

UNIVERSITY OF TORONTO

Faculty of Arts and Science

April/May Examinations 2004

NRS 202H1S

Neuroanatomy

Duration 3 hours

No aids are allowed. Answer all multiple choice questions on the exam sheets in the boxes provided. Marks outside of the boxes will not be considered. For the short answer section, please write your answers in the spaces provided. Write your name and student number below and hand this booklet in

Make sure that you have all the pages before starting the exam. You should have 17 pages including the cover. Pages 16 and 17 are for rough work. Information on these pages will not be marked. There are 15 multiple choice questions worth 45 marks and 10 short answer questions worth 55 marks, for a total of 100 marks.

Name _____

Student Number _____

Part 1 - Multiple Choice Questions. 15 Questions, 3 marks each.

1. Select the one INCORRECT statement about upper motor neurons:

- ☐ a. Upper motor neurons are arranged somatotopically in the motor cortex.
- ☐ b. Sensory neurons can act as upper motor neurons..
- ☐ c. Upper motor neurons receive direct projections from the basal ganglia.
- ☐ d. Corticospinal neurons control the movements of individual fingers.
- ☐ e. Upper motor neurons in the cerebral cortex are influenced by signals from the thalamus.

2. Select the one CORRECT statement regarding motor pathways:

- ☐ a. Axons of red nucleus neurons join the ipsilateral corticospinal tract.
- ☐ b. 80% of the corticospinal axons decussate at the junction of the pons and medulla.
- ☐ c. Corticospinal axons are located in the dorsal funiculus of the spinal cord.
- ☐ d. Corticobulbar axons terminate in the spinal cord.
- ☐ e. The neurons of nucleus ambiguus are innervated bilaterally from the cerebral cortices

3. Select the one INCORRECT statement regarding posture:

- ☐ a. Sensory transducers in the saccule and utricle respond to gravity.
- ☐ b. The postural system requires signals from all three of vestibular, visual and proprioceptive sensory systems to work properly.
- ☐ c. The saccule and utricle project to the lateral and inferior vestibular subnuclei predominantly.
- ☐ d. The descending MLF terminates within the cervical regions of the spinal cord.
- ☐ e. Proprioceptive signals arise from both the muscle spindles and tendon receptors.

4. Select the one CORRECT statement regarding the reticulospinal motor system:

- ☐ a. Axons from the medullary reticular formation are located in the medial aspect of the ventral funiculus.
- ☐ b. The reticular formation acts with very little input from the cerebral cortex.
- ☐ c. The medullary reticular formation increases activity in the extensor muscles.
- ☐ d. The pontine reticular formation increases activity in the flexor muscles.
- ☐ e. The pontine reticular formation enhances the activity of antigravity muscles.

5. Select the one INCORRECT statement about the oculomotor system:

- ☐ a. The vestibulo-ocular reflex (VOR) drives the eyes to move at the same rate as, but in the opposite direction to head movements .
- ☐ b. The optokenetic reflex is slower than the VOR.
- ☐ c. Nystagmus always indicates an abnormality in oculomotor function..
- ☐ d. The VOR adapts rapidly.
- ☐ e. We cannot read street signs while we are walking unless the VOR is working adequately.

6. Select the one INCORRECT statement regarding the perisylvian speech areas:

- ☐ a. The supramarginal gyrus recognizes sounds that encode language
- ☐ b. The primary sensory area receives proprioceptive signals from the muscles of articulation.
- ☐ c. The primary auditory area is located in the transverse temporal gyri.
- ☐ d. The angular gyrus recognizes images that have linguistic content.
- ☐ e. The precentral gyrus drives lower motor neurons that are involved in the production of sound.

7. Select the one INCORRECT statement about the motor pathways involved in speech:

- ☐ a. The part of the facial nucleus that drives the muscles around the mouth receives signals from the contralateral cortex.
- ☐ b. Muscles of the larynx are driven by lower motor neurons in nucleus ambiguus.
- ☐ c. The trigeminal nerve innervates a muscle of the palate.
- ☐ d. A stroke in the internal capsule can result in a paralyzed vocal cord.
- ☐ e. The cerebellum helps to coordinate speech.

8. Select the one INCORRECT statement regarding the formation of the central nervous system:

- ☐ a. The notochord induces formation of the neural plate.
- ☐ b. The anterior end of the neural plate forms the brain.
- ☐ c. The anterior neuropore closes at 28 days of gestation in the human.
- ☐ d. The cranial end of the neural tube forms three primary vesicles.
- ☐ e. The caudal part of the spinal cord forms from the neural plate.

9. Select the one CORRECT statement regarding the neural crest:

- ☐ a. A small population of neural crest cells migrates into the midbrain to form the mesencephalic trigeminal nucleus.
- ☐ b. Neural crest cells give rise to oligodendrocytes.
- ☐ c. Neural crest cells arise from the notochord.
- ☐ d. Neural crest cells form the sensory nuclei in the medulla.
- ☐ e. Neural crest cells form the connective tissue of the peripheral nerves.

10. The prefrontal cortex has a primary function in:

- ☐ a. circadian timing
- ☐ b. planning
- ☐ c. fear potentiation
- ☐ d. homeostasis
- ☐ e. short term memory

11. The maintenance of voluntary locomotion is associated with which EEG events?

- ☐ a. alpha.
- ☐ b. large irregular activity.
- ☐ c. Type I theta.
- ☐ d. Type II theta.
- ☐ e. all of the above.

12. According to current evidence, behavioural arousal affecting circadian timing is transmitted predominantly via the:

- ☐ a. GHT.
- ☐ b. RHT.
- ☐ c. ascending brainstem cholinergic arousal system.
- ☐ d. ascending dopamine reward system.
- ☐ e. septohippocampal pathway.

13. Photic information required for circadian entrainment in mammals is received by:

- ☐ a. deep brain photoreceptors in the hypothalamus.
- ☐ b. retinal rods and cones.
- ☐ c. retinal ganglion cells.
- ☐ d. the suprachiasmatic nucleus.
- ☐ e. hippocampus.

14. Select the one INCORRECT statement about oculomotor events.

- ☐ a. The inferior oblique muscle intorts the eye when the eye is abducted.
- ☐ b. The vestibular nucleus drives smooth pursuit movements of the eyes.
- ☐ c. Torsional eye movements can compensate for a maximum of 40 degrees of head tilt.
- ☐ d. The superior oblique muscle inserts on the posterior aspect of the globe.
- ☐ e. The gaze centers drive saccads.

15. Select the one INCORRECT statement about accommodation (the near triad):

- ☐ a. Contraction of the ciliary muscle decreases the tension on the suspensory ligament of the lens.
- ☐ b. Accommodation includes the contraction of the medial rectus muscles of both eyes.
- ☐ c. Accommodation does not require pupillary constriction.
- ☐ d. Rounding up of the lens helps to focus the image on the fovea.
- ☐ e. Accommodation is mediated by the third cranial nerve.

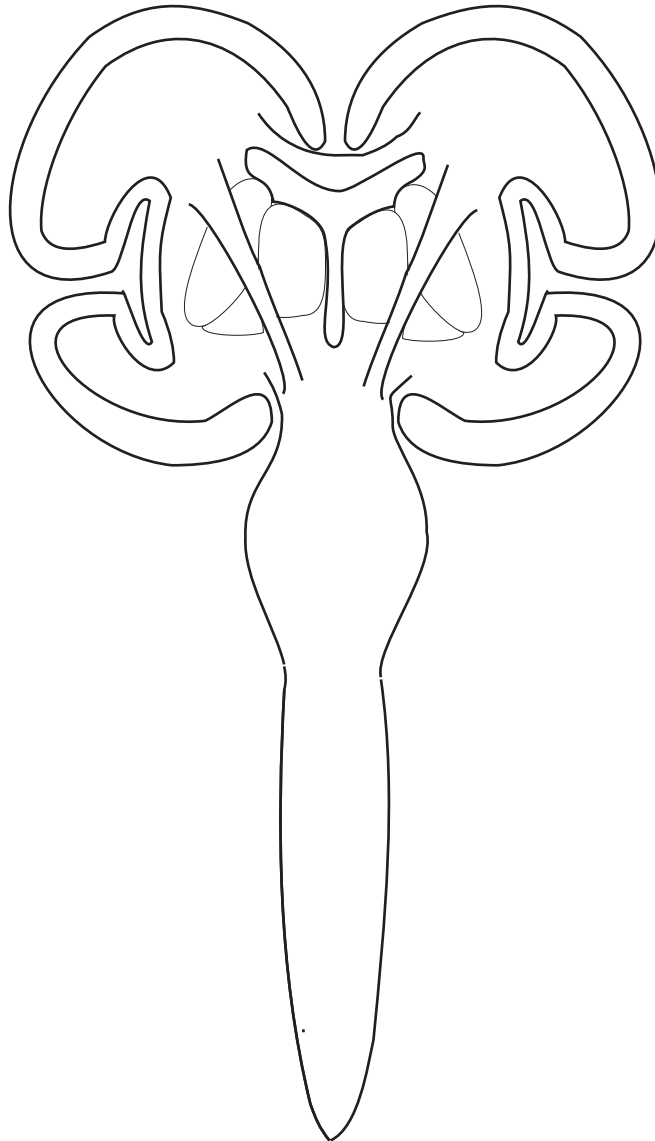
Short Answer Section, 10 Questions, 55 Marks.

Please write your answers to these questions in the space provided.

BE SURE TO WRITE OR PRINT LEGIBLY. Answers that are not readily legible will not be marked.

- 16.** Compare the effects of an upper motor neuron lesion with those of a lower motor neuron lesion. **5 Marks**

17. Define “Postural Equilibrium”. **1 Mark** On the outline below, draw and label fully the vestibulospinal tract from the sensory source to the motor effectors. **3 Marks** What is the function of this pathway? **1 Mark**



- 18.** In the space below, draw and label fully a schematic outline of the pathway that is responsible for the rightward movement of the eyes when the head is turned to the left. Confine your answer to the pathway involved in horizontal movement only. **5 Marks**

19. Examine the picture below, then describe it in a way that a person with a lesion in Broca's area would describe it. **5 Marks**



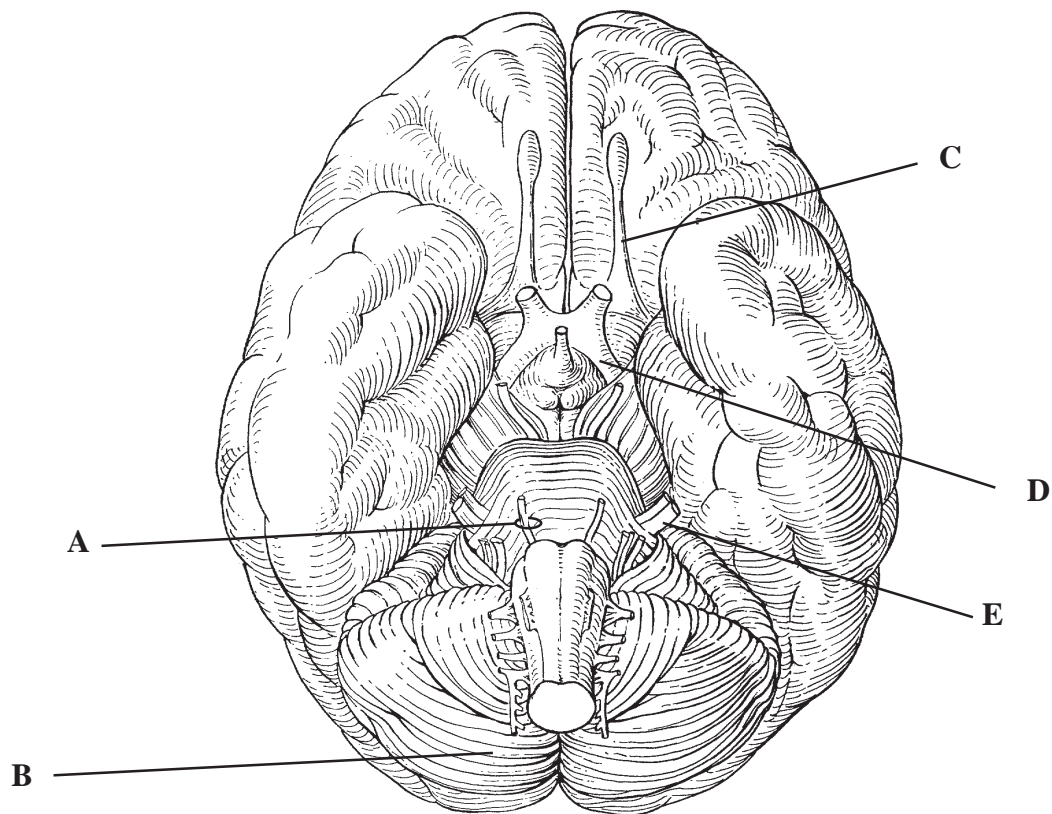
The Anatomy Lesson of Dr. Tulp, by Rembrandt

20. Fill in the blanks, or select the correct option. **10 Marks.**

- a. Nucleus ambiguus forms from the: chose one: alar plate / basal plate / neural crest.
- b. The metencephalon includes the _____ and the _____.
- c. The vestibular nucleus is _____ to the sulcus limitans.
- d. The eye forms as an outgrowth of the _____.
- e. The cerebellum forms from the: chose one: alar plate / basal plate / neural crest.
- f. Motor axons in peripheral nerves derive from the: chose one: alar plate / basal plate / neural crest.
- g. The trigeminal ganglia form from the: chose one: alar plate / basal plate / neural crest.
- h. The trochlear nucleus forms from the: chose one: alar plate / basal plate / neural crest.
- i. Which secondary vesicle does the lateral ventricle develop from? _____.
- j. Schwann cells are derivatives of: chose one: alar plate / basal plate / neural crest.

- 21.** Briefly describe the functional differences among the components of the triune brain. **5 marks**

22. What is the evidence that the circadian system uses a unique, nonvisual system for synchronization with light-dark cycles? **5 Marks**



23. Answer the following questions related to the structures indicated on the illustration above. **5 Marks**

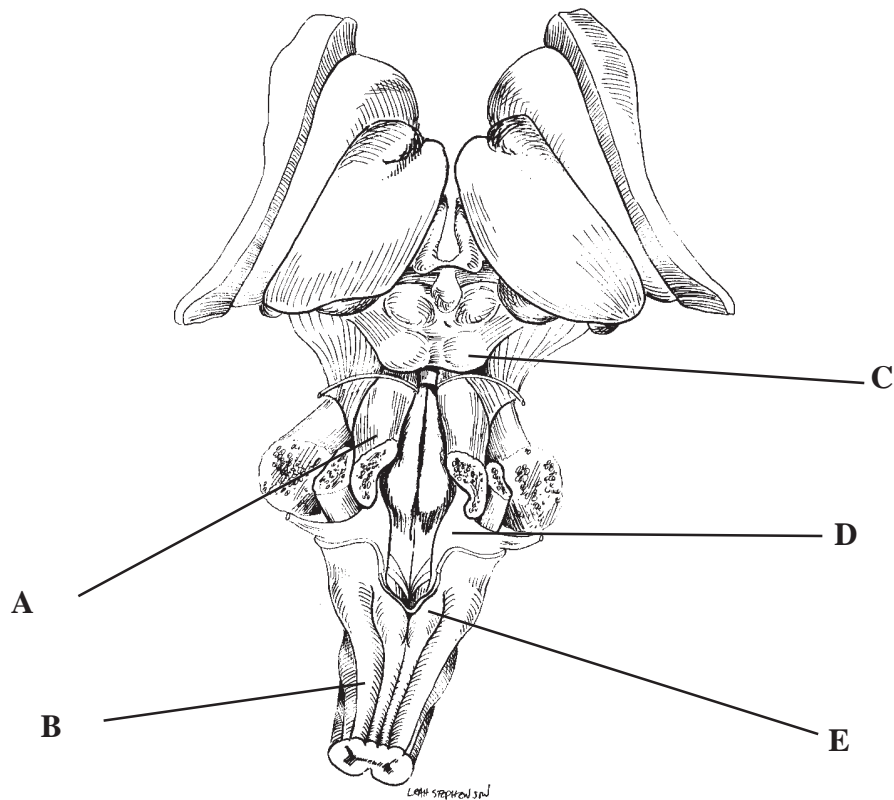
A. What is the function of structure A?.

B. Name the artery that supplies area B.

C. Identify structure C.

D. Describe the loss of function that would result from a lesion to structure D.

E. Describe the loss of function that would result from a lesion to structure E.

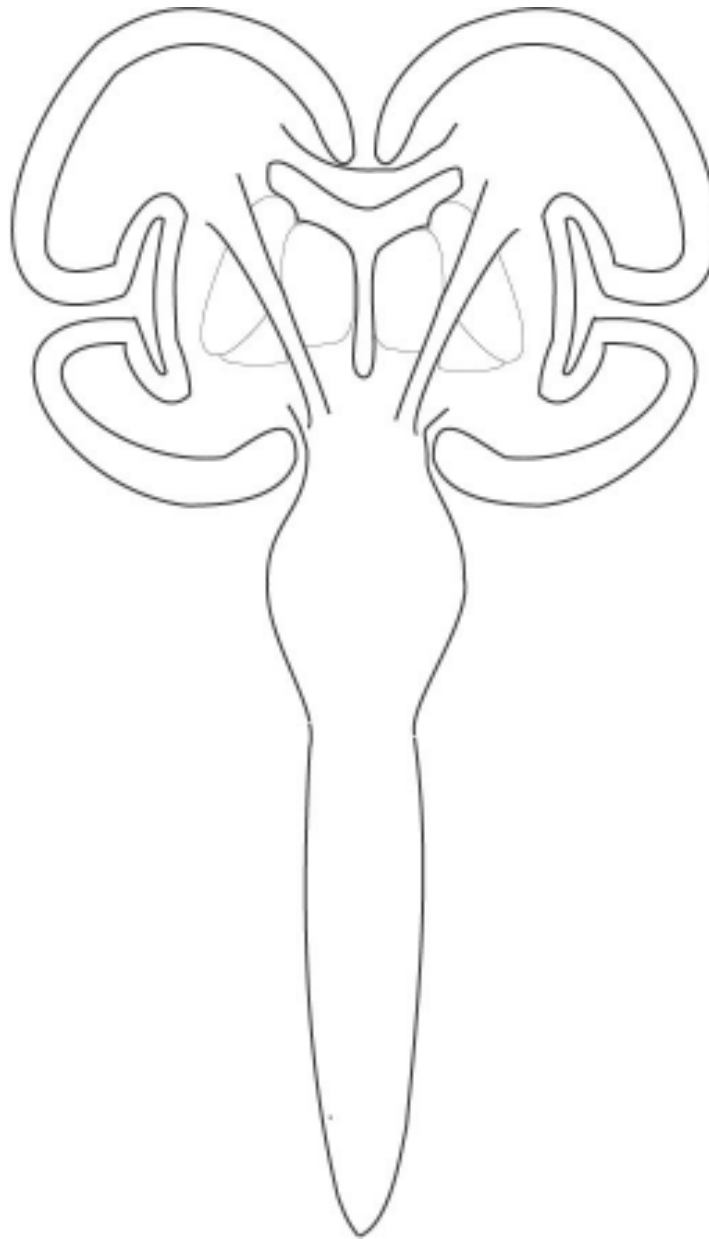


24.	Identify each of the statements below as true or false. 5 Marks	True	False
A.	Structure A carries signals from the dentate nucleus to the contralateral thalamus	<input type="checkbox"/>	<input type="checkbox"/>
B.	If structure B were lesioned, it would cause a loss of discrminative touch from the contralateral arm.	<input type="checkbox"/>	<input type="checkbox"/>
C.	If structure C were lesioned, signals from both ears could still be perceived.	<input type="checkbox"/>	<input type="checkbox"/>
D.	Structure D can be described as a collection of upper motor neurons.	<input type="checkbox"/>	<input type="checkbox"/>
E.	Structure E is vascularized by the anterior spinal artery.	<input type="checkbox"/>	<input type="checkbox"/>

- 25.** Consider a lesion on the right side of the spinal cord at C3. Describe and explain the functional losses that would result from such a lesion. **5 Marks**

Rough work. Work on this page will not be marked

Rough work. Work on this page will not be marked



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