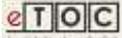


1. *For Teachers: When you use Dual method, please have the students do the shadowing after you. Then have them read by them self. And correct their pronunciation, **through all of this material.***
2. イートックのレッスン以外で使用禁止 Ban to use this without eTOC lesson.



3. Part2 Lesson5.Pre1-3.3-2019.1chobun スマホの方は横にご覧下さい

#### 4. *The Silurian Hypothesis*

5. Archeologists are experts at detailing the cultures of past civilizations by  
 6. examining ruins, remains are gravesites, and ancient trash dumps. They have  
 7. identified the point where ape and human evolution diverged, and gained  
 8. information about our ancestors' custom, lifestyles, and average life spans.  
 9. Despite this knowledge, a question remains: Earth is 4.6 billion years old, and  
 10. complex life emerged around 400 million years ago. *Homo sapiens* came onto  
 11. the scene a mere 300,000 years ago, and we have only been industrialized for  
 12. 300 years. How do we know that ours has been the only technologically  
 13. advanced civilization in Earth's long existence?  
 14. The ever-changing nature of Earth's geology is one reason this question  
 15. persists. Because tectonic activity incessantly creates and destroys the  
 16. planet's surface, most evidence of what existed on the surface more than 4  
 17. million years ago has been crushed to dust mixed with other sediments or  
 18. tectonic plates. The Negev Desert in southern Israel, at 1.8 million years old, is  
 19. the oldest surface remaining on Earth, and it is more than four times older  
 20. than the second-oldest surface, which is in the minuscule percentage of organic  
 21. material becomes fossilized rather than deteriorating, solid evidence of exactly  
 22. what beings roamed the planet – advanced or otherwise – in bygone times is  
 23. extremely scarce.

24. **Further Questions & Sample Answers** *For Teachers: Please use the direct method like CALLAN for this part. 1. Ask student to answer the question on their own at first. 2. Then read the "sample answer". 3. Tell student to close their eyes. 4. Let them repeat after you again. Because student can't see the answer. 5. Have the student try to memorize the answer. 6. Once they have memorized the answer, ask the question one last time.*

25. **1) What is one question that remains for archeologists?**

26. **1) How do we know that ours has been the only technologically advanced civilization?**

27. **2) What is the oldest surface remaining on Earth?**

28. **2) The Negev Desert in southern Israel at 1.8 million years old.**

29. Being human, we naturally focus our inquiries on matters relating to our own  
 30. species, and archeology is no exception in prioritizing evidence that is  
 31. correlated to the development of *Homo sapiens*. Astrobiologists Gavin Schmidt  
 32. and Adam Frank have pushed the envelope, however, by raising the possibility  
 33. that nonhuman species predating our own could have developed complex  
 34. civilizations that went extinct, but that any obvious record of their existence  
 35. would have been erased by the passage of eons. Referencing the British science  
 36. fiction TV program *Doctor Who*, which features intelligent reptiles called  
 37. Silurians that once inhabited Earth, Schmidt called the theory the "Silurian  
 38. hypothesis". He postulates that any civilization that reached a certain level of  
 39. sophistication would have had a similar experience to what we currently face as  
 40. Earth's population increases and technology grows more advanced.

41. It would make sense, then for scientists to examine ancient sediment samples  
 42. for traces of past civilizations. The sediments created by current human  
 43. civilization – which some scientists call the Anthropocene layer – will almost  
 44. certainly serve as evidence of our own activities. For example, the vast amounts  
 45. of fertilizer used to enhance crop yields will elevate levels of nitrogen  
 46. distributed in Earth’s sediments. Another hallmark of the Anthropocene layer  
 47. will be the plastic we leave behind, which will settle as tiny particles on the  
 48. ocean floor. Most significantly, our fossil-fuel consumption has altered the ratio  
 49. of carbon-12 to carbon-13 isotopes. The spectacular rate at which we have  
 50. burned hydrocarbons will certainly leave a spike in these isotopes in our  
 51. archeological record.

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

53. (38) What is demonstrated by the example of the Negev Desert?
- ① The best hope for finding evidence of civilizations that existed over 4 million years ago is to search for fossils in Israel.
  - ② The relative newness of even the most ancient places on Earth means evidence of earlier civilizations would be difficult to find.
  - ③ Fossils and other signs of the kinds of life that existed millions of years ago are likely to be revealed by geologic activity.
  - ④ Life on Earth has existed for far longer and in a far greater variety of forms than scientists had previously thought.
54. (39) According to Gavin Schmidt and Adam Frank’s hypothesis, if a civilization such as the Silurians had actually existed, the creatures would
- ① likely have been unable to reach a level of sophistication as high as modern human society has achieved.
  - ② likely have been closely related to *Homo sapiens* rather than having evolved directly from reptiles.
  - ③ have had to surpass the current global human population in number to have matched our technological achievements.
  - ④ have had to deal with some of the same issues that modern humans face as a result of the progress of civilization.

55. **Further Questions & Sample Answers** 

56. **3) What possibilities have Astrobiologists raised?**
57. **3) *Nonhuman species predating our own could have developed complex***
58. ***civilizations that went extinct***
59. **4) How will the Anthropocene layer serve as evidence for humans?**
60. **4) *The high amounts of nitrogen in the soil and the existence of plastics.***

61. We already know of various events that could possibly be evidence for the  
 62. Silurian hypothesis. One resulted from an event during the Paleocene epoch, 56  
 63. million years ago, known as Paleocene-Eocene Thermal Maximum, when  
 64. unusually high temperatures on Earth led to the disappearance of numerous  
 65. species. Sediments reveal an Earth almost entirely free of ice and ratio of  
 66. carbon 12 to carbon 13 that is similar to what scientists fear the Anthropocene

67. layer could someday show if global warming continues. There are also  
 68. indications of events in the Cretaceous period of events in which massive  
 69. amounts of CO<sub>2</sub> were released into the atmosphere, causing periods of extreme  
 70. heating.  
 71. Such events during the Cretaceous period deprived the oceans of oxygen for  
 72. millennia, leading to the extinction of sea creatures – and, ironically enough, to  
 73. the subsequent formation of fossil fuels like oil and coal that have contributed  
 74. to the rise of our current industrial society. If, as predicted in worst-case  
 75. scenarios, the warming we have generated on Earth causes an enormous  
 76. release of CO<sub>2</sub> from thawing Arctic tundra, the same outcome could result,  
 77. although at a rapidly accelerated pace.

### 78. Further Questions & Sample Answers

79. **5) What is one event that could be evidence for the Silurian hypothesis?**  
 80. *5) When unusually high temperatures on Earth led to the disappearance of*  
 81. *numerous species.*  
 82. **6) What did the extreme heating events of the Cretaceous period cause?**  
 83. *6) They deprived the oceans of oxygen leading to the extinction of sea creatures*  
 84. *and formation of fossil fuels.*

85. Are Schmidt and Frank proposing that industrial activity by unknown  
 86. civilizations is what caused these long-ago events? “Gavin and I don’t believe  
 87. the Earth once hosted a 50-million-year-old Paleocene civilization,” says Frank.  
 88. “But by asking if we could ‘see’ truly ancient industrial civilization, we were  
 89. forced to ask about the general kinds of impacts any civilization might have on  
 90. a planet.” A civilization changes its environment. It is inevitable, therefore,  
 91. that as civilizations expand, they affect the planet.  
 92. Schmidt and Frank suggest this may be because evolution has rules that  
 93. extend to the civilization level, and these could be demonstrated by evidence of  
 94. past civilizations and their extinction. For example, determining whether there  
 95. is a universal limit on the extent to which a species can affect its environment  
 96. and still survive would be instructive for humans’ long-term future.

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

98. **(40) What is true warming events that took place in the Cretaceous period?**  
 ① Circumstances that caused species to become extinct on Earth may have aided  
 the development of modern human civilization.  
 ② Their effects on the oceans likely destroyed any evidence that would have  
 indicated the cause of the events themselves.  
 ③ Although the high ratio of carbon 12 to carbon 13 was beneficial to certain  
 species then, it has become harmful to most species today.  
 ④ The amount of CO<sub>2</sub> that could be released from the Arctic tundra today is far  
 less than the amount that was trapped there then.
99. **(41) What do Schmidt and Frank believe about civilizations?**  
 ① The likelihood of their survival depends on whether they can speed up the  
 process of converting their resources to energy.

- ② The longer they are able to survive and adapt to their environment, the lower the chances are that they will extinction.
  - ③ They eventually reach a point where they focus equally on self-preservation and the conservation of the environment.
  - ④ They could be bound by universal rules that govern their technological and evolutionary advancement.
- 

100. **Further Questions & Sample Answers**

- 101. **7)** Why is it good to consider if we could “see” ancient civilizations?
  - 102. **7)** *We forced to ask about the general kinds of impacts any civilization might have on a planet.*
  - 104. **8)** What is an example of considering how evolution works on a civilization level?
  - 106. **8)** *Whether there is a limit on the extent to which a species can affect its environment and still survive.*
- 



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108. Answers: (38)2 (39)4 (40)1 (41)4