平成30年度 東北医科薬科大学入学試験問題

医学部 一般・外国語

《注意事項》

1．解答用紙左部に氏名、フリガナ、その下部に受験番号を記入し、例にならって○の中を塗りつぶすこと。
（例）受験番号１００００１の場合

フリガナ	
氏　名	

受験番号				
万	千	百	十	一
1	0	0	0	1
	●	●	●	⓪
●	①	①	①	●
②	②	②	②	②
⑨	⑨	⑨	⑨	⑨

2．この問題冊子は、15ページまであります。

3．解答方法は次のとおりである。

（1）各問題には、正しい答えは一つしかないので、最も適当と思われる答えを一つ選び、次の例にならって解答用紙に記入すること。
※一つの問に二つ以上解答した場合は誤りとなる。

（例）問１　東北医科薬科大学のある都市は次のうちどれか。
１．札幌市　２．青森市　３．仙台市　４．秋田市
５．山形市　６．盛岡市　７．福島市　８．横浜市
正しい答えは、３であるので解答用紙の ③ を塗りつぶして

解答番号	解答欄									
	1	2	3	4	5	6	7	8	9	10
1	①	②	●	④	⑤	⑥	⑦	⑧	⑨	⑩

とすればよい。

（2）解答の作成にはH、F、HBの黒鉛筆を使用し、○の中を塗りつぶすこと。
シャープペンシル等、黒鉛筆以外のものを使用した場合には、解答が読み取れず、採点できない場合がある。
尚、解答以外に印をつけた場合は、必ず消しておくこと。

（3）答えを修正した場合は、プラスチック製の消しゴムであとが残らないように**完全に消すこと**。鉛筆のあとが残ったり、✓●✓のような消し方などした場合は、修正または解答したことにならないので注意すること。

（4）解答用紙は折り曲げたり、メモやチェック等で汚したりしないよう、特に注意すること。

4．問題の内容については、質問しないこと。

（問題冊子は回収しません）

12時00分開始　外国語

問題訂正

外国語

11ページ

第2問　問4 [3] 30　選択肢④

（訂正前）ゲノム編集により、

（訂正後）ゲノム編集により　（「、」を削除）

第１問　次の英文を読み、問い（問１～5）に答えよ。

All of us started as a single cell. Along the way, that cell divided and morphed in very individual ways. Some of us may have ended up short or tall, dark skinned or light, clever or slow, night owls or early birds. Scientists like to attribute most of those traits (　1　) inherited genes. But much of the work in crafting the traits that make each of us unique is performed by a family of chemicals known as hormones.

Various tissues of the body (1)secrete hormones into fluids, like blood. From there, the hormones travel far from the place they were made until they reach cells that read the chemical as an instruction.

That hormone might tell the cell to grow—or to stop. It might direct a cell to change its shape or activity. These instructions might cause the heart to pump more rapidly or signal hunger to the brain. Another hormone might let you know that you're full. One hormone latches onto sugar in the bloodstream and then helps ferry that sugar into cells to fuel their work. Yet another might tell your body to burn some nutrients as fuel—or instead store their energy as fat for use at a later date. [　A　]

What's more, a hormone can have more than one role. For instance, estrogen is a hormone made by a woman's ovaries. It helps to shape her body during puberty to look—and function—differently than a man's. Indeed, during her reproductive years, monthly pulses of estrogen will prepare her breasts for the potential production of milk, something that would be needed if she became pregnant. But estrogen also sends signals to bone to become stronger. Different types of estrogens can even promote or thwart the growth of would-be cancers.

Hormones essentially whisper their instructions to affected cells. The "ears" (　2　) which cells listen for that instruction are known as *receptors. These are special structures on the outside of a cell. If a hormone's chemical recipe and shape are just right, it will dock into the receptor, like a key into a lock. These receptors are known as "gatekeepers." If and only if the right hormonal key arrives (　3　) that receptor unlock. Now some important, newly specified action will turn on. [　B　]

Or at least that's how it's supposed to work.

Sometimes (2)imposters arrive. Like fake keys, these may

inappropriately turn on some cellular action.

Clover, soybeans, fungi and marijuana, for instance, evolved compounds that resemble the estrogen in mammals. Those molecules resemble hormones well enough that consuming some of these can fool the body into thinking it got a legitimate estrogen signal. In fact, it didn't. This could even happen in males. Since estrogen is hormone that promotes feminine traits, that faulty signal could work to effectively feminize some (4) traits.

Some estrogen mimics may sit in the lock but fail to turn it on—or perhaps only slightly turn it on. They act like a bad key, stuck in the lock. Now if a true key shows up, it can't enter the blocked receptor. [C] Some pesticides as well as chemicals used in plastics can do this. If these chemicals (5) testosterone, a male sex hormone, they may block some of the activity that would be turned on when true testosterone showed up. The result could be a male animal that now looks like a female.

Over the past three decades, scientists have been (3)uncovering a growing number of chemicals that the body may mistake for hormones. These include a large number of commercial chemicals, such as pesticides, *plasticizers and combustion byproducts. Together, scientists have come to refer to such materials as "environmental hormones." Other times, they're called hormone mimics or "endocrine disruptors." That last term reflects that chemicals are central players in the body's endocrine—or hormone—system. [D]

Hormones act throughout the living world.

One reason scientists often use animals as stand-ins for people is because their bodies work similarly. Their bodies often rely on the same hormones to do the same things as in the human body. From mice and pigs to fish, insects, birds and reptiles, creatures throughout the animal kingdom rely on hormones to develop, grow and live out healthy lives.

A number of hormones instruct plants when to grow up—or grow old and die. Others inform a plant that it's time to form flowers, fruit and seeds so that it can reproduce. [E] Still others trigger the plant to heal some wound or to enter dormancy.

Fungi rely on chemicals to signal when their tissues need to take certain actions, such as communicate with microbes in its root zone or begin spore

formation (reproduction). Many such chemicals work as hormones. Sometimes, these chemicals will be (4)identical to hormones produced by plants.

[Notes]

*receptor= a chemical group or molecule (such as a protein) on the cell surface or in the cell interior that has an affinity for a specific chemical group, molecule, or virus

*plasticizer= a chemical added especially to rubbers and resins to impart flexibility, workability, or stretchability

問1 本文中の空欄(1)～(5)に入る最も適当なものを①～⑤の中から一つ選び、その番号をマークせよ。

[1] 空欄(1) 1

① for ② in ③ on ④ to ⑤ with

[2] 空欄(2) 2

① at ② for ③ into ④ of ⑤ through

[3] 空欄(3) 3

① had ② has ③ is ④ was ⑤ will

[4] 空欄(4) 4

① absorbed ② extraordinary ③ legitimate
④ male ⑤ vertical

[5] 空欄(5) 5

① block ② consume ③ mimic ④ promote ⑤ tolerate

問 2　下線部(1)～(4)の語の本文中の意味に最も近い語を一つ選び、その番号をマークせよ。

[1] 下線部(1) <u>secrete</u> [6]

① discard　② discover　③ emit　④ integrate　⑤ separate

[2] 下線部(2) <u>imposters</u> [7]

① employees　② frauds　③ pleasures　④ postmen
⑤ rationalists

[3] 下線部(3) <u>uncovering</u> [8]

① dissolving　② eliminating　③ evaporating　④ misleading
⑤ revealing

[4] 下線部(4) <u>identical</u> [9]

① inherent　② genuine　③ oval　④ similar　⑤ tangible

問 3　次の一文は、本文中の空欄[　A　]～[　E　]のどこに入れるのが最も適当か。①～⑤の中から一つ選び、その番号をマークせよ。[10]

So it can't instruct the cell that it's time to do its job.

① 空欄[　A　]　② 空欄[　B　]　③ 空欄[　C　]　④ 空欄[　D　]
⑤ 空欄[　E　]

問 4　本文にタイトルをつけるとしたら、どれが最も適当か。①～⑤の中から一つ選び、その番号をマークせよ。[11]

① Has the Origin of Life Been Found?
② How Do You Unlock the Door?
③ On Generation of Cells
④ On Proliferation of Cells
⑤ What is a Hormone?

問 5 次の文[1]～[5]において、本文に書かれている内容と一致する場合は①を、一致しない場合は②をそれぞれマークせよ。

[1] 12
血中の糖類と結びつき、それを細胞内に運ぶ働きをする薬があることが知られている。

[2] 13
エストロゲンは、骨に対して強くなるように信号を送ったり、女性を外見上も機能上も女性らしくさせるなど、幾つかの機能を合わせ持っている。

[3] 14
比喩的に言うと、「鍵穴」(受容体)に正しくはまる「鍵」(ホルモン)がやって来ると「解錠」され、特定の新しい作用が発揮される。

[4] 15
細胞膜表面にある受容体は時に、テストステロンを間違えてエストロゲンと認識してしまうことがある。

[5] 16
「環境ホルモン」と言われているものの中には、殺虫剤や食品添加物などがある。

第 2 問 次の英文を読み、問い（問 1～4）に答えよ。

A type of genetic engineering called genome editing is receiving worldwide attention as a technique that can produce amazing progress in medicine and improvement of agricultural products. But the technique, which precisely alters genetic sequences, has raised ethical and social questions. (1) the move to strongly push research on genome editing in Japan, including human genome editing, it is imperative that the government and academic societies concerned work (2) strict rules because the technique at this stage is not fully reliable and its ethical, legal and social ramifications are not completely known.

In genome editing, (ア)targeted DNA in a cell is cut away at a specific location to inactivate a problematic gene or to insert a replacement DNA sequence for replacement or repairs in order to produce a desired result. While DNA is a substance that contains genes, a genome refers to the entirety of hereditary information contained in genes and chromosomes in cells. In humans, a copy of the entire genome—more than 3 billion DNA base pairs—is contained in all cells that have a nucleus. Since the accuracy of genome editing at present is not high enough and inaccurate editing can happen, there is a view that genome editing is not an established technique. The current mainstream method in genome editing is programming a complex made (3) a guide RNA and a certain type of protein to target a problematic gene in DNA.

In April last year, (イ)news that Chinese scientists edited the DNA of human embryos—the first time this has been done—shocked the world and touched off a debate because of the ethical implication of such endeavors. A team of researchers at Sun Yat-sen University in Guangzhou injected 86 nonviable embryos with a complex called CRISPR/Cas 9 to modify the gene (4) beta thalassemia, a fatal blood disorder. Of the embryos, 71 survived and 54 of them were genetically tested. It was found that just 28 were successfully spliced, but that only a fraction of them contained the replacement genetic material. The researchers also detected a number of "off-target" mutations apparently caused by the injection of the CRISPR/Cas 9 complex.

Apparently prompted by what the Chinese team did, the Cabinet Office's life ethics study group of experts in April issued an interim report that condoned basic genome editing research on manipulating genes in fertilized human embryos but said (ウ)returning an embryo whose problematic gene has been modified through genome editing to a womb is not acceptable. The Science Council of Japan in July started discussions by a committee of specialists on issues related to medical research and treatment that applies genome editing to fertilized human embryos and reproductive cells, and plans to issue a report or proposal by fall 2017. Early this month, the Japanese Society for Genome Editing issued a statement that basically agreed with the government study group's position.

The government study group, composed of 15 experts on life sciences, law and ethics, specifically said that (エ)basic research is acceptable for such purposes as finding out the roles played by genes at an early stage of embryonic development with the help of genome editing, developing methods to treat congenital hard-to-cure diseases and improving assisted reproductive technologies. But it called (5) researchers to limit their research to the first two weeks of a human embryo's development and to dispose of such embryos after their research is over. It also said that researchers should consider whether it is possible to use animal embryos instead of human embryos.

The group flatly turned (6) clinical use of human genome editing at this stage, citing the risks of inaccurate or incomplete editing such as off-target mutations and mosaicism or interminglement of modified and unmodified genes, as well as the difficulty to predict (7) and to examine risks that future generations may face as a result of genetic alterations in embryos that will be passed from generation to generation.

Because the group's report has no binding power, (オ)the possibility cannot be ruled out that ethics committees of research institutes could permit human genome editing research beyond the scope mentioned by the report. The government and academic societies need to start working to develop binding guidelines or legal regulations that control human genome editing research by fully taking into consideration not only the ethical but also the social problems the technique can cause.

An international summit on human gene editing held in December in Washington, hosted by the U.S. National Academy of Sciences, the U.S. National Academy of Medicine, the Chinese Academy of Sciences and Britain's Royal Society, issued a statement which pointed out that "permanent genetic 'enhancements' to subsets of the population could exacerbate social inequalities or be used coercively." The statement stressed that "it would be irresponsible to proceed with any clinical use of germ-line editing" unless the relevant safety and efficacy issues are solved by fully weighing risks, potential benefits and alternatives, and unless there is broad societal consensus about the appropriateness of the proposed application. It also called for putting all clinical use of human genome editing "under appropriate regulatory oversight."

Human genome editing could have serious consequences depending on the level of its reliability and the way it is used. Theoretically it is even possible to use the technique to produce "designer babies."

The government study group's decision to make a manual to oversee the clinical use of human genome editing is meaningful. But (1) the technique's potential benefits and risks, which are both of great consequence, there is a strong need for a wide range of the public, including ordinary citizens, lawmakers, bureaucrats, scientists, and legal and ethics experts, to carry out informed and detailed discussions so that human genome editing can truly contribute to enhancing the well-being of all people.

問 1 次の文[1]～[4]において、本文に書かれている内容と一致する場合は①を、一致しない場合は②をマークせよ。

[1] 17

Genome editing is attracting attention as a promising technique in medicine and agriculture, but ethical problems concerning genetic modification still remain to be solved.

[2] 18

Although the technique of genome editing is now considered to be almost perfect and established, inaccurate editing could sometimes happen.

[3] 19

After injecting 86 nonviable embryos with CRISPR/Cas 9, Chinese scientists tested 54 embryos and found that only 28 was spliced and the others contained replacement genetic material.

[4] 20

The specialists of the government study group suggested that researchers limit the research period of a human embryo's development, and discard the used embryos.

問2 本文中の空欄(1)～(6)に入る最も適当な語句を①～④の中から一つ選び、その番号をマークせよ。(1)は二つあるが、どちらも同じものが入る。(選択肢は文頭に来るものも、すべて小文字で表記してある。)

[1] 空欄(1) 21
① although ② even if ③ given ④ if

[2] 空欄(2) 22
① against ② into ③ out ④ through

[3] 空欄(3) 23
① away with ② much of ③ up for ④ up of

[4] 空欄(4) 24
① editing ② resembling ③ responsible for ④ resulted in

[5] 空欄(5) 25
① back ② by ③ off ④ on

[6] 空欄(6) 26
① around ② down ③ in ④ off

問3 本文中の空欄(7)に入る最も適当な並び順のものを①～④の中から一つ選び、その番号をマークせよ。 27
① what other genes alteration will have on gene effects
② what alteration gene effects will on other genes have
③ what effects gene alteration will have on other genes
④ what will effects other gene alteration have on genes

問 4 本文中の下線部(ア)～(オ)の意味として最も適当なものを①～④の中から一つ選び、その番号をマークせよ。

[1] 下線部(ア) 28

① 細胞内の標的 DNA は、特定の場所で活動を妨げられて問題のある遺伝子を不活性化するが、理想の結果を得るために、置換と修復のために交換用 DNA 配列が挿入される

② 細胞内の標的 DNA は特定の場所で切り取られ、理想の結果を得るために、問題のある遺伝子が不活性化されたり、置換や修復のための交換用 DNA 配列が挿入されたりする

③ 細胞内の標的 DNA は、問題のある遺伝子の働きを弱める一部が切り取られ、理想の結果を得るために、置換と修復のための交換用 DNA 配列が組み入れられる

④ 細胞内の DNA を標的にすることにより、問題のある遺伝子の不活性化のために特定の場所が切り取られ、交換用 DNA 配列を書き込むことによって理想の結果が得られる

[2] 下線部(イ) 29

① 中国人科学者たちが中国で初めて人間の遺伝子を編集しようとしているというニュースは世界中の人々を震撼させたが、そのような試みが持つ倫理的要素によって、激しい議論はおさまった

② 中国人科学者たちが中国国内で初めて人間の受精卵を編集したことを知って世界中の人々が驚き、議論が活発になったせいで、そのような努力を再評価しようという機運が高まってきた

③ 中国人科学者たちが人間の受精卵を初めて編集しようとしているというニュースは世界中の人々を憤慨させたが、そのような試みの持つ倫理的影響をめぐる議論にまでは至らなかった

④ 中国人科学者たちが初めて人間の受精卵を編集したというニュースに世界中の人々が衝撃を受け、そのような試みの持つ倫理的意味合いから、議論が起こった

[3] 下線部(ウ) 30

①子宮に戻した受精卵の問題のある遺伝子をゲノム編集で改変するのは容認できない

②問題のある遺伝子を改変した受精卵を子宮に戻すことは、ゲノム編集としては容認できない

③問題のある遺伝子を持つ受精卵が、ゲノム編集によって切り取られ、子宮に戻されるのは容認できない

④ゲノム編集により、問題のある遺伝子が改変された受精卵を子宮に戻すことは容認できない

[4] 下線部(エ) 31

①受精卵の発達の初期段階で遺伝子が果たす役割を、ゲノム編集の助けを借りながら発見するという目的のための基礎研究は、容認できる

②ゲノム編集の助けを借りて、受精卵の発達初期段階で遺伝子が果たしている役割を発見したため、上述の目的のための基礎研究は容認できる

③受精卵の発達の初期段階で遺伝子が果たす役割がゲノム編集に役立つことが解明されれば、基礎研究は上述の目的での使用のために容認できる

④ゲノム編集を手助けできるように、受精卵の発達の初期段階で遺伝子が果たす役割が解明されるにつれ、基礎研究が受け入れられようになってきている

[5] 下線部(オ) 32

①報告書で触れられている範囲を逸脱して、ヒトゲノム編集の研究を研究機関の倫理委員会が許可する可能性を想定することはできない

②報告書で触れられている範囲を超えたヒトゲノム編集の研究を、研究機関の倫理委員会が許可する可能性は排除できない

③研究機関の倫理委員会が報告書で触れている意見を指針として、ヒトゲノム編集の研究が許可される可能性は否定できない

④研究機関の倫理委員会が報告書で触れているヒトゲノム編集の研究が許可される可能性は極めて低い

第 3 問 次の問い（問 1～5）の英文中の空欄(33)～(37)に入る最も適当なものを①～④の中から一つ選び、その番号をマークせよ。

問 1 Only after her doctor had given her a serious warning about the dangers (33) to give up smoking.

[① did she really try ② she did really try ③ she really tried
④ was she really tried]

問 2 I should have (34) to call her.

[① considered better as ② known better than
③ learned better so ④ understood more for]

問 3 In many parts of the world, I still find people who are not (35).

[① literal ② literalistic ③ literary ④ literate]

問 4 She was accepted for college on the (36) of good personal recommendations.

[① command ② consideration ③ strength ④ use]

問 5 For most of the day, Alex did not notice that he had put on his sweat shirt (37). Finally, a friend told him, and he put the sweat shirt on correctly.

[① all around ② at present ③ inside out ④ right away]

第 4 問　次の問い（問 1～5）の下線部①～④のうち、語法上誤りのある箇所を一つ選び、その番号をマークせよ。なお、間違いがない場合は⑤をマークせよ。

問 1　38

She has ①a right ②to her ③property, ④still less to her life.

問 2　39

Our teacher ①didn't like our plan ②at first, but ③to our great joy he ④ended by helping us.

問 3　40

①With ②a little more money, he ③would not ④have gone bankrupt.

問 4　41

The American standard of living ①is still ②higher ③than most of the ④other countries of the world.

問 5　42

I ①have a headache and a ②slight fever. I'm afraid I'm coming ③off ④with a cold.

第5問 次の問い（問1～5）の日本語の文の意味に合うように[　　]内の語句を並べかえて意味の通る英文を作り、空欄(43)～(52)に入るものを一つ選び、その番号をマークせよ。なお、選択肢の中には、解答に関係のないものも一つ含まれている。

問1　輸出はここ10年で70%も上昇している。

Exports (　　)(　　)(43)(　　)(44)(　　)(　　)
in the past ten years.

[① 70%　② by　③ have　④ less　⑤ more　⑥ no　⑦ risen
⑧ than]

問2　来月、祖母は満で89歳、数えで90歳になる。

Next month my grandmother will be 89, or 90 by (　　)(　　)
(　　)(45)(　　)(　　)(46)(　　) birth.

[① at　② calculation　③ makes　④ one year old　⑤ that
⑥ the　⑦ traditional　⑧ when　⑨ you]

問3　あらゆる文明社会は、一般的に家族と呼ばれる多くの小さな副次的単位からできている。

Every civilized society (　　)(47)(　　)(　　)(　　),
typically (　　)(　　)(48)(　　).

[① as　② composed　③ families　④ in　⑤ is　⑥ many
⑦ of　⑧ referred　⑨ small sub-units　⑩ to]

問4　語彙とは、ある言語を形成する語の集合のことであり、文法とは、ある言語の語群に対して構造を与えるもののことである。

Vocabulary is a collection (　　)(　　)(49)(　　), and
(　　)(50)(　　)(　　)(　　) the words in a language.

[① a language　② in which　③ grammar is　④ of　⑤ provides
⑥ structure　⑦ that create　⑧ to　⑨ what　⑩ words]

問５　時として、これから親になろうとする人が、子育ての責任に対して気持ちの上での覚悟ができていないし、また、そのような責任に対する経済的な備えもできていないと感じることがある。

Sometimes (　　) (　　) (51) (　　) (　　) (　　) (　　),
(52) (　　) they financially prepared for the burden.

[① are　② coward　③ emotionally equipped for　④ feel that
⑤ nor　⑥ parents　⑦ prospective　⑧ raising a child
⑨ the responsibility of　⑩ they are not]