

## 平成 18 年度入学者選抜個別(第 2 次)学力検査問題

# 外 国 語

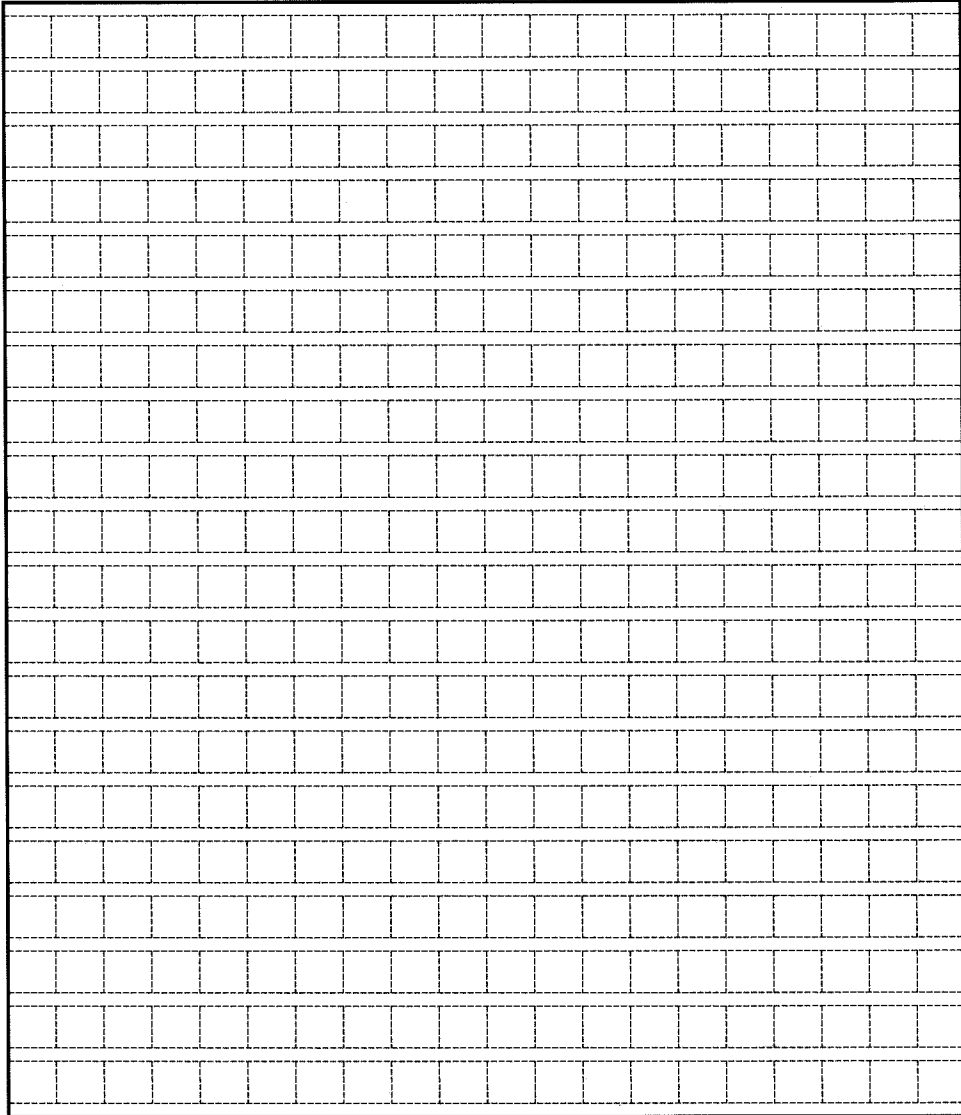
### 注 意 事 項

1. 解答用紙は、問題冊子と別に印刷されているから、誤らないように注意すること。
2. 解答は必ず解答用紙の指定された欄内に横書きで記入すること。
3. 各解答用紙には受験番号欄が 2 または 4 カ所ある。それぞれ記入を忘れないこと。
4. 解答用紙は、記入の有無にかかわらず、机上に置き、持ち帰らないこと。問題冊子は持ち帰ってよい。
5. 問題冊子は、全部で 8 ページであり、第 1～3 ページは下書用紙である。下書用紙は切り離してはいけない。
6. 問題および語句の注は第 4 ページと第 5 ページの間にはさみこんである。
7. 落丁または印刷の不鮮明な箇所があれば申し出ること。

下 書 用 紙 (切り取ってはいけない)



下書用紙 (切り取ってはいけない)



(20×20)

## 外 国 語

次の英文は雑誌 *Natural History* (2004年12月/2005年1月号)に掲載された、Dustin Stephens氏とRobert Dudley氏の共著論文“The Drunken Monkey Hypothesis”を一部改変したものです。この文章をよく読んで、問題 **1** から **6** に答えなさい。

解答は解答用紙の指定された欄に記入すること。

\*印のついている語句の注は問題のあとに示されています。

What can a *tipsy* monkey tell science about humanity’s *fondness* for—and problems with—alcohol? Possibly quite a lot. That would be a good thing, considering how widespread our problems with alcohol are. In the United States alone, 14 million people are alcoholics. Although patterns vary from culture to culture, alcoholism is common across the globe, particularly among groups undergoing modernization, and it comes with tragic consequences: In the United States, abuse of alcohol is the third leading cause of preventable death.

<sup>(7)</sup> Placing alcoholism in an evolutionary framework might reveal how our ancestors became attracted and addicted to alcohol. In 2004, one of us (Stephens) observed a monkey eating the bright orange fruits of the *Astrocaryum palm*\*, in the tropical forest of Panama’s Barro Colorado Island\*. Climbing onto the branches of a tree to reach the fruit, the monkey first *sniffed* the fruit, then frantically began to eat it, sometimes dropping partly eaten fruit onto the forest floor. Risking a ten-meter fall and serious injury, the monkey seemed as fearless as a drunken teenager.

Our tests of the fruit he dropped suggested why: He may have been drunk. Our calculations showed that the monkey had consumed a lot of alcohol. This incident fitted nicely with the “drunken monkey” *hypothesis*, developed earlier by one of us (Dudley).

The hypothesis proposes that a strong attraction to the smell and taste of alcohol was an advantage for our primate\* ancestors since it helped them *locate* nutritious fruit at the peak of ripeness. Millions of years later, in the Middle Ages, people learned to *distill* alcohol, which powerfully concentrated the natural alcoholic content of *fermented* fruits and grains. The once advantageous appetite for alcohol became a danger to human health and well-being.

The drunken monkey hypothesis goes like this: For 40 million years, primate *diets* have included large quantities of fruit. In the warm, humid tropics, where humans evolved, *yeasts* on the fruit skin and within the fruit *convert* sugars into various forms of alcohol, the most common being ethanol\*. Ethanol evaporates quickly, and the smell of ethanol is a reliable sign of ripe fruit. For a hungry monkey, a good strategy would be to follow the smell of alcohol to the fruit and eat it in a hurry. Natural selection probably favored primates with a keen appreciation for the smell and taste of alcohol.<sup>(†)</sup>

A large body of evidence suggests that contemporary primate diets are dominated by plant materials. In many primate groups those materials take the form of ripe (and probably alcohol-containing) fruits. Fossilized teeth show that fruit has been a major component of the primate diet since about 40 million years ago. Some of our closest relatives — chimpanzees, orangutans, and certain populations of gorillas — eat diets based primarily on fruit.

Our own ancestors long ago left fruit behind as the main source of their nutrition. Between 1 and 2 million years ago, fruit had been largely replaced by meat and by foods such as roots. But even though our early hominid\* ancestors stopped relying heavily on fruit, humanity shares a deep evolutionary background with other primates. It seems likely that the taste for alcohol arose during that long shared past.

Consider the evidence.

The place to begin is the relation between ripe fruit and alcohol. Yeasts that occur on fruit consume sugar in the fruit as a source of energy, in a process known

as anaerobic\* fermentation (“anaerobic,” because it <sup>(3)</sup> takes place in the absence of oxygen). As the fruit ripens, and the yeast gets going, the ethanol content of the fruit rises rapidly. For example, the unripened fruit of the *Astrocaryum* palm contains no ethanol; ripe hanging fruit is about 0.6 percent ethanol by weight; overripe fruit, often fallen to the ground, can have an ethanol content of more than 4 percent. The monkey that Stephens observed on Barro Colorado Island was feasting on fruit near its peak ripeness when its ethanol content is about 1 percent.

What is the evidence that our primate relatives (or other organisms) are attracted to alcohol as a sign of nutrition? It is known that fruit flies follow increasing concentrations of ethanol vapor as a way to find the ripe fruit within which they <sup>(4)</sup> lay their eggs. A similar sensory mechanism is likely at play in other species, including primates. The excessive consumption of fruit due to alcohol, similar to the one seen on Barro Colorado, have been observed several times in monkeys. In each instance, the monkey risked life and limb while eating quickly from bunch after bunch of *Astrocaryum* fruits, sometimes committing its full weight to a fruit cluster without even securing its tail to a branch for safety. Other observations from the rainforest describe what seems to be fruit-induced intoxication in butterflies, fruit flies, a variety of birds, fruit bats, elephants, and several other primate species.

It is possible, of course, that drunken behavior is simply an accident without a deep evolutionary context. Maybe rainforest animals just like to have fun. But some evidence implies that the connection between alcohol and nutrition is deeper than that, at least for primates. Initial observations of monkeys on Barro Colorado show that they prefer ripe fruits with moderate levels of alcohol. They avoid unripe fruits with no alcohol as well as overripe fruits with more alcohol but less sugar (by then, most of the sugar has been converted to alcohol). We note that people, too, often drink alcohol while eating, suggesting that drink with food is a natural combination. And various experiments have shown that having an alcoholic drink before a meal increases both the time spent eating and the number of calories consumed.

If there really is an evolutionary connection between alcohol and primate nutrition, an important conclusion follows: Alcohol — at least in moderation — cannot be entirely harmful to health. If it were, a good nose for alcohol would not have given an advantage to our primate ancestors.

In any event, a wide range of evidence suggests that moderate consumption of alcohol is healthful for various organisms. Fruit flies, for instance, live longer and have more offspring when they are experimentally exposed to vapors containing intermediate levels of ethanol than they do when exposed to a lot of it or to none at all. In people, too, moderate alcohol consumption seems to be more healthful than too much or too little.<sup>(5)</sup>

A variety of direct and circumstantial evidence suggests that in our deep evolutionary background, alcohol and nutrition (and consequently, alcohol and survival) were related. For some of our close genetic relatives, rainforest observations show that they remain related to this day. Furthermore, some evidence shows that intermediate levels of alcohol consumption are beneficial to human health. But if evolution has rendered alcohol so good for us, why is it now such a problem?

The answer, we think, lies in a mismatch between our species' long evolutionary past and the techno-cultural environment we have created in the past few centuries. Until well into primate evolution, the amount of alcohol our ancestors could consume was strictly limited. As we have noted, even overripe fruits have an ethanol content of only about 4 percent, and they are not the ones favored by monkeys.

That picture did not change substantially even when modern humans, some 10,000 years ago, learned to control fermentation. As agriculture was developed, barley and wheat became plentiful, which are good for making beer. Archaeological evidence from the same period indicates that wine was also being made. In fact, until industrialization made water filtration practical, alcoholic drinks are thought to have been more widely consumed in many cultures than water was.

But the alcoholic drinks of today and the alcoholism that accompanies them are, in evolutionary terms, recent. Yeasts stop making ethanol when its concentration reaches between 10 and 15 percent by weight. Hence drinks made using natural yeasts are limited in alcohol content. Beer and wine made before the invention of chemical distillation probably were no more than 5 percent ethanol.

The invention of distillation, which had reached Europe in the Middle Ages, radically changed humanity's relationship with alcohol. Drinks whose ethanol content was much higher than 5 or even 12 percent suddenly became widely available. From the perspective of the drunken monkey hypothesis, the results were predictable: wide availability of potent drink led to alcohol abuse.

From the evolutionary perspective taken by Darwinian\* medicine, alcoholism is one of the "diseases of nutritional excess" that arises from a mismatch between prehistoric and modern environments. Perhaps the most striking example of such a disease is the ongoing epidemic of obesity. In 1962, the late geneticist\* James Neel predicted that as high-fat, high-calorie Western foods became available to tribal peoples, their rates of obesity, heart disease, and diabetes\* would sharply increase. Neel's hypothesis was based on the belief that genes, which had been advantageous in storing and using limited calories, had turned harmful when fats and sugars became readily available. The high rates of diabetes among Pima Indians\*, Micronesian Nauruans\* and Australian Aborigines\* have confirmed his predictions.

Neel's hypothesis, now clearly relevant to human populations in the developed world as well, fits nicely with the drunken monkey hypothesis. The increased alcohol concentration of modern alcoholic drinks played right into a genetically rooted appetite for alcohol. This appetite was present for millions of years and served a valuable survival function for our ancestors as they climbed through the rainforest. And just as with obesity, heart disease, and diabetes, alcoholism has become a risk for anyone with access to the fruits of contemporary culture.

# 問題および注

## 問題

**1** *The following words appear in italics in the text. Circle the letter indicating the best definition for each word.*

*tipsy*

- a) hungry, starved
- b) visibly drunk, unsteady
- c) jumpy, energetic
- d) sick, ill
- e) friendly, domesticated

*fondness*

- a) hatred of
- b) problems with
- c) enthusiasm for
- d) liking of
- e) addiction to

*sniffed*

- a) squeezed
- b) smelled
- c) licked
- d) shook
- e) cleaned

*hypothesis*

- a) project
- b) fictional story
- c) scientific experiment
- d) painting or sculpture
- e) explanation or speculation

*locate*

- a) cook
- b) avoid
- c) place
- d) grow
- e) find

*distill*

- a) purify or process
- b) avoid or avert
- c) flavor or spice
- d) distrust or doubt
- e) preserve or save

*fermented*

- a) unripe
- b) harvested
- c) tropical
- d) brewed
- e) uneatable

*diets*

- a) foods eaten
- b) forests
- c) mating behaviors
- d) government warehouses
- e) weights

*yeasts*

- a) pigments
- b) rain drops
- c) particular types of fungi
- d) dirt
- e) insects

*convert*

- a) concentrate
- b) replace
- c) transform
- d) create
- e) produce

**2** *What do the following words, which are underlined in the text, refer to? Answer in English and write your answer so that it can replace the underlined word.*

- (1) it
- (2) he
- (3) it
- (4) they
- (5) it

**3** *According to the text, decide whether the following statements are true (T) or false (F) and circle the correct answer for each question.*

- (1) In the United States 140,000 people are reported to be alcoholics.
- (2) After observing the drunken monkey on Barro Colorado Island, one of the authors formed the “drunken monkey” hypothesis.
- (3) Modern primates are primarily vegetarians, that is, they mostly eat plant materials.

- (4) One million years ago, fruit was no longer the main component of the hominid diet.
- (5) Alcohol develops naturally in ripening fruit on a tree, as a result of anaerobic fermentation, a process that occurs because of yeast.
- (6) Drunken behavior of animals has been observed in many species, including fruit bats, elephants, birds, and even butterflies.
- (7) Some observations show that monkeys like their fruit as ripe as possible because overripe fruit is full of sugar as well as alcohol.
- (8) Experiments have shown that an alcoholic drink before a meal results in people consuming fewer calories during the meal.
- (9) Alcohol did not give any advantage to our primate ancestors because it is injurious to health.
- (10) Fruit flies, if exposed to high levels of ethanol, live longer and have more offspring.
- (11) Observations of genetic relatives of humans suggest that alcohol and nutrition are related.
- (12) Before industrialization, in many societies alcoholic drinks may have been drunk more widely than water was.
- (13) In the long history of evolution, alcoholism is a fairly old problem.
- (14) The authors believe the appetite for alcohol may have been evolutionarily built into human beings.

**4** *Answer the following questions in your own words, using complete sentences in English:*

- (1) Why did humanity's relationship with alcohol change radically in the Middle Ages?
- (2) Briefly explain why, if alcohol was beneficial to humans in the past, it has become a problem in the present.
- (3) In the last sentence of the article, what do the authors mean by "the fruits of contemporary culture"?

5 下線部(ア)から(ウ)を日本語に訳しなさい。

6 アルコールと人間の関係について、この論文ではどのような指摘がなされていますか。「進化」、「栄養」、「アルコール依存症」の3語を必ず用いて400字以内でまとめなさい。

注

anaerobic	酸素なしで起こる
Astrocaryum palm	ホンダネヤシ属のヤシ
Australian Aborigines	オーストラリア先住民, アボリジニー
Darwinian	ダーウィン説の, 生物進化論の
diabetes	糖尿病
ethanol	エチルアルコール(エタノール)
geneticist	遺伝学者
hominid	(ヒトとその祖先からなる)ヒト科, 原人
Micronesian Nauruans	大西洋西部ミクロネシアにあるナウル共和国の住人
Panama's Barro Colorado Island	バロ・コロラド島, パナマ運河の中ほどにある人口湖の中の島。熱帯生物学や地質学の国際研究機関である「スミソニアン熱帯研究所」が管理する自然保護地域となっている。
Pima Indians	ピマ族, アリゾナ州南部およびメキシコ北部に住む先住民
primate	霊長類, 霊長目に属する哺乳動物の総称