

Read each of the following three articles carefully and answer the questions. For each question, choose ONE BEST answer. On your answer sheet, find the number of the question and fill in the space that corresponds to the number of the answer you have chosen.

[I] (Based on Steven Weinberg, 2015. *To Explain the World: the Discovery of Modern Science.*)

① The unification of biology with the rest of science first began to be possible in the mid-nineteenth century, with the independent proposals by Charles Darwin and Alfred Russel Wallace of the theory of evolution through natural selection. Evolution was already a familiar idea, suggested by the fossil record. Many of those who accepted the reality of evolution explained it as a result of a fundamental principle of biology, an inherent tendency of living things to improve, a principle that would have ruled out any unification of biology with physical science. Darwin and Wallace instead proposed that evolution acts through the appearance of inheritable variations, with favorable variations no more likely than unfavorable ones, but with the variations that improve the chances of survival and reproduction being the ones that are likely to spread.

② It took a long time for natural selection to be accepted as the mechanism for evolution. No one in Darwin's time knew the mechanism for inheritance, or for the appearance of inheritable variations so there was room for biologists to hope for a more purposeful theory. It was particularly distasteful to imagine that humans are the result of millions of years of natural selection acting on random inheritable variations. Eventually the discovery of the rules of genetics and of the occurrence of mutations led in the twentieth century to a "neo-Darwinian synthesis" that put the theory of evolution through natural selection on a firmer basis. Finally this theory was grounded on chemistry, and [Q3] on physics, through the realization that genetic information is carried by DNA molecules.

③ So biology joined chemistry in a unified view of nature based on physics. But it is important to acknowledge the limitations of this unification. No one is going to replace the language and methods of biology with a description of living things in terms of individual molecules, let [Q4] quarks and electrons. For one thing, even more than the large molecules of organic chemistry, living things are too complicated for such a description. More important, even if we could follow the motion of every atom in plant or animal, in that immense mass of data we would lose the things that interest us—a lion hunting antelope or a flower attracting bees.

④ For biology, like geology but unlike chemistry, there is another problem. Living things are what they are not only because of the principles of physics, but also because of

a vast number of historical accidents, including the accident that a comet or meteor hit the Earth 65 million years ago with enough impact to kill off the dinosaurs, and going back to the fact that the Earth formed at a certain distance from the Sun and with a certain initial chemical composition. We can understand some of these accidents statistically, but not individually. No one will ever be able to calculate the distance of the Earth from the Sun solely from the principles of physics. What we mean by the unification of biology with the rest of science is only that there can be no freestanding principles of biology, any more than of geology. Any general principle of biology is what it is because of the fundamental principles of physics together with historical accidents, which by definition can never be explained.

⑤ The point of view described here is called (often disapprovingly) “reductionism.”* There is opposition to reductionism even within physics. Physicists who study fluids or solids often cite examples of “emergence,” the appearance in the description of macroscopic phenomena of concepts like heat or phase transition that have no counterpart in elementary particle physics, and that do not depend on the details of elementary particles. For instance, thermodynamics, the science of heat, applies in a wide variety of systems. But it does not apply to everything, and when we ask whether it applies to a given system and if so why, we must have reference to deeper, more truly fundamental, principles of physics. Reductionism in this sense is not a program for the reform of scientific practice; it is a view of why the world is the way it is.

⑥ We do not know how long science will continue on this reductive path. We may come to a point where further progress is impossible within the resources of our species. We may run out of intellectual resources—humans may not be smart enough to understand the really fundamental laws of physics. Or we may encounter phenomena that in principle cannot be brought into a unified framework for all science. For instance, although we may well come to understand the processes in the brain responsible for consciousness, it is hard to see how we will ever describe conscious feelings themselves in physical terms.

⑦ Still, we have come a long way on this path, and are [Q9] at its end. This is a grand story—how celestial and terrestrial physics were unified by Isaac Newton, how a unified theory of electricity and magnetism was developed that turned out to explain light, and how chemistry and even biology were brought into a unified though incomplete view of nature based on physics. It is toward a more [Q10] physical theory that the wide-ranging scientific principles we discover have been, and are being, reduced.

* Reductionism is a process that explains complex phenomena in simple terms.

Q 1 . In paragraph ① , the phrase ruled out is closest in meaning to —

1. compared 2. eliminated 3. included 4. influenced 5. regulated

Q 2 . Which of the following is true of the author's description in paragraph ① ?

- 1 . Scientists in the nineteenth century utterly dismissed Darwin and Wallace's idea of evolution.
- 2 . Because many scientists in the middle of the nineteenth century were not comfortable about their conceptualization of evolution, they proposed an alternative perspective.
- 3 . Part of the reason why the unification of biology with other fields of study had not started until the mid-nineteenth century is that biology was an independent field of science.
- 4 . While the idea of evolution had been shared by many scientists, Darwin and Wallace further explained that evolution operates through the appearance of inheritable variations.
- 5 . It took an extremely long period of time for biology to be unified with the physical sciences, because some biologists intentionally delayed the advancement of any theoretical understanding of evolution so as to preserve the status and privileges of biology within the scientific community.

Q 3 . In paragraph ② , which of the following could be best added in [Q3] ?

- 1 . beating 2 . for which 3 . not 4 . thereby 5 . yet

Q 4 . In paragraph ③ , which of the following could be best added in [Q4] ?

- 1 . alone 2 . down 3 . into 4 . off 5 . through

Q 5 . Which of the following is true of the author's description in paragraph ③ ?

- 1 . It is unusual for biologists to become interested in chemical phenomena.
- 2 . Chemists would not be interested in questions such as why a lion hunts antelope.
- 3 . There were some physicists who had not been welcoming of the unification of biology with chemistry.
- 4 . The unification of biology with chemistry indeed means that biology is taken over by chemistry and vice versa.
- 5 . Even upon the unification of biology with chemistry, some biological phenomena are still described in the language of biology.

Q 6 . Which of the following is true of the author's description in paragraph ④ ?

- 1 . Biology is to geology is what biology is to physics.
- 2 . Historical accidents affect general principles of biology.
- 3 . The uniqueness of biology allows it to be completely understood separately from other fields of science.
- 4 . Had there been more historical accidents, there would not have been more sophisticated biological research.
- 5 . Although there is no biological principle that exists without the fundamental principles of physics along with historical accidents, the role of physics for biology is by far more important than that of historical accidents.

Q 7 . Which of the following does NOT correspond to the author's description in paragraph ⑤ ?

- 1 . Even some physicists frown on the idea of reductionism.
- 2 . Reductionism is a perspective for why the world is the way it is.
- 3 . Thermodynamics can be applicable to some systems, but not others.
- 4 . In order for us to figure out why a particular science applies to a system, we would have to rely on the fundamental principles of physics.
- 5 . Most physicists support reductionism, because their research is grounded on complex, yet sophisticated, principles rather than more fundamental ones.

Q 8 . Which of the following best expresses the essential information in the underlined sentence in paragraph ⑥ ?

- 1 . Human beings may observe phenomena that can fit into the fundamental laws of physics.
- 2 . The fundamental laws of physics may have to be modified until the intelligence of human beings flourishes.
- 3 . Human beings may realize that we would not have to dismiss further progress in science based on the fundamental laws of physics.
- 4 . It may not be until human beings understand the fundamental laws of physics that we can come to grasp the real meaning of science.
- 5 . The comprehension of the fundamental laws of physics may be beyond the cognitive and intellectual capacity of human beings.

Q 9 . In paragraph ⑦ , which of the following could be best added in [Q 9] ?

- 1 . especially
- 2 . finally
- 3 . happily
- 4 . not yet
- 5 . soon to be

Q10. In paragraph ⑦, which of the following could be best added in [Q10] ?

1. conscious 2. difficult 3. fundamental 4. inheritable 5. negative

Q11. Which of the following would best serve as the title of this article?

1. The Synthesis
2. How Can We Reform?
3. The Reductive Path of Science
4. Comparing Biology, Chemistry, and Physics
5. Conflicts and Harmony within Natural Sciences

[II] (Based on Atul Gawande. 2014. *Being Mortal*.)

① At the center of psychological research was an attempt to solve a deceptively simple puzzle: what makes life worth living when we are old and frail and unable to care for ourselves? In 1943, the psychologist Abraham Maslow published his hugely influential paper “A Theory of Human Motivation,” which famously described people as having a hierarchy of needs. It is often depicted as a pyramid. At the bottom are our basic needs—the essentials of physiological survival (such as food, water, and air) and of safety (such as law, order, and stability). Up one level are the need for love and for belonging. Above that is our desire for growth—the opportunity to attain personal goals, to master knowledge and skills, and to be recognized and rewarded for our achievements. Finally, at the top is the desire for what Maslow termed “self-actualization”—self-fulfillment through pursuit of moral ideals and creativity for their own sake.

② Maslow argued that safety and survival remain our primary and foundational goals in life, not least when our options and capacities become limited. If true, the fact that public policy and concern about old age homes focus on health and safety is just a recognition and manifestation of those goals. They are assumed to be everyone's first priorities.

③ Reality is more complex, though. People readily demonstrate a willingness to sacrifice their safety and survival for the sake of something beyond themselves, such as family, country, or justice. And this is regardless of age.

④ [Q17], our driving motivations in life, instead of remaining constant, change hugely over time and in ways that don't quite fit Maslow's classic hierarchy. In young adulthood, people seek a life of growth and self-fulfillment, just as Maslow suggested. Growing up involves opening outward. We search out new experiences, wider social connections, and

ways of putting our stamp on the world. When people reach the latter half of adulthood, however, their priorities change markedly. Most reduce the amount of time and effort they spend pursuing achievement and social networks. They narrow in. Given the choice, young people prefer meeting new people to spending time with, say, a sibling; old people prefer the opposite. Studies find that as people grow older they interact with fewer people and concentrate more on spending time with family and established friends. They focus on being rather than doing and on the present more than the future.

⑤ Understanding this shift is essential to understanding old age. A variety of theories have attempted to explain why the shift occurs. Some have argued that it reflects wisdom gained from long experience in life. Others suggest it is the cognitive result of changes in the tissue of the aging brain. Still others argue that the behavior change is forced upon the elderly and does not actually reflect what they want in their heart of hearts. They narrow in because the constrictions of physical and cognitive decline prevent them from pursuing the goals they once had or because the world stops them for no other reason than they are old. Rather than fight it, they adapt—or, to put it more sadly, they give in.

⑥ [Q20] researchers in recent decades have done more creative or important work sorting these arguments out than the Stanford psychologist Laura Carstensen. In one of her most influential studies, she and her team tracked the emotional experiences of nearly two hundred people over years of their lives. The subjects spanned a broad range of backgrounds and ages. (They were from eighteen to ninety-four years old when they entered the study.) At the beginning of the study and then every five years, the subjects were given an electronic device to carry around twenty-four hours a day for one week. They were randomly paged thirty-five times over the course of that week and asked to choose from a list all the emotions they were experiencing at that exact moment.

⑦ If Maslow's hierarchy was right, then the narrowing of life runs against people's greatest sources of fulfillment and you would expect people to grow unhappier as they age. But Carstensen's research found exactly the opposite. The results were unequivocal. Far from growing unhappier, people reported more positive emotions as they aged. They became less prone to anxiety, depression, and anger. They experienced trials, to be sure, and more moments of poignancy—that is, of positive and negative emotion mixed together. But overall, they found living to be a more emotionally satisfying and stable experience as time passed, even as old age narrowed the lives they led.

⑧ The findings raised a further question. If we shift as we age [Q24] appreciating everyday pleasures and relationships rather than [Q24] achieving, having, and getting, and if we find this more fulfilling, then why do we take so long to do it? Why do we wait

until we're old? The common view was that these lessons are hard to learn. Living is a kind of skill. The calm and wisdom of old age are achieved over time.

⑨ Carstensen was attracted to a different explanation. What if the change in needs and desires has nothing to do with age per se? Suppose it merely has to do with perspective—your personal sense of how finite your time in this world is. This idea was regarded in scientific circles as somewhat odd. But Carstensen had her own reason for thinking that one's personal perspective might be centrally important—a near-death experience that radically changed her viewpoint on her own life.

Q12. Which of the following best expresses the essential information in the underlined sentence in paragraph ① ?

- 1 . Psychologists worked on a problem that others had never been able to solve.
- 2 . Psychological research attempted to solve a difficult question without success.
- 3 . Psychologists worked fanatically hard to reevaluate hypotheses to make them look more logical and persuasive.
- 4 . The core of psychological research was to examine an issue that was apparently easy, yet in reality difficult to resolve.
- 5 . The central concern of psychological research was to examine how it could establish meaningful relationships among pieces of information, just as one would do with puzzles.

Q13. In paragraph ① , the word frail is closest in meaning to —

- 1 . afraid 2 . firm 3 . knowledgeable 4 . mature 5 . weak

Q14. In paragraph ② , the phrase not least is closest in meaning to —

- 1 . absolutely 2 . especially 3 . frequently 4 . generally 5 . rarely

Q15. In paragraph ③ , the word readily is closest in meaning to —

- 1 . continuously 2 . easily 3 . emotionally 4 . preparedly 5 . universally

Q16. Which of the following is true of the author's description from paragraphs ① to ③ ?

1. It is Maslow's idea of human motivations that has established the foundation for recent research on aging society.
2. Maslow's theory should be modified partly because his theory is more applicable to younger generations than older generations.
3. Younger people tend to prioritize the need for survival and safety, because they are still at psychologically developmental stages.
4. While Maslow theorizes that the basic needs located in the lowest level of the hierarchy are our primary goals in life, the reality is not that straightforward.
5. Unlike the traditional Western way of thinking, Maslow in his theory of human motivations conceptualizes that the desire for self-actualization is located at the top of a hierarchy of needs.

Q17. In paragraph ④, which of the following could be best added in [Q17] ?

1. First of all
2. For example
3. However
4. Therefore
5. What's more

Q18. In paragraph ④, the word markedly is closest in meaning to —

1. gradually
2. hardly
3. prominently
4. quickly
5. unfortunately

Q19. In paragraph ⑤, the word constrictions is closest in meaning to —

1. consequences
2. expansions
3. limitations
4. protections
5. tightness

Q20. In paragraph ⑥, which of the following could be best added in [Q20] ?

1. A number of
2. Few
3. Little
4. Most
5. Much

Q21. Which of the following is true of the author's description in paragraph ⑥ ?

1. The participants in Carstensen's study were not interested in the purpose of the research.
2. The research subjects in Carstensen's study were allowed to freely express their feelings in their own terms.
3. Those who contributed to Carstensen's study as research subjects had been tracked every year to investigate their health experiences.
4. In the Stanford psychologist's project, there were almost two hundred participants who were in the same age group at the beginning of the project.
5. By following the same group of people with diverse backgrounds over time, Carstensen's research examined how people feel over years of their lives.

Q22. In paragraph ⑦, the word unequivocal is closest in meaning to —

1. ambiguous 2. ambitious 3. indifferent 4. obvious 5. unbalanced

Q23. In paragraph ⑦, the word trials is closest in meaning to —

1. difficult events 2. initial challenges 3. lawsuits
4. long-term efforts 5. medical experiments

Q24. In paragraph ⑧, which of the following could be best added in [Q24] (lines 1 and 2) ?

1. by 2. toward 3. until 4. when 5. with

Q25. Which of the following is NOT mentioned in this article?

1. The findings of Carstensen's research do not support Maslow's theory of human motivations.
2. Carstensen's research findings had us think about another aspect of the relationship between age and desires.
3. Carstensen's alternative interpretation, which focuses on a person's own perspective, was considered somewhat unusual within scientific circles.
4. Carstensen's idea on the change in our motivation in our life is quite different from conventional views in that it brings in individuals' ideas of how finite their times are.
5. Carstensen's research findings reconfirmed the general wisdom that it takes years of experience to appreciate the value of close relationships, because life lessons are not easy to learn.

Q26. Which of the following can be inferred from this article?

1. Contrary to an expectation that Maslow's theory could have us generate, people at the later stages of their lives appear to have psychologically pleasurable lives.
2. Because the question of "what makes life worth living?" is essentially a matter for each person, even theoretical explanations of prominent scholars are not valuable.
3. Despite some differences in specific aspects, many psychological theories suggest that our motivations in life change not only from young adulthood to the elderly stage, but also across different historical eras.
4. Understanding our purpose in life is not suitable as a subject for a scientific inquiry, because, as Carstensen's case suggests, it takes the occurrence of some rare life events for one to develop a comprehensive and powerful theory.
5. Carstensen's research provides counter-intuitive evidence that younger people are preoccupied with self-actualization, because they are not happier than elderly people who are mostly interested in staying with their families.

[III] (Based on Susan Greenfield. 2014. *Mind Change: How Digital Technologies are Leaving Their Mark on Our Brains*.)

① Marc Prensky, an American technologist, coined the term 'Digital Native' for someone defined by his or her perceived outlook and abilities, based on an automatic facility and familiarity with digital technologies. By contrast, 'Digital Immigrants' are those of us who, according to Prensky, 'have adopted many aspects of the technology, but just like those who learn another language later in life, retain an "accent" because we still have one foot in the past'. It is unlikely that anyone reading these words will not have strong views, firstly, as to which side of the divide they themselves belong; and, secondly, as to whether in any event the distinction is cause for unalloyed celebration or deep anxiety. Generally speaking, it corresponds to age, although Prensky himself did not pinpoint a specific [Q27]. The date of birth of the Digital Native seems therefore to be uncertain: we could even go back as far as the 1960s when the term 'computer' entered into common [Q28] or as late as 1990 when emailing, which started around 1993, would have become the default way of life by the time the young Digital Native could read and write.

② The important distinction is that, today, Digital Natives know no way of life other than the culture of Internet, laptop and mobile: they can be freed from the constraints of local mores and hierarchical authority and, as autonomous citizens of the world, they will personalise screen-based activities and services while collaborating with, and contributing to, global social networks and information sources. But then a much more negative portrait of the Digital Native is being painted by pundits like the British American author Andrew Keen:

Social networking sites such as Facebook are creating a youth culture of digital narcissism; open-source knowledge sharing sites like Wikipedia are undermining the authority of teachers in the classroom; the YouTube generation are more interested in self-expression than in learning about the world; the cacophony of anonymous blogs and user-generated content is deafening today's youth to the voices of informed experts.

③ Then again, perhaps the Digital Native doesn't actually exist after all. Neil Selwyn from the Institute of Education in London argues that they are actually no different from preceding generations: they are not 'hard-wired' to have unprecedented brains. Rather, many young people are using technology in a far more sporadic, passive, solitary and, above all, unspectacular way than the zealous proponents of cyberculture might have us believe.

④ Irrespective of whether the digital age has spawned a new type of superbeing or just ordinary humans better adapted to screen life, suffice it to say that, for the moment, parents are most likely to be Digital Immigrants and their children Digital Natives: the former are still learning the enormous potential of these technologies in adulthood, while the latter have known nothing else. This cultural divide often makes it hard for parents to know how best to approach situations that they intuitively perceive to be a problem, such as seemingly excessive time spent on computer-based activities; meanwhile children may feel misunderstood and impatient with views they regard as inappropriate and outdated for present-day life.

⑤ Although reports and surveys have focused largely on the next generation, the concerns I want to flag are not limited to the Digital Native alone. Far from it. But a generational divide has undoubtedly arisen from the vertiginous increase in the pace of ever smarter digital devices and applications. What will be the effects on each generation, and on the relationship between them?

⑥ In a 2011 report *Virtual Lives*, researchers for the UK children's charity Kidscape assessed the online activities of over 2,000 children who were 11 to 18 years old: just under half of the children questioned said they behaved differently online compared to their normal lives, with many claiming it made them feel more powerful and confident. One explained: 'It's easier to be who you want to be, because nobody knows you and if you don't like the situation you can just exit and it is over'. Another echoed this sentiment: 'You can say anything online. You can talk to people that you don't normally speak to and you can edit your pictures so you look better. It is as if you are a completely different person'. These findings, the report argues, 'suggest that children see cyberspace as detachable from the real world and as a place where they can explore parts of their behaviour and personality that they possibly would not show in real life. They seem unable to understand that actions online can have repercussions in the real world'.

⑦ The easy opportunity of alternative identity and the notion that actions don't have consequences have never previously featured in a child's development, and as such are posing unprecedented questions as to what might be for the best. While the brain is indeed not 'hard-wired' to interface effectively with screen technologies, it has evolved to respond with exquisite sensitivity to external influences — to the environment it inhabits. And the digital environment is getting ever more [Q39] at an ever younger age. Recently a children's toy company introduced a potty-training seat complete with iPad stand, presumably to complement an infant lifestyle where the recliner in which the baby may spend many hours is also dominated by a screen.

Q27. In paragraph ①, which of the following could be best added in [Q27] ?

1. accent 2. appearance 3. boundary 4. coincidence 5. emergence

Q28. In paragraph ①, which of the following could be best added in [Q28] ?

1. attitude 2. device 3. language 4. network 5. technology

Q29. Which of the following is true of the description of Digital Natives and Digital Immigrants in paragraph ① ?

1. We can distinguish Digital Natives from Digital Immigrants by their specific age, regardless of the era in which they are born.
2. Digital Natives refer to those who are preoccupied with the past and have started to learn digital technology at an early stage of their lives.
3. Digital Natives do not have accents while speaking English, because they are taught by native speakers and digital devices are available to learn that language.
4. Part of the reason why older people, compared to younger ones, would have more difficulties in learning about digital technology is that they are not able to master a foreign language in order to become a native speaker.
5. Although we do not know exactly when we started to witness the emergence of Digital Natives, there are certainly clear differences between Digital Natives and Digital Immigrants in terms of their familiarity with digital technology.

Q30. In paragraph ②, the word mores is closest in meaning to —

1. assets 2. customs 3. numbers 4. products 5. techniques

Q31. In paragraph ②, the word autonomous is closest in meaning to —

1. aged 2. immature 3. independent 4. primitive 5. subjective

Q32. Which of the following does the author explicitly mention from paragraphs ① and ② ?

1. Despite various descriptions of Digital Natives, it seems that they only know their way around digital technologies.
2. The concerns raised by the British American cannot be an issue for Digital Natives, because that expert himself is a Digital Immigrant.
3. One could not care less about the British American's comment, because there are many older people who use laptops and global social networks.
4. Although Digital Natives, unlike Digital Immigrants, may not have an accent, they are also undoubtedly embarrassed by the emergence of a multilingual digital world.
5. Because new digital devices and technologies are continuously developed and become available accordingly, those who view themselves as Digital Natives should have been considered part of the 'older generation' by now.

Q33. In paragraph ③, the word preceding is closest in meaning to —

1. antecedent 2. following 3. resulting 4. subsequent 5. succeeding

Q34. In paragraph ③, the word 'hard-wired' is closest in meaning to —

1. clear 2. disconnected 3. external 4. imprinted 5. satisfied

Q35. In paragraph ④, the word spawned is closest in meaning to —

1. abandoned 2. blamed 3. discovered 4. overturned 5. produced

Q36. In paragraph ⑤, the word flag is closest in meaning to —

1. wander 2. warn 3. weaken 4. wonder 5. worsen

Q37. In paragraph ⑥, the word echoed is closest in meaning to —

1. applied 2. explained 3. repeated 4. reversed 5. vibrated

Q38. Which of the following best expresses the essential information in the underlined sentence in paragraph ⑥?

1. The younger generations do not appear to doubt that the image they create online reflects who they are in the actual world.
2. It appears that those who were questioned find it easy to reason that their online actions are the product of their existence in the real world.
3. It seems that children are not aware of the possibility that what they do in cyberspace could have real-life consequences beyond the online world.
4. Young people seem to be unable to accept the fact that how they feel through online communications could influence how they behave online.
5. It seems that young people in the UK cannot comprehend the mechanism by which their comments in cyberspace could change their future comments online.

Q39. In paragraph ⑦, which of the following could be best added in [Q39]?

1. conservative 2. difficult 3. punctual 4. sensitive 5. widespread

Q40. Which of the following is NOT mentioned in this article?

1. The differences in the degree of familiarity with digital technology makes the parent-child relationship more complex than before.
2. There are important issues that need to be discussed regarding Digital Natives, as well as serious issues that go beyond a particular generation.
3. Availability of a social space where one can act as another person is a completely new issue when we think about how children should be raised.
4. While there are people who believe that the division brought by digital technology exists, there is an individual who argues that young people use the technology in a sporadic and passive manner.
5. According to a report on the online activities of UK children, many children consider it normal to go online on a daily basis and therefore view cyberspace as a social environment where they cannot be a different person.

Q41. Which of the following would best serve as the title of this article?

1. Digital Native: The Unprecedented Generation
2. Digital Native: How to Keep Up with Digital Technology
3. Digital War: How Digital Technology Divides 'Us' and 'Them'
4. The Victory of Digital Natives: How They Control the Modern World
5. Can We Welcome Immigrants?: The Issue of Migration in the Digital World