

Academic Reading Paper 49

Domesday, Hydrogen and Boots

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 book with no appeal

At his Christmas court in Gloucester in 1085, William the Conqueror ordered a survey of the country he had taken nineteen years earlier. The work was carried out through 1086 and the returns were compiled almost at once. The remarkable thing about the Domesday Book is not its contents but its speed: a medieval administration with no standing civil service produced a description of most of a kingdom in about a year, at a level of detail that no European state would attempt again for centuries.

The method was systematic and is known because the questions survive. Commissioners were sent out in circuits, each covering a group of shires, and in every hundred a jury was sworn, made up partly of English and partly of Norman men so that neither side could quietly agree on a false answer. The jury was asked the same list every time. Who held this manor in the time of King Edward, and who holds it now; how many ploughs are there; how many men of each rank; how many mills and fishponds; what was it worth then, and what is it worth now. The answers were written down on the spot, checked against the answers given by neighbouring juries, and sent on.

The scale is easier to state than to imagine. Something in the region of thirteen thousand places are named, and the two volumes run to roughly two million words. They are not two halves of one book. Great Domesday is a condensed fair copy covering most of England; Little Domesday is the unedited return for Norfolk, Suffolk and Essex, which was never summarised. The consequence is that the fullest surviving record of eleventh-century England is an accident of the project having been left unfinished. Where the clerk had time to summarise, information was lost; where he did not, it survives.

The name is not official and was not chosen by anybody in charge. The volume was kept at Winchester and called the Book of Winchester. Within a hundred years people were calling it Domesday, the day of judgement, and a treasury official writing in the eleven-seventies explained why: its decisions could no more be appealed against than those of the last judgement. The name is a comment on how the book was used rather than on what it contains, and it stuck because it was accurate.

It leaves a great deal out. London is missing and so is Winchester, the two largest and richest towns in the kingdom. Most of the far north is absent or covered so thinly as to be useless, some of it because it had been laid waste and some because the commissioners did not go. Certain monastic holdings are recorded in ways that cannot be reconciled with anything else. A survey that is quoted as a complete description of England is nothing of the kind, and the gaps are not random: the places left out are disproportionately the ones that were hardest to tax or hardest to reach.

It is also not a census, which is the misunderstanding that does most damage. The book records holdings, and it records heads of household and classes of tenant. It does not count people. Every population figure ever quoted for eleventh-century England is a reconstruction produced by multiplying the record-

ed heads by an assumed household size, and the assumption used has ranged from three and a half to five. That range alone moves the national total by well over a million, which is a wider margin than most of the arguments the figures are used to settle.

What the survey was for is still argued about. The traditional answer is fiscal: it provided a basis for assessing the land tax, and the repeated recording of value fits that reading closely. The second answer is that it settled title. Twenty years of confiscation and redistribution had left a landholding class whose claims rested on nothing written down, and the book gave every one of them a document. The two purposes are not exclusive and the questions asked would serve either, which may be why the argument has never been settled from the evidence of the questions alone.

Its afterlife is the part that would have surprised its compilers. The book did not become a historical curiosity; it remained an operative legal document. Its entries were produced in court to settle questions of tenure and of ancient demesne throughout the medieval period, and were still being cited in the nineteenth century, and it has been produced as evidence within living memory. A record made for a king who had recently taken a country by force went on deciding cases for eight hundred years, which is longer than most legal systems last.

Questions 1–5

Complete the notes below.

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

The survey of 1086

How it was ordered and carried out

- Ordered at the king's Christmas court at **1** in 1085.
- In every hundred a **2** was sworn, made up of both English and Norman men.

Size

- Roughly **3** places are named.
- The two volumes run to about **4** million words.
- Little Domesday is the unedited return for Norfolk, Suffolk and **5**

Questions 6–9

Complete the sentences below.

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

- 6** The book was called Domesday because its decisions could not be
- 7** London and Winchester, the two largest towns, are from the survey.
- 8** The book records heads of household but does not count

- 9** One suggested purpose is that the survey settled after twenty years of redistribution.

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** Juries were drawn from both sides so that neither could quietly agree on a false answer.
- 11** Great Domesday holds more detail than Little Domesday.
- 12** The commissioners were paid for the work they did.
- 13** Entries were still being quoted in court in the nineteenth century.

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

What the Sun is made of

In 1920 the accepted view was that the Sun is made of much the same material as the Earth, in much the same proportions. The reasoning behind it was direct and looked sound. Sunlight, spread out into a spectrum, is crossed by dark lines where particular elements have absorbed particular wavelengths, and the strongest of those lines belong to iron, calcium, magnesium and other metals. The lines of hydrogen are comparatively weak. If the strength of a line reflects how much of an element is present, the conclusion follows at once, and nobody had a reason to doubt the premise. It also fitted comfortably with the expectation that the Sun and the planets had condensed out of the same material at the same time, so that a difference in composition would have needed explaining.

The premise was wrong, and it was shown to be wrong by work that had nothing to do with the Sun's composition. Between 1920 and 1921 Meghnad Saha, working in Calcutta, published an equation describing how atoms in a hot gas are distributed among their possible states. A line appears only when an atom is in the particular state that can absorb that wavelength, and how many atoms are in that state depends on the temperature and the pressure of the gas. At the temperature of a stellar atmosphere almost all hydrogen sits in a condition that produces very little absorption in visible light. A weak line, therefore, can mean either that there are few atoms or that there are a great many of them in the wrong state. The spectrum by itself cannot distinguish the two, and until Saha's work nobody had a way of telling which was happening.

Cecilia Payne had come to Harvard from Cambridge, which taught her but would not give her a degree. For her doctoral thesis she applied Saha's equation systematically to a large collection of stellar spectra, working out for each element how many atoms would be needed to produce the lines actually observed. The answer she obtained in 1925 was that hydrogen and helium are not simply present in stars but overwhelmingly dominant, with hydrogen exceeding the metals by something of the order of a million to one. The metals whose lines dominate the spectrum are, on this account, a trace contamination of a star made of the two lightest elements.

Henry Norris Russell, the most influential astronomer in the United States, read the thesis before publication and told her the hydrogen figure was clearly impossible. She added a sentence to the text stating that the abundances derived for hydrogen and helium were almost certainly not real. The thesis was published in 1925 containing the correct result and, a few lines later, a disclaimer withdrawing it. Both sentences are hers, and only one of them is her conclusion.

Four years afterwards Russell reached the same conclusion by a different route, using different data, and published it. The result went into the textbooks as his, and remained attached to his name for decades. Otto Struve later described Payne's thesis as the most brilliant ever written in astronomy, a remark that is generally quoted without the accompanying fact that its central finding had been disavowed inside its own covers.

The moral usually drawn from this is too simple to be useful. It was not theft. Russell cited Payne's work in his paper, and it was he who had suggested the problem to her in the first place. Nor was his caution unreasonable on its face: a single new method overturning a well-supported consensus is precisely the situation in which a senior figure ought to ask for more evidence before a student stakes a career on the outcome. The fair criticism is narrower than theft and harder to answer. The same result was impossible when a graduate student produced it and correct when a professor did, and what changed in between was who was saying it.

What followed matters more than the question of credit. If stars are overwhelmingly hydrogen, the source of their energy has to be something that hydrogen can do, and within about a decade the fusion of hydrogen into helium had been identified as the mechanism that keeps them shining. The composition result is the foundation on which the physics of stars was subsequently built, and it stands underneath the modern account of where the chemical elements came from. Payne stayed at Harvard for the rest of her working life, spending many years doing the work of a professor without the title attached to it or the salary that went with it, and became the first woman to hold a full professorship at the university in 1956.

Questions 14–17

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

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

List of People	
A	Meghnad Saha
B	Cecilia Payne
C	Henry Norris Russell
D	Otto Struve

- 14 published an equation describing how atoms in a hot gas are distributed among their states
- 15 told the author of a thesis that a result was clearly impossible
- 16 applied an existing equation to a large collection of stellar spectra
- 17 described the thesis in unusually strong terms long afterwards

Questions 18–22

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

List of Words

- A metals
- B state
- C dominant
- D disclaimer
- E credited
- F gases
- G pressure
- H rejected

How a settled answer was overturned

Before 1920 the Sun was assumed to resemble the Earth, because the strongest lines in its spectrum belong to **18** while those of hydrogen are weak. Saha showed that a line appears only when an atom is in the right **19**, and that this depends on temperature and pressure. Payne concluded that hydrogen and helium are overwhelmingly **20**, exceeding the metals by about a million to one. Russell judged the figure impossible and she added a **21** to her own text. Four years later he published the same conclusion, and for decades the result was **22** to him.

Questions 23–26

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

- 23** Why is a weak spectral line ambiguous?
- A Instruments of the 1920s were not sensitive enough to measure it.
 - B It can mean few atoms, or many atoms in the wrong state.
 - C Hydrogen absorbs only at wavelengths the eye cannot see.
 - D The pressure inside the Sun was unknown.

- 24** What does the writer say about Russell's caution?
- A It was dishonest.
 - B It was a reasonable response to one method overturning a consensus.
 - C It was based on data he had not read.
 - D Nobody else at the time shared it.
- 25** What is the writer's own criticism?
- A that Russell took the result without acknowledgement
 - B that the same finding was impossible from a student and correct from a professor
 - C that Payne should have refused to add the disclaimer
 - D that Struve's praise went too far
- 26** Why does the writer say the consequence matters more than the credit?
- A because arguments about credit can never be settled
 - B because the composition result is what the physics of stars was built on
 - C because Payne was promoted in the end
 - D because Saha was not recognised either

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

The option you cannot buy

- A** There is a much-quoted observation about boots. A man who can afford a good pair pays once and has dry feet for ten years; a man who can afford only a cheap pair buys new ones every winter, spends more over the decade and has wet feet throughout. The point of the example is not that the second man chooses badly. It is that the cheaper option, measured over any sensible period, was never available to him at the moment his old boots failed, and no amount of advice about long-term thinking would have put it within reach.
- B** The pattern is general and can be measured. Goods bought in small quantities cost more per unit than the same goods bought in large ones. Electricity taken through a prepayment meter costs more per unit than electricity paid for monthly from a bank account. Money borrowed without security costs several times what the same sum costs when borrowed against a house. Cashing a cheque without an account costs a percentage of the cheque itself, taken at the counter. None of these is a scandal and each has a commercial explanation that will survive examination. Their combined effect is that the price of a given standard of living rises as the income available to pay it falls.
- C** A second cost is paid in time, and it is invisible in any account that counts only money. A household with no car shops where it can walk to. A household with no machine spends hours each week at a laundry. Somebody waiting for a decision on a benefit claim cannot accept work that begins next week. Hours spent absorbing the consequences of having no capital are hours unavailable for anything that might produce some, and the arithmetic compounds in the wrong direction, since each hour lost makes the next shortage slightly more likely.
- D** A third cost is paid in attention, and here the evidence needs handling with more care than it usually receives. The research associated with Sendhil Mullainathan and Eldar Shafir argued that a shortage of any resource captures attention and degrades performance on tasks unrelated to it, so that the same person decides worse while short of money than while not. Several of the headline experiments have replicated poorly, and the strong form of the claim, in which poverty costs a specific number of points of measured intelligence, is not well supported. The weak form is not seriously disputed and does not depend on those experiments at all: managing a shortage is itself work, and work of that kind leaves less capacity for everything else.
- E** Both of the familiar positions fail, and they fail for opposite reasons. The first holds that people on low incomes make poor choices and should be taught to make better ones. This mistakes the absence of an option for its rejection; nobody buys the ten-year boots with money they do not have on the day the old ones let in water. The second holds that choice plays no part whatever. That is

false, since choices plainly are made and some of them are better than others, and it is also useless, because a policy built on denying it will collapse the first time somebody points at a counter-example.

- F** What separates the two is not virtue but capital and slack. Almost every cheaper option requires either money in advance or the ability to absorb a delay. Buying in bulk requires cash and somewhere to put the goods. A cheaper tariff requires a deposit, or a credit record, or a bank account. A better job requires the means to live through the gap between leaving one and starting the next. Interventions that supply capital or slack act directly on that mechanism, which is the most likely explanation for a consistent finding in the evaluation literature: transfers of money without conditions outperform programmes of advice, because advice acts on a decision that the recipient was, at the moment of receiving it, in no position to carry out.
- G** The conclusion is narrow and is worth stating as such, because the argument is often stretched into something it cannot support. This is not a claim that money solves everything, nor that information never helps. Somebody who does not know that a cheaper tariff exists is genuinely helped by being told about it. It is a claim about order, and about which of two useful things has to arrive first. Information about an option is worth something only to a person who is in a position to take it, so capital comes first and advice second, and a programme that reverses the two will produce recipients who know precisely which cheaper thing they still cannot afford.

Questions 27–33

Reading Passage 3 has seven paragraphs, A–G.

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number, I–X.

List of Headings

- i** A cost counted in hours rather than money
- ii** A cost counted in money rather than hours
- iii** Two explanations, and why neither will do
- iv** Two explanations, and why one of them will do
- v** An example in which the cheaper choice was never on offer
- vi** Evidence that needs handling with care
- vii** What actually separates the two cases
- viii** A limited claim, stated as such
- ix** How retailers arrive at their prices
- x** A list of costs, each with an ordinary explanation

27 Paragraph A

28 Paragraph B

- 29 Paragraph C
- 30 Paragraph D
- 31 Paragraph E
- 32 Paragraph F
- 33 Paragraph G

Questions 34–37

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.

- 34 The writer thinks people on low incomes are simply choosing badly.
- 35 The writer accepts that being told about a cheaper tariff can genuinely help somebody.
- 36 The writer thinks prepayment meters should be prohibited.
- 37 The writer regards the strong form of the scarcity claim as well supported.

Questions 38–40

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

List of Endings

- A money in advance or the ability to absorb a delay.
- B the man in the example had not thought about the long term.
- C the cheaper option was not on offer at the moment it was needed.
- D a bank account and a good credit record.
- E know exactly which cheaper thing they still cannot afford.
- F spend less over a decade than they otherwise would.
- G refuse most of the advice they are offered.

- 38 The example of the boots is used to show that
- 39 Almost every cheaper option requires
- 40 A programme that puts advice before capital will produce people who