GCE A LEVEL EXAMINERS' REPORTS

BIOLOGY
A LEVEL

SUMMER 2017

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EDUQAS
GCE A LEVEL BIOLOGY

Summer 2017

COMPONENT 1

General comments:

There was evidence of rote learning, with next to no understanding of the work which meant marks were lost in the application of knowledge questions in the paper.

The standard of written communication was very variable and spelling was poor in some cases.

There was no evidence of lack of time with almost all candidates having attempted the essay question and very few unattempted shorter answer questions.

Specific comments:

Q.1 This was placed to be a gentle introduction to the paper and many scored good marks on this question. However there seems to be confusion over environmental questions mainly because of a lack of correct terminology and understanding of basic concepts. Most of the answers to this were in the stem or the question itself and with a little thought could have been answered easily. Common errors were focussing just on biodiversity and not thinking of the implications of slowing the flow from small streams and the wider effects of just reintroducing beavers without thinking of the effects on the landowners, their disease and genetic status or sustaining their establishment/protection.

Q.2 Largely well done, particularly the recall question on the functions of minerals. Very few linked the core work on structure of proteins and disulphide bonds with the example of a molecule containing sulphur. Candidates need to practise describing graphs; there is strong tendency to use a sweeping statement which does not reflect the shape of the graph at all. Addition of nitrogen results in the biggest increase in grass yield with further addition of minerals having a lesser effect, plus some calculations to back this up. Part (c) asked for the experiment to be carried out in the laboratory; far too many pegged out areas in fields. Knowing how to set up reliable experiments is something candidates need more experience of. Vague descriptions did not gain credit. This needed to be a reproducible description of how to carry out a suitable experiment in the laboratory.

Q.3 Candidates found this a relatively straight forward question, with many gaining good marks. The problem question, as might be expected, involved using biological terminology to explain how evolution cannot keep up with a fast changing (because of humans) environment in part (d).

Q.4 Another good question, with the recall sections being very accessible parts (a and b). The experimental sections parts (c and d) proved more problematic. Many did not explain that the oxygen produced in photolysis was responsible for filling the leaf disc air spaces, therefore making it less dense, thus causing them to rise. This is despite answering (a) (i) correctly and knowing that O_2 is produced in photolysis. Far too many thought that it was the using up of the dissolved CO_2 in photosynthesis which

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was responsible for the leaf disc becoming less dense. In part (d) there were very vague descriptions of how the experiment could be modified to investigate the effect of light wavelength. Modification of given experiments by changing the independent variable is a skill which needs to be practised. Candidates were expected to explain the action spectrum in terms of how long the discs took to rise in part (ii). Many did not even mention the results, but simply talked about the rate of photosynthesis – this is a conclusion. The experiment did not measure how fast the discs were rising, but the time taken to float to the top of the beaker.

Q.5 This was largely well done, particularly in part (b) with the reasoning behind the use of logs. Part (c) was not so well answered, with little understanding that if SD bars are overlapping, then they cannot be statistically different. This meant that they were unable to use the data effectively to come to some conclusions in part (d). Using tables of data and graphs to come to scientific, statistically valid conclusions is another skill which needs practise. Stating that the use of the extracts might cause harm is not enough for an A level answer. It was expected that candidates should be able to mention allergies/toxicity/taste/cost effectiveness as sensible suggestions.

Q.6 This proved to be well done by most candidates with part (a) and (c) being recall using the question as a prompt. Part (b) needed an explanation as to how lower ATP levels cause insect death. Simply stating that it would stop 'metabolic processes' is not enough – what are those processes?

Q.7 The more straightforward parts of this question ((a) and (c)) were well done, with most understanding the advantages of using hair tube surveys to estimate squirrel populations. The main advantage for almost all candidates was that the squirrels would not be harmed/upset/disturbed/frightened/run away, showing a great deal of empathy in our biologists. The maths in part (c) was routinely good, although a significant number of candidates calculated there to be many thousands of squirrels in a hectare which is more than the entire UK population (120,000). The question asks that they set up a line transect, so full marks were not available to those who did not read the question, but set out a grid with random number generation. Most used quadrats correctly, but it was the cone cores which needed to be counted – the number of whole pine cones or the ratio to cones to cone cores was not relevant in this survey. Few visited at different times or moved the transects to different areas.

Q.8 The recall sections of this question were good; glycolysis and amino acid metabolism is generally well learned. Parts (a) (ii) and (iii) were less well done. Many had difficulty explaining why the two mechanisms differed in their ATP yield and therefore struggled to explain why in a flying insect – with rapidly contracting muscles- would need to use mechanism A. This is an application of knowledge question which required candidates to apply their knowledge of the way the electron transport chain operates to a real example and many did not even try to work it out.

Q.9 The recall of both the Krebs and Calvin cycle was excellent in many cases, although to gain full marks there needed to be a genuine attempt at comparison. Too many stopped at this point and mentioned nothing about compartmentalisation, which they have covered during their cell biology organelle work. This is a real shame and demonstrates that a solid knowledge of the core work is needed to gain top marks in questions. Those who did discuss why compartments in eukaryotes are so important, routinely got full marks.

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COMPONENT 2

General comments:

The paper allowed all candidates to access marks.

The quality of written communication was again an issue for some candidates. A significant number lost marks because they gave answers that simply did not make sense or lacked clarity. Examiners are not permitted to apply their own interpretation to make up for lack of clarity.

Comments by question:

Question 1.

In part (a) (i), almost all candidates correctly gave 'mitosis' as the name of the type of cell division shown in the photomicrograph. A very small number gave 'meiosis' and a very small number gave an incorrect spelling.

In part (a) (ii), the majority of candidates were able to distinguish cells in metaphase and anaphase and counted them accurately. However, a small minority confused the two. The calculations in parts (a) (iii) and (iv) were generally completed correctly and 'error carried forward' was allowed for candidates who had miscounted in part (a) (ii).

Part (b) was left not attempted by a significant number of candidates, and only about a third of candidates were able to give **two** clear differences between mitosis in plant cells and animal cells. There was difficulty in explaining the formation of the cell plate in plant cells with vague references to cell wall formation. Some candidates gave vague references to spindles or spindle fibres without mentioning 'centrioles' In part (c) (i) the majority of candidates were able name 'cancer', some gave 'tumour' even though that was given in the question and some made vague references to oncogenes. The quality of drawings in part (c) (ii) was variable but there were large numbers of neat, clear and well labelled diagrams. A significant number were uncertain of the difference between intrinsic and extrinsic proteins and many candidates labelled as 'transmembrane' proteins that, in their drawings, only penetrated one layer of phospholipid. Some drew 'side' chains down the side of the transmembrane protein rather than protruding from the membrane. Many candidates were able to link the carbohydrate chains to their functions but some were not able to clearly describe the consequences of reductions to the chains.

Question 2.

Part (a) (i). Calibrating the eyepiece graticule proved to be more difficult than expected, with answers ranging from 0.04 to 10000 μm being offered for the value of 1 eyepiece unit. Candidates must understand that practical skills are assessed on written papers. A common wrong answer was 2.9μm obtained by measuring from the right hand side of one line on the stage micrometer to the left hand side of the next. Part (a) (ii) is also a practical skill and there was evidence that some candidates had never actually done this. Too many candidates ignored the instruction to measure **to the nearest whole number.** The

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calculation of the actual length of the pollen tube was well done and 'error carried forward' was allowed. Several types of simple error were seen on plotting the graph in part (iv), the most common were to omit a value from the y-axis where it joins the X axis and to fail to mark a plot for 0 time. Most candidates scored a mark for 'repeat readings and calculate a mean for part (v).

Most candidates were able to design an experiment for part (b) by identifying a dependent and independent variable as well as two control variables. However, quality of written communication was an issue for some candidates who were not able to describe a method that could be followed.

Part (c): even though the content for this question was synoptic from component 1 candidates coped with this very well and it had the second highest facility factor. They had no trouble applying the knowledge from component 1 to a novel situation from component 2.

Question 3.

In the sub-parts of part (a) candidates were required to extract information from the map and the table. In part (a) (i), almost all candidates were able to describe the 'all white' and 'all orange' pattern on the dewlaps of *Anolis brevirostris* and *Anolis websteri*, though some got those the wrong way round. Some candidates managed to give a description of the dewlaps of *Anolis caudalis* that suggested it was the intensity of the orange colour that varied. In part (a) (ii) candidates were simply required to indicate which species were found in each zone. Some candidates attempted to make links with habitat types and gave very confused answers. Those who read part (a) (iii) properly gave good answers. Some did not read the whole of the question and attempted to describe dewlap colour variation along the whole island.

Part (b) was a straightforward calculation involving the Hardy Weinberg equations; about half of the candidates had clearly prepared and practised these and scored all four marks. Those who had not practised these scored no marks.

Part (c) (i) was not well done. Many candidates did not use the information provided in the question about the function of the dewlaps and gave a vague generic answer about camouflage and natural selection. Part (c) (ii) had the lowest facility index on the paper; some candidates mentioned the importance of heterozygotes in a vague way but very few related that to allele frequency in the gene pool. Quality of written communication was an issue in part (d) many candidates made vague references to sympatric or allopatric with no explanations; the best answers used information from the graph, table and introduction and described the reproductive barrier of opposite dewlap colour.

Question 4.

Parts (a) (i) and (ii) formed a straightforward, Mendelian, dihybrid cross; with a facility index of 80.8. Candidates had clearly prepared well for this.

The calculation of χ^2 in part (b) (i) was also well done, although some candidates are unsure of how many places of decimal to use. For future reference it is probably good practice to round to the same number of decimal places as shown in the probability table. Choosing the critical value from the table presented a challenge. A common error was to choose 0.5 probability level. There was some confusion about how to describe whether to accept or reject the null hypothesis.

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Part (c) was concerned with a topic new to the specification. Most candidates recognised its name in part (c) (i) as 'epigenetics', though there were numerous candidates who incorrectly answered 'genomics'. Most candidates were able to recognise 'transcription' and 'translation' from the diagram, though a number got them the wrong way round. Part (c) (iii) caused candidates difficulty. There were lots of answers to suggest that candidates knew something about methylation. However, many gave a generic recall type answer instead of applying their knowledge to the schematic diagram. Many candidates missed the key piece of information that the methylation is of the inserted sequence, i.e. the mutation; so that blocking its transcription results in more regulator protein not less.

Question 5.

Part (a) was generally well answered. Most candidates knew the names of the enzymes involved in gene splicing and were able to apply their knowledge to the situation described in the question.

In part (b), relatively few candidates were able to deduce that feeding farmed fish genetically modified *Camelina* would reduce the need to harvest wild fish for feed. Many candidates gave answers which implied that improved nutrition of farmed fish would directly improve biodiversity.

Candidates lost marks in both of parts (c) because of careless use of language. In part (c) (i) many candidates described omitted the 'long' when describing the hydrocarbon chain and in part (c) (ii) many omitted to point out that the double bonds are C to C bonds.

Almost all candidates who attempted part (d) (i) scored both marks but a significant number did not attempt this part. Part (d) (ii) was generally well answered.

Question 6.

Part (a) was generally well answered; most candidates were able to apply their knowledge of ovulation to the photomicrograph.

In parts (b) (i) and (ii) there was a good level of understanding shown but quality of written communication was a problem with candidate referring to the effect of a hormones ON another hormone rather than on its release or production.

Relatively few candidates scored both marks on part (c) (i); the most common error was describing the reproductive organs as the target organ even though they had described oestrogen working by inhibiting the release of FSH in the anterior pituitary gland.

Question 7

This question assessed quality of extended response (QER). The best answers here considered details of all the evidence from the table; gave a sensible analysis of the phylogenetic tree and made an overall conclusion which evaluated the quality of the evidence. However too many candidates wrote copious amounts of irrelevant material without explaining how the evidence supported one or other hypothesis. The understanding of the phylogenetic tree was often poor, with candidates stating that the fish must belong to the same family because they have a common ancestor. There were accounts of speciation where candidates clearly misinterpreted 'developmental stages' as stages in the evolution of the fish and wrote extensively on that topic.

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COMPONENT 3

SECTION A

Question 1.

Question 1(a) asked candidates to describe **and** explain common adaptations of fish and mammal gas exchange surfaces. While many candidates answered the question well a large number gave adaptations without explanations, e.g,. thin (to reduce diffusion distance) or explanations without the adaptation, e.g., (large numbers of alveoli / gill lamellae) to increase surface area.

Question 1(b) (ii) was frequently answered by repeating the information given in the question rather than suggesting an explanation, e.g., heat energy needed to maintain constant body temperature.

Most answers to 1(c) tended to overcomplicate and reflected an inability to apply knowledge and understanding about mammalian breathing system to that of an insect. The purpose of a ventilation system was very poorly answered.

Many candidates were able to apply their understanding of cellulose to explain the structure and function of chitin but most did not use their knowledge of chitin molecular structure correctly when describing the bonding between molecules of chitin.

Nearly all candidates recognised X as a mitochondrion but there was confusion over the role and close proximity of tracheoles in providing the oxygen needed for aerobic respiration. Many stated that the ATP synthesised in the mitochondria was used to actively transport oxygen from the tracheoles.

Question 2.

It was evident that many candidates were not aware of a method that can be used to count stomata on leaf surfaces. While candidates do not need to carry out all the practicals in the Lab Book, they must be made aware of the methods described (or suitable alternatives).

Most candidates were able to calculate the standard deviation correctly but did not understand the information provided by a standard deviation or how to standard deviations to support their answers, especially when asked to refer to the hypothesis being tested. It was not obvious in many answers that candidates had read or understood the hypothesis.

Question 3.

Heart dissection and examination of its external structure is included in the Lab Book. A significant number were unable to identify or name the coronary arteries or explain the effect of narrowing of these blood vessels. Many indicated that narrowing of the coronary arteries would reduce blood flow through the heart to the body and lungs rather than reducing oxygen supply to the heart muscle.

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Part (b) of this question required candidates to apply their knowledge and understanding of pressure changes in the atrium and ventricle to explain increasing pressure in the jugular vein. Information was given that the jugular vein carries blood into the vena cava and that there are no valves between the jugular vein and the heart. However, candidates largely seemed to ignore this information and referred to pressure changing due to the left atrium contracting, blood being forced into the aorta and hence into the jugular vein. The best answers referred correctly to pressure increasing in the jugular when the **right atrium** contracts, thus pushing blood back into the jugular (because of there being no valves) and also when the **right ventricle** contracts, closing the **tricuspid valve** and pushing back on the right atrium.

Question 4.

Food tests are a set practical and yet many candidates were unable to describe a simple Benedict's test for a reducing sugar or state the expected colour change.

The best answers gave detailed explanations of the mechanism of transport of glucose from the lumen of the proximal convoluted tubule into the blood with clear and correct references to the information provided in the diagram. It is important that candidates understand the sequence of events in the reabsorption of glucose:

1. active transport of Na^+ ions out of the epithelial cells of the PCT,
2. thus lowering the concentration of Na^+ inside the cells compared with the filtrate;
3. cotransport of Na^+ and glucose can then take place into the epithelial cells
4. which increases glucose concentration in the cells to a level above that of the blood
5. resulting in glucose passing out of the cells by facilitated diffusion.

Most answers were confused and contradicted information provided in the question.

The majority of candidates gave suitable explanations and suggestions for how an inhibitor could be used to treat diabetes / obesity. The main inaccuracies given were that glucose is stored as starch in the human body and that depletion of glycogen reserves can help you lose weight.

Question 5.

In part (a) candidates were asked to remember the functions of pepsinogen / pepsin and hydrochloric acid and apply them to digestion of milk protein in a calf's stomach. Very few appreciated that the coagulation of proteins by chymosin increases transit time – it does not increase surface area.

Many excellent answers were given to part (b). Where candidates lost marks it was due to a lack of detail, eg., digestion of milk rather than milk **protein**, incorrect location of cellulose digesting bacteria and not stating the function of different parts of the ruminant 'stomach'.

Part (c) (ii) was synoptic from Component 2. Not many candidates gave a fully correct description of how to produce intron free DNA that can be use in genetic engineering.

The remainder of the question was well answered. However, many candidates had problems:

- could not / did not convert mm to cm even though the unit for part I is in cm^3
- did not state their answers to 1 decimal place even though this is asked for in the question
- cannot express their answers correctly in standard form

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Question 6.

The new style of essay requires candidates to communicate extended **reasoning**. This requires the ability to sequence their answers to explain cause and effect based on information provided and using their own knowledge and understanding.

To gain marks in the top band candidates needed to explain the mode of action of all three neurotoxins in detail. They were expected to use the information provided to conclude that A affected sodium ion channels, B – potassium ion channels (A and B both in the axon), and C – calcium ion channels in the presynaptic membrane. Their answers included high levels of detail of the action of the neurotoxins on the channels and flow of ions and the effects caused on depolarisation, repolarisation and synaptic transmission.

Answers given marks in the middle and lower bands lacked detail and may have included some errors. The level of detail provided and the clarity of their extended reasoning dictated in which band they were placed.

A large number of candidates obviously understood the propagation of an action potential and transmission at a synapse as they wrote several pages of detail on these topics. However, many of these gained few or even no marks as no attempt was made to link this information to the mode of action of each of the neurotoxins.

When answering this type of extended response, candidates must answer the question asked rather than just dumping their brains when triggered by a word they recognise. This type of response will gain little credit.

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SECTION B:

Question 7 – Option A: Immunology and Disease

In part (a), there was much confusion as to the identity of the structures visible in the image – cilia were often called villi or microvilli. Many candidates also did not link the combined effect of the mucus (trapping the bacteria) and the cilia (moving the mucus plus trapped bacteria out of trachea). A large number described the cilia as trapping the bacteria and the mucus acting as a lubricant.

On the whole part (b) was well answered but care needs to be taken in understanding the action of penicillin in inhibiting bond formation between peptidoglycan molecules rather than breaking these bonds.

In part (c) (i), when identifying control variables candidates need to read the information provided and look at the images / diagrams to see what has already been controlled. In part (ii) marks were lost by some candidates who did not describe how to identify the **best** antibiotic. Many candidates did not understand the term **mode of action** and gave answers referring to effectiveness rather than how the antibiotics worked. Some confused antibiotics and antibodies and gave accounts of the humoral immune response.

Part (d) was generally well answered. However, a large number of candidates insisted on referring to bacteria in their answers even though the question clearly refers to a virus!

In (e) (i), a surprising number of candidates were unable to read the values from the graph. Many gave antibody concentration values for 6mm and 12mm even though 7mm and 11mm are given in the table. There was much confusion, error and lack of detail in the answers given for part (ii) of this question. Terminology was a problem; for example, the words antigen, antibiotic and antibody seem to be interchangeable for some candidates, lympocytes seems to be a common spelling of lymphocytes and there was much reference to colonial and colonic expansion in place of **clonal**! Candidates need to understand the sequence of events in the humoral response:

- antigenic presentation resulting in clonal selection of specific B lymphocytes
- clonal expansion of B lymphocytes
- **differentiation** of B lymphocytes to form plasma cells
- which then secrete specific antibody

Many stated that the antibodies clone themselves and there was much confusion between the involvement of T cells and memory cells in antibody production.

Some candidates communicated their frustration over the lack of a named statistical test in part (iii) and missed the point that the question was generic to all statistical tests,i.e., stating the **null hypothesis**. Many candidates did not refer to there being no **significant difference** between the antibody concentrations before and after vaccination. Similarly, there was confusion over the use of the results of a statistical test and the critical value at a given probability.

In part (iv) many candidates did not understand the meaning of the term **fourfold** and as a result did not gain credit for their answers. Candidates were not penalised for calculating a fourfold increase and then calculating the actual increase in antibody levels needed. This was carried through to their answer to part (v) where they needed to conclude whether the vaccination program was successful or not based on the antibody concentration after vaccination and the minimum antibody concentration calculated in the previous question.

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SECTION B:

Question 8 – Option B: Human Musculoskeletal Anatomy

Part (a) was well answered by those candidates who had learned the basic facts. Most confusion was over the naming of the Haversian **canal** and its function in transport of oxygen etc., to the bone.

A lack of detail was seen in many answers to part (b) as to the functions of osteoclasts and osteoblasts and also in using the information provided to explain the effect of denosumab on bone where osteoporosis is taking place. However, some centres are obviously teaching a great amount of detail about osteoclasts / osteoblasts but those candidates tended to focus on breakdown of bone and collaged rather than mineral breakdown by acids produced by osteoclasts. In part (c), although most candidates identified the most effective treatment some did not make correct reference to the data provided. This was also seen in part (b) where many candidates referred to stopping loss of bone density whereas the data indicates an increase in bone density.

The treatment for a displaced fracture in part (d) involves realignment + some form of immobilisation. Many candidates just gave the second part of the answer or gave an inappropriate method of immobilisation, e.g., nailing the bones together!

In part (d) (ii) and (iii) candidates had no problem in calculating the T score but quite a number were unable to use this value to interpret the T score, either in terms of identifying osteopenia or fracture risk.

Many answers to part (e) (i) reflected a lack of detailed knowledge of joint types and the range of movements they allow. Similarly, many did not provide information as the aut-immune nature of rheumatoid arthritis or the inflammatory response leading to temperature increase.

SECTION B:

Question 9 – Option C: Neurobiology and Behaviour

Very few candidates were able to identify the hippocampus on the image given in part (a) (i), most identified labels 4 or 5. In part (ii) of this question, most candidates knew the role of the hippocampus in learning or memory but few communicated an understanding of its role in permanent memory storage or converting short term to long term memory.

In identifying two factors that should have been controlled (part (iii)) most candidates identified age but struggled in identifying a second factor, eg., health or previous driving experience.

Part (b) (i) was generally well answered; the main reason for loss of marks were giving generalised statements about significant differences, not referring to all parts of the hippocampus and not referring to the actual results (even though this is stated in the question). In this type of question which asks candidates to **justify** their conclusions, they must include references to the evidence / results provided. This is not recall and does not require prior knowledge – more an ability to use the information given.

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The answers to part (ii) generally showed an understanding of positive correlation and the significance of neuroplasticity as a cause for the changes seen but few could extend their understanding to describe redistribution of neurones between the anterior and posterior regions of the hippocampus or that this suggests that map memory is stored in the posterior hippocampus.

The focus of part (iii) was to understand the need for an imaging technique that is portable and could be used when a taxi driver was actually driving. Very few identified EEG – many stated fMRI and some CT or PET (some suggested an ECG!).

A surprising number could not calculate a percentage change in (c)(i) and some completely misread the graph. These are skills that should not pose problems to A2 students!

In the remainder of this question, in part (ii) few identified operant conditioning as the type of behaviour even though they recognised the association with food as a reward. Part (iii) was generally well answered; most recognised that learning had taken place (as a result of the operant conditioning). In part (iv) most candidates recognised the need to repeat the experiment with more hyenas or different hyenas or to repeat the experiment with a control group; some, however, suggested the use of different species or puzzle boxes which would have changed the experiment and not improved the reliability of the experiment described.

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EDUQAS
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PRACTICAL ENDORSEMENT

GCE A level Endorsement: Biology

General

JCQ was responsible for allocating centres with GCE A level entries to awarding organisations to monitor. Unless the centre was defined as being a large centre, one A level subject was monitored in the first round of visits.

Lead Monitors from the different awarding organisations met on a number of occasions over the first two years to ensure that they maintained a common and fair assessment of CPAC as well as to share information. These meetings will continue into the second round of monitoring. The second series of visits to centres will commence from September 2017.

Approximately 90% of all centres visited by Eduqas passed on their first visit. This outcome is very close to that from other awarding organisations. Centres which failed the first monitoring visit were given support and were visited a second time in the same subject. All centres who failed the first visit made by Eduqas subsequently passed the second visit. In the event that a centre fails a second visit then a first visit is triggered in all the other science subjects offered at A level. Since none of the Eduqas centres failed a second visit this was not triggered.

Centres need to be commended for the way in which they have approached the practical endorsement and assessed CPAC. There was plenty of evidence of good practice and it was evident from conversations with teachers that the practical endorsement has enabled most centres to offer a wider range of practical experience to their candidates than the previous A level model of assessment. There was evidence in a number of centres that additional investment had been made to facilitate the wide range of practical work that candidates now need to complete over the two years.

The monitoring visit requires that the monitor examines evidence that the centre has planned to complete the necessary range of practical work required by the specification; check records of candidate assessment; examine a sample of candidate laboratory books and observe a practical class in which assessment of CPAC is taking place.

The following points describe some key features observed in centres where the practical endorsement was successfully implemented:

- There was clear planning of practical work and the CPAC statements to be assessed in each practical.

- Candidates were well informed about the practical endorsement and the meaning of CPAC statements. Please do not leave candidates in the dark about CPAC; they need to understand it!

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- Practical books were used in ‘real time’ and at the bench by candidates when completing an observed practical. (I should note that their books may get stained as a result of this; that’s fine! We want candidates to move away from writing on scraps of paper, filter paper or on the back of the hand. Data should be recorded directly to their books. Practical books are therefore not expected to be in immaculate condition.)

- The teacher targeted appropriate assessment of CPAC in the practical lesson monitored. Do not be over ambitious in your assessment. Early on in the course give your candidates time to settle in before assessing practical work and then start with the more straight forward CPAC statements (e.g. 1 and 3).

- Suitable feedback was given to candidates particularly about why they may have failed to achieve a CPAC statement and what they need to do next time to evidence it. For example, if they do not get CPAC 4 because their table omits units then please tell them the reason.

- There was use of peer assessment and self-assessment to reflect on practical work. Candidates can self-annotate work to facilitate learning and save teacher time, where necessary. This is also an important skill candidates need to acquire for future learning.

- There is evidence of good communication between staff teaching the same qualification in a centre. For example, information from CPD was fed back to other members of the team delivering the qualification.

CPAC statements

CPAC 1 This was generally well assessed by centres.

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. A number of centres made 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 you are going to assess this CPAC and also give time to your candidates to develop the necessary skills before assessing it.

CPAC 3 There is no need to assess it every time. There are plenty of opportunities to assess this CPAC so please carefully choose the occasions where you want to do this. Please note that a full risk assessment does not need to be completed to gain this CPAC but candidates must be able to identify hazards and risks and work safely.

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CPAC 4 There are two elements to this: (1) making accurate observations and (2) obtaining accurate, precise and sufficient data …….

Please see the earlier comment about recording data into practical books. You also need to make sure that they are making appropriate tables to present this data.

There were a number of times where this CPAC statement was awarded but not fully supported by candidate work; often because data was not recorded to the expected precision or units were omitted from the table. Additionally some drawings in microscopy were not of the expected quality to be awarded this CPAC statement.

CPAC 5 Occasionally CPAC 4 and 5 were confused by centres. CPAC 4 is about recording data whereas CPAC 5 has two main elements: (1) processing data and (2) referencing information.

Processing data may involve making the use of graphs or calculations. Centres may use software (e.g. Excel) to draw graphs if they wish. It is probably a good idea from the point of view of the candidates' development that they use software and also draw graphs by hand over the two years.

The second element is also important. Candidates should get use to referencing sources of information whether it is a data value or a statement from a text book or website. It is not necessary to use the Harvard system for recording websites but we do expect to see the URL and date accessed.

A few candidates tended to confuse referencing with a bibliography. There is an important difference.

Many documents to support the teaching of the practical endorsement are available on the Eduqas A level science web pages.

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