PT NEUROANATOMY
CLINICAL CASES

Mikaela Stiver
mikaela.stiver@mail.utoronto.ca

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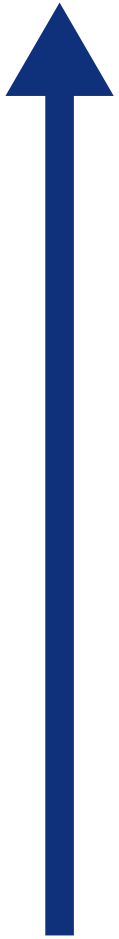
Approaching Lesion Problems

1. **What structures/pathways are affected?**
   - Motor (descending) or sensory (ascending)
   - Unilateral or bilateral

2. **What type of tissue(s) were affected?**
   - **Grey Matter:** symptoms @ level of lesion
   - **White Matter:** symptoms below the level of lesion

3. **What sensory modalities and/or motor function will be affected?**
   - **Dorsal column medial lemniscus** or **spinothalamic**?
   - **UMN** or **LMN** lesion?

4. **Where will the symptoms present?**
   - **Ipsilateral**, **contralateral**, or **bilateral** (in relation to lesion)
   - Specify **left** or **right**



In a clinical context, you will typically work in the reverse order: assessing the symptoms to determine what has been damaged and where

Clinical Cases

*Note: some supplementary diagrams include more detail than you are expected to know at this stage

Q1:

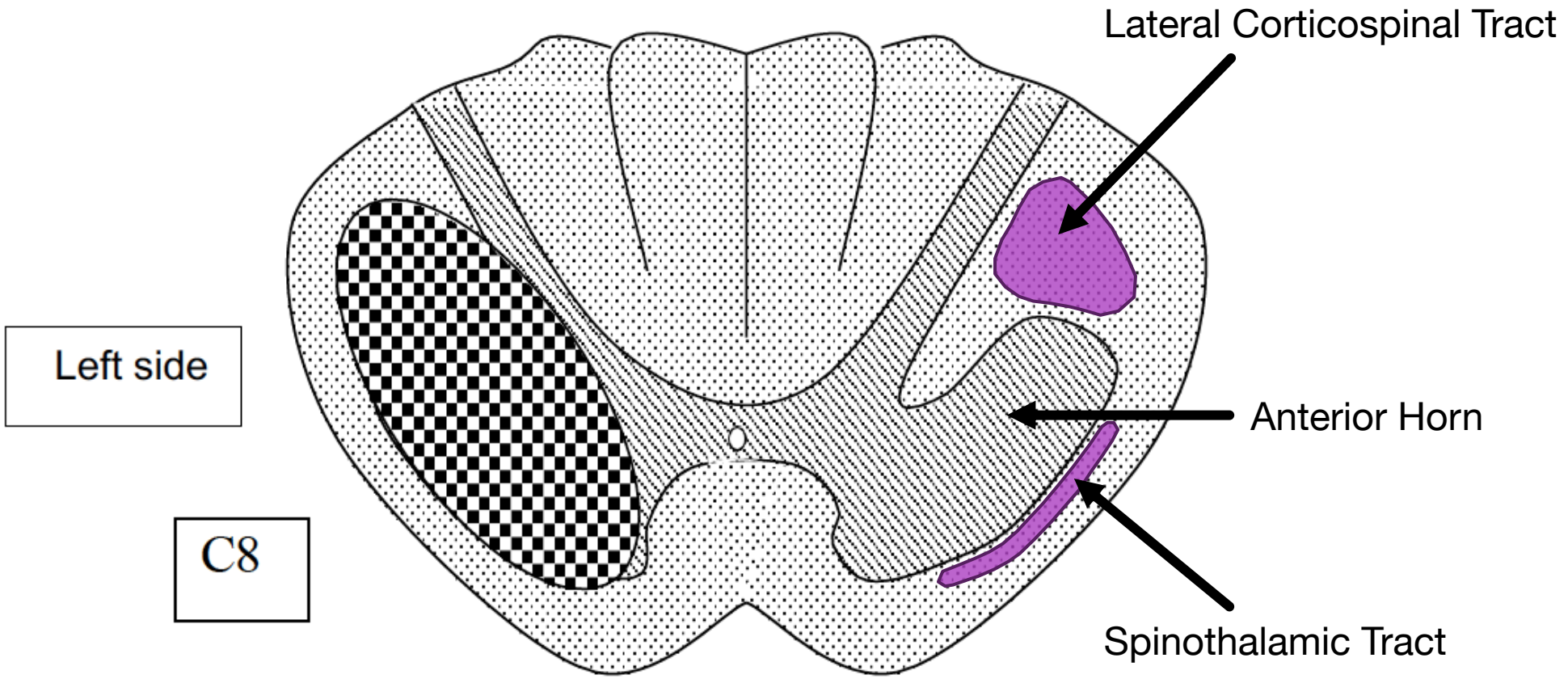
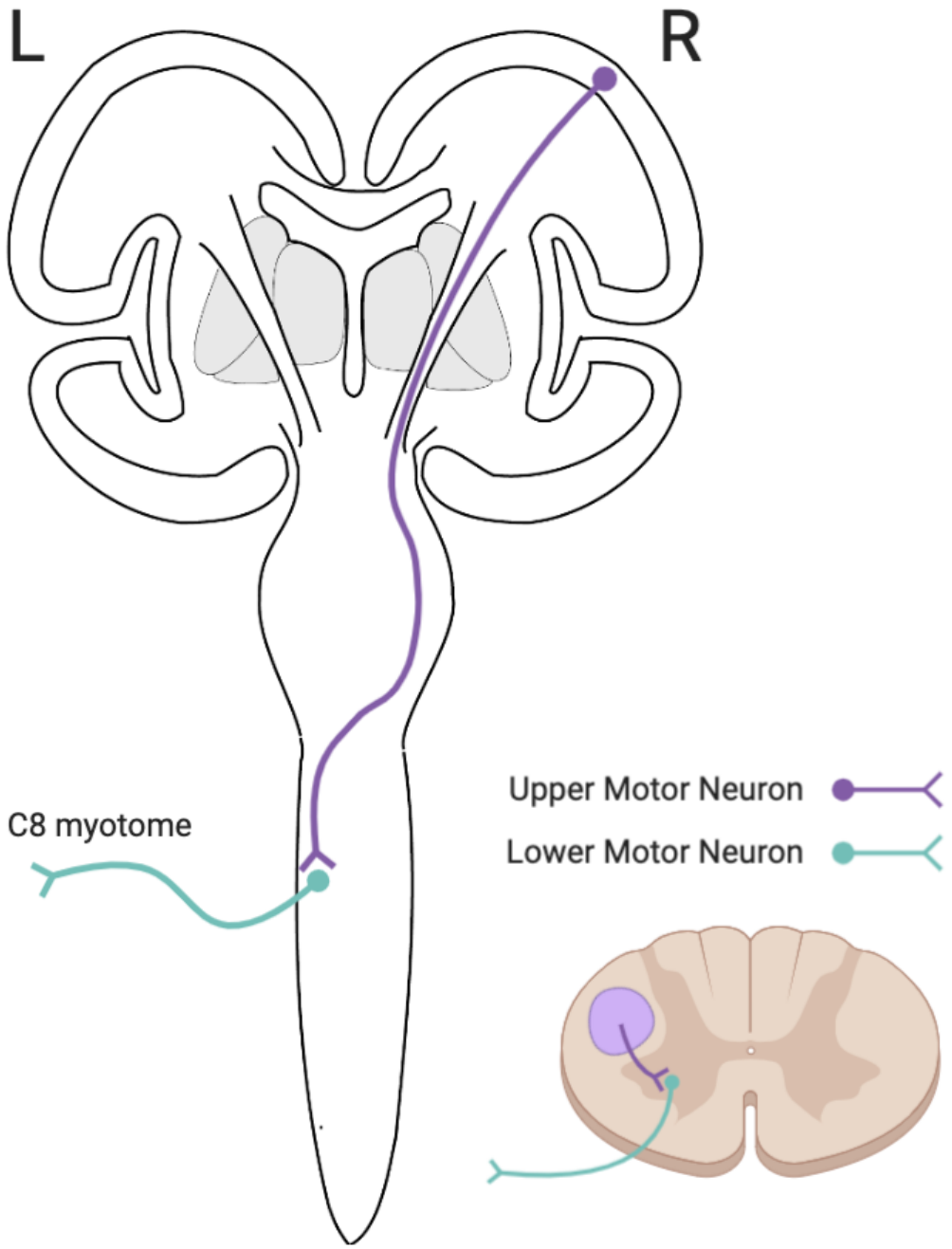


Figure from PT1104Y Neuroanatomy Lab Manual

Q1:



Corticospinal Pathway

1) **UMN in Primary Motor Cortex** (pre-central gyrus)
2) **Corona Radiata**
3) **Internal Capsule** (posterior limb)
4) **Cerebral Peduncle**
5) **Pyramid → Decussation of Pyramids**
6) **Lateral Corticospinal Tract**
7) **Synapse with LMN** (in ventral horn)

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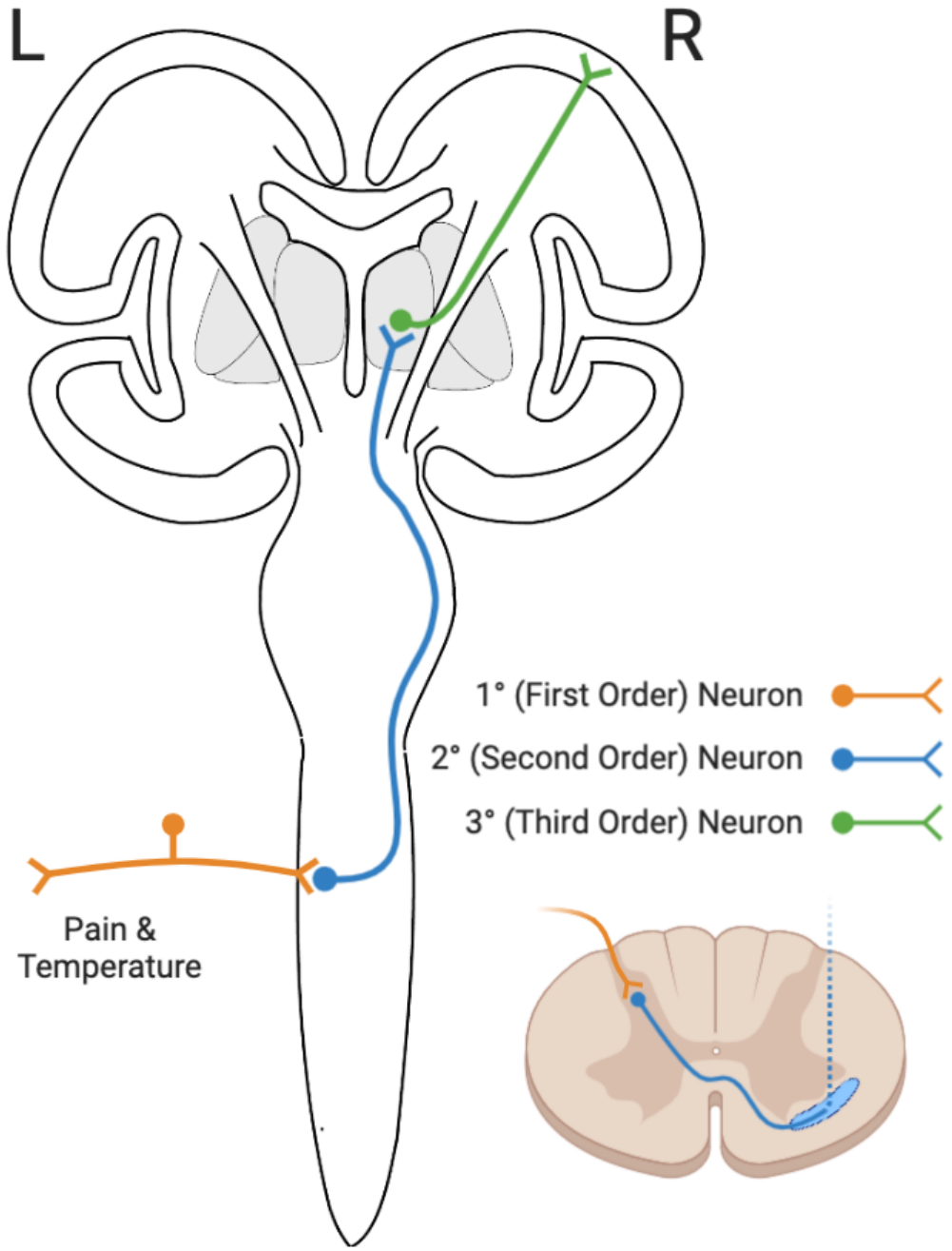
Q1:



Spinothalamic Tract

1) **1º Neuron enters Dorsal Root**
(cell body in dorsal root ganglion)

2) **Synapses with 2º Neuron**
(in substantia gelatinosa)

3) **Decussates – Anterior White Commissure**

4) **Ascends Anterolateral column**
(spinothalamic tract)

5) **Spinal Lemniscus***
*(tract changes names in the brain stem)

6) **Synapses with 3º Neuron**
(Ventral Posterior Nucleus – thalamus)

7) **Internal Capsule** (posterior limb)

8) **Corona Radiata**

9) **A: Primary Sensory Cortex** (post-central gyrus)
B: Cingulate Gyrus

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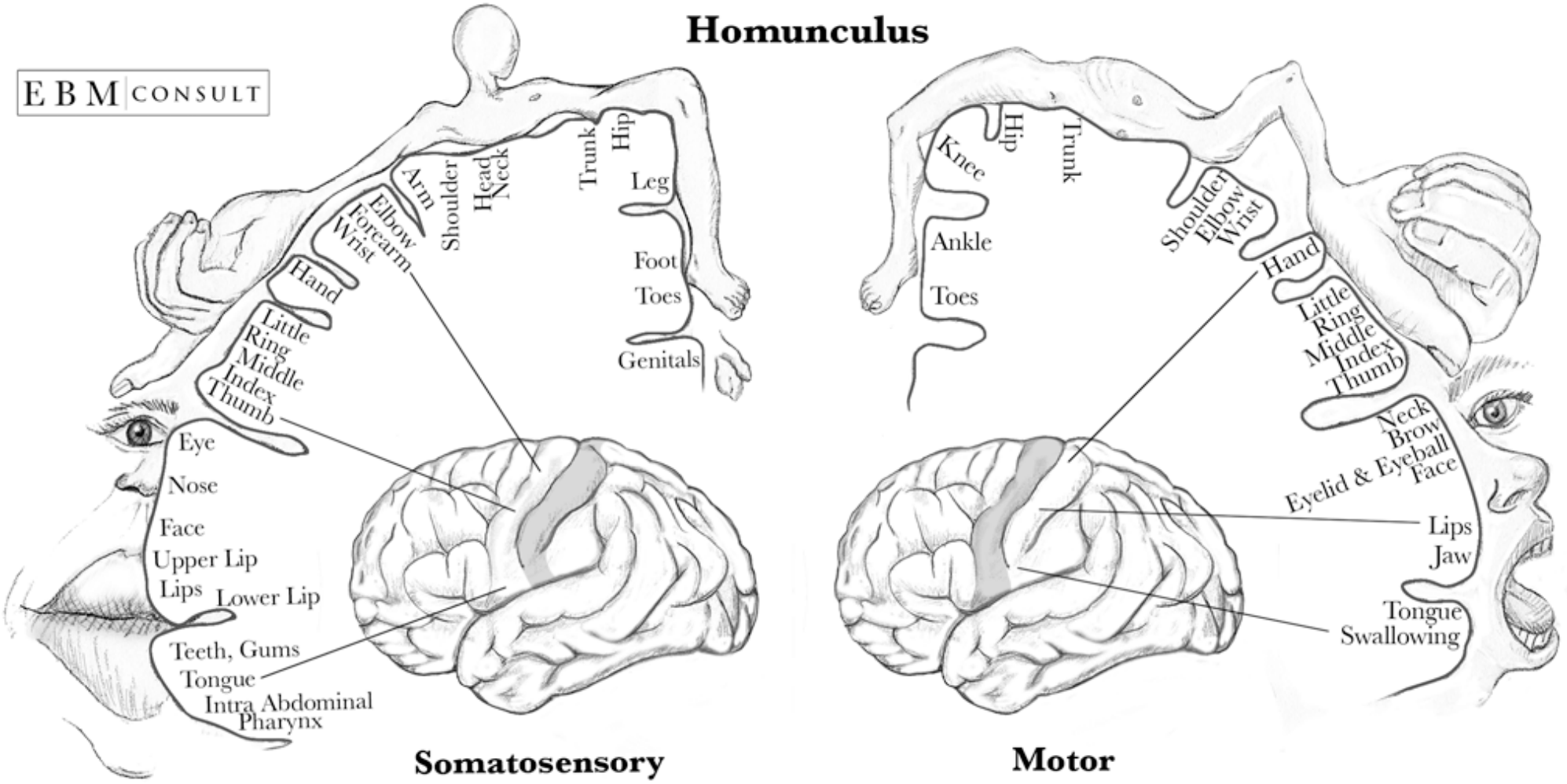
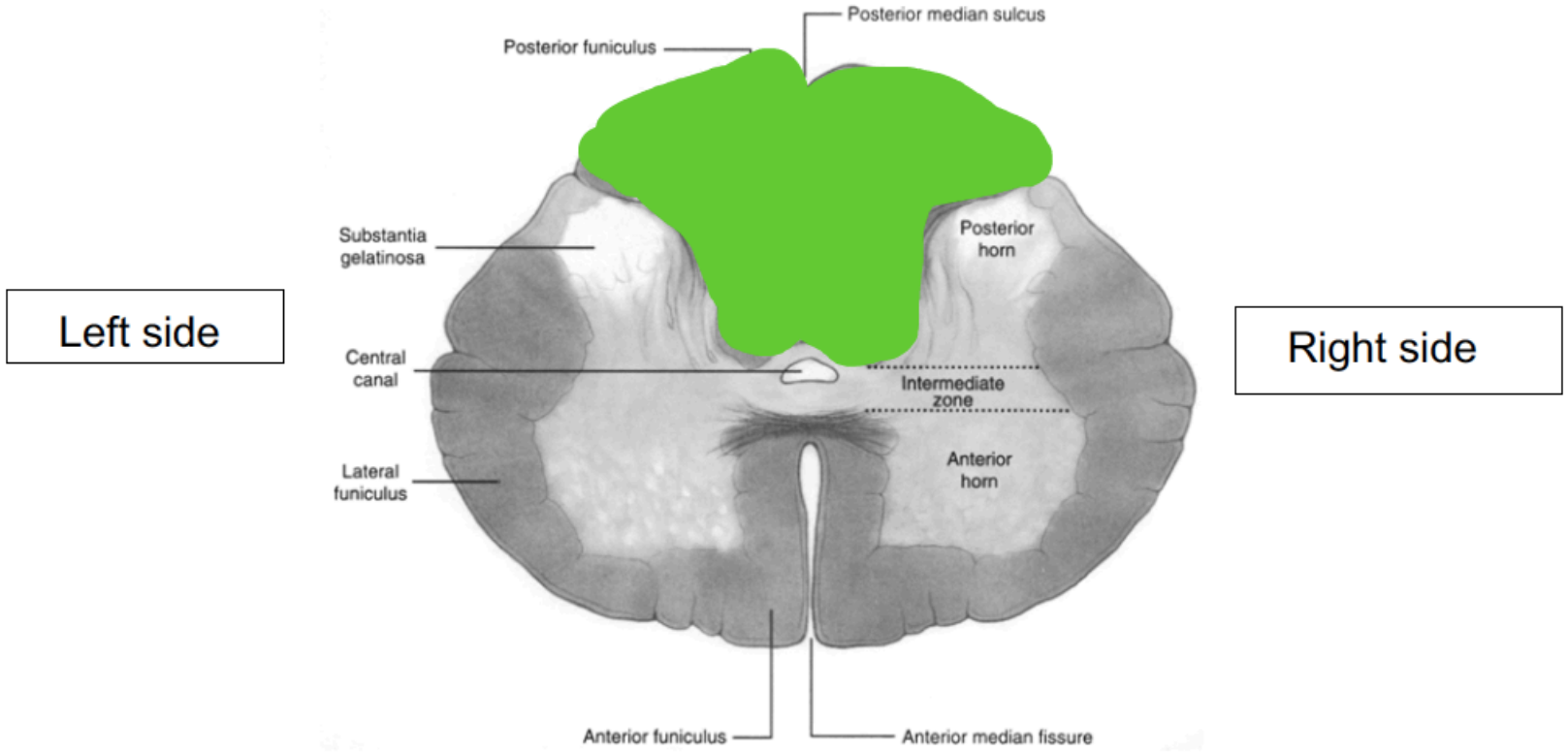


Density of Sensory Receptors

Complexity of Musculature

Q2:



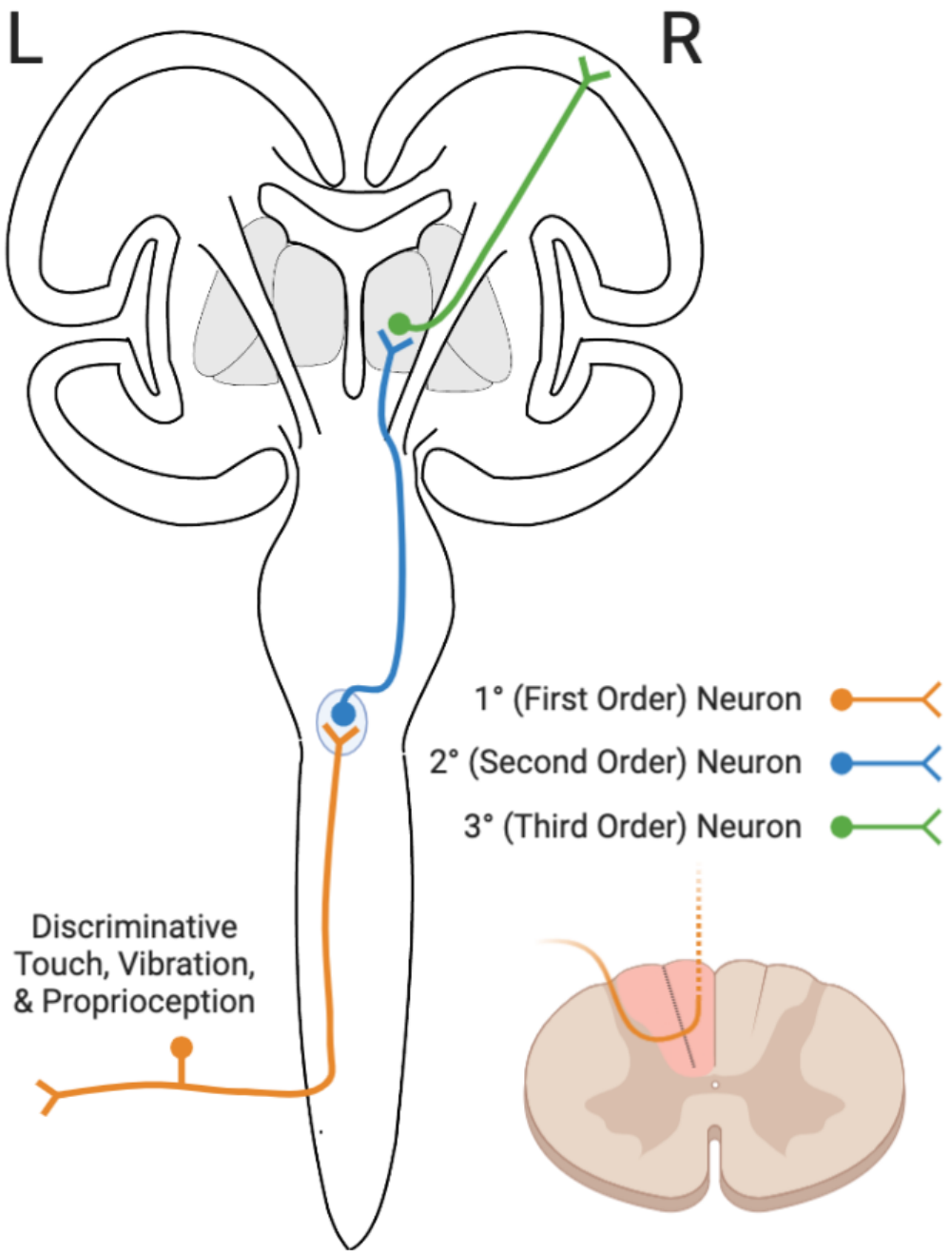
A. Lumbar

B. Dorsal column-medial lemniscus pathway
   - Loss of discriminative touch, vibration, & proprioception below lesion

C. Posterior spinal artery

Figure from PT1104Y Neuroanatomy Lab Manual

Q2:



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Dorsal Column Medial Lemniscus Pathway

1) **1º Neuron enters Dorsal Root**
(cell body in dorsal root ganglion)

2) **Ascends Dorsal Column**
(*T6 + above:* fasciculus cuneatus;
below T6: fasciculus gracilis)

3) **Synapses with 2º Neuron**
(nucleus cuneatus or nucleus gracilis)

4) **Decussates – Internal Arcuate Fibres**

5) **Medial Lemniscus**
(pathway to thalamus)

6) **Synapses with 3º Neuron**
(Ventral Posterior Nucleus – thalamus)

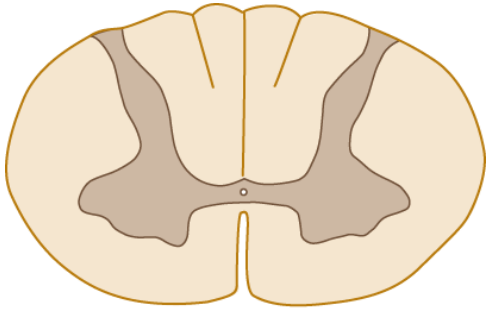
7) **Internal Capsule** (posterior limb)

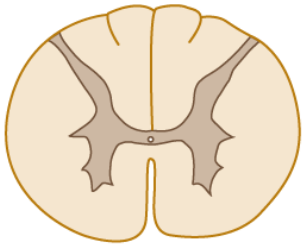
8) **Corona Radiata**

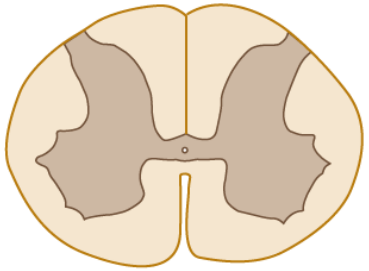
9) **Primary Sensory Cortex**
(post-central gyrus)

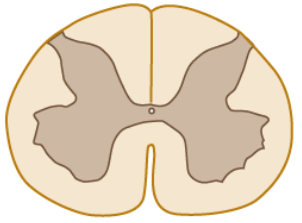
Q2:

1. Amount of white matter
   - Decreases from cervical end to sacral end
2. Shape of spinal cord
   - Oval (vs. round) near cervical end
3. Size of anterior horns
   - Enlarged @ C5 – T1 (upper limb) & L2 – S2 (lower limb)
   - *Cervical & Lumbosacral enlargements*
4. Lateral horn
   - Only present in T1 – L2
   - Cell bodies of preganglionic sympathetic neurons
5. Dorsal funiculus
   - Fasciculus cuneatus present @ T6 and above

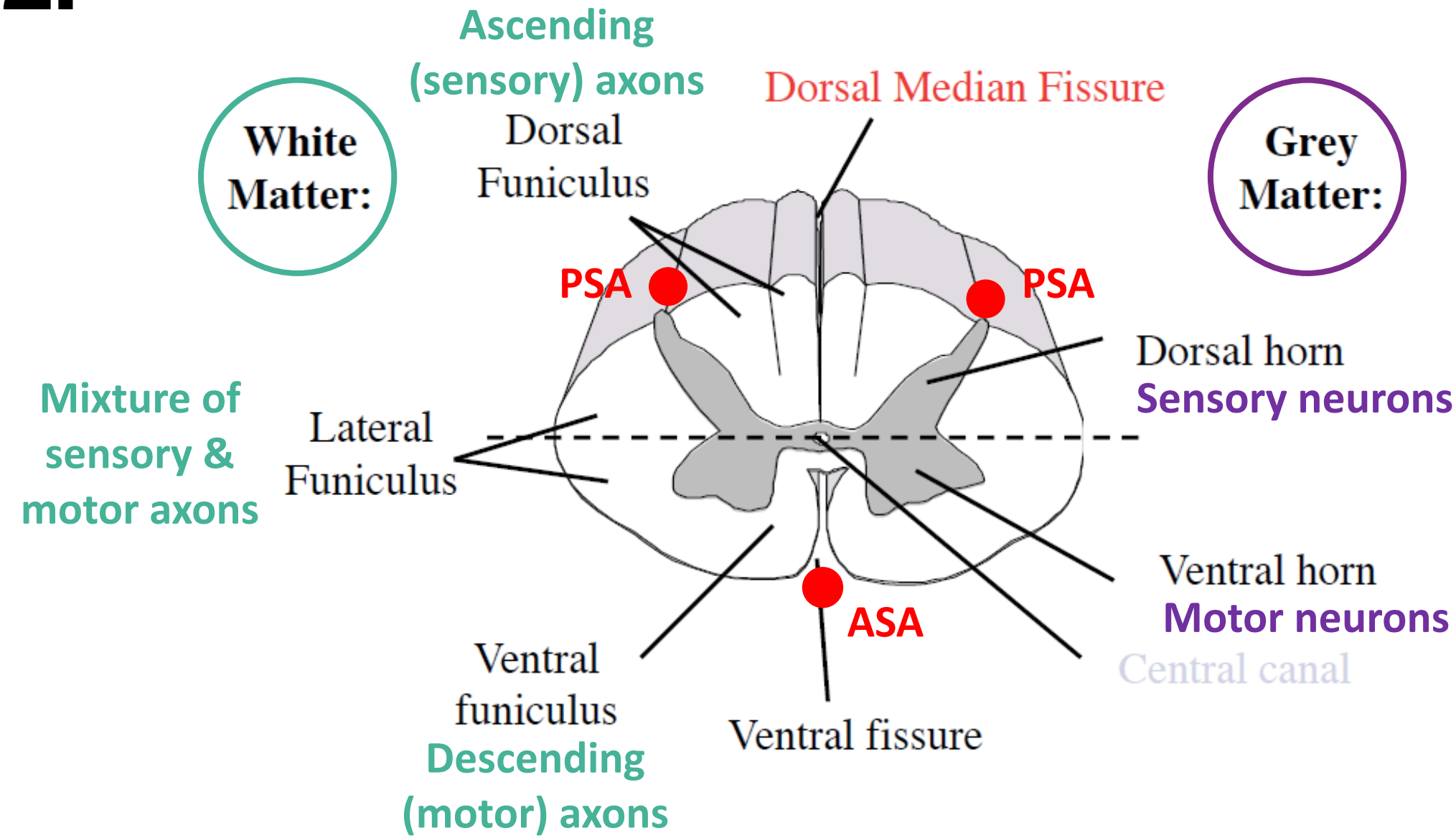

Cervical


Thoracic


Lumbar


Sacral

Q2:


White Matter:
Ascending (sensory) axons
Dorsal Median Fissure
Dorsal Funiculus
Grey Matter:
PSA
PSA
Dorsal horn
Sensory neurons
Mixture of sensory & motor axons
Lateral Funiculus
Ventral horn
Motor neurons
ASA
Central canal
Ventral funiculus
Descending (motor) axons
Ventral fissure

Q3:

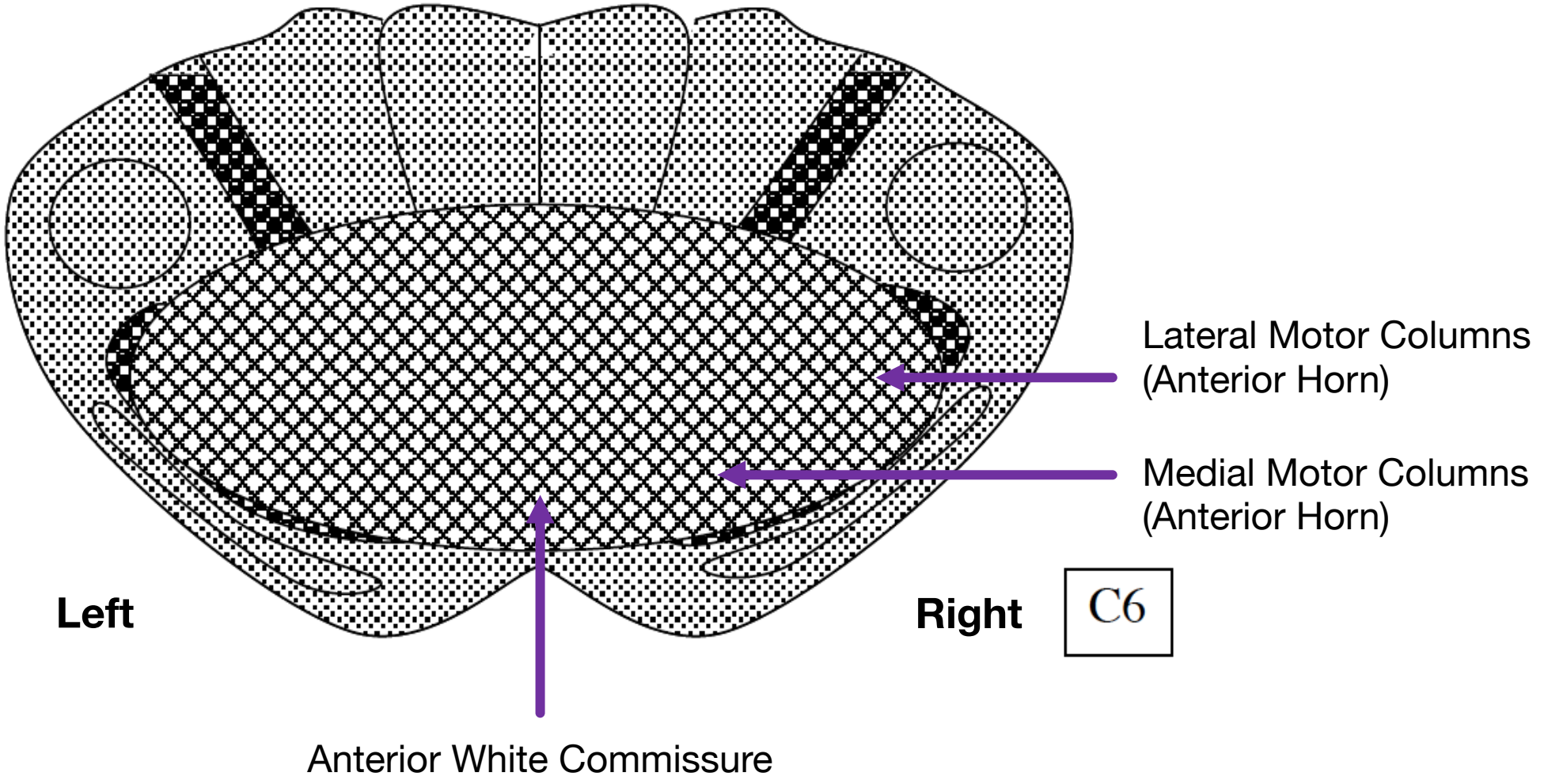


Figure from PT1104Y Neuroanatomy Lab Manual

Q4:

Lesion: level of midbrain

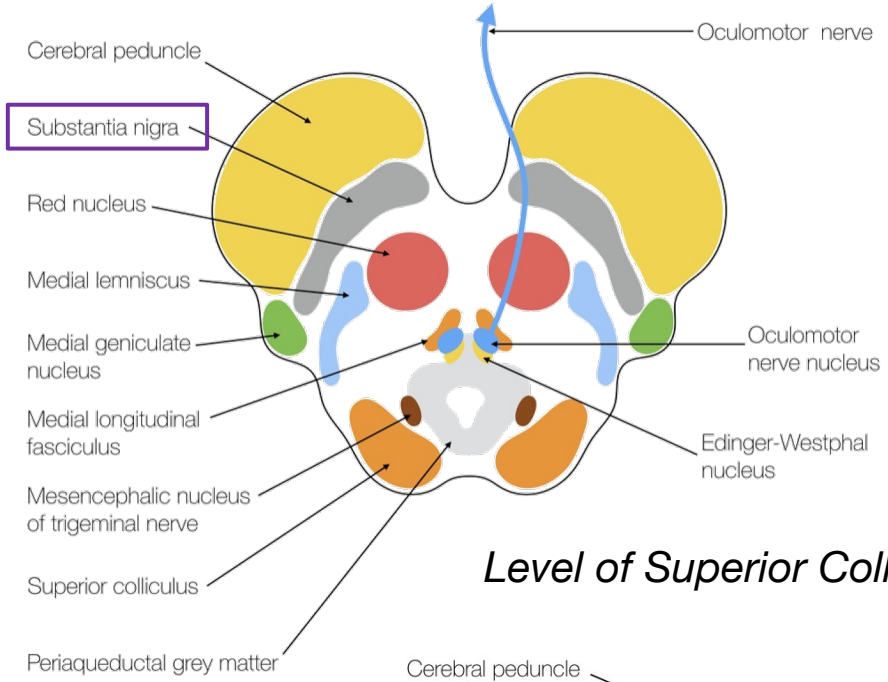
- Recall that the midbrain surrounds the cerebral aqueduct (*landmark*)
- Substantia nigra

Diagnosis: Parkinson's disease

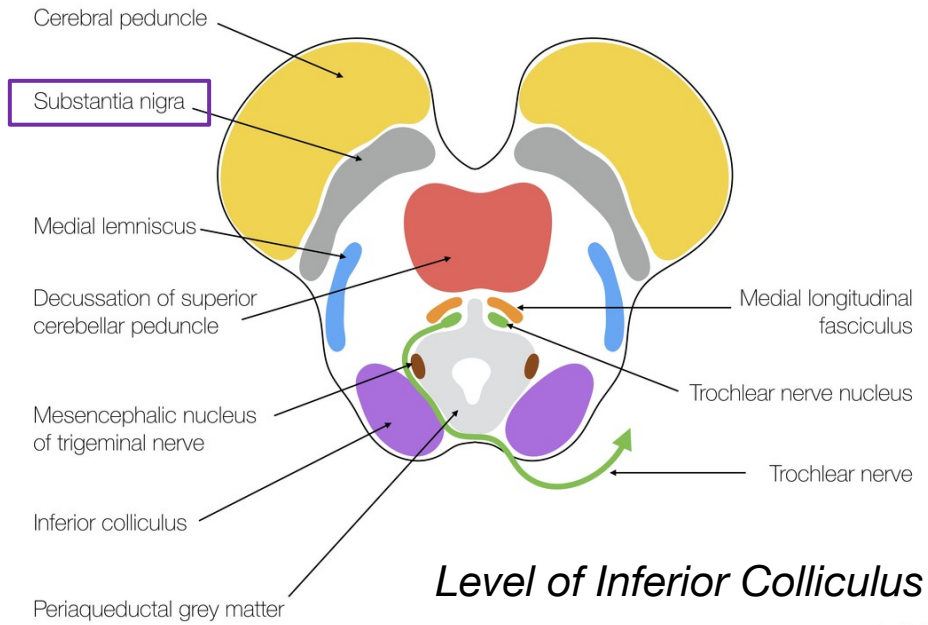
Neurotransmitter: dopamine

Neuronal pathway: nigrostriatal tract

- Transmission of dopamine from substantia nigra to caudate and putamen (dorsal striatum)



Level of Superior Colliculus



Level of Inferior Colliculus

Q5:

2 Somatic Sensory Deficits:

- Loss of pain & temperature (LEFT SIDE)
  - **Face** (trigeminothalamic tract)
  - **Body** (spinothalamic tract)
- Loss of discriminative touch, vibration, & proprioception (LEFT SIDE)
  - **Face** (trigeminothalamic tract)
  - **Body** (dorsal columns-medial lemniscus pathway)

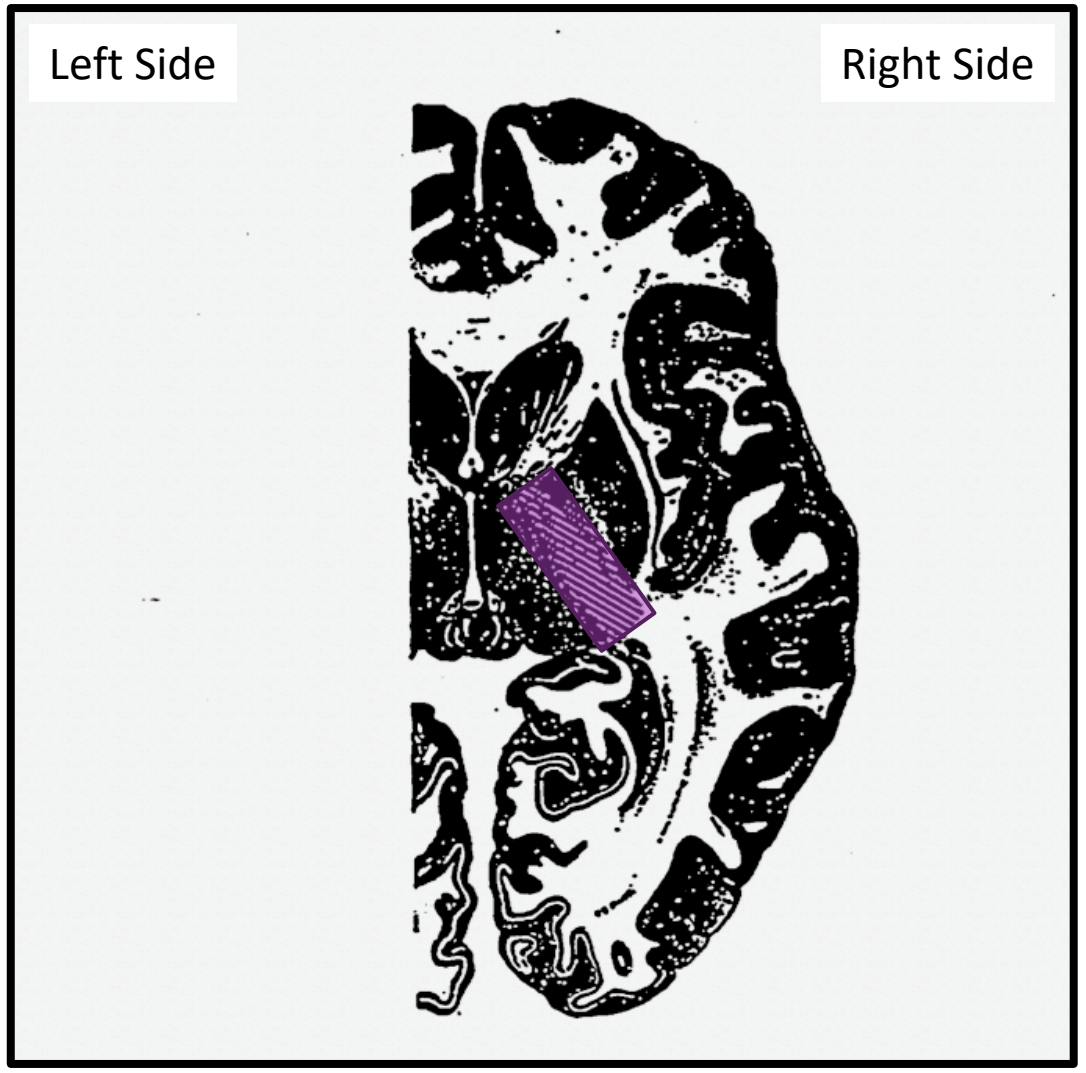


Figure from PT1104Y Neuroanatomy Lab Manual

Q5:

1 Somatic Motor Deficit:

- UMN lesion; spastic paralysis, hyperreflexia, +ve Babinski reflex (LEFT SIDE)
  - **Inferior muscles of facial expression** (corticobulbar tract)
  - **Body** (corticospinal tract)

BONUS: Blood Supply?

- Anterior choroidal artery (branch of internal carotid)

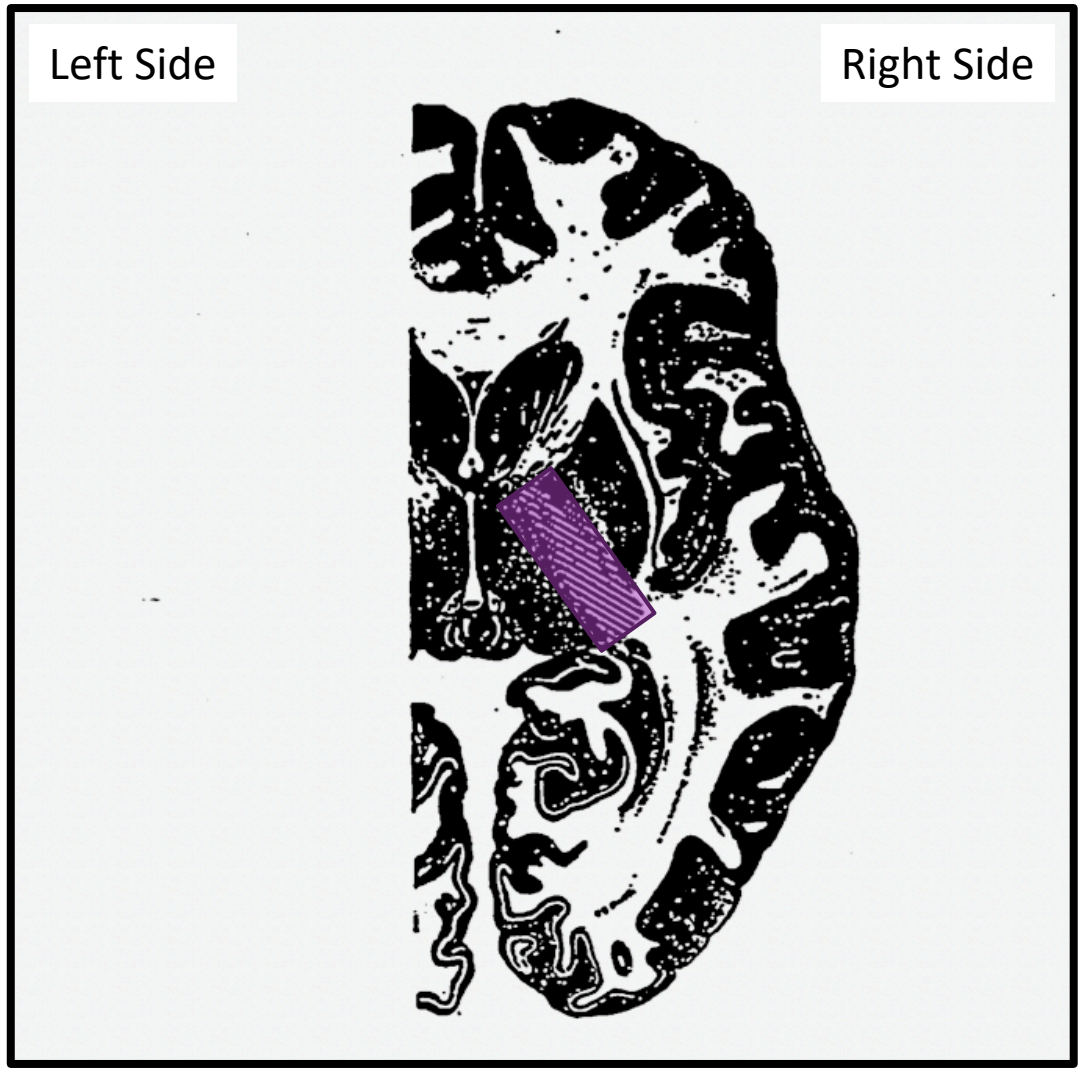
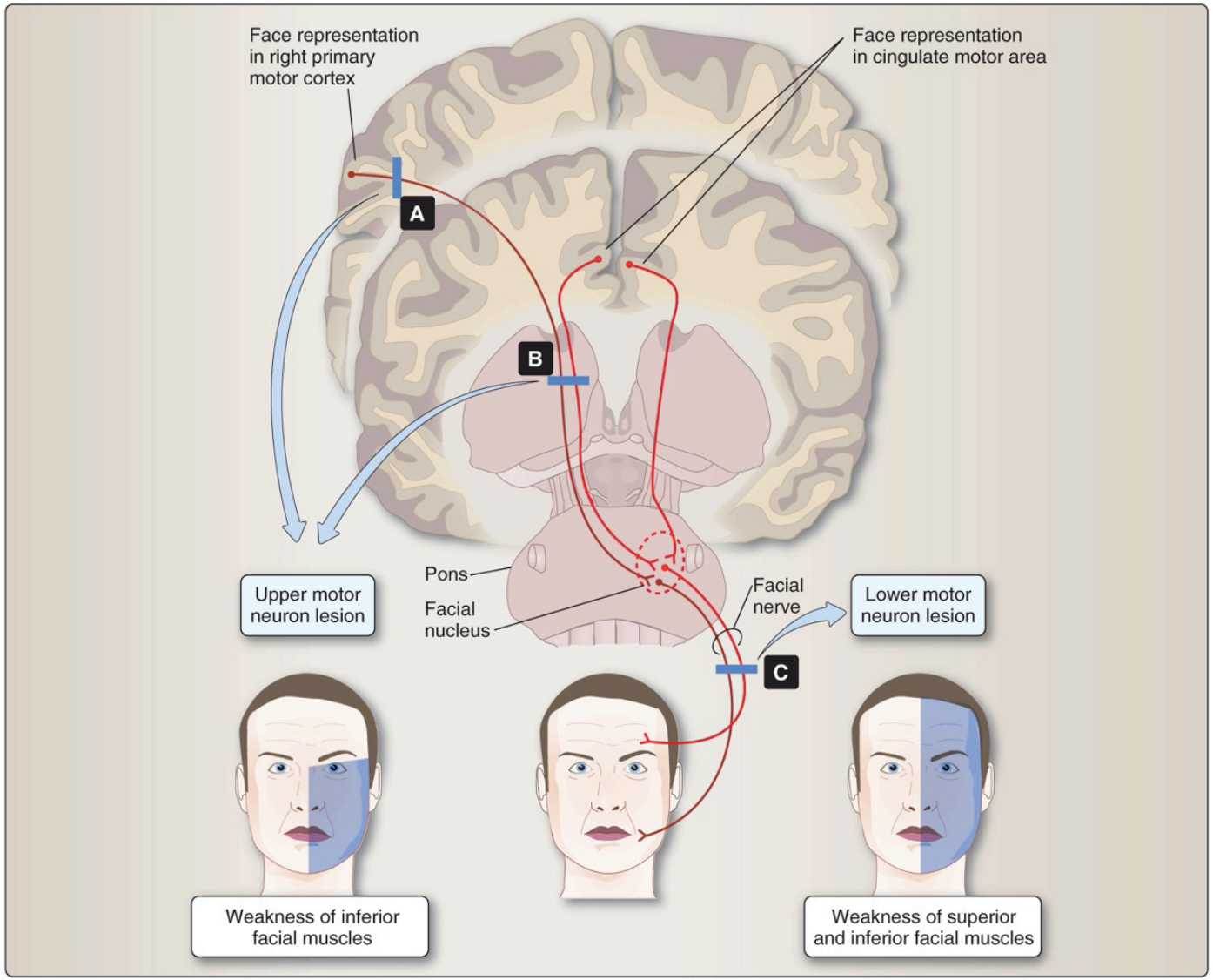
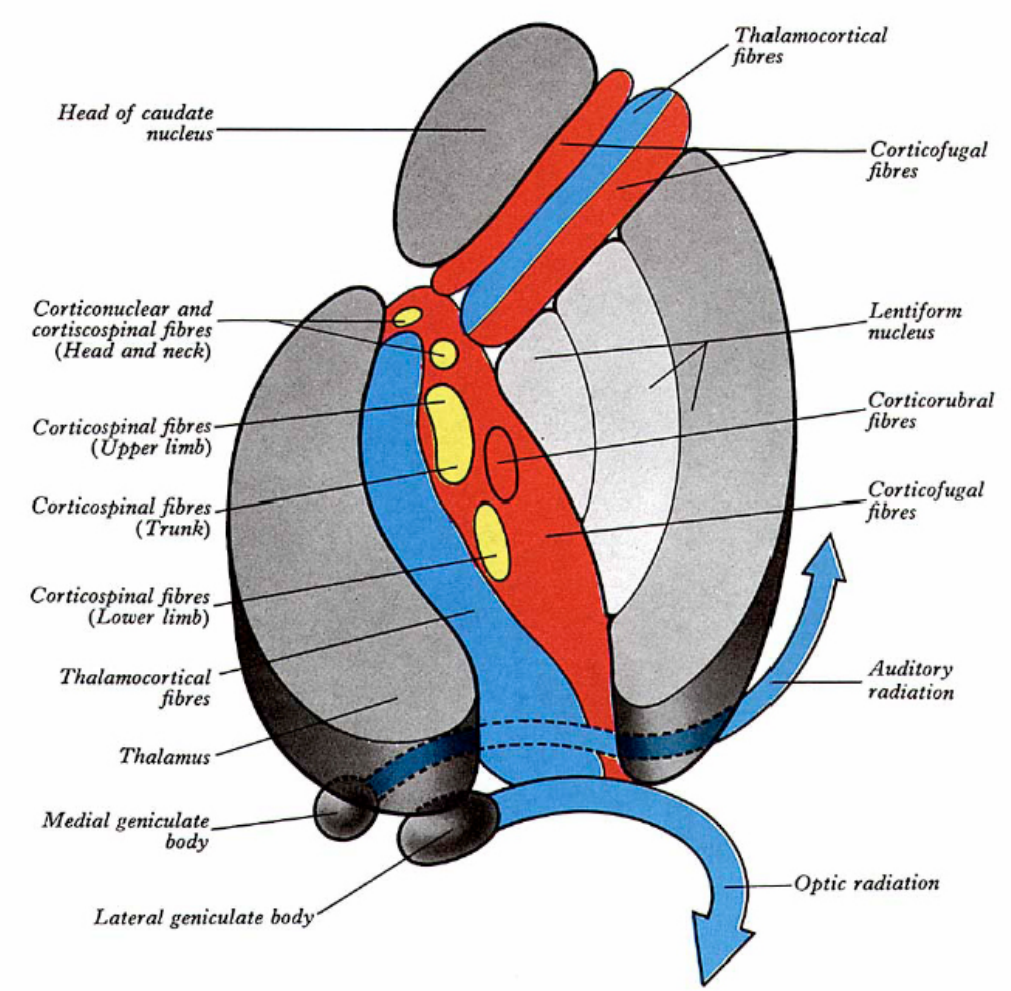


Figure from PT1104Y Neuroanatomy Lab Manual

Q5:



Q5:



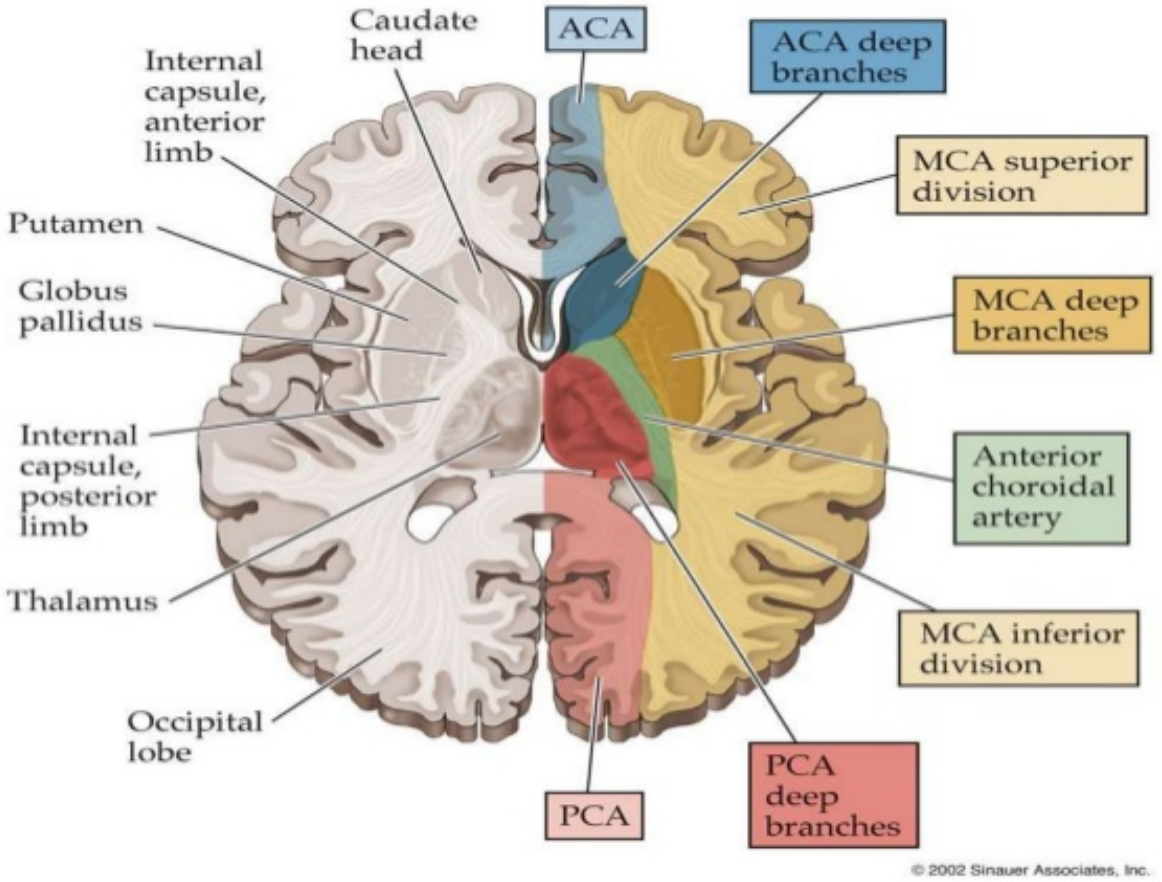


Image source unconfirmed (lecture notes)

Q6:

a. Left-sided weakness (which later developed into paralysis), esp. in lower face, arm, & hand

b. Increased deep tendon reflexes, esp. of the left UE

c. Left-sided sensory deficit, esp. of the face and hand

d. Patient seems to ignore the left side of her body, bumping into furniture on her left side, and seems unconcerned to the point of denial re: hemiparesis

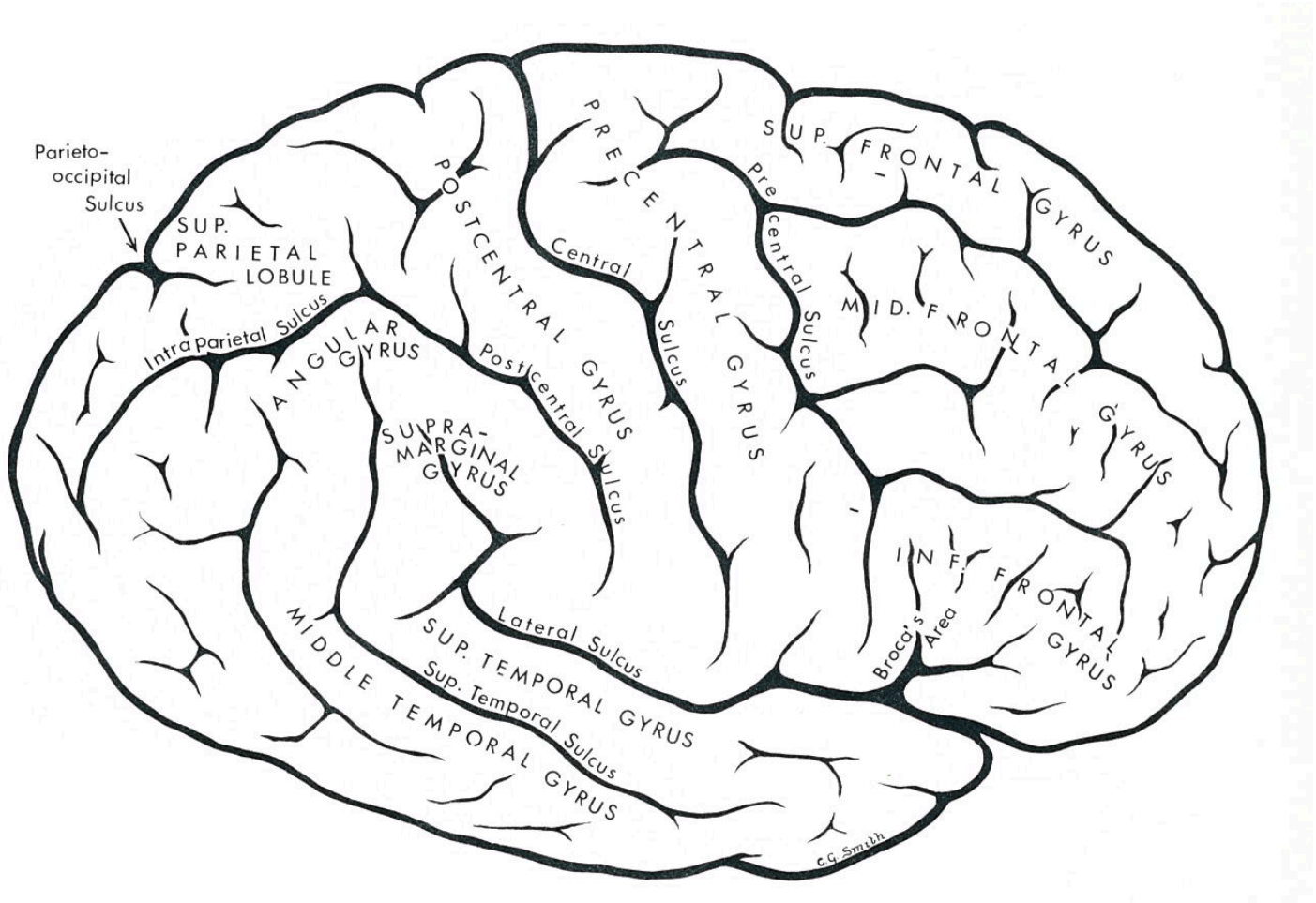


Figure from PT1104Y Neuroanatomy Lab Manual, Answers

Q7:

a. Spastic paralysis of muscles of the right UE

b. Spastic paralysis of right lower muscles of facial expression

c. Loss of cutaneous sensation to right side of the face & right UE

d. Patient's spontaneous speech is found to be non-fluent (~10 words/min). He has difficulty naming familiar objects, can not repeat common words or phrases, and has difficulty comprehending spoken word

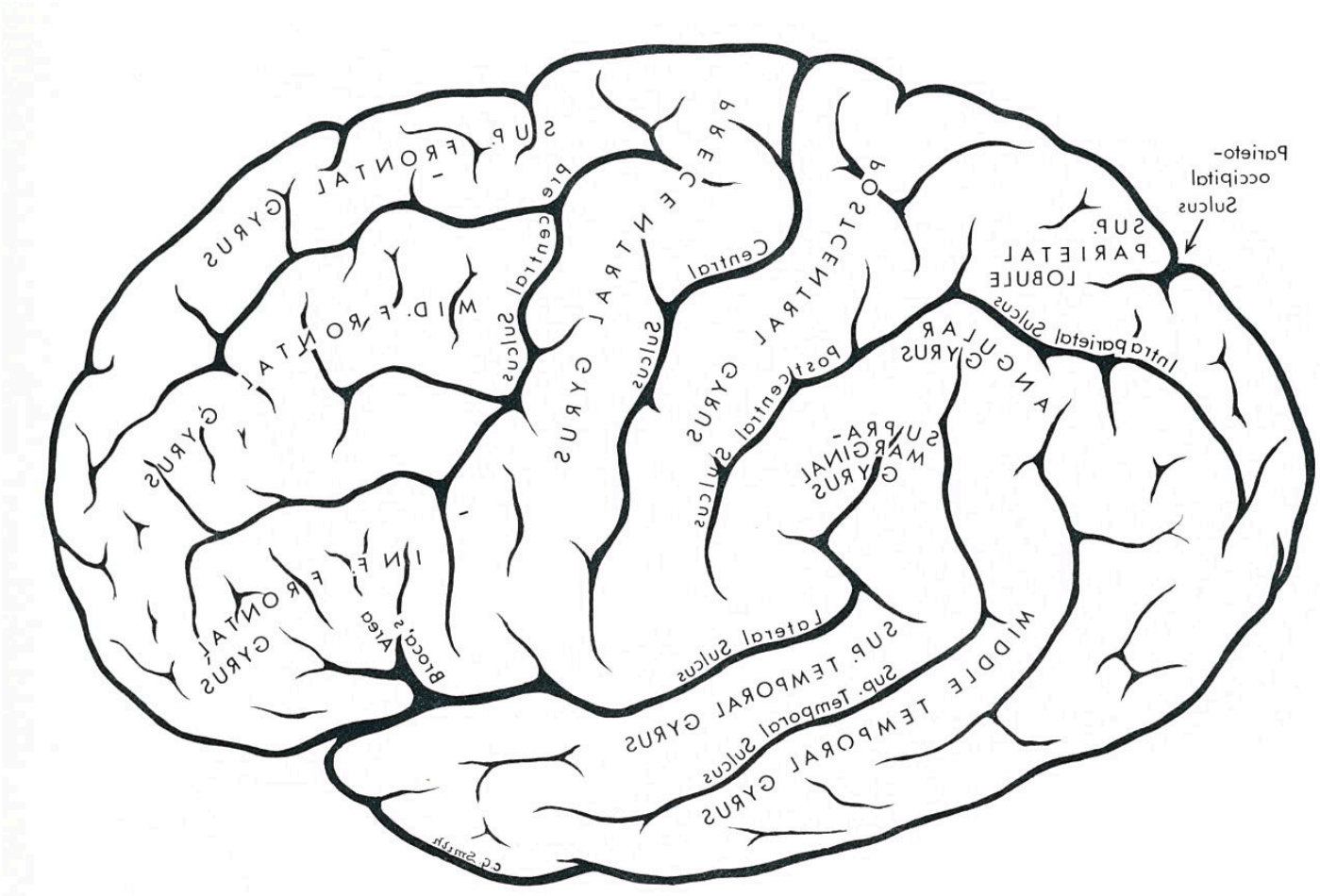


Figure from PT1104Y Neuroanatomy Lab Manual, Answers

Q8:

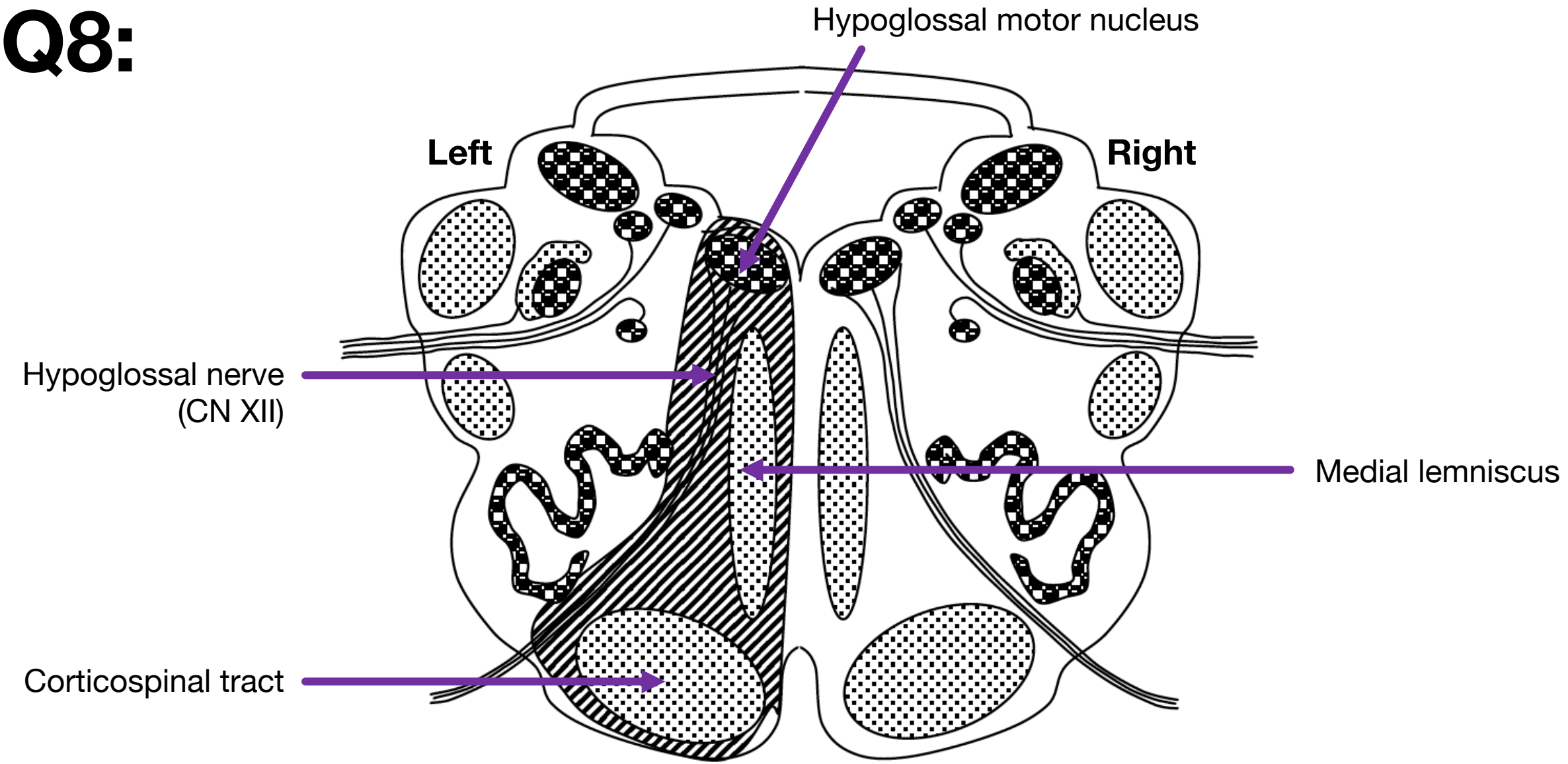
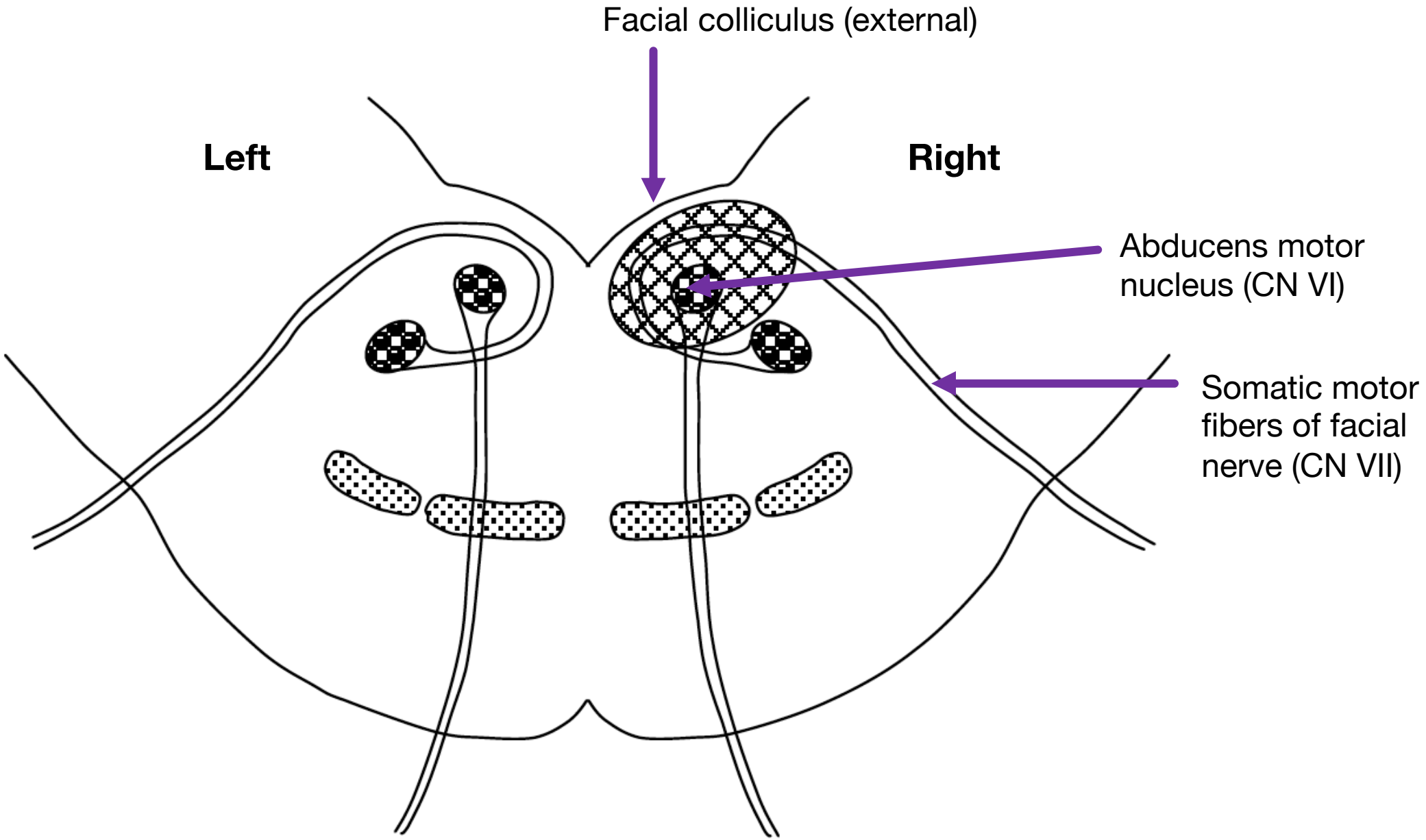


Figure from PT1104Y Neuroanatomy Lab Manual

Q9:



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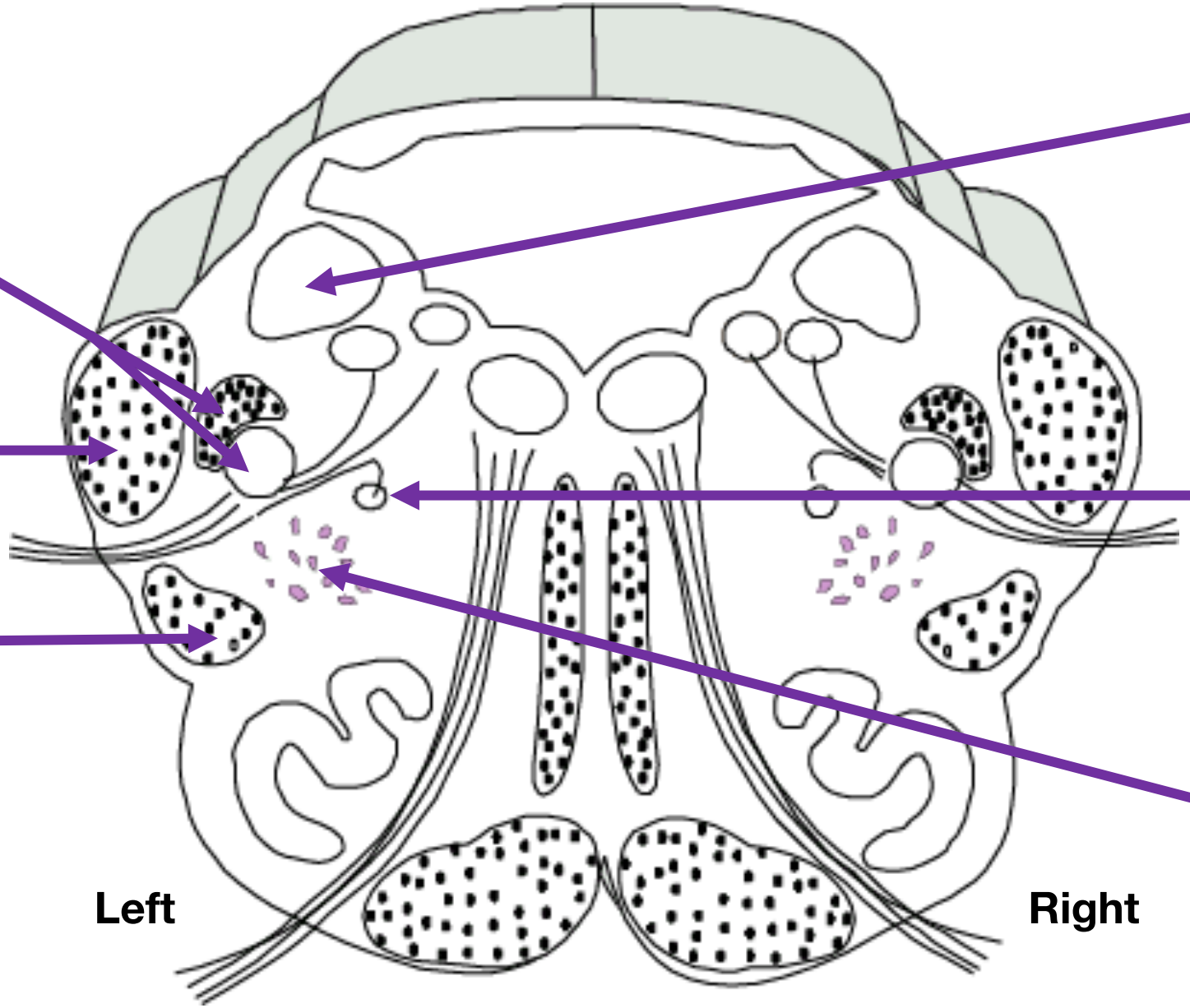
Q10:



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