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Vision Physiology

Exam — Vision

High school / pre-med / IB questions on eye optics, retina and photoreceptors, phototransduction basics, and key visual pathway concepts.

30 items — Printable Exam

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1 In a normal human eye, which structure provides the **LARGEST** share of the eye's refractive (focusing) power when looking at distant objects?



- A Cornea
- B Lens
- C Vitreous humor
- D Retina
- E Ciliary body

2 The primary function of the iris is to:



- A Focus light onto the retina by changing shape
- B Regulate light entry by changing pupil diameter
- C Convert light into nerve impulses
- D Carry blood vessels to nourish the retina
- E Produce aqueous humor for the anterior chamber

3 When shifting focus from a distant object to a near object, which set of changes is **CORRECT**?



- A Ciliary muscle relaxes → zonular (suspensory) fibers relax → lens becomes thinner
- B Ciliary muscle contracts → zonular fibers relax → lens becomes more rounded (more convex)
- C Ciliary muscle contracts → zonular fibers tighten → lens becomes thinner
- D Ciliary muscle relaxes → zonular fibers tighten → lens becomes more rounded
- E Ciliary muscle contracts → lens flattens because tension increases





4 In myopia (short-sightedness), images of distant objects are focused:



- A Behind the retina, and corrected with a convex lens
- B On the retina, and corrected with a concave lens
- C In front of the retina, and corrected with a concave (diverging) lens
- D In front of the retina, and corrected with a convex (converging) lens
- E Behind the retina, and corrected with a concave lens

5 In hyperopia (long-sightedness), images of near objects are focused:



- A In front of the retina, and corrected with a concave lens
- B Behind the retina, and corrected with a convex (converging) lens
- C On the retina, and corrected with a convex lens
- D Behind the retina, and corrected with a concave lens
- E On the retina, and corrected with no lens

6 Why is there a 'blind spot' in each eye's visual field?



- A The lens blocks light at one point
- B The retina has a region with no blood supply
- C The optic disc lacks photoreceptors because the optic nerve exits there
- D The cornea is opaque in one small region
- E Rods are absent everywhere in the retina





7 The fovea is best described as the region of the retina that:



- A** Has the highest rod density for night vision
- B** Has no photoreceptors and forms the blind spot
- C** Has the highest cone density and provides the sharpest vision
- D** Contains only bipolar cells and no photoreceptors
- E** Contains the pupil and controls light entry

8 Which statement correctly compares rods and cones?



- A** Rods mediate color vision; cones mediate night vision
- B** Rods are more sensitive in dim light but do not provide color vision
- C** Cones are more sensitive than rods in very dim light
- D** Rods are concentrated in the fovea for high acuity
- E** Cones contain no photopigments

9 You can often detect a very dim star better by looking slightly to the side of it rather than directly at it. The best explanation is that:



- A** The lens focuses dim light better when the eye looks sideways
- B** The cornea becomes more curved when looking sideways
- C** Peripheral retina has more rods, while the fovea is cone-rich and less sensitive in dim light
- D** The blind spot is located at the center of the retina
- E** Cones are more sensitive than rods in dim light





10 Which statement about photoreceptors in COMPLETE DARKNESS is most accurate?



- A They are hyperpolarized and release no neurotransmitter
- B They are depolarized relative to light and release neurotransmitter continuously
- C They fire action potentials down the optic nerve
- D They release acetylcholine instead of glutamate
- E They cannot generate any electrical change without light

11 When light hits a rod photoreceptor, the MOST direct electrical change in that photoreceptor is:



- A Opening of voltage-gated Na^+ channels causing depolarization
- B Closing of cGMP-gated Na^+ channels causing hyperpolarization
- C Opening of Cl^- channels causing depolarization
- D Generation of action potentials in the photoreceptor axon
- E Immediate contraction of the ciliary muscle

12 Which retinal cell type generates action potentials that propagate along the optic nerve to the brain?



- A Photoreceptors (rods and cones)
- B Bipolar cells
- C Ganglion cells
- D Lens epithelial cells





E Corneal endothelial cells

13 Which retinal wiring arrangement increases sensitivity to dim light but reduces visual acuity?



- A** One cone synapsing to one bipolar cell and one ganglion cell (low convergence)
- B** Many rods converging onto a single bipolar cell and ganglion cell (high convergence)
- C** No photoreceptors connecting to bipolar cells
- D** Many ganglion cells converging onto one rod
- E** One ganglion cell connecting directly to the cornea

14 A bright light is shone into the right eye. In a normal pupillary light reflex, what happens?



- A** Only the right pupil constricts
- B** Only the left pupil constricts
- C** Both pupils constrict
- D** Both pupils dilate
- E** Neither pupil changes because this reflex is voluntary

15 Which autonomic effect on the pupil is correct?



- A** Parasympathetic stimulation dilates the pupil
- B** Sympathetic stimulation constricts the pupil





- C Parasympathetic stimulation constricts the pupil; sympathetic stimulation dilates it
- D Both sympathetic and parasympathetic always constrict the pupil
- E The pupil size is controlled only by the lens

16 Vitamin A deficiency is most likely to cause:



- A Night blindness due to impaired rhodopsin regeneration in rods
- B Permanent dilation of the pupil due to iris paralysis
- C Complete deafness
- D Increased lens transparency
- E Enhanced color vision due to extra cone pigments

17 A cataract is best described as:



- A Increased pressure in the eye that damages the optic nerve
- B Clouding of the lens that reduces transmission of light
- C Loss of cones in the fovea only
- D Tearing of the cornea causing bleeding
- E Inability of the pupil to constrict in bright light

18 Which statement about glaucoma is MOST accurate at high-school/pre-med level?





- A It is caused by clouding of the cornea
- B It often involves increased intraocular pressure that can damage the optic nerve, first affecting peripheral vision
- C It is an infection of the retina by bacteria
- D It is a refractive error corrected by glasses
- E It always causes immediate complete blindness within minutes

19 Aqueous humor is produced primarily by the:



- A Cornea
- B Ciliary body
- C Optic nerve
- D Retina
- E Lens capsule

20 A blockage of aqueous humor drainage (e.g., at the trabecular meshwork/canal of Schlemm) would most directly lead to:



- A Lower intraocular pressure because fluid cannot enter the eye
- B Higher intraocular pressure because fluid cannot leave the anterior chamber efficiently
- C Immediate improvement in visual acuity
- D No change, because aqueous humor is irrelevant to pressure
- E Loss of oxygen transport in blood





21 A lesion at the optic chiasm most classically causes which visual field defect?



- A** Blindness in the right eye only
- B** Loss of left visual field in both eyes (left homonymous hemianopia)
- C** Loss of temporal (peripheral) visual fields in both eyes (bitemporal hemianopia)
- D** Loss of nasal visual fields in both eyes (binasal hemianopia)
- E** No visual deficit because the chiasm is not involved in vision

22 A lesion of the RIGHT optic tract would most likely produce:



- A** Blindness in the right eye only
- B** Blindness in the left eye only
- C** Loss of the LEFT visual field in both eyes (left homonymous hemianopia)
- D** Loss of the RIGHT visual field in both eyes (right homonymous hemianopia)
- E** Loss of central vision only, with preserved peripheral vision

23 Light from the RIGHT visual field falls on which halves of the retinas?



- A** Nasal retina of the right eye and temporal retina of the left eye
- B** Temporal retina of the right eye and nasal retina of the left eye
- C** Nasal retina of both eyes
- D** Temporal retina of both eyes
- E** Fovea of the right eye only





24 After walking into a dark room from bright sunlight, it takes several minutes for vision to improve. The **BEST** explanation is:



- A** Cones slowly regenerate their pigments over hours, which mainly explains the delay
- B** Rods slowly increase sensitivity as rhodopsin regenerates after being bleached by bright light
- C** The cornea thickens to let in more light
- D** The lens becomes opaque and then clears
- E** The retina grows new rods within minutes

25 Why are colors much harder to distinguish in very dim light?



- A** The iris becomes completely rigid in the dark
- B** The cornea stops bending light
- C** Rods dominate vision in dim light and provide little/no color information
- D** Cones are present only in the optic nerve
- E** The retina cannot detect low light at all

26 The fovea has very few blood vessels compared to other retinal regions. The **best** physiological reason is that this:



- A** Prevents rods from working in daylight
- B** Reduces light scattering and improves visual acuity
- C** Increases intraocular pressure to focus the lens
- D** Stops oxygen delivery to cones so they do not saturate
- E** Creates the blind spot





27 Which is NOT part of the normal 'near response' when focusing on a nearby object?



- A** Accommodation (lens becomes more convex)
- B** Convergence of the eyes
- C** Pupil constriction
- D** Pupil dilation
- E** Increased refractive power of the lens

28 Presbyopia (common with aging) is mainly caused by:



- A** Lens losing elasticity, reducing its ability to become more convex for near vision
- B** Cornea becoming completely opaque
- C** Optic nerve swelling due to high pressure
- D** Rods converting into cones
- E** The pupil becoming permanently wide

29 The most common form of inherited red–green color blindness is typically:



- A** Autosomal dominant, equally common in males and females
- B** X-linked recessive, more common in males
- C** Mitochondrial inheritance, passed only from mothers
- D** Due to loss of rods, causing night blindness
- E** Caused by clouding of the lens





30 Closing one eye most strongly reduces which aspect of vision?



- A** Ability to detect any light at all
- B** Ability to see colors in bright light
- C** Binocular depth perception (stereopsis)
- D** Ability to constrict the pupil in response to light
- E** Ability to focus using the lens





#	Ans	Answer Text
1	A	Cornea
2	B	Regulate light entry by changing pupil diameter
3	B	Ciliary muscle contracts → zonular fibers relax → lens becomes more roun...
4	C	In front of the retina, and corrected with a concave (diverging) lens
5	B	Behind the retina, and corrected with a convex (converging) lens
6	C	The optic disc lacks photoreceptors because the optic nerve exits there
7	C	Has the highest cone density and provides the sharpest vision
8	B	Rods are more sensitive in dim light but do not provide color vision
9	C	Peripheral retina has more rods, while the fovea is cone-rich and less s...
10	B	They are depolarized relative to light and release neurotransmitter cont...
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14	C	Both pupils constrict
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16	A	Night blindness due to impaired rhodopsin regeneration in rods
17	B	Clouding of the lens that reduces transmission of light
18	B	It often involves increased intraocular pressure that can damage the opt...
19	B	Ciliary body
20	B	Higher intraocular pressure because fluid cannot leave the anterior cham...
21	C	Loss of temporal (peripheral) visual fields in both eyes (bitemporal hem...
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23	A	Nasal retina of the right eye and temporal retina of the left eye
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27	D	Pupil dilation
28	A	Lens losing elasticity, reducing its ability to become more convex for n...
29	B	X-linked recessive, more common in males
30	C	Binocular depth perception (stereopsis)

