

School of **Bioscience**

## WRITTEN EXAMINATION

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

Examination **Supervised Written Re-Examination**

Course code **KU343G**

Credits for written examination **4hp**

Date **25-12-17**

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)

**1. Glomeruli in the olfactory bulb:**

- a. Each receive input from only one receptor type
- b. Respond only to sweet and bitter odorants
- c. Project directly to the cerebellum
- d. Are inhibited during normal breathing

**2. Odorants from the mouth can travel back up into the nasal cavity.**

- a. True
- b. False

**3. The primary olfactory cortex is located in the parietal lobe.**

- a. True
- b. False

**4. The primary gustatory cortex is located in the**

- a. Thalamus and hypothalamus
- b. Hippocampus and amygdala
- c. Pons and medulla
- d. Insula and operculum

**5. A patient has an injury to the optic nerves, such that the branches of each optic nerve that normally cross to the opposite side of the brain at the optic chiasm are severed. The remaining branches, which do not cross to the other side of the brain, are intact. Which of the following best describes the effect of this injury on his vision?**

- a. The patient can now see only by using his right eye; his left eye is functionally blind
- b. Only information from the left visual field can enter the patient's brain for processing
- c. Only the signal for half the visual field of each eye is processed by the brain
- d. The patient's brain now receives visual information only from the medial half of each retina

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. **The optic disc creates a blind spot because:**
- Photoreceptors are oversaturated in this region
  - It contains only cones
  - No photoreceptors are present where ganglion cell axons exit the eye
  - Blood vessels block incoming light
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. **The orbitofrontal cortex is an integration area for which two senses?**
- Somatosensation and vision
  - Vision and audition
  - Olfaction and gustation
  - Somatosensation and proprioception

**12. Optic ataxia is an inability to**

- a. name familiar objects
- b. read, acquired as an adult
- c. recognize familiar visual objects
- d. use visual information to guide movements

**13. Neurons in the inferior temporal (IT) cortex rarely respond to \_\_\_\_\_. Rather, they respond to \_\_\_\_\_.**

- a. lines or spots; human hands
- b. human hands; lines or spots
- c. animate objects; inanimate objects
- d. inanimate objects; animate objects

**14. Which of the following is NOT one of the basic tastes?**

- a. Acid
- b. Bitter
- c. Sweet
- d. Umami

**15. Which of the following is NOT a type of corpuscle used for cutaneous somatosensation?**

- a. Merkel
- b. Calvert
- c. Meissner
- d. Pacinian

**16. In the auditory system, the conversion of sound waves into action potentials occurs in the**

- a. ganglion cells
- b. eardrum
- c. cochlear nucleus
- d. hair cells

**17. In the auditory system, the basilar membrane is located within the**

- a. cochlea
- b. eardrum
- c. pinna
- d. middle ear

- 18. Which of the following is the best example of cortical plasticity?**
- a. The processing of tactile information by blind people in cortical regions that process visual information in sighted people
  - b. The ability of the barn owl to localize objects in space based on auditory and not visual information
  - c. The integration of information about olfaction and gustation in the orbitofrontal cortex
  - d. The activation of the superior colliculus by visual information in patients exhibiting blindsight
- 19. Retinotopic organization means that:**
- a. Adjacent areas of cortex process unrelated visual features
  - b. The entire visual field maps to the hippocampus
  - c. Neighboring regions of the retina project to neighboring neurons in V1
  - d. Visual information is represented without spatial structure
- 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?**
- a. Posterior parietal cortex
  - b. Superior temporal gyrus
  - c. Inferior temporal gyrus
  - d. 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.**
- a. base (thicker end); apex (thinner end)
  - b. apex (thinner end); base (thicker end)
  - c. superior end; inferior end
  - d. inferior end; superior end
- 22. The two ears of the barn owl are positioned asymmetrically on the head, improving sound localization in the vertical direction.**
- a. True
  - b. False
- 23. The primary visual pathway is best described as**
- a. retina → optic nerve → hypothalamus → superior colliculus → occipital lobe
  - b. retina → cochlea → optic chiasm → thalamus → occipital lobe
  - c. retina → optic nerve → optic chiasm → thalamus → occipital lobe
  - d. 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. Which area of the body has the greatest amount of representation in the human primary somatosensory cortex?
- Hands
  - Feet
  - Gums
  - Trunk
28. Of the following choices, the strongest evidence for a link between the sense of smell and the triggering of memories is the observation that
- the olfactory cortex has direct connectivity to the limbic cortex
  - the olfactory cortex has direct connectivity to area MT
  - people with damage to the basal ganglia have compromised odor recognition
  - people with damage to the cerebellum have compromised odor recognition
29. The initial activation of the nervous system by which our sense organs transduces environmental stimuli is defined as
- perception
  - awareness
  - sensation
  - observation

- 30. Which receptor type is most sensitive to vibration and rapid changes in pressure?**
- a. Merkel disks
  - b. Ruffini endings
  - c. Pacinian corpuscles
  - d. Free nerve endings
- 31. All of the following are general properties of sensory receptors, EXCEPT**
- a. Intensity
  - b. Adaptation
  - c. Acuity
  - d. 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. Which type of somatosensory fiber primarily transmits slow, aching pain?**
- a. A-beta fibers
  - b. A-delta fibers
  - c. C fibers
  - d. myelinated mechanoreceptors