# QUIZ 08 (One Attempt)

Instructions: Download the quiz from Blackboard (in Quiz Questions Folder), print a copy and use the paper copy to work through the various questions and problems. Mark the correct answers on it. When you are ready to **submit** your answers, you will see the quiz posted under Quiz Answer Sheets.

Click the quiz name to launch the quiz. Enter your answers to each of the corresponding numbered questions onto the **blank answer sheet** (the questions will not be repeated, simply a blank page for your answers). The quiz may be saved if you do not finish entering your answers in one sitting. When you are finished with the quiz, make sure to **submit** your answers and they will be recorded.

For each question, select the one **best answer** from among those given (multiple choice).   Each question is worth one (1) point.

1. The following figure depicts the firing rate histograms for 5 separate neurons in a premotor area in a human. The figure was created using neural data during the playing of a short segment of a song. What does this data suggest about how these neurons might be connected?
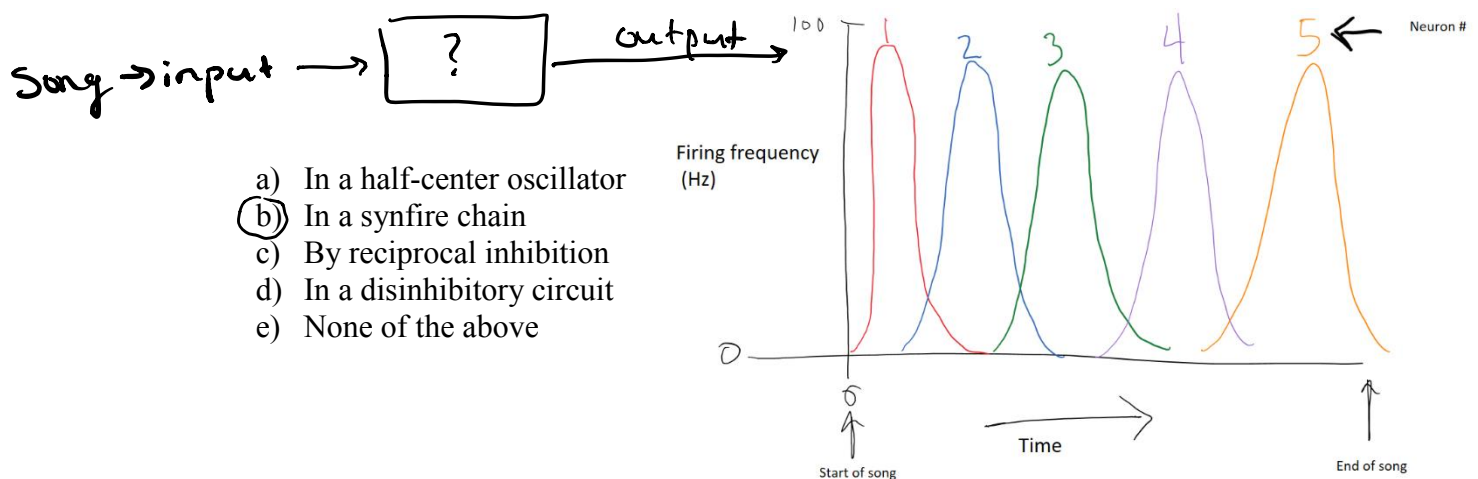
   a) In a half-center oscillator
   b) In a synfire chain
   c) By reciprocal inhibition
   d) In a disinhibitory circuit
   e) None of the above

2. The subject later sustained a head injury in which the brain area in question 1 was damaged. Which of the following is the most likely symptom of this damage?

   a) The song playing would become more precise and stereotyped.
   b) The song playing would become less precise and stereotyped.
   c) The song would slow down.
   d) The song would speed up.
   e) The song would get quieter.

3. Primary sensory afferent axons have widely varying diameters, and their size correlates with the type of receptor to which they are attached. Which of these axons are the smallest and the slowest? Choose the correct option.

a) Proprioceptors of the skeletal muscles. (Aα fiber) → *info about joint θ, muscle length, muscle tension*
b) Mechanoreceptors of the skin. (Aβ fiber) → *convert mechanical forces into change of ionic currents in sensory neurons that are innervating skin*
c) Pain and temperature (Aδ fiber)
d) Temperature, pain, and itch. (C fiber) *" Most of the axons of somatosensory receptor neurons are myelinated for fast transmission of sensory stimulus"*
e) Both A and B.

C-fibers are exception

4. Why is the sensory homunculus so distorted when compared to a real human body?
   a) The relative size of the cortex that is devoted to each body part is correlated with the density of the sensory input received from that part.
   b) It is a primitive representation of the earlier stages of evolution.
   c) The uneven surface of the cortex disrupts the representation of the body surface.
   d) The relative size of the cortex that is devoted to each body part varies widely among different individuals.
   e) None of the above.

5. Which of the following statements is false about the chemosensory and mechanosensory receptors?
   a) Mechanosensory receptors are sensitive to physical distortion
   b) Chemosensory receptors are chemically sensitive proteins that serve as sensory receptors
   c) Chemosensory receptors that sense salt and sour molecules mainly allow negatively charged ions to directly enter the taste cell through a pore in their structure.
   d) Taste receptors (T1Rs and T2Rs) use second messenger pathways to change membrane potential of taste cells.
   e) TRP channels detect temperature fluctuations.

6. Of the below statements about mammalian olfaction, which of the following is FALSE? If all are true, choose answer E.

   each olfactory receptor can be activated by multiple odorants

   a) Each odorant molecule activates only one type of olfactory receptor protein.
   b) In mammals, each olfactory sensory neuron randomly expresses one, and only one, olfactory receptor (OR).   *True ←*
   c) A glomerulus in the olfactory bulb receives input from one type of olfactory sensory neuron.   *True ←*
   d) Combinatorial activation of glomeruli generates an olfactory percept for a given odorant present in the environment.   *True ←*
   e) All of the above are true.

7. What is a key difference between the olfactory system and other sensory systems such as gustation, hearing and touch?

   Lec 29, 17
   Lec 30, 45   *Lec 29*
                                  Slide 16

   No map identified for smell! →
   a) The olfactory system does not create maps of stimulus quality.
   b) The olfactory system projects to cortex without passing through the thalamus.
   c) The olfactory system lacks feedback from higher brain centers.
   d) The olfactory system is insensitive to stimulus intensity.
   e) The olfactory system does not have the ability to adapt.

   Lec 30, 56

Both (a) and (b) are key differences!   *Chose (b) b/c it was a take home message*

8. Transduction in auditory hair cells…:

   a) Requires that Ca^{2+} ions flow through the ion channels opened by movements of the tip links that couple adjacent cilia.
   b) Is triggered by Ca^{2+} ions flowing into the hair cell and depolarizing its membrane potential.
   c) Is initiated by hair cell movements that open K^+ channels that depolarize its membrane potential.
   d) Involves closing K^+ channels which depolarizes the membrane potential.
   e) None of the above.

9. Which location is the first action potential observed on the cochlear inner hair cell shown below?

   WIKI Page on inner hair cells

   a) Hair bundle
   b) Base of the hair bundle
   c) Cell body
   d) Release site
   e) Auditory neuron
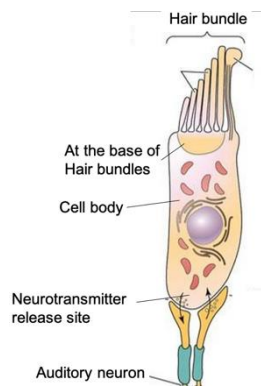
10. Using the below figure depicting delay lines in the cochlear nucleus and what you learned in class about sound localization, which coincidence detector would be most likely to fire the MOST in response to a sound stimulus localized in the left side of your auditory field? Note: All the synapses (indicated by the black balls) are excitatory, and coincidence detectors fire the most when they receive inputs from left ear and right ear simultaneously.

    E fires most

    a) A
    b) B
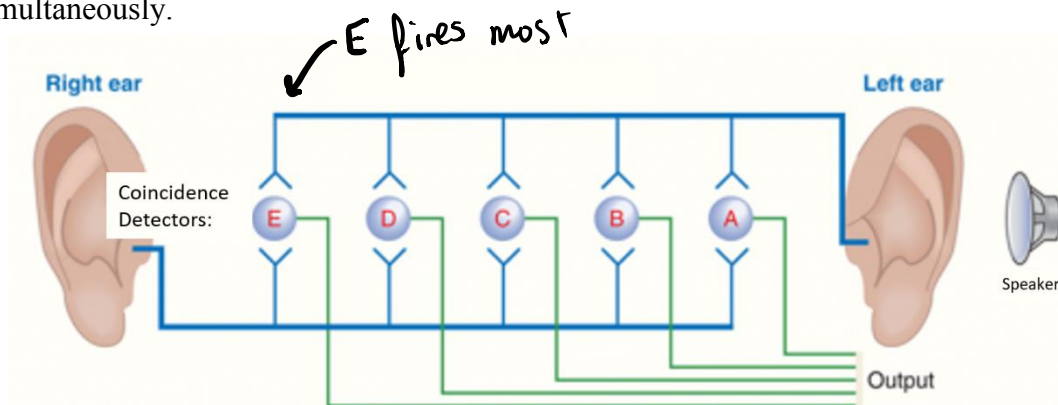
    why? Sound plays → travels down left ear → E receives both inputs
    pathway → hits E
    slowly travels down right

c) C
d) D
e) E

Thought question (ungraded):

11. **Thought question (ungraded):** The graph below shows tuning curves for four different auditory nerve fibers in a mammalian auditory nerve. The x axis shows the frequency of the tone. The y axis shows threshold intensity (in decibels, dB) to stimulate the nerve in each frequency. If pure tone sine waves of 1 kHz delivered to the ear at 40 dB sound intensity (loudness), which of these fibers will be stimulated? Star sign indicates the stimulus in the graph.