Assignment 2 Solutions:

Q1. (Option A) The influx of sodium (Na+) ions into the neuron account for the rising phase of an action potential in a typical neuron.

Q2.

A. **Descriptive:**

1. Defines qualitatively how to describe a scene or data by Neural Encoding.
2. Defines how we can extract information from neurons by Neural Decoding techniques.

B. **Mechanistic:**

1. Helps us understand how to simulate the behavior of a single neuron on a computer.
2. Helps us understand how to simulate a network of neurons.

C. **Interpretive:**

1. Helps us answer the question, why does the brain operate the way it does.
2. Helps us understand the computational principles that make the brain operate as it does.

Q3. Steps followed by a model while interpreting the signals in the receptive fields of the ganglion cells are:

1. Light enters the eye and gets concentrated in the retina via the eye lens. A stimulus is generated in the rod and cone cells present in the retina.
2. The stimulus is passed to the ganglion cells by getting passed through the horizontal and bipolar cells, following 2 different scenarios:
    a. ON-CENTRE OFF-SURROUNDING GANGLION CELLS: Stimulus entering these types of ganglion cells depolarize the stimulus coming from the center and hyperpolarize the stimulus coming from the surrounding. Thus, the stimulus coming from the central object increases the firing rate of action potential and decreases the firing rate for the stimulus coming from the surrounding.
    b. OFF-CENTRE ON-SURROUNDING GANGLION CELLS: Stimulus entering these types of ganglion cells hyperpolarize the stimulus coming from the center and depolarize the stimulus coming from the surrounding. Thus, the stimulus coming from the central object decreases the firing rate of action potential and increases the firing rate for the stimulus coming from the surrounding.

Q4. MEG signals can show absolute neuronal activity, whereas the fMRI signals show relative neuronal activity, meaning that fMRI signals analysis always be compared to reference neuronal activity. This means that MEG can be recorded in sleeping subjects. MEG does not make any operational noise, unlike fMRI.