Visual system trivia quiz!

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# Light

Fill in the blanks: Light is made up of oscillating waves of \_\_\_\_\_\_\_\_ and magnetic energy.

Answer: electric

Multiple choice: What portion of the electromagnetic spectrum is visible to humans?

1. 1000-1500 nanometres
2. 400-700 nanometres
3. 600-1000 nanometres
4. 500-800 nanometres

Answer: 400-700 nanometres

Multiple choice: Which of the following statements is true?

1. Waves with lower frequencies have shorter wavelengths, and waves with higher frequencies have longer wavelengths
2. Waves with higher frequencies have shorter wavelengths, and waves with lower frequencies have longer wavelengths
3. Waves with higher frequencies have long wavelengths, and waves with lower frequencies also have long wavelengths

Answer: Waves with higher frequencies have shorter wavelengths, and waves with lower frequencies have longer wavelengths

True or false: The perceived intensity of light (i.e., brightness) is determined by the wavelength of light.

1. True
2. False

Answer: False

## Colour

Fill in the blanks: Changes in the wavelength of light are perceived as changes in \_\_\_\_\_\_\_\_\_\_.

Answer: colour

True or False: The perception of an object's colour is entirely dependent on the wavelength of light reflected by the object.

Answer: False

Multiple choice: The trichromatic theory of colour vision suggests that:

1. there are two types of cone photoreceptors in the eye
2. there are three types of cone photoreceptors in the eye, each sensitive to a different range of wavelengths
3. colour perception is based solely on the intensity of light waves
4. colour perception is determined by the activity of the rods in the retina

Answer: there are three types of cone photoreceptors in the eye, each sensitive to a different range of wavelengths

Multiple choice: The opponent-process theory of colour vision suggests that:

1. there are only two types of cone photoreceptors in the eye
2. there are three types of photoreceptors in the eye, each sensitive to a different range of wavelengths
3. colour perception is based solely on the intensity of light waves
4. colour perception is determined by the activity of pairs of colour-sensitive neurons in the visual system

Answer: colour perception is determined by the activity of pairs of colour-sensitive neurons in the visual system

Multiple choice: A blue object will reflect more \_\_\_\_\_\_ wavelength light. A red object will reflect more \_\_\_\_\_\_ wavelength light.

1. long; short
2. short; long
3. long; medium
4. medium; long
5. medium; short
6. short; medium

Answer: short; long

# Anatomy of the eye

Multiple Choice: Which part of the eye is responsible for focusing light onto the retina?

1. Lens
2. Macula
3. Iris
4. Optic nerve

Answer: lens

Fill in the Blanks: The \_\_\_\_\_ is the coloured part of the eye that controls the size of the pupil.

Answer: iris

Multiple Choice: Which structure controls the size of the pupil to regulate the amount of light entering the eye?

1. Lens
2. Retina
3. Iris
4. Cornea

Answer: Iris

Fill in the Blanks: The \_\_\_\_\_ is a transparent structure at the front surface of the eye that helps to focus light onto the retina.

Answer: Cornea

Multiple choice: Why do we have a blind spot?

1. because rods cannot provide finely detailed visual acuity
2. because we have two eyes
3. because the optic disc has no photoreceptors
4. because bipolar cells do not generate action potentials

Answer: because the optic disc has no photoreceptors

# Retina

## Early visual processing

True or False: Rod cells in the retina are responsible for colour vision.

Answer: false

Fill in the Blanks: The \_\_\_\_\_ is a small depression in the retina that contains the highest density of cones and is responsible for detailed central vision.

Answer: fovea

True or False: Cones are photoreceptor cells that are more sensitive to dim light and are responsible for peripheral vision.

Answer: False

Fill in the Blanks: Light-sensitive cells in the retina called \_\_\_\_\_ are responsible for vision in dim light.

Answer: Rods

True or False: The fovea is a small pit in the centre of the macula that contains only rod cells.

Answer: False

True or False: The blind spot in the visual field occurs due to the absence of rods and cones at the optic disc.

Answer: True

Multiple choice: Which cells in the retina produce action potentials?

1. Photoreceptor cells
2. Bipolar cells
3. Ganglion cells
4. Horizontal cells
5. Amacrine cells

Answer: Ganglion cells

Fill in the blanks: Axons from \_\_\_\_\_\_\_\_ cells form the optic nerve.

Answer: ganglion

Short answer: What layer of the retina is the input layer?

Answer: photoreceptor layer

Short answer: What layer of the retina is the output layer?

Answer: ganglion cell layer

Multiple choice: Rod photoreceptors are responsible for our visual experience in \_\_\_\_\_\_\_\_\_ conditions; cone photoreceptors are responsible for our visual experience in \_\_\_\_\_\_\_\_\_ conditions.

1. photopic; photopic
2. photopic; scotopic
3. scotopic; scotopic
4. scotopic; photopic

Answer: scotopic; photopic

Short answer: Which photoreceptors gives rise to detailed visual acuity?

Answer: Cone photoreceptors

Short answer: Where on the retina are you least likely to find any photoreceptors?

Answer: optic disc

Fill in the blanks: Instead of generating an action potential, photoreceptors and bipolar cells produce a \_\_\_\_\_\_\_\_\_ response.

Answer: graded

Fill in the blanks: The receptive fields of ganglion cells are antagonistic and \_\_\_\_\_\_\_\_.

Answer: concentric

Multiple choice: It is the 1980s and Ali is looking up a phone number in a phone book with tiny print. Ali will most likely be able to read the number if they look at the phone book with their \_\_\_\_\_\_\_ because it has the largest number of \_\_\_\_\_\_\_.

1. peripheral retina; cones
2. peripheral retina; rods
3. central retina; cones
4. central retina; rods

Answer: central retina; cones

## Colour

Multiple Choice: Which of the following cells represents the first stage in colour vision?

1. Rod cells
2. Bipolar cells
3. Cone cells
4. Ganglion cells
5. Answer: Cone cells

Multiple Choice: Which part of the eye contains the highest concentration of cones for detailed colour vision?

1. Fovea
2. Optic disc
3. Optic nerve
4. Sclera

Answer: Fovea

Multiple choice: Retinal ganglion cells have \_\_\_\_\_\_\_\_\_\_\_; V1 cells have \_\_\_\_\_\_\_\_\_\_\_.

1. single colour opponent receptive fields; double colour opponent receptive fields
2. double colour opponent receptive fields; single colour opponent receptive fields

Answer: single colour opponent receptive fields; double colour opponent receptive fields

## Form

Multiple Choice: Which photoreceptor cells are responsible for detecting fine details and are concentrated in the central retina?

1. Rod cells
2. Bipolar cells
3. Amacrine cells
4. Cone cells

Answer: Cone cells

Multiple choice: Ganglion cell receptive fields are organised such that they respond best to a \_\_\_\_\_\_\_ of light; V1 cell receptive fields are organised such that they respond best to a \_\_\_\_\_\_\_ of light.

1. bar/edge; bar/edge
2. spot; spot
3. bar/edge; spot
4. spot; bar/edge

Answer: spot; bar/edge

# Optic nerve

## Early visual processing

Multiple Choice: The optic nerve carries visual information from the eye to which part of the brain?

1. Cerebellum
2. Hypothalamus
3. Occipital lobe
4. Temporal lobe

Answer: Occipital lobe

True or False: The optic nerve is composed of axons from ganglion cells in the retina.

Answer: True

Fill in the Blanks: The region where the optic nerve exits the eye is known as the \_\_\_\_\_.

Answer: Optic disc

Multiple choice: Axons from \_\_\_\_\_\_\_\_ cells form the optic nerve.

1. photoreceptor
2. bipolar
3. horizontal
4. ganglion
5. amacrine

Answer: ganglion

# Optic chiasm

Multiple Choice: Which part of the visual pathway is responsible for crossing over information from one side of the body to the opposite side of the brain?

1. Optic nerve
2. Optic chiasm
3. Optic tract
4. Optic radiation

Answer: Optic chiasm

True or False: The optic chiasm is the point where half of the optic nerve fibres from each eye cross over to the opposite side of the brain.

Answer: True

Multiple choice: \_\_\_\_\_\_\_\_\_ retinal fibres cross over at the optic chiasm.

1. Nasal
2. Temporal

Answer: Nasal

Short answer: The point at which the optic nerves meet and then split is termed the optic \_\_\_\_\_\_\_\_\_.

Answer: chiasm

# Lateral Geniculate Nucleus (LGN)

Multiple choice: Ipsilateral input in the LGN comes from the eye on the \_\_\_\_\_\_\_\_\_\_.

1. same side of the body
2. opposite side of the body

Answer: same side of the body

Fill in the blanks: The precise spatial arrangement of the retina is maintained in the LGN and in other cortical visual areas. This is called \_\_\_\_\_\_\_\_\_\_ mapping.

Answer: retinotopic; topographic

True or false: Retinal ganglion cells that project to the magnocellular layers of the lateral geniculate nucleus (LGN) are specialised for processing information about colour and fine detail.

Answer: False

## Colour

Multiple choice: Koniocellular cells carry \_\_\_\_\_\_\_ colour information; the parvocellular pathway carries \_\_\_\_\_\_\_ colour information.

1. red/green; blue
2. blue; red/green

Answer: blue; red/green

## Form

Multiple choice: Parvocellular ganglion cells in the retina project to which layers of Lateral Geniculate Nucleus (LGN)?

1. 1-2
2. 2-4
3. 3-6
4. 1-6

Answer: 3-6

## Depth

Short answer: Which layers of the LGN process depth information?

Answer: 1 and 2

# Area V1

Fill in the Blanks: Primary visual cortex is located in the \_\_\_\_\_ lobe of the brain.

Answer: occipital

True or False: The primary visual cortex is located in the parietal lobe of the brain.

Answer: False

Multiple choice: Ocular dominance columns in V1 separate \_\_\_\_\_\_\_\_\_.

1. cells with different orientation preferences
2. wavelengths
3. input from different eyes
4. spatial frequency

Answer: input from different eyes

Multiple choice: Which layer of V1 receives direct input from LGN?

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6

Answer: 4

True or false: Complex cells in V1 have distinct excitatory and inhibitory sub-regions in their receptive fields.

Answer: False

## Form

Fill in the blanks: V1 is organised in columns. These columns separate neurons that respond best to particular \_\_\_\_\_\_\_\_.

Answer: orientation

Multiple choice: The parvocellular inter-blob, or P-I, pathway processes aspects of \_\_\_\_\_\_\_.

1. colour
2. form
3. motion

Answer: form

Short answer: Which brain region is responsible for the initial processing of visual information and contains cells that respond selectively to different orientations of visual stimuli?

Answer: V1/primary visual cortex

## Colour

Multiple choice: Which V1 pathway processes colour?

a. Magnocellular  
b. Parvocellular inter-blob (P-I)  
c. Parvocellular blob

Answer: Parvocellular blob

Multiple choice: Retinal ganglion cells have \_\_\_\_\_\_\_\_\_\_\_; V1 cells have \_\_\_\_\_\_\_\_\_\_\_.

1. single colour opponent receptive fields; double colour opponent receptive fields
2. double colour opponent receptive fields; single colour opponent receptive fields

Answer: single colour opponent receptive fields; double colour opponent receptive fields

Multiple choice: Which V1 pathway processes colour?

1. Magnocellular
2. Parvocellular inter-blob (P-I)
3. Parvocellular blob

Answer: Parvocellular blob

## Motion

True or False: Simple cells in V1 respond to motion.

Answer: False

## Spatial frequency

Multiple choice: High spatial frequency information is associated with \_\_\_\_\_\_\_\_.

1. objects
2. coarse details
3. motion
4. colour
5. fine details
6. faces

Answer: fine details

Multiple choice: Low spatial frequency information is associated with \_\_\_\_\_\_\_\_.

1. objects
2. coarse details
3. motion
4. colour
5. fine details
6. faces

Answer: coarse details

# Parallel processing streams

Multiple choice: Visual agnosia provides support for the idea that there are two separate streams of analysis of visual information because it shows that \_\_\_\_\_\_\_\_\_\_\_.

1. both streams are necessary for object perception
2. damage to one stream produces dysfunction in the other
3. spatial perception is unaffected by damage to the ventral stream
4. object identification is unaffected by damage to the ventral stream

Answer: spatial perception is unaffected by damage to the ventral stream

Multiple choice: In visual processing, ventral is to dorsal as \_\_\_\_\_\_\_\_\_.

1. what is to where
2. where is to what
3. superior is to inferior
4. nasal is to temporal

Answer: what is to where

# Ventral pathway

Multiple choice: Select all areas listed below that are part of the ventral pathway.

1. V1
2. V2
3. V3
4. V4
5. V5
6. IT cortex
7. parietal cortex

Answers: V1, V2, V4, IT cortex

## Form processing

True or False: The ventral stream of the visual pathway, also known as the "what" pathway, is primarily involved in object recognition and identification.

Answer: True

Multiple choice: According to two-streams theory, the ventral pathway processes \_\_\_\_\_\_\_\_\_.

1. Motion
2. Depth
3. object recognition
4. musicality

Answer: object recognition

Fill in the blanks: If the ventral stream of your visual cortex were not working temporarily, you would be unable to understand \_\_\_\_\_\_ an object is.

Answer: what

Multiple choice: After being in an accident, Kelly has the selective inability to identify objects, even though there are no problems with their eyes and their vision is normal. They are most likely suffering from \_\_\_\_\_\_\_ due to bilateral damage to the \_\_\_\_\_\_\_.

1. akinetopsia; dorsal pathway
2. visual agnosia; dorsal pathway
3. prosopagnosia; dorsal pathway
4. akinetopsia; ventral pathway
5. visual agnosia; ventral pathway
6. prosopagnosia; ventral pathway

Answer: visual agnosia; ventral pathway

# Dorsal pathway

Multiple choice: Select all areas listed below that are part of the dorsal pathway.

1. V1
2. V2
3. V3
4. V4
5. V5
6. IT cortex
7. parietal cortex

Answers: V1, V2, V3, V5, parietal cortex

## Motion processing

True or False: The magnocellular pathway in the visual system primarily processes fine details and colour information.

Answer: False

Multiple choice: Damage to the dorsal pathway will result in \_\_\_\_\_\_\_\_\_\_\_\_\_.

1. deficit in object recognition
2. deficit in motion perception
3. deficits in object recognition and motion perception

Answer: deficit in motion perception

Fill in the blanks: Jo has trouble crossing the street because instead of perceiving the motion of objects as smooth and continuous, Jo perceives the movement of objects as jerky and abrupt. This is likely due to damage to the \_\_\_\_\_\_\_ processing stream?

Answer: dorsal

# Area V2

True or false: Cells in area V2 of visual cortex are arranged in columns.

Answer: False

## Depth

Short answer: Which of the stripes in V2 processes depth?

Answer: thick stripes

## Form

Multiple choice: The \_\_\_\_ stripes in V2 process form.

1. thin
2. thick
3. inter

Answer: inter

True or false: Some cells in V2 respond to more complex object properties such as the orientation of illusory contours and retinal disparity.

Answer: True

## Colour

Short answer: Which stripes in V2 are concerned with processing colour?

Answer: thin stripes

# Area V3

Fill in the blanks: Area V3 is located in the \_\_\_\_\_\_\_ lobe of the brain and is considered an important intermediary stage in the visual pathway, receiving inputs from both the primary visual cortex (V1) and area V2.

Answer: occipital lobe

## Motion

Multiple Choice: Which of the following statements accurately describes the role of area V3 in the visual system?

1. Area V3 is responsible for low-level visual processing, such as edge detection
2. Area V3 plays a crucial role in color perception and processing
3. Area V3 is primarily involved in the perception of motion and visual tracking
4. Area V3 is responsible for high-level visual processing, such as object recognition

Answer: Area V3 is primarily involved in the perception of motion and visual tracking

# Area V4

## Form

True or False: Some cells in V4 respond to simple sinusoidal stimuli.

Answer: True

Multiple choice: While some cells in V4 respond to simple sinusoidal stimuli, other cells respond to more complex object features such as \_\_\_\_\_\_\_\_\_ stimuli (select two).

1. radial
2. square
3. oblong
4. concentric
5. perpendicular
6. tangential
7. conical

## Colour

Fill in the blanks: Monkeys with V4 lesions can still discriminate hue, or colour, but are impaired in \_\_\_\_\_\_\_\_\_.

Answer: colour constancy

Short answer: Colour constancy is thought to be processed, at least in part, in which area of visual cortex?

Answer: V4

# Area V5

## Motion

Short answer: What difference between V1 cells and V5 cells allows V5 cells to process global motion whereas V1 cells can only process component motion?

Answer: larger V5 receptive fields

Which of the following visual processes is thought to be mediated by neurons in the middle temporal area (MT) of the visual cortex?

1. Form perception
2. Colour perception
3. Motion perception
4. Face perception

Answer: Motion perception

True or False: Akinetopsia is a severe impairment in the perception of motion resulting from bilateral damage to V5.

Answer: True

# Inferotemporal (IT) cortex

## Form

Short answer: Which brain area is responsible for carrying out complex object recognition?

Answer: inferotemporal cortex

Short answer: Which brain region is responsible for recognising and categorising visual objects based on their shape, size, and colour?

Answer: inferotemporal (IT) cortex

Fill in the blank: The inferotemporal cortex, located in the \_\_\_\_\_\_\_ lobe of the brain, plays a crucial role in processing complex visual stimuli.

Answer: temporal

# Parietal lobe

Fill in the blanks: The \_\_\_\_\_\_\_\_\_ lobe integrates and interprets spatiotemporal inputs related to depth and motion.

Answer: parietal

Short answer: Which brain region is responsible for integrating visual information with other sensory information and for guiding our movements through the environment?

Answer: parietal cortex

# Visual system

Multiple choice: Much of the retinotopic mapping of retinal space in the visual cortex is devoted to the \_\_\_\_\_\_\_\_.

1. blind spot
2. fovea
3. rods
4. iris

Answer: fovea

True or False: Cortical areas V1, V2, and V5 are arranged in columns.

Answer: False

True or False: Not all processing is hierarchical and there is also *parallel* processing of information in the visual system.

Answer: True

True or False: Magnocellular cells have large receptive fields and can therefore only respond to large objects.

Answer: True

## Colour

Multiple choice: How is colour information extracted by the visual system?

a. by comparing the responses of different types of cones  
b. by summing the output of all three cone types  
c. by making a guess as to the wavelength of the stimulus

Answer: by comparing the responses of different types of cones

## Form

Multiple choice: Which cells respond to large objects and are concerned with the analysis of the gross features of an object?

1. Magnocellular
2. Parvocellular

Answer: Magnocellular

## Spatial frequency

True or false: The perceived sharpness of an edge is a function of the number of neurons in that particular spatial frequency channel firing.

Answer: True

Fill in the blanks: The visual system analyses the visual scene in terms of its component spatial frequency, with different groups of neurons, known as spatial frequency \_\_\_\_\_\_\_ processing different spatial frequencies.

Answer: channels