

聖マリアンナ医科大学 一般

平成26年度

11時20分～12時50分

英 語

問 題 用 紙 1 ～ 8 頁

解 答 用 紙 1 ～ 2 頁

注 意 事 項

1. 試験開始の合図〔チャイム〕があるまで、この注意をよく読むこと。
2. 試験開始の合図〔チャイム〕があるまで、この問題の印刷されている冊子を開かないこと。
3. 試験開始の合図〔チャイム〕の後に問題用紙ならびに解答用紙の定められた位置に受験番号、氏名を記入すること。
4. 解答はかならず定められた解答用紙のそれぞれ定められた位置に、問題の指示に従って記入すること。
5. 解答はすべて黒鉛筆を用いてはっきりと読みやすく書くこと。
6. 質問は文字に不鮮明なものがあるときにかぎり許される。
7. 問題に、落丁、乱丁の箇所があるときは手をあげて交換を求めること。
8. 試験開始後60分以内および試験終了前10分間は、退場を認めない。
9. 試験終了の合図〔チャイム〕があったとき、ただちに筆記用具を置くこと。
10. 試験終了の合図〔チャイム〕の後は、問題用紙および解答用紙はすべて本表紙を上にして、通路側から解答用紙、問題用紙の順に並べて置くこと。いっさい持ち帰ってはならない。
なお、途中退場の場合は、すべて裏返しにして置くこと。
11. その他、監督者の指示に従うこと。

受験番号

氏 名

- 1 以下の[A]及び[B]は、それぞれ、睡眠と記憶の関係についての英文である。
それぞれの英文を読み、問題に答えなさい。

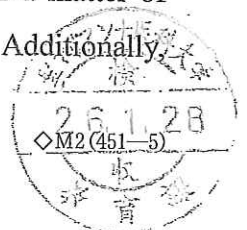
[A]

The average American sleeps some 7.6 hours a night—maybe not as much as one would like, but a number that still amounts to more than 200,000 hours in total over the course of a lifetime. What if there were some way to use all these hours to do something we don't have the time to do while awake, like learning to play a musical instrument or to speak a foreign language? The idea that you can learn new things through some sort of magical mental osmosis* while you sleep has long been wishful thinking. Researchers at Northwestern University in the United States performed a couple of experiments. These studies indicate, depending on what we hear during the night, it is indeed possible to reinforce existing memories and enhance our recall after we wake up.

(a) Their first study indicated just how surprisingly active our brains are during sleep, and how we might utilize this activity to improve memory. In this study, the 12 study participants were taught to associate each of 50 images with a random location on a computer screen. Each object, such as a shattering wine glass, was paired with a corresponding sound, such as that of breaking glass, delivered over a speaker. Locations were learned by repeating the trials until the study participants got quite good at placing all the objects in their assigned places. Approximately 45 minutes after learning, each participant took a nap in a quiet, darkened room. Electrodes attached to their heads measured their brain activity, indicating when they were asleep. Then, while the subjects slept, the researchers played some of the sounds back to them. When asked later, none of the participants thought sounds had been played during the naps. However, the participants were more skillful at remembering the memorized locations for sounds they had heard while sleeping than those they had not.

In their next study, first, (1). Then, (2). Once (3).
(4). (5).

This differs from the untrue concept of learning new information—say, a foreign language, or material for an upcoming exam—simply by listening to it during the night. According to a psychologist as well as one of the researchers of the study, (b) the critical difference is that the research shows our memory is strengthened for something we have already learned not that we have learned something new in our sleep. This is a matter of enhancing an existing memory by re-activating information recently acquired. Additionally,



the researchers measured brain activity during the sleep stage of the experiment. They also found that electrophysiological signals during sleep correlated with the extent to which memory improved. These signals may thus be measuring the brain events that produce memory improvement during sleep.

For the researchers, these experiments demonstrated ^(c) a fact which was different from what they had expected about sleep. Although past studies assumed that the mind would be most active during rapid-eye movement (REM) sleep, which is when most dreams occur, it seems that deeper slow-wave sleep** is in fact a period of significant mental activity. This indicates that deep sleep actually is a key time for memory processing.

Although scientists do not have a full understanding of how our brains cement memories during deep sleep, they believe that the mind may habitually review the day's events during each night of sleep. The new study establishes that this tendency might be used for the intentional reinforcement of memorizing relatively complex tasks. The researchers plan to further probe this ability by testing whether other sorts of memories, such as motor skills or other habits, might be enhanced by exposure to stimuli during sleep.

注: osmosis* 浸透性 slow-wave sleep** 徐波睡眠

〔1〕 下線部(a)に関して、以下の表の手順3 及び結果の空欄を埋めなさい。

被験者人数	12 人
[方法]	
手順 1	被験者は、50 の画像と、コンピュータのモニター上のそれぞれが対応する任意の場所の位置を記憶する。画像には、それぞれが表すものに対応した音が当てはめられている。(例：ワイングラスを壊そうとしている画像には、グラスが割れる音)
手順 2	被験者は、それぞれの画像と決められた場所を組み合わせる作業を繰り返し、それらの正確な位置を記憶する。(約 45 分)
手順 3	
手順 4	被験者は、目が覚めた後、画像とそれが対応する場所をどの程度記憶しているか質問される。
[結果]	

〔2〕 枠内の(1)～(5)に入る英文を、選択肢から選び、パラグラフを完成させなさい。
(文頭にくるものも、すべて小文字で表記してある。)

- (ア) this is the deepest part of the sleep cycle, which the research team suspected was the stage that contributed to most memory enhancement
- (イ) the participants were in slow-wave sleep, one of the songs was played repeatedly
- (ウ) when tested after their naps, the participants consistently performed better at recalling and playing the song they had heard while sleeping, compared to the other tune
- (エ) the research team had participants learn how to play a pair of songs by pressing keys on a keyboard in a specific sequence
- (オ) the test subjects were left in a dark, comfortable room to take a 90-minute nap

〔3〕 下線部 (b) の内容を説明しなさい。

〔4〕 下線部 (c) の内容を説明しなさい。

[B]

It is widely believed that memories of events and spaces are stored briefly in the hippocampus before they are combined and strengthened in the neocortex for permanent storage (Fig. 1). (a) Experts have long suspected that part of the process of turning temporary short-term memories into lasting long-term memories occurs during sleep. Now, Professor Susumu Tonegawa and his team have shown that mice prevented from “replaying” their activities from waking hours while asleep do not remember them.

At research facilities around the world, mice learn to run through complex mazes, find chocolate-flavored rewards, and after an interval, run the mazes again very efficiently, quickly collecting all the rewards. However, Professor Tonegawa and his team created mutant mice in which a change of diet blocked a specific part of the mouse hippocampus, the area of the brain responsible for learning and memory. Consequently, these mutant mice (b) could not perform these tasks.

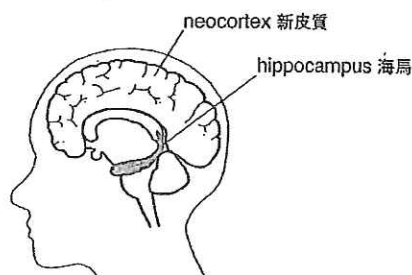


Fig. 1



In the experiment with these mutant mice, the researchers implanted electrodes in their brains and monitored the activities of their brain cells as the mice ran a maze and then slept (Fig. 2 & 3). Researchers examined a circuit within the hippocampus known as the synaptic pathway*. While the mice were still awake and running, they formed within their brains a pattern of neurons that was activated to recognize the maze the mice had learned to find their way through. During their post-run sleep, particularly during a deep sleep phase called slow-wave, the specific sequence of brain cells that had been activated during the run was “replayed” in a similar sequence. However, with these mutant mice, this replay process during the slow-wave sleep was harmed. Generally, the animals were able to form long-term memories of the maze only when their synaptic pathways were functioning after the formation of the short-term memories.

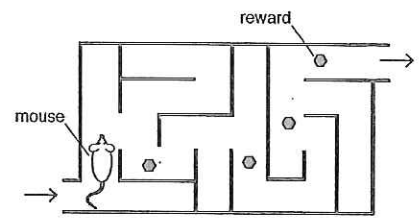


Fig. 2

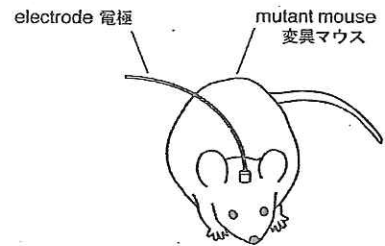


Fig. 3

Although this replay during sleep had been speculated to be important for converting the recent memory stored in the hippocampus to a more permanent memory stored in the neocortex, it had never been demonstrated. Professor Tonegawa and his team demonstrated that this pathway is essential for the transformation of a recent memory, formed within a day, into a remote memory that still exists at least six weeks later. They concluded that the synaptic pathway-mediated replay of the hippocampal memory sequence during sleep plays a crucial role in the formation of a long-term memory.

注: the synaptic pathway* シナプス経路

〔1〕 下線部 (a) を日本語に訳しなさい。

〔2〕 下線部 (b) の理由を説明しなさい。

〔3〕 変異マウスを使った実験の結果から、どのような結論を導いたのか説明しなさい。



2 次の英文を読み、問題に答えなさい。

The origins of jigsaw puzzles go back to the 1760s when European map makers pasted maps onto wood and cut them into small pieces. This “dissected map” has been a (A. succeed) educational toy ever since. American children still learn (1) by playing with puzzle maps of the United States or the world. The eighteenth century (B. invent) of jigsaw puzzles would be amazed to see the transformations of the last 330 years. Children’s puzzles have moved (2), showing diverse subjects like animals, folk stories, and modern tales of super heroes and Disney characters. But the biggest surprise for the early puzzle makers would be how adults have embraced puzzling over the last two centuries.

Puzzles for adults emerged around 1900 in the U.S. The puzzles of those days were quite (3). Most had pieces cut exactly on the color lines. There were no transition pieces with two colors to signal, for example, that the brown area (roof) fit next to the blues (sky). A sneeze or a careless move could undo an evening’s work because the pieces did not interlock. And, unlike children’s puzzles, the adult puzzles had no guide picture on the box; if the title was vague or (4), the true subject could remain a mystery until the last pieces were fitted into place.

It might seem odd at first glance that a non-necessity like a jigsaw puzzle would sell so well in the Great Depression* in the 1930s. But the appeal, then as now, was that one bought a good deal of entertainment (5). The weekly jigsaw puzzle could constitute a solitary or group activity, and would occupy one’s time enjoyably for hours. And, of course, a jigsaw puzzle was “(6),” in that one could break the puzzle up once one had completed it and then pass it on to another family member or friend. Another point to bear in mind is that “jigsaw puzzle enthusiasts” in the Depression discovered what many in our own time are rediscovering—that working on a jigsaw puzzle is a great way to reduce (7)!

Although the (C. popular) of jigsaw puzzles has declined since the Depression, they are still, just like the first jigsaw puzzle, sometimes used in education as well as for fun without spending much money. And if they are (D. addict)—and they are—they are a (8) addiction.

注: the Great Depression* 世界大恐慌



〔1〕文中の(1)～(8)に入る最も適切な英語を、それぞれ選択肢から選び、記号で答えなさい。

- | | |
|---|--|
| 1. (ア) geology
(イ) geoscience
(ウ) geography
(エ) geometry | 5. (ア) with difficulty
(イ) without making any effort
(ウ) for a small price
(エ) with speed |
| 2. (ア) across Europe to the U.S.
(イ) from lessons to entertainment
(ウ) into commercialism
(エ) away from pleasure | 6. (ア) breakable
(イ) disposable
(ウ) recyclable
(エ) communicable |
| 3. (ア) a challenge
(イ) an interest
(ウ) an experiment
(エ) a boredom | 7. (ア) energy
(イ) income
(ウ) inflation
(エ) stress |
| 4. (ア) mistrusting
(イ) misunderstanding
(ウ) miscommunicating
(エ) misleading | 8. (ア) careless
(イ) bottomless
(ウ) harmless
(エ) hopeless |

〔2〕A～Dの語を、文脈に合うように適切な形に変えなさい。但し、-ed及び-ingは使わないこと。

3 次の英文を読み、下線部(a)及び下線部(b)の日本語を英語に訳しなさい。

Technology is the know-how that puts the knowledge of science into practice. (a) 科学とは、どのようにして、そして、なぜ物事が発生するかを説明しようとする私たちの周りの世界に関する知識である。 On the other hand, technology puts scientific knowledge to work to meet people's needs and wants. Technology depends on scientific knowledge for inventions of new tools, machines, materials, and methods, or ways of doing things. (b) 技術は、生活を単純化し、あるいは、労働をより容易にすることにより、生活をより楽しめるようにする製品やプロセスをもたらす。

4

次の英文の()に入る最も適切なものを枠内から選び、記号で答えなさい。但し、同じ選択肢を重複して使用してはならない。

(文頭にくるものも、すべて小文字で表記してある。)

- [1] Although the museum's alarm did go off, () the security guards got there 15 minutes later, the thief and the painting were gone.
- [2] The violinist performed anything () it was something that the audiences would appreciate hearing.
- [3] Brian had his camera ready () he saw something that would make a good picture.
- [4] () you're not familiar with the word itself, the context usually makes it clear what the meaning is.
- [5] The unique habitats of the island are disappearing at an alarming rate and will continue to do so () preventive measures are taken.
- [6] I'm afraid I'm still not certain () I'll be able to attend the meeting or not.
- [7] My leg hurts so much. It is () someone hit it with a baseball bat.
- [8] My father is very noisy; () he's just watching a football game on TV, he cheers for his favorite team while banging a megaphone.

(ア) as long as

(イ) as though

(ウ) by the time

(エ) even if

(オ) even when

(カ) except that

(キ) in case

(ク) now that

(ケ) unless

(コ) whether



5

次の〔1〕～〔5〕には、それぞれ1箇所間違いがある。間違いのある箇所を記号で答えなさい。

- 〔1〕 In this technological era (a) that we live in today, technology is evolving so (b) rapid that it is (c) hard to (d) accurately define it.
- 〔2〕 This location (a) used to be Lotus Yoga Center, a vibrant and (b) energetic yoga studio, (c) at which I visited more than a year (d) ago.
- 〔3〕 According to the news report, two people (a) suffered serious burn injuries (b) in the fire, the cause of which (c) were yet to (d) be determined.
- 〔4〕 If you live in an area (a) where winter temperatures (b) drop below zero, you probably own (c) at least (d) few pairs of warm winter boots.
- 〔5〕 The roof of our house was badly (a) damaging in a severe storm. We have to (b) get it (c) fixed before the next storm (d) arrives.

