

Academic Reading Paper 46

Load Lines, Ears and Trials

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.

A line painted on a hull

In the eighteen-seventies the British merchant fleet was losing ships and men at a rate that would now be treated as a national emergency. Several hundred vessels and some thousands of lives went every year, and a substantial share of the losses involved ships that were old, poorly maintained and loaded well past any sensible limit. Underneath this sat an arrangement that made the losses profitable for some owners. A vessel could be insured for more than it was worth, so that a bad ship which sank returned more to its owner than a bad ship which did not. The incentive did not have to be acted on deliberately to have an effect; it was enough that repairs could always be postponed without anybody being obviously at fault.

The position of the crew was worse than is usually remembered. A seaman who signed the ship's articles and then refused to sail could be prosecuted for desertion and sent to prison, and the courts did not accept his opinion of the vessel as a defence. In the years around 1870 hundreds of sailors were imprisoned for declining to board ships they believed unfit for sea. Some of those ships subsequently sank, which is the fact that made the practice impossible to defend once anybody set it out plainly.

Somebody did. Samuel Plimsoll, elected to Parliament for Derby, published a book in 1873 called *Our Seamen*, in which he named owners and ships. He was sued, and raised money from the public to meet the costs. His figures were attacked at the time, and not all of the attacks were unfair: parts of his tabulation were loose, and the looseness was used by his opponents to discredit everything else he had written, which is a manoeuvre that works whether or not the central case is sound.

The turn came in 1875, and it came through a loss of temper. The government announced that its Merchant Shipping Bill would be dropped for want of parliamentary time. Plimsoll went to the floor of the House, shook his fist at the Speaker, called members of the House villains, and refused to withdraw the word. He was suspended from the Commons. Every newspaper in the country carried the scene, and within days the government reversed itself and passed a temporary measure.

The Merchant Shipping Act of 1876 followed and made a load line compulsory on British vessels. The idea itself was simple and old: a mark on the side of the hull showing the depth to which the ship might lawfully be immersed. If the water stood above the mark, the ship was overloaded, and anybody could see it. Marks of this kind had been used voluntarily by some owners and by one insurer for years before the law required them.

The flaw in the Act is the part usually left out of the story. It required the mark to be painted, and it said nothing whatever about where. The position was left to the owner, who was the person the mark existed to restrain. Lines were placed high enough on some hulls to permit any loading at all, and there are ac-

counts of marks painted on the funnel. The gap remained open for fourteen years, until the Load Line Act of 1890 gave the Board of Trade the power to fix the position by a formula, with different allowances for the season of the year and for the density of the water the ship would be floating in.

A national rule also protected only national ships. A foreign vessel loading in a British port was outside the Act entirely and could sail down to any depth its master chose, which put British owners at a disadvantage and gave them an argument for weakening the rule. That could only be answered by agreement between states, and the first International Load Line Convention was signed in 1930, more than fifty years after the original Act, and revised in 1966.

The ledger should be given honestly. Losses did fall steeply across the same decades, but a great many things were changing at once: steel hulls replaced iron, engines became far more efficient, weather reporting by telegraph allowed masters to avoid what they had previously sailed into, and insurers began to price the risk of a bad ship rather than simply covering it. Historians differ on how much of the improvement belongs to the line. What is not in dispute is what it did to the argument. It converted the question of whether a ship was overloaded from a matter of opinion, disputed between an owner ashore and a frightened crew, into something a person standing on a quay could settle by looking at it.

Questions 1–4

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.

- 1 A ship could be insured for more than it was worth.
- 2 Sailors who refused to board were always able to give the ship's condition as a reason in court.
- 3 Plimsoll won the legal actions brought against him.
- 4 Some of the criticism of Plimsoll's figures was deserved.

Questions 5–9

Complete the table below.

Choose **ONE WORD ONLY** from the passage for each answer.

The rule in three stages		
Year	What it did	What was still missing
1876	made a load line 5 on British vessels	left the 6 of the mark to the owner
1890	let the Board of Trade fix the position by a 7	allowances were made for the season and for the 8 of the water

1930

the first International Load Line
9 was signed

Questions 10–13

Complete the sentences below.

Choose **ONE WORD ONLY** from the passage for each answer.

- 10** A seaman who signed the articles and then refused to sail could be prosecuted for
.....
- 11** After the scene of 1875 Plimsoll was from the House of Commons.
- 12** A foreign vessel in a British port could load to any depth its chose.
- 13** The mark made overloading something a person standing on a could settle by looking.

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

The ear that answers back

- A** The ear does something that no simple mechanical device should manage. It separates sounds by frequency finely enough that a listener can tell apart two tones differing by a fraction of one per cent, it does this across a range of loudness spanning a factor of about a million, and it does it inside a fluid-filled structure the size of a pea. Any account of hearing has to explain all three at once, and for most of the twentieth century one of them went unexplained. The explanation that eventually arrived came from a direction nobody in the subject was watching.
- B** Georg von Békésy worked out the basic mechanism from the late nineteen-twenties onwards. Opening the cochlea of human cadavers, and building physical models of it at larger scale, he established that a sound sets up a wave that travels along the flexible membrane running the length of the coiled tube, and that the point at which that wave reaches its greatest height depends on the frequency of the sound. High tones peak near the entrance, low tones near the far end. Pitch is therefore encoded as a position, and the ear works as a map. He was given a Nobel Prize for it in 1961.
- C** There was a difficulty that Békésy himself pointed out. The tuning he could observe was far too broad. In his preparations any given point on the membrane responded to a wide band of frequencies, spread out and blunt, while a living listener discriminates far more sharply than that. The model explained the map and did not explain the resolution, and for thirty years the gap was treated as a technical problem that better measurements would eventually close. It was not a technical problem, and better measurements made it worse.
- D** An explanation had in fact been published in 1948, by somebody with no standing in the subject at all. Thomas Gold, whose training was in astronomy and who spent the war on radar, argued that a passive resonating system sitting in fluid would be so heavily damped that sharp tuning was impossible in principle. The ear, he concluded, must contain an active process that feeds energy back into the vibration to cancel the damping: an amplifier. He then drew the consequence that made the claim testable. Any amplifier can become unstable, and an ear containing one ought sometimes to produce sound of its own. Nobody followed it up. The paper was short, it appeared in a journal read by the wrong people, and its author never worked on hearing again.
- E** Thirty years later David Kemp placed a sensitive microphone in the ear canal, played a brief click, and recorded a faint sound emerging a few milliseconds afterwards. It was not a reflection, because its timing and its frequency content did not match one. It was a sound generated inside the ear. Some ears, he found, emit a continuous faint tone with no stimulus at all, and can be recorded doing so from outside the head. The measurement is now made routinely on newborn infants, because an ear that answers back is an ear whose amplifier is working. Gold's prediction had been in the literature, unread, for thirty years.

- F** The machinery was then identified. The cochlea holds two kinds of hair cell, and the outer ones had been assumed to be sensory like the inner ones, only less important. They turned out to do something no other cell in the body does: they change length in response to voltage, shortening and lengthening at audio frequencies. Pushing on the membrane in time with the travelling wave, they add energy to it. The gain is greatest for the quietest sounds and falls away as sound grows louder, which is also how the ear manages so vast a range without being overwhelmed at the top of it.
- G** Békésy was not wrong, and the way in which he was not wrong is the interesting part. The travelling wave is exactly what a cochlea does when the active process is absent, and absent is the condition of every cochlea he was able to examine, because the amplifier dies within minutes of the tissue. His model is an accurate description of a dead ear. No amount of care with cadavers could have revealed what was missing, and the discovery required a prediction from outside the discipline and an instrument that nobody had thought to point in that direction. It also accounts for something clinicians see constantly: an ear damaged by loud noise loses the amplifier before it loses anything else, which is why early hearing loss shows itself as difficulty picking a voice out of a crowded room rather than as an inability to hear.

Questions 14–18

Reading Passage 2 has seven paragraphs, A–G.

Which paragraph contains the following information?

Write the correct letter, A–G.

NB You may use any letter more than once.

List of Paragraphs

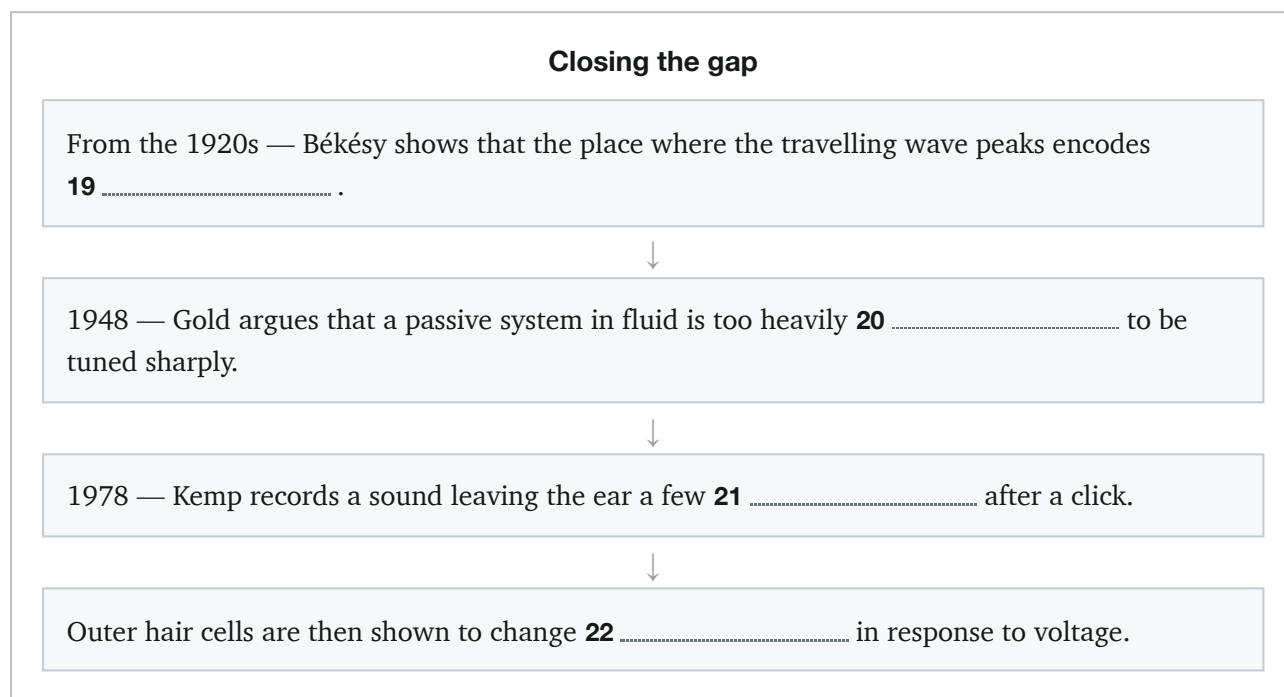
- A** Paragraph A
- B** Paragraph B
- C** Paragraph C
- D** Paragraph D
- E** Paragraph E
- F** Paragraph F
- G** Paragraph G

- 14** a reason why one way of studying the organ could never have found the missing process
- 15** a prediction that could be tested, and an account of why nobody tested it
- 16** a description of a cell that does something no other cell does
- 17** a statement that better measurement made a problem worse rather than better
- 18** a test now carried out as a matter of routine on babies

Questions 19–22

Complete the flow-chart below.

Choose **ONE WORD ONLY** from the passage for each answer.



Questions 23–26

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

- 23** What did Békésy's account fail to explain?
- A** how pitch is mapped along the membrane
 - B** how finely a listener can tell frequencies apart
 - C** why the cochlea is coiled
 - D** how the ear works out which direction a sound came from
- 24** Why did Gold's paper have no effect at the time?
- A** It contained an error in the mathematics.
 - B** It was short, it appeared where the relevant people did not read it, and its author moved on.
 - C** Every journal in the field rejected it.
 - D** It offered nothing that could be tested.

- 25** What does the passage say about the amount of amplification?
- A** It stays the same at every sound level.
 - B** It is greatest for the quietest sounds.
 - C** It works only above a certain frequency.
 - D** It grows as the sound gets louder.
- 26** Why could work on cadavers never have found the active process?
- A** The tissue is too small to be examined properly.
 - B** The process stops within minutes of death.
 - C** Cochleas are usually damaged when they are removed.
 - D** The process occurs only in animals other than humans.

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

Why the pilot works and the rollout does not

An organisation tries something in one place. It works. The thing is then extended to every place, and it does not work. This sequence is so common in education, in health services and in management generally that the result of a small trial now carries almost no information about what the full version will do, and everybody involved knows it, and the trials continue to be run and quoted in the same way. The gap between the two results has acquired names in several literatures, which is usually a sign that a thing is being described rather than fixed.

The reasons are not mysterious and they are all structural. A pilot is run in a site that volunteered, by people who chose to take part, with the person who designed the thing present in the building, under the attention of senior management, and with permission to fix problems as they appear. Not one of those five conditions survives the extension, and each of them on its own is enough to produce an effect.

Take the first. A site that volunteers for a trial is not a randomly chosen site. It is the one that was already better run, or the one whose manager wanted this particular thing and had the standing to ask for it. Whatever is measured afterwards includes the difference between that site and an average site, and there is nothing in the design that separates the two. The stronger the enthusiasm required to volunteer, the larger this component will be, so that the more convincingly a pilot is staffed the less it can tell you.

The second is older than any of us and is still ignored at the point where it matters. Being watched changes what people do. A trial site is the site everybody is looking at, and the measurement therefore includes the effect of being looked at. The rollout, by definition, cannot look at everybody, so whatever part of the result came from attention is not merely reduced at scale; it is removed.

The third is the one least often stated. A pilot is generally run with the designer in the room, noticing what is going wrong and correcting it the same afternoon, using judgement that has never been written down and in many cases could not be. What is extended is not that. It is a document, carried out by people who have never met the designer, in situations the document does not cover. The gap between the two is not a failure of implementation. It is the difference between a person and a manual, and no amount of care in writing the manual closes it, because what is missing was never available in written form.

The opposite conclusion has to be refused as firmly. Roll it out and see is worse, not better, and nothing here is an argument for it. Untested extensions fail more expensively, and they are far harder to reverse once budgets and staffing have been rearranged around them. There are also things that genuinely cannot be tested in one place, because their value depends on everybody having them at once, and for those a small trial can only mislead. Demanding evidence before spending at scale is right, and an organisation that abandons trials because trials are unreliable has drawn the wrong lesson twice over. The complaint here is narrower. It is about what the evidence is taken to show.

What follows is a change of purpose rather than of method. The job of a pilot is not to demonstrate that something works, because under the five conditions listed above almost anything works, and a pilot that succeeds has told you very little. Its job is to find the ways the thing breaks, and that argues for designing it to fail: run it in the least promising site rather than the keenest, with ordinary staff rather than volunteers, without additional support, for the full length of time rather than a favourable few weeks, and with the designer deliberately kept out of the room.

One concession remains, and it is a real use rather than a grudging one. Sometimes a demonstration of possibility is precisely what is wanted: a funder has to be moved, or a claim that the thing cannot be done has to be answered, and a single site run under the best available conditions answers it. That is a legitimate exercise. The only requirement is that everybody says which of the two they are running, because the identical activity yields evidence of opposite value depending on the answer, and a trial conducted in order to persuade should never afterwards be quoted as a trial conducted in order to find out.

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 organisations should stop running trials.
- 28** The writer believes that a trial which succeeds tells you very little.
- 29** The writer thinks trials are more misleading in health services than in education.
- 30** The writer accepts that some things cannot usefully be tested in a single place.
- 31** The writer regards the gap between trial and rollout as a failure of implementation.
- 32** The writer thinks trials have become more common in recent years.

Questions 33–36

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

List of Words

- A volunteered
- B attention
- C document
- D fail
- E succeeded
- F funding
- G budget
- H persuade

Five conditions, and what follows

A trial takes place in a site that has **33**, staffed by people who chose to take part, with the designer in the building and with senior management giving it their **34** None of that survives the extension. What is extended is a **35**, worked through by people who never met the designer. The conclusion is that a trial should instead be built to **36**: the least promising site, ordinary staff and no extra help.

Questions 37–40

Complete each sentence with the correct ending, A–G, below.

List of Endings

- A the organisation cannot look at everybody.
- B the less its result can tell you.
- C already better run than an average one.
- D the more reliable its result becomes.
- E everybody states which of the two they are running.
- F the designer stays in the room throughout.
- G it costs less than a full rollout.

37 The site that volunteers for a trial is usually one that was

- 38** The effect of being watched cannot survive the extension because
- 39** A demonstration run in order to persuade a funder is legitimate provided that
- 40** The more enthusiasm a trial demands of its staff,