

Biology 358 — Neuroanatomy

First Exam

Please **print your name clearly** on the back of the last page of this exam. Please read the instructions preceding each section carefully.

You must answer *all* questions on this exam. Because statistics demonstrate that, on average, between 2-5 questions on every exam are ambiguous enough to come out “aberrant” on an item analysis the total number of points possible on this exam is 104. However, grades will be calculated out of a possible 100 points.

Section 1: Diagram labeling. The following pages are unlabeled diagrams of either spinal cord or some portion of the brain. *Utilizing the blue marker supplied to you, label the following structures on the diagram according to the following instructions.* (2 points each)

- **If you are given sufficient, correct information about the tract then please outline the area in the diagram where the structure would be found, and then extend a line from the diagram out to the white margin. (You need to do this on one side only).** In the white margin label the outlined segment with the number found to the left of the structures listed below.
- ***However, if the information given is not totally correct, or if the structure is not found on the segment*** put the number in the margin of the segment and mark the structure NFOS (not found on segment).
- ***If you are not given adequate information such that a well-trained neuroanatomist could not determine what tract is being discussed,*** then you are to put the number in the margin of the segment and mark the structure NCSI (not given sufficient information).

HSC-1

1. This tract carries information dealing with fine touch, pressure, vibration and unconscious proprioception from the lower appendages.

NFOS

2. This tract receives sensory input from the upper 6 thoracic and all cervical spinal roots. Its fibers are somatotopically arranged within the spinal cord, and the FON of this tract will synapse within the contralateral nucleus cuneatus within the medulla of the brain.

NFOS

3. The FON (first order neuron) of this ascending tract ascends or descends for a short distance in the spinal cord before synapsing with the SON ipsilaterally. The SON then decussates to the contralateral side immediately and terminates within the **VPL** of the thalamus. This tract carries information dealing with pain and temperature, relatively crude touch and pressure.

NFOS

4. This tract is somatotopically arranged and carries unconscious proprioception.

NGSI

5. 33–40% of this tract's UMNs (upper motor neurons) originates within the premotor cortex, 33–40% originate within the primary motor cortex, and 20% originate within the somesthetic cortex of the cerebrum. Within the brain this tract gives off collateral branches to the basal ganglia, thalamus, cerebellum and reticular formation. This tract is concerned with fine motor control.

NGSI

6. 33–40% of this tract's UMNs (upper motor neurons) originates within the premotor cortex, 33–40% originate within the primary motor cortex, and 20% originate within the somesthetic cortex of the cerebrum. Within the brain this tract gives off collateral branches to the basal ganglia, thalamus, cerebellum and reticular formation. This tract is concerned with fine motor control, and would be found within all segments of the spinal cord.

PT

7. This tract is comprised of crossed fibers that terminate primarily within the cervical cord. The UMN synapses primarily on interneurons, and is believed to produce coordinated movements of the eye and head as parts of optic reflexes.

Tectospinal

8. This tract originates from cells of the red nucleus of the mesencephalic tegmentum.

RS

9. This tract carries information that appear to be directly related to the position and movements of the head in response to changes and/or disturbances in balance.

VS

10. The reticular formation is an important source of descending fibers of this tract. This tract is almost completely ipsilateral, is not somatotopically arranged, and arises from the nuclei reticularis pontis caudalis and oralis.

PRT

11. The reticular formation is an important source of descending fibers of this tract. This tract is almost completely ipsilateral, is somatotopically arranged, and arises from the nucleus reticularis gigantocellularis.

NFOS

HBS-3

12. This structure contains the SON for the sensory tract that is carrying conscious proprioception from the lower limbs.

Medial of the two DCN

13. Spinothalamic tract
14. Spinocerebellar tract
15. Reticular formation
16. Rubrospinal tract

HBS-5

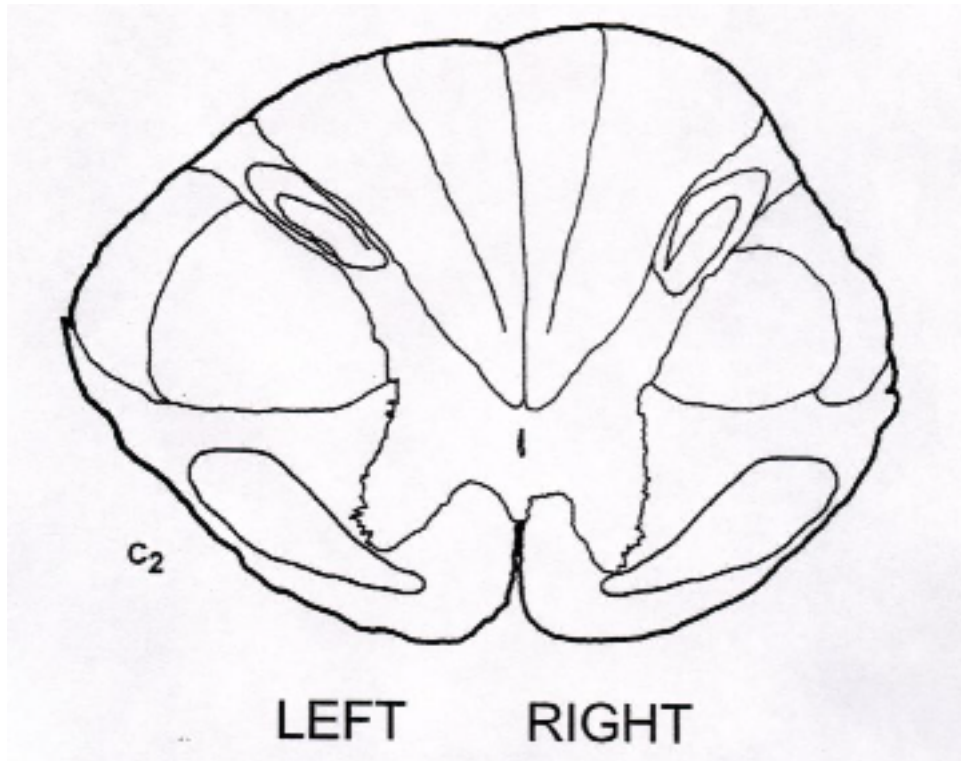
17. Medial lemniscus
18. 33–40% of this tract's UMNs (upper motor neurons) originates within the premotor cortex, 33–40% originate within the primary motor cortex, and 20% originate within the somesthetic cortex of the cerebrum. Within the brain this tract gives off collateral branches to the basal ganglia, thalamus, cerebellum and reticular formation.

PT

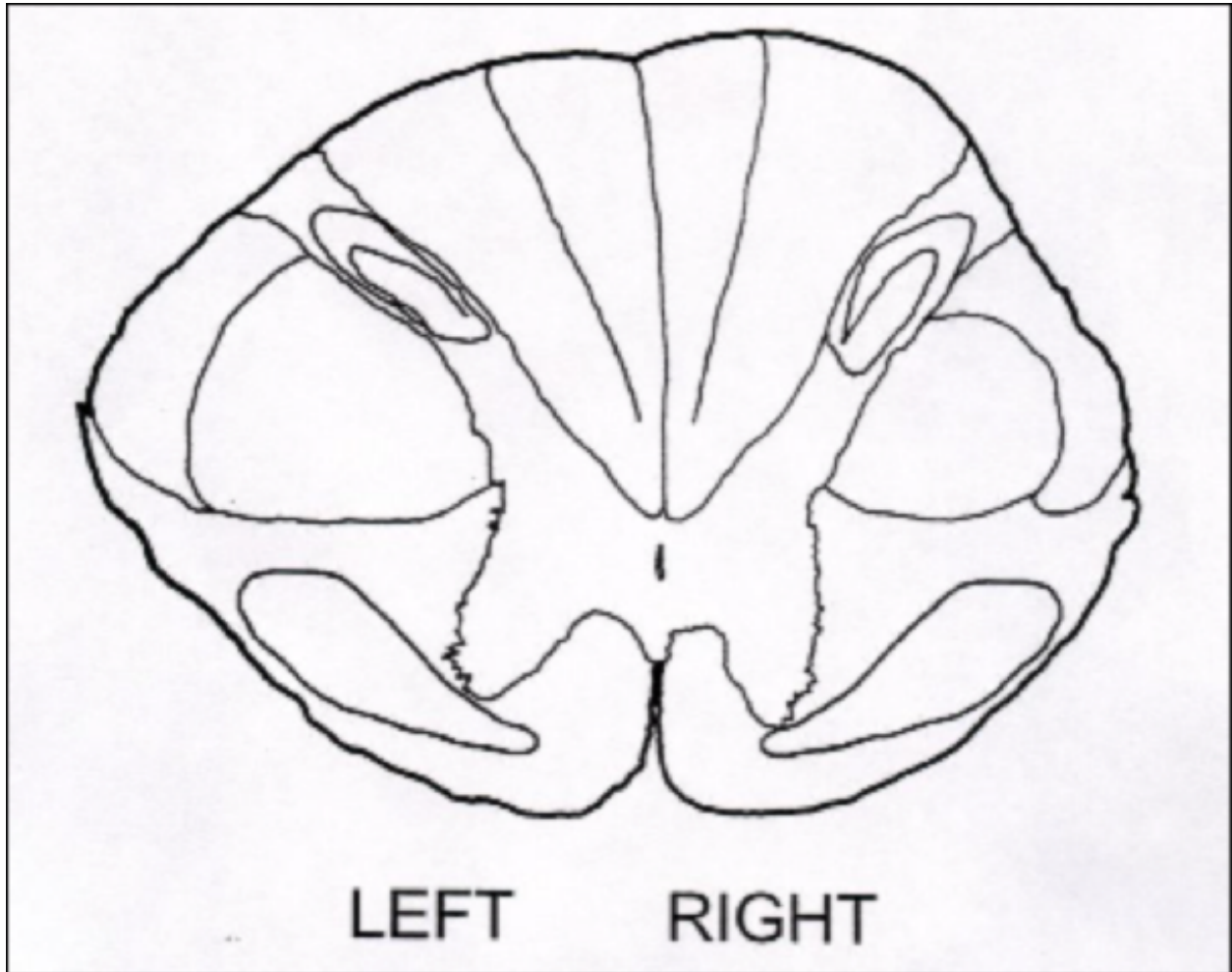
19. Inferior olive
20. This structure contains the SON for the sensory tract that is carrying conscious proprioception from the upper limbs.
21. Spinothalamic tract

Section 2 Clinical Question. Answer the following question in the space provided.

22. (10 points) Shade in the location of a single, continuous, unilateral lesion in the diagram below that will account for the following neurological deficits: deficit in conscious proprioception, vibration, and two-point discrimination from *only the right big toe*.



23. (10 points) Shade in the location of a single, continuous, unilateral lesion in the diagram below that will account for the following neurological deficits: deficit in pain, crude touch and temperature from **only the right big toe**.



Section 3: Fill-in-the blank/short answer. Answer the following questions in the space provided. Each question is worth the number of points indicated.

24. Lower motor neurons (LMNs) obey at least two rules according to their arrangement within the grey matter of the spinal cord. In the spaces provided explain both of these arrangement “rules” or “patterns.” (5 points each)

a. Medial-lateral rule

medial group innervate axial muscles
intermediate group innervates proximal limb muscles
lateral group innervates distal muscles of the limb

b. flexor-extensor rule

flexors groups are located dorsally
extensor groups are located ventrally

Section 4: Essay / short answer questions. Answer the following questions on the attached blank pages. *Please answer only one question per page, and answer the questions in order.* Each question is worth the number of points indicated.

25. Describe the anatomy of the medial lemniscus pathways. Be sure to include information transmitted by these pathways, and any differences seen between the two pathways involved in this system. (15 points)

26. Outline the difference between the pyramidal and extrapyramidal motor systems. Refer to at least one tract in each system discussed in class when discussing the differences. (10 points)

27. Compare and contrast the anterior and posterior spinocerebellar tracts. (7 points)