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Examiners' Report

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- Advanced Subsidiary

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GCE Applied Science – AS Units

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Unit SC02 – Energy Transfer Systems

General Comments

On the whole most candidates appeared to do better with the biology questions than the physics questions in this combined examination. This was particularly evident with the less able candidates. The more able candidates demonstrated a balanced understanding of energy transfer in the two different areas of expertise.

Question 1

(a)(i) Most candidates gained a maximum of two out of the three marks available. The examiners felt this was rather disappointing as there were 21 possible mark points available from the mark scheme. There was no reference to pyruvate or the possible resynthesis of Creatinine phosphate.

(ii) Most answers gained only one of the two marks available, this being mostly for giving a correct word equation for aerobic respiration, rather than a balanced equation. Only the better candidates gave a correctly balanced equation.

(b)(i) The left ventricle was generally correctly labelled on the diagram of the heart.

(ii) The aorta was generally correctly labelled on the diagram of the heart.

(c) Mostly correct names given for the blood vessels.

Question 2

(a) The normal body temperature was given correctly in most cases.

(b) Mostly candidates gave a correct cause for raised body temperature in the absence of infection. However, some incorrectly mentioned fever.

(c) Generally poor understanding of the cause of fever. Only the better answers referred to a high temperature denaturing bacteria, which are the cause of a fever.

(d)(i) Very well answered by the whole range of candidates.

(ii) Often poorly answered with candidates writing about vasoconstriction or vasodilatation.

(iii) Correctly answered by the more able candidates.

Question 3

(a)(i) Mostly correct answers with reference to energy production within cells.

(ii) Generally a good understanding of how the lungs take in oxygen and that it is then delivered to the cells to enable cellular respiration to take place.

(b)(i) A good understanding of how the alveoli work to aid gas diffusion. This was apparent with all levels of ability.

(ii) Most answers gained only one or two of the three possible marks. Many candidates wrote about alveoli in the wrong context, when the question had specifically asked for a discussion of the role of blood vessels shown in the diagram.

(c)(i) The average breathing rate was calculated correctly by most candidates.

(ii) The tidal volume and vital capacity values were mostly correctly obtained from the graph. However, some candidates appeared to confuse the two values and gave them the wrong way round, thus failing to gain the two available marks.

(d)(i) Most answers gained at least three of the possible four marks. Most candidates demonstrated a good understanding of the procedure to be followed when measuring blood pressure. Only the less able candidates failed to provide a reasonable account.

(ii) Although generally correctly answered a substantial number of candidates gave diastolic over systolic, instead of the other way round. Answers often referred vaguely to systolic and diastolic without saying that systolic was above diastolic, hence failing to gain the mark. Also, for the second mark point, very few candidates gave the correct unit. Where units were provided they were often incorrect e.g. beats per minute instead of mmHg.

Question 4

(a)(i) Many answers demonstrated a good understanding of the energy changes that take place in a crumple zone during a collision.

(ii) Fairly well answered with most candidates gaining two of the possible three marks.

(iii) Some confused answers with references to absorbing force, rather than absorbing energy.

(iv) Some of the incorrect answers mentioned seat belts and flexible glass, with no reference to absorbing energy, the key part of the answer.

(v) Most answers gained no marks at all with only the better candidates referring to the fact that damage done depends on energy transferred. No candidates gained the second mark point.

(b)(i) The graph was variously plotted. The most common errors were reversing the scales, plotting the data for the length of the car instead of the change in length of the car as asked to do, and drawing the line of best fit as a straight line instead of a curve. Where the points were correctly plotted and a curve drawn, the line of the curve often failed to reach the origin of the graph, thus failing to gain a mark point. Another source of error was failing to provide units on the axes.

(ii) Most candidates failed to give any suggestion for how the speed of the car could be measured at the point of collision. Those who did attempt to answer the question were mostly incorrect.

(iii) Good suggestions for factors which needed to be controlled. Well answered by the whole range of candidates.

(iv) Most answers were correct and gained the first mark point but failed to mention that the increase in crumple zone reached a limit or levelled off, thus gaining only one of the two marks available.

Question 5

(a) Most answers were correct and gained the first or second mark point only, with only one candidate referring to the temperature difference of 1 Kelvin.

(b) Mostly answers gained the full two marks.

(c) Only a handful of correct answers, in most cases no marks were awarded as the method was usually incorrect.

(d) Excellent answers relating to environmental problems.

(e) Most candidates wrote about heat rising, rather than hot air rising and hence failed to gain the first mark point. No reference whatsoever to there being a greater temperature difference at the ceiling, though most correctly referred to more heat being lost though the roof.

(f) Those candidates who understood that air is trapped in loft insulation provided a good explanation for how the material is suitable for limiting the rate of thermal energy movement. However, many candidates wrote about heat being trapped within the insulation, with no reference to air pockets etc.

Question 6

(a) Many attempts at this section of the question gained the two method marks only as they failed to use an acceptable number of hours of sunshine in their calculation.

(b) Many answers gave the correct equation but failed to arrive at the correct efficiency value.

(c) Most candidates correctly gave heat or light as the energy that was not turned into electrical energy. However, many also gave sound which negated the mark awarded for heat or light. Few mentioned correctly what happened to the heat/light energy, thus gaining only one of the two possible marks.

(d)(i) Most candidates understood the advantage of recharging the battery from running the boat engine while many thought that recharging it from mains power on shore would cause no pollution, rather than less pollution.

(ii) See above.

(e) The more able candidates gave a good explanation of how the feedback system worked, while others merely reworded the contents of the question.

Mark Ranges and Award of Grades

Unit	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
SC02 – Energy Transfer Systems	80	80	28.0	10.6

SC02 – Energy Transfer Systems (933 candidates)

Grade	Max mark	A	B	C	D	E
Scaled Boundary Mark	80	52	46	40	34	28
Uniform Boundary Mark	100	80	70	60	50	40

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidate lie in range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).

Uniform Mark: a score on a standard scale which indicates a candidate's performance. The lowest uniform mark for grade A* is always 90% of the maximum uniform mark for the unit, similarly grade A is 80%, grade B is 70%, grade C is 60%, grade D is 50%, grade E is 40%, grade F is 30% and grade G is 20%. A candidate's total scaled mark for each unit is converted to a uniform mark and, when subject grades are awarded in 2004, the uniform marks for the units will be added in order to determine the candidate's overall grade.