第１問　次の英文を読み、下の問い（**問１**・**問２**）に答えよ。

The odyssey of human discovery stretches over many eras, but the themes of our quest to understand the world never [1], as they arise from our own human nature. One theme is familiar to anyone who works in a field dedicated to innovation and discovery: the difficulty in conceiving of a world, or an idea, that is any different from the world or ideas that we already know.

In the 1950s, Isaac Asimov, one of the greatest and most creative science fiction writers of all time, wrote the *Foundation* trilogy, a series of novels [2] many thousands of years in the future. In those books, the men commute to work in offices every day, and the women stay home. Within only a few decades, that [3] of the distant future was already a thing of the past. I bring this up because it illustrates an almost universal [4] of human thought: our creativity is constrained by conventional thinking that arises from beliefs we can't shake, or never even think of questioning.

The flip side of the difficulty of conceiving change is the difficulty of [5] it, and that is another recurring theme of our story. We human beings can find change overwhelming. Change makes demands on our minds, takes us beyond our [6] zones, shatters our mental habits. It produces confusion and disorientation. It requires that we let go of old ways of thinking, and the letting go is not our choice but is [7] upon us. What's more, the changes resulting from scientific progress often upend belief systems to which large numbers of people — and possibly their careers and their livelihoods — are attached. As a result, new ideas in science are often met with resistance, anger, and ridicule.

Science is the soul of modern technology, the root of modern civilization. It underpins many of the political, religious, and ethical issues of our day, and the ideas that underlie it are [8] society at an ever faster pace. But just as science plays a key role in shaping the patterns of human thought, it is also true that the patterns of human thinking have played a key role in shaping our theories of science. For science is, as Einstein remarked, "as [9] and psychologically conditioned as any other branch of human endeavor." This book is an effort to describe the development of science in that spirit — as an intellectual as well as a culturally determined enterprise, whose ideas can best be understood by an examination of the personal, psychological, historical, and social situations that [10] them. To look at science that way sheds light not just on the enterprise itself, but on the nature of creativity and innovation, and, more broadly, on the human condition.

（注）odyssey, 知的探求；　upend, ひっくり返す；　underpin, 支持する；　shed light on, 解明する

問１　英文の [1] ～ [5] に入れるのに最も適当なものを、それぞれ下の①～⑩のうちから選べ。

① abandoning	② accepting	③ halt	④ limitation
⑤ set	⑥ tradition	⑦ value	⑧ vary
⑨ vision	⑩ which		

問２　英文の [6] ～ [10] に入れるのに最も適当なものを、それぞれ下の①～⑩のうちから選べ。

① accelerating	② comfort	③ conveyed	④ dependent
⑤ imposed	⑥ molded	⑦ objective	⑧ regular
⑨ subjective	⑩ transforming		

第２問　次に与えられた語について、１～３（ [11] ～ [13] ）は下線部の発音が同じものを、４～６（ [14] ～ [16] ）は第一アクセント（第一強勢）の位置が同じ語を、それぞれ下の①～④のうちから１つずつ選べ。

1．gl<u>o</u>ve [11]
① <u>o</u>nly　② pr<u>o</u>file　③ w<u>oo</u>l　④ t<u>o</u>ngue

2．g<u>au</u>ge [12]
① <u>au</u>tumn　② pl<u>a</u>gue　③ f<u>au</u>lt　④ f<u>a</u>mine

3．deb<u>r</u>is [13]
① spe<u>c</u>ies　② bre<u>a</u>th　③ r<u>h</u>ythm　④ despi<u>t</u>e

4．mo・ti・vate [14]
① ac・com・plish　② nu・tri・ent
③ in・ter・vene　④ e・nor・mous

5．as・tron・o・my [15]
① o・per・a・tor　② tem・per・a・ture
③ in・tel・li・gent　④ di・ag・no・sis

6．com・pre・hen・sive [16]
① mis・er・a・ble　② dis・crim・i・nate
③ e・quiv・a・lent　④ in・sti・tu・tion

第３問　次の１～５の文の [17] ～ [21] に入れるのに最も適当なものを、それぞれ下の①～④のうちから１つずつ選べ。

1．The travel agency [17] that its computer network had been compromised and data on some 2 million customers had been stolen.
① admitted　② permitted　③ approved　④ allowed

2．The council spent $1 million on the construction of a new [18] large enough to accommodate two hundred children.
① facility　② architecture　③ equipment　④ capacity

3．Some students see social studies as of [19] compared with science and mathematics.
① unimportant　② less important
③ small importance　④ little importance

4．The effect of trafficking on the world's cheetah population is [20], but evidence suggests that trade in wild cheetah cubs is widespread.
① absolute proof　② allegedly inevitable
③ anyone's guess　④ equally assigned

5．Grades were given based on the extent [21] students participated actively in class.
① for that　② of when　③ whose　④ to which

第４問 次の対話文の [22] ～ [24] に入れるのに最も適当なものを、それぞれ下の①～⑩のうちから１つずつ選べ。

Cathy: Oh, hi, Bobby. I hope I didn't wake you up! I haven't seen you out and about lately, and I was thinking you might want to take a brisk walk with me.

Bobby: Thanks, Cathy. [22] I just can't seem to beat the blues. In fact, I was thinking about getting some antidepressant drugs from the doctor.

Cathy: [23] It's a good idea to go to the doctor and get it checked out, but for what it's worth, I've heard that regular exercise can alleviate depression. A little stroll in the park won't hurt you. Plus you have the added benefit of enjoying my company.

Bobby: [24] I'll meet you at the park in 15 minutes.

（出典 'Feeling out of sorts !!!', http://www.englishdaily626.com/conversation.php?904. We have tried our best efforts to locate and contact the rights holder. If you have any concerns about, or objections to, the use of this material, please contact us.（本学では著作権者を探し出す努力をしましたが、特定するに至りませんでした。該当文を見られた著作権者はご一報ください。）

① That's an offer I can't refuse.
② Yeah, put me down for that time.
③ But I'm working on a biology assignment right now.
④ Well, it's a pity that you're worked up over nothing more than a paper tiger.
⑤ Oh, I'm sorry to hear you've been feeling out of sorts.
⑥ I'm glad that you kind of show me the ropes.
⑦ When I think about it my stomach starts churning.
⑧ Gee, you'll have to come up with a plan B.
⑨ Actually, I had an urge to visit your workplace.
⑩ I appreciate the thought, but I'm not up for it today.

問３ [27]

Henrietta Lacks died in 1951 from a vicious case of cervical cancer. But before she died, a surgeon took samples of her tumor and put them in a petri dish. ①Scientists had been trying to keep human cells alive in culture for decades, but they all eventually died. ②All it takes is one small mistake anywhere in the division process for cells to start growing out of control. ③Henrietta's were different: they reproduced an entire generation every twenty-four hours, and they never stopped. ④They became the first immortal human cells ever grown in a laboratory. Henrietta's cells have now been living outside her body far longer than they ever lived inside it.

（出典 Excerpt from THE IMMORTAL LIFE OF HENRIETTA LACKS by Rebecca Skloot, Copyright (c) 2010, 2011 by Rebecca Skloot. Used by permission of Crown Books, an imprint of the Crown Publishing Group, a division of Penguin Random House LLC. All rights reserved.（一部改変））

問４ [28]

At six months old, a koala joey begins to peep out from its mother's pouch. It's time to start making the transition from feeding solely on milk to its adult diet of eucalyptus leaves. ①The trouble is, joeys do not have any way to break down eucalyptus leaves. ②To most herbivores, it's not the most appetising of diets; the leaves are tough, toxic and very low in nutrients. ③The mammalian genome is not even equipped with the genes necessary to produce enzymes that can extract anything of worth from eucalyptus. ④But koalas have found a way around this problem. Like cows, sheep and many others, koalas make use of microbes to extract most of the energy and nutrients they need from fibrous plant material.

（出典 Brief quote from p. 204 from 10% HUMAN : HOW YOUR BODY'S MICROBES HOLD THE KEY TO HEALTH AND HAPPINESS by ALANNA COHEN. Copyright (c) 2015 by Nycteris Ltd. Reprinted by permission of HarperCollins Publishers.（一部改変））

第５問 次の問い（問１～４）のパラグラフ（段落）には、まとまりをよくするために取り除いた方がよい文が一つある。取り除く文として最も適当なものを、それぞれ下線部①～④のうちから１つ選べ。

問１ [25]

If you're practicing something over and over, whether it's your parachute landing fall or the conjugation of foreign verbs, you're leaning on short-term memory, and very little mental effort is required. ①You recode and consolidate new material from short-term memory into long-term memory. ②You show gratifying improvement rather quickly, but you haven't done much to strengthen the underlying representation of those skills. ③Your performance in the moment is not an indication of durable learning. ④On the other hand, when you let the memory recede a little, for example by spacing the practice, retrieval is harder, your performance is less accomplished, and you feel let down. But your learning is deeper and you will retrieve it more easily in the future.

（出典 'MAKE IT STICK : THE SCIENCE OF SUCCESSFUL LEARNING by Peter C. Brown, Henry L. Roediger, III, and Mark A. McDaniel, Cambridge, Mass. : The Belknap Press of Harvard University Press, Copyright (c) 2014 by Peter C. Brown, Henry L. Roediger, III, and Mark A. McDaniel.（一部改変））

問２ [26]

Spontaneous mummification is induced by nature and without the intervention of humans. ①A prominent example of spontaneously mummified bodies is the Iceman. His body was preserved for more than 5,300 years in an Italian Alpine glacier before he was discovered in 1991. ②The Iceman contains a considerable amount of humidity in his cells that was retained while he was naturally mummified by freeze-drying. ③Increasing development of mummification techniques resulted in thousands of mummified human remains. ④The mummified body, various tissue types, and even intestinal contents are therefore still extraordinary well preserved. Analysis of the food remains in the stomach indicates a fat-rich last meal, including a mix of grain material and meat fibers of wild animals.

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第６問 次の１～３の文において、それぞれ下の①～⑦の語句を並べ替えて空所を補い、最も適当な英文を完成させよ。解答は [29] ～ [37] に入れるものの番号のみを答えよ。

1. It seemed that _____ [29] _____ [30] _____ [31] _____ all of a similar age.
① nothing in ② except ③ had ④ they were
⑤ that ⑥ the three women ⑦ common

2. Some people _____ [32] _____ [33] _____ [34] _____ living in Australia for several years.
① to ② even after ③ become ④ fail
⑤ English ⑥ proficient ⑦ in

3. Surgery would _____ [35] _____ [36] _____ [37] _____ before the first cut is made.
① it ② given ③ carry ④ not for
⑤ enormous risk ⑥ the protective shield of antibiotics
⑦ were

第7問 次の英文を読み、下の問い（**問1・問2**）に答えよ。

For decades, scientists readily swallowed the notion that a "taste map" partitions your tongue — sweet at the front, salty at the sides. "It's all incorrect," says Charles Zuker, the Columbia neuroscientist, who has spent the last fifteen years studying how we perceive taste. "There's no taste map." Instead, he says, thousands of taste buds are scattered around your tongue, with sweet, salty, sour, bitter, and umami receptor cells throughout.

Nor do our taste buds actually decide how the food tastes. They do the detection work, definitely, but they serve primarily as relays, dispatching signals directly to the brain. "Sweet taste cells in the tongue talk to sweet neurons," says Zuker. "Salty to salty. Bitter to bitter." Within those micro-groups of neuronal constellations, the taste is given a definition. That's how you know the difference between strudel and sauerkraut.

When humans are hungry, or thirsty, those neurons will ping us to eat something, or to get a glass of water. "Evolution is smart. Clean, clear, and simple," says Zuker. "This is what innate hardwired circuits are all about." Now Zuker and his lab of twenty-two researchers want to map precisely where the taste and thirst neurons are located in the human brain. Finding them could lead to clues in controlling our cravings. In research with mice, Zuker's team shined a fiber-optic light over their thirst neurons. The mice instantly sprinted to the water spout. "Even if the mouse is not thirsty, the mouse will think it's thirsty, and look for water to drink," he says. "Isn't that remarkable?"

The same seems to apply to taste. The messages from the mouse tongue travel directly to its taste neurons. Just as in humans, those nerve cells are dedicated strictly to the five basic taste qualities. Activate the bitter neurons while a mouse drinks regular water, and it's repelled. (The mouse squints, shudders, and jiggles its head, just like someone who bit into a lemon.) But silence the bitter neurons, and the mouse will slurp bitter liquid.

The inferences are astonishing. Could physicians someday manipulate neurons to regulate diet, consumption, and sugar cravings — perhaps with a pill? "There are amazing implications," says Zuker. "I think the field is ready to do something very special." Then, reining it in: "There are challenges — making sure a pill acts on the right group of cells, that it targets the right circuit." And a reminder: "We are still doing basic neuroscience. We are still at the stage of uncovering fundamental logic and principles." Yet from his lab's ever-accumulating data, one can infer the prospective human applications — controlling anorexia, obesity, and diabetes.

More than one-third of adult Americans today are obese, and at increased risk for heart disease, stroke, and cancer. Thirty million Americans have diabetes, and three hundred thousand die from it annually. Overeating and excessive sugar consumption are the causes of both obesity and diabetes. Finding a way to govern them with pharmaceuticals would be a miracle. "And now we can begin to ask," says Zuker, "if we can control feeding and sugar craving to make a meaningful difference. I believe the answer will be yes."

The decades-old "left brain–right brain" paradigm, although not completely discarded by researchers, now survives considerably diminished, an old scientific anecdote (left-brainers, supposedly, are analytical and good at math; right-brainers, emotional and hyper-imaginative). "There is some truth to it," says Randy Bruno, a CUMC associate professor of neuroscience. "But not all functions are completely one side or another. Some things are not lateralized at all." Instead, Bruno's research reveals something much more tantalizing: "What we're working on now is top brain and bottom brain."

For more than twenty years, Bruno has been investigating the cerebral cortex, an outer sliver of brain barely thicker than a credit card and critical for higher-order functions like perception and attention. In mammals, the cortex envelops nearly the entire organ, and divides into "upper" and "deeper" layers. Our deeper layers, evolutionarily older, faintly evoke the reptilian brain. Indeed, today's alligators, turtles, and snakes have only the lower layers. "There's a really good reason for why mammals developed the upper layers," says Bruno. "But I don't know what the answer is."

Neuroscientists long assumed the upper cortex transmitted its sensory data — that's everything you see, hear, smell, taste, and feel — directly to the deeper cortex. Without that, researchers believed, the lower region in mammals would never detect an outside world. But in 2013, Bruno and his team shut off the upper cortex in a mouse. What happened (or what didn't happen) startled everyone, not just in Bruno's lab, but in the scientific community worldwide.

"Nothing changed," he says. Turns out the deep layers weren't relying on the upper cortex at all; they still received the incoming sensory information. The two cortex regions, Bruno discovered, can operate independently of each other. Independent yet intertwined: "They do work together," he says. "But they also look like they have different jobs. What's the job of this half of the cortex versus the other half? I don't know."

But he already has a hypothesis. Perhaps, Bruno says, the upper layers mediate "context-dependent" behaviors, and make sense of intermingling and often conflicting situations. (A rabbit is hungry. It sees wildflowers nearby. But a hawk hovers overhead. Does the rabbit chance it and go for the wildflowers? Or take off and go hungry?) The computations performed in the upper layers, suggests Bruno, are good at evaluating conflicting data in context. They decide what to do.

If that's so, then another theory, even more provocative, surfaces. Psychiatric patients often have problems making decisions that involve context. "Schizophrenics are an example," says Bruno. "Interpreting sensory signals in context is difficult for them. They really struggle with it. They can't deal with it." Which raises the question: could the malfunctioning neuronal networks that cause schizophrenia and other psychiatric disorders reside somewhere in the upper layers?

Determining that — the approximate vicinity of the faulty networks — is huge. "We would know where to start looking," says Bruno. "We could narrow down the places where the actual biological defect is occurring." If researchers could then pinpoint those dysfunctional neurons and target them with drugs, effective treatments for psychological disease could eventually result.

Lots of ifs. "Until we finish the science, that part is still science fiction," Bruno says. "But that's the hope, right?"

（出典 Your Beautiful Brain by Bill Retherford, Columbia Magazine, Winter 2016.（一部改変））

（注） swallow, うのみにする； strudel, シュトルーデル（菓子の一種）；
innate, 生来の； craving, 欲求； spout,（水差しの）飲み口；
shudder, 身を震わせる； slurp, 音を立てて飲む；
inference, 推論で得られる結果； rein in, 抑える； anorexia, 拒食症；
CUMC = the Columbia University Medical Center； lateralize, 大脳の（左右いずれかの）片側優位下にする；
tantalizing, 興味をかき立てる； intermingle, 入り混じる；
provocative, 興味をひく； psychiatric, 精神疾患の；
schizophrenia, 統合失調症； dysfunctional, 機能障害の

問1 次の1～3（ 38 ～ 40 ）の質問の答えとして最も適当なものを、それぞれ下の①～④のうちから1つずつ選べ。

1. Which is NOT true about "taste neurons"? 38

① Taste neurons not only receive taste signals but also send signals to take action.

② Which group of taste neurons processes which taste is not fixed.

③ The taste neurons in mice work in the same way as those in human

④ The way thirst neurons respond to thirst is similar to the way taste neurons respond to taste.

2. Why was the entire scientific community astonished by the results of the study Bruno and his team conducted in 2013? 39

① Because the reptile in the experiment functioned normally despite its brain being disabled.

② Because the mouse in the experiment was able to figure out the outside world without the upper cortex functioning.

③ Because the mouse was unable to move after its upper cortex was shut off.

④ Because the study proved that the deeper cortex of the mouse transmits its sensory data to the upper cortex, and vice versa.

3. Which is NOT true? 40

① Both Charles Zuker and Randy Bruno are hopeful that their research will lead to medical breakthroughs.

② Both Charles Zuker's and Randy Bruno's research concern how the brain functions.

③ Both Charles Zuker's and Randy Bruno's research refuted long-held scientific theories.

④ Both Charles Zuker and Randy Bruno have found an effective cure for serious medical problems.

4. Randy Bruno wonders if 44 .

① some neuronal networks in the upper cortex in schizophrenics' brains are at fault

② the neuronal networks of the upper layers in psychiatric patients' brains are unusually large

③ disconnection between the upper layers and the deeper layers prevents psychiatric patients from making decisions

④ the biological defect in psychiatric patients can be treated with drugs if it is limited to a small area

5. According to the passage, we now know 45 .

① the exact locations of the taste and thirst neurons in the human brai

② that the deeper layers of the cortex are not controlled by the upper layers of the cortex

③ the reason why mammals developed the upper layers of the cerebral cortex

④ the reason why the upper cortex and the deeper cortex have different roles

問2 本文の内容に合うように、次の1～5の文の 41 ～ 45 に入れるのに最も適当なものを、それぞれ下の①～④のうちから1つずつ選べ。

1. When Charles Zuker says "There's no taste map," he means 41 .

① our tongue cannot be divided according to the distribution of taste bu

② researchers haven't identified the distribution of taste cells yet

③ our tongue perceives sweet at the sides and salty at the front

④ each taste cell detects all kinds of tastes

2. According to Zuker, 42 .

① applications of his research to humans will call for ethical guidelines

② the data collected in his lab will certainly lead to surgical treatment of obesity and diabetes

③ his research has the potential for developing medicines which can control appetite

④ three hundred thousand Americans die from heart disease every year

3. According to Randy Bruno, 43 .

① the "left brain–right brain" framework is completely false

② the upper layers of the cerebral cortex depend on instinct to make cl

③ some functions of the brain are lateralized while others are not

④ the upper layer of the brain performs analytical functions, while the lower layer performs creative functions