

RIPPLE ENGLISH

ACTIVE LEARNING PROGRAM

Workbook for:

“Human History of Technological Development”

問題は解きっぱなしにしないで！

英語資格試験の学習は、**解いた後の復習**をしなければほとんど効果はありません。答え合わせをしておしまいせずに、**テキストの音読練習やリスニング、多読学習などのインプット学習**を何度も反復して記憶に定着させましょう。ホームページからダウンロードできる音読練習用のテキストをぜひご活用ください。また、数日置いてから再度解き直すのも効果的です。答えを記憶してしまっているかもしれませんが、**回答の根拠をなぞりながら繰り返し解くこと**で有効な復習になります！

Human History of Technological Development

1. In December 1903, Orville and Wilbur Wright succeeded in the first manned powered flight in history. Let us **ponder** some hypothetical questions on their remarkable achievement. If they hadn't been around, would airplanes have never been invented? If they had been born 10 years earlier, would we have had airplanes 10 years earlier? Either of these questions should be answered "No". The general impression may be that technological developments were the products of strenuous efforts by gifted inventors and entrepreneurs represented by James Watt, Thomas Edison, and Henry Ford. However, this understanding is missing the point.
2. First, technologies develop gradually and cumulatively. The history of inventions is a relay of contributions by countless engineers rather than the overnight achievements of individual geniuses. The Wright brothers had a lot of predecessors who laid the essential groundwork for manned flight, and The Wright brothers added the last piece of the puzzle. Also, inventions are inevitable. By necessity, an invention appears in the time and place where there are foundation and demand for it. The Wright brothers and Edison happened to be in an era where their inventions were ripe to be discovered. How have humans developed technologies?

- (1) The word "ponder" in the passage is closest in meaning to
 - A. ask
 - B. consider
 - C. raise
 - D. explain
- (2) According to paragraph 1, which of the following is true?
 - A. Technological inventions are typically the result of individual genius working in isolation.
 - B. The Wright brothers were solely responsible for the invention of manned flight.
 - C. Inventions tend to emerge when there is both a groundwork and necessity for them.
 - D. Technologies are often developed suddenly without any prior groundwork.

3. The fundamental principle of technological development will eventually come down to the following sentence; technology proceeds to the **adjacent** possible when society is motivated to allocate resources toward it.
4. Firstly, there has to be a demand. Due to the success of airships in 1900, the demand for air transportation was rising, while there was a growing frustration for the inability to fly freely, which sparked the motivation of many engineers. Both the public and private sectors recognized the military and economic potential of aircrafts, making it easier for them to invest resources. Innovation is not purely a technological matter. It has always been influenced by socio-economic conditions.
5. Secondly, inventions require accumulation of existing technologies. Henry Ford once admitted that he just assembled into a car the discoveries by other people in history. Inventing manned powered flight needs countless of other technologies, such as efficient engines and propellers, the best shape of the wing based on fluid dynamics, and skills for stable flight control. The Wright brothers didn't discover all of them; their achievement was preceded by numerous enabling technologies, including the invention of internal combustion engines, which far outperform steam engines in power weight ratio. Some engineers attempted to build airplanes powered by steam engines, but they couldn't fly because the power output was too weak relative to their weight. Also, The Wright brothers had a lot of predecessors, from Isaac Newton in the 17th Century to Otto Lilienthal in the 19th Century, who had left behind theories and data on aerodynamics and aeronautics. These forerunners had already made the cup almost full, and The Wright brothers added the last drop. Invention occurs inevitably when it's needed by proceeding only one step ahead from the existing technologies.

- (3) The word “adjacent” in the passage is closest in meaning to
 - A. important
 - B. destined
 - C. distant
 - D. neighboring
- (4) According to paragraph 4, what is a key factor that drives technological innovation?
 - A. Purely technological breakthroughs without external influences.
 - B. Socio-economic conditions that create demand and allocate resources for innovation.
 - C. Random efforts by individuals without any societal support.
 - D. A lack of interest from public and private sectors in new technologies.
- (5) According to paragraph 5 which of the following is NOT true?
 - A. The Wright brothers' invention relied on prior discoveries and technologies.
 - B. Internal combustion engines were crucial for manned powered flight due to their power-to-weight ratio.
 - C. Steam engines were effective for early attempts at building airplanes.
 - D. Theories and data on aerodynamics from earlier scientists contributed to the Wright brothers' success.

6. Sometimes it is extremely difficult to come up with an idea from scratch. Some of the inventions that transformed the world were resulted from accidental discoveries, such as the antibiotic properties of Penicillium, the relationship between electricity and magnetism, and the utility of X-rays. Inventions often depend on coincidence, but if the number of attempts across society is large enough, an invention will occur almost by necessity. Let's say there is a lottery of 10 percent chance of winning. If you draw the lottery 22 times, the probability of getting at least one success exceeds 90 percent. When there are the right conditions and incentives for the discovery, many people will work on it. The more people enter the venture, the more likely it becomes that some of them will stumble upon the solution.
7. This fact does not deny the talent, passion, and perseverance of The Wright brothers and Thomas Edison. They are great individuals. It is inspiring to learn how they set off for the challenges, went through a series of hardships, and eventually achieved their dreams. However, when a certain number of people work on the same invention, it is statistically likely that some of them are talented and passionate enough like The Wright brothers. In fact, many engineers in different countries in the same decade were working on the discovery of manned powered flight, including Samuel Langley, Ninomiya Chuhachi, Henri Farman, and Gabriel Voisin. Likewise, more than 20 people are known to deserve the credit for inventing some version of the light bulb before Edison. **It is not that the airplane was invented thanks to The Wright brothers.** It was historically inevitable that we had somebody who had the gift and enthusiasm to achieve the first manned powered flight in that era.

(6) According to paragraph 6, how do accidental discoveries contribute to technological innovation?

- A. They occur entirely by chance without any underlying conditions or incentives.
- B. They are inevitable if enough people make attempts under the right conditions.
- C. They happen only when individuals intentionally work on unrelated problems.
- D. They rely solely on the brilliance of a single inventor.

(7) Which of the following text best expresses the essential information in the highlighted sentence?

It is not that the airplane was invented thanks to The Wright brothers.

- A. The invention of the airplane was historically inevitable due to the collective efforts of numerous engineers in that era.
- B. The Wright brothers' unique talent and passion were the sole reasons behind the invention of the airplane.
- C. The invention of the airplane would not have happened without the Wright brothers' contribution.
- D. The Wright brothers achieved manned powered flight by relying entirely on the discoveries of other engineers.

8. Flying freely through the sky seems to have long been a dream for humanity. For example, Leonardo Da Vinci, a 15th-century Florentine artist, left sketches of early flying machines in his manuscripts. This versatile genius also discovered foundational ideas of hydrodynamics and helicopters. However, we don't recognize him as the inventor of the aero crafts. Both Da Vinci and the Wright Brothers were talented, **inquisitive**, innovative people, but the brothers had 4 advantages that Da Vinci couldn't have.
9. First of all, the Wright Brothers had predecessors, such as Alphonse Pénaud and Otto Lilienthal, whose experiments and discoveries had laid important foundations for modern aviation. When they were children, the brothers famously played with a rubber-powered toy airplane made by Alphonse Pénaud.
10. Secondly, the Wright Brothers had access to enabling technologies for flying machines. No matter how great Da Vinci's idea might have been, it was just a pie in the sky without a light and effective engine. Da Vinci couldn't even test his idea because necessary enabling technologies were absent in his era.
11. Thirdly, the Wright brothers had a lot of other inventors who ventured into manned powered flight in the same decade, including Samuel Langley and Glenn Curtiss, whom they learned from and imitated each other. Also, the fact that there were many other competitors have convinced them more of the future success in this realm. On the other hand, Da Vinci was alone in the 15th Century, where he had nobody whom he could inspire, compete with, and learn from.
12. Lastly, the Wright brothers had a lot of successors who inherited, improved, and commercialized their discoveries. One of the brothers' biggest contributions is the invention of the effective flight control system. Of course, modern airplanes don't use the very same system that the brothers invented, but their discoveries have been the fundamental principle of the flight control up till now because their discoveries have been succeeded, updated, and implemented by later generations, without whom we may not know the name of these great inventors from a century ago. The misfortune of Da Vinci was he had none of these advantages that the Wright brothers could enjoy.

- (8) The word "inquisitive" in the passage is closest in meaning to
- A. enthusiastic
 - B. capable
 - C. smart
 - D. curious
- (9) According to paragraph 9 to 12, what factors contributed to the success of the Wright Brothers compared to earlier figures like Da Vinci?
- A. The absence of competitors, which allowed them to work without external pressure.
 - B. Access to foundational experiments, enabling technologies, competition with other inventors, and successors to improve and implement their discoveries.
 - C. Their strenuous efforts and unparalleled talent, as well as their good fortune.
 - D. Their ability to invent flight technology completely independently of others.
- (10) According to paragraph 12, which of the following is true?
- A. The Wright brothers' flight control system is still used exactly as they invented it.
 - B. The Wright brothers' discoveries formed the foundation for modern flight control systems.
 - C. Da Vinci's aviation ideas were successful despite the limitations of his time.
 - D. The Wright brothers' contributions to aviation were forgotten by later generations.

13. Technologies, once invented, can easily be lost. It is quite difficult for a society to keep its level of technology. The knowledge cannot be maintained unless it is continuously in demand and a certain number of experts constantly exist. Even if we have technological books and blueprints, somebody has to be able to understand and implement it. In addition, the more advanced and complex the society is, the wider variety of experts are needed. Each of the cutting-edge technologies requires an enormous support network of other technologies. Here are just tiny examples from the multitude of technologies that support modern aviation; the manufacturing technology of carbon fiber and composite materials to lighten aircraft; sensors and software that enable flight control systems; infrastructures necessary for flight, such as Air Traffic Control and how to operate airports. No single individual brain can store all this information necessary for the aviation industry. Even The Wright brothers' contribution is just one piece of these vast array of technologies.
14. An advanced civilization is only possible when there is a large number of people in society who share their knowledge and expertise with each other. Indeed, when the population size of a community shrinks, we cannot maintain our existing technologies. For example, Tasmania used to be connected to the Australian Continent until the end of the last ice age, but around 10,000 years ago, the sea level rose and the island became isolated. After the isolation, the technological standard of Tasmanian people did not just stagnate but lost many technologies that their ancestors used to possess. This is apparently because Tasmanian people were cut off from the large trade network with Australian societies and could not access the collective intelligence. In other words, they lacked the adequate population size to sustain their level of technology.
15. Today, humanity can continue to fly airplanes safely because a large global population brings together their knowledge and expertise. Next time you enjoy your flight, be thankful, not only to The Wright brothers, but also to all the inventors and entrepreneurs in history that contributed to the development of aviation technology, as well as numerous people contemporary with you who support, maintain, and enable this technology.

- (11) According to paragraph 13, why is it difficult for a society to maintain its level of technology?
- A. Technological knowledge have to be preserved in difficult specialized books.
 - B. Not all inventors can store all the necessary knowledge for modern industries.
 - C. Simple societies require more experts to maintain their technologies than complex societies.
 - D. Advanced technologies require continuous demand and a large network of experts to understand and implement them.
- (12) According to paragraph 14, which of the following is NOT true?
- A. A large population that shares knowledge is necessary for advanced civilizations.
 - B. Tasmanian people lost access to collective intelligence after becoming isolated.
 - C. The technological standard of Tasmanian people leveled off after their isolation.
 - D. Tasmania became isolated from the Australian continent due to rising sea levels.
- (13) According to paragraph 15, we can fly airplanes safely today because
- A. a large global population contributes knowledge and expertise to aviation safety.
 - B. The Wright brothers' inventions ensure the safety of modern aviation.
 - C. pilots and cabin attendants are working hard.
 - D. aviation safety today is guaranteed by contributions of countless scientists.

Answers

- (1) B
- (2) C
- (3) D
- (4) B
- (5) C
- (6) C
- (7) A
- (8) D
- (9) B
- (10) B
- (11) D
- (12) C
- (13) A

(1) 文中の“ponder（熟考する）”と意味が最も近いのは

A. ask（尋ねる）

B. consider（考える）

C. raise（提起する）

D. explain（説明する）

(2) 1段落の内容に合致するのは？

A. Technological inventions are typically the result of individual genius working in isolation.（技術的な発明は、通常、個々の天才が孤立して働いた結果だ）

B. The Wright brothers were solely responsible for the invention of manned flight.（ライト兄弟は、有人飛行の発明に単独で責任を負っていた）

C. Inventions tend to emerge when there is both a groundwork and necessity for them.（発明は、基礎と必要性の両方があるときに出現する傾向がある）

D. Technologies are often developed suddenly without any prior groundwork.（技術は、事前の基礎なしに突然開発されることがよくある）

(3) 文中の“adjacent（隣接する）”と意味が近いのは

A. important（重要な）

B. destined（運命づけられた）

C. distant（距離のある）

D. neighboring（隣り合った）

(4) 4段落によれば、技術革新を推進する主な要因は何か？

A. Purely technological breakthroughs without external influences.（外部からの影響を受けない純粋な技術革新）

B. Socio-economic conditions that create demand and allocate resources for innovation.（需要を生み出し、革新のためのリソースを割り当てる社会経済的条件）

C. Random efforts by individuals without any societal support.（社会的な支援を受けない個人による無作為の努力）

D. A lack of interest from public and private sectors in new technologies.（公共部門と民間部門の新技术への関心の欠如）

(5) 5段落の内容に合致しないものは？

A. The Wright brothers' invention relied on prior discoveries and technologies.（ライト兄弟の発明は、以前の発見と技術に依存している）

B. Internal combustion engines were crucial for manned powered flight due to their power-to-weight ratio.（内燃機関は、その出力対重量比により、有人動力飛行に不可欠だった）

C. Steam engines were effective for early attempts at building airplanes.（蒸気機関は、飛行機製造の初期の試みに効果的だった）

D. Theories and data on aerodynamics from earlier scientists contributed to the Wright brothers' success.（初期の科学者による空気力学に関する理論とデータが、ライト兄弟の成功に貢献した）

(6) 6段落によれば、偶発的な発見は技術革新にどのように貢献するか？

A. They occur entirely by chance without any underlying conditions or incentives.（然る発見は、何の条件も動機もなく、完全に偶然に起こる）

B. They are inevitable if enough people make attempts under the right conditions.（十分な数の人々が適切な条件下で試みれば、必然的に起こる）

C. They happen only when individuals intentionally work on unrelated problems.（個人が意図的に無関係な問題に取り組んだ場合にのみ起こる）

D. They rely solely on the brilliance of a single inventor.（偶発的な発見は、1人の発明家の才能だけに依存している）

(7) 選択肢のうち、ハイライトされた文の重要な情報を最もよく表しているのはどれか？

It is not that the airplane was invented thanks to The Wright brothers.（ライト兄弟のおかげで飛行機が発明されたというわけではない）

A. The invention of the airplane was historically inevitable due to the collective efforts of numerous engineers in that era.（飛行機の発明は、当時の多くのエンジニアの共同努力により、歴史的に必然的なものだった。）

B. The Wright brothers' unique talent and passion were the sole reasons behind the invention of the airplane.（ライト兄弟のユニークな才能と情熱が、飛行機発明の唯一の理由だった）

C. The invention of the airplane would not have happened without the Wright brothers' contribution.（飛行機の発明は、ライト兄弟の貢献なしには実現しなかっただろう）

D. The Wright brothers achieved manned powered flight by relying entirely on the discoveries of other engineers.（ライト兄弟は、他のエンジニアの発見に完全に頼って有人動力飛行を達成した）

(8) 文中の“inquisitive”と意味が最も近いのは

A. enthusiastic（熱中している、熱心な）

B. capable（有能な）

C. smart（聡明な）

D. curious（好奇心の強い）

(9) 9から12段落によると、ダヴィンチのような先人たちと比べてライト兄弟の成功に貢献した要因は何か？

A. The absence of competitors, which allowed them to work without external pressure. (競争相手がいなかったため、外部からのプレッシャーを受けずに作業することができた)

B. Access to foundational experiments, enabling technologies, competition with other inventors, and successors to improve and implement their discoveries. (基礎実験、実現技術、他の発明家との競争、後継者にアクセスして、発見を改善し実装することができた)

C. Their strenuous efforts and unparalleled talent, as well as their good fortune. (彼らの精力的な努力と比類のない才能、そして幸運)

D. Their ability to invent flight technology completely independently of others. (他の人から完全に独立して飛行技術を発明する能力)

(10) 12段落の内容に合致するのは？

A. The Wright brothers' flight control system is still used exactly as they invented it. (ライト兄弟の飛行制御システムは、発明されたときとまったく同じまま現在も使用されている)

B. The Wright brothers' discoveries formed the foundation for modern flight control systems. (ライト兄弟の発見は、現代の飛行制御システムの基礎を形成した)

C. Da Vinci's aviation ideas were successful despite the limitations of his time. (ダヴィンチの航空に関するアイデアは、当時の制約にもかかわらず成功した)

D. The Wright brothers' contributions to aviation were forgotten by later generations. (ライト兄弟の航空への貢献は、後の世代に忘れ去られた)

(11) 13段落によると、社会が技術レベルを維持することが難しいのはなぜか？

A. Technological knowledge have to be preserved in difficult specialized books. (技術的な知識は難しい専門書に保存する必要がある)

B. Not all inventors can store all the necessary knowledge for modern industries. (すべての発明者が現代の産業に必要な知識をすべて保存できるわけではない)

C. Simple societies require more experts to maintain their technologies than complex societies. (単純な社会では、複雑な社会よりも多くの専門家が技術を維持する必要がある)

D. Advanced technologies require continuous demand and a large network of experts to understand and implement them. (高度な技術には、継続的な需要と、それを理解し実装するための大規模な専門家ネットワークが必要だ)

(12) 14段落の内容に合致しないものは？

A. A large population that shares knowledge is necessary for advanced civilizations. (高度な文明には、知識を共有する大規模な人口が必要だ)

B. Tasmanian people lost access to collective intelligence after becoming isolated. (タスマニアの人々は孤立した後、集合知にアクセスできなくなった)

C. The technological standard of Tasmanian people leveled off after their isolation. (タスマニアの人々の技術水準は孤立した後、横ばいになった)

D. Tasmania became isolated from the Australian continent due to rising sea levels. (タスマニアは海面上昇によりオーストラリア大陸から孤立した)

(13) 15段落によれば、今日、飛行機を安全に飛ばすことができるのは

A. a large global population contributes knowledge and expertise to aviation safety. (世界中の多くの人々が航空安全に関する知識と専門知識を提供しているから)

B. The Wright brothers' inventions ensure the safety of modern aviation. (ライト兄弟の発明が現代の航空の安全を保証しているから)

C. pilots and cabin attendants are working hard. (パイロットと客室乗務員が懸命に働いているから)

D. aviation safety today is guaranteed by contributions of countless scientists. (今日の航空安全は、無数の科学者の貢献によって保証されているから)