



GCE EXAMINERS' REPORTS

**BIOLOGY/HUMAN BIOLOGY
AS/Advanced**

JANUARY 2013

Statistical Information

The Examiner's Report may refer in general terms to statistical outcomes. Statistical information on candidates' performances in all examination components (whether internally or externally assessed) is provided when results are issued.

Annual Statistical Report

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

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BIOLOGY
General Certificate of Education
January 2013
Advanced Subsidiary/Advanced

Principal Examiner: Mr. Andy Clarke

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
BY1	6834	70	43.9

Grade Ranges

A	54
B	49
C	44
D	39
E	35

N.B. The marks given above are raw marks and not uniform marks.

Biology BY1

- Q.1 (a) This question was intended to be a straight forward opening question and was well answered by the majority of candidates.
- (b) The candidates' ability to interpret the changes in quantity of DNA varied. A significant minority failed to appreciate that the quantity of DNA was increasing for a large proportion of the time period and incorrectly identified X as either telophase or cytokinesis.

Many candidates correctly identified the second cell cycle as meiosis, but references to 'halving the chromosome number' or 'the production of haploid cells' demonstrated an inability to use the evidence from the graph provided.

- Q.2 This question was intended to be accessible to the majority of candidates and many achieved full marks. A common error that occurred in part (a) was the reference to RNA being composed of a 'single helix'.

- Q.3 (a) Most candidates correctly identified endocytosis but very few could describe the process. Many of the responses included the Golgi body or lysosomes being involved in forming the vesicle that 'engulfs' the algae. Approximately a third of candidates couldn't identify exocytosis with many candidates not attempting an answer.
- (b) The majority of the candidates correctly stated the function of mitochondria but only the better candidates could link this to the question; most gave vague references to feeding, digestion or being very metabolically active.
- (c) This was a fairly straight forward question and the majority of candidates picked up 3 marks. Some candidates had a tendency to 'regurgitate' comparisons between prokaryotic and eukaryotic cells and stated that the *Amoeba's* cell wall would be made of cellulose. Another common error was for candidates to make reference to the relative sizes of the cells, showing that they had not read the stem of the question carefully enough.

- Q.4 (a)&(b) Apart from (bii) this was generally answered well; very few candidates knew that at one end of a polypeptide chain there is an amine group and at the other there would be a carboxyl group.
- (c) Many candidates gained both marks for clear comparisons between triglycerides and phospholipids. The quality of written communication was sometimes poor and prevented some candidates gaining marks.
- (d) There were very good responses to this question and many candidates stated that the hydrophilic head would be submerged in the water while the hydrophobic tails would remain above the water. Weaker candidates either gave a simple description of the terms hydrophilic and hydrophobic or described the arrangement of phospholipids within a membrane.

The more able candidates were able to interpret the information on the experiment and gained both marks. Many candidates appreciated that there is a phospholipid bilayer in the membrane but doubled the surface area of the monofilm instead of halving it. A significant minority didn't attempt an answer.

- Q.5 (a) This was generally well answered however many candidates appear to think that the phospholipid bilayer is the membrane as opposed to being a component of it. Many responses included statements such as 'oxygen is lipid soluble so can therefore diffuse through the membrane' and 'as phosphate ions are polar they cannot cross the membrane so need the help of carriers'.
- (b) This question was aimed at the more able candidates and therefore the responses were poor, with the majority of candidates unable to interpret the graphs. A worrying number of students referred to active transport as 'the diffusion of molecules against the concentration gradient'. The more able candidates however picked up the majority of marks and showed a good understanding of active transport and facilitated diffusion.
- (c) Responses to this question were also disappointing with candidates stating that phosphate ions were required for healthy growth, photosynthesis or as a component of chlorophyll.
- Q.6 (a) The majority of candidates recognised that water was required for the reaction, but very few drew an arrow indicating the water would be inserted into the molecule of lactose; and many went on to correctly draw the resulting monosaccharides. Some candidates lost marks by drawing the 'OH groups' at the bottom of the molecules or they unsuccessfully tried to invert one of the molecules.
- (b) Questions on immobilised enzymes are common and the majority gained 2 marks, however here were some candidates who thought that because the enzymes were immobilised this would allow them to function in extremes of temperature and pH.
- (c) Many candidates stated that the Benedict's test would be required and that if a reducing sugar was present the solution would turn red, however a significant number failed to state that the solution needs to be heated and/or there would be a colour change from blue to red.
- Many candidates failed to state what a biosensor is but instead gave detailed descriptions of how digital biosensors work. Vague responses were given regarding the advantages of using them, such as they are 'more accurate', 'precise' give a faster result' and very few related it to the experiment.
- (d) Responses to this question were disappointing. Most candidates stated that there would be a decrease in reducing sugars detected but then simply went on to rewrite the stem of the question. Only the better candidates could make the link between the effects of a reduced substrate concentration and/or a decrease in pH on the rate of the enzyme catalysed reaction.
- Q.7 (a) This question was answered by the majority of candidates. Many gave coherent accounts of the effects of inhibitors on enzymes gaining most if not all the marks available. Many candidates included diagrams in their responses and graphs showing the effects on the rate of reaction, unfortunately a large proportion labelled the X-axis as time and not substrate concentration.

- (b) The more able students gave excellent responses to this essay and gained full marks were not uncommon, however they were in the minority. Many candidates were clearly confused by the terminology surrounding this topic, but managed to pick up some marks. There were many common errors such as referring to animal cells as either 'turgid' or 'plasmolysed'; many students mustn't realise that plant cells actually have a plasma membrane as they stated that in turgid cells 'the cytoplasm pushes against the cell wall' and in plasmolysed cells 'the cytoplasm pulls away from the cell wall'.

BIOLOGY
General Certificate of Education
January 2013
Advanced Subsidiary/Advanced

Principal Examiner: Mr. Brian Hughes

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
BY2	1806	70	46.0

Grade Ranges

A	59
B	54
C	49
D	44
E	39

N.B. The marks given above are raw marks and not uniform marks.

Biology BY2

General Comments

The paper allowed all candidates to access marks.

The quality of written communication was again an issue for some candidates. They were reminded of the necessity for good English and orderly presentation on the front of the examination paper, but a significant number lost marks because examiners could not make sense of what had been written.

- Q.1 A substantial majority of candidates were awarded both marks for part (a), although some gave answers which related to possessing common features or failed to include the fact that offspring would be fertile. Parts (b) (i) was answered correctly by most candidates though the simple calculation in (b) (ii) caused some candidates difficulty. Part b (iii) was an example of a question where candidates lost a mark for poor quality of written communication. In part (c) (i) there was a wide distribution of positions for the common ancestor showing some candidates did not understand what the branches on a phylogenetic tree represent. Most candidates were able to recognise the significance of genus in the binomial system in part (c)(ii). In part (d) most candidates were able to name homologous structures for (i) fewer gave analogous for part (ii).
- Q.2 Part (a). Most candidates were able give three properties common to all respiratory surfaces though fewer were able to explain the importance of the properties. Candidates particularly struggled to explain why a large surface area is important, and some failed to explain that gases have to dissolve to pass through the membrane. Some candidates gave 'good blood supply' or similar, this is not a property of the respiratory surface and even organisms with no blood supply have respiratory surfaces. Part (b) required candidates to apply knowledge to an unfamiliar situation. Most were able to suggest the frog used its body surface for part (i). In part (ii) many candidates were able to recognise that fast-flowing was the important condition in the stream but fewer were able to make the link with that and maintaining a high diffusion gradient for the second mark. Quality of written communication was a problem in part (c) most were able to describe counter current flow, though there were some imprecise descriptions such as 'blood and water flow in different directions'; fewer were able explain its significance and why it is more efficient.
- Q.3 Part (a). The labelling of the photomicrograph proved more difficult than expected though most were able to correctly label C and D, xylem and phloem. Most difficulty was with B, the endodermis; some labelled this endothelium and some left it unlabelled. Most correctly named xylem and phloem in part (b) though some got them the wrong way round and some failed to give an answer. Part (c) was not well answered many candidates were unable to give the functions of either sieve tubes for part (i) or companion cells for part (ii). Relatively few gave correct answers to both (i) and (ii). The majority of candidates were able to name and describe the water pathways in part (d) (i), though a significant number gave descriptions that did not match the names they had given. Again quality of written communication was an issue in part (ii).

- Q.4 Part (a). Spelling metamorphosis was a problem for many candidates in part (i), the usual phonetic rule was applied. Candidates were uncertain about the names of X and Y with many leaving these blank. Part (b) was generally well answered but again quality of written communication was an issue for some. Part (c) also drew mainly good answers. Part (d) was less well answered, many gave answers relating to internal fertilisation or referred to additional parental care. There were also the usual issues with quality of written communication.
- Q.5 Most candidates were able to name the oxygen dissociation curve in part (a) (i) and position the curve for foetal haemoglobin to the left in part (ii) however some drew curves that extended above 100 % at the top end, or that did not extend beyond 8 kPa., or with odd shapes. Quality of written communication again prevented many candidates from gaining both marks in part (iii). In part (b) the majority of candidates were able to predict the movement of the curve in part (i) and name the Bohr Effect in part (ii). However, fewer were able to gain all 4 marks in part (iii). Some explained the mechanism in some detail but did not refer to its significance, some explained the significance but not the mechanism.
- Q.6 Part (a) has been asked before but many candidates gave answers that did not refer to both obtaining nutrition from and causing harm to the host. Most candidates recognised the hooks from the tapeworm photograph in part (b) (i) though some incorrectly referred to them as 'teeth'. In part (b) (ii) most candidates were able to explain that they helped attach the tapeworm to the gut wall, fewer went on to explain that doing so would prevent them being removed by peristalsis. In part (c) some candidates had difficulty explaining why the tapeworm does not need a digestive system. Most explained the surface area aspect of the tape-like shape but fewer went on to explain the short diffusion path due to its flatness. Part (d) many candidates referred to the worms having both male and female organs but some incorrectly referred to this as asexual reproduction. Most candidates correctly described the production of large numbers of eggs or larvae.
- Q.7 Option 7(a) was the less popular choice. A range of marks was awarded, and there were some very good answers but the majority had clearly not prepared properly and gave very vague answers with descriptions of peristalsis but no details of the enzymes involved. Option 7(b) was attempted by the majority of candidates and many of those who did attempt it gained the maximum 10 marks. Some gave very pithy accurate accounts, in correct sequence which meant they gained full marks with relatively short answers. Some gave lengthy descriptions of the cardiac cycle with no reference at all to how it is initiated or controlled. The quality of written communication was an issue for a number of candidates in both options.

HUMAN BIOLOGY
General Certificate of Education
January 2013
Advanced Subsidiary/Advanced

Principal Examiner: Mr. Philip Owen

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
HB2	246	70	37.8

Grade Ranges

A	48
B	44
C	40
D	36
E	32

N.B. The marks given above are raw marks and not uniform marks.

Human Biology HB2

Many candidates continued the trend of recent exams whereby, they struggled to express themselves in a clear and concise manner, using appropriate biological terminology. On a positive note, many candidates scored well on the free response question about immunity.

- Q.1 (a) Very few candidates scored full marks for filling in the blanks in part (a). A sizeable number thought that the adult heart, at rest, beat over 150-200 times a minute whilst many failed to state that the heart cycle was started in the right atrium. Instead they simply stated atria or atrium. Despite the question saying that abbreviations would not be accepted, a substantial number used the abbreviations SAN and AVN. Whether this was simply a failure to read the question carefully enough, or simply that they did not know what the abbreviations represented.
- (b) The most common marking point to be awarded was that blood flowed in vessels. Few mentioned at high pressure and even fewer articulated the idea that the blood does not come into direct contact with cells. Many candidates penalised themselves in describing a double circulation by stating that 'blood passes through the heart twice'. Many failed to add the essential comment that it does so during one complete circuit of the body. Many candidates did attempt to qualify the 'through the heart twice' by referring to it happening during a cycle. It was not clear whether this was using the term from part (a) or an oblique reference to a circuit of the body.

- Q.2 (a) Only a minority could correctly identify A and B and many candidates thought that the function of the suckers is to absorb food. A minority appreciated that these structures were essential to anchor the tapeworm to the host's intestinal wall but then referred to them preventing the tapeworm being removed during 'excretion'. This question was not the only occasion on the paper when the term, 'excretion' was used in an incorrect context.
- (b) This was only answered fully by a small minority of candidates. Many recognised that nutrients were supplied by the host but then, went on to talk about these nutrients requiring further digestion by the tapeworm's simplified digestive system. Few recognised that the surface area to volume ratio of the tapeworm allowed efficient absorption of nutrients across the whole of the body.

Most candidates recognised that the tapeworm lived in conditions with little or no oxygen and so, respired anaerobically as a result.

- Q.3 (a) (i) This was well answered with the majority of candidates giving the correct answer.
- (ii) Most candidates only usually, managed one mark for this. This was usually for a reference to *Homo ergaster*. What candidates failed to do was to work through the line of evolution, ending in *Homo sapiens* and describing how this largely all took place in Africa.
- (c) It was unusual for candidates to score maximum marks. The most common correct observation was that *Homo ergaster* had been around for a long time. However, many candidates went on to say that this meant there were more fossils which is simply a repeat of the question. They should have tied in the length of time with the point that there would be far more of these organisms over the years. Some candidates recognised that *Homo ergaster* died out much more recently.

Q.4 Many did not know the type of bacterium and far too many failed to specify that the mode of transmission was water, contaminated with faeces from a sufferer. Some thought that it was transmitted through airborne droplets, no doubt confusing cholera with tuberculosis.

(c) The answers were often little more than a repeat of the stem of the question rather than using the information provided. Many knew about dehydration and a good number made reference to the loss of water and salts in the faeces. However, this question was a further example of where the term 'excretion' was used inappropriately. Few candidates made any reference to the impact of the loss of ions on the conduction of the nerve impulse or any other relevant metabolic process.

(d) This should have been easy but many candidates could not make a simple statement about drinking water treatment and sewage treatment plants. Instead, there were vague references to Western Europe being more hygienic.

Most candidates did not know how the antibiotic affects the bacterium and whilst many realised that indiscriminate use of the antibiotic could lead to resistant strains, very few recognised that the disease could be treated with oral rehydration therapy. The number of candidates who said that the bacterium could become 'immune' to the antibiotic was disappointing.

Q.5 This question in a variety of similar forms has appeared on many of the papers but again, this time, there were some disappointing answers. Even where candidates could identify which was the tidal volume and vital capacity, many, failed to draw their identifying lines accurately so were not awarded the marks. A sizeable number drew their lines at a slope and therefore failed to score the mark. The calculation in part (b) was made marginally more difficult because the trace sloped. However, this was enough to defeat many candidates.

Whilst many candidates knew the purpose of the soda lime few could give a suitable safety precaution that needs to be taken.

Very few candidates in answering part (e) realised that some of the oxygen would be in the trachea or bronchioles and that these are 'dead' spaces in terms of oxygen uptake. Many candidates recognised that there was a residual volume in answer to part (f) but, very few could give an adequate description of how this is the air remaining, (many insisted on using the term oxygen in their answers) after forced expiration has taken place.

- Q.6 (a) The graph was mark yielding and most candidates scored maximum marks. A few placed the axes the wrong way round. It should be noted that, a sharp pencil should be used for graph drawing.

Many of the answers to part (b)(i) were drawn at the 1kPa position rather than the 1.5kPa position. Most candidates could not correctly name the Bohr shift. Instead, many referred to it as a 'dissociation curve'

Few candidates connected the lower pH with increased carbon dioxide evolution and its subsequent formation of carbonic acid and its dissociation into H^+ . This meant that few could identify, in answering part (iv), that more oxygen is released to respiring muscles.

Some of the foetal haemoglobin graphs resembled the one for myoglobin and a number of candidates drew a graph to the right of the ones given.

Part (c)(ii) caused problems. Although many candidates recognised that the position of the curve means that foetal haemoglobin has a higher affinity for oxygen, few could go on to state that this would mean oxygen would pass from the haemoglobin of the mother to that of the foetus at all partial pressures. Candidates coming close to this though insisted that this would only occur at low partial pressures.

- Q.7 (a) This was the more popular and better answered of the two. A significant number of candidates were able to score maximum marks in answering this question. However, there were one or two areas where knowledge was either scant or confused. It was rare to see any candidates make reference to the fact that a toxoid could be used in order to vaccinate an individual. Further, there was confusion in the minds of a substantial number of candidates between vaccination and the injection of antibodies. Few made any reference to the latter being a short term expedient to deal with a situation that could lead to the immune system being overwhelmed if not treated.
- (b) The answers were less satisfactory, though there were some candidates who achieved full marks. Too many candidates ignored the question and spent a significant amount of time writing irrelevant comments about the role of enzymes in the alimentary canal and failed to concentrate on structure which the question was asking about. Few candidates made any reference to the thin epithelial lining or to glands in the gut wall for enzyme secretion. Few understood the role of the stomach in expanding to accommodate food.

BIOLOGY
General Certificate of Education
January 2013
Advanced Subsidiary/Advanced

Principal Examiner: Dr T M Morgan

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
BY4	3930	80	54.0

Grade Ranges

A	63
B	57
C	52
D	47
E	42

N.B. The marks given above are raw marks and not uniform marks.

Biology BY4

On the whole, the paper was answered well with many candidates demonstrating an excellent recall of the facts and a high level understanding of the biological principles being tested.

However, some general points need to be made:

- While phonetic spelling is accepted the general standard of spelling was poor and many candidates would have lost a significant number of marks if only absolutely correct spellings had been accepted.
- Many candidates lost marks because they did not read the information given in the questions.
- BY4 is a synoptic paper and centres should remind candidates to expect to be tested on some aspects of BY1 and common elements of BY2 / HB2. When teaching certain topics synoptic elements should be pointed out wherever they are applicable.

Q.1 Incorrect spelling was the reason for most marks lost on this question. Many candidates were also unable to recall the correct formulae for nitrate and ammonium ions.

Q.2 A surprising number of candidates did not know the colours of Gram + and Gram – bacteria following staining with the Gram technique and much confusion was seen over the difference between the structure of their cell walls. In addition, there was significant misuse of the terms cell membrane and cell wall – these terms are not interchangeable.

In labelling the bacteria the spelling of the types of bacteria was very poor and many candidates did not check which bacteria were labelled A, B and C, losing marks as a result. Candidates were required to refer to the structure of the cell wall conferring protection as a possible reason for Gram -ve bacteria being the cause of the food poisoning rather than making a general statement about the bacteria being Gram – ve.

When explaining the choice of plates to use in estimating the bacterial count general statements such as ... too many or ... too few needed to be backed up with an explanation, e.g., unable to count accurately or that the results would not be reliable.

Estimating the number of bacteria using serial dilution remains a challenge to many candidates. Many did not take note of the volume of dilution plated (0.5cm^3) and many could not carry out the calculation correctly.

Few candidates recognised that the bacteria responsible for the food poisoning were human pathogens needing to be cultured at close to human body temperature. General statements such as ...this was their optimum temperature, or ...their enzymes would work better did not provide a good enough explanation.

Q.3 Candidates lost marks on part b of this question because they did not communicate their answers clearly. Many did not use the concept of interspecific competition to explain their answer despite this being asked for in the question. Furthermore, clear indication was given at the start of the question that the species of *Paramecium* being investigated were competing for food. Many gave explanations based on the different species being obligate or facultative anaerobes and some confused *Paramecium* with *Penicillium* and the production of antibiotics in response to depletion of resources.

Q.4 Many candidates scored full marks on part a of this question but a number lost marks through interchanging structures found in chloroplasts and mitochondria despite the table being headed chloroplasts and mitochondria. In addition, marks were lost where candidates could not associate the stages of ATP production with the relevant structures.

The answers to part b were in many cases confused or lacking in detail without providing explanations of why a particular attribute of ATP is important. For example, stating that ATP is hydrolysed by ATPase is biologically correct but the fact that ATP is hydrolysed by a single enzyme is more important. Most candidates' definition of ATP being the *universal energy currency* focussed only on cells within an organisms rather than being universal across all species.

Q.5 A surprising number of candidates could not suggest suitable values for resting and action potentials. Again, despite the question asking them to explain how *ion channels* are involved in depolarisation and repolarisation many referred only to 'pumps'. Most did not refer to which channels were opened or closed and a significant number confused which ions were moving and in which direction.

Very few candidates gave fully correct explanations of what is meant by the *quaternary structure* of a protein or were able to explain that the centre of the axon membrane contains non-polar fatty acid tails. Many referred to hydrophobic phosphate heads or tried to explain that water had to be kept out of the axon. It should be noted that candidates should be aware that there will be synaptic elements within the A2 papers.

A small number of candidates gave explanations of synaptic transmission despite the information given before the question. Spelling of the words myelin and Schwann (cells) was atrocious. Most candidates would have lost both marks available here if correct spellings only were accepted.

Q.6 A well answered question in general. However, some confusion was seen between mitochondria and chloroplasts and in identifying the regions where different stages of respiration takes place; a number identified substance W as ATP rather than carbon dioxide and quite a few were unable to identify where substrate-level phosphorylation occurs.

Q.7 (a) Calvin Cycle

This essay was very well answered by most candidates who chose this option. The main errors made were:

- glycerate-3-phosphate is not the same as glycerol-3-phosphate and is not interchangeable with glyceraldehyde-3-phosphate
- photosynthesis involves NADP not NAD
- RuBP is regenerated from TP not TP is regenerated into RuBP

(b) Osmoregulation

Not as well answered as 7a mainly because candidates focussed on ultrafiltration and selective reabsorption rather than osmoregulation and the role of ADH. The main errors were as follows:

- ADH is released by the (posterior) pituitary gland NOT the loop of Henle or the collecting duct
- the water potential of the blood is detected by osmoreceptors in the hypothalamus NOT the kidney
- ADH affects the permeability of the distal convoluted tubule and collecting duct NOT the proximal convoluted tubule and the loop of Henle

HUMAN BIOLOGY
General Certificate of Education
January 2013
Advanced Subsidiary/Advanced

Principal Examiner: Dr. C. Blake

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
HB4	180	80	56.4

Grade Ranges

A	64
B	59
C	54
D	50
E	46

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Human Biology HB4

- Q.1 (a) (i) Very few candidates were able to calculate the percentage increase of population size between 1600-1800 and between 1800-2000. It was common to find the first calculation attempted (but rarely correct) but the second not.
- (b) (i) The vast majority of candidates were able to state two factors which have led to the enormous increase in the size of the human population but some state that, simply, it was because birth rate was higher than death rate.
- (ii) Two acceptable factors which could slow down the rate of increase in the human population were commonly given.
- (c) (i) Many candidates referred to the absence of the decline/ death phase in the human population curve and that it had not yet reached the plateau/ stationary phase. Correct reference to the carrying capacity was often given but many considered that there was no lag phase in the human population curve.
- (ii) It was rare to get a correct response for the calculation of the number of bacteria present in an original sample by serial dilution.
- Q.2 (a) (i) Most candidates understood that glycolysis takes place in the cytoplasm but a significant number thought that it was matrix or 'cytoplasm' in the mitochondria.
- (ii) Candidates had a very sound understanding of the stages of glycolysis and the stages where dehydrogenation, phosphorylation and splitting of hexose take place.
- (iii) Most candidates correctly stated that the net gain of ATP when one molecule of glucose is broken down was two.
- (iv) There was a very good understanding of the process of anaerobic respiration in muscle.
- (b) (i) There was a very good understanding of what happens to fats under aerobic conditions. Most candidates correctly stated that fats were broken down into fatty acids and glycerol and correctly stated how these were used, several candidates correctly stated that there was more hydrogen and linked this to chemiosmosis.
- (ii) Most correctly stated that carbon dioxide was the form that carbon was excreted from the body, there were some very interesting alternatives but alas incorrect.
- (iii) Some candidates did state that increased levels of oxygen would be required when fats are used as a respiratory substrate and that more carbon dioxide would be produced but many candidates were unable to give a valid suggestion as to why fats were not used in muscles as the main source of energy.

- Q.3 (a) (i) Many candidates incorrectly identified myofibrils as myosin, the Z line as actin and mitochondria as glycogen or fat. Candidates should be advised to take care with the spelling of scientific terms such as sarcomere. Sacromere is not acceptable.
- (ii) The majority of candidates did understand which bands would disappear if the muscle fibre had been treated with an enzyme which digests the protein actin or the protein myosin.
- (iii) It was rare to have glycogen stated as a polysaccharide found in muscle fibres, fats being the most common answer.
- (b) This question did cause some problems for the weaker candidates.
- (c) The knowledge shown by candidates about differences between slow twitch and fast twitch muscle fibres is to be commended. All points on the mark scheme were seen.
- (d) A significant number of candidates incorrectly stated that ATP is used to supply energy for the power stroke and made reference to the use of ATP in the transmission of a nerve impulse or during synaptic transmission. It was rare to see reference to the use of ATP in the active transport of Ca^{2+} back into the sarcoplasmic reticulum.
- Q.4 (a) Proteins/ amino acids commonly given as one molecule which contains nitrogen, but the second did cause some problems- fats and carbohydrates being given by some.
- (b) S ome candidates did get the role of the two bacteria the wrong way around. (*Nitrosomonas* uses ammonia, *Nitrobacter* nitrites 'back ter' nitrate might help)
- (c) Many correctly linked creation of aerobic conditions to the improvement in nitrification and prevention of denitrification.
- (d) Very few candidates appreciate that if crops are removed the nitrate which they have absorbed and converted into amino acids etc are removed and in consequence need to be replaced using fertiliser. There were, however, some excellent well structured and logical responses.
- (e) Leguminous plants, Rhizobium, root nodules features in many answers but most candidates stated that the bacteria released nitrate ions into the soil and did not appreciate that the bacteria and plants need to be decomposed to release nitrates back into the soil.
- Q.5 (a) (i) Usually correct responses given, the most common incorrect being nephron.
- (ii) Proximal convoluted tubule, Bowman's capsule and glomerulus identified by almost all candidates.
- (iii) The common error was not qualifying a statement for example 'mitochondria' rather than 'large numbers of bacteria'. Marks were also lost by stating features which were not visible for example, transfer proteins/ protein pumps / receptors.

- (b) Most candidates were not able to describe how ultrafiltration takes place with any precision or detail. Some candidates adopted a 'pick and mix' approach and wrote all they knew about the kidney and others confused ultrafiltration with selective reabsorption or the function of the kidney in the control of water potential in the blood. There was much confusion!
- Q.6 (a) (i) Burning of fossilised fuels was a popular choice but respiration less common, as processes which increase carbon dioxide levels in the atmosphere.
- (ii) The correct answer, chloroplast, was usually given the most common error being chlorophyll.
- (iii) Responses tended to lack precision, clarity and were not concise.
- (b) (i)&(ii) Many candidates did not appreciate that photosynthesis is responsible for the production of oxygen and even less that it is responsible for the production of organic molecules.
- Q.7 (a) The most common error was that candidates did not discuss the involvement of the membrane in the transmission of a nerve impulse. There is confusion between the sodium and potassium pumps and the voltage gated channels. Many candidates assume they are the same and some candidates referred to sodium pumps and potassium pumps, not realising that it was the same pump. There were some excellent accounts of the involvement of the membrane in synaptic transmission.
- (b) The causes, effects and treatment of both Parkinson's disease and Motor neurone disease were usually excellent, accurate and detailed.



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