平成30年度　入学試験問題

医学部（Ⅱ期）

英語・数学

注意事項

1. 試験時間　平成30年3月3日，**午前9時30分から11時50分まで**
2. 配付した試験問題(冊子)，解答用紙の種類はつぎのとおりです。

(1) **試験問題**(冊子，左折り)(表紙・下書き用紙付)

英　語

数　学(その1，その2)

(2) **解答用紙**

英　語　　1枚(上端黄色)(右肩落し)

数　学(その1)　1枚(上端茶色)(右肩落し)

〃　(その2)　1枚(上端茶色)(左肩落し)

3. 下書きが下書き用紙で足りなかったときは，試験問題(冊子)の余白を使用して下さい。
4. 試験開始2時間以降は退場を許可します。但し，試験終了10分前からの退場は許可しません。
5. 受験中にやむなく途中退室(手洗い等)を望むものは挙手し，監督者の指示に従って下さい。
6. 休憩のための途中退室は認めません。
7. 退場の際は，この試験問題(冊子)を一番上にのせ，挙手し，監督者の許可を得てから，試験問題(冊子)，受験票，下書き用紙および所持品を携行の上，退場して下さい。
8. 試験終了のチャイムが鳴ったら，直ちに筆記をやめ，おもてのまま上から解答用紙〔英語，数学(その1)，数学(その2)〕，試験問題(冊子)の順にそろえて確認して下さい。確認が終っても，指示があるまでは席を立たないで下さい。
9. 試験問題(冊子)はお持ち帰り下さい。
10. 監督者退場後，試験場で昼食をとることは差支えありません。ゴミ入れは場外に設置してあります。
11. 午後の集合は1時です。

英　語

1 次の各組の単語について(1)～(2)は一番強いアクセントの位置が他と異なるものを，(3)～(5)は下線部の発音が他と異なるものを，それぞれ１つ選び，記号で答えなさい。

(1) A. ex-e-cute　　B. pho-to-graph　　C. em-bar-rass
　　D. in-ter-val　　E. con-sti-tute

(2) A. mel-an-chol-y　　B. mo-not-o-nous　　C. psy-chol-o-gy
　　D. ba-rom-e-ter　　E. di-am-e-ter

(3) A. anchor　　B. accident　　C. ancestor
　　D. admirable　　E. ancient

(4) A. yearn　　B. heart　　C. early　　D. earnest　　E. heard

(5) A. exact　　B. exhibition　　C. exaggerate　　D. example　　E. exist

2 次の各文の(　　)の中に入れるのに最も適切な表現を１つずつ選び，記号で答えなさい。

(1) My father gave me the money. (　　), I couldn't have afforded the trip.
　　A. For this　　B. Therefore　　C. Nevertheless
　　D. But　　E. Otherwise

(2) About three fifths of the money (　　) on travel with my friends.
　　A. spent　　B. was spent　　C. were spent
　　D. has spent　　E. have been spent

(3) Make sure you return the book to (　　) it was after reading it.
　　A. which　　B. what　　C. how　　D. that　　E. where

(4) What would you say (　　) out tonight?
　　A. for dine　　B. to dine　　C. to dining　　D. dining　　E. dine

(5) Please tell me (　　) to open the can with.
　　A. how　　B. that　　C. the way　　D. when　　E. what

(6) I am ashamed (　　) kind to the old man on the bus.

A. of having been not　　B. of having not been　　C. of not having been

D. not having been　　E. not of having been

(7) I knew all about the incident, but I kept the knowledge (　　) myself.

A. in　　B. within　　C. for　　D. with　　E. to

(8) Her brother grew up in Italy, which (　　) for his fluency in Italian conversation.

A. seems　　B. accounts　　C. looks　　D. stands　　E. explains

(9) I have half a (　　) to buy that red car.

A. belief　　B. thought　　C. feeling　　D. heart　　E. mind

(10) There were some grammatical errors in her report, but they seem (　　).

A. correcting　　B. corrected　　C. to correct

D. to be corrected　　E. to have been corrected

3 次の各和文を英訳するとき，(　あ　)～(　そ　)の中に入れるべき単語をそれぞれ1語ずつ正しい形で答えなさい。ただし，(　　)内にアルファベットが示されている場合には，そのアルファベットで始まる単語を答えること。

(1) ご質問やご意見がありましたら，連絡下さい

(S　あ　) you have any questions or (c　い　), please call our office.

(2) 彼が赤い新車を買ったということは大きな驚きだった。

(　う　) he bought a new red car was a big surprise to us.

(3) 他の全てのことが同じだとすると，小さな機械の方が大きな機械よりコストがかからない。

All other things (　え　) equal, a small machine will cost less than a large one.

(4) 強盗は家に押し入るとすぐに金庫へ向かった。

(U　お　) breaking into the house, the burglar went (　か　) to the safety box.

(5) 君の意見は私のと同様によい。それどころか，わずかにだが，よりよい。

Your opinion is no (　き　) than mine. Actually it is slightly better.

(6) トムはメアリーが自分より2歳年上だとわかった。

Tom found he is（　く　）to Mary（　け　）two years.

(7) この絵の送料および手数料は価格に含まれている。

（　こ　）in the price are the（　さ　）and handling charges for this picture.

(8) 今はもう政府が渡航禁止令を解除しているので，私は友達に会いにトルコに行く。

Now that the government has (l　し　) the ban on going abroad, I'm (o　す　) to Turkey to see my friend.

(9) A：May I smoke here? ここでタバコを吸ってもいいですか。

B：I'd rather（　せ　）（　そ　）. ご遠慮願えますか。

4 次の各対話中の（　あ　）～（　お　）に入る表現として最も適切なものをそれぞれ選択肢から1つずつ選び，記号で答えなさい。

[対話1]

Man 1: How can I help you?

Man 2: Could you break a fifty dollar bill for me?

Man 1: Sure.（　あ　）

Man 2: Could I have four tens and the（　い　）in ones?

（　あ　）の選択肢

A. I don't have enough money right now.

B. I recommend you to go to another shop.

C. How do you want it?

D. Can you tell me how much you need?

E. Could you come back later?

（　い　）の選択肢

A. some

B. another

C. half

D. full

E. rest

[対話２]

Waitress: Welcome to Showa Cafe. （　う　）?

Customer: No, I have a reservation for three. It should （　え　）.

Waitress: This way, please.

Customer: Thank you.

Waitress: Would you like something to drink while you wait for your friends?

Customer: I'll just have water, please.

（　う　）の選択肢

A. Are you ready to order

B. What do you usually have for lunch

C. Table for two

D. Do you have any specials

E. Can I get you anything else

（　え　）の選択肢

A. be four

B. have a table in a quiet spot

C. see you at 8:00

D. be under Suzuki

E. have those out shortly

[対話３]

Man 1: I would like to talk with Dr. Brown.

Man 2: I'm afraid he's out now. （　お　）

Man 1: Yes, please. Please tell him that Suzuki called.

Man 2: I will.

（　お　）の選択肢

A. What can I do for you?

B. Can I take a message for him?

C. Let me know if you need help.

D. Could you call again?

E. What shall I do?

5 次の文章を読んで以下の設問に答えなさい。

[1] That flock of pigeons flying overhead may look like a chaotic cloud of birds, but it's more like an airborne* hierarchy. By strapping tiny global positioning system (GPS) backpacks onto the birds, researchers have found that a flock follows several leaders at any given time in flight. But the flock's leadership can change so that even low-ranking birds sometimes get a chance to command. The findings could shed light on how other groups of animals behave en masse*, such as herds of wildebeest*, schools of fish, and even crowds of humans.

[2] Flocks of birds are one of the most common sights in everyday life, but many aspects of the animals' behavior remain poorly understood. Why, for example, do flocks suddenly change directions and then change directions again within a few seconds? Why do birds in flight suddenly stop to rest on a certain stretch of telephone wire? And lacking any threat or sudden disturbance, why do flocks on the ground spontaneously take to the air?

[3] To find some of the answers, researchers exploited a bit of 21st century technology. A team led by statistical physicist Tamás Vicsek of Eötvös University in Hungary outfitted a trained flock of 13 homing pigeons with tiny GPS receivers that could determine each individual bird's position every 0.2 seconds. Then they sent as many as 10 members of the flock out on 15 test flights. The journeys included four flights of about 15 kilometers back to the birds' roost* and 11 flights (1) freely around their home base outside Budapest. The researchers tracked each bird's directional changes and how often those changes either followed or were copied by its flockmates.

[4] In today's issue of *Nature*, the team reports that the flight patterns showed a definite hierarchy, with most or all of the birds consistently copying changes in direction by the flock's leaders, (2) almost always flew in front. If, for example, a leading bird suddenly swerved* to the right, its followers copied its move (あ)within about 0.4 seconds — an amount of time considered too long to be reflexive.

[5] However, the data also revealed that the leaders weren't always the same, even within a single flight. And sometimes, even the birds at the bottom of the pecking order would lead the flock for brief periods. The arrangement made each flight more (い)egalitarian, but the researchers think (う)the reason might be more evolutionarily than politically driven. It's possible that this type of group decision-making is more accurate or beneficial than others, says zoologist and co-author Dora Biro of the University of Oxford in the United Kingdom. Perhaps the individuals in the flocks stand a better chance of survival if they sometimes participate in guiding the group rather than constantly submitting to a single leader.

[6] Another curiosity was that the lower-ranking birds most often flew behind and to the right of the leaders. The researchers think this relates to the structure of the birds' brains, in which the left side handles spatial tasks and the right side governs social recognition. Therefore, anything the birds see with their left eye (which is processed by the right side of the brain) tends to yield a quicker social response.

[7] "The degree of coordination that flocks achieve is really impressive," Biro says. "We identified a clear hierarchical structure within the decision-making process." She says the team next plans to study flock members in greater depth, including their genders, ages, navigational experiences, to determine "what airborne leaders are made (3)."

[8] The findings could help explain group behavior of other animals, such as schooling fish, says evolutionary biologist Iain Couzin of Princeton University. There's a "fascinating balance" between democratic and hierarchical control in the pigeon flocks, he says. And this sophisticated study reveals the link between the birds' brain hemispheres and how they gather information during their flights. It achieves "a deeper understanding of coordinated control in animal groups," he says.

(From When Pigeons Flock, Who's in Command? by Phil Berardelli Apr. 8, 2010 Science (http://www.sciencemag.org/news/2010/04/when-pigeons-flock-whos-command). Reprinted with permission from AAAS.)

(注)

airborne 空中の　　en masse 集団で

wildebeest ヌー(南アフリカ産のウシ科の動物)

roost ねぐら　　swerve ～へそれる

(1) 空所(1)～(3)に入れるのに最も適切な語(句)を次から1つ選び，記号で答えなさい。

(1) A. roam　B. roams　C. roaming　D. roamed　E. being roamed

(2) A. whom　B. which　C. that　D. when　E. where

(3) A. after　B. of　C. on　D. over　E. to

(2) [4]の下線部(あ)の反応時間から，どの様な結論が導き出されたかを，句読点を含め60字以内の日本語で書きなさい。

(3) [5]の下線部(い)の語の定義を1つ選び，記号で答えなさい。

A. based on the belief that some races of people are better than others

B. based on the belief that any violence is unjustifiable under any circumstances

C. based on the belief that good things will happen and that something will be successful

D. based on the belief that everyone is equal and should have equal rights

E. based on the belief that pleasure is the most important thing in life

(4) [5]の下線部(う)の内容を具体的に説明している文を抜き出し，その文頭と文末の1語を書きなさい。

(5) 次の中から本文の内容に合っているものを3つ選び，記号で答えなさい。

A. If you watch flocks of pigeons in flight, you will see only high-ranking pigeons in a flock can lead the group.

B. It is still not known why birds suddenly take flight or stop to rest.

C. The flock may look like a chaotic cloud of birds, and in fact flocks are not highly organized.

D. A research team attached tiny GPS receivers to a trained flock of pigeons. The receivers determined each bird's position five times a second.

E. When the flock's leadership can change, the time lag between the change in a leader's position and its followers' reaction was about 0.2 seconds.

F. Low-ranking birds sometimes get a chance to lead a group for a long time.

G. Followers usually flew in front and to the right of the leaders. This may be because of the structure of the pigeons' brains.

H. Researchers' findings may help greatly understand how other groups of animals behave, such as schooling fish, herds of cattle, and humans.

数　学（その１）

1 次の各問いに答えよ。ただし，答えは結果のみを解答欄に記入せよ。

平行四辺形 OACB を考える。$\overrightarrow{OA}=\vec{a}$，$\overrightarrow{OB}=\vec{b}$ とする。また，$|\overrightarrow{OC}|=1$，$|\overrightarrow{BA}|=2$ とし，$\overrightarrow{OC}$ と $\overrightarrow{BA}$ のなす角は 60° とする。

(1) $|\vec{a}|$，$|\vec{b}|$，および内積 $\vec{a}\cdot\vec{b}$ を求めよ。

(2) s が実数全体を動くとき，$|\vec{a}+s\vec{b}|$ が最小となるときの s の値を求めよ。また，そのとき $(\vec{a}+s\vec{b})\cdot\overrightarrow{BA}$ の値を求めよ。

(3) すべての実数 t に対し $|t\vec{a}+k\vec{b}|\geqq|\vec{a}|$ が成り立つような実数 k の範囲を求めよ。

(4) 平行四辺形 OACB の面積を求めよ。

2 次の各問いに答えよ。ただし，答えは結果のみを解答欄に記入せよ。

(1) α および β が複素数であるとき，

$$\overline{\left(\frac{\alpha\overline{\beta}}{\overline{\alpha}\beta}\right)}$$

を，α，β，$\overline{\alpha}$ ならびに $\overline{\beta}$ を用いてできるだけ簡単に表せ。

(2)

$$\alpha = \frac{2}{1-i},\quad \beta = \frac{4\sqrt{3}}{\sqrt{3}-i}$$

を計算過程に用いて，$\sin\dfrac{\pi}{12}$，$\cos\dfrac{\pi}{12}$，$\sin\dfrac{5}{12}\pi$ および $\cos\dfrac{5}{12}\pi$ の値を求めよ。ただし i は虚数単位とする。

(3) α，β が(2)のように与えられるとき，

$$\left\{\overline{\left(\frac{\alpha\overline{\beta}}{\overline{\alpha}\beta}\right)}\right\}^{9}$$

の値を求めよ。ただし，必要ならば，i を虚数単位として用いよ。

数　学（その２）

3 次の各問いに答えよ。ただし，答えは結果のみを解答欄に記入せよ。

(1)

$$\begin{cases} 2^{x-1}+3^{y-1}=19 \\ 2^{x+2}-3^{y+2}=47 \end{cases}$$

を解け。

(2) $(a+2b)(2b+3c)(3c+a)+6abc$ を因数分解せよ。

(3) ５人でじゃんけんをするとき，一度のじゃんけんで勝ちが１人決まる確率を求めよ。ただし，各人がじゃんけんでグー，チョキ，パーを出す確率はすべて $\frac{1}{3}$ であるとする。

(4) a を実数とする。３辺の長さがそれぞれ $a-1$，a，$a+2$ となる三角形が鈍角三角形になる a の範囲を求めよ。

(5) 半径１の円に内接する正 n 角形の面積の $\frac{1}{n}$ を S_n とする。このとき，S_{2018} を S_{1009} を用いて表せ。

4 次の各問いに答えよ。ただし，答えは結果のみを解答欄に記入せよ。

(1)

$$\int_1^e x(\log x)^2 dx$$

の値を求めよ。ただし，e は自然対数の底である。

(2) x の方程式 $e^{3x} = kx(3x + 2)$ が実数解を1つもつように実数 k のとり得る値の範囲を定めよ。ただし，e は自然対数の底である。

(3) 関数

$$f(x) = \int_x^{x+1} |t(t^2 - 1)| dt$$

の最小値を求めよ。