GCE

Human Biology

Advanced GCE **A2 7886**

Advanced Subsidiary GCE **AS 3886**

Report on the Units

June 2008

3886/7886/MS/R/08

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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.

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

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Advanced Subsidiary GCE Human Biology (3886)

REPORT ON THE UNITS

Chief Examiner's Comments

Great care is taken to ensure comparability between the GCE Human Biology and Biology specifications. As the candidature for Human Biology is less strong than the candidature for Biology, this inevitably leads to a lower proportion of A grades and a lower pass rate for the Human Biology specification. Given that the two specifications are of 'equal worth', centres are advised that the entry criteria they employ for the two courses should therefore be broadly similar.

As has been reported in previous Chief Examiner's comments, this examination series saw an increase in entries at AS and A2. This shows that the specification continues to be well received and indeed all the indications are that the new Human Biology specification will be able to build upon the successful elements of this one. Centres are continuing to deliver the context-based approach true to the aims of the specification. This was seen in particular in unit 2856, where the long answer question was set on the conditions under which whole blood is stored.

The candidature included many candidates resitting from previous series (especially from 2856 and 2866). This strategy is well informed as it allows candidates to improve their UMS scores. There was, however, evidence that many of these candidates did not show improvement – especially those candidates from the weaker end of the ability spectrum.

The A2 units in this specification both contain synoptic elements. This series saw a significant candidature sit 2867 and the examiners of this unit reported that candidates fared particularly poorly on the synoptic questions with the first question proving far more difficult to candidates than the examiners' anticipated. Centres are reminded that although there is a significant amount of material to be covered for 2867, teaching time still needs to be allocated to training candidates to perform well on the synoptic questions.

The examiners reported this series that the extended writing questions, especially in the A2 papers, showed a great deal of positive achievement and that many candidates were able to produce very coherent and well structured paragraphs, even under examination conditions. However, one particular long answer question on 2866 required candidates to describe a pregnancy test which lent itself to annotated flow diagrams. Examiner reported very few such diagrams. Centres should be aware that labelled diagrams or annotated flow diagrams will be accepted by examiners as legitimate ways of answering such questions.

The most problematic questions this series were those that started 'What is meant by the term ..' Many candidates had genuine difficulty expressing their knowledge in clear, written English.

> **Teaching tip**
>
> Key terms and definitions can easily be recapped with matching exercises. Matching exercises are useful even on their own. However, they are most effective when linked with exercises that end up with students writing their own definitions out by hand.

Understanding and answering the questions

As a science, Human Biology questions are written in a clear but somewhat technical way. Candidates need to develop the ability to use prompt material judiciously and to respond to the actual questions that are asked.

> **Teaching tip**
>
> Encourage candidates to develop study skills by incorporating generic skills training into teaching schemes. Geoff Petty has developed some excellent freely available resources to this end (http://www.geoffpetty.com/genericskills.html)

There were many instances where candidates did not always read the questions properly or pay close attention to the prompt material. Candidates in some instances showed evidence that they had failed to read prompt material even when it was essential for the proper understanding of a particular question.

> **Teaching tip**
>
> Candidates need to be aware that some prompt material is 'scene setting', introducing them to the topic of the question, while other prompt material is essential for producing a complete answer. Candidates should be trained to read prompt material and to decide whether it is introductory or whether it is required for answering the questions. Past question papers can be used to devise class exercises to improve this skill.

Unit 2856 had a final question printed on the back page of this series' examination paper. The omit rate for this question was the highest for the paper. This suggested that some students failed to notice that there was a question on the back page and had missed 6 of the 60 marks for the paper.

> **Teaching tip**
>
> Ensure some of the past papers used for tests and examination training have questions on the back page, or part questions on a follow-on page, or lines to be added to graphs. The more practice that students have, the less likely they are to be caught out in the exam hall.

There was evidence that some candidates were not producing answers that matched the tariff on the questions. It is generally the case that one piece of AS or A level information is required for each marking point in a question.

Information, Figures, Tables and Graphs

In general, the data questions were handled well by candidates and they were able to describe patterns and trends of graphical data well. A common weakness, however, was the failure to refer to the whole of a graphical curve and candidates often began their description at a specific or significant point in the curve.

Some of the questions set on graphs this series required candidates to draw a line onto a graph. The omit rate on these questions was significant and indicated that some candidates simply failed to realise there was a question to be answered.

Teaching tip

Teachers would be well advised to 'cherry pick' some past question papers for tests that have graphs where lines need to be drawn on. Then the need to watch out for these can be emphasised during class feedback.

Mathematical requirements

This series saw good answering of the mathematical questions. Centres are reminded that the scope for setting calculations is broad in context but limited in the mathematical skills required. Therefore, it is well worth ensuring that candidates have practiced examples of the most common types of mathematical questions.

Teaching tip

Mathematical questions are questions that all candidates of all abilities should attempt. These are the questions where one mark could be picked up by simply 'having a stab'. At the end of class tests, a simple table could be added for students to complete.

Mathematical skills question	*Done (✓)*
Did I attempt the maths question	
Did I show my working	
Did I give my answer to the degree of accuracy the question asked for	

Centres should continue to make candidates aware that these questions can be set on any of the modules of this Human Biology specification.

Presentation

Diagrams are acceptable parts of a candidate's response but they should **always** be labelled. Surprisingly few labelled diagrams and flow charts were presented in responses this series.

The language of written responses at times led to candidates failing to score marks. Examiners continue to see "creating and producing energy" as roles of the mitochondria. "Water concentration" is another term that is still seen in the responses of some candidates. Examiners can only give credit for what is presented to them. Therefore, it is important that candidates can communicate their ideas in an appropriate level of detail. Examiners reported from all the examined units that candidates continue to lose marks due to responses being too vague for the standard required at GCE AS and A level.

INSET

OCR is offering a full programme of training event introducing the new GCE Human Biology A level specification for first teaching September 2008. Further details are available from the OCR website http://www.ocr.org.uk/Data/publications/training/Science_Training_Programme.pdf

INSET events for new GCE Human Biology, for first teaching from September 2008

Get Started – *towards successful delivery of the new specification.*

These **new full day** courses will give guidance and support to those planning to deliver the new AS/A level Human Biology (H023/H423) specifications from September 2008.

Course dates and codes

AS courses - Tuesday 23 Sept 2008 (Plymouth, OSCC801), Wednesday 15 October 2008 (Birmingham, OSCC802), Friday 24 October (Durham, OSCC803), Monday 10 November 2008 (London, OSCC804), Thursday 27 November 2008 (London, OSCC805).

A2 courses – Tuesday 24 February 2009 (London, OSCD101), Friday 20 March 2009 (Birmingham, OSCD102).

Fee – £160 standard course rate (including refreshments, lunch and course materials). £190 if you book within 7 days of the course date.

Places may be booked on these courses using the booking form available on-line (http://www.ocr.org.uk/training/alevel_inset_training.html). Please quote the course code in any correspondence.

2856 Blood, Circulation and Gaseous Exchange

General Comments

Candidates achieved a wide range of marks for this paper. Nearly all the candidates attempted all the questions with the exception of question 6 which was printed on the back of the exam paper. The examiners reported that otherwise strong candidates were included in the group that omitted this question. It is possible that some students failed to notice the final question and centres should work with each new cohort of students to develop their exam technique.

The paper was taken by many students as their first exam and by a significant number of students as a resit from previous sessions. The performance of the cohort of Yr13 candidates resitting was markedly improved on their first attempt but the cohort of Yr12 candidates resitting from January 2008 showed only a slight improvement. Centres are reminded that the act of resitting in itself does not guarantee success and that strategies to improve the preparedness of candidates resitting could be considered.

This paper was marked by examiners on-line for the first time this summer. The post results service offered to centres will not show the annotations on candidates' scripts but will provided a question-by-question account of where marks were awarded.

The examiners found too many candidates unable to answer questions to the level of detail required at AS level. In addition, some questions revealed where candidates were clearly not well prepared on subjects that have not been tested extensively in this unit. Question 2(b) was a good example of this.

Those candidates that were able to answer the questions with appropriate AS detail achieved well and the teaching of this unit had clearly prepared these candidates well. There was no evidence that candidates were running out of time in the exam hall.

The long answer question was well answered by many candidates, though some candidates strayed onto other blood products in their responses. Centres are reminded that this specification regularly tests the more applied aspects of the specification and candidates should be prepared on these as well as the more traditional biological content.

Teaching tip

The specification for this unit introduces a range of terms that candidates will not have been previously familiar with. It would be useful to encourage students to take ownership of their own learning. They may, for example, build up their own revision cue cards for each new specification term with simple but precise definitions for each. The boldified terms in the specification are a useful starting point but are by no means a complete list of the terms in this unit.

Comments on Individual Questions

Q.1   Most candidates were able to access this question though particularly poor spelling limited the marks of some candidate in section (c).

   (a)   (i) Candidates either knew the correct answers or did not and the majority scored the available mark.

   (ii) The most common incorrect responses to this question were to state bicuspid or semi-lunar.

Teaching tip

It is worthwhile teaching students to be able to match up parts of the heart by name, description and by picture. The use of card sorting exercises is particularly effective here.

   (b)   Few candidates gave two responses the same indicating the fact both ventricles contract in unison is not universally understood by candidates.

   (c)   Examiners saw many correct answers scoring all four marks. Spelling that was phonetic was credited here, however spelling that was intermediate with other words could not be credited e.g. "ventricioles".

   (d)   Many candidates failed to gain both marks because their answers were too vague. Common answers that did not gain credit were 'amount of blood' and 'ejected from the heart per minute' (i.e. left side / left ventricle was not stipulated). The post marking statistical report showed 65% of the candidates failed to score a mark on this question, with only 10% giving a clear definition that scored 2 marks.

Q.2 (a) (i) Many candidates were able to correctly identify the molecules making up the membrane. A number of candidates just stated that R was a protein, without further qualification (i.e. extrinsic).

(ii) Few candidates scored full marks on this question and many failed to get any marks. Most referred to the arrangement of the phospholipids and the ability of certain molecules to pass through the bilayer. Some candidates were confused by the term fluid in the stem and gave answers about water potential. In general this was a poorly answered question.

(iii) Many candidates got the mark for this. The majority of candidates that did not get the mark did not specify that it was the presence of a C=C but merely stated that there was a double bond. Examiners were unable to credit this answers as the question was framed in relation to the diagram given.

Teaching tip

Use diagrams of molecules as prompts for questions.

(b) Although this question required direct recall of a specific learning outcome, few candidates had sufficient knowledge to score full marks.

Q.3 (a) It was pleasing to see some excellent answers to this question and most candidates were able to communicate their knowledge successfully here. This question also tended to be a good overall discriminator with only the best candidates achieving all the available marks. Common errors were:

Stating that blood has to be kept cool without further qualification.
Stating that reactions would stop at low temps.
Stating that changes to temperature or pH would denature the blood cells.
Not stressing the concept of maintaining the pH.

Very few candidates realised that blood is stored in gas permeable bags and thought that it was stored in airtight bags.

(b) (i) This question was well answered with the most common wrong line being that of AB blood.

(ii) The question stem explained that agglutination is the result of mixing incompatible blood groups so therefore knowledge of this specific term was not actually required to answer the question. However, few got the second marking point for specifying that it was the RBCs that clumped together. As expected, many confused agglutination with clotting or thought that clumping of the cells was a clot.

Q.4 (a) Most candidates gained one or two marks for this question. The majority of candidates were able to identify smoking for one mark. Most candidates also stated high blood pressure and high plasma cholesterol concentrations to get the second mark. Few candidates quoted data for this question despite being specifically asked to in the stem and even those that did, usually gave incorrect figures.

Teaching tip

Candidates must practice ad nauseum reading questions, picking out the command words and explaining what the questions are looking for.

   (b) It was interesting to note that candidates approached this part question well. Many candidates who scored badly in (a) were able to apply logical thought to (b) and pick up some marks.

   (c) The majority of responses were too vague to gain credit for this question. Many unqualified answers stating that high blood pressure damages the artery wall and that fatty deposits or a plaque builds up on the wall of the artery. It had been reported before but is worth stressing again that the build up of atheroma is in or under the endothelium and not on it.

Q.5 (a) Many candidates scored the maximum four marks here and most found discerning, from the two terms on offer, which one fit the gap best to be quite straightforward.

   (b) Another well answered question by many candidates. The part of the story that candidates seemed weakest on is the actually fact that muscles are close to veins and when the muscle contract the muscle exerts force on the vein causing the vein to be compressed.

   (c) Two thirds of the candidates scored the two available marks for this calculation. Examiners reported that some candidates are still failing to express their answers to the degree of accuracy asked for in bold by the question stem.

Q.6 (a) Many candidates were unable to disentangle what they had learned about CPR from what they had learned about EAR. Examiners positively marked these responses and credited correct information about EAR wherever it appeared. Unfortunately some candidates gave extensive detail on CPR, including the chest compressions but did not give enough detail on the rescue breaths to gain full marks.

   (b) There were many responses that related to the chest compressions so did not gain credit. However, those that only referred to the differences in expired air resuscitation often scored two marks.

2857 Growth, Development and Disease

General Comments

This paper proved to be a positive examination experience for the majority of candidates and all questions were answered well by at least some candidates. Any problems with answering the questions seemed to be centre-related. Whereas many candidates read the questions carefully and focused their answers on the question asked, some candidates wrote at length on details not specifically required by the question. This was particularly the case with question 3d and 4c. It was pleasing to see an improved response to questions on the nutritional requirements of the developing embryo and foetus. Questions requiring candidates to apply their knowledge to different situations proved to be the most challenging and it is important that centres provide candidates with the opportunity to develop this skill during the teaching of the course.

Comments on Individual Questions

Q1   This proved to be a challenging first question on the paper.
(a)(i)   Most candidates correctly identified the stage of mitosis shown in the photomicrograph as anaphase.
(a)(ii) Only a few higher attaining candidates answered this correctly. The most common mistakes were to describe mitosis in general terms without referring to the behaviour of chromosomes and to confuse chromosomes, chromosome pairs and chromatids.
(b)(i)   There were a few excellent answers to this including reference to: semi-conservative replication of DNA during interphase; the formation of identical chromatids which were then separated; and as a result each daughter cell received identical chromatids. However, most candidates found this difficult and gained no marks or 1 mark, usually for DNA replication.
(b)(ii) This was generally well answered and most candidates gained marks for growth of tissues and the replacement of damaged or worn out cells. A few candidates lost a mark by referring to 'repair of cells' which was not allowed.

Q2   This question was accessible to most candidates
(a)(i)   Most candidates scored between 4 and 6 on this question. The most common mistakes were to give: protein chain instead of polypeptide chain; amino adenine instead of base adenine; and when oxygen levels are high instead of low.
(b)   Candidates found this question demanding and many did not gain any marks. Some candidates gained at least 1 mark on this question by stating that there is more than one codon for an amino acid. A few then went on to state that this means that the code is degenerate and that a mutation may still result in the same amino acid being put into the polypeptide chain. A small number of candidates were able to describe how a changed codon may code for a different amino acid with similar properties and so not have a big effect on the functioning of the protein.
(c)(i)   This was well-answered by most candidates. The good answers included reference to ultrasound, the use of hypodermic needles and taking samples of tissue from the chorionic villi in the developing placenta. A few candidates confused CVS with amniocentesis.
(c)(ii) About 50% of candidates gained the one mark on this question by correctly referring to the increased risk of miscarriage.

(c)(iii) Only about 30% of candidates gained two marks on this question by describing that it might lead to having to make a decision about abortion or continuing with pregnancy when the child will be known to have an impaired quality of life. The most common mistakes were to give very vague answers or not relate the ethical concern to the issue in the question.

Q3 (a) Most candidates answered this question well. They described the trends shown by the graphical data and used comparative figures to support their answer. A few candidates lost marks by not making it clear which part of the curve they were referring to.

(b) Some candidates answered this well by describing how they would measure the height of children at the beginning and end of the specified time period. Then calculate the increases in height, add them together and divide by the number of children in the group.

(c) This question was generally very well answered. Most candidates gained three or four marks. The most common answers were carbohydrates for energy, calcium to help in the growth of bones, iron needed for haemoglobin and protein needed to provide amino acids for synthesising new proteins.

Q4 (a) This question proved to be more difficult than expected. Only the higher attaining candidates gaining three marks for correctly identifying which type of immunity gives immediate and long lasting protection.

(b)(i) This question also proved to be difficult with very few candidates gaining three marks for correctly identifying the different regions of an antibody molecule.

(b)(ii) Higher attaining candidates answered this well by describing how the specific shape of the variable region of an antibody molecule complements the shape of the antigen to which it binds.

(c) This question was well answered and most candidates gained some marks. The good answers focused exactly on the question asked and described how vaccines contain weakened strains of disease organisms that are injected into the body and cause an immune response. The response involves specific B lymphocytes which undergo clonal selection and expansion to produce large numbers of the same type of lymphocyte. Some of these B lymphocyte differentiate into memory cells which remain in the blood and cause a faster secondary immune response if the same disease organism enters the body again. Weaker answers described the immune response in more general terms and so only gained some of the marks.

Q5 (a) About 30% of candidates gained this mark for describing cloning as the production of genetically identical cells, tissues, organs or individuals.

(b)(i) This question was well answered and many candidates were able to state that stem cells are used in cloning because they have the ability to keep dividing and to differentiate into different types of cells.

(b)(ii) Many candidates seemed to be unsure of this question and failed to gain any marks. Some detail about how stem cells might be cultured was needed such as: putting them into the correct, sterile, culture medium; adding appropriate growth factors; keeping them at a suitable temperature and pH.

(b)(iii) This question proved to be difficult and only a few of the most able candidates gained three marks. They described how, as a stem cell differentiates into a specialised cell (erythrocyte), genes are switched on / off, haemoglobin is synthesised, the cell loses its nucleus and changes to a biconcave shape.

(c)   Many candidates gained marks on this question and were able to describe two benefits of therapeutic cloning such as more organs being available so les waiting time and less chance of rejection because the organ matched the recipient's tissue type.

2858/01 Case Studies

The examiners were pleased with the overall performance of candidates on this paper. Where candidates had been well prepared, the learning outcomes 'signposted' in the case study had been well developed. There were some excellent responses on karyotyping with accurate detail on the use of phytohemagglutin and colchicine. Photomicrographs of karyotypes had clearly been used by candidates and it was gratifying to see how many of them correctly identified the karyotype provided. Similarly, the section on the role of radiographers was full of detail.

The examiners were concerned, however, at the inaccurate descriptions given of the pathology of coronary heart disease. The case study made reference both to high blood pressure and to high levels of saturated fat and a common misconception was that the narrowing of artery lumens by 'fatty deposits' **caused** high blood pressure. This is not correct. The endothelium is damaged by shear forces caused by high blood pressure and factors such as smoking and diabetes can make the endothelium more susceptible to tearing. This tearing then results in LDL/cholesterol depositing in the subendothelial space (**in** the artery wall). The combination of endothelial damage and LDL deposits attract macrophages which engulf cholesterol deposits and become 'foam cells'. It is the build up of foam cells which results in atheromatous plaques.

Teaching Tip

Using a 'card sorting' exercise, let students sequence the events in the formation of atheromatous plaque in coronary arteries. Split terms – for example **coronary** and **artery** are presented on two separate cards. Provide them with 'linking' words – 'leads to', 'results in' or 'also called'. A surprising number of students think that the build up of plaque which deprives the cardiac muscle of oxygen **leads to** coronary heart disease – this **is** coronary heart disease!

Question 1

1 (a)   Only about 50% of candidates scored one or more marks here. Yet again, biochemistry proved to be a difficult topic for candidates with relatively few referring to a saturated fat being a triglyceride with no double carbon to carbon bonds in the fatty acids. Answers tended to be phrased in very general terms – 'no double bonds' or 'having maximum number of hydrogen bonds'. The term 'atom' was rarely used with too many candidates using terms like molecule and atom as if they were interchangeable.

1(b)   This question tended to be done well although several candidates failed to use the information provided to inform the dietary recommendation. Low scoring candidates clearly could not distinguish between the fatty acid and the source of the fatty acid in the table. The calculation was done well – a 'model' was provided in the case study. However, correct answers were often given to the incorrect decimal place despite the question specifically stating what this should be.

1(c)   This question has been discussed above. Other common errors included not specifying that it is the **lumen** of the artery that is narrowed, that it is the **coronary** artery which is being occluded, that it is heart **muscle** which is being deprived of oxygen and that the death of heart muscle **is** myocardial infarction. Comments on the LDL:HDL ratio was also frequently confused with candidates incorrectly identifying which would rise (LDLs) with a diet high in saturated fat. A major concern to the examiners was the number of candidates who used the term 'clots' to describe atheromas. As a consequence of the above mistakes, although many candidates wrote at length on the topic of CHD, only the better candidates secured maximum marks.

1(d)   Most candidates suggested a suitable health consequence with liver damage being the most common. This suggests that recent health warning have been noted by candidates as this is not currently on the specification at AS. Although 'weight gain' as given in the preamble to the question, the question itself did not specify 'other than weight gain' and consequently obesity was accepted – this was often described in terms of a 'beer belly'.

1(e)   Many candidates mentioned systolic and diastolic blood pressure but failed to link the terms to the correct figure. The commonest mistake was to suggest that the figures were a 'range' of results. The examiners were concerned at the misinterpretation of what the pressures were a measure of – atrial and ventricular pressure and artery and vein pressure were both given by some candidates with systemic vascular resistance given for the systolic pressure. 50% of candidates failed to score any marks on this question despite blood pressure being clearly 'signposted' in the case study.

1(f)   Candidates did not always understand that, to describe the design of the experiment, they needed to give some idea of the participants and the methodology. While there were some very good answers given which scored maximum marks, too many candidates either discussed the findings of the DASH diet experiment and their implications or described the effects salt on osmotic balance.

1(g)   Osmosis has always been an area of difficulty for some candidates and only about 50% of candidates scored one or more marks on this question. The use of terms like 'water concentration' or incorrectly identifying areas of lower or higher water potential in relation to high levels of salt in the blood plasma were the commonest mistakes. Too many candidates answered in terms of water moving in or out of red blood cells and this 'thickening' the blood. However, some excellent answers were given again possibly indicating differences in preparing the candidates – the link between blood pressure and salt was clearly 'signposted in the case study.

2(a)(i)   Most candidates answered this well with 70% of candidates scoring at least one mark and about 25% scoring maximum marks although note the comment in the introduction. Marks tended to be lost for omissions in detail rather than inaccuracies in the description.

2(a) (ii)   This question was done well by most candidates although some did assume that this would be a Klinefelter's karyotype and some unusual answers were given with sickle cell anaemia being the most common.

2 b (i)   Poor use of terminology such as confusing the terms embryo, zygote and gamete or mixing up terms such as haploid and diploid resulted in too many candidates failing to gain marks here. Contradictory statements were common.

Teaching Tip

For both meiosis and mitosis, use the 'Why', 'Where', 'How' questions as prompts or 'quick questions' for starters or plenaries. This will be even more important in the new Human Biology specification when the stages of both meiosis and mitosis form part of AS assessment.

2(b) (ii)   It was anticipated that this would be a difficult question and less than 10% of candidates scored all three available marks. Turner's syndrome is usually considered in terms of a non-disjunction event in the formation of gametes and it was in these terms that most candidates tried to explain the appearance of cells with 45 chromosomes in the adult despite the highlighted terms in the preamble to this question. A simple description of mitosis leading to genetically identical daughter cells being produced with the same number (45) chromosomes as the parent cell was required but this answer rarely appeared. Using the case study and researching Turner's syndrome would have revealed that many cases are, in fact, mosaics with the X chromosome being lost during mitosis in early embryo development.

2 (c)   Most candidates could give either CVS or amniocentesis although there was some confusion about which technique was which.

2(d) (i)   A variety of shapes and sizes of graph were seen. The examiners were looking for an indication that one symptom of Turner's syndrome is that the full potential adult height may not be achieved and this was clearly signposted in the case study. The examiners were looking for a line which 'levelled off' below the line given. This question was omitted by 14% of candidates - an oversight rather than an indication of the level of difficulty of the question.

2 (d) (ii) Again, growth curves are a difficult area and around 45% of candidates failed to score any marks on this question. The idea of measuring growth in some form over a unit of time was generally understood but describing how this would be plotted to obtain the growth rate curve was beyond most candidates.

2 (e)   Most candidates could name up to three techniques and there were some excellent descriptions given. Where mistakes were made, it was in confusing the detail of techniques – particularly PET scans, MRI scans, CAT scans and Thermography. The type of radiation used for the imaging was not well understood by some candidates – 'Radiographers use radio waves' or 'Metabolically active cells absorb more X-rays'. However, this was generally a high scoring question.

2858/02 & 2868/02 Report on Coursework

Once again the number of candidates that entered at both AS and A2 showed a significant increase. The work submitted showed evidence of tremendous hard work on behalf of the teachers and the candidates. The standard of work submitted reflected a wide range of ability that had, on the whole, been recognised in the marking by teachers.

General summary:

As with last year, centres that were adjusted fell into 3 main categories i.e. Centres who had:
- misapplied the hierarchical mark scheme
- omitted a descriptor in the candidates' work
- chosen an inappropriate task

with the first and last categories being the most common.

Each of these areas is discussed, and advice given, in later sections of this report.

Again, at AS the key areas that led to the marks being supported by the Moderator differing from those being awarded by the centre were in the Analysis and Evaluation skills. Concern still exists that the subtleties of the generic mark scheme are inadvertently overlooked in some Centres, which impacts on the marks such as P5ai and P7aii or E3a and E5ai.

At A2, the main area of discrepancy arose in the S skill, with several candidates, and on occasions whole centres, failing to submit a separate report. In the case of the R skill, many candidates failed to evaluate the interview **and** suggest simple improvements, hence limiting the mark for this skill to 2.

Any centres who wish to gain more detailed feedback regarding this year's moderation, or proposals for next year via the coursework consultancy service (available free of charge), should contact OCR.

Administration
This year saw a worrying and disappointing increase in the number of centres who failed to complete all the appropriate paperwork. Several centres failed to send their candidates work within the time limit specified and there were an increase in the number of centres with small entries that did not submit their candidates work with the MS1 by the 15th May.

Centres are encouraged to note that a 'Centre Authentication Form' **must** be submitted for **both** AS and A2 entries. Failure to do so will mean that this has to be requested at a later date and could potentially delay the publication of candidates results.

Most forms that will be required for any particular session can be found on the website:

http://www.ocr.org.uk/qualifications/publications/AS_ALevelGCEHumanBiology.html

In accordance with the specification, work should be submitted loose-leaved but stapled in the corner with the individual candidate form attached to the front. The inclusion of additional plastic folders and wallet folders are unnecessary and can hinder the moderation process. It can also lead to work potentially becoming muddled when the work is removed from these folders.

Annotation, in the main, was clear and accurate although there was distinctly less annotation this year than in the past. The purpose of moderation is to standardise the work across the cohort but also to support the marks awarded by the Centre. This is far easier if it is clearer to the Moderator where the evidence for a particular sub descriptor is and why it was awarded e.g. P5ai.

It is preferable that teachers annotate in the style of:
P5ai ✓   to indicate a full match
I5bii x   to indicate the sub descriptor is not met
(E5bi)   to indicate a partial match

Tolerance:
AS: A tolerance limit of plus or minus **four** marks (out of 60) is applied to the AS investigative skills.

A2: A tolerance limit of plus or minus **six** marks (out of 90) is applied to the A2 extended investigation.

Adjustment of candidates' marks:
Candidates in a centre will have their marks increased or decreased as a result of the centre falling outside the tolerance limit. This will occur if:

- all the candidates entered have been uniformly over or under-assessed in which case a single adjustment will be applied to the whole Centre.
- candidates towards the top of the Centre's rank order have been over or under-assessed more than the rest of the sample then a tapering scaling will have been applied. This will mean that the top candidates were adjusted to a greater extent than those candidates at the bottom of the rank order.

In either case the rank order of the candidates from a Centre will remain unaltered, but there may be a compression of the mark range.

In some cases this session when work had been moderated it led to the rank order of candidates being changed. Due to this, work had to be returned to centres for remarking, with direction given by the Moderator as to the areas of concern. The reason for this is to lessen the adjustment to some candidates. The OCR policy is that the rank order submitted by the centre has to be maintained, but on occasions when an adjustment has to be made it could mean that some candidates have to be adjusted more than necessary to maintain the rank order. By the work being remarked by the centre, hence producing a new rank order, this should hopefully be avoided and hence a fairer adjustment to all the candidates in the centre.

Please note that as soon as a centre falls outside the tolerance limit, scaling adjustments can be made using the marks appropriate. Where centres were found to be significantly outside of tolerance, a further sample was requested from the Centre. The second sample was moderated and the evidence used to support or modify the initial moderation.

Hierarchical nature of the mark scheme:
A major reason for centres being adjusted was the incorrect application of the hierarchical mark scheme. For each skill, the scheme allows the award of intermediary marks 2, 4 and 6 that are between the defined mark levels. An intermediate mark may be awarded when the meets **all** the descriptors for one level e.g. level 3 in planning **and** also meets **50%** of the sub descriptors for the next level e.g.

i)   **all** of P5a (i.e. P5ai, P5aii and P5aiii) **or**
ii)   **all** of P5b (i.e. P5bi and P5bii) **or**
iii)   50% of the P5a and P5b e.g. P5ai, P5aiii and P5bii.

The award of 8 marks for the P and A skill has caused some difficulties for some centres again this session. The mark is intended only for the candidates who have clearly performed outstandingly in each of these skills. On some occasions where 8 marks were awarded by the centre, the Moderator(s) felt that one of the sub descriptors at level 7 had not been met resulting in the mark will be out of tolerance by minus 2 (or minus 4 out of 60(AS) or 90(A2)) which puts the candidate on the boundary of tolerance through only one skill.

It is **not** necessary for a candidate to go beyond the specification to gain 8 marks. Also candidates who write excessively in an attempt to score 8 are unlikely to be awarded P7aii due to irrelevance or A7bi on the grounds of failing to be concise.

Nature of tasks:
Common tasks included enzyme investigations e.g. the effect of temperature, enzyme concentration, substrate concentration and pH, membrane permeability with temperature and alcohol and osmosis. These investigations were suitable for all four skills and allowed access to the higher descriptors.

Centres are advised there is no requirement for each candidate to carry out a different investigation. Whilst it cannot be denied this approach is of significant educational value particularly where candidates report back to the rest of the class on what they have discovered. It is difficult to achieve standardised marking as internal moderation often breaks down, particularly where there is a difference in experience of the teachers concerned.

a) Human physiology investigations:
The main area of concern and cause for adjustment this session was due to the failure to meet 3 key sub descriptors. The details given below are meant as amplification of the sub descriptors and in is in no way an alteration to the specification.

P3aii   In the case of human physiology investigations, it is paramount that the
            candidates recognise the vast range of factors which should be
            considered when dealing with human subjects. In most cases these
            should include:
            - **age**
            - **gender**
            - **genetic predisposition**
            - BMI (where appropriate)
            - fitness level (where appropriate)
            - diet (where appropriate)

P3b   - For P3b candidates should plan **at least 10 subjects** in each of five
              categories, as this is good practice.

            It is realised that this is not always possible to **implement** and so data
            must then be collected from a minimum of **ten subjects** in a minimum of
            two categories.

b) Inappropriate tasks for A2:
It is imperative that the investigation is **centred** on a topic from the A2 specification. For example an investigation which looks at the effect of pulse rate before and after exercise can easily permit candidates to base their prediction and analysis on the method used to measure pulse rate and the scientific knowledge and understanding (SK&U) related to pulse rate, without the emphasis being placed on the SK&U taken from the A2 specification i.e. exercise.

Several cases were seen this session where the candidates had loosely mentioned exercise but based the main part of their report on the structure and function of the lung and/or smoking and hence not accessed the sub descriptors P5ai, P5aiv, A5bi and A5biii.

It is equally as important that higher ability candidates have the opportunity to be able to use AS SK&U to **support** and underpin their A2 SK&U to allow them to meet the synoptic sub descriptors in the P and A skills (P7aiv, A7aiii and A7biii).

Implementing:
Some centres incorrectly assessed tables of processed data for this skill. It is only the table of raw data that can be used for this skill. However, that said, it does not need to be the actual table that was drawn up during the investigation. It can be 'copied up into neat' for submission. Annotation should also cover the sub descriptors of the 'a' strand and a tick list should accompany the work submitted for moderation. If no raw data has been submitted, the moderator will be unable to support any marks for this skill.

In several cases, candidates were adjusted due to the use of 'split tables'. All raw data should be displayed in a single table to allow a comparison to be made of the independent variable range and the replicates. The independent variable should be in the first column with SI units for both the dependent and independent variable in the appropriate row/column heading(s). Failure to do so will limit the mark to 4 for this skill. On some occasions it was evident that centres had provided blank tables to their candidates which encouraged students to submit the data in split tables, thus limiting their marks to a maximum of 4.

Analysis:

Again this year moderators had to adjust some centres downwards as no evidence of processing of data could be found. In these cases the candidates mark was reduced to zero.

A3a is the presentation of the processed data e.g. a histogram or bar chart used in the correct context (bar charts to represent discrete data and histograms to represent continuous data). Whilst the use of ICT is to be encouraged, candidates should ensure they could use the packages at a suitable standard to produce a graph of suitable quality. There should be sufficient horizontal and vertical grid lines to allow new intermediate data to extracted accurately. In several cases, graphs produced using software packages such as Microsoft Excel® did not fulfil this criteria. All graphs should also have an informative title, axis labels, appropriate units on both axis and an appropriate line drawn. Some examples of suitable and unsuitable graphs are provided in the 'Principal Moderator's report to centres, 2005'.

In some cases candidates were incorrectly awarded A5a for a graph. This is **not** appropriate. A5a requires detailed numerical processing e.g. the calculation of the standard deviation (this can be used to aid the progression through the Evaluation skill), deduction of an intercept or appropriate use of statistical testing. Centres should note that plotting **range bars** does **not** meet A5a as no further numerical processing has been undertaken.

Confusion appears to exist regarding the difference between range bars and error bars in some centres:

- range bars – consists of plotting the highest and lowest value of data above and below the average. As this requires no mathematical processing it can not be used for A5a but may discussed in detail to help provide evidence for E5bi.

- Error bars – consist of calculating the standard deviation of the data and plotting a bar from the mean +/- 1 SD. The calculation of the SD can be used to credit A5a, and again the discussion of the error bars can be used to provide evidence for E5bi. Centres should note that the SD can be determined for assessment purposes even if there are only 3 sets of data as it is the skill that is being assessed not the numerical answer.

A5bi requires conclusions to be linked with detailed scientific knowledge and understanding of an AS (or A2 as appropriate) standard and linked coherently, comprehensively yet concisely for A7bi.

Evaluation:
The use of suggested writing frames was encouraging this session and it appeared that this had indeed helped the weaker candidates score more highly in this skill.

There remains confusion in some centres as to the difference between errors and limitations:
- ***A limitation*** – is a fault that lies within the method and will potentially affect each trial/run of the method such as the fluctuation of the temperature in a waterbath or the parallax error when reading a meniscus i.e. this is a design fault.

- ***An error*** – is a fault that occurs at random and effects intermittent set of data/one point such as the failure to measure out a chemical incorrectly for one run.

Confusion also remains regarding the difference between accuracy and precision.
To gain E3bi candidates can calculate/comment on the % error, comment on the accuracy for piece(s) of apparatus, **or** comment on how the trendline compares to the theoretical trendline.

Considering the closeness to the mean, variance, size of the range bars/percentage error/standard deviation/standard error etc. can all be used by candidates to assess reliability, and hence meet E5bi.

For E5bii the candidates must explain what impact the main error(s) (inaccuracy in the numbers), has on the **raw** data and how it is affected e.g. if data is increased/decreased as a result of the error(s).

A2 specific skills only:

Searching for information

As with last session, the main area of concern in this skill was that some centres had failed to realise that this report was **separate** from the 'Plan' and as such rarely scored higher than 3 marks out of 5. Candidates are expected to submit a concise report of 500-1000 words on the information gained from the resources stated in the bibliography (S1b). It is important to stress that the report is about resources used in the **planning** and **not** about the whole investigation.

To gain S5a candidates should **explain** their choice of diagrams, charts, data etc selected from the sources listed in terms of the usefulness to the investigation and validity of the information presented in the source, and finally for S5b the report produced should **coherently integrate** the information gained from the sources with evidence of a variety of presentational techniques such as tables, graphs and pictures.

Recording an interview

In some cases, candidates only recorded 8 questions, or 6 questions then 4 supplementary questions etc. In both these cases as an initial 10 questions had not been recorded R1b could not be supported and the mark for this skill was limited to zero.

Whilst almost all candidates asked ten **appropriate** key questions (R1a) several candidates failed to suggest (in the report) 2 supplementary questions to partly meet R3b. This sub descriptor also requires candidates to suggest simple improvements to their interview.

To gain R5b these supplementary questions must be **asked** and evaluated in terms of the investigation.

Details are available on the OCR web site. Centres are reminded that there is a Coursework Consultancy service that is provided free of charge. Please contact OCR for further details.

2866 Energy, Control and Reproduction

General Comments

Examiners were pleased to report that many candidates found this series examination paper accessible. The paper produced a broad range of marks including an encouraging number at the top end. There was no evidence to suggest that candidates had insufficient time to complete the paper and the majority of candidates attempted to answer each section.

Many of the answers provided in this series were of a higher standard than previous series. There were fewer vague statements such as the use of the word 'affects' without qualification, and, in general, candidates' responses were more descriptive. It is evident that teachers have taken on board the advice from previous reports and have been encouraging candidates to be more precise and use appropriate scientific terminology. This was particularly evident in the long answer section in question 5 relating to synapses where many candidates easily gained the QWC mark for the use of scientific terms.

Centres should encourage candidates take time to ensure that they have read the paper properly. It was apparent that some candidates, both higher and lower ability, had missed Q2(a)(iii) and 6(a)(ii) in which they were being asked to write / draw on the diagrams.

Comments on Individual Questions

Q.1   The majority of candidates did not do well in the first part of this question relating to mitosis usually confusing interphase with prophase and therefore, failing to gain any marks. Candidates also found it difficult to see why it is important that the cells remain genetically identical. However, the remainder of the question proved to be more accessible. These were topics covered in AS and it was evident that few candidates had spent the time to go back over them.

    (a)(i)   As stated above, most candidates confused interphase with prophase and described the movement of chromosomes and formation of spindle fibres etc. Few candidates understood the role of interphase and many of those that did stated that DNA replication took place and then went on to describe the process in detail, meaning that they were only awarded one of the three available marks.
Some of the better candidates gained full marks for listing some of the cellular processes taking place during interphase. The most common answers to gain credit were DNA replication, protein synthesis and synthesis of organelles.

    (ii)   Again, most candidates missed the point of this question. The majority of candidates failed to do anything other than reword the stem of the question or detail the possible outcomes of a gene mutation, which was not what the question asked.
The candidates that did gain credit tended to get marks for stating that remaining genetically identical was important since mitosis was the basis of growth and cell repair / replacement. Few understood the importance of maintaining the chromosome number.
A number of candidates made references to the daughter cell performing the same role / function as the parent cell, which was credit with under the AVP.

    (iii)   The majority of candidates were awarded the mark for stating the correct hormone. Frequent wrong answers included progesterone and a few candidates misread the question and stated where in the body oestrogen is released instead of what causes the rise in concentration.

(b)   The majority of candidates scored at least one mark in this question although few gained full marks. It was encouraging to find that few confused the two processes although it was disappointing that a number of candidates gave the answer that was already provided in the top row of the table as one of their differences.
The examiners were encouraged to find that candidates provided a variety of responses and all of the available marking points were explored.
Common mistakes included putting a correct answer in one side, but not filling in the corresponding box in the 2nd column, or filling it in correctly but for a different marking point. This did not earn credit as this did not demonstrate that candidates fully understood the corresponding differences between meiosis and mitosis.
Vague references (e.g. 46 vs. 23 chromosomes) also did not earn credit as candidates did not fully state what this meant.
A number of candidates stated that mitosis had one stage and meiosis had two. This was did not gain credit (unless further qualified) due to the ambiguity with the stages (i.e. prophase, metaphase etc.) of mitosis and meiosis.

(c)   This question was generally well answered. Candidates tended to score at least one mark and many were awarded the two marks available. Most candidates gained credit for explaining that X-rays are a form of radiation and therefore, can damage the (DNA of) foetus although it was pleasing to see that the majority of marking points were explored.

Q.2   Examiners were delighted that the majority of candidates attempted to answer the high graded question regarding myoglobin's high affinity for oxygen. It was obvious that some centres had provided candidates with a sound knowledge of this area and as a result, some lower ability candidates also performed well. Disappointingly, many candidates did not describe the shape of the graph, as asked in the first part of this question. The examiners were disheartened since candidates seemed to do well in a similar question in the January 2008 paper. It would be beneficial for candidates to practice describing graphs since this type of question will be asked in future sessions and can potentially allow the candidates to score some relatively easy marks.

(a)(i) Unfortunately, this session, most candidates did not realise that they were being asked to describe the graph and the majority explained how difficult or easy it was for the oxygen to bind to the haemoglobin at different points on the graph. Examiners found this disappointing since the word 'shape' was emboldened in order to cue the candidates into the aim of the question.
A high number of candidates that quoting figures from the graph (both axes were required) did so incorrectly. Centres may find it beneficial to practice reading different scales since the candidates seemed to struggle with the scale on this relatively easy graph.
Many candidates only scored one mark in this section for stating that the curve is s-shaped / sigmoid. Those that interpreted the question correctly usually gained full marks.

(ii)   Most candidates were able to correctly read the graph in this section and were awarded the one mark available.

(iii) The majority of candidates scored at least one mark for drawing an s-shaped curve and an encouraging number placed the curve in the right position to gain the second mark. This question was targeted at the higher end so it was pleasing to see that, on the whole, candidates performed well here.

(iv) As expected in this question, many of the lower ability candidates did not make the link to the increase in carbon dioxide concentration and as a result, were lucky to gain any credit. Some scored 1 mark for stating that the Bohr effect / shift occurred.
Examiners were pleased by the quality of responses from the candidates that understood the concept behind this question which easily achieved the maximum marks. Many of the better answers covered all of the available marking points.

(b) Examiners were delighted by the quality of many of the responses seen. This high targeted question was generally answered well by higher ability candidates. However, a number of lower ability candidates also provided responses that demonstrated a sound knowledge of the principles covered by this question. This did tend to be centre specific and was evidence of thorough coverage of this area of the specification by many centres.

(c) The majority of candidates performed well in this question although a number of candidates referred to there being a 'lack' of red blood cells or confused it with sickle cell anaemia (described the shape of cell etc). Examiners did not credit vague answers that included these statements.

Q.3 Examiners have observed in previous sessions that candidates do well on questions regarding improving athletic performance and it was pleasing to find that this was also the case this session.
However, many candidates struggled to answer the question in section (d)(i) relating to the water an athlete takes in during an endurance event.

(a)(i) Many candidates scored well in this question, often making more points than could be credited. Basic answers concentrated on there being a lower concentration of atmospheric oxygen at high altitudes and this leading to increased erythrocyte numbers. More capable candidates described the body's reactions leading up to this increase, including stating the correct cytokine produced and its main source (erythropoietin). They then went on to describe the effects of this additional red blood cell count by describing the benefits in terms of increased oxygen carrying capacity.
A few candidates confused the kidney with the liver when referring to erythropoietin production or did not imply that this would increase and then increase red blood cell production etc. Examiners were generous and awarded credit if an increase was stated for one of the marking points and carried the increase forward to subsequent statements. However, centres should encourage candidates to state whether there is an increase or decrease for each component or process.

(ii) Most candidates understood that sprinting was not an endurance event and examiners were generous in accepting a number of alternative wordings that described this. Better candidates went on to describe anaerobic respiration and that oxygen is not needed, hence not benefiting from improving the aerobic system Examiners were pleased to see a number of candidates referring to stores of ATP / CP which were credited with the AVP.

(b) Although there has been a definite improvement this session in the descriptiveness of candidates' responses, unfortunately, number of candidates gave answers here that were often too vague and general to gain credit.
Weaker candidates referred to the athlete 'getting used' to the conditions but not about the body adapting to conditions. Easier marks were obtained simply by mentioning altitude sickness and a symptom.

(c) The majority of candidates managed to gain both of the available marks in this question. Most candidates understood eating large amounts of carbohydrates and that loading referred to building up glycogen stores in preparation for an event. Common errors were failing to state that the athlete would consume a high level of carbohydrate and failing to imply that it was for a short period before the event, although, Examiners were generous with the timescale. Candidates often referred to energy stores, which was not credited with the mark for increasing glycogen stores.

(d)(i) Examiners found that, in general, this question was poorly answered. Few candidates scored full marks, although most scored one for stating that, during an endurance event, water is lost through sweat.
While most candidates understood that water is lost through sweat during endurance events, many did not state why athletes sweat. Those that made the connection did not state why the body was overheating. Many candidates made unqualified references to dehydration, but did not make any sort of comparative statement to normal conditions and needing to drink water as standard to avoid dehydration.

(ii) The majority of candidates were able to earn credit in this question and found it less of a challenge than the previous question.
It was pleasing to see that candidates across the range of abilities understood that isotonic drinks contain a variety of salts and ions that had been lost in sweat during exercise to earn two marks. Better responses made reference to water potentials between these drinks and bodily fluids, or that these drinks have a source of glucose for respiration.
A few candidates made vague statements regarding water potential e.g. keeps water potential the same / returns water potential to normal, which were not given credit.

Q.4 This was the most poorly answered question on the Examination Paper with most candidates struggling to score even half of the available marks.
It was encouraging to find that many of the candidates gained credit for the calculation.
Poor responses to section (d) often brought candidates scores for this question down.

(a)(i) As stated above, many candidates were able to gain credit for this calculation. Although some candidates still had difficulty converting the units appropriately (i.e. 15mm = 15000μm) it was evident that some centres had taken on board advice from previous sessions and had spent time on this area. One mark was awarded to candidates' answers that were out by a factor of ten.

(ii) A significant number of candidates were able to correctly identify at least one feature from the electron micrograph that was typical of a eukaryotic cell. Examiners were generous with candidates' interpretation of features that were visible in the micrograph and many candidates were awarded the two marks available in this section. A number of candidates stated a cell wall as a feature which did not gain credit. Examiners did not credit any features that are also present in prokaryotic cells since the question specifically states that candidates should provide features typical of a eukaryotic cell.

(b)(i)   Unfortunately, few candidates made the connection between the movement of oxygen with the process of diffusion in this low targeted question. There were a variety of incorrect processes candidates suggested for the movement of oxygen but the most commonly provided were active transport and osmosis and facilitated diffusion. Those that did correctly identify the process as diffusion, often did not take it a step further to describe the process as the question stated. Therefore, candidates rarely scored the full three marks in this question.

(ii)   This question was aimed at higher ability candidates yet it was encouraging to find that the majority of candidates gained one mark for stating that the folding increased the surface area of the membrane. As expected most candidates struggled take this a step further to gain the second mark.

(c)   Most candidates scored at least one mark in this section. Marks were awarded across the range of abilities and the more able candidates did not necessarily do better than the less able candidates. Many were able to fill in the bottom two rows correctly to gain two marks but, generally, struggled to get the top row correct. As usual, there was the occasional hybrid tick that Examiners did not credit.

Q.5   The first part of this question proved difficult for many since it was aimed at the higher ability candidates. However, the majority were able to pick up marks in the extended writing section which made up for a poor first half.

(a)(i)   It was encouraging to see that the majority of candidates attempted this difficult question, although, some struggled to provide three roles. Many candidates had the right idea but, unfortunately, were not descriptive enough with their answer to gain credit. For example, a number of candidates merely stated 'one-way transmission' but failed to mention that they were referring to action potentials. Weaker candidates also referred to structures and events, such as neurotransmitters without describing the ultimate effect of these being activated. Better candidates discussed nervous transmissions and in doing so, earned one or more of the first three marking points. A handful of excellent answers also referred to the quality of the stimulus required and how synapses allowed weak stimuli to be filtered out.

(ii)   Examiners were expecting this question to perform better since it was targeted quite low. While most candidates made reference to energy being required in the synaptic knob for various named processes, too many answers failed to a make a simple statement that this energy is provided / released by the mitochondria through the synthesis of ATP and therefore, failed to gain credit. Statements referring to the creation / production of energy also failed to gain credit.
Any marks gained were predominantly for explaining the uses for the ATP in the synaptic knob.

(b)(i)   Many candidates were awarded at least one mark in this question that covered a challenging topic. Most understood that diamorphine could bind to the post-synaptic membrane receptors to gain one mark. However some thought they were antagonists of endorphins or the body's natural painkillers, rather than acting in the same way. Better candidates went on to qualify answers of reducing pain in terms of inhibiting action potentials and were capable of earning full marks.

(ii)   A commonly misunderstood question. Most candidates referred to cravings and linking the drug to the occasion where it was taken. Some candidates gained one mark for stating that the drug induces a feeling of euphoria, but they did not go on to explain the biological response that caused this in terms of dopamine release.

(c)   This was generally an accessible question for most candidates and Examiners were delighted by the quality of many of the responses seen. There was evidence of thorough coverage of this area of the specification by many centres and many candidates easily reached the maximum available marks.
Generally the first three marking points were ignored and most candidates didn't see the depolarisation as being the cause for calcium ion channels opening. However it was still possible for candidates to sequentially describe the events during synaptic transmission. It was good to see that most candidates had at least some basic understanding of this, although the most frequent wrong answers included describing vesicles physically travelling across the synaptic cleft instead and binding to receptors themselves, instead of releasing their neurotransmitters from the pre-synaptic membrane. By going through the marking points, candidates were able to earn the QWC mark by using several of the scientific terms on offer.

Q.6   Many candidates scored well on this question although some confused responses to the extended writing section often meant that Examiners often found it difficult to award credit.

(a)(i) Most candidates scored at least two marks for correctly identifying the ovary and the cervix. A number confused the uterus with the endometrium, which was not credited.
Credit was given for incorrect spellings if the answer was phonetically correct and had no other connotations. This was also the case for Q6(b)(i).

(ii)   Examiners were pleased that the majority of candidates could identified where fertilisation would normally take place by correctly labelling the diagram with an X.

(b)(i) Many candidates correctly identified the hormone as human chorionic gonadotrophin although, common incorrect responses included progesterone, oestrogen or confusing the letters in the abbreviation (e.g. HGH)

(ii)   This question polarised the candidates. There were some excellent answers demonstrating that the candidate had a sound knowledge of this difficult subject. However, it was easy for candidates to get confused with the different antibodies used in the test and it was often difficult for Examiners to extract material worthy of credit.
Many candidates wrote at length about how the antibodies for the test kit are produced, which did not answer the question so did not gain any credit.
Candidates are encouraged to focus their responses around the key words in the question.

(c)(i) Examiners were fairly generous when applying the mark scheme with this question and many candidates gained the mark. There were a number of responses stating that a multiple pregnancy is when more than one egg is fertilised which did not gain the mark.

(ii)   Many candidates scored full marks in this last section. Examiners did not credit vague statements such as 'they can die' or 'anaemia' if left unqualified and unfortunately, this is where the majority of marks were lost.
Although it has been noted in previous reports, it is disappointing that there are still candidates that provide more than the stated number of responses to a question that specifically asks for a certain number. Centres should make it clear to candidates that if a question states the particular number of responses required i.e. two; Examiners can only credit the first two answers given.

2867 Genetics, Homeostasis and Ageing

General comments

The essay style questions in 3(d) and 6(b) scored well with candidates able to recall detail regarding the menopause and transplant surgery. Some questions, for example Questions 4 and 7, however, were not answered well, with few candidates scoring more than half the marks allocated. It was encouraging to see that the majority of candidates had attempted all parts of all questions. However, many responses lacked scientific detail and biological terminology, especially the responses to synoptic questions. At the end of the paper, Q7 appeared problematic for the majority of candidates. It is possible that this was due to the length of the examination, with candidates either running out of time or 'steam'. Overall, many of the papers had marks clustered in the middle grade ranges but few A grade candidates were seen.

Question 1

(a)(i)   There was a long list of body fluids for students to choose from and most scored at least 1 mark. The most common incorrect answers were urea and plasma. Plasma was not accepted on account of 'Blood' being the body fluid mentioned in the question stem.

(ii)   Students rarely scored full marks on this part of the question, and the dissolving/transport mark was the most common with the effect of keeping body cool as the second most frequent answer

(iii)   This question was generally well answered with the majority of candidates opting for types of blood cell. 'Large proteins' was required in the mark scheme with many candidates simply stating proteins.

(b)(i)   Few answered this part correctly with the loop of Henle as the most common incorrect answer. The mark was missed by many candidates.

Teaching Tip

Candidates should be advised to read each question carefully and perhaps cross through the number as they answer a question to reduce the risk of missing out on marks. This is particularly important where a question is not followed by dotted answer lines.

(ii)   This was well answered and many candidates scored 2 marks.

(c)   Few candidates scored 3 marks on this table, the last part being the least well answered. Many candidates were able to gain a mark for the role of the posterior pituitary, correctly stating that ADH was secreted or released. However some simply stated 'hormones' rather than ADH which failed to gain a mark.
The role of osmoreceptors was often answered by saying that they detect the change in concentration or water levels rather than using water potential terminology.
The role of the loop of Henle was most often correctly answered when candidates referred to the production of concentration of urine.

(d)   Many candidates mis-understood this question and answered it in the context of homeostatic control of temperature. Cells bursting or shrinking was the most frequent correct answer and many scored the osmosis mark.

Question 2

Most parts of this question were answered well, and scored highly, though (b) (i) was answered poorly and showed a lack of understanding of the role of glucose in the development of Type 2 diabetes. Some candidates also found difficulty in describing the flow chart in (c).

(a)(i)   The majority of candidates correctly worked out the percentage of women who developed Type 2 diabetes as 5%. Some candidates lost one mark for failing to give their answer to the nearest whole number.

(ii)   Many candidates scored marks for stating that age, physical activity, other foods in the diet, etc. needed to be controlled in the investigation. However some candidates incorrectly made reference to controlling the size or number of portions of potato eaten during the investigation, which gained no credit.

(b) (i)   This question was poorly answered, with many candidates assuming potatoes contained fat and led to increased levels of obesity, which in turn led to a rise in type 2 diabetes. This gained no credit, as examiners were looking for the idea that potatoes contain starch, which is broken down into glucose, and that the rise in blood glucose levels leads to increased insulin levels and a de-sensitising of cells to insulin.

(ii)   Many candidates correctly described differences between Type 1 and Type 2 diabetes , though some lost marks for failing to identify that it was the beta cells which do not produce enough insulin in Type 1 diabetes, and only a few candidates mentioned that Type 1 diabetes could be caused by an autoimmune condition.

(c)   Many candidates correctly identified the Hypothalamus as the receptor in the control of Leptin production and that the process involved negative feedback. However, many failed to correctly describe the feedback loop shown in the diagram and so did not score marks for using the information in the flow chart.

Question 3

This question allowed candidates across the range to score highly with some candidates achieving full marks; part (d) being particularly high scoring. However very few candidates mentioned parathormone in their answer to part (c).

(a)   The majority of candidates were able to score a mark for the mention of X-rays on this part of the question. Good candidates correctly used the term DEXA and went on to describe in detail how bone density was measured. Some candidates incorrectly identified ultra sound as the method used.

> **Teaching Tip**
> Candidates should be given the opportunity to learn procedures as outlined in the AS and A2 text books or offered on various websites such as the BUPA website.

(b)(i)   Many candidates correctly described the trends as shown by the graphs, although some lost marks by failing to mention the age range for the trend they were describing. Unfortunately a number of candidates are still confusing the terms describe and explain. Any explanation of the data was not credited.

(ii)   The majority of candidates were able to gain credit for explaining the 'fracture threshold' term.

(iii)   There were surprisingly few candidates achieving full marks for this part of the question. Many candidates gained credit for the 'lifestyle' and 'greater dependence' answers. A number of candidates repeated statements about 'risk of fracture' which did not gain credit as a social consequence.

(c)   The majority of candidates gained one mark on this part of the question by correctly stating the loss of oestrogen as a reason for osteoporosis being more common in post-menopausal women. Good candidates were able to gain a second mark for referring to the increased activity of osteoclasts. However, it was of some concern that a number of candidates referred incorrectly to osteoblasts being the cells responsible for reduction in bone density.

(d)   This part of the question scored well with a good number of candidates also achieving the QWC mark. The section on the A2 syllabus regarding ageing and the menopause had obviously been well taught by the majority of centres.

Question 4

This question was poorly answered overall with few candidates achieving more than 8 marks. Few marks were seen at all for parts (a) and (e)(ii).

(a)   Few candidates scored any marks at all on this part of the question with many continually referring to rate which was present in the question stem. Some candidates were able to score one mark for correctly referring to the use of respiratory substrates such as glucose.

(b)   The majority of candidates scored marks for referring to less heat produced and less ATP produced. Marks were credited for the reverse argument which many candidates used.

(c)   There were very few candidates gaining two marks for this part of the question. The most popular answers that gained credit referred to the distribution in the blood or the ability to reach target cells.

(d)   This was generally well answered with most candidates realising the need for regulation.

(e)(i)   Hypothalamus was a popular incorrect answer along with pituitary gland. As the term 'thyroid' was in the stem of the question it was surprising that there were few correct answers.

(ii)   This part of the question was not well-answered and many candidates referred to active site which the examiners did credit.
(iii)   There were some good answers for this part of the question from candidates who scored more than the maximum 3 marks. Some candidates failed to answer the question at all or repeated much of the information in the question stem.

Question 5

Relatively few candidates achieved a high mark on this question with the majority scoring 15 or less.

(a)   The majority of candidates recognised cystic fibrosis as being due to a recessive allele although a sizeable number referred to it as a recessive disease/condition and the term gene as opposed to allele was seen on a number of occasions.

References to the dominant allele masking the recessive or use of the term homozygote were rarely seen although many answers referred to both chromosomes needing to carry the mutant allele for c.f. to occur. Several candidates referred to chromosome pair 7 as being identical.

(b)(i) The majority of responses were correct with most of the incorrect responses referring to epithelial cells (often ciliated).

(b)(ii) Here candidates tended to fall into two groups, those scoring full marks and those scoring 1 or 0. Most achieved the first marking point relating to movement of chloride ions but often answers failed to refer to water potential or osmosis.

(b)(iii) The full three marks were rarely achieved. Most referred to the blocking of the ducts/tubes/vasa deferentia but failed to relate this to a lowered sperm count, instead simply referring to sperm unable to get out or be ejaculated. Many stated that sperm were unable to reach the egg with very few using the terms oocyte or ovum. A few answers referred to sperm being unable to swim but no references to sperm running out of ATP or to mucous being toxic/alkaline/acidic were seen.

(c) Almost all the candidates scored full marks on this part

(d)(i) Responses were very poor with virtually no candidates scoring full marks and few achieving more than half marks. In the first part many gained the mark for reduced surface area for gas exchange but few commented any further so did not gain the second mark. On the second part most scored zero. The terms FEV, TV and Peak Flow were almost never seen and nor were references to dust, bacteria or infection. Most referred to inefficient gas exchange or less air/oxygen inspired or lungs being unable to expand. In the third part most mentioned infection as more likely but few referred to dormant/opportunistic infections or increased risk of lung cancer.

(d)(ii) Most achieved the first two marks on smoking and exercise but many were unable to add a third valid point

Question 6

Most candidates scored at least half the points on this question. Candidates had plenty of ideas to answer the questions and most could explain the trends shown in the data. Some ideas used to answer questions were very weak and were therefore not awarded marks.

(a)(i) The fair majority of candidates managed to label the correct figure (i.e. 150) with the name of the type of pressure (systolic). However candidates which achieved this rarely scored a third mark. This is because they failed to mention that these values were indicative of high blood pressure. Also when describing what the terms systolic and diastolic pressure they were not specific enough to be awarded the mark.

(ii) Only very occasionally full marks were awarded for this question. About half the candidates obtained the mark by relating hypertension to various heart conditions or problems. However few candidates were able to elaborate further to obtain the additional mark by mentioning either healthy ranges of blood pressure or explaining some of Mr X's symptoms.

(b) (trends shown in the data)
Most candidates answered this question well by simply stating the trends shown in the data using the correct values.

(reasons for shortage of donated organs)

Candidates used a large variety of points to obtain marks. This was generally well answered. However the most common error was attributing the shortage of donated organs to people living longer. The candidates justified this point without realizing that organs of elderly people are not suitable for transplant.

(c)   This question was generally answered well. Common marks were lost by candidates when stating the advantages of a non-related living donor. Frustratingly only a select few understood that only an identical twin is genetically identical; most candidates wrote 'related living donor' in the bottom box.

Question 7

This question appeared to tax many candidates at the end of a long examination. Many candidates appear to have a poor understanding of the immune response and confuse the terms antigen and antibody.

(a)   The majority of candidates were able to score one mark for correctly referring to the term antigen with some going on to achieve a second mark for recognising that this was on the erythrocyte. Some candidates lost this mark by not being specific and simply referring to 'blood cells'. Few candidates achieved three marks.

(b)(i)   Many candidates were able to score marks on this question with good candidates using the correct terminology. Answers for the third marking point were rarely seen.

(ii)   It was pleasing to see that the majority of candidates had correctly worked out the correct probability. There were a few candidates that confused ratio and stated 1: 2 which failed to gain credit.

(c)   As this was a synoptic question, it was disappointing to see that few candidates scored more than two marks. The most common answers seen referred to differences in antibody production with few references to memory or plasma cells.

Teaching Tip

The immune response could be taught as a flow diagram to show primary response, production of memory cells and secondary response.

(d)   This part of the question was poorly understood by the majority of candidates and few candidates scored any marks at all. Some candidates correctly identified the fact that the second child may be blood group A with others going on to say that the mother could have been given anti-D injections.

Grade Thresholds

Advanced GCE (Subject) (Aggregation Code(s))
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2856	Raw	60	43	37	31	26	21	0
	UMS	90	72	63	54	45	36	0
2857	Raw	60	45	39	33	27	22	0
	UMS	90	72	63	54	45	36	0
2858/A	Raw	120	97	84	71	59	47	0
	UMS	120	96	84	72	60	48	0
2858/B	Raw	120	95	82	69	57	45	0
	UMS	120	96	84	72	60	48	0
2866	Raw	90	69	60	52	44	36	0
	UMS	90	72	63	54	45	36	0
2867	Raw	120	80	71	62	54	46	0
	UMS	120	96	84	72	60	48	0
2868	Raw	90	74	66	58	50	42	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

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

	Maximum Mark	A	B	C	D	E	U
3886	300	240	210	180	150	120	0
7886	600	480	420	360	300	240	0

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

	A	B	C	D	E	U	Total Number of Candidates
3886	3.0	14.0	32.5	57.4	78.7	100	1641
7886	6.4	23.0	47.7	75.6	94.5	100	984

2625 candidates aggregated 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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