

考 試 科 目	神經生物學	系 所 別	神經科學研究所	考 試 時 間	2 月 9 日 (三) 第 4 節
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選擇題：每題 2 分

1. Which of the following statement about "DENDRITE" is correct?

- (A) A neuron usually has only one dendrite.
- (B) It contains ribosomes for protein synthesis.
- (C) The dendritic membranes contain many voltage-gated sodium channels.
- (D) Proximal branches of dendrites are rare.
- (E) none of above

2. In terms of activation of neurotransmitter-gated channels during an post-synaptic potential,

- (A) excitatory: inhibitory = norepinephrine : dopamine
- (B) excitatory: inhibitory = glutamate : acetylcholine
- (C) excitatory: inhibitory = glutamate : γ -Aminobutyric acid
- (D) excitatory: inhibitory = dopamine: γ -Aminobutyric acid
- (E) excitatory: inhibitory = dopamine : acetylcholine

3. In terms of ion flow during an action potential,

- (A) depolarization: repolarization = K^+ : Na^+
- (B) depolarization: repolarization = Na^+ : K^+
- (C) depolarization: repolarization = Na^+ : Cl^-
- (D) depolarization: repolarization = K^+ : Cl^-
- (E) none of above

4. People with damaged Broca's area will be difficult to

- (A) understand what you said.
- (B) walk coordinatly.
- (C) recognize your face.
- (D) talk to you.
- (E) all of above

5. Which lobe of the brain mainly processes motor information?

- (A) Frontal lobe
- (B) Temporal lobe
- (C) Occipital lobe
- (D) Parietal lobe
- (E) all of the above

6. Which type of the following cells is responsible for color vision?

- (A) hair cells
- (B) bipolar cells
- (C) rod cells
- (D) cone cells
- (E) none of above

7. Which of the following brain regions may determine sexual orientation?

- (A) corpus callosum
- (B) superchiasmatic nucleus
- (C) superior colliculus
- (D) locus coeruleus
- (E) anterior hypothalamus

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8. Which of the following statement about "Alzheimer's disease (AD)" is NOT correct?

- (A) AD only occurs in people older than 60 years of age.
- (B) Most AD cases are sporadic.
- (C) AD patients often show progressively declined cognitive function.
- (D) Senile plaques can be detected in the brain of AD patients.
- (E) none of the above

9. Which of the followings is NOT a component of medication for Parkinson's disease?

- (A) Levodopa
- (B) DDC inhibitors
- (C) COMT inhibitors
- (D) Dopamine
- (E) all of above

10. How does neurotransmitters be released in a regular basis?

- (A) by diffusion
- (B) by exocytosis
- (C) through channels
- (D) through transporters
- (E) all of above

11. Whose properties of the following channels determine the threshold of an action potential?

- (A) voltage-gated sodium channels
- (B) voltage-gated potassium channels
- (C) voltage-gated calcium channels
- (D) voltage-gated chloride channels
- (E) sodium-potassium pumps

12. Molecules with _____ can hardly pass through the blood-brain barrier.

- (A) low electrical charges
- (B) low molecular weight
- (C) low lipophilicity
- (D) low hydrophilicity
- (E) all of above

13. Which of the following can be a function of cytoskeleton in neurons?

- (A) Cell movement
- (B) Retrograde transport
- (C) Cell division
- (D) Cell shape maintenance
- (E) all of above

14. Which of the following neurotransmitters is synthesized in the nerve terminals?

- (A) Nitric oxide
- (B) Opioid
- (C) Dopamine
- (D) Endorphin
- (E) none of above

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15. Which of the following movement disorders is NOT caused by imbalanced dopamine in the brain?

- (A) Parkinson's disease
- (B) Huntington's disease
- (C) Tourette's syndrome
- (D) Restless legs syndrome
- (E) None of above

二、解釋名詞：每題 5 分

1. Long-term potentiation
2. saltatory conduction
3. tangential migration
4. Cortical homunculus

三、問答題：每題 10 分

1. How does environment (nurture) affect gene expression (nature) causing diseases in the brain? Please explain the possible molecular mechanism.
2. Dysregulated neurotransmission has been implicated in pathogenesis of schizophrenia. Please explain what and how the neurotransmitters linked to the symptoms of schizophrenia.
3. How does a smoker get addicted to nicotine? Please explain the possible action of nicotine in the reward circuit of his brain.
4. Please describe (A) the anatomical components of the basal ganglia (B) how the basal ganglia motor loop control voluntary movement.
5. Covid19 pandemic has severely affected people's life all over the world. Many cases report a symptom of smell loss. However, ACE2 (the receptors for SARS-CoV-2) is not expressed in olfactory sensory neurons (Cooper et al., 2020, Neuron). Please speculate any possible pathological mechanisms for COVID-induced olfactory impairment in patients.

備

註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。