From Neuron to Brain 6th edition Martin Test Bank

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Chapter 2: Signaling in the Visual System

Test Bank

Type: multiple choice question
Title: Chapter 02 Question 01
1. We read words on a page with our central visual field. This is because the
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Describe the concept of convergence and divergence of connections.
Bloom's Level: 2. Understanding
a. visual field is distorted in the peripheral visual field.
b. peripheral visual field only responds to motion.
c. central visual field has fewer photoreceptors.
*d. central visual field has a higher density of photoreceptors.
e. retinal image is only focused at the central visual field.

Type: multiple choice question
Title: Chapter 02 Question 02
2. The lateral geniculate nucleus is comprised of six layers. Each layer receives visual information from
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Describe the concept of convergence and divergence of connections.
Bloom's Level: 1. Remembering
a. the entire visual field of one eye.
b. the entire visual field of both eyes.
*c. half of the visual field of one eye.
d. half of the visual field of both eyes.
e. half of the inputs from each eye.

Type: multiple choice question
Title: Chapter 02 Question 03
3. A neuron in the lateral geniculate nucleus (LGN) receives input from many retinal ganglion cells. This property is called
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Describe the concept of convergence and divergence of connections.
Bloom's Level: 1. Remembering
a. receptive field.
*b. convergence.
c. divergence.
d. accommodation.
e. dilation.

Type: multiple choice question
Title: Chapter 02 Question 04
4. A neuron in the lateral geniculate nucleus (LGN) sends input to many visual cortical cells. This property is called
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Describe the concept of convergence and divergence of connections.
Bloom's Level: 1. Remembering
a. receptive field.
b. convergence.
*c. divergence.
d. accommodation.
e. dilation.

Type: multiple choice question
Title: Chapter 02 Question 05

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5. What is one result of converging input in the visual system?
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Discuss the abstract information carried by the nerve impulse at each relay from ganglion cells to the visual cortex.
Bloom's Level: 5. Synthesizing
*a. Assembly of complex receptive fields from simpler ones
b. Conductance of action potentials to the Lateral Geniculate Nucleus
c. Sharing information from one part of the visual field to many cells
d. A reduction in receptive field size from photoreceptors to LGN cells
e. Monocular receptive fields

Type: multiple choice question
Title: Chapter 02 Question 06
6. Action potentials in the retinal ganglion cells report the presence of
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Discuss the abstract information carried by the nerve impulse at each relay from ganglion cells to the visual cortex.
Bloom's Level: 2. Understanding
a. light in a particular portion of the receptive field.
b. dark in a particular portion of the receptive field.
*c. a contrasting pattern of light and dark in a particular portion of the receptive field.
d. uniform illumination across the receptive field.
e. none of the above—retinal ganglion cells do not respond to light.

Type: multiple choice question
Title: Chapter 02 Question 07
7. Severing the optic chiasm along the midline will result in blindness in
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Discuss the abstract information carried by the nerve impulse at each relay from ganglion cells to the visual cortex.
Bloom's Level: 3. Applying
a. the left visual field.
b. the right visual field.
c. the central visual field.
*d. the peripheral visual field.
e. all visual fields.

Type: multiple choice question
Title: Chapter 02 Question 08
8. The left visual cortex receives information from the
Feedback: *Subhead:* Pathways in the Visual System
Learning Objective: Discuss the abstract information carried by the nerve impulse at each relay from ganglion cells to the visual cortex.
Bloom's Level: 2. Understanding
*a. left LGN only.
b. right LGN only.
c. left eye only.
d. right eye only.
e. left visual field only.

Type: multiple choice question
Title: Chapter 02 Question 09
9. The first general step in the analysis of the visual world is to
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells

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Learning Objective: Explain what the receptive field of a neuron is.
Bloom's Level: 4. Analyzing
*a. define edges and lines.
b. categorize objects.
c. determine absolute light levels.
d. detect motion.
e. recognize faces.

Type: multiple choice question
Title: Chapter 01 Question 10
10. Which of the following is true about excitatory and inhibitory portions of the receptive field for a simple cell in visual cortex?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Explain what the receptive field of a neuron is.
Bloom's Level: 3. Applying
a. They are always overlapping.
*b. They can be binocular.
c. They are always concentric.
d. They are interchangeable.
e. They are always on-center.

Type: multiple choice question
Title: Chapter 01 Question 11
11. Which of the following is true about retinal ganglion cell receptive fields?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Explain what the receptive field of a neuron is.
Bloom's Level: 2. Understanding
a. Neighboring retinal ganglion cells always display the same receptive fields.
b. Neighboring retinal ganglion cells always display different receptive fields.
c. Neighboring retinal ganglion cell receptive fields do not overlap.
*d. Neighboring retinal ganglion cell receptive fields overlap substantially.
e. Neighboring retinal ganglion cell receptive fields are antagonistic.

Type: multiple choice question
Title: Chapter 01 Question 12
12. What is meant by an "excitatory" portion of the receptive field?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Explain what the receptive field of a neuron is.
Bloom's Level: 2. Understanding
*a. The portion of the receptive field that increases the number of action potentials fired by a cell
b. The portion of the receptive field that decreases the number of action potentials fired by a cell
c. The portion of the receptive field that causes the action potentials fired by a cell to increase in size
d. The portion of the receptive field that causes the action potentials fired by a cell to decrease in size
e. The portion of the receptive field that causes other neurons to fire action potentials

Type: multiple choice question
Title: Chapter 01 Question 13
13. What kind of Retinal Ganglion Cell slow down or stop signaling when the central area of their field is illuminated?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 4. Analyzing
a. On-center retinal ganglion cells
*b. Off-center retinal ganglion cells
c. Reverse threshold retinal ganglion cells

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d. M cells
e. P cells

Type: multiple choice question
Title: Chapter 01 Question 14
14. Light shone onto the surround of an off-center receptive field causes _____ of the cell
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 4. Analyzing
*a. excitation
b. inhibition
c. integration
d. temporal Summation
e. accommodation

Type: multiple choice question
Title: Chapter 01 Question 15
15. Shining an annulus ("donut") of light on the surround portion of an on-center ganglion cell's receptive field will cause that ganglion cell to fire
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 3. Applying
a. more action potentials compared to baseline.
*b. fewer action potentials compared to baseline.
c. the same frequency of action potentials compared to baseline.
d. more action potentials if the light is very bright.
e. None of the above: Light in the surround does not change the firing rate of retinal ganglion cells.

Type: multiple choice question
Title: Chapter 01 Question 16
16. Retinal ganglion cell responses can best be described by which of the following?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 3. Applying
a. Retinal ganglion cells respond to the presence of light.
b. Retinal ganglion cells respond to dark spots in the light.
c. Retinal ganglion cells respond to light spots in the dark.
*d. Retinal ganglion cells respond to light spots or dark spots depending on their receptive field.
e. Retinal ganglion cells respond to changes in light levels.

Type: multiple choice question
Title: Chapter 01 Question 17
17. You are recording action potentials from a monkey retinal ganglion cell, and discover that the cell has a small receptive field, high spatial resolution, and is sensitive to color. What kind of cell are you recording from?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 4. Analyzing
a. Magnocellular
*b. Parvocellular
c. X cell
d. Y cell
e. W cell

Type: multiple choice question

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Title: Chapter 01 Question 18
18. You are recording action potentials from a cat Retinal Ganglion Cell, and discover that the cell has a large receptive field, low spatial resolution, and conducts action potentials quickly. What kind of cell are you recording from?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 4. Analyzing
a. Magnocellular
b. Parvocellular
c. X cell
*d. Y cell
e. W cell

Type: multiple choice question
Title: Chapter 01 Question 19
19. The relationship between the center and surround portions of the Retinal Ganglion Cell receptive field can best be described as
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 2. Understanding
a. synchronous.
b. subtractive.
*c. antagonistic.
d. synergistic.
e. mutually compatible.

Type: multiple choice question
Title: Chapter 01 Question 20
20. Light completely covering the receptive field of an off-center retinal ganglion cell will produce
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 2. Understanding
a. a substantial increase in action potential firing.
b. a substantial decrease in action potential firing.
*c. no substantial change in action potential firing.
d. a substantial decrease in action potential firing when the light is removed.
e. responses in LGN cells but no response in retinal ganglion cells.

Type: multiple choice question
Title: Chapter 01 Question 21
21. Two gray squares that have the same luminance value may appear to be different in a scene. This effect is due to the fact that
Feedback: *Subhead:* What Information Do Ganglion and Geniculate Cells Convey?
Learning Objective: Discuss how the information provided by ganglion cells and lateral geniculate nucleus cells differs from that provided by photoreceptors.
Bloom's Level: 4. Analyzing
a. photoreceptors do not carry information about luminance.
b. photoreceptors only carry information about contrast.
*c. retinal Ganglion Cells and geniculate cells respond to local contrast, not luminance.
d. retinal Ganglion Cells and Geniculate cells respond to luminance, not contrast.
e. visual cortical cells do not respond to light.

Type: multiple choice question
Title: Chapter 01 Question 22
22. Which of the following cells would respond best to the image of a fly against a cloudless sky?

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Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss how the information provided by ganglion cells and lateral geniculate nucleus cells differs from that provided by photoreceptors.
Bloom's Level: 4. Analyzing
a. Photoreceptor
*b. Retinal ganglion cell
c. Cortical simple cell
d. Cortical complex cell
e. All would respond equally well.

Type: multiple choice question
Title: Chapter 01 Question 23
23. Which of the following is a difference between simple and complex cells in the visual cortex?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 4. Analyzing
a. Simple cells have end inhibition while complex cells do not.
b. Simple cells have orientation selectivity while complex cells do not.
*c. Simple cells have distinct "off" regions while complex cells do not.
d. Simple cells have binocular visual fields while complex cells do not.
e. Simple cells have movement sensitivity while complex cells do not.

Type: multiple choice question
Title: Chapter 01 Question 24
24. Which of the following statements is supported by the progression of neural representation of visual information through the visual system?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 4. Analyzing
a. Neural representations become more abstract from lower-order units to higher-order units.
b. Lower-order neurons convey luminance information, higher-order units convey location information.
*c. The progressive integration of information in the visual system leads to highly specific stimulus requirements for higher-order neurons.
d. Information from each eye is separated and processed in only one hemisphere of the brain.
e. Neuronal firing does not seem to play a part in perception of objects.

Type: multiple choice question
Title: Chapter 01 Question 25
25. When an end-inhibited cell in visual cortex fires action potentials, what information is most likely being conveyed?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 3. Applying
a. There is diffuse light in the area of the receptive field.
b. There is a bar of light in the receptive field.
c. There is a vertical bar of light in the receptive field.
d. There is a vertical bar of light moving from left to right in the receptive field.
*e. There is a corner within the receptive field.

Type: multiple choice question
Title: Chapter 01 Question 26
26. When a simple cell in visual cortex fires action potentials, what information is most likely being conveyed?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 3. Applying

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a. There is diffuse light in the area of the receptive field.
b. There is a bar of light in the receptive field.
c. There is a vertical bar of light in the receptive field.
*d. There is a vertical bar of light moving from left to right in the receptive field.
e. There is a corner within the receptive field.

Type: multiple choice question
Title: Chapter 01 Question 27
27. In which of the following layers of visual cortex are simple cells typically found?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 2. Understanding
a. Layer 1
b. Deep layer 2
c. Superficial layer 3
d. Layer 4
*e. Layer 5

Type: multiple choice question
Title: Chapter 01 Question 28
28. Which of the following cell types has the most stringent stimulus requirements for activating its receptive field?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 4. Analyzing
a. Photoreceptor
b. Retinal ganglion cell
c. Lateral geninculate nucleus cell
*d. Cortical simple cell
e. Cortical complex cell

Type: multiple choice question
Title: Chapter 01 Question 29
29. Experiments using calcium imaging to examine responses of cells in mouse visual cortex to moving gratings reveals that
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 4. Analyzing
a. cortical cells do not respond to drifting grating stimuli.
b. neighboring cortical cells show similar responses.
*c. cellular responses are selective for the direction of the stimulus.
d. orthogonal stimuli activate overlapping populations of neurons.
e. mouse visual cortex is arranged identically to primate visual cortex.

Type: multiple choice question
Title: Chapter 01 Question 30
30. Corners, edges, and angles are best detected by which of the following cells?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 4. Analyzing
a. Photoreceptors
b. Retinal ganglion cells
c. Lateral geniculate nucleus cells
d. Cortical simple cells
*e. Cortical complex cells

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Type: multiple choice question
Title: Chapter 01 Question 31
31. A square that appears light when surrounded by a black border can be made to appear dark merely by increasing the brightness of the surround. This suggests that the visual cortex
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Bloom's Level: 5. Evaluating
a. receives action potentials that convey information about luminance from the entire visual field.
*b. receives action potentials only from cells at the edges of the square.
c. identifies the absolute levels of brightness in an image.
d. responds to the periphery more than to the center of the visual field.
e. receives information about color through the periphery of the visual field.

Type: multiple choice question
Title: Chapter 01 Question 32
32. A property of certain cells in visual cortex is that they respond only to a bar of light of a certain length. This property is called
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Define end inhibition (also called end stopping).
Bloom's Level: 3. Applying
a. length constancy.
b. edge detection.
c. off-surround.
d. response selectivity.
*e. end inhibition.

Type: multiple choice question
Title: Chapter 01 Question 33
33. You record from a cell a robust response to a bar of light 10cm in length. When you change the stimulus to a bar of light 15 cm in length, you no longer see a response. What characteristic of this cell's receptive field does your finding suggest?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Define end inhibition (also called end stopping).
Bloom's Level: 4. Analyzing
a. Pattern completion
b. Size specificity
*c. End inhibition
d. Orientation selectivity
e. Direction selectivity

Type: multiple choice question
Title: Chapter 01 Question 34
34. In any given visual scene, the best-responding Retinal Ganglion Cells will be those with _____ in their receptive field.
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Define end inhibition (also called end stopping).
Bloom's Level: 5. Evaluating
a. diffuse illumination
*b. maximum contrast
c. moving spots of light
d. moving bars of light
e. horizontal lines

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Type: multiple choice question
Title: Chapter 01 Question 35
35. Many cells respond best to bars of light moving in one direction. This property of direction selectivity is found commonly in
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 3. Applying
a. photoreceptors.
b. retinal ganglion cells.
c. LGN cells.
*d. simple cells.
e. complex cells.

Type: multiple choice question
Title: Chapter 01 Question 36
36. Simple cells in primary visual cortex respond most strongly to which of the following?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 1. Remembering
a. A bar of light in any orientation
b. A spot of light
*c. A bar of light in a particular orientation
d. An annulus ("donut") of light
e. A complex visual scene

Type: multiple choice question
Title: Chapter 01 Question 37
37. The receptive fields of cells carrying information from the central visual field tend to be _____ compared to the receptive fields of cells carrying information from peripheral visual field.
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 3. Applying
a. more active
b. less active
c. larger
*d. smaller
e. about the same size

Type: multiple choice question
Title: Chapter 01 Question 38
38. You record from a cell in the cat visual cortex, and find a cell that responds only when a bar of light with a particular width is presented at a particular angle. What kind of cell is this?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 4. Analyzing
*a. Simple cell
b. Complex cell
c. Hypercomplex cell
d. On-center cell
e. Off-center cell

Type: multiple choice question
Title: Chapter 01 Question 39
39. Photoreceptors signal _____ while retinal ganglion cells and lateral geniculate nucleus cells signal _____.

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Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 3. Applying
*a. light intensity; contrast
b. orientation; contrast
c. contrast; light intensity
d. contrast; orientation
e. light intensity; orientation

Type: multiple choice question
Title: Chapter 01 Question 40
40. Binocular receptive fields found in cortical simple cells can be used in the perception of
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 3. Applying
a. movement.
*b. depth.
c. color.
d. size.
e. light.

Type: multiple choice question
Title: Chapter 01 Question 41
41. In the visual cortex, a complex cell's receptive field requires that a stimulus fall
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 3. Applying
a. only on the center of the receptive field in any orientation.
b. only on the surround of the receptive field in any orientation.
*c. anywhere in the receptive field in a specific orientation.
d. anywhere in the receptive field in any orientation.
e. on both eyes simultaneously.

Type: multiple choice question
Title: Chapter 01 Question 42
42. Which of the following has a receptive field that can be best described as monocular and having distinct on and off regions?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 3. Applying
a. Photoreceptor
*b. Retinal ganglion cell
c. Lateral geniculate nucleus cell
d. Visual cortex simple cell
e. Visual cortex complex cell

Type: multiple choice question
Title: Chapter 01 Question 43
43. Dr. Bakai sees a patient in her clinic who complains of a severe headache. When asked to describe her friend's face, she claims that all she can see is a pattern of wallpaper where her friend's head should be. Which of the following might Dr. Bakai consider in making her diagnosis?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 5. Evaluating

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a. A problem with the patient's photoreceptors
b. A problem with the patient's retinal ganglion cells
c. A problem with the patient's lateral geniculate nucleus
d. A problem with the patient's simple cells in visual cortex
*e. A problem with the patient's complex cells in visual cortex

Type: multiple choice question
Title: Chapter 01 Question 44
44. The orientation of a bar of light is important for responses for which of the following cell types?
Feedback: *Subhead:* Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Bloom's Level: 4. Analyzing
a. Photoreceptor
b. Retinal ganglion cell
c. Lateral geniculate nucleus cell
*d. Cortical simple cell
e. None of the above

Type: essay/short answer question
Title: Chapter 01 Question 45
45. Compare the anatomical arrangement of the photoreceptors in the fovea with that in the peripheral visual field. What is the functional significance of this arrangement?
Feedback: Photoreceptors are more densely packed in the Fovea than in the periphery, leading to higher spatial acuity at the fovea and diminished spatial acuity in the periphery.
Subhead: Pathways in the Visual System
Learning Objective: Describe the concept of convergence and divergence of connections.
Bloom's Level: 3. Applying

Type: essay/short answer question
Title: Chapter 01 Question 46
46. Describe the receptive field of an on-center retinal ganglion cell and a description of the cell's response to illumination.
Feedback: There is a center-surround arrangement of the receptive field, with illumination in the central portion eliciting an increase in the firing rate of the RGC, and illumination of the surround (using an annulus or "donut" of light) eliciting a decrease in the firing rate. The receptive field is that portion of the visual world that elicits a response from the cell, either an increase or a decrease in firing rate.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 3. Applying

Type: essay/short answer question
Title: Chapter 01 Question 47
47. What happens when a spot of light in the center of an off-center retinal ganglion cell's receptive field is removed?
Feedback: The removal of the light stimulus from the center of the off-center retinal ganglion cells' receptive field will lead to a transient increase in the firing rate of this cell.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Name the two major types of retinal ganglion cells and explain how each one responds to illumination.
Bloom's Level: 4. Analyzing

Type: essay/short answer question
Title: Chapter 01 Question 48
48. How does the information carried by retinal ganglion cells and cells in the lateral geniculate nucleus differ from the information carried by photoreceptors? Support your answer using information about receptive fields in each cell type.
Feedback: Photoreceptor responses scale with light intensity (akin to a light meter), while RGC and LGN cells respond according to the comparison between the center and the surround.

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Subhead: Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss how the information provided by ganglion cells and lateral geniculate nucleus cells differs from that provided by photoreceptors.
Bloom's Level: 3. Applying

Type: essay/short answer question
Title: Chapter 01 Question 49
49. Describe the progression of image information from the photoreceptors to the primary visual cortex. What information is being conveyed at each stage?
Feedback: Photoreceptors detect light at a particular point in the visual world; RGCs and LGN cells assemble these points into information about local contrast; visual cortex simple cells use local contrast information across many LGN cell receptive fields to relay information about orientation and direction of light objects; visual cortex complex cells use information from simple cells to represent edges, corners, angles, and bar-ends.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system
Complexity of the Information Conveyed by Action Potentials
Bloom's Level: 5: Synthesis

Type: essay/short answer question
Title: Chapter 01 Question 50
50. How do retinal ganglion cells and lateral geniculate nucleus cells respond to diffuse light? Why?
Feedback: These cells do not respond well to diffuse light because the receptive fields of each of these cell types have a defined "off" region that is antagonistic to the center, so when the entire receptive field is illuminated, the excitatory and inhibitory responses cancel each other out.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss how the information provided by ganglion cells and lateral geniculate nucleus cells differs from that provided by photoreceptors
Output of the Retina
Bloom's Level: 3. Applying

Type: essay/short answer question
Title: Chapter 01 Question 51
51. In addition to trains of action potentials from single retinal ganglion cells, what other information might the brain use to analyze visual information?
Feedback: There is the possibility that synchronous firing among neighboring RGCs might convey additional information about light falling on the retina that cannot be deduced from the firing of the cells separately.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Learning Objective: Discuss how the information provided by ganglion cells and lateral geniculate nucleus cells differs from that provided by photoreceptors.
Bloom's Level: 5: Synthesis

Type: essay/short answer question
Title: Chapter 01 Question 52
52. Explain the difference between responses of simple and complex cells in primary visual cortex.
Feedback: While both classes of cells are heterogeneous and can be similar in some ways (e.g., orientation selectivity, binocularity), simple cells have a clear "off" region in the receptive field, whereas complex cells do not.
Learning Objective: Compare and contrast simple and complex cells in the visual cortex.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Bloom's Level: 5. Evaluating

Type: essay/short answer question
Title: Chapter 01 Question 53
53. Describe the completion phenomenon, and discuss what is thought to be the neural basis for it?

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Feedback: The student should describe the assembly of a simple cell receptive field (e.g., bar of light) from concentric on-center ganglion cells.
Learning Objective: Define end inhibition (also called end stopping).
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Bloom's Level: 5: Synthesis

Type: essay/short answer question
Title: Chapter 01 Question 54
54. Discuss the function of a receptive field with end inhibition, and explain how it differs from a conventional "off" region of a receptive field
Feedback: The student should explain that a cell exhibiting end inhibition will only respond to a bar of light of a particular length; extending the bar beyond this length will cause the cell to fire more weakly. This is different from a conventional "off" region because diffuse illumination of the area around the receptive field center does not produce the same inhibitory effect.
Learning Objective: Define end inhibition (also called end stopping).
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Bloom's Level: 5. Evaluating

Type: essay/short answer question
Title: Chapter 01 Question 55
55. Intracellular recordings from complex cells in the visual cortex reveals that these cells receive most of their synaptic contacts through long-latency inputs. What is the significance of this finding?
Feedback: The student should answer that this result suggests that complex cells receive most of their input from cortical simple cells rather than from LGN cells (which would show a short latency). This is consistent with the hypothesis that complex cell receptive fields are assemblages of simple cell receptive fields.
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Subhead: Synthesis of the Complex Receptive Field
Bloom's Level: 5. Evaluating

Type: essay/short answer question
Title: Chapter 01 Question 56
56. Describe how the visual system uses information about local differences in illumination to convey information about the visual world. Use examples as appropriate.
Feedback: The student should answer with an explanation of the receptive fields of RGCs, LGN cells, and/or visual cortical cells, clearly explaining how each of these is arranged not to detect light levels, but local differences that adhere to a particular arrangement or pattern.
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Complexity of the Information Conveyed by Action Potentials
Bloom's Level: 5. Evaluating

Type: essay/short answer question
Title: Chapter 01 Question 57
57. What role does integration play in the receptive field of a retinal ganglion cell?
Feedback: The student should explain that the receptive fields of RGCs are constructed by selective connections with photoreceptors, such that the surround portion is inhibitory and the center is excitatory (for an On-center cell), and that these responses are integrated at the level of the RGC to produce a center-surround receptive field.
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Concept of the Receptive Field
Bloom's Level: 4. Analyzing

Type: essay/short answer question
Title: Chapter 01 Question 58

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58. Explain how the receptive field properties of simple cells in primary visual cortex arise from the responses of retinal ganglion cells.
Feedback: The student should describe the assembly of a simple cell receptive field (e.g., bar of light) from concentric on-center ganglion cells (see Figure 2.11).
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Bloom's Level: 4. Analyzing

Type: essay/short answer question
Title: Chapter 01 Question 59
59. Explain how the receptive field properties of complex cells in primary visual cortex arise? Include a description of the cells and receptive fields that provide input to complex cells.
Feedback: The student should describe the assembly of a complex cell receptive field (e.g., location-insensitive edge) from cortical simple cells with receptive field characteristics favoring a bar of light (see Figure 2.17).
Learning Objective: Discuss the characteristics of receptive fields at successive levels of the visual system.
Subhead: Receptive Fields of Ganglion and Geniculate Cells
Bloom's Level: 4. Analyzing

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