This is a “closed book” exam. You may NOT use any books, notes, laptops, cell phones or other such aids during this exam.

If you need extra paper, please raise your hand and we will provide some for you.

You have the entire class period to finish this exam.

Note, the actual exam will be about twice as long.
MULTIPLE CHOICE SECTION: Unless otherwise stated circle only one answer per question. If the question states something to the effect of “SELECT ALL THAT APPLY” then the correct answer may require circling zero, one, or more than one answer. There is NO penalty for guessing on multiple choice questions. Each multiple choice question is worth 2 points.

1. The process of transforming energy in the environment into electro-chemical energy in the neurons is called:
   a. refraction
   b. transduction
   c. reduction
   d. construction

2. To double the perceived brightness of a particular light, you need to multiply the physical intensity of the light by about 9. This is an example of response:
   a. compression
   b. expansion
   c. linearity
   d. inversion

3. If you were trying to evaluate how efficiently someone can use a website to find a news item she is looking for, which of the following behavioral/psychophysical methods/measures would be the most useful?
   a. absolute threshold
   b. reaction time
   c. selective adaptation
   d. a delayed-match-to-sample task

4. The primary cortical receiving area for vision is located in the _____ lobe.
   a. frontal
   b. parietal
   c. temporal
   d. occipital

5. The upper limit of a neuron’s firing rate is estimated to be around _____ action potentials per second.
   a. 20
   b. 100
   c. 800
   d. 4400
6. The physiological cause of dark adaptation is:
   a. visual pigment regeneration
   b. the enzyme cascade
   c. modular organization
   d. photon remission

7. The receptive fields of simple cells appear useful for (SELECT ALL THAT APPLY):
   a. producing sparse representations of natural stimuli
   b. acting as “grandmother cells”
   c. detecting the borders of objects
   d. detecting information about object shape from shading

8. The inability of lateral inhibition to explain White’s illusion suggests that some contrast effects are based in:
   a. the retina
   b. the cortex
   c. the lateral plexus
   d. the macula

9. The results of experiments that induced selective adaptation to gratings with specific orientations can be related to the _____ of ______ cells.
   a. lateral inhibition; simple cortical
   b. lateral inhibition; end-stopped
   c. tuning curves; amacrine
   d. tuning curves; V1 cells

10. Optical imaging would be a good technique for studying:
    a. the activity of cortical columns
    b. the activity of individual neurons
    c. the activity of the LGN
    d. the activity of individual synapses

11. After training participants on the recognition of “Greeble” stimuli, Gauthier et al. found that their FFAs responded:
    a. about as well to Greebles as to human faces
    b. weakly to Greebles and strongly to human faces
    c. unpredictably to Greebles and weakly human faces.
    d. strongly to Greebles and weakly to human faces.
12. S.B. was a blind man whose blindness was cured at the age of 52. What did we learn from S.B. about the plasticity of the visual system? (SELECT ALL THAT APPLY)
   a. There is a critical period for some visual functions such as depth perception.
   b. Some visual learning is still possible, even in late middle age.
   c. Knowledge from one sensory modality can transfer to another sensory modality.
   d. Face recognition is innate.

13. Which of the following statements about receptive fields are true? (SELECT ALL THAT ARE TRUE)
   a. Receptive fields tend to get smaller and more accurate as you go up the cortical hierarchy
   b. A neuron’s visual receptive field is the part of the retina that can elicit action potentials from that neuron
   c. A neuron’s response to what is in its receptive field can be affected by stimuli outside of its receptive field
   d. Complex receptive fields are produced by the convergence of excitatory and inhibitory neurons
1. Fill in the SIX missing labels in the following diagram of the dorsal and ventral visual pathways: (2 pts each)

**Dorsal Pathway**

- _______ Lobe
- VI
- _______
- _____-Ganglion Cell

**Ventral Pathway**

- _______ Lobe
- VI
- _______
- _____-Ganglion Cell
2. When using the method of limits to measure someone’s absolute threshold, sometimes you start with a stimulus that is too weak for people to detect and other times you start with a stimulus that is strong enough to be easily detectable. Why is it a good idea to start at both extremes? (6 pts)

3. Describe specificity coding and distributed coding. For each type of code, give one piece of evidence that the brain appears to use that code. Which type of coding is most likely the most frequently used by the brain and why? (12 pts)
4. When looking at a Hermann grid (illustrated above), people see ghostly dark spots between the four corners of the blocks. Curiously, these illusory spots are weaker at the center of gaze than in the visual periphery. If the textbook’s explanation for these illusory spots is correct, what further piece of information about the neural networks in the retina can we infer from the fact that the illusory spots are weaker at the center of gaze? (6 pts)