

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)。

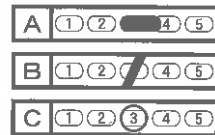
記入上の注意

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

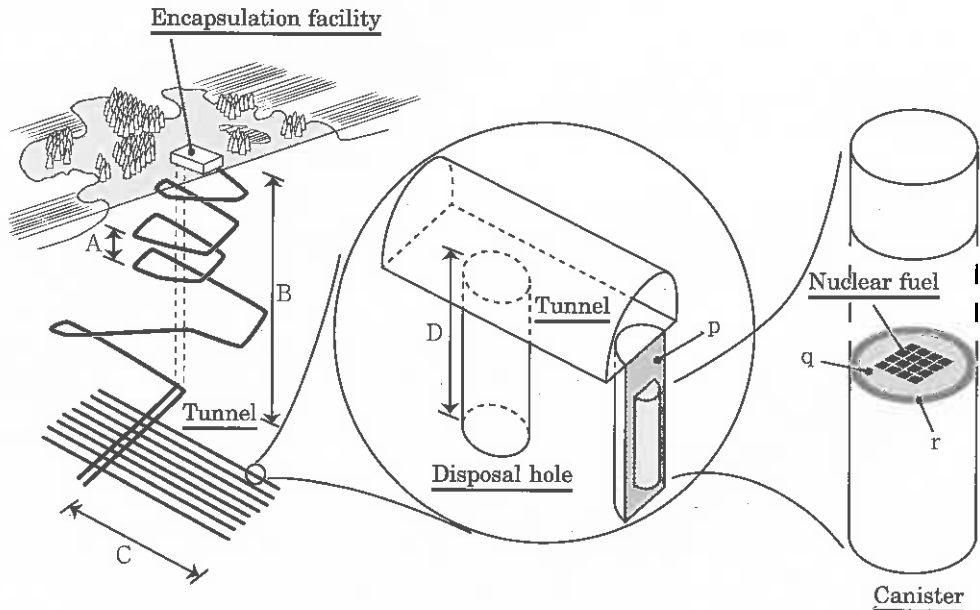


枠外にはみださないこと。

○でかこまないこと。

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。

〔 I 〕 放射性廃棄物の処理場に関するつぎの英文を図を参照しながら読み，設問に答えよ。



図：放射性廃棄物処理場

Stuck with Thousands of Tons of Old Radioactive Material?

Bury it underground, says the Finnish government. It has just approved a three-billion-euro project to do just that—after more than 30 years of planning. “That budget covers the operating time of about 100 years,” says Erkki Palonen, senior vice president at Posiva, the firm constructing the repository*1.

The island of Olkiluoto is the preferred site thanks to a mixture of hard rock and willingness from the local community. Tunnels will be drilled into rock at a depth of about half a kilometer, and spent nuclear fuel will be placed into copper canisters with 5-cm thick walls at a special above-ground encapsulation facility. The canisters will be filled with argon gas to remove

any internal moisture and then sealed by electron beam welding*². Ultrasound and X-ray scans, among other inspections, will be performed to ensure the canisters are secure. Then they will be transported to the disposal holes along underground tunnels and packed in with bentonite clay. Finally, the holes will be closed with concrete. Once the repository is full, sometime after the year 2120, all tunnels will be closed and the buildings above ground will be removed.

Storing spent nuclear fuel underground is not popular with everyone, given that no one knows whether such a facility will remain safe for thousands of years. And the Swedish Radiation Safety Authority recently published a report suggesting the copper canisters may not be quite as resistant to corrosion*³ as hoped. "Copper was selected because of its non-corrosive characteristics, so it was kind of a surprise," says Palonen. Further studies, he says, are ongoing. Still, he insists that conditions for such corrosion won't be possible at the repository.

語注*

*¹ repository: a storage facility

*² welding: a method of joining two pieces of metal together by heating

*³ corrosion: the gradual destruction of metal by the effect of water, chemicals, etc.

問1 この施設の1年あたりの運営予算をイ～ホから一つ選び、その記号を解答用紙にマークせよ。

イ one million euros

ロ thirty million euros

ハ one hundred million euros

ニ three hundred million euros

ホ three billion euros

問2 この施設で行われる工程の手順に関して、(1)~(3)に入る最もふさわしい組み合わせを下表イ~へから一つ選び、その記号を解答用紙にマークせよ。

(1)



Fill with argon gas



Seal using electron beam welding



(2)



Transport along underground tunnel



(3)



Pack with bentonite clay



Plug with concrete



Dismantle building above ground

	(1)	(2)	(3)
イ	Place inside canister	Set in disposal hole	Check using X-ray
ロ	Check using X-ray	Set in disposal hole	Place inside canister
ハ	Set in disposal hole	Place inside canister	Check using X-ray
ニ	Place inside canister	Check using X-ray	Set in disposal hole
ホ	Check using X-ray	Place inside canister	Set in disposal hole
ヘ	Set in disposal hole	Check using X-ray	Place inside canister

問3 図内のA～Dのうち、値が約500メートルであるものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

イ A ロ B ハ C ニ D

問4 図内のp, qに詰められる物質をイ～ニからそれぞれ一つ選び、その記号を解答用紙にマークせよ。ただし、同じ選択肢を二度使用してはならない。

イ moisture ロ concrete
ハ bentonite clay ニ argon gas

問5 図内のrの厚さに該当する値をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

イ 2 cm ロ 3 cm ハ 5 cm ニ 10 cm

問6 地上の encapsulation facility が撤去される時期をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

イ 約30年後 ロ 約100年後 ハ 約1000年後 ニ 約2000年後

問7 canister の材料として用いられるものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

イ a soft, reddish-brown metal that allows electricity and heat to pass through it easily
ロ a shiny, light grey metal that is used to make jewellery, knives, coins, etc.
ハ a silver-white metal that is very light and is used to make cans, window frames, etc.
ニ a strong metal that can be shaped easily, consisting of iron and carbon

問8 canisterの安全性に関するSwedish Radiation Safety AuthorityとPalonen氏の見解について正しい組み合わせをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

	Swedish Radiation Safety Authority	Palonen 氏
イ	肯定的	肯定的
ロ	肯定的	懐疑的
ハ	懐疑的	肯定的
ニ	懐疑的	懐疑的

〔Ⅱ〕 つぎの英文を読み，設問に答えよ。

It is easy to get trapped into thinking about a problem in one way. Breaking out and being 'imaginative' or original in solving a problem can require a different way of thinking rather than correct methods already learned. Simple problems that require the application of fixed rules in a faultless way can usually be solved by the ^(a)second approach. For example, if someone challenges you to a game of noughts and crosses* you should never lose, regardless A whether you move first or second. There is a strategy whose worst outcome is a draw, but it will give you a win only if your opponent deviates from that strategy.^(b)

However, not all problems are as easy as finding the best move in noughts and crosses. Here is an example of a simple problem whose solution will almost certainly take you by surprise.

Draw a 3-by-3 square of nine dots.

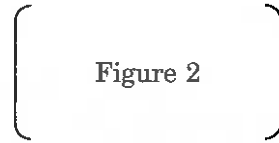


Now, pick up your pencil. Without lifting the pencil point from the paper or going back the same path you have come, draw four straight lines that pass through all the dots.

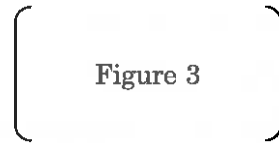
Here's one failed attempt. It misses one of the points in the middle on the left edge:⁽¹⁾



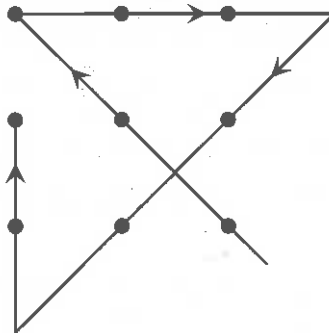
Here's another. It's also one point short because it doesn't go through the central point: ⁽²⁾



You think you can do it with four straight lines only if you trace back over the same line you have drawn, going down the diagonal and then going back and forth along the crossing lines. ⁽³⁾ But that requires a drawing of far more than four lines, even though only four appear to be present when you have finished:



There is a way to draw four lines through all the points without lifting the pencil or going back over its path, but it requires breaking a rule that you imposed B yourself for no reason at all. It wasn't one of the restrictions imposed at the outset. ^(c) You were just so used to playing by a certain type of rule that you didn't think to step outside the box and break it. The solution requires that you draw straight lines that extend beyond the box of nine points before they turn back C a different direction.



Think outside the box! ^(y)

語注*

* noughts and crosses: a paper-and-pencil game for two players, who take turns marking ○ and × in the nine boxes of a 3-by-3 square

問1 空欄 ~ に入る最も適切な前置詞をそれぞれイ~へから一つ選び、その記号をマークせよ。ただし、同じ選択肢を二度使用してはならない。

イ for	ロ to	ハ in
ニ from	ホ of	ヘ on

問2 文脈に照らして下線部(a)~(c)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。

(a) application

イ use	ロ denial
ハ investigation	ニ analysis

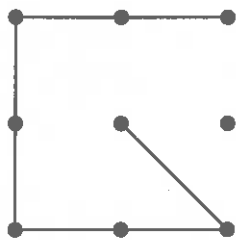
(b) deviates from

イ thinks of	ロ agrees to
ハ laughs at	ニ departs from

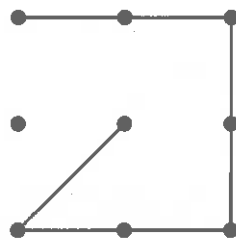
(c) at the outset

イ from the beginning	ロ in no time
ハ at the same time	ニ in the end

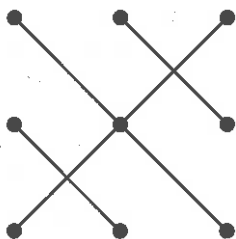
問3 下線部(1)~(3)が表す Figure 1~3 に入る図形を、それぞれイ~ニから一つ選び、その記号を解答用紙にマークせよ。ただし、同じ選択肢を二度使用してはならない。



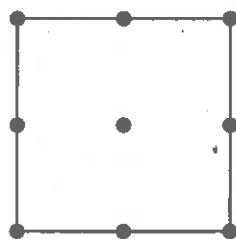
イ



ロ



ハ



ニ

問4 波線部(x) “the second approach” が指すものをイ~ニから一つ選び、その記号を解答用紙にマークせよ。

- イ breaking out
- ロ a different way of thinking
- ハ correct methods already learned
- ニ being ‘imaginative’ or original

問5 波線部(y) “Think outside the box!” が表す教訓に最も近いものをイ~ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Difficulties may contain hidden opportunities.
- ロ Knowledge without imagination is not enough.
- ハ Don’t think too much and you can do it.
- ニ Science is about knowing; engineering is about doing.

問6 本文の内容と一致しない英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ You can win or draw the game of noughts and crosses just by applying fixed rules.
- ロ You will lose a game of noughts and crosses if you move second.
- ハ The rules you set for yourself could make solving even simple problems difficult.
- ニ A different way of thinking is necessary when an already learned technique does not work well.

〔Ⅲ〕 手話に関するつぎの英文を読み、設問に答えよ。なお、英文中の〔1〕～〔7〕は
パラグラフ番号を示す。

〔1〕 Speech, writing, and computer-mediated communication are the three mediums to express our thoughts and feelings, but there is a fourth medium, used by deaf people: sign language.

〔2〕 Probably no topic in linguistics has been subject to so many misunderstandings as sign language. In the popular mind, there is a widespread belief that signing is no more than a system of sophisticated gesturing, and not a real language at all. Signs are also thought to be ⁽¹⁾ simply pictorial representations of external reality; and because of this, people assume there is just one sign language, which can be understood all over the world. Is all of this true?
(x)

〔3〕 When non-signers see a sign language in operation, they often try to guess the meaning of some of the hand movements—and they may occasionally get them right. This is because a few of the signs in any system are indeed *iconic*—that is, they reflect properties of the external world—and therefore people have a chance of recognizing what they refer to. ⁽²⁾ However, the vast majority of signs do not fall into this category. They are arbitrary, just as the words of spoken language are. There is nothing in ⁽³⁾ the spoken word *car* which physically resembles the object 'car', and it is the same with the sign for *car* in a sign language.

〔4〕 It is of course possible that some signs were iconic when they were first devised, but the iconicity has been lost because of linguistic change, which affects sign language as it does spoken and written language. It is no longer possible to see the originally iconic basis of most Chinese characters, for example, and it is the same with signs. We do not know how old most signs are, but even if a sign language has a history of only a few hundred years, this is more than enough time for signs to change their

form. In addition, the speed at which signers express themselves—one or two signs a second—also makes it difficult to see any iconicity.

[5] Many signs are deceptively iconic. A sign may appear 'obvious' after its meaning has been revealed, but it proves not so easy to predict the meaning from the shape of the sign alone. The reason is that things in the real world have so many properties that a sign could reflect. A sign for an animal, for example, could be based on its physical shape—its head or legs or any other distinctive piece of its body—or its movement. The sign might have nothing to do with physical appearance at all, but relate to the animal's behavior or uses in society. When we consider the whole range of animals, it is evident that there could be no simple way of expressing the required set of distinctions. We might notice hand shapes which represent, say, ears, but without further knowledge of the sign as a whole, it would be impossible to say which animal the ears belonged to.

[6] The point emerges again if we compare signs in different languages. There are signs which have the same form in two languages but different meanings. For example, the sign for *push* in American Sign Language (ASL) looks the same as one in Chinese Sign Language (CSL), but the CSL sign means *help*. Or again: ASL signers recognize the CSL sign for *father*, but interpret it as the ASL sign for *secret*. There are many such 'false friends' between sign languages.

[7] Thus, no single sign language exists. Rather, there are many independent languages—French Sign Language, Danish Sign Language, and so on—and they are not mutually understandable. Even within an area that uses the same spoken language, the differences may be so great as to preclude mutual comprehension. It sometimes surprises people to learn that that Y. When Mark Medoff's play about deafness, *Children of a Lesser God*, was first shown in London, the actors used ASL. British Sign Language (BSL) members of the audience had to have the signs interpreted.

問1 文脈に照らして下線部(1)~(6)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) sophisticated

イ habitual

ロ significant

ハ silent

ニ elaborate

(2) properties

イ features

ロ lands

ハ estates

ニ labels

(3) arbitrary

イ rational

ロ unpredictable

ハ absolute

ニ accountable

(4) deceptively

イ informally

ロ honestly

ハ sharply

ニ seemingly

(5) say

イ for example

ロ compared to

ハ in fact

ニ in addition

(6) preclude

イ pretend

ロ provoke

ハ prevent

ニ prompt

問2 (1)~(5)の a, b はそれぞれ指定のパラグラフの内容に関する英文である。内容に一致しているか否かを判断し、その組み合わせを以下のイ~ニからそれぞれ一つ選び、その記号を解答用紙にマークせよ。

	a	b
イ	一致	一致
ロ	一致	不一致
ハ	不一致	一致
ニ	不一致	不一致

(1) パラグラフ [2]

- a Sign language has not been well understood in the past.
- b People generally suppose that deaf people use signs based on spoken words.

(2) パラグラフ [3]

- a Non-signers may sometimes understand the proper meaning of some signs if they are iconic.
- b Few signs in any language are iconic: many signs have nothing to do with external reality.

(3) パラグラフ [4]

- a Linguistic change has resulted in the loss of iconicity in some signs as well as Chinese characters.
- b We know that sign languages have a history of a few thousand years.

(4) パラグラフ [5]

- a Signs for animals enable us to learn their habits and lives.
- b The hand shapes which represent ears are enough to identify which animal they refer to.

(5) パラグラフ [6]

- a The signs for *father* and *secret* in CSL are too similar for signers to interpret correctly.
- b 'False friends' means signs which have the same form in two languages but different meanings.

問3 波線部(x) “Is all of this true?” に対する答えとして、本文の内容に照ら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 Certainly it is true. □ It depends on the language.
ハ It's up to you to decide. ニ It's all wrong.

問4 文中の空欄 に入る最も適切な文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ BSL and ASL signers cannot easily understand each other
□ BSL has many characteristics in common with ASL
ハ many signs in BSL and ASL are still iconic
ニ it is not difficult for ASL signers to learn BSL

〔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>l</u> eader | □ <u>b</u> reathe |
| ハ <u>c</u> ease | ニ <u>e</u> ndeavor |
| (2) イ <u>g</u> arbage | □ <u>a</u> ward |
| ハ <u>p</u> article | ニ <u>t</u> arget |
| (3) イ <u>w</u> ool | □ <u>t</u> ool |
| ハ <u>p</u> roof | ニ <u>z</u> oo |
| (4) イ <u>t</u> ogether | □ <u>s</u> outhern |
| ハ <u>f</u> urther | ニ <u>m</u> ethod |
| (5) イ <u>c</u> heer | □ <u>c</u> hamber |
| ハ <u>c</u> hemistry | ニ <u>c</u> heat |

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 ad- <u>v</u> ise | □ per- <u>c</u> ent |
| ハ pat- <u>t</u> ern | ニ an- <u>n</u> oy |
| (2) イ al- <u>t</u> hough | □ com- <u>p</u> lete |
| ハ dis- <u>g</u> ust | ニ com- <u>f</u> ort |
| (3) イ con- <u>t</u> in-ue | □ com- <u>p</u> li-cate |
| ハ com- <u>p</u> ro-mise | ニ con- <u>c</u> en-trate |
| (4) イ Pa- <u>c</u> ific | □ em- <u>p</u> ha-sis |
| ハ am- <u>b</u> i-tious | ニ en- <u>c</u> our-age |
| (5) イ mi- <u>n</u> or-i-ty | □ tech- <u>n</u> ol-o-gy |
| ハ ma- <u>t</u> er-i-al | ニ fun- <u>d</u> a-men-tal |

問3 (1)~(8)において、それぞれ下の語(句)を並べかえて空所を補い、最も適当な文を完成させよ。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。なお、頭文字の大文字、小文字の区別は問わない。

(1) She 2 4 increasing sales, and we decided to give it a try.

イ for came with
ニ a new idea up

(2) Because he had a bad cough for a week, the doctor 2 4 smoking.

イ him to up
ニ give advised

(3) I 2 4 Maki until the party. I still regret the evening.

イ with on terms good was

(4) It cost me 2 4 . It was less than I had thought.

イ ten dollars it repaired
ニ have to

(5) Why don't we ask the driver 2 4 ?

イ downtown goes this
ニ whether bus

(6) 2 4 in the park yesterday?

イ do what think I saw you

(7) What was wrong with you? I thought 2 4 to drive without a license.

イ than know you would better

(8) The man 2 4 betrayed me.

イ was

ロ my friend

ハ I

ニ who

ホ thought

[V] 人工知能に関するつぎの英文を読み、設問に答えよ。

In March 2016, AlphaGo, a computer program specially designed to play the board game Go, caused shockwaves among fans. It defeated Lee Sidol, one of the world's top-ranked professional players, winning a five-game tournament by a score of 4-1.

Why, you may ask, is that news? Twenty years have passed since the IBM computer Deep Blue defeated the world chess champion, Garry Kasparov, and we all know computers have improved since then. But Deep Blue A: win through computing power only. It used its ability to calculate the outcomes of more moves to a deeper level than even a world champion can.

On the other hand, because Go is played on a far larger board (19 by 19 squares, compared to 8 by 8 for chess) and has more possible moves than ^(a) the number of atoms in the universe, such raw computing power was unlikely to beat a human with a strong sense of the best moves. Instead, AlphaGo was designed to learn how to win by playing a huge number of games against other programs and adopting the strategies that proved successful. You could say that AlphaGo evolved to be the best Go player in the world, achieving in only two years X natural selection took millions of years to accomplish.

Eric Schmidt, executive chairman of the company which owns AlphaGo, is enthusiastic about what artificial intelligence (AI) means for humanity. ⁽¹⁾ Before the match between Lee and AlphaGo, he said that humanity would be the winner in the long run, whatever the outcome was, because advances in AI would make every human being smarter, more capable, and "just better human beings."

Is this really true? Around the same time as AlphaGo's triumph, Microsoft's "chatbot"—software named Taylor that was designed to respond

to messages from young people—was having a humiliating experience. Taylor was supposed to be able to learn from the messages she received and gradually improve her ability to conduct pleasing conversations. Unfortunately, within 24 hours, people were teaching Taylor discriminatory ideas based on race and sex. When she started saying positive things about Hitler, Microsoft turned her off and deleted her most offensive messages.

I do not know whether the people who turned Taylor into a racist were themselves racists, or just thought it would be fun to undermine Microsoft's new toy. Either way, the contrast between AlphaGo's victory and Taylor's defeat serves as a warning. It is one thing to set AI free in a game with specific rules and a clear goal; it is something very different to release AI into the real world, where the unpredictability of the environment may reveal a software error that has disastrous consequences.

Nick Bostrom, director of the Future of Humanity Institute at Oxford University, argues in his book *Superintelligence* that it will not always be as easy to turn off an intelligent machine as it was to turn off Taylor. He defines superintelligence as an intellect that is “smarter than the best human brains in practically every field, including scientific creativity, general wisdom, and social skills.” Such an advanced form of AI may be able to outsmart our attempts to turn it off.

You may doubt that superintelligence will ever be achieved; but according to a survey by Bostrom and another researcher, most experts expect that superintelligence will be possible within 30 years after achieving human-level intelligence. This prospect of AI achieving superintelligence may seem distant enough not to worry about. But there is a case to be made for starting to think about how we can design AI to take into account the interests of humans.

Think about the discussions over driverless cars already on California roads. As such cars improve, they will save lives, because they will make

fewer mistakes than human drivers do. Sometimes, however, they will face a choice between lives. Should they be programmed to go off course to avoid hitting a child running across the road, even if that will put their passengers at risk? How about doing so to avoid a dog? What if the only risk is damage to the car itself, not to the passengers? Such discussions imply that it is not too soon to ask whether we can program a machine to act ethically. And teaching ethics to a machine that is more intelligent than we are, in a wide range of fields, is a far more difficult task.

Bostrom begins *Superintelligence* with a fable* about sparrows who think it would be great to train an owl to help them B: build their nests and care for their young. So they set out to find an owl egg. One sparrow objects that they should first think about how to train the owl; but the others are impatient to get the exciting new project underway. They will take on the challenge of training the owl (for example, not to eat sparrows) when they have successfully raised one.

If we want to make an owl not only intelligent but also wise, let's not be
(f) like those impatient sparrows.

語注*

* fable: a traditional short story, typically with animals as characters, that teaches a moral lesson

問4 波線部(a) “has more possible moves than the number of atoms in the universe” の内容に最も近い英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Go offers players countless choices to take.
- ロ In Go games, players can make as many moves as they want.
- ハ A Go board represents the fundamental system of the universe.
- ニ Go helps players think about the nature of the universe.

問5 波線部(b) “a humiliating experience” の内容に最も近い英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Taylor received embarrassing messages and stopped talking.
- ロ Taylor learned unethical behavior.
- ハ Taylor misunderstood what her conversation partners said.
- ニ Taylor did not win in a chess tournament.

問6 波線部(c) “a warning” の内容に最も近い英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ It is too difficult for AI to predict disasters.
- ロ A rival company will release a smarter AI system soon.
- ハ It is difficult to develop AI that functions in the real world.
- ニ AlphaGo is better at playing other games.

問7 波線部(d) “it will not always be as easy to turn off an intelligent machine as it was to turn off Taylor.” の内容に最も近い英文をイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ Turning off Taylor made it more difficult to turn off other intelligent machines.
- ロ Turning off Taylor was difficult without turning off another intelligent machine.
- ハ Turning off other intelligent machines could be more difficult than turning off Taylor.
- ニ Turning off other intelligent machines is as difficult as turning off Taylor.

問8 下線部(e)の as と同じ用法で as が使われているものをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

- イ The fog dispersed gradually as the sun rose.
- ロ Please turn off the light, as you are leaving last.
- ハ It came out the same way as it did before.
- ニ I changed the password as you suggested.

問9 AI と superintelligence について、本文の内容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 AlphaGo is an example of AI, and Taylor is an example of superintelligence.
- ロ Teaching AI morals is easy, but creating ethical superintelligence is difficult.
- ハ AI can be called superintelligence when it learns ethics.
- ニ Some AI systems have already been achieved, but not superintelligence.

問10 波線部(f) “If we want to make an owl not only intelligent but also wise, let’s not be like those impatient sparrows.” は比喩的な表現である。ここで owl と sparrow がそれぞれ何のたとえか、最も適切な組み合わせをイ～ニから一つ選び、その記号を解答用紙にマークせよ。

	owl	sparrow
イ	humans	AI
ロ	AI	humans
ハ	superintelligence	AI
ニ	AI	superintelligence