

Academic Reading Paper 30

Type, Prions and Plain Words

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 part that was already there

The invention is named after the press, and the press is the least original component in it. Screw presses had been squeezing grapes, olives, paper and cloth in Europe for centuries, and adapting one to push a sheet against an inked surface required no insight of any consequence. Paper was already available, made in China from the second century, carried westward through the Islamic world and manufactured in Germany from 1390. Printing from carved wooden blocks was already being used for playing cards and devotional pictures. Movable type itself had been made in China in the eleventh century and cast in metal in Korea before 1234, more than two hundred years before anybody in Mainz attempted it. A Korean book printed from metal type in 1377 survives.

So the interesting question is not how somebody thought of printing. It is why the assembled thing worked in Europe in the 1450s and had not worked anywhere else, and the answer lies in three problems of materials that Johannes Gutenberg appears to have solved and that nobody talks about, because none of them photographs well and none of them can be drawn in a schoolbook.

The first and largest is how to make the type. A page of text needs several thousand pieces, every one of the same height to a fraction of a millimetre, or the impression will be uneven, and they have to be produced in tens of thousands and replaced as they wear. Carving them is out of the question. Gutenberg's answer was an adjustable hand mould: a two-part metal box that closes around a copper matrix, which has itself been stamped by a hardened steel punch cut with the shape of the letter. Pour metal in, open the mould, and a finished piece of type falls out. Change the matrix and adjust the width, and the next letter comes out at exactly the same body height as the last, which is the property the whole page depends on.

The second problem is what to pour into it. The metal has to melt at a low enough temperature to be handled in a workshop and recast repeatedly, be hard enough to survive thousands of impressions without deforming, and reproduce the fine detail of the matrix. Lead alone is too soft and shrinks as it cools, pulling away from the corners of the mould, so the letter comes out blunt. Gutenberg used lead with tin and antimony, and the antimony does something unusual: it makes the alloy expand very slightly as it solidifies, so that the metal is pressed into the detail of the matrix at the moment it sets.

The third problem is ink. The ink a scribe uses is water-based and it will not stay on metal; it gathers into beads and slides off. What was needed was something closer to a painter's material, and what Gutenberg used was an oil-based ink, thick, made with lampblack, which sticks to a metal surface, transfers cleanly under pressure, and does not spread into the fibres of damp paper. The blackness of the surviving pages is not an accident of age. It was formulated.

The demonstration piece was a Bible set in forty-two lines to the column, produced in Mainz around 1454 and 1455 in an edition of roughly a hundred and eighty copies, of which about thirty-five were printed on vellum and the rest on paper. It runs to some twelve hundred and eighty pages, and to keep several pages standing in type at once the workshop needed something in the region of a hundred thousand individual pieces. It is not a prototype and it does not read like a first attempt. It is a large industrial job, on the most valuable text available, attempted at the first opportunity.

Gutenberg did not profit from it. He had borrowed heavily from a financier named Johann Fust, who sued him in 1455, won, and took the workshop, the type and the completed sheets, retaining Gutenberg's assistant Peter Schöffer to run the business. Gutenberg received a small pension from the archbishop late in life and died in 1468. Fust and Schöffer printed prosperously for years, and the first book to carry a printer's name and a date carries theirs.

What followed happened faster than anything comparable before it. Within fifty years presses were operating in around two hundred and fifty European towns, and the books printed before 1501 are estimated at some twenty-eight thousand distinct editions. The point worth holding on to is that none of this waited on a new idea. It waited on a mould, an alloy and an ink, and on somebody willing to spend years on three problems that look, from a distance, like details of manufacture.

Questions 1–4

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

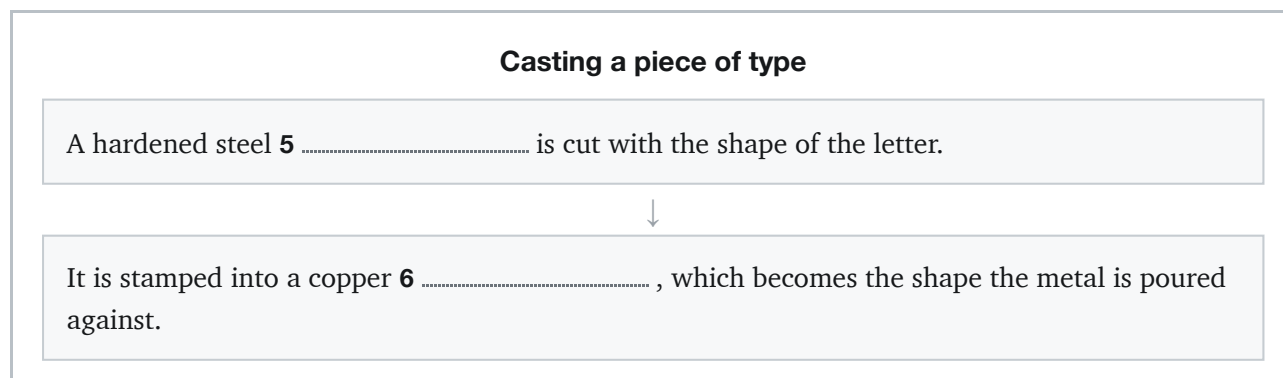
Write **TRUE** if the statement agrees with the information, **FALSE** if the statement contradicts the information, or **NOT GIVEN** if there is no information on this.

- 1 Metal movable type existed outside Europe before Gutenberg worked on it.
- 2 Adapting a screw press for printing required a significant insight.
- 3 Gutenberg learned of the Korean method before designing his own.
- 4 Gutenberg made a large fortune from the Bible he printed.

Questions 5–9

Complete the flow-chart below.

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



↓
A two-part adjustable 7 closes around it.

↓
Molten lead with tin and 8 is poured in.

↓
The antimony makes the alloy 9 very slightly as it solidifies, pressing metal into the detail of the matrix.

Questions 10–13

Complete the sentences below.

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

- 10** A scribe's water-based ink will not stay on metal because it gathers into and slides off.
- 11** The Bible was set in lines to the column.
- 12** Keeping several pages standing at once required about a hundred thousand individual •
- 13** Within fifty years presses were working in around two hundred and fifty European •

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

The infection with no genes

- A** In the 1950s a fatal disease of the brain was found among the Fore people of the eastern highlands of Papua New Guinea. It was called kuru, it affected mainly women and children, and it destroyed the nervous system over months. Vincent Zigas and Carleton Gajdusek established that it was passing between people through the handling and consumption of the dead at funerals, and Gajdusek later transmitted it to chimpanzees, which settled that it was infectious. It behaved like nothing else. The interval between exposure and illness could be years, there was no fever and no immune response, and nobody could find an organism. The term used at the time was a slow virus, which named the puzzle rather than solving it. Kuru declined and then disappeared once the funeral practice stopped, which confirmed the route of transmission and left the agent as unidentified as before.
- B** A sheep disease supplied the constraint that made the puzzle sharper. Scrapie had been known to British farmers for two centuries, and in the mid-1960s Tikvah Alper and her colleagues exposed infected tissue to ultraviolet and ionising radiation at doses far beyond anything a virus could survive. Radiation of that kind works by breaking nucleic acid, and the target size can be estimated from the dose required. The scrapie agent remained infectious. Whatever was transmitting the disease either had no nucleic acid or had one far too small to encode an organism. That is a strong constraint arrived at without knowing anything about what the agent actually was.
- C** A mathematician named J. S. Griffith took the obvious next step in 1967 and was ignored for it. If the agent is not a nucleic acid, he pointed out, a protein could in principle do the job, provided that a misfolded form of a protein could induce a normal copy of the same protein to adopt the misfolded shape. Nothing would need to be copied in the ordinary sense. The information would be carried by a shape, and it would spread by contact rather than by replication. The proposal was published in a leading journal and attracted almost no attention for fifteen years.
- D** Stanley Prusiner spent the 1970s purifying the scrapie agent, step by step, watching which fraction remained infectious. Infectivity tracked a single protein. Treatments that destroy proteins abolished it; treatments that destroy nucleic acids did not. In 1982 he published this with a name for the thing, calling it a prion, a compression of proteinaceous infectious particle, and the reception was hostile in a way that is worth understanding. It was not simple conservatism. Every known infectious agent carried genetic material, the rule that heritable information travels in nucleic acid had been the organising principle of biology for thirty years, and a purified fraction can always be argued to contain a virus that nobody has detected yet, which is an objection that cannot be answered by further purification.

- E** The discovery that reframed the argument came in 1985, when the gene for the protein was located. It was not in any pathogen. It was in the host's own genome, in every healthy animal examined, producing a protein present in normal brain tissue. The disease agent was not a foreign organism at all: it was a molecule the animal manufactures itself, folded the wrong way, converting its neighbours as it went, which also explained why there is no fever and no immune response: the body has no reason to attack a protein it makes itself.
- F** The test that convinced most of the remaining doubters was done by Charles Weissmann in 1993. Mice were engineered to lack the gene entirely, so that they made none of the protein, and were then inoculated with scrapie. They did not become infected and they did not fall ill. Whatever else the injected material contained, without the animal's own protein it could do nothing, which is very difficult to reconcile with a hidden virus. Prusiner received the Nobel Prize in 1997, by which time the subject had acquired an audience for other reasons: cattle in Britain had been fed the remains of other animals, and the disease had crossed into people.
- G** One serious objection has never been fully answered and honest accounts include it. Prions come in strains, which breed true: inject one and the incubation period, the pattern of damage and the affected brain regions reproduce reliably, and a different strain gives a different and equally reliable result. Strains are exactly what a genome is normally invoked to explain. The current answer is that the information sits in the details of the folding rather than in a sequence, and while the evidence for that is now substantial, it is a good deal thinner than the evidence for the main claim.

Questions 14–18

Reading Passage 2 has seven sections, A–G.

Which section contains the following information?

Write the correct letter, A–G.

NB You may use any letter more than once.

- 14** an objection that no amount of further work could answer
- 15** a proposal that was published and then left alone for years
- 16** an explanation of why the body does not fight the agent
- 17** a limit derived without knowing what was being measured
- 18** a feature of the disease that the accepted account still explains poorly

Questions 19–22

Look at the following contributions and the list of people below.

Match each contribution with the correct person, A–D.

List of People

- A Carleton Gajdusek
- B Tikvah Alper
- C J. S. Griffith
- D Charles Weissmann

- 19 She showed the agent survived treatment that destroys nucleic acid.
- 20 He demonstrated that the human disease could be passed to another species.
- 21 He proposed a mechanism years before there was evidence for it.
- 22 He used animals that could not make the protein at all.

Questions 23–26

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

List of Words

- A shape
- B sequence
- C host
- D pathogen
- E strains
- F incubation
- G virus
- H folding

Where the information sits

On the protein-only account, what is transmitted is not a molecule carrying a code but a **23**, passed on by contact rather than copied. The gene for the protein turned out to lie in the **24** 's own genome rather than in any invading organism. The strongest surviving objection concerns **25**, which reproduce reliably and are normally explained by a genome. The current answer places the information in the details of the **26** rather than in a sequence.

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

Why plain language is hard

Advice about writing clearly is usually given in the form of a rule about words. Prefer the short word, cut the adjective, avoid the passive, do not use a Latin word where an English one will serve. The rules are not wrong and following them will improve most bad prose slightly. They also miss the thing that is actually making the sentence hard to read, which is why a writer can obey every one of them and still produce a paragraph nobody can get through, and why the same writer can break several and be perfectly clear.

Consider what the standard measurements do. A readability formula counts syllables per word and words per sentence and turns them into a grade level. That is a reasonable way to grade a text after the fact, since long words and long sentences do correlate with difficulty, and it is a disastrous way to guide the writing of one, because both quantities can be reduced without touching the difficulty. Chop a hard sentence into three and the formula improves. The reader is now assembling the same unclear thought out of three fragments instead of one.

The first real source of difficulty is the one that has been given a name, the curse of knowledge. Once you know a thing, you cannot reliably reconstruct what it was like not to know it. The steps you crossed years ago are no longer visible to you as steps, the terms you use no longer feel like terms, and you leave out precisely the connective material a reader needs, not through arrogance but because from where you stand it is not there to leave out. This is why an expert's draft is often incomprehensible in a way the expert cannot see and an outsider spots in a sentence, and why rereading your own work is such a poor substitute for giving it to somebody else.

The second source is less flattering and, I think, larger. A great deal of obscure prose is obscure because the writer has not yet decided what they mean. A sentence that hedges, that turns verbs into nouns, that stacks qualifiers and attaches a clause to soften each of them, is very often a sentence produced by somebody who has not settled which of three claims they are making and has written something that could be read as any of them. The vagueness is not a failure of expression. It is an accurate expression of an unresolved thought.

That diagnosis has a test attached, which is the practical value of it. Take a sentence you cannot simplify and try to state, in a few words and out loud, what it asserts. If you can, the sentence was merely badly built and you can rebuild it. If you cannot, the problem was never the sentence. You will find, quite often, that you were holding two incompatible things at once and that the syntax was doing the work of not choosing between them. The revision that follows is a decision, not a rewording.

It follows that the usual defence of dense writing is half right, and it is worth conceding the half. Some prose is dense because the material is, and compressing it is a service to the reader rather than an injury. A paper written for two hundred specialists can use their vocabulary without apology, and expanding

every term would waste the time of everyone who already knows it. Density and obscurity are different things, and the confident demand that everything be written for everybody produces its own kind of damage, usually in the form of a document three times as long that still cannot be relied on.

What does not survive is the version of that defence which is offered for writing aimed at people who do not share the vocabulary: consent forms, contracts, official letters, instructions. Where plain-language rewriting of such documents has been tested properly, with comprehension measured before and after, the improvements are large and repeatable. The people who could not understand the original were not failing to concentrate. They were being asked to reconstruct a decision the writer had not made, from a text arranged to avoid stating it.

The recommendation, then, is not a list of words to avoid. It is to test on readers rather than on a formula, since five people reading a draft and saying where they stopped will find more than any measurement will; to treat a sentence you cannot state plainly as a signal about your thinking rather than about your style; and to reserve density for occasions when the reader genuinely has the vocabulary, which is a smaller set of occasions than most writers believe.

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 all technical writing should be made accessible to a general reader.
- 28** The writer accepts that the usual rules about words improve most bad prose a little.
- 29** Readability formulas were designed to help writers rather than to grade texts.
- 30** Experts who write unclearly are usually aware that they are doing so.
- 31** The writer holds that a sentence which cannot be stated plainly indicates unfinished thinking.
- 32** Plain-language rewriting is more expensive than most organisations expect.

Questions 33–36

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

Endings

- A the reader assembles the same unclear thought out of more fragments.
- B the steps crossed years ago are no longer visible as steps.
- C the writer has not settled which of several claims they are making.
- D comprehension improved substantially and repeatably.
- E the vocabulary used was too difficult for the readers.
- F the formula was designed for a different language.
- G specialists prefer to read shorter documents.

- 33 If a hard sentence is chopped into three, the score improves but
- 34 An expert omits connective material because
- 35 A sentence full of hedges and stacked qualifiers often means that
- 36 When official documents have been rewritten and tested properly,

Questions 37–40

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

- 37 What does the passage say a readability formula measures?
- A How much the reader already knows.
 - B Syllables per word and words per sentence.
 - C Whether the writer has decided what they mean.
 - D The number of technical terms used.
- 38 Which position does the writer reject?
- A That some prose is dense because the material is dense.
 - B That obscurity is chiefly a problem of vocabulary.
 - C That five readers find more than a measurement does.
 - D That an outsider spots what the writer cannot.
- 39 According to the passage, what does the revision of an unclear sentence amount to?
- A A rewording.
 - B A decision.
 - C An application of the standard rules.
 - D A shortening.

- 40** Which of the following best expresses the writer's recommendation?
- A** Test on readers, treat an unstatable sentence as a signal about thinking, and reserve density for readers who have the vocabulary.
 - B** Follow the standard rules about words more strictly.
 - C** Write everything for a general audience.
 - D** Use a readability formula before publishing.