

**For Teachers:** Please have the students read the sentences one at a time and correct their pronunciation of each sentence then have them repeat after you. Wait until after they read the sentence (use the number in place of the missing word) to have the students choose the correct answer to fill in the blank. When the students finish the article, move on to the further questions.

日本語訳なしタイプ B もございます。スクロールダウンするとございますので好きな方をご利用下さい。

インターフェース

### 3[B] – Brain-Computer Interfaces



AP1E 12-2

高 (たか) める

併合 (へいごう) する

1. Scientists have long dreamed of enhancing the human body by merging the brain with computer technology—what is now referred to as brain-computer interfacing. The difficulty with the brain-computer interface (BCI) lies in integrating electronics with the brain's delicate tissue. Early researchers inserted sensors directly into the brain, but this caused scarring that prevented the tissue from sending signals.
2. Using external sensors to read the brain's electrical impulses was not possible because such signals are weak, and unwanted impulses, or “noise” made interpretation too difficult. Modern computer programs, however, can ignore this noise and isolate specific brain signals, eliminating the need to insert sensors directly.

### Further Questions&A

\*Ask student to answer the question on their own at first. If the student can't answer correctly, have him look at the last page and read the “example answer” for the question. Have the student try to memorize the answer, if it's too long or difficult, you should divide the sentence into 2 or 3 parts to make it easier to remember. Once they have memorized the answer, the teacher should ask the question one last time so that the student can practice answering. Also if you find any mistakes, please mark the page and let me know ASAP.

3. **1) What have scientists long dreamed of?**
4. 科学者たちが長年夢見てきた事とは何ですか。
5. **2) What happened when early researchers inserted sensors directly into the brain?**
6. 最初の頃に研究者が、脳の中に直接センサーを入れたとき何が起こりましたか。
7. **1) Scientists have long dreamed of enhancing the human body by merging the brain with computer technology.**
8. **2) It caused scarring that prevented the tissue from sending signals.**
9. The most promising technology for brain-computer interfacing is electroencephalography (EEG). With EEG, sensors and electrodes are held in place on a person's head with a tight-fitting cap. The sensors then record electrical signals caused by the activation of nerve cells in the brain.
10. Assistant Professor Deniz Erdogmus of Northeastern University in Massachusetts has used this technology in his research. In one study, subjects controlled the movements of a robot just by looking at various patterns on a computer screen. Each pattern represented a single command and caused unique, identifiable electrical signals in the subject's brains. The signals were recorded by sensors, and another computer then translated these signals and sent them to a robot.

## Further Questions&amp;A



11. **3) What do EEG sensors do?**
12. EEGにおいて、センサーは何をしますか。
13. **4) What could subjects in one study do?**
14. ある調査では、被験者は何をすることができましたか。
- 
15. **3) The sensors record electrical signals caused by the activation of nerve cells in the brain.**
16. **4) Subjects controlled the movements of a robot just by looking at various patterns on a computer screen.**
- 
17. Advances in BCIs could lead to great improvements in quality of life for people with damaged nervous systems. Robotic devices controlled by BCIs, such as artificial limbs for amputees, would allow disabled people to regain movement they had lost. “We hope to show that a person [affected by a] stroke, or an amputee, would be able to control an assistive device,” says neuroscientist and electrical engineer José Contreras-Videl. A wheelchair that can be steered through a BCI—thereby leaving the operator’s hands free—is currently being developed.

## Further Questions&amp;A



18. **5) How could advances in BCI lead to great improvements in quality of life for people with damaged nervous systems?**
19. BCIの進歩が、神経系に損傷がある人たちの生活の質を大きく改善することにどのようにつながるのですか。
20. **6) What is currently being developed?**
21. 現在開発されているものはどんなものですか。
- 
22. **5) Robotic devices controlled by BCI, such as artificial limbs for amputees, would allow disabled people to regain movement they had lost.**
23. **6) A wheelchair that can be steered through a BCI—thereby leaving the operator’s hands free—is currently being developed.**
- 
24. Professor J. Peter Rosenfeld of Northwestern University of Illinois is taking BCI research in a new direction. He recently conducted an experiment using an EEG head cap, where subjects were told to plan a terrorist attack on a city, whose name they kept secret from the researchers. The subjects then looked at slides of different cities as researchers measured their P300 brain waves—a type of signal generated when a person sees something familiar to them. By examining the strength of these waves, the researcher were consistently able to identify the city targeted by the “terrorists.” It is hoped that further advancements may lead to real-life BCI applications which can be used as counter-terrorism tools.

## Further Questions&A

25. 7) What are P300 brain waves?

26. P300脳波とは何ですか。

27. 8) What could researchers in the experiment consistently do?

28. この実験で、研究者は一貫して何ができましたか。

29. 7) *They are a type of signal generated when a person sees something familiar to them.*

30. 8) *They were consistently able to identify the city targeted by the “terrorists”.*

31. \*Choose the correct answer from these choices.



32. (35) What is one thing that has made it increasingly possible for scientists to realize their dream of using BCIs?

33. 科学者たちに、BCIを使って夢をかなえることが可能になってきていると感じさせた要因の一つは何ですか。

34. 1. The development of new computer programs that can accurately interpret weak brain signals.

35. 2. The use of new technology that can help the brain identify signals sent from other parts of the body.

36. 3. The creation of computer programs that allow the brain’s electrical signal to be read without the use of sensors.

37. 4. The design of the devices that when inserted into the brain can read signals by damaged brain tissue.

38. (36) What happened in Deniz Erdogmus’s study?

39. Deniz Erdogmus の調査で何が起こりましたか。

40. 1. An electronic device was successfully used to record subjects’ eye movements and analyze them for possible patterns.

41. 2. When subjects looked at particular patterns, signals from their brains were recorded and used to operate a robot.

42. 3. Subjects with damaged nervous systems succeeded in performing a number of movements using artificial limbs.

43. 4. Subjects used computer software to create visual patterns, which a robot then interpreted as specific commands.

44. (37) The research conducted by J. Peter Rosenfeld

45. J. Peter Rosenfeld が行った調査は

46. 1. was restricted to a specific type of brain wave that is only produced when people respond to a physical threat.

47. 2. showed that P300 brain waves are less useful in experiments involving BCIs than previously thought.

48. 3. measured the strength of a particular type of brain wave in order to identify the focus of subjects’ thoughts.

49. 4. was supervised by counter-terrorism officials to stop terrorists from accessing the BCI technology being tested.

## Review Questions



50. 1) What have scientists long dreamed of?
51. *Scientists have long dreamed of enhancing the human body by merging the brain with computer technology.*
52. 2) What happened when early researchers inserted sensors directly into the brain?
53. *It caused scarring that prevented the tissue from sending signals.*
54. 3) What do EEG sensors do?
55. *The sensors record electrical signals caused by the activation of nerve cells in the brain.*
56. 4) What could subjects in one study do?
57. *Subjects controlled the movements of a robot just by looking at various patterns on a computer screen.*
58. 5) How could advances in BCI lead to great improvements in quality of life for people with damaged nervous systems?
59. *Robotic devices controlled by BCI, such as artificial limbs for amputees, would allow disabled people to regain movement they had lost.*
60. 6) What is currently being developed?
61. *A wheelchair that can be steered through a BCI—thereby leaving the operator's hands free—is currently being developed.*
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66. 解答: (35) 1 (36) 2 (37) 3



## Type B 日本語訳なし

## 3[B] – Brain-Computer Interfaces



AP1E 12-2

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**Further Questions&A** 

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