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Combined Science: Trilogy

8464/B/2H Combined Science: Trilogy Biology Paper 2H

Report on the exam 2023

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Overview

This paper is one of the six examined components for Combined Science: Trilogy. All of these papers follow a similar structure and test the same assessment objectives.

This paper has 70 marks available to students and is made up of six questions.

- Approximately 40% of marks assess AO1; 40% of marks assess AO2; and 20% of marks assess AO3.
- Approximately 40% of marks target Standard demand, 40% of marks target Standard/high demand and 20% of marks target High demand.

Questions 1 and 2 on this paper and questions 6 and 7 on the Foundation Tier paper are common. These questions are identical and are targeted at standard demand.

Questions are set at three levels of demand for this paper:

- **Standard demand** questions are designed to broadly target grades 4–5.
- **Standard/high demand** questions are designed to broadly target grades 6–7.
- **High demand questions** are designed to broadly target grades 8–9.

A student's final grade is based on their attainment across all six papers.

Summary of overall performance

Understanding of the vocabulary involved in the genetics was strong, and most students could apply their knowledge to use a Punnett square. Very few students gained full marks because few identified which offspring genotypes would have polydactyly. Many assumed polydactyly was recessive and a significant proportion performed a genetic cross with two heterozygous parents.

On this Higher tier paper, students could generally explain several methods of reducing the rate of evolution of antibiotic-resistant bacteria.

Understanding and application of knowledge about environmental implications of increasing numbers of cows being farmed was good. Many responses illustrated a good breadth of knowledge with different aspects of the environment being considered within each student's response.

Knowledge of the procedures required for an investigation into distribution using transects was challenging for many students. Generally, in-depth understanding of the required practical activities appears to be an issue. Many students confused a transect with a quadrat and could not describe how to use either.

The interactions of the hormones involved in IVF was poorly demonstrated.

The questions assessing maths skills in this paper (**05.5**, **06.3** and **06.4**) were generally answered well. Some students are not sense checking their numerical responses.

Question 1 (Standard demand)

01.1 Phonetic spelling was allowed, and variations of many phonetically correct spellings were seen. Hybrid terms between meiosis and mitosis were not credited. The list principle was applied when students stated both meiosis and mitosis. See the 'Information for examiners' on page 4 of the mark scheme for an explanation of how lists within responses are marked.

Whilst mitosis was a common error, there were many students who simply put any word that they could relate to sexual reproduction such as fertilisation, ovum, sperm, hormones.

01.2 Few students could give two reasons why sexual reproduction causes variation in the offspring. Marking point 2 was seen more frequently than marking point 1.

Responses that did not gain credit only referred to the offspring having different characteristics, such as eye colour.

For marking point 1 we were looking for the idea of variation in gametes from one parent or for the variation in gametes more generally, such as 'the genes from the egg and sperm are different'. The word genetically was bracketed, therefore is not required, but could not be contradicted, such as 'the egg and sperm look different'. We cannot put every variation of how students could phrase this in the mark scheme. For example, the mark scheme allowed 'cells produced by meiosis are not identical', so if a student wrote 'cells produced by meiosis are different' that was also worth the mark.

A few students referred to chromosomes crossing over in meiosis. This was a correct response that is beyond the specification and scored marking point 1.

We did not credit vague answers that were open to different interpretations such as:

- egg and sperm contain 50% DNA
- half is from mother, half is from father
- genetics is from mother and father
- one gene from each parent.

Errors were seen in some responses that referred to chromosomes. The response needed to be biologically correct to gain the mark. 'They get chromosomes from each parent' or 'Chromosomes mix' or '2 sets of chromosomes mix' was acceptable. However, '2 chromosomes mix' or 'pairs of chromosomes come from each parent' are incorrect. Likewise, '2 genes mix' was incorrect.

There was a fall back mark for 'mutations'. This mark was awarded only if no other mark was given.

0 1 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 The off spring is a combination of DNA from mother and father

2 The DNA taken from mother and father is not always the same

0 6 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 Each sperm and egg cell carry different genes.

2 Mother's and father's ~~are~~ genes are combined differently each time.

The first response (from a Higher tier paper) gave marking point 2 twice, therefore only 1 mark was awarded. The second response (from a Foundation tier paper) gave marking point 1 and marking point 2 for 2 marks.

01.3 This was very well answered. Phonetic spelling was allowed. See page 5 of the mark scheme for information on marking phonetic spelling.

01.4 On the Foundation tier, few students achieved all 5 marks, but partial credit was given frequently, such as correct derivation from incorrect gametes.

On the Higher tier, most students could complete the Punnett square and state the probability of the child having polydactyly. However, few students identified which offspring genotype would result in polydactyly. This could be indicated on any or all offspring, with a circle, line, key or label or any other clear method of identification.

01.5 Clear responses most frequently knew that embryo screening enables us to find out whether an embryo has an inherited disorder. Some confusion was seen between the term disorder and the terms diseases or disabilities.

Many responses were vague, such as ‘to see if the embryo is healthy’. Some incorrect responses incorrectly implied that embryo screening is ultrasound screening.

Very few students took the marking point 4 approach of the implications to the population over time.

A general misconception was that embryo screening is the same as genetic counselling, so students referred to finding out the likelihood of the embryo having an inherited disorder. The misconception that embryo screening can change DNA or treat inherited disorders was also seen.

Question 2 (Standard demand)

02.1 In this question students were asked to identify why the percentage of species that are extinct is only an estimate. Over 95% of students gave the correct answer.

02.2 Most students could state that fossils or DNA are used as evidence to study species that have become extinct. References to fossil fuels were seen and did not gain credit. A few students misread the question and gave details of the reasons why species become extinct instead.

02.3 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the three levels of response at the top of the scheme, giving a hierarchy of response. Within each level there are 2 marks.

In this question, students were asked to explain how the evolution of an antibiotic-resistant bacterium could be slowed down. As students were asked to explain how this could be done, it was necessary to link suggested actions with reasons in order to achieve higher level marks.

The question was not asking how antibiotic resistant bacteria evolve in the first place and neither was it about genetic engineering.

Students achieving Level 1 gave simple unconnected but appropriate suggestions such as 'isolation of infected people' or 'don't use antibiotics when not necessary'. To enter Level 2 there had to be evidence of at least an attempt at linking an idea with the underlying reason(s) behind it together with some limited but additional relevant information. To enter Level 3 students had to make several appropriate points as well as show at least one clear, logical link.

The most frequently seen suggestion was that patients should complete courses of antibiotics. This was often correctly linked with the need to kill all *C. difficile* but fewer answers then went on to say that none would therefore (survive and) mutate to form resistant strains.

Simple rewording of the question did not gain credit. Answers that simply said 'so the bacteria would not be able to evolve and become antibiotic resistant' added nothing else to be credited.

Other points that were commonly made included references to isolation of patients and to hand washing. The question context here was of infection of the digestive system by *C. difficile* and, therefore, suitable qualification of hand washing, such as 'after going to the toilet' or 'before preparing food' was required in order for a strong, reasoned link to be credited. Vague answers relating to 'good hygiene' only were insufficient. Some students thought that diet and exercise would kill the bacteria.

Several students made references to doctors not prescribing antibiotics inappropriately but few students went on to explain why. Similarly, the reason for not using antibiotics for mild infections – 'the body's own immune system can respond effectively' – was rarely seen. Students do seem to appreciate, though, that antibiotics cannot kill viruses and so a mention of this linked to no antibiotics being used in such cases often gained credit.

Some answers suggested that new antibiotics might be developed but the idea that antibiotics can be made 'stronger' is incorrect. As with the point about completing courses of antibiotics, the advantage of a new antibiotic would need to be linked to 'all *C. difficile* being killed' or 'none could survive to mutate' in order to gain credit for a linked statement.

Some students commented on developing a vaccine against *C. difficile* but very few then managed to link this to an explanation.

The indicative content in the mark scheme can never cover all ideas that are worthy of credit, but are there to guide examiners. Other ideas such as 'Treatment with several antibiotics at the same time to kill all of them' was another appropriate method with linked explanation.

Many students referred to 'it' in their answer. Sometimes this meant antibiotics and other times this meant bacteria. We always read for context to make sense of the term 'it'.

'Immune bacteria' was not an acceptable alternative to resistant bacteria. It was assumed that bacteria referred to in a response meant *C. difficile*.

0 7 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve.
Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]

the evolution of the antibiotic resistant C. difficile can be slowed down by getting people who have it on the antibiotics instantly and make sure they take the full course correctly. Another way to stop the evolution from happening so quick is by quarantining people who have it or have been near someone who had it to stop it spreading and developing fast. also staying out/away from lots of heat as that lets bacteria multiply faster.

The student (from a Foundation tier paper) has given bullet point 7 and then linked bullet points 14 and 15 from the indicative content. This exceeds the minimum requirement to meet the Level 2 descriptor, but does not meet the Level 3 descriptor, therefore 4 marks were awarded.

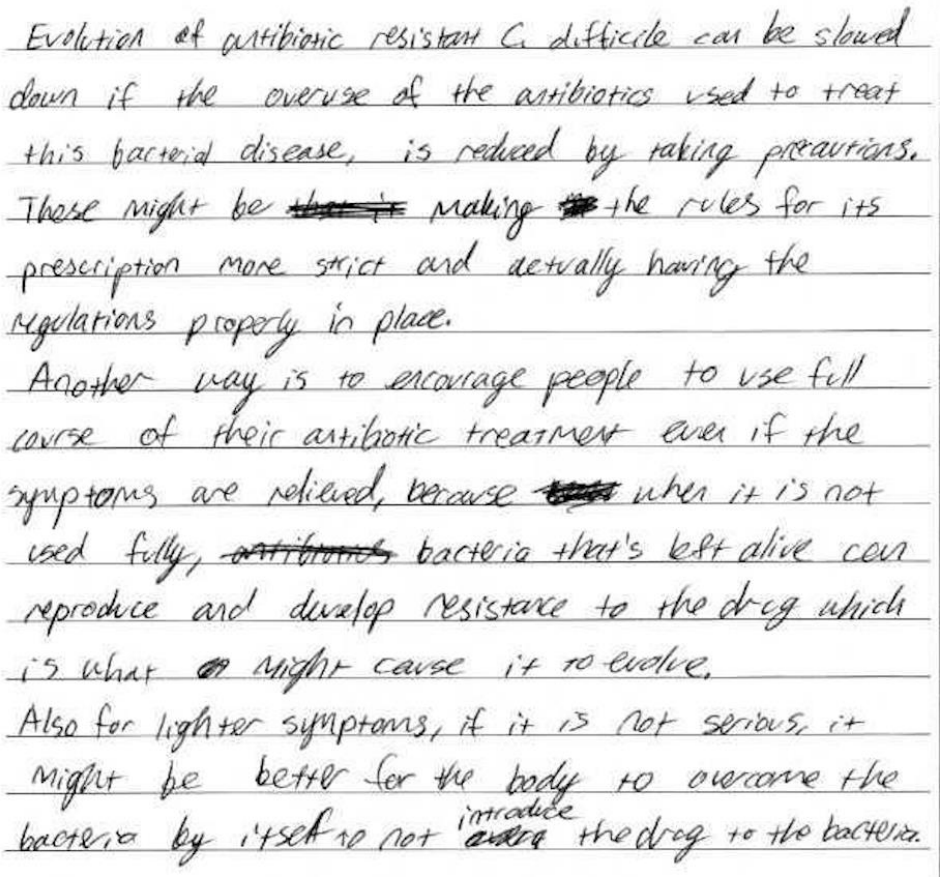
0 2 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve. Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]



The student (from a higher paper) has given bullet point 1 from the indicative content. They link bullet points 7 and 8. In the final paragraph they link bullet points 3 and 4. This exceeds the minimum required for the Level 3 descriptor, therefore 6 marks were awarded.

Question 3 (Standard, Standard/high and High demand)

03.1 This investigation is part of Required Practical Activity 7. This was a challenging novel context for students to apply their knowledge of practical techniques. Many students assumed this required random sampling of the plant species in the field. which was incorrect. Students were prompted to explain how to use a transect in their method. Many students used the term transect in place of quadrat. In a high proportion of answers there was confusion between a transect and quadrat, eg 'place a 1m^2 transect on the ground' and

‘count how many plant species there are in each transect’. Some students also referred to ‘using a quadrat (transect)’ which implies that the terms can be used interchangeably. There is clearly confusion amongst students between the words and their meanings, with a key misconception being that a transect is the same as a quadrat.

Where students knew the difference between a transect and quadrat, there were still many examples of students not knowing the name of a quadrat, with terms such as metal grid, transquare, wire panels and even Punnett square being used.

Few students correctly described how to place the transect. Some of the clearest answers drew their transect and locations for quadrats on Figure 1. Marks could be awarded in these cases.

When students understood what a transect was, it was common for them to score marking points 2 and 3. These students could refer to placing quadrats at set intervals and counting the number of species in each quadrat at these intervals. Marking points 1 and 4 were less commonly seen. For marking point 1, this was usually because students gave no indication of the direction the transect should be. Students awarded marking point 1 often added a transect line to the diagram provided or used the word perpendicular, which gained them credit. Marking point 4 was rarely seen. It seems that most students do not think about repeating transects in the same way as other sampling techniques / experiments. Students often failed to get marking point 4 because it wasn't clear if they were talking about repeating the quadrat sampling along the same transect or if they were talking about moving the transect along the river.

Many students attempted to sample randomly, or to throw quadrats from different distances from the river. Throwing quadrats is never an appropriate method.

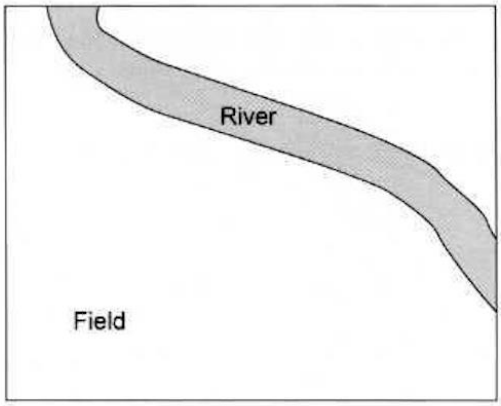
References to calculating a mean were frequent, but usually in the incorrect context of calculating the mean of the results from all distances along one transect.

Some students did not have a concept of size. This could be seen with wording such as:

- lay down a transect of 1 m and then place 100 cm quadrats along it
- use a quadrat 10 m × 10 m
- use a 1 cm by 1 cm quadrat
- use a quadrat every 5 cm
- use a 100 m ruler.

0 3 **Figure 1** shows a river next to a field.

Figure 1



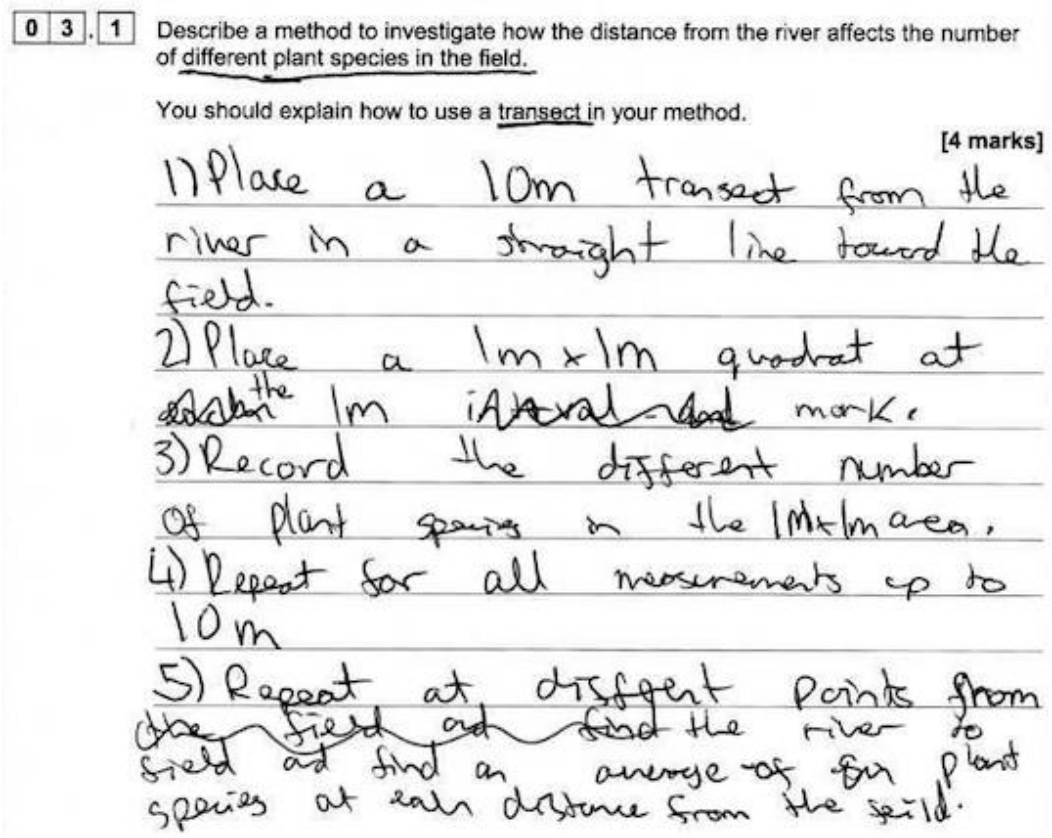
0 3 . 1 Describe a method to investigate how the distance from the river affects the number of different plant species in the field.

You should explain how to use a transect in your method.

[4 marks]

You should have big net & filled with species with any measurements (like 5cm by 5cm). Then You can count the different plant species within the areas. Also you do need to be a certain distance from the river everytime such 1m, 2m 3m, 4m & 5m

The response above does not describe where to place the transect, therefore no marking point 1. They have not used the term quadrat, therefore cannot access marking point 2 (notice the underlined part of marking point 2 in the mark scheme). They do collect appropriate data at each distance therefore marking point 3 was awarded. There is no appropriate reference to repeating the transect, therefore no marking point 4.



0 3 . 1 Describe a method to investigate how the distance from the river affects the number of different plant species in the field.

You should explain how to use a transect in your method.

[4 marks]

1) Place a 10m transect from the river in a straight line toward the field.
2) Place a 1m x 1m quadrat at the 1m mark.
3) Record the different number of plant species in the 1M x 1m area.
4) Repeat for all measurements up to 10m
5) Repeat at different points from the river to field and find an average of the plant species at each distance from the field.

This response was awarded all 4 marks.

03.2 Approximately one-third of students could identify that the mean value the students can be most certain about is 5 metres from the river. This suggests a lack of understanding of range bars on graphs.

03.3 Approximately-two thirds of students could identify an abiotic factor that could affect the number of different plant species found near the river.

03.4 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the three levels of response at the top of the scheme, giving a hierarchy of response. Within each level there are 2 marks.

Students were asked to explain the environmental implications of an increasing number of cows being farmed. A mark scheme relating to a question this broad cannot cover all possible valid responses. Examiners used professional judgement with other content. For example, some students discussed rivers becoming polluted with antibiotics used when farming cows, described environmental implications of increased fertiliser use due to growing more crops to feed the higher cow numbers, or described environmental implications of increased machinery or transport use associated with increasing cow numbers. All of these were valid points.

Many students could give one or several aspects of environmental implications of farming more cows. Some students thought this would mean fewer cows and answered accordingly. Some marks could still be awarded in some such instances.

At Level 1, students needed to give some indicative content that might be a consequence or an environmental implication. This could be very simply stated such as ‘cows will release more greenhouse gases’. Crucially, if two or more ideas were given but not a linked consequence and environmental implication, the answer did not meet the criteria for Level 2.

To enter Level 2 the generic descriptor shows that there must be attempts at logical linking. To enter Level 2, therefore, students must link a consequence with an environmental implication and give another piece of indicative content. An example that gained 3 marks would be ‘More cows produce more methane and methane is a greenhouse gas, so global warming will get worse’. To decide if the response is worth 4 marks, the criteria for 3 marks plus some other indicative content must be seen.

For a Level 3 mark, students must strongly link consequence(s) with environmental implication(s), for example by linking one consequence with two associated implications or by linking two associated consequences with their implication as well as giving further indicative content points. An example that meets the Level 3 criteria and gains 5 marks would be ‘There are fewer plants growing as more plants get eaten by cows. Therefore, there are fewer plants photosynthesising and absorbing carbon dioxide from the atmosphere. Carbon dioxide is a greenhouse gas’.

We always look to positively mark, so where errors were seen, such as that cows release methane only when they die or that farming an increasing number of cows will decrease the cow population, a student could still gain credit if indicative content is also seen in the response. Such errors were helpful when deciding where within a level a response sits.

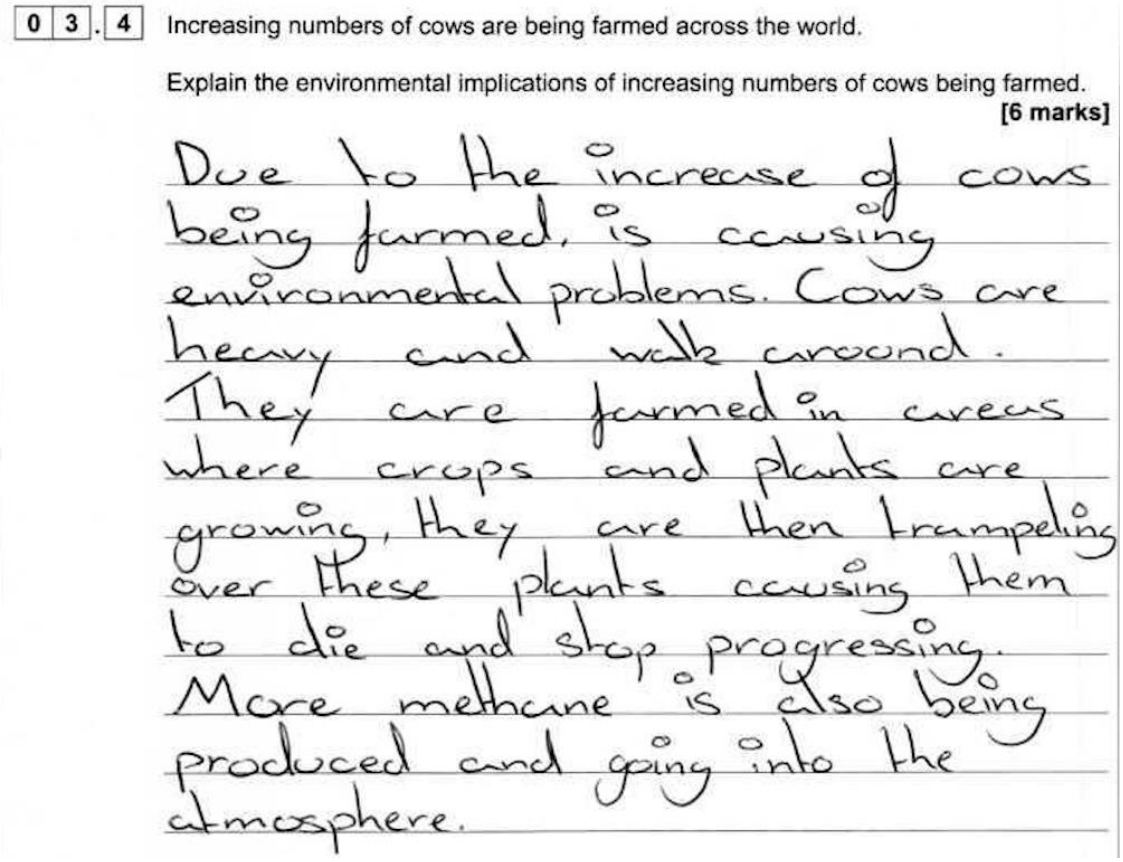
Common misconceptions included:

- confusion between the ozone layer and the greenhouse effect
- cows release methane or carbon dioxide only when they die
- trees release carbon dioxide when they are cut down
- that cows die and form fossil fuels.

0 3 . 4 Increasing numbers of cows are being farmed across the world.

Explain the environmental implications of increasing numbers of cows being farmed.

[6 marks]

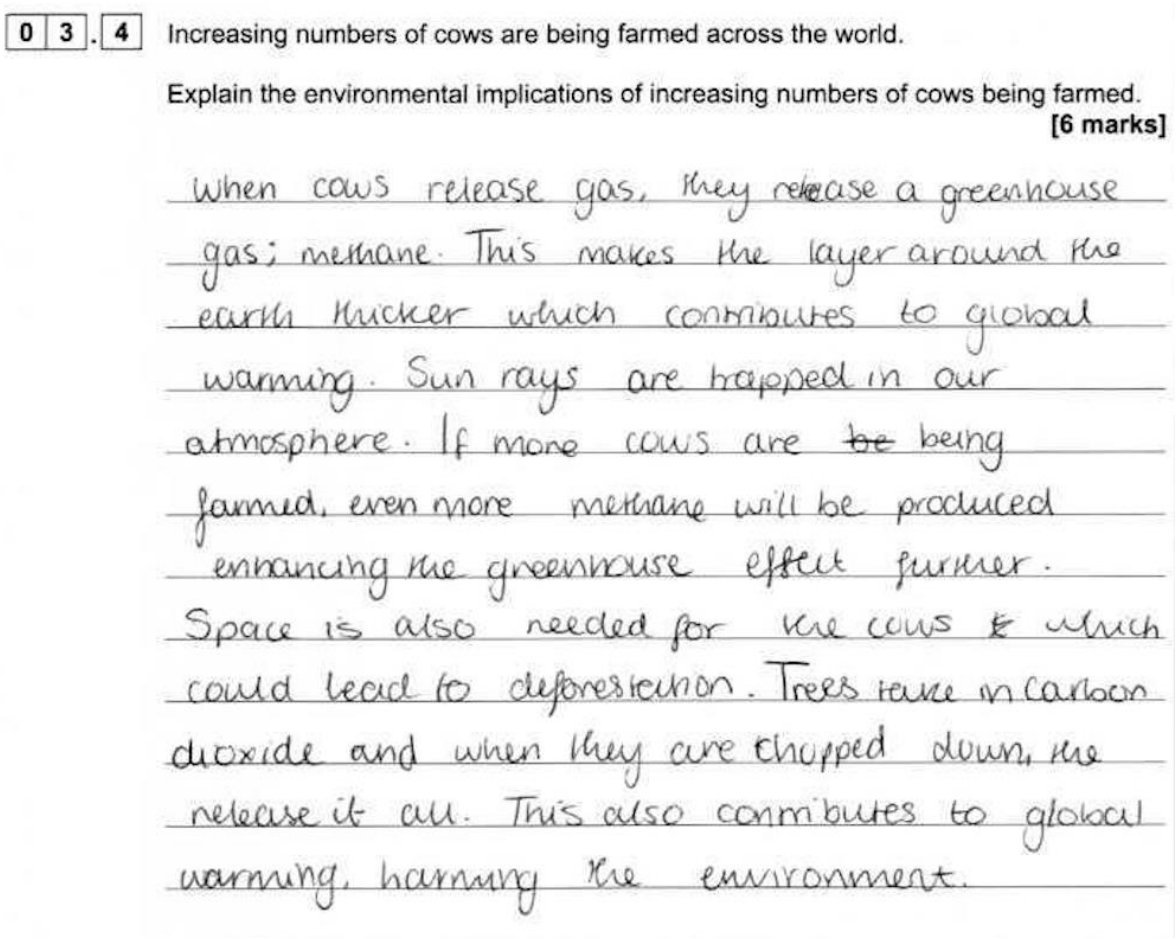


The response gives bullet points 1, 2 and 8, which are consequences of increasing numbers of cows being farmed. There are no links to environmental implications, therefore the response is in Level 1 and was awarded 2 marks.

0 3 . 4 Increasing numbers of cows are being farmed across the world.

Explain the environmental implications of increasing numbers of cows being farmed.

[6 marks]



When cows release gas, they release a greenhouse gas; methane. This makes the layer around the earth thicker which contributes to global warming. Sun rays are trapped in our atmosphere. If more cows are ~~be~~ being farmed, even more methane will be produced enhancing the greenhouse effect further. Space is also needed for the cows & which could lead to deforestation. Trees take in carbon dioxide and when they are chopped down, the release it all. This also contributes to global warming, harming the environment.

The student links bullet points 8, 12 and 13, then bullet point 9. There is also a correct reference to carbon dioxide contributing to global warming. The statement about carbon dioxide being released when trees are chopped down was a common error. This response is in Level 3 and was awarded 5 marks.

Question 4 (Standard, Standard/high and High demand)

04.1 Some students gave the binomial, which was incorrect.

A large number of students were giving incorrect names including the domain / Linnaean classification system (eg Archaea, Eukaryote, Family) or other classification groups (eg Animalia, Vertebrates, Mammal, Fish, Amphibian, Insect).

04.2 Students found it challenging to name the correct domain.

Common incorrect responses were archaea, prokaryotes, bacteria, insect, kingdom and animals. Some students gave the species or genus name. Many students gave classification groups again (ie Animalia, Mammal, Fish, Amphibian, Insect, Fungus). Some students named roles in a food web such as consumer, prey, predator, tertiary consumer. Some students named the domain as the water/sea/ocean.

04.3 There were many responses that were too vague to score marks. In most cases, these repeated the question. References to selecting and breeding fish with the gene were common, and not creditworthy alone.

Some students implied that the parents were being bred repeatedly, rather than the next generation. Few students could describe when the selective breeding would be finished.

Some misconceptions were seen regarding genetic modification.

0 4 . 3 Some salmon have genes that result in fewer sea lice attaching to the skin.

Describe how fish farmers can selectively breed salmon that sea lice **cannot** attach to.

[3 marks]

They can catch the salmon that fewer sea lice attach to. They then bread the fish and breed the offspring until they produce salmon that sea lice cannot attach to.

This response gains marking point 1. It is then unclear that the offspring are being selected before breeding so no further marks were given.

04.4 Generally, students could state some advantage to salmon farmers, but few could give a full explanation.

Responses relating to the fish being 'healthier', 'fresher' or 'higher quality' were insufficient.

04.5 Students found this question challenging. When asked to explain the disadvantage of selective breeding, many students gave responses that could apply to any population (whether selectively bred or not), such as 'may get diseases' or 'may pass on inherited disorders). These were insufficient.

Some students ignored the 'Do not refer to cost or time in your answer' statement in the question and referred to how long selective breeding takes.

For marking point 1 some students incorrectly stated that genes / DNA / gene pool would be the same in all the salmon. So, 'smaller gene pool' / 'similar DNA' were equivalent to the marking point but 'same gene pool' / 'same DNA' did not gain credit.

There were different ways that students could be awarded marking point 2. In option 1 (marking point 2), the idea of an inherited disorder / defect was important, and it needed to be clear that this is across the whole population. Answers of 'all get the same disease' did not gain credit as they miss the idea of it being an inherited condition. An answer of 'one parent can pass on a genetic disorder' would not gain credit as it does not imply all the salmon having it and could apply with or without selective breeding.

In option 2 (marking point 2), we were looking for the idea is that all salmon would be ‘prone / susceptible to’ ‘the same / a particular’ disease. So, ‘all likely to get the same diseases’ or ‘fish are likely to die from the same disease’ would be equivalent.

Very few students went the option 3 (marking point 2) route, to explain how there would be a lack of variation to survive future environmental change.

Evidence of misconceptions was common, such as the suggestion that salmon are prone to developing genetic diseases. This was stated in terms that suggested genetic diseases are communicable or develop later in life.

References to ethics suggested that students are confused between selective breeding with genetic modification. Some responses referred to the unethical nature of killing fish or sea lice being a disadvantage (despite the whole point of salmon farming being to kill salmon for food). References to mutations implied that some students view any mutation as harmful or negative. Many students gave references to sea lice evolving or becoming extinct. Some misconceptions were seen around selective breeding involving chemicals, resulting in fish not being organic.

Question 5 (Standard, Standard/high and High demand)

05.1 Nearly two-thirds of students could identify the hormones that are given to women having IVF treatment.

05.2 Most students could state ovary / ovaries as the target organ of the hormones used in IVF.

05.3 Students found this question challenging. Many simply stated that egg / sperm are too small to see without a microscope, which was insufficient to answer the question.

Students could refer to any relevant stage in the process of IVF, as illustrated by the list of bullet points on the mark scheme.

One common misconception was that microscopes are needed to view hormones.

05.4 Students could write follicle stimulating hormone for FSH and luteinising hormone for LH. Students gave lots of detail on the general roles of FSH and LH that are irrelevant to the question.

Many students did not answer the question in terms of IVF, but could still gain marks.

In marking point 2, ‘womb’ was taken as equivalent to ‘uterus’. ‘Building up’ (of the uterus lining) is equivalent to ‘thickening’. Endometrium was an acceptable alternative to lining (that is beyond the specification). Note that the list rule was applied if additional hormones were referred to here.

For marking point 3, ‘the lining is prepared for pregnancy’ was common, but insufficient, because this did not add to the information given in the question.

05.5 The correct answer without any working received full marks. If the correct answer was given with working then examiners checked the working to see that it is logical before awarding full marks.

The correct answer did not have to be on the answer line but anything that has been given on the final answer line will always take precedence. Students sometimes displayed the alternative method 2 in a slightly different way, such as dividing both sides of the ratio by 5, then by 3 and then by 3 again.

There was a fall back mark if students did not complete their simplification of the ratio but got part way through the process. Alternatively, the fall back mark was given for a ratio of 3:10, which indicated students misinterpreted the table but simplified that ratio correctly.

If the ratio was given the incorrect way round, no mark was awarded.

05.6 The most commonly awarded marks were for age (bullet point 1) or for smoking, obesity or alcohol as named reasons for infertility (bullet point 2). There were many insufficient vague references to health or lifestyle which were not creditworthy. Other commonly seen insufficient answers included hormone levels or the levels of named hormones such as FSH as well as statements about the condition or health of the uterus.

Bullet points 4 or 5 were very rarely awarded. When students did attempt these marking points they often referred to the amount of eggs without suggesting it was the number collected that was important or suggesting it was eggs or fertilised eggs that were implanted rather than embryos.

05.7 For bullet point 1 there were many vague statements about stress, it being emotional or harmful without saying how or why it was stressful, emotional or potentially harmful. References to the risks of surgery were seen very rarely.

Bullet point 2 was the most commonly awarded marking point although many students were not awarded this marking point as they made vague references to the idea that it might not work rather than emphasising the low success rate.

There were many references to multiple births or twins, which were not creditworthy as they failed to qualify the reference with the idea of the risks associated with multiple births or that IVF made multiple births more likely.

0 5 . 7 Give **two** arguments against the use of IVF treatment.

Do **not** refer to cost or to religion in your answer.

[2 marks]

1 It ~~can~~ can be emotionally and physically stressful for the women

2 IVF treatment doesn't always work

This response did not gain any marks. The first reference is too vague to award bullet point 1. The reference to IVF treatment not always working could apply to any conception and therefore needed to be qualified, such as 'low chance of working'. Some students quoted their ratio from question **05.5** to support this response.

There were many references to the process of IVF being unethical or unnatural without saying what made it unethical but on many occasions students went further and explained it was unethical as it might lead to the destruction of a potential life.

Other insufficient answers referred to the embryo or egg not being able to consent or the misconception that IVF allows parents to choose characteristics or will lead to designer babies.

Question 6 (Standard, Standard/high and High demand)

06.1 The most common correct answer was blood glucose concentration. Incorrect answers seen included disease, sweating, stomach acid, diabetes, immune system, hormone levels, heart rate, metabolism, urea, blood flow, light intensity.

06.2 Note that optimum / optimal is underlined in marking point 1 and is therefore required for the mark. Descriptions of optimum, such as 'ideal conditions', were insufficient.

For marking point 2, responses of 'Enzymes don't denature' gained credit. Some students answer efficiently, so a response of 'Enzymes have an optimum temperature' gained 2 marks.

Many students gave answers that were too vague, such as 'needed for organs to work', or stated that hypothermia or hyperthermia would occur.

06.3 Students should sense check their answers to calculations. This may be a general issue with students not understanding the idea of 'rate' or 'per hour'. Many such students gave incorrect answers such as 35.5 °C.

There were some responses where the decrease after each hour was found, added together and divided by 4, ie (0.05 + 0.25 + 0.5 + 0.7) ÷ 4. This was acceptable.

06.4 Many students gained all 4 marks for this question. Generally, if students attempted to give their answer to 2 significant figures, it was then correct.

Some students did not sense check their final answers, suggesting that the swimmer was only at risk of hypothermia when the body temperature decreased to 2 °C.

06.5 Phonetic spelling of pituitary was allowed and many variations were seen. Common incorrect answers were thyroid and pancreas.

06.6 Most students knew that the adrenal glands release adrenaline when the body temperature decreases. The next most commonly awarded mark was for knowing that adrenaline increases heart rate. Few students gained marks beyond this.

Some incorrect references were seen to energy being produced / made / created.

Some students were confused between the thyroid and adrenal glands.

06.7 Many responses show references to TSH. This was not worth credit alone, but was often followed by marking point 1.

We allowed phonetic spellings for thyroxine. Many responses recognised that the thyroid gland releases thyroxine. However, a substantial number referred to adrenaline or simply stated 'hormone'.

Where a response gave the incorrect hormone in marking point 1, marking point 2 could still be awarded if the named hormone would increase metabolic rate. For example, if adrenaline is wrongly stated in marking point 1, marking point 2 could still be credited because adrenaline increases metabolic rate. Likewise, 'TSH increases metabolic rate' would gain marking point 2. If no hormone was named in marking point 1, then marking point 2 could still be credited.

For marking point 2, the abbreviation BMR could be substituted for (basal) metabolic rate. It was insufficient to say 'controls' or 'helps' metabolic rate: there needed to be an indication of an increase.

The best responses gained marking point 3 and clearly understood how negative feedback applies in this situation, but weaker responses simply stated that it was negative feedback, or described negative feedback in general terms, which was insufficient.

Some students interpreted the decrease in body temperature as needing a decrease in metabolic rate. Although this was an incorrect interpretation, some of these responses still gained one or two marking points as detailed on the mark scheme.

Contact us

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

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