

School of **Bioscience**

WRITTEN EXAMINATION

Course **Central Topics in Cognitive Neuroscience I G1F**

Examination **Supervised Written Exam**

Course code **KU343G**

Credits for written examination **4hp**

Date **25-10-28**

Examination time **14:15-18:30**

Examination responsible **Patrick Falk**

Teachers concerned **Patrick Falk**

Aid at the exam/appendices

Other

Instructions

- ☐ Take a new sheet of paper for each teacher.
- ☐ Take a new sheet of paper when starting a new question.
- ☐ Write only on one side of the paper.
- ☐ Write your name and personal ID No. on all pages you hand in.
- ☐ Use page numbering.
- ☐ Don't use a red pen.
- ☐ Mark answered questions with a cross on the cover sheet.

Grade points

Examination results should be made public within 18 working days

Good luck!

Total number of pages

Welcome to the Central Topics in Cognitive Neuroscience I (KU343G) supervised multiple-choice exam.

This exam determines your final grade (A-F). Each question awards 1 point for each correct answer, and each question has one correct answer among the four options provided, unless otherwise noted! For each question, carefully read all answer options before selecting the one you believe is most correct by circling the letter (a-d). If you change an answer, ensure the old mark is completely erased to avoid ambiguity.

A: 33-35p (Pass with Distinction)

B: 29-32p (Pass with Merit)

C: 25-28p

D: 21-24p

E: 17-20p (Pass)

F: 0-16p (Fail)

Good luck!

1. **All of the following are common across each sensory system, EXCEPT:**
 - a. Neuronal signals are passed along specific sensory nerves
 - b. System nerves terminate either monosynaptically or disynaptically in different parts of the thalamus
 - c. The system begins with a structure for collecting, filtering, and amplifying information from the environment
 - d. The system contains specialized receptor cells that transduce environmental stimuli

2. **Information about which of the following senses does NOT pass through the thalamus on the way to the cortex?**
 - a. Audition
 - b. Olfaction
 - c. Gustation
 - d. Somatosensation

3. **The primary olfactory cortex is located at the junction of the _____ and _____ lobes.**
 - a. frontal; temporal
 - b. frontal; parietal
 - c. temporal; occipital
 - d. parietal; occipital

4. The primary gustatory cortex is located in the
- thalamus and hypothalamus
 - hippocampus and amygdala
 - pons and medulla
 - insula and operculum
5. Before entering the brain, each optic nerve splits into two branches so that information from the _____ half of each retina crosses to the opposite side of the brain.
- nasal (medial)
 - temporal (lateral)
 - left (dorsal)
 - right (ventral)
6. Simple cells in the primary visual cortex selectively respond to visual stimuli based on
- direction of stimulus motion
 - stimulus color
 - stimulus orientation
 - distance of the stimulus from the viewer
7. If you were to conduct a single-cell recording from a neuron in the MT region of the extrastriate visual cortex, you would probably find that it fires most vigorously to a
- bar of light that alternates in color between red and green
 - bar of light tilted at a 15° angle in the center of the cell's receptive field
 - corner-shaped region of light on a dark background
 - bar of light that moves across the cell's receptive field
8. Achromatopsia is due to
- the absence of the photopigment sensitive to long wavelengths
 - the absence of the photopigment sensitive to short wavelengths
 - cortical lesions in area V4
 - cortical lesions in area MT
9. The highest density of _____, or color-sensitive photoreceptors, can be found in the _____ of the retina.
- cones; fovea
 - cones; periphery
 - rods; fovea
 - rods; periphery

10. The patient D.F., studied by Goodale and Milner (1982), had severe problems with object recognition. When presented with a circular block into which a slot had been cut,
- D.F. was able to insert a card into the slot when asked to do so, even though she was unable to follow the instruction to orient the card so that it would fit
 - D.F. was able to orient the card so that it would fit into the slot but was not able to insert the card into the slot when asked to do so
 - D.F. was unable to deduce that this object could be used to contain slips of paper upon touching it
 - D.F. was able to deduce that this object could be used to contain slips of paper but was unable to provide a name for the object upon touching it
11. With regard to the two main output pathways from the occipital lobe, _____ is to dorsal and _____ is to ventral.
- "where"; "what"
 - "what"; "where"
 - "who"; "what"
 - "what"; "who"
12. Optic ataxia is an inability to
- name familiar objects
 - read, acquired as an adult
 - recognize familiar visual objects
 - use visual information to guide movements
13. Neurons in the inferior temporal (IT) cortex rarely respond to _____. Rather, they respond to _____.
- lines or spots; human hands
 - human hands; lines or spots
 - animate objects; inanimate objects
 - inanimate objects; animate objects
14. Which of the following is NOT one of the basic tastes?
- acid
 - bitter
 - sweet
 - umami

15. Which of the following is NOT a type of corpuscle used for cutaneous somatosensation?
- Merkel
 - Golgi
 - Ruffini
 - Pacinian
16. Which of the following results would be expected for an individual experiencing the most common form of synesthesia?
- Their visual cortices have been shown to be sensitive to tactile discrimination
 - They show interference effects when asked to identify the colors of letters if the colors are inconsistent with their synesthetic experiences
 - Their somatosensory cortices have been shown to be sensitive to visual information
 - They show interference effects when asked to identify sung letters if the pitches are inconsistent with their synesthetic experiences.
17. Which subcortical region is known to maintain multimodal maps of the environment and is involved in the control and orienting of movements?
- the pons
 - the cerebellum
 - the medulla
 - the superior colliculus
18. Which of the following aspects have to be fulfilled to successfully induce the rubber hand illusion in most participants? Select all which apply.
- The hands are more than 30cm apart
 - The touches occur at the same time
 - The model hand has to look like a hand
 - The model hand has to be not more than 30% bigger than the real hand
19. Which of the following is the best example of cortical plasticity?
- the processing of tactile information by blind people in cortical regions that process visual information in sighted people
 - the ability of the barn owl to localize objects in space based on auditory and not visual information
 - the integration of information about olfaction and gustation in the orbitofrontal cortex
 - the activation of the superior colliculus by visual information in patients exhibiting blindsight

20. In which of these brain areas do you have the highest chance to find a neuron that is able to integrate visuo-tactile information?
- Posterior parietal cortex
 - Superior temporal gyrus
 - Inferior temporal gyrus
 - Postcentral gyrus
21. High-frequency sounds primarily activate hair cells at the _____ of the cochlea, whereas low-frequency sounds primarily activate hair cells at the _____ of the cochlea.
- base (thicker end); apex (thinner end)
 - apex (thinner end); base (thicker end)
 - superior end; inferior end
 - inferior end; superior end
22. The two cues that barn owls use to localize sounds are
- echolocation and interaural time
 - interaural time and interaural intensity
 - interaural intensity and interaural frequency
 - interaural frequency and echolocation
23. The primary visual pathway is best described as
- retina → optic nerve → hypothalamus → superior colliculus → occipital lobe
 - retina → cochlea → optic chiasm → thalamus → occipital lobe
 - retina → optic nerve → optic chiasm → thalamus → occipital lobe
 - retina → hippocampus → thalamus → superior colliculus → occipital lobe
24. Due to a defect in one type of photoreceptor, Sheena has poor vision at night, when light levels are relatively low. Which type of photoreceptor is defective?
- ganglion cell
 - cone
 - rod
 - cornea
25. A selective loss of motion perception is called
- achromatopsia
 - anomia
 - akinetopsia
 - agnosia

26. While simultaneously listening to a person saying "ba" and seeing a video of them saying "ga," you will most likely hear _____. This is because of _____.
- "ba"; the McGurk effect
 - "da"; the McGurk effect
 - "ba"; auditory acuity
 - "da"; visual acuity
27. Different parts of the body are represented in the primary somatosensory cortex in proportion to their size.
- True
 - False
28. The term *prosopagnosia* refers to unusual sensory unions, either between two senses, such as perceiving tastes for words, or within a single sense, such as perceiving colors for letters.
- True
 - False
29. The initial activation of the nervous system by which our sense organs transduces environmental stimuli is defined as
- Perception
 - Awareness
 - Sensation
 - Observation
30. What is the correct model to use for the statement "What is left of our observations when we make our best predictions"
- $\text{Data} - \text{Model} = \text{Error}$
 - $\text{Error} = \text{Data} - \text{Model}$
 - $\text{Data} = \text{Model} + \text{Error}$
 - $\text{Error} + \text{Model} = \text{Data}$
31. All of the following are general properties of sensory receptors, EXCEPT
- Intensity
 - Adaptation
 - Acuity
 - Range

32. What order best describe the retinal pathway of visual sensation

- a. Light → glial cells → bipolar neurons → rods/cones → optic nerve
- b. Light → optic nerve → ganglion cells → bipolar neurons → rods/cones
- c. Light → receptor cells → horizontal neurons → glial cells → optic nerve
- d. Light → rods/cones → bipolar neurons → ganglion cells → optic nerve

33. A cells receptive field corresponds to

- a. whatever pattern of stimulation affects that neuron's firing
- b. the surface area of receptor cells (e.g., rods/cones for vision, or hair cells in the cochlea)
- c. the right and left visual field transduced by the retina
- d. the cortical region relevant for its specific perceptual processing

34. High tactile acuity in discriminative touch is represented by _____ and _____

- a. small receptive density; large cortical representation
- b. small receptive fields; small cortical representation
- c. small receptive fields; large cortical representation
- d. large receptive density; small cortical representation

35. Affective/pleasant touch takes a privileged pathway to the cortex via _____ to the _____

- a. Slow C-Tactile afferent nerves; posterior insular cortex
- b. Fast C-fiber afferent nerves; primary somatosensory cortex
- c. Slow C-Tactile afferent nerves; primary somatosensory cortex
- d. Fast C-fiber afferent nerves; posterior insular cortex