Lecture #11 Basal Ganglia

Question 1: The two main output targets of the striatum of the basal ganglia are which?

a) Substantia nigra pars reticulata (SNr) and subthalamic nucleus (STN)

b) Substantia nigra pars compacta (SNc) and subthalamic nucleus (STN)

c) Internal segment of the globus pallidus (GPi) and substantia nigra pars reticulata (SNr)

d) Substantia nigra pars compacta (SNc) and substantia nigra pars reticulata (SNr)

e) External and internal segments of the globus pallidus (GPe and GPi)

Lecture #11 Basal Ganglia

Question 2: Which is the LEAST likely sign of Parkinson's disease?

a) Intention tremor

b) Hypometria in gait

c) Bradykinesia

d) Resting tremor

e) Akinesia

Lecture #11 Basal Ganglia

Question 3: What is the most direct early cause of the signs of Huntington's disease?

a) Loss of D1 receptor expressing striatal projection neurons

b) Loss of D2 receptor expressing striatal projection neurons

c) Loss of substantia nigra pars compacta dopamine neurons

d) Loss of neurons throughout cerebral cortex

e) Loss of substantia nigra pars reticulata dopamine neurons

Lecture #11 Basal Ganglia

Question 4: Which neurotransmitter is supplied by structures that lie one just dorsal to the crus cerebri and the other in the midbrain tegmentum, ventrally near the midline?

a) Histamine

b) Acetylcholine

c) Serotonin

d) Norepinephrine

e) Dopamine

Lecture #11 Basal Ganglia

Question 5: Excitatory glutamate output projects from which basal ganglia neuron type, nuclear division, or nucleus, etc.?

a) globus pallidus external segment

b) D1 striatal projection neurons

c) globus pallidus internal segment

d) D2 striatal projection neurons

e) subthalamic nucleus

Lecture #11 Basal Ganglia

Question 6: What is the main neurotransmitter of the substantia nigra pars reticulata neurons?

a) Dopamine

b) Glutamate

c) GABA

d) D2

e) D1

Lecture #11 Basal Ganglia

Question 7: Which provide the main input to the external segment of the globus pallidus (GPe)?

a) Substantia nigra pars compacta (SNc) neurons

b) Substantia nigra pars reticulata (SNr) neurons

c) Subthalamic nucleus (STN) neurons

d) D2 striatal projection neurons

e) D1 striatal projection neurons

Lecture #11 Basal Ganglia

Question 8: The two main output nuclei of the basal ganglia are which?

a) External and internal segments of the globus pallidus (GPe and GPi)

b) Substantia nigra pars compacta (SNc) and substantia nigra pars reticulata (SNr)

c) Substantia nigra pars reticulata (SNr) and subthalamic nucleus (STN)

d) Internal segment of the globus pallidus (GPi) and substantia nigra pars reticulata (SNr)

e) Substantia nigra pars compacta (SNc) and subthalamic nucleus (STN)

Lecture #11 Basal Ganglia

Question 9: Which is the hyperdirect pathway?

a) Striatum to substantia nigra pars compacta

b) Striatum to substantia nigra pars reticulata

c) Cerebral cortex to substantia nigra pars reticulata

d) Cerebral cortex to subthalamic nucleus

e) Cerebral cortex to substantia nigra pars compacta

Lecture #11 Basal Ganglia

Question 10: Which provide the main input to the internal segment of the globus pallidus (GPi)?

a) D1 striatal projection neurons

b) Subthalamic nucleus (STN) neurons

c) Substantia nigra pars reticulata (SNr) neurons

d) Substantia nigra pars compacta (SNc) neurons

e) D2 striatal projection neurons

Lecture #11 Basal Ganglia

Question 11: What is the early motor sign of Huntington's disease?

a) Oculomotor paresis and/or saccadic suppression

b) Bradykinesia or akinesia

c) Uncontrolled movements or chorea

d) Tremor

e) Intention tremor and/or decomposition of movement

Lecture #11 Basal Ganglia

Question 12: The output from D1 receptor expressing striatal projection neurons is which?

a) Glutamatergic excitatory

b) GABA-ergic inhibitory

c) Neuromodulatory, either excitatory of inhibitory depending on context

d) Enkephalinergic

e) Dopaminergic excitatory

Lecture #11 Basal Ganglia

Question 13: What is the genetic or biochemical cause of most instances of Parkinson's disease?

a) Somatic mutation of the Pk1 gene

b) Intracellular damage due to low intracellular Ca++

c) Methylation of the Pk1 gene

d) Unknown

e) Genetic mutation of the Pk1 gene

Lecture #11 Basal Ganglia

Question 14: The output from the globus pallidus external segment (pars externa) is which?

a) Axons that project to spinal cord motor neurons and interneurons

b) Dopaminergic

c) Axons ending primarily in motor cortex

d) Glutamatergic

e) GABA-ergic

Lecture #11 Basal Ganglia

Question 15: What is a (are) major direct output(s) of the substantia nigra pars reticulata and internal segment of the globus pallidus?

a) Association cortex

b) Substantia nigra pars compacta and external segment of the globus pallidus

c) Motor cortex

d) Spinal cord ventral horn

e) Ventral thalamus

Lecture #11 Basal Ganglia

Question 16: What is the most likely function of the hyperdirect pathway?

a) Inhibitory sculpting of direct pathway excitation

b) Roughly equivalent in excitation of movement to direct pathway activation

c) Providing a pinpoint focus of inhibition to block a specific response commanded by the direct pathway

d) Stronger excitation of movement than the direct pathway

e) Shortening the latency of excitatory signals through the direct pathway

Lecture #11 Basal Ganglia

Question 17: The output from the globus pallidus internal segment (pars interna) is which?

a) Axons that project to spinal cord motor neurons and interneurons

b) Axons ending primarily in motor cortex

c) GABA-ergic

d) Glutamatergic

e) Dopaminergic

Lecture #11 Basal Ganglia

Question 18: Which lists the indirect pathway through the basal ganglia via the correct structures in the correct order?

a) neocortex>substantia nigra >ventral thalamus>neocortex

b) neocortex> ventral thalamus >globus pallidus internal segment>striatum>neocortex

c) neocortex>striatum>globus pallidus external segment>ventral thalamus>neocortex

d) neocortex>striatum>globus pallidus internal segment>ventral thalamus>neocortex

e) neocortex>striatum>globus pallidus external segment>subthalamic nucleus>globus pallidus internal segment>ventral thalamus>neocortex

Lecture #11 Basal Ganglia

Question 19: Which lists the direct pathway through the basal ganglia via the correct structures in the correct order?

a) neocortex>striatum>globus pallidus external segment>ventral thalamus>neocortex

b) neocortex>substantia nigra>ventral thalamus>neocortex

c) neocortex>striatum>globus pallidus internal segment>ventral thalamus>neocortex

d) neocortex>ventral thalamus>globus pallidus internal segment>striatum>neocortex

e) neocortex>striatum>globus pallidus external segment>subthalamic nucleus>globus pallidus internal segment>ventral thalamus>neocortex

Lecture #11 Basal Ganglia

Question 20: How is adenylate cyclase activity (in response to dopamine) affected in striatal projection neurons expressing D1 receptors vs those expressing D2 receptors, respectively?

a) Increased vs increased

b) Decreased vs increased

c) Increased vs decreased

d) Decreased vs decreased

e) Unaffected vs increased

Lecture #11 Basal Ganglia

Question 21: What neurological disorder is most closely associated with loss of the subthalamic nucleus?

a) Hemiballism

b) Tardive dyskinesia

c) Huntington's disease

d) Parkinson's disease

e) Essential tremor