidates who included diagrams often scored more marks than those without. The majority of candidates were able to describe the conditions required for a solar eclipse and many also referred to the tilted orbit of the Moon. Making the required link between this and the rarity of the eclipse was uncommon. Some candidates went into good detail about partial eclipses

Q3(a) This question was well answered but a significant number of candidates incorrectly quoted ‘Super Red Giants’ in place of (Red) Super-giants.

Q3(b) Many candidates seemed aware of the position being across from the Luminosity of 1 on the Y axis but careless placement of the cross, either off the main sequence line or too high or low, meant that they were not awarded this mark. A significant number of candidates incorrectly placed the cross within the super-giant or giant regions.

Q3(c) Many candidates had the correct arrow but a significant number did not relate this arrow to the star required by the question.

Q4 This was the second six-mark extended writing question. The vast majority of candidates were able to fully describe the debate (some even giving dates) as well as the interpretations. Most went on the correctly describe the influence of Hubble. The most common errors were in not referring to distance when quoting Hubble's data, or assuming that Curtis-Shapley was one man. Some weaker candidates confused Edwin Hubble's observations and the Hubble space telescope. A minority of candidates were unfamiliar with the Curtis-Shapley example and gave generic answers that did little other than repeat the question.

Q5(a) Most candidates were able to calculate the correct answers. Some incorrectly rounded (20920)

Q5(b) The most common correct responses were that the Galaxies are moving away (Universe expanding) and that the furthest are moving fastest. Some candidates recognised a conflict in suggested ages but only a small number were able to suggest that this might be due to speeds not being constant.

Q6(a) Many candidates gained both marks for correctly subtracting 273. Those gaining 1 mark did so by adding 273 and not by showing correct working only. A significant number of candidates quoted an incorrect conversion temperature (270 was quite common).

Q6(b) The most common correct marking point was that the Sun fuses hydrogen. Although many candidates stated that higher temperatures were needed to fuse helium, few linked this to energy requirements. Many candidates referred to energy incorrectly i.e. referred to output from fusion rather than the requirements for fusion.

Q6(c) Most candidates got 'iron'. Far fewer also recognised that hydrogen was also a correct answer. A surprising number ticked every box except hydrogen or ticked three boxes with only 'iron' being correct and so gained no credit.

Q7 This was the third six-mark extended writing question. Many candidates compared the advantages/disadvantages of adaptive optics rather than ground verses space-based telescopes. Most common correct comparisons were of cost and accessibility for maintenance. Although a large number of candidates recognised a shift of advantage in favour of ground-based telescopes, they didn't acknowledge that adaptive optics did not address issues of light pollution and absorption both generally and of specific wavelengths. The weakest candidates considered that the space telescope being closer to the stars is an advantage. Many candidates' answers were not well structured, involving extended introductions which added nothing beyond the stem of the question, much repetition and lack of clarity.

Q8(a)(i) Very few candidates clearly laid out their working meaning that 'method marks' were often not awarded. Since a high number of candidates were not able to give the correct final answer, this was significant. The most common errors were; not identifying what the numbers they were using represented and despite regularly rearranging the equation correctly, many failed to square 'c' in the calculation. Many students seemed unhappy handling standard form. Correct responses were often expressed as 4333333333.

Q8(a)(ii) The most common error was to simply take their answer in ai and multiply by 10^{10}. Those who showed their working nearly always got something for calculating the seconds in a year. Many got one power out presumably because they did not know how to put 10^{10} into their calculator properly.

Q8(b)(i) Many candidates appeared to confuse 'protons' and 'positrons'.

Q8(b)(ii) Many candidates recognised that charge was involved but were unable to express the idea of charge conservation clearly.

Q9(b) The most common correct response were ‘right ascension and declination’. The most common incorrect responses involved a misunderstanding of the question with descriptions of the position of the Moon, Sun etc. e.g. ‘the Sun rises in the east’, ‘they all move east to west’ etc,

A184 – Physics A Controlled Assessment

Overview

This was the first session for the assessment of the Twenty First Century Science suites Investigation controlled assessment. There were significant changes to the structure and assessment criteria for the investigation from the previous specification. Many centres managed the transition from the old specification very successfully, demonstrated a good grasp of these changes and criteria. However a disappointingly large proportion of centres had their marks altered this session, many with large scalings. The most common cause of significant changes to centres marks related to the hierarchical nature of the marking criteria, details of which are addressed below.

Administration

Documentary evidence of internal standardisation was also supplied in a large number of instances, but for many Centres, this was not provided. Much inconsistent marking seen suggested that internal standardisation procedures had not been applied by some Centres, and Centres are reminded of their obligations:

> *'It is important that all internal assessors of this Controlled Assessment work to common standards. Centres must ensure that the internal standardisation of marks across assessors and teaching groups takes place using an appropriate procedure.'* Section 5 of the specifications suggests some ways in which this can be carried out.

In general the provision of samples was very good, with work sent promptly with all the correct administrative documents. When not correct the most common omission was the CCS160 Centre Declaration although a number of centres failed to attach the controlled assessment cover sheet to the front of each candidate's work, which always causes problems to the Moderator. When submitting samples please do not use plastic wallets, the preferred method for holding a candidates work together is treasury tags. There were few clerical errors this session, but where they did occur they were nearly always the result of careless addition or transcription of marks.

Few Centres provided their Moderator with detailed accounts of how the tasks and levels of control were administered; where present, these aided the moderation process. Candidates' scripts from a small number of Centres were overly long, although timings indicated in the specification are for guidance only; it was clear that in some instances these had been exceeded markedly. Candidates should not be allowed unreasonable amounts of time and It should be impressed upon candidates that producing reports is an exercise in conciseness.

Annotation

Annotation of candidates' work was excellent in many instances, but variable from Centre to Centre, and sometimes within a Centre. The annotation ranged from *just a series of ticks here and there* to *the relevant skill area code written adjacent to where the point had been made, backed up by a supporting comment.* We would always encourage centres to adopt the latter of the two approaches. Please note that it is a requirement that 'each piece of internally assessed work should show how the marks have been awarded in relation to the marking criteria'.

Hierarchy

A significant number of centres did not treat the criteria as hierarchical. Where this was the case centres were often significantly out of tolerance. Each statement at a lower must be met before marks can be awarded at a higher level. So for example all the criteria at level 1-2 marks need to be met before 3-4 marks can be awarded.

When marking the work each criterion should be annotated where it is met. Beginning with the lowest level and working up to the level where a criterion is not met. This will determine the level of marks awarded. If the candidate meets all the criteria at a given level then the higher of the two marks is awarded. Where the candidate meets some of the criteria at a level the lower of the two marks must be awarded.

For example, in strand **Eb** a candidate who fails to make any comments about outliers is limited to a maximum of 3 marks no matter how well they consider the degree of scatter and general pattern of results. A consequence of this is that it is important that:

- candidates are taught to address lower level criteria as well as higher level criteria.
- teachers take care in identifying where the criteria are met otherwise quite large alterations in marks may result during moderation.

Particular criteria that have not been addressed by candidates are identified below

Interpretation of assessment criteria

Sa – formulating a hypothesis or prediction

For Twenty First Century Sciences a scientific hypothesis is a tentative explanation of science related observations or some phenomenon or event. The key point here is the idea of the explanation. A useful hypothesis allows a prediction to be made from it that can be tested experimentally.

The most common difficulties here were insufficient science used to develop the hypothesis. A common mistake was to provide ‘a large chunk’ of scientific knowledge but not relating this clearly to the development of the hypothesis.

Secondly, major factors were not considered before selecting a factor for the development of the hypothesis. It is not sufficient to state a factor, give a hypothesis and then list other factors as control variables.

At the highest levels (7-8 marks) it is important that candidates consider all relevant factors. A quantitative predication must be derived or related to the hypothesis not simply an unjustified guess.

It is worth mentioning that work in this strand may not be credited for work in strands **Ra** or **Rb** which are carried out under conditions of high control.

Sb - Design of techniques and choice of equipment

In this session, this strand was often generously marked. It was often not possible to justify the centre marks because candidates limited themselves to a maximum of 5 marks by failing to explain their chosen range of data. It was disappointing to find that the range (of the independent variable) was rarely explained. Centres seemed to believe that just ‘stating’ the range was sufficient. This explanation can be pragmatic, 'there were only 5 different strength lens available', based on safety issues, 'the upper end of the range was limited to 2M as any more concentrated would be too corrosive' or based on prior knowledge/preliminary work 'from PE I know

candidates cannot do step ups steadily for more than 3 minutes' or 'my preliminary work showed a reasonable change in the dependent variable of this range'. Note both ends of the range should be mentioned.

Good scientific justifications of the method, equipment and techniques selected must be provided for candidates to be awarded marks in the 7-8 mark level. Some candidates carried out preliminary work prior to the experiment proper. Although not a requirement, if it is practicable to do so in the allotted time, this can help candidates to justify the method, equipment or range used. Justifications, however, were often weak, and the reasons for the use of a particular method, in particular, were often not provided. Many candidates produced tables, ostensibly to justify the equipment used, but these often listed every piece and simply described how they were used rather than justifying the choice, some very mundane statements were seen. At this mark level, candidates should be using terminology such as 'resolution', 'accuracy' and 'precision' in their justifications.

In this strand, candidates are also required to review aspects of Health and Safety, ranging from comments, through to producing full and appropriate Risk Assessments. These were sometimes absent, and where a high mark had been awarded, centre marks had to be lowered significantly. It is suggested that there is no excuse for omitting Risk Assessments; this phase of the task is under limited control, and more importantly, a Risk Assessment is a prerequisite to any practical work being carried out. Risk Assessment proformas can be used, and these should include the chemical, organism, piece of equipment or activity that is likely to constitute a hazard, the hazard defined (using the appropriate terminology), the associated risk(s), and measures intended to reduce risk. Risk Assessments should pertain to the experiment in question and not to generic hazards and risks (though clearly, candidates are not penalised for the inclusion of these).

Please also note the hierarchy of awarding marks here; hazards must be identified for 3-4 marks, with 'some precautions' to minimise risk for 5-6 marks. While the word 'some' is used, it was not possible to support Centre marks where arguably the most important safety precautions are omitted e.g. the use of low voltage power supplies in electrical experiments. For 7-8 marks, for a Risk Assessment to be 'full', it must refer to *all* potential hazards and risks. This includes such things as using low voltage power supplies, limiting concentrations of solutions and the source of biological materials. Here, candidates should be encouraged to use statements such as 'low hazard' and 'limited risk'. Candidates should also consider hazards and risks of a final product of the experiment, e.g. the products of a chemical reaction or incubated agar plate. For a Risk Assessment to be 'appropriate', the hazard/risk must be appropriate to that for the chemical/equipment/activity used or undertaken. At this level they should ideally refer to PAT testing of electrical equipment, COSSH, Cleapps Hazard cards or other similar documents and show an awareness of who/where the first aider is in case of injury.

C - Range and quality of primary data

Errors in marking in this strand tended to be at the higher end. The '*correctly recording of data'* at the 5-6 mark level requires meaningful column headings, correct units and consistency in the number of significant figures/decimal places used. To match 6 marks, candidates need to show consistency both with the number of decimal places reported for their raw data and the actual measuring instrument as well as including all quantities and units in table headings.

In strand **C** there is no need to do more than 2 sets of results if there is close agreement between the two sets obtained. If they are not close, however, then there is a need to do a further repeat for this value –an intelligent repeat. The *regular repeats or checks for repeatability* criterion would then be matched and a possible outlier could be identified. In the new (2011/2012) specifications for Twenty First Century Science, statement 1.6 in the 'Ideas about Science' has clarified the definition and treatment of outliers (compared with the version in the legacy (2006) specifications) to state, *"If a measurement lies well outside the range within which the others in a set of repeats lie, or is off a graph line on which the others lie, this is a sign that it*

may be incorrect. If possible, it should be checked. If not, it should be used unless there is a specific reason to doubt its accuracy." Potential outliers in data collected during a Controlled Assessment should be handled in accordance with this statement.

Please note that experiments that 'pool' data from a class are not suitable for this controlled assessment. Strand **C** is based on the primary data collected by the candidate. Data collected by other candidates is secondary data. It is very likely that a candidate pooling data with other candidates in a class will be limited to the 1-2 mark level.

A - Revealing patterns in data

Overall, the quality of work in this strand was disappointing. Arguably, this should have been the strand of the Practical Data Analysis where candidates scored the highest marks, but it was here where often the largest discrepancies between Centre and Moderator marks occurred.

Some graphs seen were of poor quality. There was clear evidence that some Centres had not checked the plotting of points carefully before awarding marks. Graphs drawn without appropriate scales, e.g. where these were non-linear, or without one or more labelled axes, and poorly-drawn lines of best fit, were often, incorrectly, awarded high marks. If the scale is inappropriate, or points are plotted incorrectly, the candidate mark cannot exceed four marks. Likewise, if an inappropriate line of best fit has been applied, a mark above five cannot be awarded, irrespective of whether the candidate has drawn range bars. For marks to be awarded in the highest mark levels, range bars must be drawn accurately (in addition to there being minimal errors in the plotting of data). The scales chosen by candidates often made difficult accurate plotting of data, as did crosses drawn with unsharpened pencils, particularly where millimetre graph paper was used. Although it is not essential that graph scales should start at (0,0), where axes begin with a ‘zig-zag’ section it is important that candidates do not extend their line of best fit into this ‘undefined’ area. This bad practice was seen on a number of occasions

In some instances, however, candidates that were awarded very low marks having drawn very poor graphs could be awarded three or four marks owing to their calculations of means, a point sometimes overlooked by Centres.

Centres are reminded that for candidates to be awarded marks at the 5-6 mark level and higher, graphs having gridlines should be produced. They should not be drawn on lined paper. Where computer software is used to generate graphs, these should have appropriate scales, appropriate labelling, and gridlines. For candidates to score high marks, lines of best fit and range bars should be drawn manually.

Ea - Evaluation of apparatus and procedures

This was generally well assessed by centres however the common errors consisted of over marking candidates who suggested improvements but did not consider the limitations, hence not meeting the criteria at 3-4 marks.

Some improvements mentioned were trivial or lacked the detail required for higher marks. In general doing more repeats is unlikely to be a significant improvement.

There was some confusion over improvements to the experimental procedure and apparatus which is addressed here in strand **Ea** and the additional data or methods which can be used to increase confidence in the hypothesis which falls in stand **Rb**

Eb - Evaluation of primary data

A major stumbling point here was the requirement for outliers to be considered at level 3-4 marks. A significant number of centres ignored this requirement. In addition there appeared to be some confusion over what an outlier is, both amongst candidates and teachers. The criteria

state *'individual results which are beyond the range of experimental error (are outliers)'*. Not all anomalous results are outliers, in particular averages are not outliers and a set of data points for a single value cannot all be outliers. In the new (2011/2012) specifications for Twenty First Century Science, statement 1.6 in the 'Ideas about Science' has clarified the definition and treatment of outliers (compared with the version in the legacy (2006) specifications) to state, *"If a measurement lies well outside the range within which the others in a set of repeats lie, or is off a graph line on which the others lie, this is a sign that it may be incorrect. If possible, it should be checked. If not, it should be used unless there is a specific reason to doubt its accuracy."* Potential outliers in data collected during a Controlled Assessment should be handled in accordance with this statement. Candidates are permitted to draw a graph of their results during the (limited control) data collection stage of the Controlled Assessment task. This may help them to identify potential outliers. Ideally, any data points that look to be potential outliers should be re-measured, and this is easiest to achieve if they are identified during the data collection session i.e. strand **C**.

For 5-6 marks, although there were some often good discussions of spread of data, 'repeatability' was not always discussed. Candidates should discuss the spread of data qualitatively at this level, and quantitatively to obtain the highest marks at the top mark level at 7-8marks. Candidates' evaluations were often very long, but many covered the pertinent points in the first few sentences.

Ra - Collection and use of secondary data

This strand was poorly addressed by many candidates.

The intention in strand **Ra** is that candidates should do some research and find their own examples of secondary data. The OCR data in the 'Information for candidates (2)' document is only provided as a back up for those who fail to find any relevant secondary data from their own research.

Generally candidates are limited to 5 marks in strand **Ra** if all they use is the OCR data and/or results from another candidate or group. In order to access 6 or more marks in Strand Ra candidates must present a 'range of relevant secondary data', which means that some data from the candidate's own research must be included and the source(s) of the data must be fully referenced. Guidance on referencing can be found in the 'Guide to Controlled Assessment' handbook for Unit A154 / A164 / A174 / A184 (Practical Investigation). The direct download link is http://www.ocr.org.uk/Images/77479-guide-to-controlled-assessment.pdf

Secondary data can be of different types:

- the data provided by OCR in the 'Information for candidates (2)' document;
- data collected by other candidates doing the same (or a similar) investigation;
- data from other sources (e.g. textbooks or the internet).

Data do not necessarily have to be quantitative; they can be qualitative. Candidates do not necessarily have to find a table of numbers that looks exactly like the one they have generated from their own experiment; graphs, descriptions of trends, conclusions, mathematical relationships, relevant constants, models and simulations can all be presented as secondary data.

It is helpful to the Moderator if candidates included copies of the secondary data that they discuss in their report. This could be cut and pasted into the report (so long as it is clearly identified as third-party material), or may be attached to the end of the report. The material included should be carefully selected and cropped to show only the relevant parts, rather than comprising swathes of irrelevant material indiscriminately printed out.

Rb - Reviewing confidence in the hypothesis

This strand was also over-generously marked by some Centres. Candidates should be encouraged to re-state their hypothesis at the beginning of the review section to provide focus for this strand. Candidates often discussed findings but did not refer the hypothesis at all, or say if their data supported it. All candidates should make at least a statement referring to whether the hypothesis has been supported (or not), and the extent to which the data support the hypothesis.

At the 3-4 mark level upwards, candidates should make reference to some science when explaining their results. This was rarely done. It is not sufficient to merely refer to science used in strand **Sa**, as strand **Sa** is carried out under conditions of low control whereas Rb is done under high control conditions. At level 5-6 the science must be used to support the conclusion about the hypothesis.

When giving an account of extra data to be collected this must go beyond simply suggesting improvements to the procedure used, which is assessed in strand **Ea**. Different techniques or experiments that will provide additional data to assess the hypothesis are required for this strand.

Sources of Support

In addition to this Principal Moderator's Report, OCR also offers several avenues of **free** support, including:

- A 'Guide to Controlled Assessment' handbook for Unit A154 / A164 / A174 / A184 (Practical Investigation). The direct download link is http://www.ocr.org.uk/Images/77479-guide-to-controlled-assessment.pdf

- INSET training events for 2013-14 are available details may be found on the OCR website.

- OCR also offers a Controlled Assessment Consultancy service, in which candidate work that you have marked will be reviewed by a senior moderator prior to moderation.

  – To make use of this service, post photocopies of three marked pieces of work to the following address: *Carolyn Brawn, Science Team, OCR, 1 Hills Road, Cambridge, CB1 2EU*.

  – Typically, Centres are encouraged to send work which covers a range of attainment or which illustrates particular points of concern. The Controlled Assessment scripts should be marked and annotated before being photocopied. Please include a covering note on Centre-headed paper, and give a contact email address. A senior Moderator will look at the work and will write a report on the Centre marking, which we will email or post back to you within 6 weeks. You can then make adjustments to your marking, if you wish, before submitting marks for moderation in May.

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