Name _____KEY_____

Nsci 4100: Development of the Nervous System
2017 Final Examination

On your scantron answer sheet, enter your name (last name, space, first name), internet ID (X.500 name) and student number. Please do it now!!!

Questions in blue are reused from the first two midterm exams.

Class 2 neuro 101

1. Which of the following cell types would not normally be found in the spinal cord?
   - A. oligodendrocyte
   - → B. schwann cell
   - C. astrocyte
   - D. microglia
   - E. More than one of the above are correct.

2. Neurons can receive synaptic input on all parts of the cell except the …
   - A. axon.
   - B. dendrite.
   - C. soma.
   - → D. None of the above is correct.

Class 3 & 4 embryology

3. What cell group is below [ventral to] the midline of the neural plate in the early mammalian embryo?
   - A. epidermis
   - B. somite
   - C. epiblast
   - D. hypoblast
   - → E. notochord

4. Which of the following best describes the location of cells in the neural plate that are likely to become neural crest cells?
   - A. midline
   - → B. lateral margin
   - C. a stripe between the lateral margin and the midline
   - D. the top furthest from the primitive streak
   - E. the bottom closest to the primitive streak

5. The lumen of the embryonic neural tube persists into the adult brain. True or false?
   - → A. true
   - B. false

Class 5 induction

6. Neural induction requires activation of two receptors, the FGF receptor and the BMP receptor. True or false?
   - A. true
   - → B. false

7. If you transplanted a region from the animal cap of an early blastula stage frog embryo into a region that would normally develop into skin of another embryo of the same age, what would you expect to see over the next day?
   A. The transplanted cells would develop into mesoderm, and the host cells around the transplant would develop into nervous system.
   B. The transplanted cells would develop into mesoderm, and the host cells around the transplant would develop into skin.
   C. The transplanted cells would develop into nervous system, and the host cells around the transplant would develop into skin.
→ D. The transplanted cells would develop into skin, and the host cells around the transplant would develop into skin.
   E. The transplanted cells would develop into skin, and the host cells around the transplant would develop into nervous system.

8. Which of the following is true regarding Spemann's organizer?
   A. It later becomes epidermis.
→ B. It later becomes axial mesoderm.
   C. It induces neural tissue in the underlying endoderm.
   D. It only exists in avian embryos.
   E. None of the above is correct.

Class 6 & 7 regionalization

9. Which of the following statements is NOT true about the segmental organization of the hindbrain?
→ A. A reduced level of retinoic acid signaling results in the expansion of the caudal hindbrain at the expense of the rostral hindbrain.
   B. The rostral border of *Hox* gene expression in the hindbrain is defined by signals from the isthmic organizer.
   C. Deletion or ectopic expression of Hox genes sometimes changes segmental identity of the hindbrain.
   D. All of the above are true.

10. Which of the following statements is NOT true about the isthmic organizer?
   A. Mutual repression between the transcription factors Otx2 and Gbx2 is important for its formation.
   B. It later contributes to the cerebellum.
   C. Its transplantation into the caudal diencephalon results in the induction of ectopic midbrain.
→ D. It secretes Sonic hedgehog.
   E. More than one of the above are NOT true.

11. Which of the following is TRUE regarding early regionalization of the nervous system?
   A. The identity of a neuron in the brain is independent of the position of the progenitor cell that produces the neuron.
   B. The rostral-most part of the neural plate later becomes the thalamus.
   C. Inhibition of BMP signaling leads to the induction of the nervous system with the identity of the future hindbrain.
   D. The lateral margin of the neural plate later becomes the floor plate.
→ E. None of the above is true.

12. Which of the following statements is NOT true about the anterior neural ridge?
    A. It is formed at the anterior end of the central nervous system.
    B. It secrets FGF8.
    C. It is responsible for the anterior-posterior patterning of the cerebral cortex.
    D. Its formation requires a signal from nearby non-neural tissues.
→ E. All of the above are true.

Class 8 & 9 cell division

13. Numerous growth factors promote division of neural progenitor cells by activating a cell surface receptor tyrosine kinase (RTK). The activated RTK has what effect in these cells?
    A. phosphorylation of CREB
    B. stabilization of β-catenin
    C. degradation of β-catenin
    D. increased expression of cyclin D
→A/D E. More than one of the above are correct.

14. Retinoblastoma protein (Rb) normally …
    A. promotes cell division by activating E2F transcription factors.
→ B. inhibits cells division by sequestering E2F transcription factors.
    C. promotes cell division by activating DNA polymerase.
    B. inhibits cells division by degrading DNA polymerase.
    E. promotes cell division by inactivating cyclin dependent kinase inhibitor (CKI).

15. What effect would a traditional knockout of the Emx2 gene in mouse likely have on the development of the neocortex?
    A. The cortex would be larger than normal.
→ B. The cortex would be smaller than normal.
    C. The cortex would have an abnormally high percentage of glial cells.
    D. The cortex would have an abnormally low percentage of inhibitory interneurons.
    E. The cortex would be normal in size and in the relative proportion of the various cell types.

16. Neurogenic cell divisions are required for the exponential expansion of the cell population in the early developing neural tube. True or false?
    A. true
→ B. false

Class 10 & 11 cell fate

17. Which of the following factors is responsible for inducing dorsal cell fates in the developing spinal cord?
    A. Sonic hedgehog
    B. neuregulin
    C. chordin
→ D. BMPs
    E. More than one of the above are correct.

18. Rod photoreceptors are generated just after birth in the rodent retina. Imagine that you could isolate progenitor cells from the newborn retina and transplant them to an embryonic day 12 retina, an age at which ganglion cells are just starting to be born. What cell type(s) would you expect the transplanted progenitor cells to generate?
    A. mainly retinal ganglion cells
    B. mainly retinal ganglion cells first and then probably other retinal cell types
→ C. mainly rod photoreceptor cells first and then possibly glia
    D. The transplanted cells would most likely be inhibited from generating differentiating cells in the new environment.

19. Proneural factors …
→ A. bind E-box sequences in the regulatory regions of target genes.
    B. promote neural progenitor cell division.
    C. are expressed as the result of Notch activation.
    D. bind the Notch protein and block Notch signaling.
    E. More than one of the above are correct.

20. Which of the following is the approximate sequence of genesis of various cell types in the ventral horn of the spinal cord from earliest to latest?
→ A. projection neuron-interneuron-glia
    B. projection neuron-glia-interneuron
    C. interneuron-glia-projection neuron
    D. interneuron-projection neuron-glia
    E. glia-projection neuron-interneuron

21. Notch …
    A. is a secreted factor.
    B. is a cell surface ligand for its receptor.
→ C. is cleaved when activated, and a fragment of Notch functions in the nucleus.
    D. is a receptor tyrosine kinase.
    E. More than one of the above are correct.

22. What effect would you expect if you experimentally misexpressed Neuregulin-1 (Nrg1) in sclerotome cells on one side of an early chick embryo compared to the contralateral (control) side?
    A. Crest cells that give rise to the peripheral nervous system would migrate dorsolaterally.
    B. Fewer melanocytes would migrate to the skin.
→ C. Dorsal root ganglia would fail to form, or if they did form, they would have fewer neurons and more glia.
    D. Dorsal root ganglia would develop, but would have more neurons and fewer glia.
    E. More than one of the above are correct.

Class 17 & 18 cell migration

23. Cadherins …
    A. activate integrins.
→ B. require calcium to bind.
    C. are GPI-linked cell surface proteins.
    D. are components of the extracellular matrix.
    E. More than one of the above are correct.

24. SDF1 (Cxcl12) …
    A. attracts migrating neural crest cells that form sympathetic ganglia.
    B. repels early migrating neural crest cells from taking the dorsolateral pathway.
    C. repels migrating neural crest cells from entering the caudal half of sclerotomes.
    D. attracts migrating interneurons into the developing cerebral cortex.
→AD E. More than one of the above are correct.

25. Neural crest cells undergo an epithelial-to-mesenchymal transformation prior to formation of the neural tube. True or false?
    A. true
→ B. false

26. Which of the following do NOT develop from neural crest cells?
    A. neurons of cranial nerve sensory ganglia
    B. some bones of the face and head
    C. parts of the heart
    D. neurons in the wall of the intestines
→ E. All of the above develop at least in part from neural crest cells.

Class 20-23 mechanisms of movement & guidance

27. Migrating cells form plaques of tight membrane adhesion to elements in their environment. These patches are coincident with intracellular concentrations of …
    A. microtubules
    B. neurofilaments (intermediate filaments)
→ C. actin filaments
    D. collagen filaments
    E. More than one of the above are correct.

28. Which of the following statements describes a characteristic of the cell process that becomes the axon in a developing neuron in tissue culture?
    A. The first process that extends from the cell will usually become the axon.
    B. The axon usually forms on the side of the soma opposite to the side with the centrosome.
    C. The axon usually forms on the same side of the soma as the Golgi apparatus.
    D. The only cell process with membrane vesicles will become the axon.
→AC E. More than one of the above are correct.

29. Which of the following statements is correct regarding the role of GDNF in the growth of spinal motor neuron axons into limb bud in developing vertebrate embryos?
→ A. GDNF attracts the growing axons towards the limb.
    B. GDNF repels the growing axons into a tight pathway prior to their entering the limb.
    C. GDNF is expressed in the ventral limb compartment and attracts the ventral axons.
    D. GDNF is expressed in the dorsal limb compartment and repels the ventral axons.

30. Dynein usually transports cargo in an axon towards the cell body. True or false?
→ A. true
    B. false

31. Which of the following statements is correct regarding the growth of spinal motor neuron axons into the limb bud in developing vertebrate embryos?
    A. EphBs are expressed by cells in the dorsal limb compartment, and they attract dorsal axons.
    B. EphBs are expressed by cells in the dorsal limb compartment, and they repel ventral axons.
    C. EphrinBs are expressed by cells in the dorsal limb compartment, and they attract dorsal axons.
→ D. EphrinBs are expressed by cells in the dorsal limb compartment, and they repel ventral axons.
    E. EphAs and EphrinAs are expressed by cells in the dorsal limb compartment. EphAs attract dorsal axons, and ephrinAs repel ventral axons.

32. Some migrating cells use laminin as an adhesive substrate. What type of membrane protein is involved in this type of adhesion?
    A. Cadherins
    B. Ig-like CAMs
→ C. Integrins
    D. EphA
    E. More than one of the above are correct.

33. Ena/VASP proteins …
    A. bind microtubules.
    B. bind neurofilaments.
    C. promote depolymerization of actin filaments.
→ D. promote protrusion of filopodia.
    E. More than one of the above are correct.

34. Which of the following does NOT usually occur after an attractive guidance cue binds its receptor on the growth cone surface?
    A. Arp2/3 activity increases.
    B. Actin polymerization increases.
→ C. Myosin II contractility increases.
    D. Microtubule polymerization increases.
    E. Rac activity increases.

Class 24 & 25 specificity

35. How do growing axons change as they enter their appropriate target region?
    A. The amount of polysialic acid (PSA) associated with Ig-CAMs on the growing axons decreases.
    B. The axons become more fasciculated.
    C. The rate of axon extension increases.
→ D. The growth cones and axons become more complex and branched.
    E. More than one of the above are correct.

36. Eph proteins are …
→ A. receptor tyrosine kinases.
    B. ligands for Trk receptors.
    C. secreted, and often function in gradients.
    D. extracellular matrix proteins found in some parts of the developing nervous system.
    E. More than one of the above are correct.

37. In most cases, it is not known why a population of axons chooses the particular group of cells with which to form connections. What mechanism has been shown to be important in at least one case?
    A. A molecule secreted by the target cells attracts the appropriate population of growing axons.
    B. Homophilic interactions between cell adhesion molecules on the growing axons and the target cells allow the growing axons to enter the appropriate cell group.
    C. Repulsive molecules funnel growing axons into the appropriate cell group.
    D. Growing axons enter nearby cell groups indiscriminately, and then incorrect connections are secondarily eliminated by activity dependent mechanisms.
→ E. More than one of the above are correct.

Class 26 synaptogenesis

38. In development of neuromuscular junctions, what molecule is released from the growth cones of the motor neurons that initiates clustering of neurotransmitter receptors in the muscle membrane and other aspects of synapse development?
    A. MuSK
    B. Rapsyn
    C. Low density lipoprotein receptor-related protein 4 (LRP4)
→ D. Agrin
    E. Dystroglycan

39. Which of the following molecules is important for anchoring in place the elements of the active zone of synapses in the CNS?
    A. neurexins and neuroligins
    B. PSD95
    C. cadherins and protocadherins
    D. Ig-like cell adhesion molecules (CAMs)
→AB E. More than one of the above are correct.

40. A mutation in the gene for which of the following is likely to result in muscle weakness?
    A. dystroglycan
    B. rapsyn
    C. s-laminin
    D. MuSK
→all E. More than one of the above are correct.

Class 31 & 32 cell death / trophic factors

41. In general, approximately what percentage of all the neurons generated in the developing brain normally die during development?
    A. 10%
    B. 30%
→ C. 50%
    D. 70%
    E. 90%

42. Programmed cell death during normal development is typically accomplished by what cell death mechanism?
    A. mitosis
    B. halitosis
    C. hepatosis
    D. necrosis
→ E. apoptosis

43. Which of the following is a characteristic of a neuron undergoing programmed cell death in the normal developing nervous system?
    A. cell swells
→ B. chromatin condenses
    C. lysosomal enzymes breakdown organelles
    D. cell membrane ruptures
    E. More than one of the above are correct.

44. A transgenic mouse with over-expression of which of the following genes by all neurons would mostly prevent programmed cell death during development in the nervous system?
    A. Bax
→ B. Bcl-X_L
    C. cytochrome C
    D. caspase-activated DNase Inhibitor (ICAD)
    E. More than one of the above are correct.

45. Activated Trks can block cell death by which of the following mechanisms?
→ A. activation of CREB
    B. dephosphorylation of Bad
    C. phosphorylation of Bcl-X_L
    D. degradation of ICAD
    E. More than one of the above are correct.

46. Which of the following is NOT true regarding activated Trks? Activated Trks …
    A. are internalized by the neuron.
    B. dimerize.
→ C. are transported to the nucleus where they promote expression of certain genes.
    D. are retrogradely transported from the synapse to the soma.
    E. More than one of the above are not true.

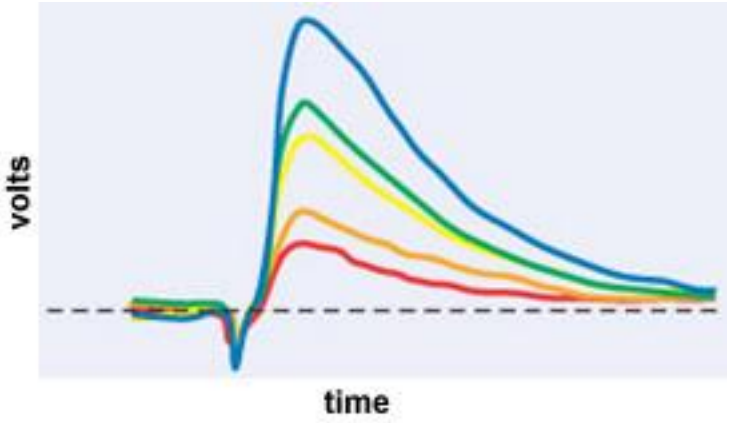
47. $p75^{NTR}$ in association with sortilin …
    A. initiates growth cone collapse in response to Nogo66.
→ B. promotes cell death in response to pro-NGF.
    C. promotes cell survival in response to BDNF.
    D. promotes cell division in response to bFGF.
    E. More than one of the above are correct.

48. Which neurotrophin receptor is used by the most neurons in the developing mammalian brain?
    A. TrkA
    → B. TrkB
    C. TrkC
    D. TrkD
    E. GFRα1

Class 33 & 34 refinement

49. In developing rodents, some ganglion cells in the center of the retina project axons to visual centers on the ipsilateral side of the brain. Which of the following statements best describes the future of these cells?
    A. All of these ganglion cells will die during the refinement period.
    → B. Some of these ganglion cells will retract their ipsilateral projection and will have an axonal projection to the contralateral side of the brain.
    C. Most of these ganglion cells lose their axon and become amacrine cells.
    D. These ganglion cells are still present in the adult and still have axons to the ipsilateral side of the brain.
    E. More than one of the above are correct.

50. The image below shows the electrical potential recorded from an electrode in a developing muscle fiber. The nerve to that muscle was stimulated electrically. Each trace shows the result of stimulating with a different voltage. A higher stimulating voltage resulted in a higher excitatory postsynaptic potential in the muscle fiber. What does this tell you?
    A. The higher the stimulating voltage, the stronger the action potential in the axon connected that synapses with the muscle fiber.
    B. The higher the stimulating voltage, the more neurotransmitter was released by the axon at the synapse.
    → C. The higher the stimulating voltage, action potentials were initiated in more axons that connected to the muscle fiber.
    D. More than one of the above are correct.
    E. None of the above are correct.



51. Kittens were raised through the critical period for ocular dominance column formation with an induced strabismus (amblyopia). At the end of the critical period, it was found that the ocular dominance columns receiving information from one eye were larger than normal and the columns for the other eye were smaller. True or false?
    A. True
    → B. False

52. Segregation of inputs from the two eyes in the lateral geniculate nucleus of developing kittens requires …

→ A. synchronous activity between neighboring retinal ganglion cells, which depends on input from neighboring cholinergic amacrine cells.
B. synchronous activity between neighboring retinal ganglion cells, which depends on both the eyes being open and normal vision.
C. normal photoreceptor function.
D. communication between neighboring neurons in the lateral geniculate nucleus, which is mediated by glutamate.
E. More than one of the above are correct.

53. Which of the following conditions is true at the end of refinement in the retinotectal system compared to the beginning of refinement?

→ A. There are more retinotectal synapses.
B. There are fewer retinotectal synapses.
C. There are more retinal ganglion cells projecting to the tectum.
D. There is an overall reduction in the precision of the topography of the projection.

54. Axonal projections to incorrect targets in the developing brain are eliminated during refinement by what mechanism?

A. death of the neuron giving rise to the projection
B. retraction of the errant axon
C. degeneration of the errant axon
D. The errant axons persist, but do not function.
→ E. More than one of the above are correct.

Class 35 behavior

55. What initiates the very first movements in a vertebrate embryo?

A. spontaneous activity in dorsal root ganglion neurons (i.e. sensory neurons) that synapse with motor neurons
B. evoked activity in dorsal root ganglion neurons (i.e. sensory neurons) that synapse with motor neurons
C. spontaneous activity in developing myofibers
→ D. spontaneous activity in motor neurons
E. spontaneous activity in neurons in the brainstem that synapse with motor neurons

56. During development of the sexually dimorphic nucleus of the preoptic area in the hypothalamus, testosterone in males functions to …

A. promote cell division.
B. promote cell growth.
C. promote cell death.
D. reduce cell division.
→ E. prevent cell death.

57. In neurons, testosterone is converted to …

A. aromatase.
B. tyrosine hydroxylase.
→ C. estradiol.
D. testosterol.
E. some yucky chemical that poisons the brain.

Everyone received credit for #58.

58. Why does visual acuity improve with maturation in postnatal humans?
    A. Babies learn what they are seeing.
    B. Babies become better able to keep their eyes directed at an object of interest.
    C. The optical properties of the eye improve.
    D. The precision of the visual circuitry, particularly in the cortex, improves.
→CD E. More than one of the above are correct.

59. All vertebrate embryos exhibit swimming-like movement as embryos. What feature of the nervous system is essential for this behavior?
    A. commissural circuitry in the spinal cord
    B. direct synapses from dorsal root ganglion neurons (i.e. sensory neurons) to motor neurons in the spinal cord.
    C. serial connections from motor neurons in one level of the spinal cord to motor neurons in the next lower spinal segment.
    D. connection from motor cortex to spinal motor neurons
→AC E. More than one of the above are correct.

Class 36 disorders

60. A mutation in the gene for the L1 cell adhesion molecule has been linked to what development problem?
→ A. hydrocephalus
    B. spina bifida
    C. down syndrome
    D. Waardenburg syndrome
    E. holoprosencephaly

61. What developmental abnormality would you expect to result from a loss-of-function mutation in the smoothened gene in humans?
    A. Duane syndrome
    B. medulloblastoma
→ C. holoprosencephaly
    D. autism spectrum disorders
    E. None of the above are correct.

62. Which of the following is NOT a characteristic of Fragile-X syndrome?
    A. Projection neurons in the brain have more dendritic spines than normal.
    B. The Fragile-X Mental Retardation gene (FMR1) has a trinucleotide repeat expansion.
    C. Neurons have abnormal micro-RNA function.
→ D. Neurons have a lower than normal level of Lim kinase expression in dendrites.
    E. More than one of the above are not characteristics of Fragile-X syndrome.

Class 37 adult neurogenesis

63. It is well established that new neurons are normally generated in a portion of what part of the adult human brain?
    A. cerebellum
    B. striatum
→ C. hippocampus
    D. cerebral cortex
    E. substantia nigra

64. Generation of new oligodendrocytes by cell division has been linked to a certain type of learning in mice. True or false?
→ A. true
B. false

65. Neuroblasts in the subventricular zone of the adult mammalian forebrain …
A. will undergo cell division.
B. will migrate into the granule cell layer of the dentate gyrus.
→ C. will migrate into the olfactory bulb.
D. line the ventricle in this region.
E. are wrapped around the capillaries and small arteries in this region.

66. What type of neurons are normally generated in the adult mammalian olfactory system?
A. interneurons in the olfactory bulb, which have short axons that synapse in the olfactory bulb
B. projection neurons in the olfactory bulb, which have long axons that synapse in the olfactory cortex
C. receptor neurons in the nasal cavity, which have long axons that synapse in the olfactory bulb
D. receptor neurons in the olfactory bulb, which have long axons that sense olfactory information in the nasal cavity
→AC E. More than one of the above are correct.

67. Which of the following activities is most likely to reduce neurogenesis in your brain?
A. taking Prozac, an antidepressant
B. sleeping
C. exercising
→ D. taking this exam
E. having sex with someone to whom you are attracted

Class 38 injury & regeneration

68. Which of the following would result in the most rapid and severe atrophy of the left hamstring muscles in the back of a person's thigh? (The main part of the hamstring muscles is innervated by the sciatic nerve, which is formed by nerves from the lower lumbar and upper sacral spinal cord.)
A. a complete mid-thoracic spinal cord transection
→ B. a complete left sciatic nerve transection just distal to its origin from the spinal cord
C. a complete right sciatic nerve transection just distal to its origin from the spinal cord
D. being confined to bed for an extended period of time

69. When a neuron's axon is cut, a conspicuous change in the soma of the neuron is a loss of what organelle?
A. mitochondria
B. Golgi apparatus
→ C. rough endoplasmic reticulum (rER)
D. nucleolus
E. nucleus

70. Imagine that you were hit by a car while walking across University Ave. The car bumper crushed your common peroneal nerve at the level of the knee. The nerve normally innervates muscles in the leg about 15cm below the injury. Approximately, how long after the accident would you expect to regain the use of these leg muscles?
    A. 10 days
    B. 30 days
    C. 60 days
→ D. 100 days
    E. 300 days

71. Immediately following axotomy, …
→ A. action potentials may be generated because sodium (Na^+) leaks into the damaged portion of the axon.
    B. action potentials may be generated because potassium (K^+) leaks into the damaged portion of the axon.
    C. the damaged axon is incapable of generating an action potential, and is described as refractory.
    D. calcium (Ca^{++}) is released from storage inside the damaged axon, and it causes a continuous stream of action potentials, which stimulates regeneration.

72. Wallerian degeneration refers to …
    A. neurons that die because they lose their main synaptic input.
    B. the changes in the soma of a neuron when its axon has been cut.
    C. the death of oligodendrocytes following axotomy.
→ D. the degeneration of the part of an axon that has been separated from the soma.

Class 39 current research (from Dr. Georgieff)

73. Approximately what percentage the total energy expenditure in a human neonate is devoted to brain function and development?
    A. 20%
    B. 40%
→ C. 60%
    D. 80%
    E. 100% (Yes, I am joking.)

74. Dr. Georgieff told us during his research talk that supplementing the diet with _____ after prenatal or neonatal iron (Fe) deficiency improved brain development and function? (Fill in the blank.)
→ A. choline
    B. niacin
    C. magnesium
    D. folate
    E. glutamate

Class 40 discussion

75. Klf4 is a …
    A. cell surface receptor.
    B. neurotrophic factor.
→ C. transcription factor.
    D. component of myelin.
    E. glycoprotein of the extracellular matrix (ECM).

Class 41 stem cells

76. Fibroblasts harvested from the skin are often used to make what type of stem cell?
    A. neural stem cells (NSCs)
    B. embryonic stem cells (ESCs)
→ C. induced pluripotent stem cells (IPSCs)
    D. epidermal stem cells (EPSCs)

77. Which of the following neurodegenerative diseases involve death of medium spiny neurons in the striatum?
    A. Spinocerebellar ataxia
→ B. Huntington's disease
    C. Age-related macular degeneration (AMD)
    D. Amyotrophic lateral sclerosis (ALS)
    E. More than one of the above are correct.

78. Transfecting fibroblasts harvested from the skin with the BAM factors (i.e. *Brn2*, *Ascl1*, and *Myt1L*) has been used to generate what cell type?
    A. induced pluripotent stem cells (IPSCs)
    B. neural stem cells (NSCs)
→ C. neurons
    D. oligodendrocytes

79. Parkinson's disease is caused by death of dopaminergic neurons in the substantial nigra of the midbrain. Clinical trials have been completed or are underway transplanting dopaminergic neurons, which were harvested from the midbrain of fetuses or made from stem cells, to the midbrain of people with advanced Parkinson's disease. True or false?
    A. true
→ B. false

Freebie

80. Your Professor wishes you a joyous holiday. True or false?
→ A. true
    B. false

The End!

Please turn in your bubble answer sheet. You may keep your exam questions.

Have a wonderful and safe holiday!
…HO, HO, HO!