OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A
Twenty First Century Science

General Certificate of Secondary Education **J635**

Report on the Units

January 2009

J635/MS/R/09J

Oxford Cambridge and RSA Examinations

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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 syllabus 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.

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Chief Examiner's Summary

It has been a pleasure to see the performance of candidates in this assessment session. As hoped candidates have had more opportunities to score higher marks than in previous specifications and this is reflected in the high mean scores, both at foundation and higher tier.

It is clear that centres have done a good job in preparing candidates for this style of paper, with most candidates now familiar with the different styles of objective question. One issue worth noting by centres concerns the relationship between the number of marks given at the end of a part question and the number of responses required by the question. The number of marks does NOT necessarily equal the number of responses. For example a question may ask for ticks in the boxes for the best answers and have 2 marks available, but require 3 ticks in the boxes to obtain the two marks.

The Principal Examiners' reports which follow indicate

- gaps in factual knowledge,
- common errors which reveal misconceptions, both in *Ideas about Science* and in *Science Explanations*, and
- places where the candidates did not follow the instructions in the questions.

Important changes to papers A331 and A332 from January 2010

Up to, and including, June 2009, the current model for the objective style question papers will continue to be used. In these papers, all questions currently require objective responses: candidates select from a defined set of alternative responses or provide a short answer which is expected to be clear and unambiguous.

From, and including, January 2010 a new style of question will be introduced to these papers. While the majority of questions will continue to be objective, following the current format, a number of questions on both Foundation and Higher tiers will be open-ended, requiring candidates to provide longer written answers without selecting from a set of alternatives. Each of these responses will be worth from 1 to 4 marks, providing candidates with opportunities to organise information, develop arguments, analyse and evaluate.

The papers affected all carry 42 marks. These open-ended questions will in total carry 12-14 marks of those available, with the remaining 28-30 marks continuing to be assessed with objective style questions.

New specimen assessment materials for these papers have been developed and are awaiting approval by QCA. As soon as they have been approved, centres will be informed with a further 'Notice to Centres' and the papers will be made available on the OCR website (www.ocr.org.uk). At the same time, revised specifications will be published to reflect these changes. No other significant changes have been made to the specifications, but a small number of minor corrections and clarifications will be included and highlighted at the time of publication.

A331/01 Twenty First Century Science Physics A (P1, P2, P3) Foundation Tier

General Comments

This paper is designed for candidates operating the G-C range. There was no evidence to suggest that candidates had been inappropriately entered for the paper. In general candidates performed well on the paper. Questions 6, 8 and 9 were in common with the higher tier paper and targeted at grades D and C. All candidates seemed to have made good use of their time. Very few candidates left answers blank.

The Ideas about Science questions were generally well answered, however those requiring recall of scientific facts and knowledge were less well done.

Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Comments such as 'please mark the pencil lines not the ink ones' are impossible for markers to interpret. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit either of two possible responses, where only one is correct – will ***not*** gain credit on this paper.

Q1 The types and penetrating properties of radiation from radioactive sources were not well known. Common errors in (i) were x-rays and UV, which demonstrated an understanding of ionising radiation but not radioactivity. Answers to part (ii) were almost random. Parts (b) and (c) were generally well answered.

Q2 Part (a) demonstrated the common confusion between greenhouse effect and ozone layer issues. By far the most common error was carbon dioxide/carbon monoxide. Part (b) was well answered by nearly all candidates. Candidates had some understanding of photosynthesis in part (c), but many confused which gas was produced and which gas absorbed.

Q3 Candidates appeared uncertain about nuclear waste with many answers being crossed out and replaced, before getting a correct answer. It was pleasing to see many candidates understanding the term half-life.

Q4 Where candidates were expected to recall information they performed poorly e.g. parts (a) and (b). However, they performed well on the idea of an expanding universe in part (b) and the idea of peer assessment in part (d)

Q5 This question differentiated well. Weak candidates often gave 'reflect' and 'expand' in part (a) presumably mixing up the properties of microwaves and kinetic theory with heating effects. Better candidates' errors were more likely to be putting 'absorb' and 'vibrate' the wrong way round. Many candidates thought microwaves were ionising. Part (b) was generally well answered, with the air vents being the strongest distracter.

Q6 This question was an overlap question with the higher tier, targeted at grades D and C. However it proved to be fairly straightforward with many candidates scoring well. The most common errors were Kevin in part (a), Joe in part (b) and Mark or Joe in part (c).

Q7 Candidates demonstrated a good understanding of disasters related to plate tectonics and the risk management associated with the disasters.

Q8 This question was an overlap question with the higher tier, targeted at grades D and C. As such it was challenging for most candidates. The range of answers to part (a) suggested candidates may not have had calculators. The 65% proved too tempting a distracter for many candidates in part (b). Parts (c) and (d) were more often correct, with 'sulfur' being the most common error in part (b) and 'producing electricity does not harm the environment' in part (d).

Q9 This question was an overlap question with the higher tier, targeted at grades D and C. This was the most demanding question on the paper. Very few candidates were able to answer part (a) correctly, there was no apparent pattern in the wrong answers. Part (b) was more straightforward with more correct answers, but again no particular pattern of errors. In part (c) the most common error was to invert the question and tick the two statements which were not data.

A331/02 Twenty First Century Science Physics A (Modules P1, P2, P3) Higher Tier

General Comments

The paper was tackled well by candidates and produced a high mean mark.

Candidates seem to have been well prepared for this objective style of questioning.

Candidates should be aware that the marking is done from scanned images of their scripts.

Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit for either of two possible responses, where only one is correct – will not gain credit on this paper.

The level of difficulty was appropriate for the ability range and all questions were accessible to candidates across the ability range.

The vast majority of candidates generally performed well and marks were awarded across a wide range, demonstrating good differentiation.

Scores typically ranged from the low twenties to the high thirties (out of 42 marks).

Most candidates correctly followed the instructions in the questions and most made their responses appropriate to the number of marks available. Some, however, did not read the questions carefully enough.

All candidates seemed to have made good use of their time.

There was no evidence of candidates running out of time.

Q1 Almost all candidates were able to interpret the energy flow diagram correctly and performed well on parts (a) and (b) of this question. Part (c) differentiated well, with only the most able candidates able to successfully complete the description of fission in a nuclear power station correctly. A significant number of candidates believed that it is an electron rather than a neutron that splits the nucleus. Many weaker candidates seemed to be unaware of the concept of a chain reaction.

Q2 Parts (a) and (b) were generally well answered by most, with the second box in (a) and the first in (b) being popular incorrect responses with some weaker candidates. In part (c) many candidates showed a good understanding of data. This part question is an example of where candidates did not always use the number of ticks demanded - 3 ticks instead of two often appeared in (c), causing the candidate to lose a mark.

Q3 This question was well answered by all but the weakest candidates. It seems clear that this style of question is now more familiar to candidates, probably due to teachers preparing them well and with the use of past examination materials to support learning in the classroom.

Q4 Most candidates were able to state whether each observation agreed or disagreed with the theories described in this question. A significant minority of candidates felt that the 2nd observation proved the idea of a supercontinent (Pangaea) rather than merely supporting the idea.

Q5 Parts (a) and (b) of this question were only tackled well by the more able student. Many students felt that the question was about the brightness of the stars (third answer box) rather than the correct answer. In part (b)i many candidates opted for the first answer which was the correct speed in m/s rather than km/s. Candidates can expect questions where a change of units is required on this higher tiered paper. A significant number of candidates calculated 10% of the value for the speed of light and therefore chose 30 000 as their answer in (b)ii. An understanding of the light year as a unit of distance, including simple calculations such as this, is expected of candidates. Some weaker candidates did not seem to appreciate the issues discussed in part (c) of this question, particularly feeling that the scientists would travel to the planet to continue exploration.

Q6 A large number of weaker candidates did not seem to recognise the terms for describing categories of nuclear waste in part (a). Half life calculations in part (c) were handled well by only the most able. The majority of candidates felt that none of the radioisotope would remain after 72 000 years. Candidates are reminded that a scientific calculator is allowed for this paper. Many calculators will allow multiplication of fractions, which may have helped some candidates in this question.

Q7 This different approach to linking information from each column proved very accessible, with a small minority of candidates disregarding the instruction and choosing to link boxes anyway (If correct, they were not penalised for this). A large number of candidates felt that the change caused to the atmosphere by this process is a permanent one. Many weaker candidates got confused with ideas about the greenhouse effect and therefore could not score well here.

Q8 Almost all candidates realised that the number of photons arriving per second affected the intensity of received radiation in part (a). Only more able candidates correctly selected the energy of each photon as the second factor. The total number of photons was a very popular incorrect choice. Part (b) differentiated well in terms of ability, although a significant number of grade A candidates seem to believe that photons lose energy as they travel. Weaker candidates chose this answer, often in combination with the idea that low energy photons cannot travel very far.

Q9 This question differentiated best of all the questions on this paper. Very few weaker candidates got more than a single mark on the whole of this question. A wide range of answers were seen in part (a) where the candidate was given a free choice. Again, many candidates suffered from not using a calculator in parts of this question. In part (b)i both ‘91’ and ‘93’ were popular choices for the majority of candidates, although performance was far better on (b)ii.

A332/01 Twenty First Century Science Physics A (Modules P4, P5, P6) Foundation Tier

General Comments

This paper is designed for candidates operating in G-C range. There was no evidence to suggest that candidates had been inappropriately entered for the paper. There was no evidence of candidates having time difficulties with the vast majority completing all questions in the time allowed.

Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit to either of two possible responses, where only one is correct – will not gain credit.

Q1 This question was fairly well answered by all candidates. The most common errors were in 1d, i.e. in correctly identifying kinetic and gravitational potential energies.

Q2 Candidates scored well in part (a) of this question but found parts (b) and (c) much more difficult. Many wrongly identified instantaneous speed with constant speed (part b) and the horizontal straight line in a distance-time graph as representing constant speed (part c).

Q3 This proved to one of the most difficult questions on this paper. Candidates tended to know the largest resistor in a series circuit would have the highest voltage and where the largest current will flow in the parallel circuit but they did not understand the rules for a series circuit nor that the smallest resistor in a parallel circuit would have the largest current. They also correctly identified that the voltage of a battery is a measure of the push it gives to charges but did not realise the bigger the voltage across a resistor then the more energy is lost by a charge flowing through it.

Q4 Most candidates could explain how the resistance of a thermistor changes with temperature but found more difficulty in correctly identifying the symbols for a thermistor and a LDR.

Q5 This was a well answered question, the most common error was the checker being identified as the voltmeter.

Q6 The vast majority of candidates identified wavelength but had more difficulty with frequency in understanding differences in different colours. Similarly they knew where visible light belonged in the electromagnetic spectrum and that light travels at very high speed but less seemed aware that not much light is absorbed by glass.

Q7 Candidates were not clear in their knowledge of digital signalling and this question provided many disappointing answers. Whilst the majority knew digital signals were made up of 1s and 0s fewer could identify the other differences between analogue and digital signals. Even fewer could explain that a receiver makes a copy of the original sound in an analogue system whilst in a digital signal it is the decoder.

Q8 This question was an overlap question with the higher paper and it proved to be a good differentiator with able candidates often scoring all four marks whilst weaker candidates only scored one mark.

A332/02 Twenty First Century Science Physics A (Modules P4, P5, P6) Higher Tier

General Comments

This paper is designed for candidates operating the A*-D range. There was no evidence to suggest that candidates had been inappropriately entered for the paper. The paper was generally well attempted, with a mean mark slightly down on January 2008. Questions 1, 5 and 6 were in common with the foundation tier paper and targeted at grades D and C.

An overall impression is that candidates were generally clear about their subject knowledge, and many showed impressive understanding of some very difficult concepts in forces and waves. Most candidates correctly followed the instructions in the questions and most made their responses appropriate to the number of marks available. This was an improvement over previous sessions.

Candidates should be aware that the marking is done from scanned black-and-white images of their scripts and are marked online. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. To put additional lines or write comments such as “please mark the pencil” or “the blue lines are correct” make it difficult for the examiner. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit for either of two possible responses, where only one is correct – will ***not*** gain credit on this paper.

All candidates seemed to have made good use of their time. Very few candidates left answers blank.

Q1 This question was an overlap question with the foundation, targeted at grades D and C. candidates performed well demonstrating a good grasp of speed. weaker candidates common errors included the sprinter getting tired in part (a), instantaneous speed meaning a very quick time in part (b) and graph **B** confusing distance-time and speed time graphs in part (c).

Q2 Most candidates correctly chose balanced forces in part (a). Parts (b) and (c) were more demanding. Common errors in part (b) were to connect A (lift) to Earth B (drag) to exhaust particles and D (thrust) to Molecules of air. In part (c) many candidates appeared to only consider kinetic and gravitational potential energy hence correctly answering the top row but only ticking the level flight box for energy conservation. There was some evidence that some candidates mistakenly thought they could only tick one box in each row and column.

Q3 This question was not answered well by many candidates. The ability to apply ideas about voltage and current in circuits numerically was demonstrated by very few candidates. Part (a)(i) was best answered. Common errors in (a)(ii) where 8V and 12V, in (c)(iii) 6V and in (b) doubling the voltage. More practice in circuit calculations would have benefitted many candidates.

Q4 In part (a) most candidates scored 2 out of the three marks, errors were fairly evenly split between the three distracters. Part (b)(i) was answered correctly by most candidates

Unfortunately part b(ii) contained a typographical error. The stem of the question implied that there was more than one correct answer to the question, whereas there was only one correct answer. An erratum notice was issued prior to the examination. No evidence was seen during the marking process that candidates had been confused by the correction.

$N_s = N_p \frac{V_s}{V_p}$ was by far the most common incorrect answer given.

Few gained both marks in part (c) with commonly only 2 graphs listed. The majority of correct answers stated C&D, with a significant number linking A&C. It seems likely the majority plumped for linking similar images rather than understanding the idea of DC (linking A and C because they are both above the x-axis, linking C and D because they are both almost straight lines).

Q5 This question was an overlap question with the foundation, targeted at grades D and C. Nearly all candidates correctly answered this, nearly all incorrect answers joined 'checker' to 'voltmeter'.

Q6 This question was an overlap question with the foundation, targeted at grades D and C. It was generally answered correctly. The most common error was to reverse B an E, confusing diffraction and refraction. Candidates coped well with the different style of question.

Q7 In part (a) 'light reflects from mirrors' proved a very strong distracter, resulting in many candidates ticking three boxes and losing a mark. Part (b) was generally well answered with 'speed of photon' the most common error in (i) and 'wavelength' in (ii).

Q8 The calculations in part (a) were generally done well. The common error in (i) was 0.1 doing the division the wrong way round. Common errors in (ii) were 1200 and 40. Most candidates correctly answered part (b), with the wave speed answer being most often incorrect.

Grade Thresholds

General Certificate of Secondary Education
Physics A (Specification Code J635)
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A331/01	Raw	42	N/A	N/A	N/A	31	25	20	15	10	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A331/02	Raw	42	36	32	27	22	16	13	N/A	N/A	0
	UMS	50	45	40	35	30	25	20	N/A	N/A	0
A332/01	Raw	42	N/A	N/A	N/A	25	21	18	15	12	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A332/02	Raw	42	33	29	24	19	15	13	N/A	N/A	0
	UMS	50	45	40	35	30	25	20	N/A	N/A	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J635	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J635	0.0	25.0	75.0	100.0	100.0	100.0	100.0	100.0	100.0	4

155 candidates were entered for aggregation this series.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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