edexcel

Examiners' Report/ Principal Examiner Feedback

January 2014

IAL Biology

Unit 2: WBI02_01

Development, plants and the environment

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2014
Publications Code IA037565*

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

General

Overall, the students' responses for this paper demonstrated a relatively good standard of biological knowledge; particularly where answers were more straightforward. The standard of communication, however, sometimes let students down. Where students exhibited poor communication skills it was not always clear exactly what the students were referring to. Poor spelling often led to marks being lost especially in distinguishing between singular and plurals. Failure to read questions carefully and use the specific information presented on the question paper were evident. Students should be aware that if, say, two marks are available, it is a good idea to try to write down two clear and separate ideas or facts. In some questions this had not been done.

SPECIFIC

Q1(b)(i)

This question asked students to compare the structures of a mitochondrion with structure P – which should have been identified as the Golgi apparatus in **Q1(a)**. There were some good responses, covering features such as the cristae in the mitochondrion and the overall shape of the two organelles. However, many students failed to address the term **structure** and described **function** instead – it's important that students can differentiate between these terms. Others lost marks for failing to **compare** the structures – just listing features of each organelle separately. Another common example of not quite answering the question was stating 'the mitochondrion has a double membrane but the Golgi apparatus does not'- students needed to state that the Golgi apparatus has a single membrane. A significant number of students also misidentified organelle P as the rER.

Q1(b)(ii)

This question asked why the presence of a mitochondrion and organelle P (the Golgi apparatus) would indicate that the cell is eukaryotic. The majority of students recognised that the answer involved the membrane bound nature of the two organelles, however, many failed to state that membrane bound organelles are **only** found in eukaryotic cells or **never** present in prokaryotic cells.

Q1(c)

The majority of students correctly provided 'ribosomes' as an answer to this question, although other responses were also acceptable. Many of those who didn't gain the mark had not read the question carefully, and offered answers such as 'cell membrane' or 'cell wall', which are not 'found in the cytoplasm'.

Q2(b)(i)
Most students correctly described the function of lipid droplets in providing an energy store.

Q2(b)(ii)
Most students understood that the cortical granules are involved in the prevention of polyspermy, but fewer were able to describe how they achieve this. Good responses referred to the release of the contents of the cortical granules from the surface membrane of the egg cell followed by changes to the zona pellucida. References to changes in the charge across the egg surface membrane and formation of a fertilisation membrane were also seen – the former was ignored as this process has not been observed in mammalian gametes and the latter was accepted as an alternative to a change in the zona pellucida. A number confused the granule with the contents – 'the granules ... secreted by exocytosis'. Many students started their responses with descriptions of the acrosome reaction, which appeared to be better understood than the cortical reaction.

Q2(c)
Marks were lost here as a consequence of not reading the question with care. Those who attempted to describe **similarities** between the **nuclei** the egg cell and the sperm cell frequently achieved both marks. However, many students stated that 'both have a haploid nucleus' or claimed that both are 'haploid cells', instead of saying that they were both haploid nuclei. As a consequence of misinterpreting the question as asking for similarities between egg cells and sperm cells, there were many answers referring to a variety of organelles including mitochondria. This emphasised the need to read questions with care.

Q3(a)(i)
There were many good answers to this question, showing a clear understanding of the purpose of the cell cycle with reference to repairing damaged tissues, replacing damaged cells, increasing cell number, growth of the organism and asexual reproduction. However, a significant number lost marks as a result of referring to the repair of damaged cells instead of tissues. Some students failed to gain any marks because they just described the stages of mitosis. The main reason for failing to score high marks was giving an account of what happens in the cell cycle rather than descriptions of its purpose.

Q3(b)
On the whole, students demonstrated a good knowledge of differential gene expression. However, marks were lost due to confusion between transcription and translation, and answers lacking precision in describing the sequence of events, eg 'mRNA was transcribed' (instead of the DNA/gene being transcribed) or 'mRNA produces proteins'. Vague descriptions of genes being 'switched on and off' also cost marks as did general descriptions of protein synthesis, which did not address the question.

Q3(c)(i)
The definition of the term 'pluripotent' as referring to undifferentiated cells capable of dividing and giving rise to almost all cell types was rarely seen in responses to this question, although there were some good answers. Only about half of all responses referred to an undifferentiated or unspecialised state, whilst a lot of students lost a mark by stating that pluripotent cells can become all cells except for 'embryonic cells', instead of referring to 'extra-embryonic' cells or tissues. Many students seemed unaware that embryonic cells are pluripotent, whereas pluripotent cells cannot give rise to 'extra-embryonic' tissues, such as the placenta.

Q3(c)(ii)
Most students gained both marks, although some failed to mention tissues at all. Some responses described differential gene expression, instead of considering levels of organisation from cell to organ.

Q4(b)
It did appear that many students failed to understand the meaning of the term 'sustainable'. Many responses referred to irrelevant points including: greenhouse gases, carbon neutrality, global warming, pollution, biodegradability, recycling and cost. Those who recognised that the key was renewability often lost a mark due to lack of precision in phrasing their answers by referring to the biofuel itself as being renewable instead of the source. The most commonly awarded mark was the one for describing fossil fuels as non-renewable.

Q4(c)
The majority of students correctly identified xylem or sclerenchyma as good sources of lignocellulose. However, many lost marks because they didn't clearly explain that these tissues contain lignin and cellulose in their cell walls. Vague responses stating that 'xylem is made of lignin' did not gain marks apart from the first mark for naming xylem as the tissue.

Q5(a)QWC
Those students who had a good grasp of the principles of natural selection achieved high marks for this question and many gave well-written accounts, applying their knowledge to answer the question precisely. To achieve full marks, there had to be clarity of expression in the response.

Some students described evolution without referring to the context of the moths, others referred to dominant alleles being responsible for the increased frequency of melanic moths and there were also references to the role of MSH, confusing melanic with melanin. Misconceptions concerning natural selection were evident in answers which suggested the moths deliberately became adapted to the change in environmental conditions. Marks were also lost by those who referred to genotypes or phenotypes being passed onto the next generation rather than alleles. There were also many who lost marks by referring to genes instead of alleles.

Q5(b)

There were some very good responses to this question, clearly recognising the difference in the changes between 1960-1970 and 1980-1990. Good answers noted the slight decrease from 1960-1970 and the greater decrease from 1980-1990, with many correctly calculating the changes as 7% and 47% respectively. Many students also correctly suggested a decrease in pollution as a cause of the decrease in numbers of melanic moths – having read the question with care.

However, many lost marks as a consequence of incorrect subtractions, just quoting figures from the graph. There were others who either failed to suggest a reason, or described an increase in pollution. There were also some responses that ignored the date ranges specified in the actual question and described the overall trends in the graph instead.

Q5(c)

The definition of polygenic inheritance was either well understood, with good descriptions of many genes at different loci interacting to give rise to a particular characteristic, or partly understood with vague references to 'may genes'.

Some students appeared not to understand the concept, or confused it with multiple alleles, epistasy or phylogeny. Others just described inheritance which did not gain any marks in this context.

Q6(a)(i)

Most students gained two marks here, although others missed the point that the number of species would have to be an integer, and offered 2.9 or 2.94 as their answer, having done the calculation correctly. A worryingly large minority misread 10000 as 1000.

Q6(a)(ii)

It is important that students understand that the command phrase 'Using information in the table' requires some manipulation of the data and that merely quoting figures from the table will not gain credit. The majority gained the mark for stating that the biodiversity of lizard species was greater in California than in Texas, with some gaining the second mark for describing a difference of 0.7 species per 10000 km^2.

Q6(a)(iii)

Those students who had learned the definition of 'species richness' did well, whilst others referred to a range of irrelevant ideas including natural selection and population size of individual species. Imprecise phrasing included "the amount of numbers of a species" which could be interpreted to mean population size. A surprising number of students related species richness to habitat or environment, rather than one specific area. Students should also be aware that providing a list of alternatives, such as "region / habitat / environment", does not guarantee gaining the mark – examiners cannot be expected to select the correct answer for them!

Q6(b)(i)
It was good to see that most students had learnt the definition for endemism and were able to describe it clearly. However, there were many that had the right idea, but then referred to habitat instead of a specific location.

Q6(b)(ii)
Most students gained at least one mark for this, understanding that 'niche' refers to the role of a species and not the place in which they live. However, there were some that did describe niche as a 'small part of a habitat'.

Q6(b)(iii)
This question was generally well answered. The majority of students referred to the geckos being active at different times of the day and gained at least one mark. Most students had the idea of non-overlapping niches, gaining two marks for correct reference to the geckos not competing for the same food sources. Better answers linked different activity times to different foods available, which reduced competition and others described camouflage with reference to the two species having different adaptations to survive.

However, some failed to gain marks as they did not specifically relate it to the geckos. There were some students that did not appreciate the fact that the geckos were different species, and described interbreeding between the green gecko and the brown forest gecko.

Q7(a)
Although many students appeared to understand the mechanism involved whereby the environment determined the phenotype, there were many responses that were not clearly worded. Some repeated the information already provided within the question without taking the next step and applying it to the question. Good answers clearly described sunlight as the environmental factor and increased melanin, or darkness of skin, as the phenotype. The best answers linked the environmental stimulus with the response by explaining that bright sunlight raises MSH levels that cause an increase in melanosomes. Those who scored full marks identified and named both the environmental factor and the phenotype, whereas others failed to gain those marks due to vaguely worded answers that did not address the question precisely.

Q7(b)(i)QWC
There were some very good answers to this indicating a sound grasp of the idea of protein modification and packaging in the rER and Golgi apparatus. However, only the best responses applied it to the context of the question and described the fusion of vesicles from the Golgi apparatus with the melanosomes. However, many students did not acknowledge the context and gave irrelevant details of the process of exocytosis.

As a QWC question focusing on spelling, many students lost a mark as a result of misspelling **vesicle** – most frequently as either 'vessicle' or 'vesical'.

Q7(b)(ii)
This question was well answered by those students who successfully applied their knowledge of exocytosis having grasped that normally the tyrosinase enters **melanosomes** within the cell. Many students achieved one mark for 'exocytosis', with only the better answers describing the source of the vesicles containing the tyrosinase.

Q8(a)(i)
It seemed as if many students had only read the first part of the question – 'Describe how the Petri dishes should be made safe...' without taking into account the context, which was 'before incubation'. This resulted in many irrelevant references to sterilising the Petri dishes and aseptic technique.

Those that had correctly analysed the context generally had the right idea concerning the covering of the dish in such a way as to allow some air to enter the Petri dish, but many students failed to gain marks due to imprecise descriptions. For example, 'tapping' the Petri dish is not the same as 'taping' it and there were many references to having to 'tape at each corner'.

Students who discussed covering the Petri dish in order to prevent contamination by other bacteria gained both marks. However, there were many confusing descriptions of 'pathogenic bacteria forming' in the absence of air instead of referring to anaerobic conditions encouraging the growth of pathogenic bacteria. Many answers provided suggested that the bacteria would become pathogenic if deprived of oxygen.

Q8(a)(ii)
It was pleasing to see an appropriate range of temperatures, with the correct units which were required for the first mark. As there was no reference to 'safe temperature' or to the culturing of bacteria in schools, temperatures up to 40°C were accepted, **if** the explanation was linked to enzyme activity in either the fruit extract or the bacteria.

The majority of students achieved one mark for an appropriate temperature, although some failed to gain credit for imprecise references to 'room temperature' without giving a value.

Fewer students gained the second mark for a relevant explanation for the choice of temperature. Stating that the chosen value is 'a suitable temperature for bacteria' merely repeated the question; stating that it is the 'optimum for bacteria' needed qualification eg 'optimum for bacterial growth'. References to 'harmful bacteria' instead of 'bacteria be harmful to humans' could not be given credit. A common error was also seen where students stated that bacteria would become pathogenic if incubated at higher temperatures.

Further, students should explain that a temperature **higher** than their chosen one would result in denaturation (of enzymes) or growth of pathogenic bacteria; many did not explain this and missed out on a straightforward mark.

There were many answers that were too brief and ambiguous.

Q8(b)(i)
This question asking for a reason for the observation of clear zones around the wells could be answered by either referring to the antimicrobial properties of the fruit extracts diffusing into the agar, or by explaining the reason for observing these zones – eg to compare the effectiveness of the different fruit extracts. Relatively few students gained both marks. Some students described the presence of 'microbials' and others mentioned the digestion of the fruit extract by the bacteria – indicating lack of familiarity with this core practical.

Q8(b)(ii)
Students were asked to compare the effects of the different fruit extracts on the bacteria. Most students gained at least one mark, usually for identifying the apple extract as the one **most** effective against bacterial species A. Many also gained a second mark for describing the guava extract as being **most** effective against bacterial species B **and** C. There were also some good answers referring to those fruit extracts which were **least** effective against each bacterial species.

Many lost marks as a result of failing to use the superlative – instead of stating which extracts were **most** effective, they just stated which extracts were 'more' or 'less' effective. Others either quoted figures from the graph or just provided information comparing the sizes of the clear zones.

The best answers were provided by students who had clearly understood that the fruit extracts should be compared rather than the bacterial responses.

Q8(c)
This question required a description of how produce **reliable data** to compare the effects of jambolan with guava. However, a large proportion of students provided many irrelevant details concerning aseptic technique instead of describing the actual design of the investigation.

The marks most often awarded were those for measuring the size of the clear zones and carrying out repeats. Many students referred to keeping either the time or the temperature of incubation constant, but not both which prevented them from achieving that marking point.

Vague references to 'amounts' of fruit or extract were not given credit.

Good answers came from students who grasped the idea of reliability and were able to identify which variables needed to be controlled and went on to describe, with precision, how this could have been done.

Paper Summary

In order to improve their performance students should:-

- Read all of the details in the questions carefully and double check the context of the question, do not 'skim read' - make sure to read every word. Answer the question being asked, with reference to the actual context.

- Develop a familiarity with the terminology encountered at this level and learn how to define key phrases accurately.

- Try for shorter, more precise sentences. When sentences start to ramble on it becomes difficult to determine where one point ends and another starts.

- When underlining key words in a question, try to refer to them when writing the response.

- Review all of the recommended core practicals with particular reference to the process of practical investigations.

- Gain practice at interpreting information presented graphically and in tables.

- Practice simple mathematical calculations – subtractions, and % differences.

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE