

# Academic Reading Paper 20

Elms, Sleep and Checklists

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**Time allowed: 1 hour**

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## 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 disease named after the people who explained it

Dutch elm disease is not Dutch. The name records the country of the scientists who worked out what was killing the trees, and the first of them was a doctoral student named Bea Schwarz, who in 1921 isolated a fungus from diseased elms and showed that healthy trees inoculated with it fell ill in the same way. Her result was doubted, partly on the grounds that she was young and partly because the inoculation experiments were said to be unconvincing, and it was confirmed later in the decade by another Dutch researcher, Christine Buisman, who repeated the work at a larger scale. The disease had a cause eight years before most foresters accepted that it had one, and the name that stuck credits a nationality rather than either of the two women who did the work.

The mechanism is a partnership between a fungus and a beetle, and neither is much use to the other without it. Elm bark beetles breed under the bark of dead and dying elms, and the fungus grows in the same galleries, so a beetle emerging in spring comes out dusted with spores. It then flies to a healthy elm and feeds in the crotches of young twigs high in the crown, which is a small wound in exactly the wrong place. The spores are introduced into the water-conducting vessels of the tree, and from that moment the tree is carrying the fungus in the system it uses to move water from the roots to the leaves.

What kills the elm is its own response. Faced with something spreading through its vessels, the tree seals them, plugging them with gums and with balloon-like growths that push into the vessel from the cells alongside. This is a reasonable defence against a local infection and a fatal one here, because the fungus is already ahead of the sealing and the tree is progressively cutting off its own water supply. The first sign a person sees is a branch of yellow, wilting leaves in an otherwise green crown in midsummer, by which time the outcome is usually settled.

There is a second route that has nothing to do with beetles. Elms planted in rows along a hedgerow or a street commonly fuse their roots where they touch, and a fungus in one tree can pass directly into the next through the graft. This is why the disease so often runs along an avenue in order rather than appearing at random, and it is also why felling a diseased tree without severing its root connections can leave the infection already delivered to its neighbours.

The first European epidemic ran through the 1920s and 1930s and was serious without being catastrophic; a substantial number of elms died and many recovered. The fungus reached North America around 1928 in a consignment of veneer logs. What arrived in Britain in the late 1960s, again on imported logs with the bark still attached, was not the same organism. It was a far more aggressive species, and against it the trees had almost no defence at all.

The scale of what followed is difficult to convey to anyone who did not see the landscape before it. Britain lost in the region of twenty-five million elms in about two decades. The elm had been the characteristic large tree of hedgerows across the English midlands and south, the tree in the paintings, and it

was effectively removed from the countryside within the working life of one farmer. The species did not become extinct, because elms sucker freely from their roots, but the suckers grow to about the thickness of an arm and are then found by the beetles and killed in their turn.

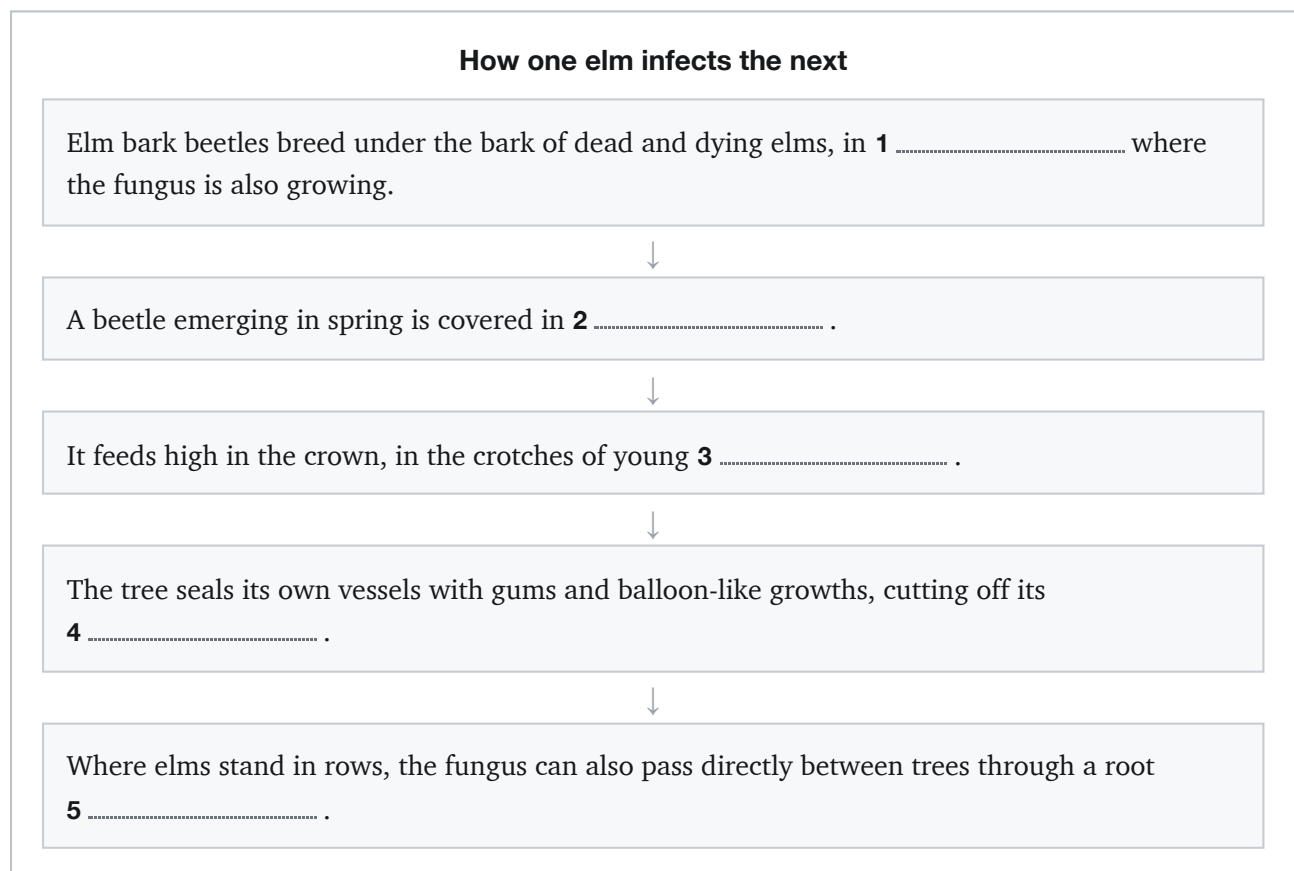
Control has worked in exactly one kind of place, and the reason is worth stating precisely. Sanitation felling means finding an infected tree and removing and destroying the wood before the beetles inside it emerge, which requires inspection often enough to catch trees within weeks rather than seasons. On its own it slows the disease and does not stop it, because new beetles keep arriving from outside. Where it has succeeded is where arrival from outside is limited by geography.

Brighton and Hove, on the English south coast, has the sea on one side and the chalk downland on the other, neither of which suits elm bark beetles, and the local authority has run an inspection and felling programme continuously since the 1970s. The result is that East Sussex still holds something in the order of fifteen thousand mature elms and the national collection of the species. It is not a cure. It is the same measure everybody else tried, working because the door it closes is the only door. Anywhere with elms on several sides of it, the same programme run with the same diligence buys years and not much more.

### Questions 1–5

Complete the flow-chart below.

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



### Questions 6–9

Complete the sentences below.

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

- 6 Bea Schwarz isolated the fungus in ..... , while still a doctoral student.
- 7 The fungus reached North America in about 1928 in a consignment of veneer  
.....
- 8 Britain lost roughly ..... elms in about twenty years.
- 9 East Sussex still holds around fifteen thousand mature elms and the national  
..... of the species.

### 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 The elm has not been driven to extinction in Britain.
- 11 The organism that reached Britain in the late 1960s was the same one that caused the earlier European epidemic.
- 12 Christine Buisman was also a doctoral student when she confirmed the cause.
- 13 Sanitation felling alone is enough to stop the disease.

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

## What the brain does with the night

- A** The oldest experiment in this field was published in 1924 and used two undergraduates. John Jenkins and Karl Dallenbach had them learn lists of nonsense syllables and then tested recall after one, two, four and eight hours, either of ordinary waking activity or of sleep. The sleepers remembered more at every interval, and the gap between the two conditions widened as the interval grew longer. The interpretation offered then was entirely passive: sleep was not doing anything to the memory, it was merely a period in which nothing else arrived to interfere with it. For half a century that reading was the sensible one, because nobody had a way of seeing what a sleeping brain was up to. It also had the advantage of requiring nothing new: forgetting was already understood as the crowding of one memory by another, and sleep simply stopped the crowd arriving.
- B** The first direct look came from rats. Matthew Wilson and Bruce McNaughton recorded from cells in the hippocampus that fire when an animal is in a particular place, and watched which cells fired together as a rat ran a track. When the animal afterwards fell into slow-wave sleep, the same cells fired again in the same order, and did so at roughly twenty times the original speed, so that a run taking half a minute on the track was reproduced in about a second and a half. The brain was not resting in any ordinary sense. It was running the afternoon again, faster, without the rat. The sequences were not random selections from the animal's repertoire either; they were the routes it had actually taken, in the order it had taken them.
- C** Human evidence that sleep improves a skill rather than merely preserving it came from a visual task. Avi Karni and Dov Sagi, with colleagues, trained people to spot a small texture difference in a briefly flashed pattern, and found that performance improved between one day and the next with no practice in between. Improvement of that kind does not happen across an equivalent period awake, and it does not happen across a night in which the person is kept from sleeping and allowed to catch up afterwards. Selectively disturbing people during rapid eye movement sleep removed the gain; disturbing them during deep slow-wave sleep, which is equally unpleasant, did not. That asymmetry is what rules out the obvious objection, which is that the subjects were simply tired.
- D** The most direct intervention was done with a smell. Björn Rasch and Jan Born had volunteers learn the positions of cards in a grid while a rose odour was present in the room. During the following night the odour was delivered again to some of them while they were in slow-wave sleep. Those people recalled the card positions better the next morning. The same odour presented during rapid eye movement sleep did nothing, and neither did presenting it while the subjects were awake. A cue attached to a memory could be used to summon that memory during a particular stage of sleep, and doing so strengthened it. Nobody had to be woken, told anything, or asked to try.

- E** Put together, the four results describe a process rather than a pause. Something learned during the day is held first in the hippocampus, is replayed during deep sleep, and is progressively established in the cortex, where it becomes less dependent on the structure that first held it. Different stages appear to do different jobs, which is why the smell worked in one stage and not the other, and why the visual skill depended on a stage the card task did not. A single night contains several cycles through those stages, and their proportions change across it, with deep sleep concentrated early and rapid eye movement sleep towards morning.
- F** It would be easy to overstate all this, and a good deal of popular writing does. The effects reported vary considerably between laboratories, several well-known findings in this area have replicated poorly, and the size of the improvement in a typical experiment is a good deal smaller than the headlines suggest. There is also a large gap between the declarative memory results, which are robust, and the much weaker evidence that sleeping on a problem improves the solving of it. The first concerns holding on to something already learned; the second would require the brain to do new work on it, which is a considerably stronger claim and is supported by considerably less.
- G** What survives the caution is still substantial and it changes the picture the 1924 experiment left. Sleep is not the absence of interference. It is a scheduled period in which the day's material is selected, rehearsed and moved, and the selection is not neutral: material that the person was told would be tested is preferentially retained. That last finding is the one that ought to unsettle anybody who thinks of memory as a recording, because it means the decision about what to keep is taken after the event, by a brain that is not conscious at the time.

### Questions 14–17

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** a way of ruling out the objection that the subjects were merely tired
- 15** an explanation that required no new idea to be introduced
- 16** a distinction between keeping something and working on it
- 17** a statement of how much faster an event was reproduced

### Questions 18–21

Look at the following findings and the list of researchers below.

Match each finding with the correct researchers, A–D.

**List of Researchers**

- A Jenkins and Dallenbach
- B Wilson and McNaughton
- C Karni and Sagi
- D Rasch and Born

- 18 They showed that a memory can be summoned during one stage of sleep and not another.
- 19 They found that a sequence of activity was repeated in its original order.
- 20 They compared recall after sleeping with recall after ordinary activity.
- 21 They showed that a skill improved with no further practice.

**Questions 22–26**

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

**List of Words**

- A interference
- B hippocampus
- C cortex
- D recording
- E selection
- F practice
- G cycles
- H conscious
- I passive
- J aggressive

**From a pause to a process**

The 1924 result was read as showing only that sleep prevented **22** ..... The modern account is different: material is first held in the **23** ....., replayed during deep sleep, and progressively established in the **24** ..... Because the proportions of the stages change across the night, the **25** ..... of a single night are not interchangeable. The

most unsettling finding is that what is kept is decided afterwards, which means memory is not a

26 .....

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

## Why the checklist is resented

In October 1935 the United States Army Air Corps watched a competition for its next bomber, and the aircraft everyone expected to win took off, climbed, stalled and crashed, killing two of the five men aboard. The Boeing Model 299 was more complicated than anything the service had flown, and the crew had left a locking mechanism engaged that held the control surfaces still on the ground. The pilot was the chief of flight testing. The newspapers concluded that the aeroplane was too much for one man to fly, which was the wrong lesson, and a small group of pilots concluded that what was needed was a list, which was the right one.

They did not add training, because the pilot who crashed was the most experienced man available and more training would have insulted him without helping. They wrote out the actions for take-off, flight, landing and taxiing, short enough to fit on an index card, and the aircraft went on to fly for years without a comparable accident. The insight was that the failure had not been one of knowledge. Nobody had forgotten what a gust lock was. The failure was of attention, in a situation with more items in it than attention reliably covers, and lists are good at exactly that.

Medicine took seventy years to try the same thing seriously. Peter Pronovost put a five-item list on the wall for the insertion of central lines in intensive care units across Michigan, covering things every doctor already knew, and infection rates fell to near zero and stayed there. A larger trial of a surgical checklist across eight hospitals in several countries reported deaths falling from around one and a half per cent to under one, and complications by roughly a third. Those numbers are very large for an intervention that costs nothing.

And then the effect declined to appear again. When the province of Ontario made surgical checklists mandatory across more than a hundred hospitals, a study of the outcome found no significant improvement in mortality or complications. This is usually reported as a failure of the checklist, and it is not. It is evidence about what the checklist had been doing in the trials, because the thing that was mandated in Ontario was the document, and the thing that worked in the trials was not the document.

What the successful versions had in common was a pause in which people who do not ordinarily speak were required to. The surgical list begins with the members of the team saying their names and roles aloud, which sounds like a formality and is the active ingredient. An operating theatre has a steep hierarchy and a nurse who has noticed something wrong must decide whether to interrupt a surgeon. Having spoken once, in a structured moment, makes speaking again far more likely, and most of the errors the checklist catches are caught by somebody who already suspected.

This is why the two standard positions on checklists are both wrong. The first says that professionals resist them out of arrogance, which does not survive contact with the people involved: what they are usually resisting is a form that must be signed whether or not anybody read it, and their objection is accu-

rate. The second says that checklists deskill, replacing judgement with procedure. That gets the purpose backwards. A list exists to take the routine items off the top of the mind precisely so that judgement has somewhere to go, in the same way that a surgeon does not exercise judgement about whether to wash.

There is a further reason the resistance is rational, and it is about who benefits. A checklist that works produces nothing visible. The infections that do not happen are not counted by anybody in the room, the crash that does not occur is not in the newspaper, and the person who filled in the form gets no signal at all that it mattered. Meanwhile the cost is immediate, specific and paid by the same person every time. An intervention with invisible benefits and visible costs will always be under-used, and calling that irrational is a way of avoiding the design problem. The aviation version escaped this only because a checklist there is not a form to be filed but a conversation between two people who each hold half of it.

So the useful question is not whether checklists work. It is which of the things bundled under that name is doing the work, and the answer appears to be the part nobody thinks to copy. Mandating the list is cheap and produces the Ontario result. Changing who is permitted to speak in the room is expensive, slow, and hard to audit, which is why the version that spreads is reliably the version that does nothing.

### Questions 27–31

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 the Ontario study showed that checklists do not work.
- 28** The writer regards the objection made by many professionals as accurate.
- 29** Aviation checklists are longer now than they were in 1935.
- 30** The writer believes the newspapers drew the right conclusion from the 1935 crash.
- 31** The writer accepts that the costs of using a checklist fall on the same person each time.

### Questions 32–35

Complete the summary below.

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

#### What is actually doing the work

The 1935 crew were not short of knowledge; what failed was **32** ....., and a list is good at exactly that. In the successful surgical version the members of the team say their names and roles aloud, which the writer calls the active **33** ..... This matters because most of the errors a checklist catches are caught by somebody who already **34** ..... The

version that spreads, however, is the cheap one, because the change that actually matters is slow, expensive and hard to 35 .....

### Questions 36–40

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

- 36** Why does the writer say more training was not the answer in 1935?
- A Training was too expensive for the Air Corps.
  - B The pilot who crashed was already the most experienced man available.
  - C The aircraft was too complicated for any crew.
  - D The gust lock had not yet been invented.
- 37** Which position does the writer reject?
- A That a checklist frees judgement for the things that need it.
  - B That resistance to checklists is often reasonable.
  - C That checklists replace judgement with procedure.
  - D That the benefits of a checklist are hard to see.
- 38** According to the passage, what happened to infection rates in the Michigan intensive care units?
- A They fell by about a third.
  - B They rose before falling.
  - C They fell to near zero and stayed there.
  - D They were unchanged after eighteen months.
- 39** What does the writer say a surgical checklist mainly does?
- A It reminds surgeons of steps they had forgotten.
  - B It creates a moment in which junior staff are required to speak.
  - C It provides a record for later investigation.
  - D It shortens the length of operations.
- 40** Which of the following best expresses the writer's conclusion?
- A The part of a checklist that works is the part nobody copies.
  - B Checklists should be made compulsory everywhere.
  - C Checklists should be abandoned in medicine.
  - D Hierarchy in operating theatres cannot be changed.