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Examiners' Report June 2009

GCE

GCE Biology 6BI01 / 6BI02

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6BI01 Unit 1

Maximum mark	80
Mean mark	36.4
Standard deviation	11.8

As a result of consultation with teachers, Edexcel has gained accreditation from QCA to increase the duration of this paper from 1 hour 15 minutes to 1 hour 30 minutes. This revision of time allocation will come into effect in the January 2010 series.

Question 1





The multiple choice section to this question did not cause the candidates too many problems, with even the E grade candidates picking up two or three marks.


Drawing the DNA molecule was poorly done, with only the A grade candidates consistently gaining all three marks. Common mistakes included drawing two mononucleotides hydrogen bonded together and not joined in a strand; and poorly drawn diagrams that did not show accurately enough the position of the bonds (although we ignored this in awarding marking point 1).

Some examples are shown below.

(b) DNA is a double-stranded molecule composed of mononucleotides.

(i) In the space below, draw a diagram to show **two** mononucleotides joined together in a **single** strand of DNA (polynucleotide). Use the symbols shown below for each component in your diagram. (3)

Phosphate group		Base	
Deoxyribose sugar		Bond	





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Examiner Comments

This response was awarded marking point 1

(b) DNA is a double-stranded molecule composed of mononucleotides.

- (i) In the space below, draw a diagram to show **two** mononucleotides joined together in a **single** strand of DNA (polynucleotide). Use the symbols shown below for each component in your diagram.

(3)

Phosphate group



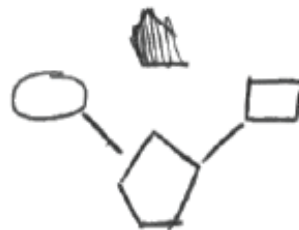
Base



Deoxyribose sugar



Bond



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Examiner Comments

This response could only be awarded marking point 1

A surprisingly high number of candidates named RNA polymerase as the enzyme in (b)(ii).

Question 2

Candidates who chose to describe amniocentesis in (a) generally scored well. However, embryos were found in some odd places (such as the stomach), amniotic fluid was withdrawn from the embryo and DNA was free floating in the fluid! Candidates describing chorionic villus sampling did less well, even at the A grade boundary. A very common mistake was to refer to the method as *chronic* villus sampling and there was little understanding of the actual location of the fetal tissue. Weaker candidates described preimplantation techniques.

2 Cystic fibrosis is a genetic disorder caused by one of a number of possible gene mutations. Prenatal testing can be used to determine whether or not a fetus has cystic fibrosis.

(a) Name **one** method of prenatal testing and explain how it can be used to detect cystic fibrosis.

(3)

Chronic villus sampling, when fetal tissue is extracted from the placenta chronic villi. The tissue is then tested for genetic disease, in this case cystic fibrosis. After 2-3 weeks results are shown, therefore they can determine any diseases or issues.

2 Cystic fibrosis is a genetic disorder caused by one of a number of possible gene mutations. Prenatal testing can be used to determine whether or not a fetus has cystic fibrosis.

(a) Name **one** method of prenatal testing and explain how it can be used to detect cystic fibrosis.

(3)

Amniocentesis. Patient is anaesthetised and fine needle is inserted from stomach and amniotic fluid is taken out which contain fetal cells. Fetal cells contain DNA which can then be analysed to detect cystic fibrosis.

There was good understanding of the benefits of prenatal testing. The majority of candidates understood that there were risks and ethical issues surrounding the technique, but failed to score well for one of two reasons. Firstly, especially at the E boundary, there was confusion over what constituted a risk and what an

ethical issue. Secondly, across the ability range, answers were poorly worded or too vague. Hopefully, with the publication of the mark scheme, candidates in the future will be able to phrase their answers to similar questions more eloquently.



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Examiner Comments

This candidate scored the first three marking points but could not be awarded the fourth point as there was not a reference to **healthy** foetus.

(b) Describe **one** benefit and **one** risk, to a pregnant woman, of prenatal testing. (4)

Benefit A benefit is that the woman will know if her child carries a chance of having cystic fibrosis and can make a decision upon that information, this could be an abortion.

Risk A risk is that there is a small chance of the woman having a miscarriage as a result of the test, this will mean the foetus will die.

(c) Discuss either **one** ethical issue or **one** social issue relating to the use of prenatal testing. (2)

Prenatal testing can be seen as unethical because, someone is aborting a child because of its genetically inherited disease. This is unethical because the baby has "rights" to life.



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Examiner Comments

This was a very typical response that scored marking point 12:

Question 3

The table was completed correctly by many candidates, including those at the E boundary.

In (b), a large number of high scoring responses was seen, although few candidates appreciated that the valves were open during diastole. Marks were lost by the weaker candidates who failed to specify clearly at which stages in the cardiac cycle events were occurring.

This is one such example:

(b) Describe the roles of the atrioventricular (bicuspid and tricuspid) valves during the cardiac cycle. (4)

one role is to prevent blood backflow, they close after the blood has passed through in order to stop it from going backwards.



A common response by a weaker candidate.

The calculation using the graph caused problems for candidates across the whole ability range. A relatively large percentage of candidates read values from the y axis to use in their calculation and as a result ended up with meaningless calculations and interesting units! From those candidates who selected the correct axis, inaccurate values were read off. It is imperative that candidates should be encouraged to read values from graphs precisely and to not make approximations; this also applies in any calculations too.

Part (c)(ii) scored highly, many candidates understanding the role of the left and right hand side of the heart. Very few candidates extended their answers to explain that high pressure through the lung would damage the tissues.

Question 4

The definitions given in (a) for causation and correlation were very disappointing, despite the fact that we asked for the definition of correlation in January. There was the expected confusion between the two terms and there were a lot of definitions where the candidates were using the words themselves in the definitions. Other frequently seen mistakes included using the words *thing* or *data* instead of variable or factor and not mentioning that there is a *change* in variables involved. A number of candidates gave specific examples, some of which were very imaginative, but did not give a generic definition.

Below are some examples to illustrate these points:

(a) There could be a causal link or correlation between high blood pressure and the other variables shown in the table.

Distinguish between the terms **causation** and **correlation**.

(2)

Causation is where there is a cause that affects the data.

Correlation is where there is a general increase or decrease in the data.

(a) There could be a causal link or correlation between high blood pressure and the other variables shown in the table.

Distinguish between the terms **causation** and **correlation**.

(2)

Causation is when there is a definite link that one factor causes another. e.g. cholesterol causes blood pressure.

Correlation is how definite that link is and the trend that that link follows e.g. positive strong correlation.

(a) There could be a causal link or correlation between high blood pressure and the other variables shown in the table.

Distinguish between the terms **causation** and **correlation**.

Causation is a when one variable directly⁽²⁾ influences another.
 Correlation is when a pattern is seen between two variables, but it is unknown whether they directly influence each other.

(a) There could be a causal link or correlation between high blood pressure and the other variables shown in the table.

Distinguish between the terms **causation** and **correlation**.

(2)

causation is the factors which influence certain characteristics or issues. correlation is the link between varying factors (one has an effect on another) this can be positive or negative.

The other parts to this question were reasonably well attempted with candidates picking up a scattering of the marks. Candidates clearly appreciate the importance of a decent sample size in collecting reliable data.

Question 5

This question yielded some good answers.

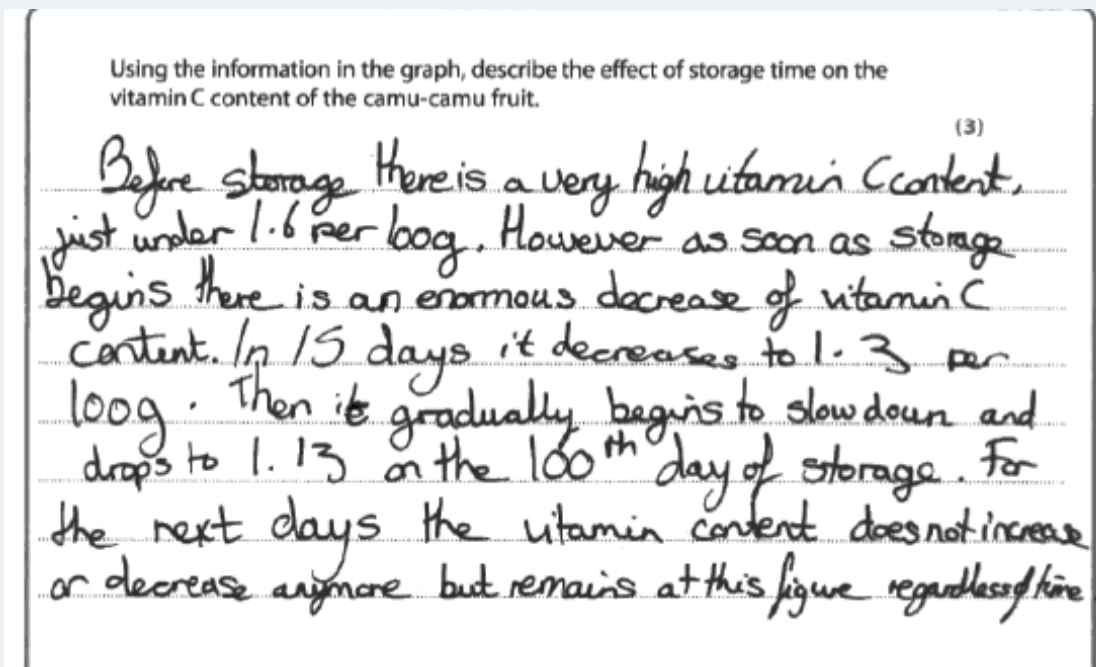
In (a), candidates scored two marks fairly consistently and the grade A candidates three marks. Marking point 5 was less frequently awarded, either because the values were incorrectly read off from the graph or because candidates were simply quoting figures and not manipulating them.

Many candidates scored all three marks in (b). The commonest mistake was simply to write **exercise** or **diet**, for example, without stating that these increased or improved respectively. Candidates have a good knowledge of the development of atherosclerosis. The grade E candidates generally scored two or three marks and the grade A candidates 4 max. Mistakes that were made included reference to fatty deposits for mp 4, the build up of plaque (as on teeth) for mp 6 and reference to the hardening of the arteries for mp 7.

Question 6

Part (a) caused a lot of problems to candidates, with only the very best candidates gaining all three marks. The first two marks were lost by candidates who either did not state when the changes in vitamin C content took place or did not read the values accurately enough from the graph, although consequential error rules applied. For questions of this type, candidates should be encouraged to lay a ruler along the straight line so that they can determine accurately the point at which the line begins to curve. The scale on the y axis was difficult and we allowed a lot of flexibility in the values we accepted for the manipulated figures mark; there were very few candidates who actually attempted some sort of calculation.

This is a typical answer:



Part (b) saw a range of answers, with some of the grade A candidates scoring 5 max. It was clear that some candidates had not covered the vitamin C practical in very much detail. Weaker candidates, who had covered the practical, scored marks for details of the vitamin C assay but could not apply their knowledge to the actual question scenario.

Question 7

Defining the terms again caused problems to candidates, especially gene and allele. Genes were frequently described as *something that codes for our characteristics* and alleles as *types of gene*.

Below are some examples to illustrate these points:

7 Albinism is a genetic trait resulting from the inheritance of recessive alleles.

(a) (i) Distinguish between the terms **allele** and **gene**.

(2)

The allele gives the characteristic of a gene.
It is a part of the gene.

7 Albinism is a genetic trait resulting from the inheritance of recessive alleles.

(a) (i) Distinguish between the terms **allele** and **gene**.

(2)

Allele is part of the gene e.g. A or a and gene is the ~~use~~ alleles put together e.g. Aa which codes for a certain characteristic.

7 Albinism is a genetic trait resulting from the inheritance of recessive alleles.

(a) (i) Distinguish between the terms **allele** and **gene**.

(2)

Genes are what code for proteins. Alleles are what make up genes.

In (b), many candidates could identify that Cara, Jasjeet and Daniel were carriers of albinism but some went on to penalise themselves by suggesting that other family members were too. Naveeda was frequently named, as there are candidates who do not appreciate that the heterozygous individual is referred to as a carrier and not the recessive homozygous individual. Vague reasons were given for their choices, with few candidates actually explaining that an allele was being passed on from parent to child.

Part (c) saw a variety of answers, the most frequent being the lack of camouflage that albino squirrels would have. There were suggestions that white squirrels would not appear attractive to other coloured squirrels and there were one or two candidates who commented on the number of predators that squirrels had, compared to humans who have none.

The final part of this question must have appeared too straightforward to some candidates as there were some very long and complicated answers. The weaker candidates simply rewrote the information shown in the equation.

Question 8

Question 8 caused candidates the most problems, even though it was based on a very basic and traditional biological experiment.

If (a) had been well answered we could have made the comment that candidates knew the meaning of the term, but had no understanding of the process. However, very few candidates could clearly explain the meaning of the term, giving vague statements that did not clearly indicate what concentrations they were referring to. This is illustrated in the response below that could only be awarded mp 1.

(a) Explain the meaning of the term **osmosis**. (2)

The movement of water particles through a partially permeable membrane from low concentration to high concentration.

The marks for this question were generally scored in (c) and (d), although very few candidates who tried to discuss the use of a rule could actually explain why it would be less accurate than a balance. This is illustrated below in the candidate's second statement.

(d) A second student wanted to perform this investigation by measuring the change in length of the potato pieces. The student was advised that this method would not be as accurate as weighing the potato pieces.

Suggest **two** reasons why measuring the change in length would not be as accurate as weighing the potato pieces. (2)

- 1 The change would be very slight as the ~~cell~~ cells are so tiny and the overall ~~change~~ absorption isn't much.
- 2 It would be difficult to measure with a ruler and so mistakes could be made that makes the results less accurate.

6BI02 Unit 2

Maximum mark 80

Mean mark 48.3

Standard deviation 13.0

As a result of consultation with teachers, Edexcel has gained accreditation from QCA to increase the duration of this paper from 1 hour 15 minutes to 1 hour 30 minutes. This revision of time allocation will come into effect in the January 2010 series.

General comments

This paper saw the first major cohort of unit 2 candidates and it was most pleasing to see that many dealt effectively with the diverse array of question styles. A number of Examiners commented on the encouraging knowledge-base of candidates: credit should be given to both candidates and their teachers for this. The paper also effectively allowed candidates to display understanding, in both familiar and unfamiliar contexts, and many acquitted themselves admirably across the whole paper.

In some cases, candidates' written responses were ambiguous or insufficiently clear to allow marks to be awarded. In other cases, there was evidence that some candidates may not have read question items sufficiently carefully. For example, a number of candidates failed to put crosses in question items that requested either a tick (✓) or a cross (✗). There were also occasions of hybrid cross/ticks (✕) being seen, where marks could not be awarded. It would be worth reminding future candidates of the need to tick or cross each appropriate box carefully.

Question 1

This question presented a variety of different questions types and candidates responded well as suggested by a mean of nearly 7 out of 9. Some candidates limited their scores in (a)(i) by either supplying one or three ticks when two were asked for. Several placed crosses in the remaining boxes but were not penalised. Part (a)(ii) showed the full range of scores whilst only a minority found (b) challenging.

Question 2

Many candidates found it hard to express themselves succinctly in (a). In particular, few appeared to take note of the different command word in (a)(i) and wrote a definition for an organ **and** for a tissue. Perhaps the most common misconceptions appeared to be that organs have a blood supply but tissues do not and whether both had a function as illustrated by a relatively typical candidate answer below.

2 The liver is an organ with many functions.

(a) (i) Give **one** difference between an organ and a tissue.

(1)

An organ has a specialised task, whereas tissue doesn't
e.g. lungs for respiration

(ii) Suggest **one** way in which tissues and organs are similar.

(1)

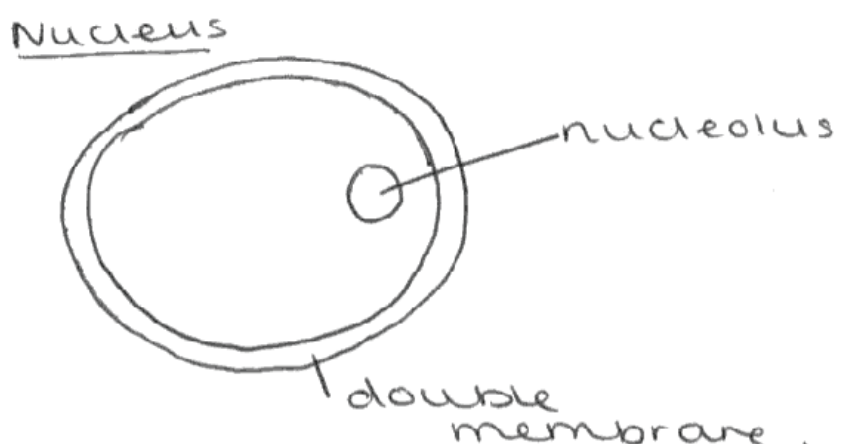
~~Both organs and tissues have jobs to do in the body.~~
Organs and tissues are both made up of cells.

It was pleasing to see that many candidates had a good knowledge of cell organelles and scored full marks in (b). A few candidates suggested centromeres rather than centrioles for the second organelle. The description for the third organelle makes reference to structures filled with hydrolytic enzymes so the term vesicle was considered to be too general.

There was a wide diversity of diagrams for (c), ranging from those that appeared to draw a cell as seen under an optical microscope to the one shown below. Half the marks were awarded for labels but the labels had to refer to the correct structure.

(c) In the space below, draw a fully labelled diagram of a nucleus, as seen using an electron microscope.

(4)



Question 3

Some candidates relished this question and were able to showcase a thorough understanding of both cell and organism adaptations, plus knowledge of a core practical.

Generally, (a) was tackled well although some had a less sound grasp of the difference between physiological and anatomical adaptations. Part (b) delivered the full mark range and all examples given on the mark scheme were encountered by Examiners except 7D and 7E. There was evidence that, whilst almost all candidates fully appreciated the describe command, several were less secure as to the meaning of explain.

The example below displays a slightly ambiguous and relatively common response for 2E. The reference to lipid stores was awarded (2D) but the accompanying explanation was too far removed from 'supplies nutrients for division/eq'. Both 4D and 4E were awarded for the second adaptation.

(b) The human egg cell is adapted for its function. Describe and explain **two** adaptations of the human egg cell. (4)

- 1 Contains lipid stores to nourish the developing embryo after fertilisation
- 2 Has a ^{jelly-like} layer surrounding the membrane (zona pellucida) which can be thickened after fertilisation to prevent penetration by any more sperm.

Part (c) offered candidates the opportunity to apply their knowledge of a core practical to a new possible antimicrobial plant source. Whilst many candidates were able to write a clear and logical answer (and therefore scored highly), it was not uncommon to have passages that either did not make reference to a bacterial lawn/eq or to agar. The mean score, however, for this item was only a little over two and there was evidence that a sizeable number of candidates seemed unfamiliar with the practical details.

Question 4

The first two parts to this question were tackled especially well. Candidates displayed a good ability to identify the correct stages of mitosis, though a number also suggested interphase or cytokinesis as answers in (b). Part (c) proved a little more tricky and (ii) in particular elicited a host of responses. Only a minority recognised that the acid in stage 2 softened the tissue by working on the middle lamella. Many felt that the acid was to stop mitosis progressing or to break down the cell membrane.

In (c)(iv), candidates were required to suggest both a risk and appropriate precaution to achieve a mark. Most suggested safety risks but a few considered risks to the root tip squash not progressing successfully. Both routes enabled candidates to gain the marks but it was not uncommon to see precautions that were too general such as tying hair back or getting the teacher to use the sharp knife for the student!

The candidate response below gives both a procedural risk and a safety risk and suitable precaution in each case.

(iv) There are various risks associated with the production of a root tip squash.
Suggest **two** risks and the precautions you would take to minimise each risk.

(2)

- 1 The use of acid. Minimise the use of the acid by only using the amount required because acids can be highly corrosive. Or use as weak an acid as suitable, so the risk of it having a corrosive effect is limited.
- 2 The use of the stain can stain skin or eyes. Wear goggles and gloves to reduce contact with it.

Question 5

Rather surprisingly this was one of the lowest scoring questions with an overall mean mark less than half the question total. Approximately half of all candidates gave a sensible suggestion to (a)(ii), though many felt that it was a stimulus from the pollen grain itself that caused the growth towards the micropyle. The example below illustrates nicely the type of answer often seen in (a)(ii), whilst the enzyme eating the style was a favourite.

- (ii) The tip of the growing pollen tube releases digestive enzymes into the style.
Suggest the role of these digestive enzymes in the growth of the pollen tube. (3)

The pollen tube has to get all the way down to the micropyle. It will need digestive enzymes to get down there as there will be things in its way. Like the Sperm in humans it will have to go through a layer to get to it, it will need the digestive enzymes for this.



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Examiner Comments

A common response produced by candidates.

Candidates appeared to fall into one of two camps with regard to (b). Either they had a comprehensive grasp of various functions of water in the plant and gave precise answers; or the three answers tended to repeat each other and often relate to plants dehydrating.

Question 6

This was another question which challenged candidates across the spectrum of items. In (a)(i), most realised that it was graph A; but a number then failed to supply an adequate explanation for the height distribution. Instead, they tended to justify why they did not choose the other graphs. Candidates who selected the wrong graph could still gain marks for an appropriate explanation. Few candidates had difficulty completing the graph but only a minority gained two marks for the description in (b)(ii) and almost nobody offered marking point 2.

Candidates again displayed their ability to tackle novel questions as many achieved all the marks for (c). However, it was (c)(iv) that caused the most trouble with the most popular response being that it was the median altitude.

Question 7

Candidates clearly enjoyed (a) and described in excellent detail the double blind trial. In a few cases, candidates' wording implied that both the suppliers (doctors usually) and the patients did not know what drug they were taking! However, they still supplied sufficient information to gain full marks. A similar ambiguous situation arose in (b)(iii) where many felt that bioplastic was renewable, whereas it was the source that was renewable. Some candidates seemed not to distinguish between sustainable and biodegradable and gave similar answers for (ii) and (iv). In (c), a range of suggestions was seen and a few candidates felt inclined to label the remainder of the diagram.

Question 8

There were many exemplary answers to (a), with candidates recognising that it encompassed protein transport and some aspects of exocytosis. However, other candidates felt it necessary to write comprehensively about transcription and translation (a topic that is not in this unit). Many of the best answers followed a logical sequence, starting with the rER. Incorrect references to sER were quite common but it was very heartening to see so many fine responses.

Much of (b) was also tackled well, though defining a totipotent stem cell often only scored one mark as exemplified by (b)(i) in the student response below. The most common risk suggested in (iii) was rejection. However, a number of candidates appeared to misinterpret the question, as demonstrated in the same candidates answer below.

(b) There are certain rare blood disorders in which there is a shortage of white blood cells. One potential treatment would be to inject totipotent stem cells into individuals with these disorders.

(i) Explain what is meant by the term **totipotent stem cell**.

(2)

The ability to produce all types of cells, and specialised cells in organisms including extra-embryonic cells.

(ii) Suggest why injecting totipotent stem cells may benefit a person with a shortage of white blood cells.

(1)

totipotent stem cells can differentiate and produce more white blood cells, therefore increasing the white blood cells.

(iii) Suggest **one** risk to the person receiving the stem cells.

(1)

Not all people believe using stem cells are OK. Some people believe that because stem cells come from the early stage of an embryo, it has wanted a innocent life.

(Total for Question 8 = 9 marks)

APPENDIX A

Unit Grade Boundaries And Uniform Marks

The raw mark obtained in each module is converted into a standardised mark on a uniform mark scale, and the uniform marks are then aggregated into a total for the subject. Details of the method of aggregation are given in Appendix B.

For AS examinations, the two examined unit tests (6BI01 & 6BI02) each have a weighting of 40% with a maximum of 120 uniform marks; and the coursework unit* (Unit 6BI03) has a weighting of 20% with a maximum of 60 uniform marks.

For the A2 units, the two examined unit tests (6BI04 & 6BI05) also each have a weighting of 40% with a maximum of 120 uniform marks; and the coursework unit* (Unit 6BI06) has a weighting of 20% with a maximum of 60 uniform marks.

Therefore, for candidates taking the full A level, the four examined unit tests (6BI01, 6BI02, 6BI04, 6BI05) each have a weighting of 20% with a maximum of 120 uniform marks; and the two coursework units* (Unit 6BI03 & 6BI06) have a weighting of 10% with a maximum of 60 uniform marks.

The table below shows the boundaries at which raw marks were converted into uniform marks in this examination. The A and E grade boundaries are determined by inspection of the quality of the candidates' work. The other grade boundaries are determined by dividing the range of marks between A and E. Marks within each grade are scaled appropriately within the equivalent range of uniform marks.

Unit grade boundaries

	Maximum mark	Grade				
		A	B	C	D	E
Unit	Uniform marks					
	120	96	84	72	60	48
	Raw marks					
6BI01 (Unit 1)	80	49	44	40	36	32
6BI02 (Unit 2)	80	61	56	51	46	42

	Maximum mark	Grade				
		A	B	C	D	E
Unit	Uniform marks					
	60	48	42	36	30	24
	Raw marks					
6BI03	40	34	30	26	22	18
6BI07 (International)	40	29	25	22	19	16

*or written alternative for International centres

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