

デザイン工学部A方式Ⅱ日程・理工学部A方式Ⅱ日程
生命科学部A方式Ⅱ日程

1 限 英 語 (90分)

〈注意事項〉

1. 試験開始の合図があるまで、問題冊子を開かないこと。
2. 解答はすべて解答用紙に記入しなさい。
3. マークシート解答方法については以下の注意事項を読みなさい。

マークシート解答方法についての注意

マークシート解答では、鉛筆でマークしたものを機械が直接読みとって採点する。したがって解答はHBの黒鉛筆でマークすること(万年筆、ボールペン、シャープペンシルなどを使用しないこと)。

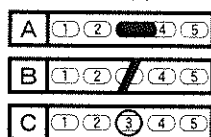
記入上の注意

1. 記入例 解答を3にマークする場合。

(1) 正しいマークの例



(2) 悪いマークの例



枠外にはみださないこと。

○でこまないこと。

2. 解答を訂正する場合は、消しゴムでよく消してから、あらためてマークすること。
3. 解答用紙をよごしたり、折りまげたりしないこと。
4. 問題に指定された数よりも多くマークしないこと。

4. 問題冊子のページを切り離さないこと。

〔 I 〕 いて座の方向にある電波源(Sagittarius A*)の中にはブラックホールがある。
このブラックホールに関するつぎの英文を読み、設問に答えよ。

An international team of researchers has launched an ambitious project to observe a supermassive black hole. Named Sagittarius A*, the region is located at the center of the Milky Way about 26,000 light years from the Earth. It is estimated to have approximately 4 million times the mass of the Sun.

Researchers will try to observe the exact size and shape of Sagittarius A*, or Sgr A*, using an array of radio telescopes located at seven places around the world, including Chile, Hawaii, Mexico, and the Antarctic. If successful in shedding new light on this mysterious region, the project could lead to a ⁽¹⁾ rethink of modern physics.

Scientists theorize that black holes are formed after a star explodes at the end of its life in an event called a supernova. It is impossible to observe a black hole due to its strong gravitational forces, which prevent particles and even light from escaping. A black hole does, however, emit X-rays and radio waves as it absorbs stars and gas around it. A
present, the existence of black holes can only be confirmed by observing these waves. Most other details—such as their shape—are still unknown.

The project brings together researchers from the National Astronomical Observatory of Japan (NAOJ), the University of Tokyo, and the Massachusetts Institute of Technology in the U.S. The global array—which includes the ALMA telescope in Chile, operated by Japan, the U.S., and Europe—essentially forms one huge telescope focused B Sgr A*. To get an idea of just how powerful the array is, think of a parabolic antenna ⁽²⁾ with a radius of 4,500 km. Data from the array will be collected into a supercomputer to produce high-resolution images of Sgr A*.

The Subaru Telescope in Hawaii, operated by the NAOJ, is one of the

world's most powerful optical telescopes. However, in terms of resolution, even this monster is dwarfed by the new array.⁽³⁾ According to project members, images will have about 1,000 times the resolution of those captured by the Subaru Telescope, making it possible to see an object the size of a compact disc on the Moon.

Sgr A* emits radio waves when it absorbs gas and dust around it. If the project goes C planned, researchers will be able to obtain images of the black hole surrounded by the gas-dust mixture. "We want to capture an actual image of a black hole," said NAOJ professor Mareki Honma, who heads the Japanese team.

The project is scheduled to run through 2018 and beyond, with improvements in resolution expected along the way. Huge black holes are thought to exist at the centers of some galaxies, but scientists are still unsure how they form. The Sgr A* project hopes to solve this mystery. Researchers also want to discover how black holes are related D the birth of galaxies.

The German physicist Karl Schwarzschild predicted the existence of black holes a century ago based E Albert Einstein's general theory of relativity. This project could help confirm Einstein's theory, or perhaps unexpectedly reveal something that could shake the foundations of modern science.⁽⁴⁾

問1 図はブラックホール概念を示している。ブラックホールに関する現象や物について、本文の説明に即して以下の設問に答えよ。ただし、同じ選択肢を二度使用してはならない。

- (1) Xの方向に進む現象や物をイ～ヌから二つ選び、その記号を解答用紙にマークせよ。
- (2) Yの方向に進む現象や物をイ～ヌから三つ選び、その記号を解答用紙にマークせよ。
- (3) ブラックホール内部Zにとどまる現象や物をイ～ヌから二つ選び、その記号を解答用紙にマークせよ。

- | | | |
|---------------|-------------|------------------------|
| イ radio waves | ロ gas | ハ light |
| ニ the Moon | ホ galaxies | ヘ gravitational forces |
| ト X-rays | チ particles | リ dust |
| ヌ stars | | |

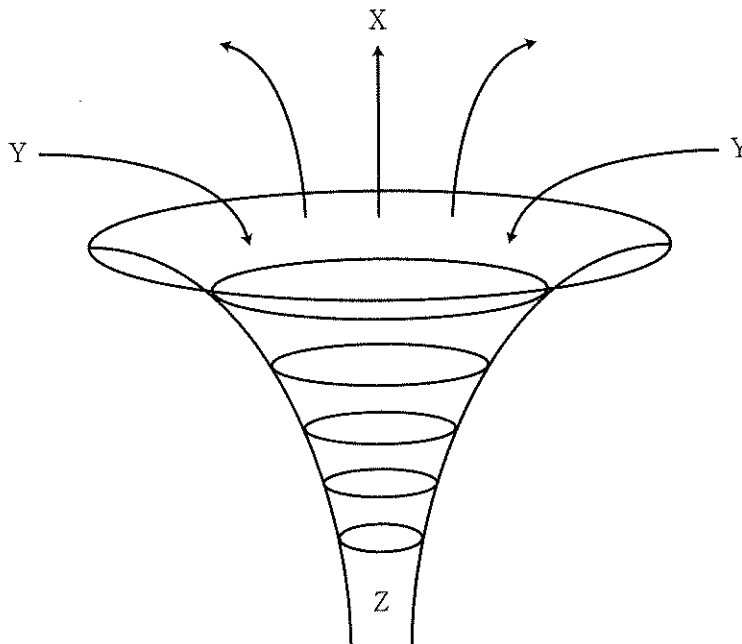


図 ブラックホール概念

問2 空欄 ～ に入る最も適切な語をそれぞれイ～トから一つ選び、その記号をマークせよ。同じ選択肢を二度以上使用してもかまわない。

- | | | | |
|----------|------|------|------|
| イ before | ロ as | ハ of | ニ at |
| ホ from | ヘ to | ト on | |

問3 下線部(1)“shedding new light on this mysterious region”の言い換えとして最も適切なものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ scheduling the project to run through 2018 and beyond
- ロ collecting data into a supercomputer
- ハ obtaining images of the black hole
- ニ confirming Einstein’s general theory of relativity

問4 下線部(2)“a parabolic antenna with a radius of 4,500 km”について最も適切な英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The parabolic antenna is operated by the countries within a radius of 4,500 km from Japan.
- ロ The project has built a parabolic antenna with a radius of 4,500 km.
- ハ The parabolic antenna replaces the radio telescopes located 4,500 km away from Japan.
- ニ The array of radio telescopes is equivalent to a parabolic antenna with a radius of 4,500 km.

問5 下線部(3) “in terms of resolution, even this monster is dwarfed by the new array” の意味として最も適切な英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The Subaru Telescope can see an object the size of a compact disc on the Moon.
- ロ An antenna should be added to the Subaru Telescope to improve the resolution.
- ハ The Subaru Telescope is much weaker than the array of radio telescopes.
- ニ The array of radio telescopes is as powerful as the Subaru Telescope.

問6 下線部(4) “shake the foundations of modern science” の言い換えとして最も適切なものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ force a rethinking of modern physics
- ロ lead to observing X-rays and radio waves
- ハ make Schwarzschild famous
- ニ establish the basis of modern science

- 〔Ⅱ〕 (1)~(7)の英文はそれぞれ、下の浮世絵版画について説明したものである。文中の空欄に入る語(句)として最も適切なものを選択肢イ~ニから一つ選び、その記号を解答用紙にマークせよ。



- (1) A mountain is drawn in the part of the image.
 イ lower right-hand □ lower left-hand
 ハ lower right-foot ニ upright
- (2) The great wave dominates the of the print.
 イ leftover □ left hand ハ left corner ニ left half
- (3) Both the wave at the front and the mountain at the back have a similar .
 イ inverted V-shape □ rectangular shape
 ハ W-shape ニ table-like shape

(4) The mountain is painted smaller than the waves. This method, called , gives a three-dimensional effect to the picture.

- イ illusion drawing □ perspective drawing
ハ optical drawing ニ fine drawing

(5) The dynamic waves show a strong with the static mountain.

- イ constancy □ comparison ハ confusion ニ contrast

(6) The picture is wider than it is high, in order to capture a wider view of the scene. This kind of picture is called a .

- イ portrait □ bird's-eye view
ハ landscape ニ still image

(7) To create *ukiyo-e* woodcut prints, carve an image onto woodblocks, cover it in ink, and then press it on a sheet of paper.

- イ upside-down □ in reverse
ハ wrong side up ニ inside out

〔Ⅲ〕 人工知能(artificial intelligence)に関するつぎの英文を読み、設問に答えよ。

Artificial intelligence has a new job: setting a good example for your kids. It seems that children's behavior can be influenced by the personality of a robot companion—playing with an enthusiastic robot, for instance, makes children engage more and work harder.

Researchers ran a series of experiments with Tega, a companion robot. To test how the robot's personality could affect the children's behavior, they programmed the robot with different responses. "The goal is to have a companion that has all of the behaviors that we want to teach and promote in the child," says one of the team members.

Forty children played a puzzle game against Tega. With half the children, the robot had a neutral personality, meaning that when it won it said something like "I solved the puzzle," and when it lost it said something like "That was hard." With the other half of the group, Tega had more of a can-do attitude. When it won, it might say "That was hard, but I tried my best and nailed it," and when it lost it might say to the child "You worked hard and succeeded!"

The differences in the robot's personality were subtle, but the effect it had on the children's reactions was not. "We found that the children in the second group tried much harder, and when they lost they were far more determined to win—they had guts," says Hae Won Park at the Massachusetts Institute of Technology, who led the research.

The researchers also did research with Tega as a storytelling partner. First, they observed 18 children telling stories in pairs and identified the characteristics they displayed most often when enthusiastic. "We found that children really lean in and gaze at their partner when they're engaged with a story. Adults don't really do this, but for children it's really important," says Park.

Children then told a story to two identical Tega robots placed next to each other. One was programmed to listen like a child—leaning forward, nodding and smiling, and reacting more when the storyteller was more energetic—while the other listened in a more reserved way. In surveys, the children said they thought the childlike Tega was more enthusiastic and they preferred telling it stories.⁽⁴⁾

This was also evident in their behavior. “When children sense enthusiasm, they tell longer stories with more complex narratives, and their vocabulary improves faster,” says Park.

Storytelling is important for child development, so it is exciting if a robot can encourage that, says Liz Pellicano at the Institute for Education, London. “We need to be careful though,” she says. “Not every child is the same, so in the future it would be good if the robots could tailor their behaviors to each child as well.”⁽⁵⁾

We can’t know yet what impact a robot’s personality has on a child’s attitude to learning in the long term, says Park. The current findings could be partly because of a “novelty effect” from children first encountering this sort of robot. The team plans to explore longer-term effects in the future, and will present their work so far at a conference on human-robot interaction in Vienna in March.

問1 文脈に照らして下線部(1)~(5)に最も近い意味の語(句)をそれぞれイ~ニから一つ選び、その記号を解答用紙にマークせよ。

(1) ran

イ reported □ performed ハ designed ニ found

(2) can-do

イ relaxed □ brave ハ popular ニ positive

(3) nailed it

イ tricked it □ fixed it ハ caught it ニ did it

(4) reserved

イ quiet □ common
ハ polite ニ reasonable

(5) tailor

イ report □ explain ハ match ニ send

問2 下線部(a)“the effect it had on the children’s reactions was not”の意味として最も適切な英文をイ~ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The puzzle greatly influenced the children’s responses.
- The puzzle slightly influenced the children’s responses.
- ハ Tega’s personality greatly influenced the children’s responses.
- ニ Tega’s personality slightly influenced the children’s responses.

問3 下線部(b)“Adults don't really do this”の意味として最も適切な英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Adults don't express their interest using body language while they are listening to a story.
- ロ Adults don't like to exchange opinions with children after they finish listening to a story.
- ハ Adults don't feel like playing a puzzle game with Tega when it wins against a child.
- ニ Adults don't feel comfortable when they are seen playing puzzle games with Tega.

問4 本文に出てくる一つ目の実験“playing puzzle games”について、述べられていることと一致する英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The experiment examined how children can improve their puzzle game playing skills.
- ロ Forty children were divided into two groups, and then played puzzle games in smaller groups.
- ハ When children played the games with a more enthusiastic robot, they tried harder to solve the puzzles.
- ニ When children played puzzle games with adults, they seldom won and got discouraged.

問5 本文に出てくる二つ目の実験“telling stories”について、述べられていることと一致する英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The experiment investigated whether Tega could learn mathematics or not.
- ロ Children got more interested in artificial intelligence when Tega displayed enthusiasm.
- ハ Tega can learn more words and grammar from children as it understands them better.
- ニ Tega’s positive reactions toward children enable them to develop their oral language skills.

問6 本文中の二人の研究者が考える今後の課題について、(1)、(2)の空欄に入る最も適切なものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

(1) Pellicano is wondering whether we can .

- イ improve Tega to behave in a positive way consistently
- ロ develop Tega to help adults acquire skills
- ハ customize Tega to adapt to each child
- ニ educate Tega to win more games against children

(2) Park is wondering whether the positive effect of this kind of robot on children will .

- イ last for a long time
- ロ help them grow quickly
- ハ work on adults
- ニ be adaptable to a new type of robot

〔IV〕 つぎの設問に答えよ。

問1 (1)～(5)において、下線部の発音が他の三つと異なる語をそれぞれイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- | | |
|------------------------|----------------------|
| (1) イ <u>b</u> udget | □ <u>c</u> ustom |
| ハ <u>s</u> tructure | ニ <u>p</u> ollution |
| (2) イ <u>c</u> risis | □ <u>cl</u> ient |
| ハ <u>c</u> ivil | ニ <u>co</u> mbine |
| (3) イ <u>ch</u> ase | □ <u>ch</u> aracter |
| ハ <u>ch</u> arge | ニ <u>ch</u> allenge |
| (4) イ <u>r</u> esource | □ <u>oc</u> casional |
| ハ <u>m</u> easure | ニ <u>vi</u> sion |
| (5) イ <u>s</u> mooth | □ <u>th</u> irsty |
| ハ <u>t</u> heory | ニ <u>br</u> each |

問2 (1)～(5)において、最も強いアクセントのある位置が他の三つと異なる語をそれぞれイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- | | |
|-----------------------|-------------------|
| (1) イ suc-cess | □ pur-chase |
| ハ de-lay | ニ ad-vice |
| (2) イ se-cure | □ con-vince |
| ハ pro-tein | ニ re-spect |
| (3) イ crit-i-cize | □ choc-o-late |
| ハ op-er-ate | ニ in-ter-pret |
| (4) イ spe-cif-ic | □ ac-cu-rate |
| ハ op-po-nent | ニ ge-net-ic |
| (5) イ con-se-quent-ly | □ ar-chi-tec-ture |
| ハ in-ter-est-ing | ニ in-de-pend-ent |

問3 (1)~(7)において、それぞれ下の語(句)を並べかえて空所を補い、最も適切な文を完成させよ。解答は2番目と4番目に入るもののみをイ~ホから選び、その記号を解答用紙にそれぞれマークせよ。

(1) My brother is 190 cm tall. His height 2 4 in the crowd.

イ him □ it ハ makes ニ to find ホ easy

(2) I'm sorry 2 4 so long.

Someone came to talk to me when I was about to leave my office.

イ you □ to ハ kept

ニ waiting ホ have

(3) Both Gracie and I like British movies a lot. I 2 4 about them.

イ without □ cannot ハ meet

ニ talking ホ her

(4) He cares about 2 4 .

イ what □ him ハ think ニ of ホ others

(5) Further discussion 2 4 .

イ the lunch break □ after ハ postponed

ニ until ホ was

(6) I hope this book 2 4 you.

イ be □ of ハ to

ニ will ホ some use

(7) What 2 4 your mind so suddenly?

イ change □ has ハ to

ニ caused ホ you

[V] つぎの英文は、物理学者 Albert Einstein の日本訪問(1922年)と、その2年後に起きた、Yasusaburo Sakaki という人物が関わった事件を描いたものである。これを読み、設問に答えよ。

In December 1922, upon the invitation of a Tokyo-based publisher, the world-famous physicist Albert Einstein and his wife stepped off a ship in the port of Yokohama. People A: excite to see the new Nobel Prize winner, and the world's top physicist attracted Japanese people with his general friendliness. Intellectuals who met Einstein also had positive feelings toward him. For example, a famous author of children's books described him as a "tender poet one would remember with nostalgia." Even people who were suspicious of scientists were won over by Einstein's extraordinary career and charming looks. A female journalist described Einstein's appearance as follows: "I used to think that all scientists were narrow-minded and serious, but Professor Einstein's impressive eyes completely changed my view." Moreover, the common people were so eager for anything about Einstein that at times it shocked Einstein himself. It was reported that he even professed that "meaningless respect is like a loveless relationship."^(a)

In short, Einstein's visit did not promote the essence of his theory of relativity, but rather the image of scientists as "lovable" and at times even "holy" or above reality. Although many Japanese audiences tried to make sense of Einstein's work, their enthusiasm yielded little progress in deepening understanding of his theory, physics, or science in general. Einstein's scholarship was so sophisticated that sometimes even other physicists could not understand parts of his lectures. Still, newspapers widely reported Einstein enjoying his stay in Japan—including a backstage visit at a *kabuki* theater and a party with geisha—and it turned people's attention away from the intellectual gap.^(b) This "Einstein boom" reached the

point where university officials in Fukuoka preserved the blackboard on which Einstein had written something quickly during a lecture and forgotten to erase it.

In this way, Einstein's visit strengthened the popular idea that science was a positive force, even if it was too difficult for ordinary people to understand. It also spread the idea that scientists are intellectually and even morally superior people, even though they may appear unusual.

Thus, science became something for the general public X. This image of science created a potentially dangerous situation; the enthusiasm for anything scientific grew into overconfidence in scientists and their methods, and caused a scandal B: surround medical practice. In 1924, two years after Einstein's visit to Japan, Yasusaburo Sakaki, a professor of psychology at Kyushu Imperial University, announced that he had found the ingredients for a sort of *elixir vitae*—a medicine believed to cure illnesses or make people live forever. Sakaki claimed that he could make patients young again by stimulating their ⁽³⁾thyroid gland*. He also claimed that he had succeeded in making patients' gray hair turn black and giving their skin a healthy color. The newspapers covered this discovery sensationally, and the general public went crazy about the prospect of remaining young forever. While other, more thoughtful scholars questioned the validity of his claims, Sakaki continued his experiments. He even tried to obtain government funding to establish a national research institute for the prevention of aging.

Although many of his claims were questionable at best, Sakaki was a trained doctor. He was respected as the head of the psychology department at the university. He was married to the sister of the emperor's doctor. After he graduated from the Medical School at Tokyo Imperial University, he spent three years in Germany as a government-funded student, and became acquainted with Einstein. For music lovers, he was known as the ⁽⁴⁾professor who founded the first Western-style orchestra in Japan. In his

desire to find an *elixir vitae*, however, Sakaki hardly appeared to be the elite doctor he actually was.^(c)

The strange case of the *elixir vitae* ended when he and two of his colleagues were arrested for selling their services in an unofficial capacity.⁽⁵⁾ The three resigned from the university, but the investigation revealed that a considerable number of other medical professionals were willing to offer similarly questionable services to anyone willing to pay for them. The fact that Sakaki's totally senseless claims became popular illustrates the faith of contemporary society in the unlimited power of science. It also reveals the dishonesty of certain scientists who were eager to exploit such confidence.^(d) In short, the *elixir vitae* scandal made visible the problem of popular ignorance about science and the danger of scientific advancement unchecked by morals.

語注*

* thyroid gland: 甲状腺。首の付け根にある器官で、成長に関与するホルモンを分泌する。

問1 A: excite , B: surround について、本文中で最も適切な形をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

A: excite

イ excited

ロ were exciting

ハ were excited

ニ had been exciting

B: surround

イ surrounded

ロ surrounding

ハ surrounded

ニ being surrounded

問2 文脈に照らして、下線部(1)~(5)に最も近い意味の語(句)をイ~ニから一つ選び、その記号を解答用紙にマークせよ。

(1) won over

イ entertained

□ defeated

ハ blamed

ニ impressed

(2) yielded

イ achieved

□ sacrificed

ハ detailed

ニ sought

(3) claimed

イ argued

□ complained

ハ worried

ニ suspected

(4) became acquainted with

イ grew harsh on

□ got used to

ハ turned away from

ニ came to know

(5) capacity

イ shop

□ role

ハ quantity

ニ ability

問3 下線部(a)“meaningless respect is like a loveless relationship”の意味として最も適切な英文をイ~ニから一つ選び、その記号を解答用紙にマークせよ。

イ Japanese people respected Einstein only because of his fame.

□ Japanese people pretended to like Einstein.

ハ Japanese people did not show respect to their husbands and wives.

ニ Japanese people should have been more welcoming.

問4 下線部(b)“the intellectual gap”の説明として最も適切な英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Einstein’s lectures were more difficult for ordinary Japanese people than for Japanese physicists.
- ロ Einstein seemed less intelligent when he was enjoying Japanese culture.
- ハ Einstein knew more about Japanese culture than ordinary Japanese people did.
- ニ Japanese people could not understand Einstein’s theory.

問5 本文中の空欄 に入る最も適切なものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ not to believe but to understand
- ロ not to understand but to believe
- ハ not only to believe but also to understand
- ニ neither to believe nor to understand

問6 下線部(c)“Sakaki hardly appeared to be the elite doctor he actually was”の意味として最も適切な英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Sakaki was looked up to as an able doctor throughout his life.
- ロ Sakaki was believed to be a trained doctor, but it was revealed that he was not.
- ハ Sakaki was a respected doctor, but he did not act like one during the scandal.
- ニ Sakaki made great efforts to make up for his disadvantaged background.

問7 下線部(d) “the dishonesty of certain scientists who were eager to exploit such confidence” の意味として最も適切な英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Sakaki and his fellow doctors continued their experiments despite opposition.
- ロ Sakaki and some other doctors paid little attention to the impact of their research.
- ハ Some doctors took advantage of enthusiasm for science.
- ニ Some physicists pretended to the public that they understood Einstein's theory.

問8 Einstein の来日と Sakaki が関わった事件の共通点として、本文で述べられていることと一致する英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The reactions of ordinary people revealed the necessity to understand science.
- ロ Ordinary people were more concerned about making money than scientific achievements.
- ハ Einstein and Sakaki kept high moral standards as scientists.
- ニ Einstein and Sakaki had their reputations damaged by a single scandal.



