General Principles
Sensory Receptors
The Receptor Potential
Primary Sensory Coding
Neural Pathways in Sensory System
Specific Sensory Systems
Somatosensation
Vision
Vestibular System
Chemical Sensation

General Principles
Sensory system uses Receptor cells that receive sensory information from external and internal environment
Sensation – is sensory information that does not reach the consciousness.
Perception is conscious awareness of the stimulus
Sensory Receptor Cells always change Stimuli to graded or action potentials.
Sensory Transduction: is transformation of stimulus to electrical response.

Stimulus
Stimulus is change in environment detected by sensory receptor cell.
Stimulus is characterized by
Type of energy and its intensity
Location of the body affected by it
Modality is main type of stimulus – temperature, taste
Submodality is its subtypes – cold or hot; salt, sour, sweet and bitter

Sensory Receptors
Sensory Receptors are either endings of an afferent neuron or a receptor cell that passes information to an afferent neuron.
Adequate Stimulus is one form of stimulus that generates best response from receptor cell.
Narrow range: many receptors respond to a narrow range of stimuli – particular color of light
Types of Receptors:
Mechanoreceptor – touch, pressure, stretch
Thermoreceptor – temperature
Photoreceptor – light
Chemoreceptors – binding of particular chemical
Nociceptors - pain

Primary Sensory Coding
Coding changes stimulus to signal having meaningful information for CNS
Receptive field: a smaller receptive field helps in spatial location
Lateral Inhibition: Among different sensory receptors with overlapping receptive field the central one, firing strongest signals, inhibit the neighboring receptors. This helps in localization.
Adaptation is reduction in # of action potentials in presence of stimuli. It helps to avoid sensory overload.
Rapidly Adapting Receptors – sensation of clothes
Slowly Adapting Receptors – upright posture

Neural pathways
A Pathway has parallel chains, each formed of 3 or more neurons connected by synapses.
Ascending Pathways
1. Distinguish between sensation and perception. (Sensation is depolarization of sensory receptor and sending the action potentials to brain. Primary Sensory Cortex receives the input and the perception is integration by Association area. It means we do not taste food on activation of gustatory cells in taste buds or sensory input to primary gustatory cortex but realization of taste is only when processed by Gustatory Association Area compared with stored information.)

2. Distinguish between rapidly and slowly adapting receptors. Give examples.

3. Role of primary area and association areas in cerebral cortex. (Discuss it by taking example of taste as explained in class or question # 1. Association area uses input for temperature, texture and smell of food along with taste)

4. Receptors for touch and pressure.

5. Explain accommodation of eye. Define accommodation and use the table but explain what is going on.

6. Distinguish between near-sightedness = myopia and far-sightedness = hyperopia.

7. Give main parts of visual pathway. (Cornea → aqueous humor → pupil → aqueous humor → lens → vitreous humor → cone or rod cells → bipolar neurons → ganglion cells → optic nerve → optic chiasm → optic tract → optic radiation → primary visual cortex)

8. Outline transduction of sound by ear. (Auricle and auditory canal lead sound waves to tympanic membrane → malleus → incus → stapes → membrane of oval window → perilymph in vestibular duct → vestibular membrane → endolymph in cochlear duct → basilar membrane → hair cells in organ of Corti move up and down → depending on pitch of sound hairs of hair cells hit → tectorial membrane → hair bend and get depolarized → action potentials send through vestibulocochlear nerve to → Pons → Thalamus → Primary Auditory Cortex → Auditory Association Area interprets the sound)

9. Role of vestibular system in picking angular motion. (Picked by cristae in ampullae of semicircular canals → one or 2 cristae moves in the direction head is tilted → endolymph moves the gelatinous cupule covering sensory cells in crista → it bends the hair of sensory cells → cells get depolarized and → send action potentials to brain through vestibular branch of vestibulocochlear nerve → pons → cerebellum processes the information)

10. Role of vestibular system in linear motion or direction of gravity. (Explain role of maculae in utricle and saccule → linear motion of body → endolymph drags behind → otoliths in gelatinous membrane drag behind → hairs of sensory cells bend and send action potentials to brain through vestibular branch of vestibulocochlear nerve → pons → cerebellum processes the information)

11. Define terms sensory adaptation, adequate stimulus, modality, lateral inhibition, referred pain, colorblindness, astigmatism.