

# IBN Descriptive Quiz- 2020

NOTE: ANSWER ON A SHEET OF PAPER. SCAN. UPLOAD PDF TO CLASSROOM

Q1

Assume this image below is in the the field of view the eye of an animal under experimentation. The animal's retina sees the world in B&W as an image 5X5 pixels. Assume its V1 to be a grid of 20X20 neurons. Draw a figure of V1 grid and demonstrate how the animal's V1 fires in response to this image.



Q2

Synesthesia is a condition where sometimes people feel that some stimuli are colored. For instance when they see numbers they see it in colour although they really are not. Maybe 3 is seen to be in red, 7 in blue and so on. The mapping between number and colour is not the same for different synesthetes. However for a given synesthete, the mapping does not change with time

- a) Describe an experiment using an experimental prop as shown below to differentiate fake synesthetes from real ones. Describe the experimental protocol and your expected results

2	2	2	2	2	2
2	5	2	5	2	5
2	2	5	2	5	2
2	2	2	5	2	2

- b) Propose a mechanisms for phenomenon of synesthesia.

c) Can you use synesthesia to argue that there is such a thing as a natural language - A language which does not need to be learnt. Just hearing the word automatically brings to mind the intended meaning - similar to "oumbula" for a ball and "churuk" for a needle.

### Q3

A neuron fires action potentials at the following times in ms

5, 11, 14, 17, 20, 30, 33, 45, 53, 59, 64, 68

Plot the rate code for this neuron using

- Rate code with a moving window of 50 ms
- Rate code with moving window of 10 ms
- Rate code with moving window of 1 ms
- instantaneous frequency using inter-spike-intervals. Scan the answer sheet and upload

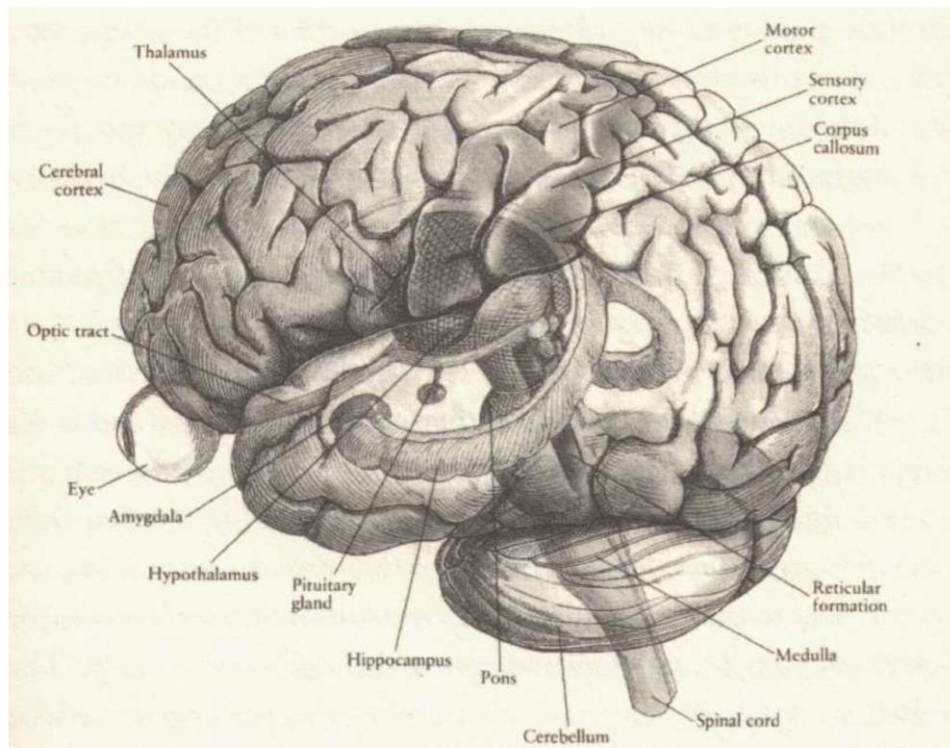
### Q4

Given groups of neurons that are tuned to a variety of inter-aural time differences(in MSO) and inter-aural intensity differences(in LSO) explain how neurons in the inferior colliculus can localize the source of sound ? Explain using a diagram

### Q5

In the following diagram,

- Classify each labelled part into brainstem / cortex / sub-cortical structure
- Describe the function of each labelled part



Tell Tale brain : VS Ramachandran