GCSE

Physics A

Twenty First Century Science Suite

General Certificate of Secondary Education **J635**

OCR Report to Centres

January 2012

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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 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.

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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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OCR REPORT TO CENTRES

Overview

As always it is a pleasure to see candidates who are knowledgeable and have been well prepared performing well in the J635 Physics examinations. In particular it is good to see nearly all candidates across the ability range attempting the longer free response questions. Unfortunately the problem of candidates not having calculators in the examination persists, seriously disadvantaging many. When questions are written, the Examiners assume that candidates will have access to a calculator.

Candidates' performance in Unit 1, A331 and Unit 2, A332 were significantly different. In particular the entry for A331 papers was noticeably weaker than in previous sessions; this is not too surprising as we are approaching the end of this specification's life time and a much a higher proportion of the candidates were re-taking the module. A consequence of this was the significantly lower percentage of candidates gaining the higher grades. There was little apparent change in the entry for Unit 2 A332 papers.

Examination papers are now scanned and marked online. It is vital that candidates use legible handwriting. Candidates who write outside of designated areas are at risk of their answers not being fully marked. Candidates would be well advised to ensure that they use the appropriate answer lines and spaces in which to write their responses. This is often exacerbated by candidates crossing out initial incorrect responses, and then cramming the answer into a much smaller space. Candidates should think carefully before beginning to write their answer to the question.

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

General Comments

Two thirds of the marks on this paper were awarded to objective type questions and one third of the marks were awarded for 'free response' answers in which candidates had to write their own responses. In general candidates performed better on the objective type questions.
There was no evidence of candidates having time difficulties with the vast majority completing all questions in the time allowed. It was also clear that the vast majority of candidates were entered for the correct level paper

Candidates should be encouraged to give an answer especially with the 'tick box' type of question. Failure to read the question as to how many ticks were required caused problems for some candidates. Candidates should take care to read the requirements of the question.

There were a number of very good scripts, but too many appeared to be poor this session.

Comments on Individual Questions

Q1ai) Most candidates scored at least one mark on this question although "reactor" appeared frequently as a distracter. A small number had the exact reverse order to that which was required.

1aii) Solar was frequently given, but many candidates thought that nuclear energy was renewable.

1aiii) Carbon dioxide was usually given although a small number wrote it as CO^2 and so scored no marks. Carbon monoxide and carbon were often given as answers.

1b) Candidates gave every possible combination although many scored at least one mark. In this type of question candidates should be encouraged to first use pencil because it was not easy to distinguish between crossings-out and lines which candidates considered to be correct.

1ci) All of the distracters appeared to be chosen.

1cii) "Half-life" appeared in the correct position far more frequently than did "background". "Ionising" and "radioactivity" were popular distracters.

2) Candidates found this question, requiring a written answer, difficult, with many making contradictory statements. Few appeared to appreciate the significance of the word 'better' in the question and failed to give comparisons between gamma and the other two types of radiation. When candidates did try to compare the radiations, the words 'strongest' or 'weakest' frequently appeared and scored no marks.

Q3ai) Few candidates appreciated that the aerial *emits* the radio waves; improves and reflects appeared randomly across the answers and several candidates considered that the air *absorbs* the waves.

aii) The standard of the drawing was generally poor and candidates lost marks because of this. Many did not consider the ionosphere when drawing the lines. Candidates should be encouraged to use a ruler for this type of diagram.

3b) Answers were generally poor with all parts of the electromagnetic spectrum being indicated in b(i). Even when candidates indicated UV they were unable to come up with a suitable reason.

3c) The idea of global warming/greenhouse effect was not often well understood.

Q4. The glass window was a notable distracter.

Q5 This question required an explanation and it was difficult to give marks, with few candidates appreciating the significance of the tiny sample or the lack of any control group.

5b) All distracters were seen from candidates although the majority did know that microwaves were non-ionising.

Q6ai) Although the majority of candidates did know that stars are formed from a cloud of dust and gas, collision between planets was often chosen incorrectly by candidates.

6aii) Only a minority of candidates knew that the Sun's energy came from fusion, with burning hydrogen proving to be a popular distracter.

6aiii) Although the majority of candidates scored one mark here with moons and comets in approximately equal numbers, a surprising number selected stars or galaxies.

6aiv) Only a minority of candidates scored the mark for this question; the word million was often omitted and 450 million rather than 4500 million was often seen. A number of candidates added the 500 on to produce 5500 million years.

6bi) Few candidates understood the meaning of a '*light year*' and all alternative answers were selected.

6bii) "Radar" proved to be a popular distracter as did "a laser measurer".

6biii) Many candidates failed to read the question carefully and gave the answer as one, presumably for the Earth. Some answered in a sentence without making it clear how many planets supported life **outside** the solar system and talked about Earth and life forms being found in rock from Mars.

7a) The second alternative distracter proved to be popular.

7b) Most candidates scored a mark for the first answer, but choices 2 and 4 were popular.

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

General Comments

Since the new Unit 1 paper A181/02 was offered this year, the number of candidates entered for this paper was much lower than last year. The proportion of more able candidates seemed to be lower.

Generally candidates performed reasonably well on this paper, although there are still a significant number of candidates who had difficulty assessing the questions and as a consequence performed badly. This suggests that candidates may be being entered for the higher tier, for whom the foundation tier would be more appropriate. The majority of candidates made a good attempt at the paper, with nearly all candidates attempting most questions. There was no evidence of candidates running out of time.

In general, the candidates coped reasonably well with the extended prose questions. There was clear evidence that centres had been working on how candidates deal with extended prose questions. However, for a significant minority of candidates the quality of the handwriting verged on the illegible.

Comments on Individual Questions

Question 1

Most candidates were able to give at least one of the marking points. ‘Detection outside the body’ was the least popular of the marking points. Some answers were very vague or wrong, using the idea of ‘strength’ or ‘half-life’ of the radiation, or displayed the candidate’s lack of understanding of the situation, usually assuming the question was about ‘killing cancers’. Quite a few candidates incorrectly thought gamma was the most ionising radiation and some failed to distinguish clearly between ‘penetration’ and ‘passing through the body’. A common error amongst weaker candidates was a lack of comparison between gamma, beta and alpha radiations.

Question 2

In part (a), ‘Chain reaction’ was the one answer that was most often correct, even when some of the others were incorrect. ‘Proton’ & ‘Turbine’ crept into quite a number of incorrect responses. 'Beta reaction' was occasionally seen in place of 'chain reaction'. For part (b) the two correct answers were equally popular. By far the most common error was 'energy is released from electrons'. Most candidates correctly answered part (c)(i), the most common error was mixing up the high and intermediate level waste. Part (c)(ii) was not answered very well. Although many candidates knew the intermediate waste would be active longer, they very often failed to link this clearly to the half-life. Some of those who did used words such as ‘higher’ or ‘slower’. Quite a number of candidates attempted to define half-life but were not explicit in saying how this was linked to the waste. Examples of answers not being awarded a mark are ‘stays active longer’ or ‘longer to reach its half-life’. Some candidates failed to mention ‘half-life’ at all, even though the question asks for this. A number of the incorrect answers discussed the environmental impact of the waste. For part (d) the most common errors were 'Radiation comes from the nuclei of atoms' and 'Ions have lost or gained electrons'.

Question 3
For part (a) many candidates failed to answer the question and hence did not gain any marks. Instead they gave answers about how microwaves can cause cancer or which parts of the body are affected. Few candidates referred to the creditworthy marking point about 'no mechanism'. Some candidates said there was 'no evidence' rather than "no mechanism". The words 'coincidence' and 'link' were used quite often instead of 'correlation' and thus did not gain that mark. Most candidates correctly answered part (b).

Question 4
The most common correct answer in part (a) was 'the intensity of electromagnetic radiation decreases with increasing distance from the Sun'. By far the most common error was 'the photons arriving at Venus have a higher energy'.

For part (b) most candidates knew that carbon dioxide was important although many lost the first mark because they also considered the lack of oxygen or nitrogen as being an important factor. The idea that 96% of carbon dioxide on Venus was exceptionally high and of great significance was usually appreciated. A smaller number of candidates then went on to consider the idea that the greenhouse effect was greater. Incorrect ideas included the suggestion that nitrogen actively cooled the Earth (perhaps thinking of liquid nitrogen?). Oxygen was also incorrectly identified by some candidates as a factor. They attributed the hotter climate on Venus to the lack of ozone which meant that UV could warm up the plant. Many believed that carbon dioxide itself had a heating effect on the planet; others simply gave an answer which considered the distance from the Sun.

Part (c) was not answered well and few candidates gave the correct answer of W/m^2. A common error was m/s^2. Quite a few of the better candidates often selected J/m^2.

Question 5
This was generally well answered by candidates, although the spelling was very imaginative at times. Usually the first two answers were correct, although 'breathing' was a common error with weaker candidates. The third 'deforestation' point was the most commonly incorrect with 'Driving/Pollution' as common errors, possibly indicating that candidates were not reading the question carefully.

Question 6
In part (a) most of the candidates gave a correct response. There was no apparent pattern to the errors. Part (b) was generally well done although a surprising number of candidates only ticked two boxes, despite the instruction to tick three. The most common error was "Fossils of the same type of dinosaur are found on different continents".

Question 7
Part (a) was answered poorly by many candidates. The big bang/start of the universe was most commonly correct. Many candidates incorrectly gave answers in terms of the evolution of dinosaurs and man.

Most answers were correct for part (b). Some free-hand lines were drawn sloppily and bent over to go through the origin, losing a mark.

Question 8

Part (a) was a challenging question targeted at the better candidates. The most common error was 958. Most candidates correctly deduced the answer to part (b)(i) and there was no noticeable pattern to the errors. Part (b)(ii) proved surprisingly difficult, the most commonly correct response was 'the brightness of a star'. The most common errors were 'Use the Hubble relationship' and 'measure how long it takes light to get to the Earth'. The first suggests candidates had not appreciated how close the crab nebula is to the Earth and the second that they had not considered how this would be measured!

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

General Comments

This paper appeared to have been well received by candidates with most attempting all of the questions in the time allowed.

Comments on Individual Questions

Q1(a) This question differentiated well. A considerable number of candidates did not recognise that the purpose of the wind turbine was to produce a current. Many placed C early in the list and others reversed the last two (current makes voltage).

Q1(b) Most candidates obtained both marks. The most common incorrect response was 'heating the wire' and a few candidates ticked only one box.

Q1(c) Most candidates ticked the 'changes direction' box but many chose an incorrect second response. '..does not transfer energy' was quite common.

Q1(d) Most candidates responded and got this question correct. 'Protons' was a common error.

Q2(a)(i) There was a completely random set of responses to this question.

Q2(a)(ii) Many candidates produced a good graph. There were also sinusoidal and saw-tooth shapes as well as curves, some ending in a plateau. Some drew straight lines without a ruler and others a number of straight lines superimposed on each other.

Q2(b) Incorrect responses were split between the 'current' and the 'voltage' boxes.

Q2(c) Answers were generally poorly expressed and contained a lot of confused science. Many candidates repeated parts of the stem and others talked of 'electricity flowing'. Very few obtained both marks by mentioning 'current' and 'heat' in the correct context.

Q2(d) The most common incorrect response was £300.00, but a few candidates selected £30,000.00.

Q3(a)(i) Most candidates scored the 2 marks.

Q3(a)(ii) Most candidates scored the 1 mark. The most common error was to think slowing down causes an increase in momentum and speeding up causes a decrease.

Q3(b) There were many good responses and few Maths errors to this question. Common mistakes were not to square the velocity or to square everything.

Q3(c) This was the most poorly answered question on the paper. Only a few candidates scored 1 mark. The majority of candidates did not refer to energy transfer at all. Many candidates wrote about forces and counter forces without mentioning energy. Several stated that the Kinetic Energy became Gravitational Potential Energy despite the question telling them that it was a flat road.

Q4(a) This question was generally well answered. The most common error was to correctly calculate 50 x 100, but then divide the answer by 10.

Q4(b) Most candidates responded correctly but some selected Bronwyn or Tony.

Q4(c)(i) Most candidates scored the two marks.

Q4(c)(ii) Many candidates incorrectly chose “kinetic to potential”.

Q5 Many candidates scored the ‘diffraction’ mark and the ‘constructive/destructive’ mark, although some gave these last two the wrong way around. A large number of candidates selected ‘wavelengths’ instead of ‘amplitudes’.

Q6(a)(i) There were many correct responses to this question, especially for ‘gamma’. The second box was occasionally left blank. Many incorrect waves were chosen, especially sound waves.

Q6(a)(ii) All the incorrect answers were chosen, but “frequency” slightly more than the others.

Q6(b) A very well answered question.

Q7 Many candidates scored the first mark for ‘reflection’ but few scored the second mark for refraction – often confusing refraction with diffraction. Most candidates drew a ray on the mirror diagram, but few did so within the accepted tolerance. The ray was often drawn at right angles to the mirror and sometimes through the mirror. The refracted ray, when attempted, was often in the correct direction, but exit beam was rarely parallel to entry beam.

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

General Comments

The paper was generally well attempted.

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

Candidates produced a good range of responses to the free response questions, although there was evidence that a significant number of candidates did not use a calculator in answering this paper.

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

Candidates seemed to make good use of the formulae provided at the front of the examination paper.

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

There was no evidence of candidates running out of time.

Comments on Individual Questions

1 This question on electricity produced a reasonable level of differentiated responses, with the most able candidates scoring close to full marks. Weaker candidates could not demonstrate understanding of an LDR in part (a) and could not explain why a filament bulb glows in part (c). Although many recognised it was due to increased temperature, most failed to link this to the flow of current and resistive heating. The calculation in part (d) produced a mixed response with £300.00 being a common wrong answer.

2 This question examined ideas regarding the generation of a.c. electricity. In part (a) the majority of candidates failed to sequence the statements correctly, the last two statements often being transposed. Most candidates could identify both factors which would result in an increase in current in part (b). Parts (c) and (d) were both free response and differentiated well across the ability range. Some very clear descriptions were seen for both of these answers, but weaker candidates produced poorly labelled diagrams in part (d). A common error was failure to identify the iron core of the transformer. Many of the weakest candidates confused the transformer with the a.c. generator, drawing a spinning magnet inside a coil of wire or metal core.

3 The first part of this question was very well answered by almost all candidates. Part (b) of this question was entirely free response. The kinetic energy calculation proved straightforward for the vast majority of candidates, most scoring full marks. A significant minority failed to square the velocity or thought that they needed to convert the mass into weight before proceeding. Many candidates failed to discuss energy transfer in (b ii), instead preferring to answer only in terms of the forces acting. The final part proved too challenging for all but a minority of the most able candidates, with most just multiplying or dividing the speed by the time.

4 Most candidates could divide the energy transferred by the distance travelled in part (a), but many failed to convert the distance into metres first, thus only scoring one mark. Parts (b) and (d) posed little problem for the average candidate. In part (c) 1 mark out of 3 was commonly scored. The statement that “kinetic energy is proportional to speed” was often identified as true, even by more able candidates.

5 Overall, this question differentiated well. Strong candidates had no trouble with parts (a) and (b) of the question. In part (a) average candidates scored the first and third marking points, but often incorrectly selected ‘frequencies’ in place of the correct answer of ‘amplitudes’ in the description of interference. Almost all candidates could correctly complete the list of radiations present in the electromagnetic spectrum in part (c). The calculations of wavelength and frequency proved problematic, with a higher than average rate of non–completion. **Candidates should be reminded that use of standard form in calculations is part of the mathematical requirements for this specification.**

6 This question produced a good spread of marks across the ability range. The diagram showing total internal reflection was well answered, but a surprising number of the written responses confused reflection and refraction. A significant number of candidates ticked two boxes in part (b), possibly confused by the question asking which pair of statements explains the difference. The instruction clearly asked for a tick in the box next to the correct answer. Candidates should be reminded of the need to take time to carefully read the instruction before answering.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553