2016(平成28)年度　環境情報学部　一般入学試験問題　訂正

教科・科目	ページ	設問	誤	→	正
数学 または 情報 （数学）	3	Ⅰ	1行目　問題冒頭部分 数学－Ⅰ	→	数学－Ⅰ 以下の設問ではボールを取り出しても確率 α は変化しないものとする。
数学 および 外国語 （数学）	17	Ⅲ	1行目　問題冒頭部分 Ⅲ	→	Ⅲ 以下の設問ではボールを取り出しても確率 α は変化しないものとする。
外国語	20	英語 Ⅲ	第16段落 [77]　(1. dividing and conquering　3. ducking and covering　3. twisting and turning).	→	第16段落 [77]　(1. dividing and conquering　2. ducking and covering　3. twisting and turning).

I.　次の文章に関して、空欄補充問題と読解問題の二つがあります。まず、[1]から[10]の空所を埋めるのに、文脈的に最も適切な語を 1 から 3 の中から選び、その番号を解答欄（1）から（10）にマークしなさい。次に、内容に関する[11]から[15]の設問には、1 から 4 の選択肢が付されています。そのうち、文章の内容からみて最も適切なものを選び、その番号を解答欄（11）から（15）にマークしなさい。

1 Rosie, C-3PO, HAL, WALL-E, Bender, Optimus, Asimo. We have envisioned building humanoid machines with the ability to walk, talk and think like us—or better than us—since long before the creation of the microchip.

2 But here's the thing—humanoid robots are never going to happen. To understand why, you have to understand the shape of the technical problems and compare them to market [1](1. caps 2. forces 3. locations).

3 First, the mechanics of the human body are spectacularly complex. Sure, we have built machines [2](1. for 2. on 3. with) arms and legs, but we are a long way from having a unified platform that can walk the Earth with the [3](1. demonstrability 2. integrity 3. dexterity) and reliability of a human.

4 Second, we need major advancements in input/output software. Anyone who's gotten into an argument with his smartphone can well understand how far we are from having a dependable [4](1. conversation 2. debate 3. lecture) with a machine. It's amusing, if frustrating, to ask one's phone to "Send Jenn a text" and hear it reply, "What song would you like me to play?" Speaker-independent, open-ended speech [5](1. breakdown 2. recognition 3. recording) with better than 99 percent reliability isn't part of our near future.

5 Third, artificial intelligence is the biggest software challenge in the universe. The human brain's ability to process information and learn and make decisions is something we can barely understand, [6](1. let alone 2. never to 3. only to) reproduce. Reproducing human thought in a controlled situation—like the game of chess—is barely within our grasp. Software that enables machines to act like us, which requires them to think like us, isn't something we'll be able to develop for generations, if ever.

6 So all we have to do to build a humanoid robot is build a machine to replicate the human form. Then solve the input/output problem so we always understand each other. And finally, replicate the thought process of the human brain. Any one of those three tasks is [7](1. frequently 2. nearly 3. undeniably) impossible. The combination of all three represents one of the greatest technical challenges known to man.

7 However, it's not just the scale of the technical challenge that makes a humanoid robotic future impossible; it's the intersection of those three challenges with simple economics.

8 A humanoid robot would be a multipurpose [8](1. pedestal 2. platform 3. stage) that could do almost anything. It could do things like get a drink from the fridge or a newspaper from the front door. But those are sub-$20 problems—meaning realistically you wouldn't pay $20 for someone to solve those problems for you. That same humanoid robot could do more useful things like vacuum your house or [9](1. grow 2. replace 3. soothe) your baby or drive your car. Those things are worth more than $20 and we already use robots to solve those problems—they just aren't humanoid.

9 You can pay $400 for a robot that vacuums your house. For around $250 you can buy an infant seat to rock your baby. When buying a new car you can select robotic options on the fringe of self-driving technology, like lane departure warning and collision avoidance and dynamic cruise control.

10 The point is, we don't need to build a humanoid robot to do these things. We can build the robots into the things themselves.

11 The idea that we'll have robots in the future to assist in daily tasks isn't wrong. The idea that we need a multipurpose humanoid robot is. As costs continue to [10](1. increase 2. decline 3. soar) and technology continues to advance, we'll be able to make lots of special-purpose robots to solve real consumer problems. There's just no need to make them humanoid.

—Based on Daley, R. (January 2015). The robots are coming—Aren't they? *TechCrunch*.

[11] In the 1st paragraph, why does the author make a list of robots?

1. To show people's fascination with humanlike robots over many years.
2. To show the great diversity of opinion about robots in society.
3. To set up the target at which modern robotics is aiming.
4. To represent both the good and bad prospects of robots.

[12] In the 4th paragraph, what is the purpose of mentioning arguing with phones?

1. To demonstrate how much fun robots can be.
2. To show that effective artificial intelligence is many years away.
3. As an example of the great strides forward we have made in robotics.
4. As a cautionary tale of the dangers of giving machines the power to think.

[13] What is a "sub-$20 problem," as mentioned in the 8th paragraph?

1. Problems of a domestic variety, such as raising children, and cleaning homes.
2. Problems for which very cheap humanoid robots may one day be developed.
3. Problems which people frequently spend around 20 dollars to solve.
4. Problems that people don't mind solving for themselves.

[14] What is true about the author's opinion of robots?

1. Robot development is a waste of time, money, and effort.
2. Robots are useful, but not in the form traditionally imagined.
3. Within a few generations, robots may look and act like people.
4. None of the things that robots can do are actually needed or wanted.

[15] Which of the following is ***NOT*** a reason to doubt the development of humanoid robots?

1. The complicated nature of human bodies.
2. Limitations in technology.
3. Lack of public interest.
4. Financial restrictions.

II.　次の文章に関して、空欄補充問題と読解問題の二つがあります。まず、[16]から[25]の空所を埋めるのに、文脈的に最も適切な語を 1 から 3 の中から選び、その番号を解答欄 (16) から (25) にマークしなさい。次に、内容に関する[26]から[30]の設問には、1 から 4 の選択肢が付されています。そのうち、文章の内容からみて最も適切なものを選び、その番号を解答欄 (26) から (30) にマークしなさい。

1 A nanoparticle is one billionth of a metre; it might be hard to appreciate how small that is, but Australian virtual nanoscientist Amanda Barnard understands this "invisible" world. So it's no [16](1. excuse 2. doubt 3. wonder) that today the Foresight Institute announced Amanda as this year's awardee of the prestigious 2014 Feynman Prize for Nanotechnology Theory—it's like the Nobel Prize of the nanoscience world. Not only is Amanda the first Australian in the Prize's 22-year history to win the award, she's also the first woman, shining a much-needed spotlight on the achievements of women in science. The award is named after Richard Feynman, a renowned physicist and Nobel Prize winner from last century: the father of quantum electrodynamics.

2 Amanda's award winning work required the use of powerful supercomputers to make the [17](1. least 2. most 3. whole) of decades of big data on tiny nanoscience, gaining insights that might one day lead to extraordinary, life-changing products. We're thinking: self-cleaning surfaces, fuel cells for harnessing energy, printable inks that conduct electricity, and new drugs to cure life-threatening illnesses. These are just some of the incredible possibilities.

3 Just a few years ago, Amanda made a fundamental discovery on diamond nanoparticles, finding that they have unique electrostatic properties that make them spontaneously arrange into very useful structures, with huge implications for improving healthcare.

4 Already, her diamond discovery has [18](1. underpinned 2. understood 3. undertaken) the development of a potentially life-saving chemotherapy treatment that targets brain tumours, created by the University of California.

5 Among her other research highlights, Amanda developed a new technique for investigating the shape of nanomaterials including their size, temperature or potential uses in chemistry. This means we can [19](1. tailor 2. dress 3. sew) them to make custom-made nanoparticles targeted to specific application areas.

6 Before Amanda [20](1. sends 2. sets 3. stands) off for California next month to pick up her award, she shared with us some more insights about her work at the nanoscale.

7 ***What do you enjoy most about your job?***

8 I enjoy our current move into big data. Going into big data-sets to identify trends between nano properties and structures is like finding buried treasure. It's exciting when you can see the forest for the [21](1. birds 2. grass 3. trees) and get a moment of clarity when all the data collects. Those moments are really interesting and I look forward to having more of them. I also love that science is reinventing itself all the time. It never becomes complacent and will always be exciting as it continually [22](1. devolves 2. evolves 3. revolves). One finding always leads to another question.

9 ***How does your work impact on product design and development?***

10 I use statistics to determine how well certain tiny material structures will perform under specific conditions. By predicting how imperfections at a molecular level impact on performance, we can design products with less [23](1. adaptability to 2. responsibility for 3. susceptibility to) faults from the outset. We can also design "molecular machines" that can perform more familiar tasks, like cogs in a watch; they are an [24](1. integral 2. interpreted 3. interested) component that can enhance or improve products.

11 ***What would you say has been the highlight of your career so far?***

12 This prize is definitely a career highlight and I'm thrilled! This would have to be up there as a career highlight for anybody working in nanotechnology.

13 ***What is the biggest challenge you're grappling with at the moment?***

14 Implementing our science on the cloud is the biggest technical challenge for us at the moment. The data is so big and the skillset is so new and so specific. The cloud would provide easy open access to results amongst our research peers and we need to do this to collaborate and make the most of all the research data that's available.

15 ***Where would you like to see your research /science go or lead to in future?***

16 I don't want to know. I hope I'm not able to predict where science goes, [25](1. nevertheless 2. otherwise 3. rather), I want to be surprised by where it takes us next, and enjoy the ride.

—Based on Hawley, J. (April 2015). Nanotech prize: No small win for Australia and women in science. *News @ CSIRO.*

[26] Based on the information in the article, which of the following is the most likely product to result from Amanda Barnard's research?

1. More cost-effective cloud computing.
2. A bathtub that doesn't need washing.
3. Cures for conditions such as colds, hay fever, and headaches.
4. Batteries that never need replacing or recharging.

[27] What is meant by "buried treasure" in the 8th paragraph?

1. Awards and accolades, such as the Nobel and Feynman prizes.
2. Curing harmful diseases and improving product effectiveness.
3. Hard-to-find meaning in large amounts of information.
4. Working with colleagues through the cloud.

[28] Which of the following is ***NOT*** true according to the article?

1. Amanda Barnard loves science because it is predictable.
2. Cloud computing is important, but poses specific problems.
3. In the past, the size of data-sets made making discoveries difficult.
4. Medical advances have already been made due to nanoparticle research.

[29] The tone of this article can be said to be

1. humorous and dismissive.
2. optimistic and laudatory.
3. pessimistic and critical.
4. dry and technical.

[30] "Molecular machines," mentioned in the 10th paragraph, can be compared to

1. simple but important parts of complex mechanisms.
2. supercomputers that can sift through enormous amounts of data.
3. design programs that improve product durability and functionality.
4. quality inspectors that automatically identify material imperfections.

III. 次の文章に関して、空欄補充問題と読解問題の二つがあります。まず、[61]から[80]の空所を埋めるのに、文脈的に最も適切な語を 1 から 3 の中から選び、その番号を解答欄（61）から（80）にマークしなさい。次に、内容に関する[81]から[90]の設問には、1 から 4 の選択肢が付されています。そのうち、文章の内容からみて最も適切なものを選び、その番号を解答欄（81）から（90）にマークしなさい。

1 Science has a poor track record when it comes to comparing our brains to the technology of the day. Descartes thought that the brain was a kind of hydraulic pump, propelling the spirits of the nervous system through the body. Freud compared the brain to a steam engine. The neuroscientist Karl Pribram likened it to a holographic storage device.

2 Many neuroscientists today would add to this list of failed comparisons the idea that the brain is a computer—just another [61](1. analogy 2. promise 3. technology) without a lot of substance. Some of them actively deny that there is much that is useful in the idea; most simply ignore it.

3 Often, when scientists resist the idea of the brain as a computer, they have a particular target in mind, which you might call the serial, stored-program machine. Here, a program (or "app") is loaded into a computer's memory, and an algorithm, or recipe, is executed step by step. (Calculate this, then calculate that, then compare what you found in the first step with what you found in the second, etc.) But humans don't download apps to their brains, the [62](1. critics 2. supporters 3. undecided) note, and the brain's nerve cells are too slow and variable to be a good match for the transistors and logic gates that we use in modern computers.

4 If the brain is not a serial algorithm-crunching machine, though, what is it? A lot of neuroscientists are [63](1. afraid 2. inclined 3. reluctant) to disregard the big picture, focusing instead on understanding narrow, measurable phenomena (like the mechanics of how calcium ions are trafficked through a single neuron), without addressing the larger conceptual question of what it is that the brain does.

5 This approach is misguided. Too many scientists have given up on the computer analogy, and far too little has been offered in its place. In my view, the analogy is due for a [64](1. rethink 2. rebuttal 3. reaction).

6 To begin with, all the standard arguments about why the brain might not be a computer are pretty [65](1. long 2. weak 3. strong). Take the argument that "brains are parallel, but computers are serial." Critics are right to note that virtually every time a human does anything, many different parts of the brain are engaged; that's parallel, not serial.

7 But the idea that computers are strictly serial is woefully [66](1. off the record 2. on the way 3. out of date). Ever since desktop computers became popular, there has always been some degree of

parallelism in computers, with several different computations being performed simultaneously, by different components, such as the hard-drive controller and the central processor. And the trend over time in the hardware business has been to make computers more and more parallel, using new approaches like multicore processors and graphics processing units.

8 Skeptics of the computer metaphor also like to argue that "brains are analog, while computers are digital." The idea here is that things that are digital operate only with [67](1. approximate 2. continuous 3. discrete) divisions, as with a digital watch; things that are analog, like an old-fashioned watch, work on a smooth continuum.

9 But just as either format is possible for a watch, either format is possible for a computer, and many "digital" computer switches are built out of analog components and processes. Although virtually all modern computers are digital, most early computers were analog. [68](1. And 2. Otherwise 3. So) we still don't really know whether our brains are analog or digital or some mix of the two.

10 Finally, there is a popular argument that human brains are capable of [69](1. fabricating 2. counteracting 3. generating) emotions, whereas computers are not. But while computers as we know them clearly lack emotions, that fact itself doesn't mean that emotions aren't the product of computation. [70](1. At most 2. On the contrary 3. To that end), neural systems like the amygdala that modulate emotions appear to work in roughly the same way as the rest of the brain does, which is to say that they transmit signals and integrate information, and transform inputs into outputs. As any computer scientist will tell you, that's pretty much what computers do.

11 Of course, whether the brain is a computer is partly a matter of definition. The brain is obviously not a Macintosh or a PC. And we humans may not have operating systems, either. But there are many different ways of building a computer.

12 The real payoff in [71](1. arranging for 2. running from 3. subscribing to) the idea of a brain as a computer would come from using that idea to profitably guide research. In an article last fall in the journal *Science*, two of my colleagues and I endeavored to do just that, suggesting that a particular kind of computer, known as the field programmable gate array (FPGA), might offer [72](1. a final 2. an intermediate 3. a preliminary) starting point for thinking about how the brain works.

13 FPGAs consist of a large number of "logic block" programs that can be configured, and reconfigured, individually, to do a [73](1. deep 2. wide 3. high) range of tasks. One logic block might do arithmetic, another signal processing, and yet another look things up in a table. The

computation of the whole is a function of how the individual parts are configured. Much of the logic can be executed in parallel, much like what happens in a brain.

14 Although my colleagues and I don't [74](1. literally 2. figuratively 3. constantly) think that the brain is an FPGA, our suggestion is that the brain might similarly consist of highly orchestrated sets of fundamental building blocks, such as "computational primitives" for constructing sequences, retrieving information from memory, and routing information between different locations in the brain. Identifying those building blocks, we believe, could be the Rosetta stone that unlocks the brain.

15 To put this differently, it is unlikely that we will ever be able to directly connect the language of neurons and synapses to the [75](1. diversity 2. fantasy 3. regularity) of human behavior, as many neuroscientists seem to hope. The chasm between brains and behavior is just too [76](1. narrow 2. powerful 3. vast).

16 Our best shot may come instead from [77](1. dividing and conquering 3. ducking and covering 3. twisting and turning). Fundamentally, that may involve two steps: (1) finding some way to connect the scientific language of neurons and the scientific language of computational primitives (which would be comparable in computer science to connecting the physics of electrons and the workings of microprocessors), and (2) finding some way to connect the scientific language of computational primitives and that of human behavior (which would be comparable to understanding how computer programs are built out of more basic microprocessor instructions).

17 If neurons are akin to computer hardware, and behaviors are akin to the actions that a computer performs, computation is likely to be the [78](1. book 2. glue 3. pin) that binds the two.

18 There is much that we don't know about brains. But we do know that they aren't [79](1. magical 2. natural 3. systematic). They are just exceptionally complex arrangements of matter. Airplanes may not fly like birds, but they are subject to the same forces of lift and drag. Likewise, there is no reason to think that brains are [80](1. compatible with 2. exempt from 3. subject to) the laws of computation. If the heart is a biological pump, and the nose is a biological filter, the brain is a biological computer, a machine for processing information in lawful, systematic ways.

19 The sooner we can figure out what kind of computer the brain is, the better.

—Based on Marcus, G. (June 2015). Face it, your brain is a computer. *The New York Times*.

[81] Which of the following is the most likely reason that the author begins this article with references to Descartes, Freud, and Pribram?

1. To establish his credibility as an expert in the field of neuroscience.
2. To provide a history of technology metaphors used for the brain.
3. To celebrate the rich imagination of theoreticians on this topic.
4. To gently mock the discredited theories of past theoreticians.

[82] In the 3rd and 4th paragraphs, the author criticizes neuroscientists' rejection of the brain-computer metaphor because it

1. focuses on the broad themes, ignoring the particulars.
2. disregards the overall similarities in favor of technical accuracy.
3. over-emphasizes current trends in the computer industry.
4. overlooks the mechanical similarity of chemical and electrical processes.

[83] Which of the following best represents the author's thoughts on parallel and serial processing in the 6th and 7th paragraphs?

1. Both computers and brains use parallel processing.
2. Both computers and brains use serial processing.
3. Computers employ the use of many parts, whereas the brain uses only one.
4. Brains are made up of many different structures, much like a computer.

[84] Which of the following best represents the author's thoughts on the difference between analog and digital in the 8th and 9th paragraphs?

1. The brain employs both analog and digital information processing.
2. The brain only appears to operate in analog, but is actually digital.
3. Computers only employ digital information processing for specific tasks.
4. The contrast between digital and analog is not as clear as many think.

[85] Which of the following best characterizes the author's thoughts on emotions in the 10th paragraph?

1. Computers could be programmed to display emotions.
2. Emotions are the one feature of brains that computers cannot recreate.
3. In the brain, even emotions appear to be the result of computation.
4. Emotions will arise in any computing system given enough input.

[86] Which of the following best summarizes the author's argument about FPGAs?
1. FPGAs are a misguided metaphor for the brain.
2. FPGAs serve as a useful model for understanding the brain.
3. The human brain was the original model for FPGAs.
4. The human brain is made up of discrete computational components like an FPGA.

[87] Which of the following best defines "computational primitives" as first mentioned in the 14th paragraph?
1. Brain functions passed down from our ancestors.
2. Structures in the brain that perform computations.
3. Similarities between chemical and electrical processes.
4. Basic information-processing operations.

[88] Which of the following pairs of words is closest in relationship to that of airplanes and birds in the analogy given in the 18th paragraph?
1. cameras and eyes
2. ships and horses
3. wires and blood vessels
4. crutches and legs

[89] Which of the following is a ***DIFFERENCE*** between brains and computers cited by the author?
1. The brain is natural; the computer is artificial.
2. The computer is infinitely programmable; the brain is not.
3. The computer requires installed software to work; the brain does not.
4. The brain makes calculations step-by-step; the computer does it all at once.

[90] With which of the following statements would the author most likely agree?
1. Computer components have been designed to closely resemble those of the human brain.
2. Brains are capable of processing information faster than computers.
3. The computational functions of the brain are fundamentally different from those of computers.
4. The similarities between brains and computers are more important than the differences.