

Academic Reading Paper 15

Clones, Colonies and Labels

Time allowed: 1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this booklet until you are told to do so.
- Write your name and the date at the top of the answer sheet.
- Answer **all** the questions.
- Write your answers **on the answer sheet**, not in this booklet.
- You must transfer your answers within the hour. **No extra time is given for transferring answers in the Reading test.**
- Do not remove this booklet from the examination room.

INFORMATION FOR CANDIDATES

- There are 40 questions in this paper.
- Each question carries one mark.
- There are three passages, with 13, 13 and 14 questions.

These passages were written for this library. They are **not** reproduced from any published past paper. The format, timing and task types follow the published specification for the Academic Reading test so that sitting this on paper feels like the real thing.

You should spend about 20 minutes on Questions 1–13, which are based on Reading Passage 1 below.

The banana has no plan B

The banana sold in supermarkets across the world is not a variety in the sense that an apple is a variety. It is a clone. Every Cavendish banana on every continent is genetically identical to every other one, descended by cuttings from a single plant, because edible bananas cannot reproduce sexually. They carry three sets of chromosomes rather than two, which prevents the orderly division that makes seeds, so a grower who wants another plant does not sow anything. He removes a sucker from the base of an existing one and plants that.

A field of identical plants is efficient. Everything ripens together, everything is the same size, the packing and the shipping can be standardised, and a buyer eight thousand kilometres away knows exactly what will arrive. It is also, from the point of view of anything that attacks bananas, a single organism spread across the tropics. Whatever gets into one plant will get into all of them, because there is no variation anywhere for it to fail against. The uniformity is also what makes the fruit cheap, so the price shoppers are accustomed to is a consequence of the same arrangement that creates the risk.

This is not a hypothetical. Until the nineteen-fifties the banana of world trade was a different clone called Gros Michel, by most accounts a better fruit, and it was destroyed by a soil fungus. Panama disease enters through the roots and blocks the vessels that carry water up the plant, which then wilts and dies. There is no cure and no useful fungicide, and the fungus survives in the soil for decades in a resting form, so an infected plantation cannot simply be replanted. The industry responded first by abandoning land and moving, and eventually by abandoning the variety.

The replacement was chosen for one property. Cavendish was resistant to the strain of Panama disease that had killed Gros Michel; it was not chosen because it tasted better, and by general agreement it does not. The switch took most of a decade, required replanting entire regions, and worked. For about forty years the problem was considered solved.

Around 1990 a new strain was identified in Taiwan. Tropical Race 4 does to Cavendish what the earlier strain did to Gros Michel, and it has been moving ever since: through Southeast Asia, into northern Australia, to the Middle East, into Mozambique in 2013, and in 2019 to Colombia, which was the first confirmed case in Latin America and therefore in the region that supplies most of the fruit traded internationally. There is still no cure and no useful fungicide. Control means quarantine, boot washes, restricted access and, where the fungus arrives, destroying the plants and closing the land. Each of those arrivals is a failure of quarantine rather than of biology, because the fungus does not travel by itself. It moves on boots, tools, vehicles and soil.

The obvious response is to switch again, and this is where the analogy with the nineteen-fifties breaks down. Switching worked last time because a resistant clone was sitting in a botanical collection, already domesticated, already capable of surviving three weeks in a ship. There are perhaps a thousand banana

varieties grown around the world, and the overwhelming majority of them are eaten within a few days of where they grow, because they bruise, or ripen unevenly, or yield too little, or simply do not taste like what the market has spent seventy years being trained to expect. No obvious successor is waiting.

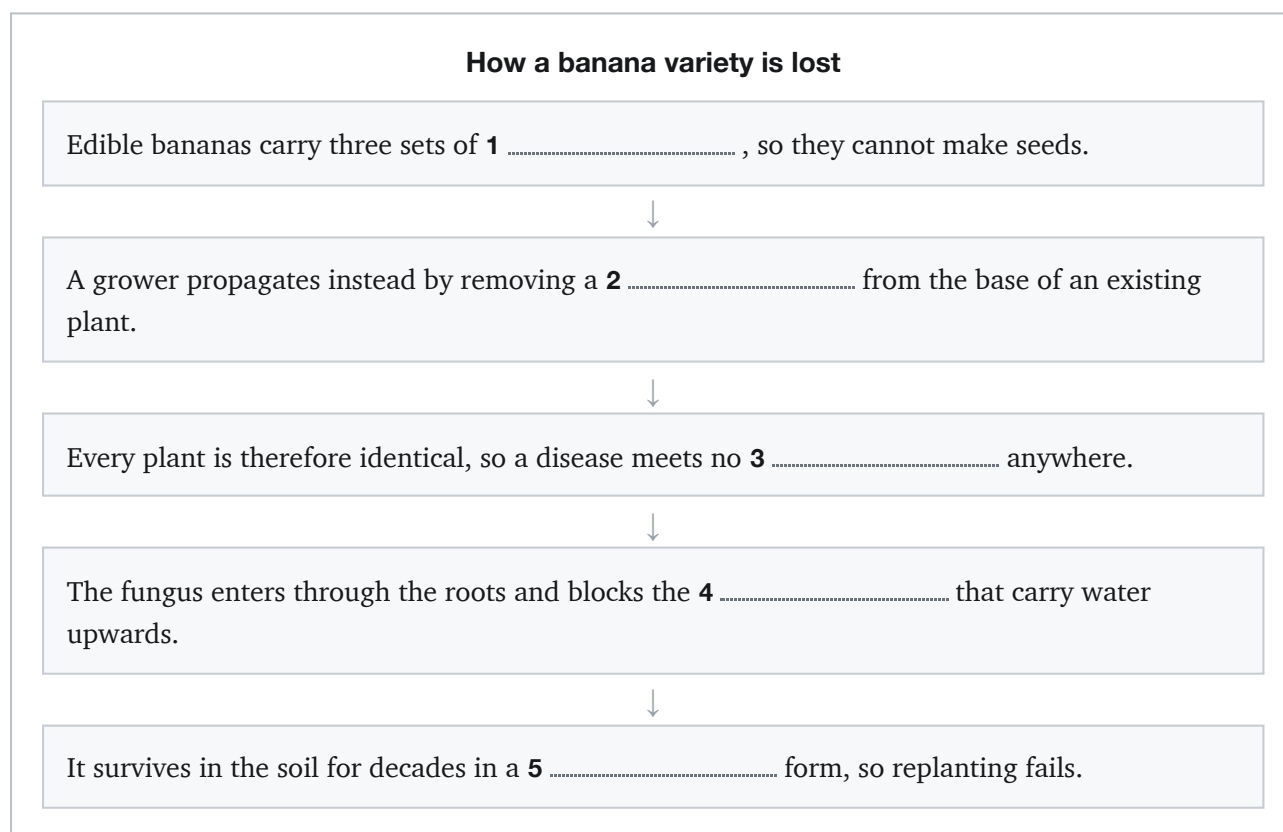
Breeding one is difficult for the reason the whole problem exists. A plant that does not make seeds is a plant that cannot easily be crossed, and banana breeding programmes work with tiny numbers of viable seeds recovered from enormous numbers of pollinations. Progress is real and slow, and the alternative approaches now being pursued in laboratories raise regulatory questions in the countries that buy the most fruit. The programmes that exist are small, and they are competing for attention with a crop that has so far always been rescued by something.

It is worth being clear about what is at stake, because the framing in wealthy countries tends to be about the price of a snack. For several hundred million people in East Africa and parts of Asia, bananas and plantains are a staple rather than a dessert, grown in small plots from local varieties, and those varieties are not immune. The commercial monoculture is the visible part of the problem and not the largest part of it.

Questions 1–5

Complete the flow-chart below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.



Questions 6–9

Answer the questions below.

Choose **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the passage for each answer.

- 6 What was the banana of world trade called before the 1950s?
- 7 In which country was Tropical Race 4 first identified?
- 8 Roughly how many banana varieties are grown worldwide?
- 9 For whom are bananas and plantains a staple rather than a dessert?

Questions 10–13

Do the following statements agree with the information given in Reading Passage 1?

Write **TRUE** if the statement agrees with the information, **FALSE** if the statement contradicts the information, or **NOT GIVEN** if there is no information on this.

- 10 Cavendish was adopted because consumers preferred its flavour.
- 11 Tropical Race 4 had reached Latin America before 2020.
- 12 Cavendish plants are harder to grow than Gros Michel was.
- 13 Local banana varieties are unaffected by the disease.

You should spend about 20 minutes on Questions 14–26, which are based on Reading Passage 2 below.

The organ nobody counted

- A** A human body carries something on the order of thirty trillion of its own cells and a comparable number of bacteria, most of them in the large intestine. For most of the history of medicine these were regarded as passengers: harmless where they were not harmful, and of interest mainly when one of them caused a disease. The reassessment of the last twenty years has been substantial, and it has also been oversold, and both of those things need saying in the same breath.
- B** The strongest evidence comes from animals raised without any microbes at all. Mice delivered by caesarean into sterile isolators and kept there develop abnormally in ways that have nothing obviously to do with digestion. The gut wall is thinner, the immune system does not mature properly, and the animals behave differently under stress. None of this is a subtle statistical signal. It is the difference between an animal that has been colonised and one that has not, and it establishes that the community is doing something structural rather than merely sitting there.
- C** The most striking demonstration that what it does can be transferred came from Jeffrey Gordon's laboratory. His group found pairs of human twins in which one was obese and one was lean, took gut bacteria from each, and introduced them into separate germ-free mice fed identical diets. The mice that received the microbes of the obese twin put on more fat than those that received the lean twin's. The bacteria carried something that produced the difference, and the diet did not vary.
- D** There was a second half to that experiment which is less often quoted and more interesting. When the two groups of mice were housed together, so that they were exposed to each other's microbes, the lean community spread into the mice carrying the obese one and the extra fat gain did not happen. It did not work in the other direction. Something about the lean community made it able to invade, and that asymmetry is not explained by any simple account of the microbiome as a balance to be restored.
- E** Where the field has produced an unambiguous clinical result is in a single infection. *Clostridioides difficile* takes hold in a gut whose normal community has been destroyed by antibiotics, and it recurs in a substantial proportion of patients no matter how it is treated with more antibiotics. In a randomised trial published in 2013, patients received either standard antibiotic treatment or an infusion of faeces from a healthy donor. The trial was stopped before it was complete, because the difference was large enough that continuing to give the control treatment could not be justified.
- F** That result is regularly used to support claims of a quite different order. Studies reporting an association between gut bacteria and depression, autism, obesity, arthritis and Parkinson's disease appear continuously, and the great majority are correlational, small, and comparing group averages of communities that differ enormously between healthy individuals. Two people in perfect health can share a smaller proportion of their gut species than a patient shares with a control. In that setting

an average difference between twenty patients and twenty controls is a weak thing on which to hang a mechanism. None of which means the associations are false. It means that an association is where the work starts, and that a great deal of what is published treats it as where the work finishes.

- G** The word that carries most of the overreach is dysbiosis. It is used as though it named a condition, with the implication that there exists a correct community which has been departed from. No such reference state has been defined. What the word usually marks is that somebody has measured a difference and does not know what produced it or what it produces, and giving that a clinical-sounding name makes it sound like a diagnosis.
- H** The reasonable position is neither of the two on offer. The community is not decorative, and the germ-free animals settle that. It is also not a control panel, and the honest summary is that one infection can now be treated by replacing it, that a mechanism has been demonstrated in mice for one trait, and that most of the rest is a research programme rather than a set of findings. That is a smaller claim than the field is generally credited with, and it is the part of it that will still be standing in twenty years.

Questions 14–19

Reading Passage 2 has eight sections, A–H.

Choose the correct heading for sections A–D, F and G from the list of headings below.

Write the correct number, I–XII.

List of Headings

- i** A reassessment, and a warning about it
- ii** A reassessment, and the reasons it was resisted
- iii** What happens when the community is absent
- iv** What happens when the community is removed
- v** A difference that could be transferred
- vi** A difference that could not be explained
- vii** The half of the experiment that is usually left out
- viii** The half of the experiment that failed
- ix** Claims that outrun the evidence
- x** Claims that the evidence has confirmed
- xi** A word that sounds like a diagnosis
- xii** A word that has been abandoned

14 Section A

15 Section B

- 16** Section C
- 17** Section D
- 18** Section F
- 19** Section G

Questions 20–23

Look at the following statements and the list of studies below.

Match each statement with the correct study, A–C.

NB You may use any letter more than once.

List of Studies	
A	the germ-free animal work
B	Gordon's twin transplant experiment
C	the 2013 randomised trial

- 20** It showed that the immune system does not develop properly without colonisation.
- 21** It was ended early on ethical grounds.
- 22** It produced an asymmetry that simple accounts of the microbiome do not explain.
- 23** It held the animals' diet constant while varying what they carried.

Questions 24–26

Complete the sentences below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.

- 24** Before the recent reassessment, gut bacteria were treated as
- 25** *C. difficile* establishes itself in a gut whose normal community has been destroyed by
- 26** The writer says no reference state has been defined for the community, which is why the term dysbiosis is an

You should spend about 20 minutes on Questions 27–40, which are based on Reading Passage 3 below.

The word that does no work

There is a word on a great many food packets that has no agreed meaning, no legal definition in most of the places the packets are sold, and a measurable effect on what people are willing to pay. The word is natural, and the interesting question is not whether it is being used loosely. It is what people think they are being told, and whether anything could tell them that.

The logical objection is old and is usually stated too quickly. From the fact that something occurs without human intervention, nothing follows about whether it is good for a person. Hemlock is natural. So is the cyanide compound in bitter almonds, the mould toxin that grows on badly stored grain, and the venom of every snake. And the reverse holds equally: the insulin that keeps several hundred million people alive is manufactured, and the vitamin C in a supplement is the same molecule as the vitamin C in an orange, atom for atom, with no test able to distinguish them. Stated like that the argument seems to finish the discussion, and it does not, because nobody who buys the packet believes hemlock is safe.

The regulatory situation is stranger than the logical one. In most jurisdictions natural is not defined for food at all, which means the claim can be made about a flavour compound produced by feeding sugar to a fungus in a steel vessel, since the organism is alive and therefore the process is not synthesis. Meanwhile an identical molecule assembled in a different vessel must be labelled artificial. The label is describing the route, and the route is invisible in the product. This is not a loophole that somebody found and exploited. It is what happens when a category is defined by an intuition and then handed to an inspector to apply.

The sharpest example is in plant breeding and it is not the one people expect. Since the nineteen-fifties, plant breeders have exposed seeds to radiation or to chemical mutagens in order to generate random mutations, then grown out the survivors and selected anything useful. Several thousand crop varieties in commercial use were produced this way, including widely grown wheats, barleys, rices and a grapefruit. The mutations are numerous, uncharacterised and scattered across the genome. These varieties are not specially regulated, are not labelled, and are permitted in organic production. Whatever line the word natural is drawing, it is not a line about how much of a plant's genome has been altered, or how deliberately, or how well anybody understands the result.

It would be a mistake to conclude from this that the people using the word are simply confused, and that mistake is made constantly by the people who enjoy pointing out the fallacy. Something is being tracked. When people say they want natural food, the things they turn out to mean, when asked carefully, include: that they can recognise the ingredients, that the process has been used for a long time, that it can be reversed or escaped if it turns out badly, that they were not asked to bear a risk decided by somebody else, and that the benefit does not go entirely to a firm they have no relationship with. Every one of those is a serious consideration. None of them is naturalness.

That is the useful move, and it is available. Familiarity, reversibility, the distribution of risk and benefit, and whether consent was sought are all properties that can be stated, argued about and in some cases regulated. They are also properties that can come apart from each other, which is why collapsing them into one word produces the results it does: a process that is ancient and harmful passes, and one that is novel and harmless fails, and the label cannot explain either outcome because it was never tracking the thing that mattered.

The objection to retiring the word is practical rather than philosophical. Shoppers have limited time and a label is a shortcut, and a shortcut that is wrong some of the time may still be better than no shortcut at all. That would be a good argument if the errors were random. They are not. The word systematically favours long-established processes over new ones regardless of their effects, and it is available to any firm willing to construct a qualifying production route, which means the shortcut is most reliable for the people who least need protecting and least reliable where a new risk actually appears.

None of this is an argument that novelty is safe or that tradition is foolish. It is an argument that a word doing the work of five different considerations will do all five badly, and that the remedy is to say which one is meant. That is more effort than printing a single adjective. It is the only version of the claim that can be true or false. The word itself will not go anywhere, and there is no reason it should. But a regulator is not obliged to treat it as though it meant something, and at present a great many of them do.

Questions 27–32

Do the following statements agree with the claims of the writer in Reading Passage 3?

Write **YES** if the statement agrees with the claims of the writer, **NO** if the statement contradicts the claims of the writer, or **NOT GIVEN** if it is impossible to say what the writer thinks about this.

- 27** The writer thinks pointing out the appeal-to-nature fallacy settles the argument.
- 28** The writer believes people who prefer natural food are simply confused.
- 29** Mutation-bred varieties have been shown to be less safe than conventionally bred ones.
- 30** The writer accepts that a label serving as a shortcut has some value.
- 31** The writer thinks organic certification should be withdrawn from mutation-bred varieties.
- 32** The writer holds that the considerations behind the word can come apart from one another.

Questions 33–36

Complete the summary using the list of words, A–H, below.

List of Words

- A route
- B molecule
- C familiarity
- D purity
- E consent
- F cost
- G shortcut
- H tradition

What the label is actually marking

Because an identical compound may be called natural or artificial depending on how it was made, the label describes the **33** rather than the product. What shoppers turn out to mean by the word includes **34** with the process, reversibility, the way risk and benefit are distributed, and whether **35** was sought. The writer accepts that the label works as a **36**, but argues that its errors run in one direction rather than at random.

Questions 37–40

Choose the correct letter, A, B, C or D.

- 37** According to the passage, mutation breeding has produced
- A several thousand crop varieties in commercial use.
 - B several thousand mutations in a single variety.
 - C varieties that must carry a special label.
 - D varieties excluded from organic production.

- 38** Why does the writer mention insulin and vitamin C?
- A To show that manufactured substances can be beneficial or identical.
 - B To argue that supplements are as good as fruit.
 - C To explain why natural is undefined in law.
 - D To give examples of substances that occur without human intervention.
- 39** The writer says the label's errors are
- A random, and therefore tolerable.
 - B systematic, and biased towards established processes.
 - C too rare to matter.
 - D confined to imported foods.
- 40** Which of the following best states the writer's conclusion?
- A Novel processes are safer than traditional ones.
 - B The word should be replaced by naming the consideration actually meant.
 - C Food labelling should be left to manufacturers.
 - D Consumers should be given more information about chemistry.