

平成 29 年1月7日実施

名古屋市立大学大学院医学研究科修士課程入学試験(2回目) 英語(出題言語一英語)

Read the following sentences and answer the following 5 questions. (100 points)

この部分に掲載されている文章については、  
著作権法上の問題から掲載することができません  
ので、ご了承ください。

Quoted from : A Bilingual Handbook on Japanese Culture (Natsumesha Co. Ltd.)

Question 1 Who developed Judo as a sport and how did the person develop Judo?

Who ( )

How ( )

Question 2 What kind of categories does Judo have?

Question 3 The rank of Judo is indicated by the color of participants' belts. Explain the rank by the color.

Question 4 When was the International Judo Federation founded?

( )

Question 5 How did Judo become an official Olympic event?

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Read the following sentences and answer the following 4 questions. (100 points)

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Quoted from : 1, 3. The Precision Medicine Initiative, The Whitehouse

2. FACT SHEET: President Obama's Precision Medicine Initiative, January 30, 2015, The Whitehouse

Question 1 What does (1) “one-size-fits-all” approach mean? Explain it in your own words.

Question 2 Explain the underlined sentences (2) in your own words.

Question 3 Regarding the underline (3), explain what “Precision Medicine Initiative” is. Explain the difference between “Precision Medicine” and conventional medicine.

Question 4 Explain the (4)future of precision medicine. Also, what do we need to realize “Precision Medicine Initiative”?

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Choose any 3 of the following 5 examination questions **(I) ~ (V)**. Enter the examination question number of your choice in the boxes below.

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(I) Briefly define any 5 of the following terms. (100 points)

circadian rhythm

dementia

epithelium

endocytosis

genome editing

glycolysis

oncogene

RNA splicing

transcription

Zika virus

1) \_\_\_\_\_

2) \_\_\_\_\_

3) \_\_\_\_\_

4) \_\_\_\_\_

5) \_\_\_\_\_



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**(II)** Answer the following 2 questions. (100 points)

Question 1 Explain two major intercellular signaling pathways by giving specific examples.

Question 2 Explain the role of intracellular calcium ions ( $[Ca^{2+}]_i$ ) in neuromuscular transmission.

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(III) Read the following sentences and answer the following 3 questions. (100 points)

The genetic information stored in DNA is firstly transcribed into mRNA, and then mRNA serves as a template for translation of protein. (A) During translation, it was thought that the bases would have to be used in combinations of three nucleotides to recognize 20 amino acids (triplet theory), and this assumption proved to be true later. Khorana and his co-workers have performed the following experiments to solve the coding assignments of individual triplets. (B) They synthesized two kinds of artificial mRNA ((1)5'---ACACACACACAC---3', (2)5'---CAACAACAACAA---3') and tested amino acids incorporated into proteins. As a result, a kind of protein (---Thr-His-Thr-His---) was found from mRNA(1), and three kinds of products (---Asn-Asn-Asn-Asn--- or ---Gln-Gln-Gln-Gln--- or ---Thr-Thr-Thr-Thr---) were identified from mRNA(2).

(Thr, threonine; His, histidine; Asn, asparagine; Gln, glutamine)

Question 1 Regarding the sentence underlined (A), explain the reason why it was thought that the combination of 3 bases is necessary to recognize one amino acid.

Question 2 Triplet that recognizes each amino acid is termed “genetic code (codon)”. Results from the experiments underlined (B), explain how to decode the each codon of Thr, His, Asn, and Gln.

Question 3 In the point mutations of the gene, explain the reason why the protein as gene product can be drastically changed in case of one base deletion or insertion in comparison with one base substitution.

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(IV) Answer the following 2 questions. (100 points)

Question 1 Explain the following four scales of measurement in statistics.

1. Nominal scale

2. Ordinal scale

3. Interval scale

4. Ratio scale

Question 2 Explain reliability and validity of measurement.

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(V) Answer the following 5 questions. (100 points)

Question 1 When an object is subject to force vector  $\mathbf{F}$  and travels distance with vector  $\mathbf{s}$ , express the work  $W$  by using angle  $\theta$  between  $\mathbf{F}$  and  $\mathbf{s}$ ,  $\|\mathbf{F}\|$  and  $\|\mathbf{s}\|$  as the norms of  $\mathbf{F}$  and  $\mathbf{s}$ .

Question 2 Confirm if an inner product of vectors  $\mathbf{f} = (f_1, f_2)$  and  $\mathbf{g} = (g_1, g_2)$ , represented as  $\langle \mathbf{f}, \mathbf{g} \rangle$ , equals to the sum of each product of elements with the same suffixes, i.e.,

$$\langle \mathbf{f}, \mathbf{g} \rangle = f_1 g_1 + f_2 g_2$$

Use cosine law with angle  $\theta$  between  $\mathbf{f}$  and  $\mathbf{g}$ .

Question 3 If a two-dimensional pair of vectors  $\{v_1, v_2\}$  is orthogonal with each other and each norm is equal to 1, the pair is called as orthonormal basis.

Confirm if a pair of vectors  $v_1 = \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$  and  $v_2 = \left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$  is the orthonormal basis.

Question 4 A vector of the combination of vectors  $v_1$  and  $v_2$  with coefficients  $C_1$  and  $C_2$  is able to represent an arbitrary vector in two-dimensional surface:

$$f = C_1 v_1 + C_2 v_2$$

Explain  $f = \left(\frac{\sqrt{3}}{2}, \frac{5}{2}\right)$  as the serial combination above by using  $\{v_1, v_2\}$  given in Question 3.

Question 5 Suppose a group of functions with its inner product of each pair of two functions equal to 0. When the group of functions of

$$\{ \phi_k(t), k = 0, 1, 2, \dots \}$$

is orthogonal with the inner product of any pair of functions within the interval  $[a, b]$ , it is expressed as below:

$$\langle \phi_m(t), \phi_n(t) \rangle = \frac{1}{b-a} \int_a^b \phi_m(t) \phi_n(t) dt = 0 \quad (m, n = 0, 1, 2, \dots, m \neq n)$$

When the norm of each function, in addition, is also equivalent to 1,

$$\langle \phi_m(t), \phi_m(t) \rangle = \frac{1}{b-a} \int_a^b \phi_m^2(t) dt = 1$$

the functions group is called as the system of orthonormal functions.

Confirm if a system below is the orthonormal functions within the interval  $[-\pi, \pi]$ .

$$\{ 1, \sin t, \sin 2t, \sin 3t, \dots \}$$