GCE A LEVEL EXAMINERS' REPORTS

BIOLOGY
A LEVEL

SUMMER 2019

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BIOLOGY

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COMPONENT 1

General Comments

The standard of some responses was excellent, showing a real knowledge and understanding of A-level biology with correct use of biological terminology. These answers routinely showed excellent exam technique, with reference to the stem of the question and some thought as to what the question is asking. However, there are still many responses showing confusion (most questions), lack of knowledge and understanding, sloppy/incorrect terminology and poor explanations. Handwriting is getting worse.

Comments on individual questions/sections

Q.1 Most of this question was generally well done, although there are many who had not bothered to learn the features of a eukaryote or the phases of a population growth curve with the biological explanation for each. There are still too many inappropriate references to yeast cells giving birth. Very few correctly identified both C and D as phases where sexual reproduction would occur, despite being told about environmental stress in the stem of the question and even fewer mentioned the resistant spores (again, in the question stem) that would allow the yeast to survive adverse conditions.

Q.2 This question was well done, with exception of (d) which is core biology. Few referred to kinetic energy breaking **H-bonds**. Far too many wrongly mentioned all bonds, including peptide (which requires boiling with acid to hydrolyse it in the absence of enzymes).

Q.3 Parts (a) and (b) were good with the exception of those who did not label the arrow or had it pointing to lipid droplets; most could identify the pigment.
Unscientific use of language lost marks in (b). Responses variously had light entering, hitting, being trapped/captured/received by photosystems; light/photons are **absorbed** by photosystems.

In 3(d) it was common to see zero or one out of the three marks for what is essentially recall of core biology.

There were many poor responses to (e) showing little understanding of the influence of stopping the light dependent stage on the Calvin cycle, the effects of lack of triose phosphate/glucose/carbohydrate on respiration, subsequent ATP synthesis and how a lack of ATP could kill cells. Large numbers of candidates appeared to think that the lack of ATP synthesised by the LDS would kill cells because they would not be able to carry out 'metabolic processes'.

Q.4 This was the least well done question on the paper.

Parts (b) and (c) required analysis of the diagrams to enable explanations. Many did not take time to study the diagrams and so answers were confused / incomplete / wrong.

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In (b) (ii) the cancer cells undergo uncontrolled mitosis which requires large quantities of ATP. A simple explanation of the action of 3-BrPA on HK and how lack of ATP could kill cells was all that was needed. Cancer cells were variously replicating / multiplying / dividing / reproducing; it is **mitosis**. The response 'there is no ATP so it kills the cancer cells' is not an explanation.

Incomplete answers to (c) (i) were common – often only two of the three explanations were given. Many candidates chose to answer the question 'Why was glucose not used as the respiratory substrate?' in (ii). Only the best responses explained that this experiment involved isolated mitochondria, there were no enzymes present to carry out glycolysis as there was no cytoplasm, and that pyruvate was the substrate for the link reaction in the mitochondrial matrix. Data analysis in (iii) was poor. Some reference to the data sets and the SD was needed, with 10 ^{o}C being picked out as the least reliable. Very few gave a conclusion that could be drawn from the data; most described the data or stated that 40 ^{o}C was the best temperature.

Q.5 There was some confusion over the appropriate terminology in (a). Many candidates did not give three abiotic factors in (b) despite all possible answers being in the stem of the question. The same is true of (c) (i). The field work in (d) was a mixed bag, with many giving excellent descriptions of how this would be carried out; however, some appeared not to have a clue what to do and many omitted the returning at suitable intervals (daily is not sensible – there would be no vegetation left after a couple of weeks!) or that it must be the same area.

Q.6 Largely well done, although a considerable number did not divide the number of kites by two, to give breeding pairs. If correct terminology had been used many more would have scored higher in (b). The question is all about intraspecific competition and lack of predators; few could explain this succinctly. It was very disappointing that so few know what an SSSI is. Many got the wrong words and those that did, did not necessarily have them in the right order. There is a distinct lack of knowledge as to what an SSSI achieves in terms of environmental protection.

Q.7 There were few really strong essays which was very surprising, given that this is a highly topical subject and that biologists should know the causes and effects of rising global temperatures on ecosystems. The information on the human effects was often brief; there were many who did not refer to the data at all and could not give any detail on the effects on aquatic environments. There was too much time spent on irrelevancies such as polar bears, seals and penguins. Statements which were imprecise such as 'pH changed' rather than decreased or acidification of the water were common. Incorrect references to the ozone layer were rife, with many stating that increased CO_2 increases holes in the ozone layer.

Summary of key points

- A common feature was complete inability to distinguish between explain and describe; if the question requires an explanation, then a description does not answer the question.
- In the absence of knowing the answer, candidates frequently wrote the stem of the question out again; this will not gain marks.
- There is strong evidence of core biology not having had sufficient revision. Questions requiring core biology knowledge were generally badly done.

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- There is a big gap in candidates' knowledge about what ions and biological molecules are, and the ions required to synthesise biological molecules. The responses to 3(d) were truly incredible for A-level biologists.

- Data analysis is poor. Just because 'the experiment was repeated three times and a mean calculated', does not make it reliable; this was a common response in 4(c)(iii).

- There is considerable effort made to ensure candidates have the information to answer application of knowledge questions – this is frequently in the text/photographs and diagrams; there appears to be a distinct reluctance to use them.

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BIOLOGY

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COMPONENT 2

General Comments

The paper assessed the required breadth of topics including synoptic material from the core and other components, and the Assessment Objectives (AO) with the required weightings. Attempt rates for all questions except 7(c)(ii) were over 90% and for approximately half the questions over 99%. Facility factors, expressed as the mean mark as the percentage of the maximum mark, show that accessibility was good for most items with the exception of parts 5 (c) and 5 (f). Performance was best in items requiring mathematical skills and worst where items required clarity of written communication.

Comments on individual questions/sections

Q.1 The attempt rate for part (a) was over 95% and for parts (b) and (c) over 99%.

(a) **(i)** targeted Assessment Objective (AO) 2; candidates were expected to link their knowledge of evolution and modes of nutrition. The best responses gave clear accounts of the development of the Kingdoms from Protoctists showing the three different modes of nutrition. Most responses made some link between the Kingdoms and their characteristic mode of nutrition, some gave descriptions of the modes of nutrition but made no link to the Kingdoms. Marks were lost because of poor quality of written communication. Part (a)(ii) was straight recall but a facility factor in the mid fifties suggests that the description of Fungi was not widely recognised. Animalia was a common incorrect response.

(b) Part (b) targeted AO1 and AO2, and a facility factor of approximately 60% indicates it was very accessible. There was some ambiguity in some responses to part (b)(iii), when indicating the position of the most recent common ancestor.

(c) This part of the question was the most accessible item on the paper with a facility factor of over 85%, even so there were a significant number of incorrect responses to completion of the taxon list in part (c)(i).

Q.2 The attempt rates for all parts were between 97% and 99%.

(a) Part (a) targeted AO1, and with a facility factor in the low fifties discriminated reasonably well. A significant number of responses gave two differences for one mark but could not gave a third difference for the second mark.

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(b) Part (b) also targeted AO1 but was less accessible with a facility factor in the low forties. The difficulty was omitting that the enzyme acted at a specific sequence, giving instead vague references to 'sticky ends'.

(c) Part (c) which targeted AO2, was even less accessible as indicated by a facility factor in the mid thirties. The best responses utilised the bullet points given in the description of CRISPR; identified the egg cells as the target cells; identified the fertility gene as the target gene; and wrote a clear account. Some responses ignored the information provided and some showed serious inaccuracies such as 'insert into the mosquito'. Some responses showed poor quality of written communication to the extent that it was not possible to make sense of what was written.

(d) Part (d) was in the top quartile of items for accessibility with a facility factor in the mid sixties, nevertheless responses to the ethical elements were weak, in many cases amounting to nothing more than 'it is wrong to play God'.

Q.3 Attempt rates for separate parts were the highest of all the questions, all above 97%, peaking at 99.9% for part (b).

(a) Part (a) was the least accessible in this question and was in the top quartile of poorest answered on the whole paper with a facility factor in the mid thirties. Quality of written communication was an issue, whereas most responses successfully described a method for randomising quadrat placement, many made vague references to transects. The best responses showed evidence of practical experience of the process.

(b) Part (b) was among the best answered items with a facility factor in the high eighties. It targeted AO2 and maths skills. The straightforward Simpson's Diversity Index problem had a high level of scaffolding, so most responses obtained all three marks. A notable exception was where responses neglected to subtract the calculated fraction from one, here the response was still able to get two marks and the error was carried forward to parts (c) and (d).

(c) Part (c) was also well answered with a facility factor in the low sixties. It targeted AO3. Most responses made the link between lower Simpson's Diversity Index and reduced biodiversity for one mark. The best responses identified the frequency of mowing rather than mowing per se as the cause. Some responses noted the reduction in Simpson's Index but did not make the link to biodiversity so in effect made no conclusion. (A small number of responses were given credit for the conclusion that biodiversity was increased as an error carried forward from part (b).)

(d) Part (d) targeted a mix of AO1, AO2 and AO3, as such it had a high level of demand and proved so with a facility factor in the mid thirties. The best responses recognised the importance of the meristems for regrowth after cutting and gave a clear account of the consequences of their removal or not by the mower. Quality of written communication was an issue. (Credit was given to responses which accounted for an increase in biodiversity with respect to competition for light as error carried forward from part(b).)

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Q.4 Attempt rates for the separate parts of question 4 ranged from 95% to 99.8%

(a) Part (a) was a straightforward AO1 question about the definition of a species. A facility factor in the mid forties suggests that this proved more difficult than it should have. To establish that two groups belong to the same species they must interbreed and produce fertile offspring. The most common error was to omit reference to one subspecies being able to breed with another subspecies.

(b) Part (b) was a genetics problem involving incomplete dominance, candidates should have practised this type of cross and know the conventions, and the facility factor in the low seventies confirms a good level of understanding. A significant number of responses did not use an appropriate convention for incomplete dominance and some attempted to carry out a dihybrid cross. A small number of responses gave a ratio that did not match the phenotypes written above them.

(c) Part (c) targeted a mix of AO2 and AO3 with a relatively high level of demand in terms of suggesting a possible mechanism for the trend. The best responses recognised increased competition for territories on smaller islands and the importance of aggression in that context. Some responses incorrectly suggested increased competition on the larger island. The quality of written communication was so poor in some responses that no coherent explanation was discernible.

(d) (i)and(ii)

These two parts targeted AO3 but with a lower demand than in part (c), so candidate performance was better with a facility factor in the upper fifties. Quality of written communication was an issue in both parts.

(e) Part (e) caused more difficulty than expected with a facility factor in the mid thirties with a significant number of responses not making the link between radiation and mutation.

Q.5 Attempt rates for the separate parts of question 5 varied from 95% to 99.5%.

(a) Part (a) was an observation exercise targeting AO2 and application of synoptic knowledge from component 3, specified practical work (page 45 of the specification).
The facility factor in the mid fifties showed that this part discriminated well. A relatively common error was to identify A and B as venule and arteriole even though Figure 5.2 on page 15 shows clearly that these are not in the umbilical cord.

(b) Part (b) targeted AO2 and given that all the information needed to answer the question is clearly visible in **Figure 5.2,** the demand is moderate. A facility factor in the low forties suggests that performance was poorer than expected on this part.

(c) Part (c) had the lowest facility factor of all the items on the paper, at less than ten, suggesting it was largely inaccessible. The item targeted AO2 requiring reference to **Figure 5.2** but many of the responses treated it as a completely different AO1 question and launched into a description of counter-current flow.

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(d) Part (d) was one of the best answered items on the paper with a facility factor in the mid eighties. Even though it involved synoptic material from component 3 and targeted a mix of AO2 and AO3, the demand was low because of extensive scaffolding. The level of maths skills involved was rudimentary.

(e) Part (e) targeted AO3, making predictions, but the demand was probably too low even though it required synoptic material from component 3, and the facility factor came out in the mid seventies.

(f) Part (f) was rather inaccessible with a facility factor in the mid teens. The issue here was lack of accuracy and confusion about where the surfactant has its effect, with many responses describing alveoli sticking to each other instead of the internal surfaces sticking together.

Q.6 Attempt rates for the separate parts of question 6 varied between 93% and 99.5%.

(a) Part (a) targeted AO2 and tested synoptic material from the core concepts. The marks were very accessible, with a facility factor in the low sixties this item was within the best answered quartile. One notable error was the labelling of starch grains as ribosomes.

(b) Part (b) targeted AO2 and tested synoptic material from component 1. With a facility factor in the low thirties this item was in the least well answered quartile. The best responses gave a correct word equation, and clear explanations of lower efficiency in terms lower energy release and ethanol as part of the commercial products. The mark most commonly lost was the mark for the importance of the process because responses did not articulate that the ethanol is an important component of the products of brewing.

(c) **(i)** This part of the question targeted a mix of AO2 and AO3. A facility factor in the high thirties suggests this part was fairly inaccessible. It was the first marking point which was most commonly lost because responses neglected to describe the use of group means or symbols, responses usually successfully commented on the reproducibility of the data.

(ii) This part also had a facility factor in the high thirties; sub-part II was most commonly answered incorrectly despite repeatability being explained in the introduction to part (c).

(iii) (iii) was a straight recall question (AO1), it had a facility factor in the high fifties, so it did discriminate. The most common incorrect response was ‘chi squared’.

(iv) This was in the top quartile of best answered items with a facility factor in the mid seventies. The best responses described the relationship between gibberellin content and rate of amylase production as well as the time lag, but a significant number neglected to describe the delay.

Q.7 Attempt rates for the separate parts generally varied between 92% and 97%, however part (c)(ii) stood out with the lowest attempt rate on the paper at 83%. The question tested material from specified practical, ‘Scientific drawing of a low power plan of a prepared slide of an anther, including calculation of actual size and magnification of drawing.’ (page 34 of specification)

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(a) Part (a) targeted AO2 and AO3. With a facility factor in the high thirties, this part was less well answered than expected. The best responses showed a semi-circle drawn with a single clean line of approximately the correct size; clearly labelled vascular strand/bundle; and gave a clearly described function. A number of responses had drawings over something that was already shown on Figure 7.2 or did not name the feature or describe a function of the feature.

(b) Part (b) targeted AO2 and AO3 and tested maths skills. The best responses measured X-X and Y-Y on the drawing accurately to within 1mm, recorded the measurements including units; calculated the ratio of the measurements; calculated the ratio of the actual measurements given in Figure 7.2; (or calculated magnifications of X-X and Y-Y); and made a conclusion by comparing the two values; set out the calculations fully labelled, in the space provided, so that the strategy could be followed; and made a conclusion with reference to the calculations. The least successful responses did not record the measurements or omitted units; scattered workings in a random fashion around the space provided with no labels or with inappropriate use of equal signs; or showed no workings.

(c) (i) & (ii)

Both of these proved more challenging than expected with a facility factors in the mid thirties. Quality of written communication was an issue particularly in (c)(i).

Q.8 The attempt rate for question 8 was 99%, but there was a large variation in the amount of content in responses; varying from a few lines to the three sides provided, and to some responses that continued on to the additional pages.

The question targeted AO2 and AO3 as well as testing quality of extended response(QER). Performance on this question was amongst the poorest of all the items on the paper with a facility factor in the low thirties. The best responses tackled the question in the three parts suggested in the question and addressed all of the information provided. Many responses were seen where the wording of the question had been ignored and described pollination in general or addressed the difference between wind and insect pollinated flowers. There was an alarming level of inaccurate use of the word 'plant' to describe flowers. Quality of written communication was also an issue.

Summary of key points

- Quality of written communication continues to be an issue. The information for candidates printed on the front cover of every answer book states that the quality of written communication will affect the awarding of marks. In practice what a candidate writes must make sense whether it is a correct or incorrect response. Clarity is also important, candidates must not rely on examiners knowing what is meant by a vague response, examiners are simply not allowed to fill in anything omitted from a candidate's response. Candidates should be encouraged to re-read each response to make sure it makes sense and is clear.

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- Relying too much on recall is another issue on post 2015 papers. The number of marks for AO1 is limited on this style of paper, there are many more marks for AO2 where candidates are required to apply knowledge to information provided in the question. Some candidates read the question briefly, identify the topic and give a recall answer for that topic. Candidates should be trained to read questions in detail and use the information provided in their answers.

- The specification emphasises the importance of practical work, to quote from page 5, 'Practical work is an intrinsic part of this specification. It is vitally important in developing a conceptual understanding of many topics ... … specified practical work [that] must be undertaken by learners in order that they are suitably prepared for the written examinations.'. It was apparent that the best responses in some parts of the paper came from candidates that had actually carried out the practical work and obvious where candidates had not.

- Where mathematical skills are being tested and especially when the question asks for workings to be shown, candidates are most successful if they present their calculations in a well ordered and fully labelled sequence, always including appropriate units. Candidates should avoid writing a jumble of unrelated and unlabelled numbers and only use the equals symbol if the components either side are actually equal.

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COMPONENT 3

General Comments

In general this paper was well answered with many excellent answers seen to nearly all questions. However, there was also a wide range in total marks showing that the paper discriminated well between the most and least well prepared candidates and all questions had a high attempt rate.

Questions assessing practical aspects of A-level Biology were, on the whole, answered better than in previous years but possible lack of coverage of all practicals in the lab book may be preventing some candidates accessing marks. The issue of whole centres providing extension booklets rather than telling candidates to use the additional response page at the end of the paper continues to be an issue.

Comments on individual questions/sections

Q.1 **(a)** Many candidates could recognise both palisade mesophyll and xylem on a slide of TS leaf. A significant number lost marks through inaccurate use of label lines. Candidates need to end their label lines **in the tissue** being labelled not to the edge. This was most evident when labelling the xylem vessels as many label lines ended in the cambium, phloem or bundle sheath.

Most candidates correctly identified and gave suitable adaptations of a hydrophyte leaf but some confused the terms hydrophyte and xerophyte and others lost marks by referring to adaptations not present in the image provided.

(b) Candidates were instructed to use only the scale bar to calculate the magnification of image 1.2 and yet many insisted on measuring the drawing of the root, making no reference to the scale bar or incorrectly converting units (or indeed not converting units at all!).

A lack of detail cost marks when explaining the slower rate of transport via the vacuolar route than the symplast; many answers implied that the vacuoles in different cells were adjacent and that water moved directly from vacuole to vacuole.

(c) Few candidates could describe the arrangement of vascular tissues in a stem and even fewer knew the main chemicals involved in strengthening xylem vessels and phloem sieve tubes.

Candidates are advised to make sure that they know **all** the slides described in the specification and centres need to make sure that their candidates can apply this knowledge to different images.

Q.2 **(a)** Very few candidates could apply their knowledge of nephron structure and function to the image of the dissected kidney.

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(b) The main confusion here was identifying microvilli as villi or cilia, but most understood that the structures increased surface area for selective reabsorption. The role of the capillaries in selective reabsorption was well understood.

(c) Overall, there was a sound understanding of the inheritance of Alport's Syndrome. However, candidates lost marks by not explaining why in this example inheritance could not by due to a dominant allele. In addition, there was some confusion over the use of the terms recessive and dominant and a lack of understanding of sex linkage in some answers.

When candidates dissect the kidney (if they do) they should ensure that they can recognise the position and appearance of the different tissue layers and be able to relate the functions of the kidney to the structure of the organ. They also need to be given opportunities to observe the detailed structure of parts of the kidney, e.g., through the use of microscope slides and / or electromicrographs.

Q.3 **(a)** Understanding the use of a potometer to measure water uptake is one of the practicals in the lab book. Very few candidates could look at the unit of water uptake, $mm^3\ cm^{-2}\ minute^{-1}$, and recognise the measurements they would need to make to gain the information needed to calculate this rate. The use of the syringe was quite well answered.

(b) The vast majority of candidates could calculate the value of y given the equation $y = mx + c$ and suitable values. What many could not then do was to use this value and the value of c (the intercept on the y axis) to plot a line of best fit. The use and application of this equation is one of the required mathematical skills.

(c) Candidates must learn to read the questions before diving in and answering questions. Despite being told that stomata close at high wind speed most candidates stated that water loss would increase and yet then went on to state, correctly, that this would reduce water loss! The use of absolute terms, such as prevent and stop, cost marks for a number of candidates.

Candidates and centres need to understand that questions can be set on any of the practical in the lab book and that they need to be able to apply the required mathematical skills to these practicals where relevant.

Q.4 **(a)** Reading and comprehension of written information and then applying your own knowledge and understanding to interpret that information is an important skill. While most candidates identified key facts in the information provided many were unable to make this link. There was much confusion as to the effect of bidirectional and unidirectional transmission of nervous impulses on the speed of transmission or on an organism's ability to coordinate sensory information with a motor response.

(b) Few candidates were able to link events in the transmission of an action potential through a motor neurone and synapse. While most identified the location of dendrites correctly there was much confusion as to the location of Ca^{2+} channels. The effect of the myelin sheath was generally well explained.

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Candidates are advised to read the information provided and even annotate the text / diagrams to help them recall facts and interpret the content.

Q.5 **(a)** Many candidates' responses to the questions on ventilation in fish and mammals suffered from a lack of detail. Knowledge and understanding of pleural membranes in particular continue to be quite poor. This reflects a lack of knowledge of basic facts which underpin this section of the specification.

(b) There was an improvement in the identification of the independent and dependent variables but candidates do need to read the information provided and use the wording given rather than overcomplicating the questions.

(c) Deciding when readings are anomalous is a practical skill that is key when analysing experimental results. Most candidates realised that the results for Fish 1 followed the same trend but many did not support their answer with sufficient reference to the data even though this was asked for in the stem of the question.

Linking temperature, oxygen content of water and air, and ventilation rate provided the basis for this question. Candidates who focussed on increased activity and respiration during warmer weather or ice preventing oxygen dissolving in water in the winter did not use all the information provided and missed the point of the question.

Candidates are advised to follow the rubric of the questions and make sure that their answers meet the demand of the questions.

Q.6 **(a)** Characteristics of the cell type of the domain Eukarya was being tested but was not well answered.

(b) There were two main issues with the answers to the calculation in this question. First, when a ratio is requested in the format …. : 1 there is no excuse for dividing both numbers by the smaller number – the order of surface and volume is crucial here. Second, candidates are still not reading instructions as to the level of precision of the answer, in this case, one decimal place.

Surface area, volume and radius / diffusion distance are key principles in understanding the limitation of increasing size on the absorption of oxygen to meet respiratory demand. Many good answers were seen but many provided unclear or incomplete answers and did not gain the marks.

(c) Recalling the yield of ATP from aerobic and anaerobic respiration posed more of a problem than anticipated and many were unable to state the advantages of a closed circulatory system over an open circulatory system.

(d) The basic explanations of the advantage and disadvantage of having haemoglobin with a high oxygen affinity were not clearly communicated by many candidates. In addition, they did not refer to the information provided on increasing NaCl concentration on oxygen affinity when attempting to explain the advantage to lugworms.

This question assessed candidates' knowledge of the key principles underlying gas exchange and transport. Candidates are advised to make sure that they know and understand how to apply these principles to different scenarios.

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Q.7 This question on modes of nutrition produced the whole range of responses; while some candidates had only a very basic and confused knowledge of the different modes of nutrition, made many errors or did not link their answers to the images provided, others gave excellent answers. The essay focused on adaptations for nutrition – the inclusion of irrelevant information, e.g., tapeworms being hermaphrodite, prevented some candidates gaining full marks.

Candidates are again advised to answer the question as given and to focus on identifying and understanding the stimulus material rather than picking on one or two key words in the question and then writing everything they know on the topic.

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Option A: Immunology and Disease

Candidates were able to recognise that there were many more microbial cells than human cells on and in the human body. In many cases they failed to realise that there is also a wide variety of genomes amongst the human microbiome.

While candidates were able to describe antigen presentation using the diagram, they generally struggled to explain the T cell response. Many candidates thought that T cells produced antibodies.

The best answers to the antibody question recognised that the hinged regions allowed the antibody to bind to more than one antigen and could “flex” to do so. Candidates who got this idea also explained the advantage of IgM over IgG. However, many thought that it allowed changes to the binding site to enable the antibodies to bind to differently shaped antigens, i.e.., forgetting that antibodies bind to specific antigens.

The calculation was generally well done with most candidates applying ideas on counting microbial numbers correctly. The question on sterile technique was well answered, although some candidates referred to sterile conditions or autoclaving, but the question was about inoculation of the plates.

Candidates were able to suggest potential uses of phage therapy and were able to suggest ethical issues.

Option B: Human Musculoskeletal Anatomy

Most candidates were able to label the bones of the forearm, but many could not articulate how the joint allows the arm to perform its function. Many candidates wrongly identified it as a ball and socket joint.

Few candidates could identify the functions of yellow elastic and hyaline cartilage; they did not compare the structure between the two types. More candidates could explain why cartilage is slow to heal when damaged.

Calculation of percentage increase in rickets cases was correctly calculated in many cases. Candidates were able to suggest how data could be inaccurate and they generally were able to suggest how a study could take place. Many candidates identified osteomalacia, but not all of these were able to explain that it is less serious than rickets because adult bones have stopped growing.

Energy sources in muscle caused a problem for many candidates. They struggled to identify that ATP sources in muscle were used first and quickly. They mentioned CP, but few candidates correctly described the transfer of a phosphate group to ADP to create more ATP. The explanation of why aerobic respiration takes over from anaerobic was better described in most cases.

The question on flat feet and suitable treatment was well answered.

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Option C: Neurobiology and behaviour

Labelling the lobes of the brain was well done, although some of the spelling was so incorrect that it was not phonetic and so did not score marks.

Candidates could calculate how many times greater the number of cortical neurones was in human compared to mouse, but the question about cognitive function in the long-finned pilot whale was answered by re-phrasing the question in many cases. Whilst candidates were able to recognise the increased number, they were less likely to equate this to a specific function of the cerebral cortex.

Many candidates were able to identify the lobe of the cerebral cortex affected by different injuries.

Most candidates were able to identify the neurotransmitters involved in the sympathetic and parasympathetic nervous systems. Fewer candidates equated the sympathetic nervous system to increasing heart rate/ blood pressure and delivery of more blood/ oxygen to muscles.

Most candidates were unable to explain the role of the brain in preventing the brain becoming overstressed or why traumatic childhood can pre-dispose individuals to mental illness.

The part of the question on animal behaviour was generally well answered; candidates, in most cases, correctly identified the risk and control measures in studying bees.

Many candidates failed to realise that the smaller difference in repetitions of the waggle dance as the food was further from the hive decreased the accuracy of the waggle dance.

Many candidates correctly explained how Von Frisch improved repeatability and reproducibility of his investigation, although some lost marks by referring to accuracy here.

Identifying the idea of adapting to different food sources / different habitats by chimpanzees was explained by some candidates very well. Other answers were vague.

Summary of key points

It is strongly recommended that candidates:

- read the questions and follow the instructions given.
- revise **all** the practicals in the lab book in preparation for the external examinations.
- know how to label all the microscope slides listed in the specification.
- be able to apply key principles to different situations

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PRACTICAL ENDORSEMENT

General

The second cycle of monitoring the practical endorsement covered the period September 2017- April 2019. Eduqas visited most centres doing practical endorsement in year one of this cycle. The third cycle of visits will commence in September 2019.

Approx. 90% of centres passed on the first monitoring visit in the second cycle. This is compatible with the outcome from the first cycle of visits and similar to other awarding bodies. Centres which failed the first monitoring visit were given support and were visited a second time in the same subject. All centres which failed the first visit made by Eduqas subsequently passed the second visit.

Centres are commended for the way in which they have embraced the practical endorsement. Eduqas monitors saw many examples of good practice and assessment used by schools and colleges.

Monitors were required to examine evidence of how the school manages practical endorsement. In common with other awarding bodies, monitors are required to view the following evidence:

- Plans for completing and assessing practical work.
- The centre is required to plan to complete the necessary range of practical work required by the specification.
- Teacher records of candidate assessment.
- Candidates' laboratory books.
- Teacher assessment of a practical class.
- The monitor is required to observe a year 13 practical class in which assessment of CPAC is taking place and speak to the teacher about the assessment of the relevant CPACs linked to the session.

There are several key features that characterise centres that successfully implement practical endorsement:

- Clear planning of both practical work and the CPAC statements to be assessed in each practical.
- Candidates are well informed about practical endorsement, the meaning of CPAC statements and the outcome of each assessment.
- Practical books are used in 'real time' at the bench by candidates when completing a practical.
- Practical books should be used in the lesson. We do not expect to see practical books which are in immaculate condition! Candidates should not write on scraps of paper and later copy the work up neatly into practical books.
- The teacher targets appropriate CPAC for assessment in the practical lessons.

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- Suitable feedback is given to candidates.
  This is particularly important when a candidate does not achieve a CPAC; why have they failed to achieve a CPAC statement and what they need to do next time to evidence it? We understand that there are limits to the feedback that may be given. Use peer assessment and self-assessment to reflect on practical work.
- Encourage candidates to self-annotate work to facilitate learning. This is particularly helpful if you give verbal feedback.
- There is evidence of good communication between staff teaching on the same qualification.
- Where a number of teachers are involved in the delivery of a qualification, there should be evidence that centres standardise their approach.
- Information from CPD is fed back to other members of the team delivering the qualification.

CPAC statements

Centres are reminded that in order to award a pass for practical endorsement, a candidate needs to 'consistently and routinely meet the criteria'. This means there needs to be evidence of multiple occasions where a candidate evidences a pass for each CPAC statement. It is important that suitable opportunities have been built into the assessment plan which allow candidates to generate this evidence.

CPAC 1: This is generally well assessed by the majority of the centres visited.

In a few cases, candidates did not always carefully follow instructions during the observed practical. When this happens, the candidate should not achieve the CPAC. It is therefore important that candidates are carefully observed when they conduct their work.

When assessing more complex procedures, teachers may wish to use a check list to aid assessment. This is particularly helpful in standardising assessment when a number of teachers are involved assessing the same scheme.

CPAC 2: This is the most difficult CPAC for candidates to evidence since it involves higher level skills. Generally, we do not expect to see this CPAC assessed in the first two terms of an A level course. However, we do expect to see evidence of some assessment of this criterion by the beginning of the second year of the A level course. Some centres make use of the period at the end of the first year to introduce the assessment of this CPAC statement. Please make sure that you know where and when you are going to assess this CPAC. It is also important that sufficient time is given to candidates to develop the necessary skills before assessment occurs.

CPAC 3: There is no need to assess this skill every time a practical is completed. There are plenty of opportunities to assess this CPAC so choose the occasions where there are more significant risks or hazards.

CPAC 3 (a) requires learners to identify hazards and asses the risks associated with the hazards. Some centres choose to assess this by asking candidates to write a risk assessment. This is a valid means of assessment although it goes beyond what is required for the criterion. If a risk assessment is not written by the candidate, then it will be necessary to consider how to assess this. A simple method used by some centres is to ask candidates to identify to the teacher the hazards / risks of a technique while they do the experiment. Successful completion could then be marked on a tick sheet.

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CPAC3 (b) should be assessed by observation of learners conduct during a practical session.

CPAC 4 (a) making accurate observations
Observations should be made directly into their practical books. They should not be written on to scraps of paper and copied up later.
Tables of the candidates' **own** devising should be used to record information. The tables should have appropriate headings and units. It should be noted that it is a requirement that candidates record units in the table to achieve the criteria. Do not use proforma with blank tables when assessing this skill.

CPAC 4 (b) obtaining accurate, precise and sufficient data …….
Please carefully check learners' data. Is it recorded to appropriate precision? Is there sufficient data? Is the data what you expect?

CPAC 5: Please remember the difference between CPAC4 and CPAC 5.

- CPAC 4 is about recording data 'live' into appropriate tables.
- CPAC 5 has two main elements: (1) processing data and (2) referencing information.

(1) Processing data

There should be evidence of learners processing data using graphs and calculations. Centres should require candidates to draw graphs by hand on some occasions and, on other occasions, to use software (e.g. Excel) to draw graphs.
Make sure graphs are constructed correctly, i.e. there is a title, each axis is correctly labelled, points plotted correctly, an appropriate scale used etc.

(2) Referencing data

Candidates **must** show evidence of referencing sources of information. The evidence produced towards this aspect of the CPAC varies considerably among centres. Some have candidates demonstrating referencing on multiple occasions, even using the Harvard System (which exceeds our requirements), while, in other centres, it is rarely evidenced.

Opportunities for assessing referencing should be built in from early in the course. The information referenced may be, for example, data or a quote; the information may come from a textbook, journal, website, EDUQAS data sheet etc.
A few centres, and therefore candidates, still confuse referencing with a bibliography. There are important differences.

Summary

Successful delivery of practical endorsement needs careful thought and planning. Ensure that you review and adapt these plans as you deliver the qualification. Make sure that there are ample opportunities for candidates to evidence each CPAC statement.

Ensure that candidates are engaged with practical endorsement and its assessment. Candidates need to have the practical endorsement and its assessment explained at the beginning of the course. In addition, candidates must be clearly informed of the CPACs that are assessed in each practical session.
Review your assessment of CPAC with colleagues. This is particularly important when new members join your teaching team. Make sure that practical endorsement is an item on the agenda of subject meetings.

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Please also remember that candidates **must** be informed if they have achieved the practical endorsement **before** the centre submits outcomes to Eduqas in accordance with JCQ requirements. Eduqas will not change centre gradings if a centre has passed the monitoring visit.

Centres are reminded to download the following document which provides support on interpreting CPAC: 'The Practical Endorsement Standard'

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