Receptive Fields
Student Pre-/Post-Test

Questions 1-8 are demographical. They are for evaluative purposes and will be kept confidential.

1. I am a UCLA student?

a. Yes
b. No

UCLA Student ID Number
--OR--
Non-UCLA Student Institution Name: _____

2. Email Address: _____

(This will be used for tracking purposes and possibly to send you a reminder to take the Post-Test only. We will keep your email address confidential; we will not share it with anyone.)

3. Academic year:

a. Freshman
b. Sophmore
c. Junior
d. Senior
e. Other

4. Department/major in which the course was offered:

a. Psychology department/major
b. Biology department/major
c. Neuroscience department/major
d. Other

5. Department/major to which I belong: _____

6. Grade expected to receive in the course:

a. A
b. B
c. C
d. D
e. F

7. Gender

a. M
b. F

8. I would characterize myself as:

a. Asian
b. Black
c. Latino(a)
d. Native American
e. White
f. Other

Questions 9-25 (each with options a-e) are based on the content of the Receptive Fields module.

9. What is the stimulus that would maximally drive cells in V1?
a. A field of solid, invariant color.
b. A bar of given orientation anywhere in the visual field.
c. A bar of a specific color anywhere in the visual field.
d. A dark bar in a given part of the visual field.
e. A field of solid, invariant gray.

10. Suppose that you found a person who would not see Red and Green at all. Which of the following reasons could explain this outcome?

a. Lack of color – opponent cells in the LGN.
b. Red cones actually having Green opsin.
c. Lack of all cones in the retina.
d. Lack of Blue-Yellow cells in the LGN.
e. options ***a***, ***b***, and ***c***

11. In the LGN, cells that responded to stimuli are expected to be applied to:

a. one eye or the other, but not both.
b. both retinas
c. a center-surround configuration
d. both ***a*** and ***c***
e. both ***b*** and ***c***

12. Suppose that you are presented with a fat bar of light and record from a given cell in the LGN. What would you expect to observe?

a. More responding in one orientation than another.
b. A big response proportional to the width of the bar.
c. A big increase in firing response but only when you move the edge of the bar into the part of the visual field for which the cell codes.
d. A big increase in firing response but throughout the visual field.
e. A meager increase in firing rate when the stimulus is in the part of the visual field for which the cell codes.

13. If a cell in the primary visual area (V1) responds both to Stimulus 1 and to Stimulus 2, but the cell was making more action potentials in response to Stimulus 1 than to Stimulus 2, we could conclude that:

a. Stimulus 1 is probably closer to the cell's preferred orientation than is Stimulus 2.
b. Stimulus 2 is probably not close to the part of the visual field for which the cell codes.
c. Stimulus 1 and Stimulus 2 must differ in contrast.
d. options ***a*** and/or ***c***
e. all of the above

14. If you found a cell in the LGN that responded optimally to a spot of light, increasing the diameter of that spot would:

a. increase the firing rate.
b. decrease the firing rate.
c. result in a sustained firing rate due to self-exciting circuits.
d. result in feedback to the retinal ganglion cells.
e. both ***c*** and ***d***

15. Babies cannot see contrast as well as adults. Which of the following statements could explain this phenomenon?

a. Babies have contrast invariance.
b. Babies do not have GABAergic neurons in their visual systems, but adults do.
c. Babies have less experience with the visual world relative to adults.
d. Brain mechanisms coding for contrast must be innate.
e. both ***b*** and ***c***

16. If you were to record from the optic nerve vs. the LGN, cells would:

a. reveal hierarchical organization.
b. have similar optimal stimuli.
c. code for retinal-specific loci in the optic nerve but not the LGN.
d. code for retinal-specific loci in both regions.
e. both ***b*** and ***d***

17. Which is not a cell type in the retina?

a. stellate cell
b. amacrine cell
c. ganglion cell
d. horizontal cell
e. rod

18. Receptive fields in the retina:

a. are equally sized.
b. exist only for cones (not rods).
c. are equal for both rods and cones, on average.
d. are smaller in the fovea.
e. are larger in the fovea.

19. Suppose that someone who was blind since birth, due to opaque cataracts, is suddenly given sight as an adult. He can now discriminate color but not shape or depth. Which of the following are consistent with these observations?

a. color vision is innate.
b. all visual percepts require experience.
c. neither shape nor depth must be innate percepts.
d. his visual system was probably flawed at birth both in the eye and in the brain.
e. both a and c

20. Suppose that someone was born with retinas completely devoid of cones. You would expect this person to be:

a. very light sensitive.
b. lacking the ability to discriminate color.
c. lacking the ability to discriminate brightness at high illumination levels.
d. completely lacking the ability to discriminate form.
e. options ***a***, ***b***, and ***c***

21. The depolarization of a neuron:

a. can be inferred from the number of action potentials that it makes.
b. cannot be inferred from the number of action potentials that it makes because the action potential is all-or-nothing.
c. is proportional to the hyper-responsive rebound mechanism.
d. depends on the sum of excitatory and inhibitory influences on the neuron.
e. both ***a*** and ***d***

22. High contrast stimuli elicit more action potentials from cell in the visual cortex than do low contrast stimuli. Suppose also that stimuli of one orientation drive cells more effectively than from other orientations. Further, the ability of the cell to be driven by a stimulus diminishes as you get further away from optimal orientation. Together, these phenomena lead to which of the following predictions?

a. Orientation must be a cue to depth perception.
b. Contrast must be a cue to depth perception.
c. Contrast and orientation must be coded by completely separate neural mechanisms.
d. When contrast is lower, the cell will be responsive to fewer orientations.
e. both ***b*** and ***c***

23. Suppose that a cell fired maximally to an orientation of 90 degrees and also fired to other orientations, but less and less so as the orientation moved further away from 90 degrees. Suppose also that a cell fired less to low contrast vs. high contrast stimuli. Which of the following would be true?

a. The cell would show more orientation specificity for low contrasts than high contrasts.
b. The cell would show more orientation specificity for high contrasts than low contrasts.
c. Contrast is invariant, so it would not matter.
d. Orientation is invariant, so it would not matter.
e. both ***c*** and ***d***

24. The fovea has better spatial resolution than does other aspects of the visual system. This phenomenon exists because there is:

a. a 1:1:1 correspondence between cones, bipolar cells, and ganglion cells.
b. a greater density of cones in the fovea than in the rest of the retina.
c. a greater density of rods in the fovea than in the rest of the retina.
d. a greater density of rods in the periphery than in the rest of the retina.
e. both ***a*** and ***b***

25. Suppose that recording from the visual system is done with the animal under anesthesia that enhances GABA binding allosterically. Which of the following would be true?

a. Cells in the un-drugged state would actually show greater specificity for stimuli such as orientation than in the drugged state.
b. The drugged and un-drugged state would probably reveal the same specificity for stimuli.
c. The animal would probably learn different neural response patterns in the drugged state due to state dependency.
d. Cells in the drugged state would actually show greater specificity for stimuli such as orientation than in the un-drugged state.
e. both ***b*** and ***c***

For questions 26-28 (each with options a-e), suppose the following:

M, N, O, and P are all different individuals.

I. M is the daughter of N.
II. N is the son of O.
III. O is the father of P.

26. Which of the following statements is true?

a. O is the uncle of M.
b. P and N are brothers.
c. M is the daughter of P.
d. If B is the daughter of N, then M and B are sisters.
e. If C is the granddaughter of O, then C and M are sisters.

27. Which of the following statements is contradictory?

a. P is the father of M.
b. O has three children.
c. M has one brother.
d. M is the granddaughter of O.
e. C could be the mother of M.

28. If B is the son of N, and B has one brother, D, then which of the following statements is true?

I. M is the sister of D.
II. D and N are brothers.
III. O is the grandfather of D.

a. option ***I*** only
b. option ***II*** only

c. option ***III*** only
d. both ***I*** and ***II***
e. both ***I*** and ***III***

For questions 29-32 (each with options a-e), suppose the following:

Six scientists, A, B, C, D, E, and F, are each to present a paper during a one-day conference. Three of them will present their papers in the morning session (before the lunch break) in the first, second, and third presentation slots, sequentially. The other three will present their papers in the afternoon (after the lunch break) in the fourth, fifth, and sixth presentation slots, sequentially. The presentations must be scheduled in such a way that they comply with the following rules:

I. B must present his paper immediately before C.
II. B and C's presentations must not be separated by the lunch break.
III. D must be either the first or last to present his paper.

29. If C presents his paper fifth, when must B present his paper?

a. first
b. second
c. third
d. fourth
e. sixth

30. B could present his paper at any of the following slots EXCEPT which?

a. first
b. second
c. third
d. fourth
e. fifth

31. If F presents his paper immediately after D, then C could present his paper at which of the following slots?

a. first
b. second
c. third
d. fourth
e. fifth

32. If F and E are the fifth and sixth presenters, respectively, then which of the following must be true about the order of presenters?

a. A is first.
b. A is third.
c. A is fourth.
d. B is first.
e. C is fourth.

For questions 33-34 (each with options a-e), suppose the following:

> **In an experiment conducted at a laboratory with 320 white mice, 160 experimental mice were injected with Serum D, while the other 160 control mice were injected with a harmless sugar solution. In two weeks time, 39% of the experimental white mice (who were injected with Serum D) contracted the highly contagious and often fatal disease, jungle fever. Hence, it can be concluded that jungle fever is caused by some elements similar to those in Serum D.**

33. The above discussion would be weakened most severely if it is shown that:

a. people contracting jungle fever are usually the victims of the bite of the South American Lesser Hooded Viper.
b. one among the 160 experimental white mice had already contracted jungle fever prior to the laboratory experiment.
c. the natural habitats of white mice do not contain any of the elements found in Serum D.
d. the scientists administered the injections while blind to the contents of the solutions used.
e. the 160 experimental white mice were kept in isolation from each other.

34. The above argument would be greatly strengthened if it were shown that:

a. some of the elements in Serum D were extracted from the root of a certain poisonous jungle wildflower.
b. within a period of two weeks, about 40% of the control white mice also contracted jungle fever.
c. almost all the white mice died within a period of two days after the first symptoms of jungle fever appeared.
d. normally the rate of jungle fever among white mice is less than 0.01%.
e. invariably the blood of jungle fever victims contains a high level of a certain toxic substance also found in Serum D.

For questions 35-39 (each with options a-e), suppose the following:

> **A manufacturer carries a stock of five essences, L, M, N, O, and P, to make a variety of perfumes. Two or more of these essences are used together in each perfume. For a blend of essences to be agreeable, it should comply with the following rules:**
>
> **I. a perfume containing L must also contain N, and the quantity of N should be twice that of L.**
> **II. a perfume containing M must also contain O, and the quantity of O should be equal to that of M.**
> **III. a single perfume should never contain both N and O.**
> **IV. a single perfume should never contain both O and P.**
> **V. the quantity of P in a perfume must be greater than the total quantity of the other essence(s) in the perfume combined.**

35. Among the following, which is an agreeable formula for a perfume?

a. One part L, one part P.
b. Two parts M, two parts L.
c. Three parts N, three parts L.

d. Four parts O, four parts M.
e. Five parts P, five parts M.

36. Adding more N will make which of the following perfumes agreeable?

a. One part L, one part N, five parts P.
b. Two parts M, two parts N, two parts P.
c. One part M, one part N, one part P.
d. Two parts M, one part N, four parts P.
e. Two parts N, one part O, three parts P.

37. Adding which of the following combinations would make an un-agreeable perfume, initially containing two parts N and one part P, agreeable?

a. One part L.
b. One part M.
c. Two parts N.
d. One part O.
e. Two parts P.

38. Among the following, which combination CANNOT be used together in an agreeable perfume containing two or more essences?

a. L and M.
b. L and N.
c. L and P.
d. M and O.
e. P and N.

39. Among the following, which combination can be made agreeable by eliminating some or all of ONE essence?

a. One part L, one part M, one part N, four parts P.
b. One part L, two parts N, one part O, four parts P.
c. One part L, one part M, one part O, one part P.
d. Two parts L, two parts N, one part O, two parts P.
e. Two parts M, one part N, two parts O, three parts P.

Question 40 is to verify which test you are taking.

40. If taking the Pre-Test, write the word **PRE**

--OR--

If taking the Post-Test, write the number of weeks it has been since completing the **Receptive Fields** module:

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