



PART 1

Read the text below and answer questions 1–13.

THE SCIENCE OF SLEEP: MORE THAN JUST REST

A

Sleep is sometimes described as a simple absence of wakefulness, as if the brain merely “switches off” for a number of hours. In physiological terms, however, sleep is an actively organised state, regulated by specialised neural circuits and characterised by recurring stages that can be measured in the laboratory. Across a typical night, the brain alternates between non-rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep in cycles that last roughly 90 minutes, with the balance between stages shifting as morning approaches. These stages differ in electrical activity, autonomic regulation, and muscle tone, and they appear to support different forms of biological maintenance. Understanding sleep, therefore, requires treating it not as a passive pause, but as a dynamic process in which the brain repeatedly changes its operating mode.

B

Two internal regulatory mechanisms largely determine when sleep begins and how it unfolds. The first is the circadian timing system, whose “master clock” is located in the *suprachiasmatic nucleus* (SCN) of the hypothalamus. The SCN is entrained primarily by light: bright morning exposure tends to stabilise timing, whereas intense evening light—especially short-wavelength light from screens—can shift the clock later. The second mechanism is the *homeostatic sleep drive*, which increases with time awake and makes sleep progressively more likely. This pressure is linked to the accumulation of adenosine in the brain; caffeine can delay sleep onset because it blocks adenosine receptors, reducing the felt force of the homeostatic signal without removing the underlying need for sleep. In practice, sleep timing emerges from the interaction between circadian alerting signals and homeostatic pressure, rather than from willpower alone.

C

Within NREM sleep, the deepest stage—slow-wave sleep—is associated with pronounced changes in brain activity and physiology. Slow waves reflect highly synchronised neural firing, and this stage is often linked to physical restoration, including endocrine regulation and aspects of immune signalling. In recent years, research has also highlighted a potential “clearance” function: during deep NREM sleep, the space between brain cells appears to expand, allowing cerebrospinal fluid to circulate more freely through perivascular channels. This activity, commonly discussed under the label of the glymphatic system, may help wash away metabolic waste produced during wakefulness.



Although the details remain an active research area, the central implication is that deep sleep may support a form of neural housekeeping that is less efficient when the brain is fully engaged with sensory input and continuous thought.

D

REM sleep, in contrast, is marked by rapid eye movements, a distinctive pattern of brain activation, and a temporary suppression of major voluntary muscles, sometimes called REM atonia. Dreaming is especially vivid in this stage, and researchers often associate REM with emotional processing and certain types of memory integration. Rather than storing information as isolated fragments, the sleeping brain may weave new experiences into existing knowledge networks, helping later recall become more fluent and meaning-based. Crucially, however, sleep's contribution to learning is not confined to REM. Different memory systems appear to benefit from different phases: some procedural skills improve after repeated cycles across the night, while aspects of declarative memory may relate more strongly to NREM features such as slow waves and sleep spindles. The emerging picture is therefore one of division of labour, with REM contributing to some forms of consolidation and regulation, and NREM supporting others.

E

When sleep is curtailed, the consequences are not limited to feeling drowsy. Laboratory studies show that restricted sleep can slow reaction time, increase lapses of sustained attention, and impair working memory—effects that become particularly dangerous in low-stimulation situations such as late-night driving or monitoring tasks. One especially problematic feature is reduced awareness of impairment. Sleep-deprived individuals often report that they are coping reasonably well, even as objective performance deteriorates. This mismatch between confidence and capability matters for safety, because it encourages people to take risks they would avoid if they accurately perceived their limitations. In other words, sleep loss can damage both attention and the ability to judge one's own attentional failure.

F

Contemporary living frequently conflicts with sleep biology, and the mismatch is amplified by certain disorders. Shift work can force sleep to occur when the circadian system promotes alertness, producing chronic misalignment that may affect mood, metabolism, and accident risk. Long commutes, irregular schedules, and late-night device use can fragment sleep and weaken circadian stability. At the same time, some problems persist even when people spend adequate time in bed. Obstructive sleep apnoea, for example, involves repeated breathing interruptions that reduce oxygen and trigger brief arousals, preventing restorative architecture despite apparently “long” sleep. Insomnia, by contrast,



often involves difficulty initiating or maintaining sleep and can be sustained by conditioned arousal—worry about sleep becomes, paradoxically, a factor that blocks it. These cases illustrate why sleep quality and timing can matter as much as duration.

G

Because sleep is regulated, it can also be supported through targeted habits and environments. Sleep researchers commonly recommend consistent wake times to anchor the circadian system, since irregular wake-up schedules can shift internal timing from day to day. Light management is equally important: bright morning exposure helps stabilise the SCN, while reducing intense light in the evening lowers the risk of circadian delay. A cooler, darker, quieter bedroom can support sleep onset by reducing physiological arousal, and limiting late caffeine avoids artificially weakening the homeostatic signal. Where disorders are suspected, behavioural strategies may need to be combined with medical assessment rather than relying on generic advice. Overall, sleep science portrays rest as a multi-function biological state—shaped by internal clocks, homeostatic pressure, and modern environments—and therefore as something that can be protected through informed choices rather than treated as optional spare time.

Questions 1–5

Which paragraph contains the following information?

- 1 A description of repeated cycles between two major sleep states across a typical night.
- 2 An explanation of a condition in which breathing disruptions can prevent restorative sleep despite sufficient time in bed.
- 3 The idea that sleep loss can reduce a person’s ability to judge how impaired they are.
- 4 A discussion of two internal regulatory mechanisms that together determine sleep timing.
- 5 A suggestion that deep sleep may assist the brain in clearing accumulated waste.

Questions 6–9

Complete the summary below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

Sleep cycles, regulation and brain maintenance

Across the night, sleep alternates between NREM and **6** stages. The body’s timing is influenced by a circadian “master clock” located in the **7** (**SCN**) of the hypothalamus, while increasing time awake leads to an accumulation of **8** in



the brain. During deep NREM sleep, researchers propose that the glymphatic system may help remove metabolic **9** from brain tissue.

Questions 10–13

Select the correct answer.

10 What relationship between the two main sleep-regulation mechanisms is described in Paragraph B?

A Circadian signals determine sleep independently of the amount of time a person has been awake.

B Sleep timing results from the combined influence of internal clock signals and pressure accumulated during wakefulness.

C Homeostatic pressure becomes important only after the circadian system has stopped responding to light.

D Both mechanisms are controlled mainly by changes in exposure to artificial light.

11 What possibility does recent research raise about deep NREM sleep?

A Changes around brain cells may allow fluid to circulate more freely and assist the removal of metabolic waste.

B Reduced neural activity may temporarily prevent cerebrospinal fluid from entering brain tissue.

C Waste clearance appears to depend mainly on the rapid eye movements associated with dreaming.

D The glymphatic system has been conclusively shown to remove all accumulated waste during each night.

12 How does the passage characterise REM's contribution to memory?

A REM appears to contribute to some forms of memory processing, while other forms also benefit from NREM features.

B REM is mainly responsible for declarative memory, whereas procedural learning occurs only during NREM.

C Memory consolidation begins in REM only after all physical restoration has been completed.

D REM supports learning principally because voluntary muscle activity continues throughout the stage.

13 What makes sleep deprivation especially dangerous in activities such as late-night driving?



A People may underestimate their own impairment while their attention and reaction performance are already deteriorating.

B Sleep loss makes people more aware of minor mistakes, causing them to react too cautiously.

C Restricted sleep affects confidence more strongly than it affects objective cognitive performance.

D The main danger is that sleep loss prevents the circadian system from responding to environmental light.

Answer Key

1. A
2. F
3. E
4. B
5. C
6. REM
7. suprachiasmatic nucleus
8. adenosine
9. waste
10. B
11. A
12. A
13. A