

知覺與生理心理學：三大題（生心兩大題，知覺一大題），生心與知覺各佔 50 分，共計 100 分

※ 本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

一、生心名詞解釋題：共 13 題，可自行選擇 10 題作答（回答超過 10 題者，採前 10 題計分）。每題 2 分，共計 20 分。請簡單扼要回答重點並簡要說明其意涵或主要作用（英翻中不給分）。

1. cannabinoid receptor
2. tDCS
3. dose-response curve (DRC)
4. absolute refractory phase
5. cerebrospinal fluid
6. myelin
7. dementia
8. Psychosurgery
9. in situ hybridization
10. ketamine
11. striatum
12. amphetamine psychosis
13. SSRI

二、生心問答題（3 題，每題 10 分，共 30 分）：請簡單扼要回答但務求詳盡。

1. 兒茶酚胺類（catecholamine）是一類重要的神經傳導物質和激素，請問（1）包含哪三個神經傳導物質和激素？（2）他們主要的功能為何？或與哪些重要的生心理功能或疾病有關？
2. 請問何謂 Optogenetics 與 Chemogenetics？其主要的機制或原理為何？兩者主要差異為何（如功效、方式、目的等）？
3. 根據第二題，請分別以這兩種方式設計一個合理可行的實驗，透過實驗法來回答或驗證你感興趣的生心或行為神經科學相關研究議題。

見背面

※ 本大題請於試卷內之「選擇題作答區」依序作答。

三、知覺選擇題：單選題 20 題，每題 2.5 分，共 50 分。

1. What is the fundamental distinction in the response properties of a "complex cell" compared to a "simple cell" as identified by Hubel & Wiesel (1968)?

- A) Complex cells are insensitive to stimulus orientation.
- B) Simple cells are found exclusively in layer 4C, while complex cells are found in the LGN.
- C) Simple cells respond only to moving stimuli, while complex cells respond to stationary ones.
- D) Complex cells exhibit phase-insensitivity, responding to an oriented edge regardless of its exact position within the receptive field

2. The L and M opsin genes are 98% identical and situated head-to-tail on the X-chromosome. What is the primary mechanism responsible for the high prevalence of "anomalous trichromacy" (protanomaly/deuteranomaly) in the human population?

- A) Random X-inactivation in the retinal mosaic of males.
- B) Intergenic unequal recombination producing hybrid genes with shifted absorption spectra.
- C) Point mutations in the 11-cis-retinal binding pocket of the S-opsin.
- D) Deletion of the LCR (Locus Control Region) in the downstream region of the M-opsin.

3. In the Composite Face Task, it is difficult to identify the top half of one face when it is aligned with the bottom half of another face. If the two halves are misaligned, the task becomes much easier. This is evidence for:

- A) Part-based recognition of objects.
- B) The superiority of the Magnocellular pathway in identifying chin shapes.
- C) The failure of the lens to focus on two things at once.
- D) The mandatory nature of holistic integration in face perception.

4. The VWFA in the left fusiform gyrus responds specifically to written words. Since reading is a recent cultural invention (~5,000 years), Stanislas Dehaene's "Neuronal Recycling" hypothesis suggests that the VWFA:

- A) Evolved specifically for alphabets via a sudden genetic mutation.
- B) Is a byproduct of the auditory system "leaking" into the visual system.
- C) Co-opts an evolutionary precursor area originally used for high-resolution pattern recognition.
- D) Does not actually exist; reading is handled entirely by the frontal lobes.

5. Gestalt psychologists proposed the Law of Prägnanz (the Minimum Principle), suggesting the brain chooses the simplest interpretation. Conversely, Helmholtz proposed the Likelihood Principle. How does modern vision science reconcile these two?

- A) The simplest description is often the most probable one, making the two principles equivalent.
- B) They are mutually exclusive; the brain only uses simplicity for 2D stimuli and probability for 3D stimuli.
- C) The Minimum Principle is handled by the retina, while the Likelihood Principle is handled by the prefrontal cortex.
- D) Probability is only used for color, while simplicity is used for motion.

6. Prosopagnosic patients often fail to recognize familiar faces but can recognize objects. Interestingly, they often do not show the Face-Inversion Effect. What does this imply?

- A) Their eyes are physically unable to rotate images.
- B) They likely perceive faces as a collection of individual parts rather than a unified whole.
- C) They have forgotten the names of their family members.
- D) They are relying entirely on the dorsal stream for face recognition.

7. What did the successful perception of depth in a random dot stereogram fundamentally prove about the visual hierarchy?

- A) That stereopsis can occur at a "pre-attentive" level before any monocular shape or contour recognition has taken place.
- B) That the brain uses color contrast to resolve depth.
- C) That the retina is capable of performing 3D reconstruction independently of V1.
- D) That the correspondence problem is solved by the Superior Colliculus.

8. In the classic study of Holway & Boring (1941), observers matched the size of a comparison disk to a test disk placed at various distances. What was the critical finding when all depth cues (monocular and binocular) were removed via a "reduction" tunnel?

- A) Observers still maintained perfect size constancy.
- B) Observers perceived all disks as being at a distance of exactly one meter.
- C) The perceived size was determined almost entirely by the retinal image size.
- D) The disks appeared to change color as they moved further away.

9. The Purkinje shift

- A) occurs when reds appear brighter than blues in well-lit conditions, but blues appear brighter than reds in dim conditions.
- B) occurs when blues appear brighter than reds in well-lit conditions, and blues also appear brighter than reds in dim conditions.
- C) occurs when details that are easily seen in well-lit conditions become more difficult to see in low-light conditions.
- D) demonstrates the importance of eye movements in visual pigment regeneration.

10. In regard to specificity vs. population coding, most researchers conclude that

- A) Population coding has the most research support.
- B) Specificity coding has the most research support.
- C) Basic taste qualities are determined by specificity coding, and population coding is important for discriminating subtle differences.
- D) Basic taste qualities are determined by population coding, and specificity coding is important for discriminating subtle differences.

11. In the perceptual process, what is the fundamental difference between "perception" (Step 5) and "recognition" (Step 6)?

- A) Perception is the conscious awareness of a stimulus, whereas recognition is the process of placing that object into a meaningful category.
- B) Perception involves the transformation of environmental energy into electrical signals, while recognition involves neural processing.
- C) Perception is a strictly bottom-up process, while recognition is a strictly top-down process.
- D) Recognition occurs immediately after transduction, while perception occurs only after the signal reaches the frontal lobe.

12. According to Anne Treisman's Feature Integration Theory, at what stage are independent features combined into coherent objects?

- A) The sensory memory stage where the filter unit operates.
- B) The motor signal stage that coordinates eye movements.
- C) The preattentive stage where features are processed automatically.
- D) The focused attention stage which requires conscious effort.

13. What is the primary purpose of a saliency map when analyzing a visual scene?
- A) To identify which regions are visually different from others.
 - B) To predict eye movements based on an observer's goals.
 - C) To provide information regarding the semantic meaning of objects.
 - D) To track the "just in time" strategy during tasks.
14. In the context of optic flow, what information does the Focus of Expansion (FOE) provide?
- A) It indicates the destination toward which the observer moves.
 - B) It signals the gradient of flow in the foreground.
 - C) It measures the speed of movement relative to objects.
 - D) It provides invariant information about an object's physical size.
15. What did Larsen's fMRI research reveal about apparent motion compared to real motion?
- A) Apparent motion activates separate areas for each flashed square.
 - B) Apparent and real motion activate similar areas in the cortex.
 - C) Real motion activates the cortex while apparent motion does not.
 - D) Apparent motion requires more processing time in the MT area.
16. Which brain area is specifically associated with the perception of biological motion?
- A) The primary visual receiving area in the striate cortex.
 - B) The superior temporal sulcus.
 - C) The parietal reach region.
 - D) The lateral geniculate nucleus.
17. In Janzen and van Turennout's (2004) study on museum navigation, what did fMRI activity reveal about decision-point landmarks?
- A) Brain activation increases only for those objects that the participants successfully remembered.
 - B) The parahippocampal gyrus shows higher activation for these landmarks even if they are forgotten.

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C) Non-decision-point objects elicit the strongest neural responses within the parietal reach region.

D) Virtual navigation performance relies strictly on global optic flow rather than specific landmarks.

18. According to corollary discharge theory, why does the world stay stable during eye movements?

A) Motor signals are ignored when the eyes move rapidly.

B) The image displacement signal is blocked during every saccade.

C) Both the IDS and CDS signals reach the comparator.

D) Predictive remapping occurs after the eye movement is finished

19. When Hofman and colleagues (1998) placed molds in listeners' ears to alter their spectral cues, what happened to their localization ability after the molds were removed?

A) Localization was permanently impaired because the brain had "overwritten" the old spectral cues.

B) Localization remained excellent immediately after removal.

C) Listeners could localize azimuth but lost all ability to localize elevation.

D) The "cone of confusion" became significantly larger, making all localization ambiguous.

20. Research by Aniruddh Patel and colleagues (1998) on the P600 event-related potential (ERP) provided evidence for which of the following regarding the relationship between music and language?

A) Music and language are processed in separate, non-overlapping modules of the brain since P600 only responded to violations in syntax but not music.

B) Only highly trained musicians show a P600 response when musical expectations are violated.

C) Music and language share a common neural mechanism for processing syntax, as violations in either elicit the same P600 response.

D) The P600 response is an emotional reaction to "scary" music rather than a cognitive reaction to structure.