Unit 4 Pictures

BIOL 212 Online Lab PowerPoint

Hint: Slides with colored backgrounds help to divide content into different days.
Use the following pictures to help you identify terms from the lab term handout.

Another good resource is the Olexik website: http://faculty.montgomerycollege.edu/wolexik/204_histology_page.htm
Nervous Histology
**Nervous tissue**

**Description:** Neurons are branching cells; cell processes that may be quite long extend from the nucleus-containing cell body; also contributing to nervous tissue are nonirritable supporting cells (not illustrated).

**Function:** Transmit electrical signals from sensory receptors and to effectors (muscles and glands) which control their activity.

**Location:** Brain, spinal cord, and nerves.

**Photomicrograph:** Neurons (350x)
Axon
Neurilemma
Terminal branches
Node of Ranvier
Impulse direction
Schwann cell (one internode)
Axon terminals
Axon hillock
Neurilemma
(b)
Figure 13.4b Structure of a nerve.

- Endoneurium
- Perineurium
- Epineurium
- Axon
- Myelin sheath
- Fascicle
- Blood vessels

Nerve Fiber Anatomy
Spinal Cord
Cross-Sectional Anatomy

- Two lengthwise grooves divide cord into right and left halves
  1. Ventral median fissure (anterior)
  2. Dorsal median sulcus (posterior)
- **Gray commissure**—connects masses of gray matter; encloses central canal

Marieb
Gray Matter

- **Dorsal horns**—interneurons that receive somatic and visceral sensory input

- **Ventral horns**—somatic motor neurons whose axons exit the cord via ventral roots
Gray Matter

- **Lateral horns** (only in thoracic and lumbar regions) – sympathetic neurons (ANS mobilization)

- **Dorsal root (spinal) ganglia**—contain cell bodies of sensory neurons
White Matter

• 3 Tracts:
  – mostly of ascending (sensory) and descending (motor) tracts
  – transverse tracts (commissural fibers) cross from one side to the other
White Matter

• 3 Tracts:
  – mostly of *ascending* (sensory) and *descending* (motor) tracts
  – *transverse* tracts (commissural fibers) cross from one side to the other

• Tracts are located in 3 white columns (*funiculi*) on each side—dorsal (posterior), lateral, and ventral (anterior)
White Matter

• 3 Tracts:
  – mostly of **ascending** (sensory) and **descending** (motor) tracts
  – **transverse** tracts (commissural fibers) cross from one side to the other

• Tracts are located in 3 white columns (**funiculi**) on each side—dorsal (posterior), lateral, and ventral (anterior)

• Each spinal tract is composed of axons with similar functions
Use the following pictures to help you practice finding the terms from the lab term handout on unlabeled images.

- Remember, you won’t learn them if you don’t take plenty of time to practice!
- Also, be sure to mix up the order once you get comfortable with the unlabeled slides.
- Over the weekend, once you are feeling confident with the pictures here, do the nervous histology and spinal cord quizzes in PAL (from the Pearson website) to get practice with new pictures that you haven’t seen.
Nervous Histology
Function: Transmit electrical signals from sensory receptors and to effectors (muscles and glands) which control their activity.

Location: Brain, spinal cord, and nerves.

Description: Neurons are branching cells; cell processes that may be quite long extend from the nucleus-containing cell body; also contributing to nervous tissue are nonirritable supporting cells (not illustrated).
Neurons are HUGE so this point actually connects to Arrow #2.
Spinal Cord
Objective
Use the following pictures to help you identify terms from the lab term handout.

Another good resource is the Visible Body ATLAS app: [http://atlas.visiblebody.com](http://atlas.visiblebody.com)

Don’t forget that to use the link to download to a personal device, the device must first be connected to the MCPA Wi-Fi at the Rockville campus.
Brain Anatomy
Regions and Organization of the CNS

Adult brain regions

1. Cerebral hemispheres
2. Diencephalon
3. Brain stem (midbrain, pons, and medulla)
4. Cerebellum
Regions and Organization of the CNS

- Spinal cord
  - Central cavity surrounded by gray matter (cell bodies)
  - External white matter (myelinated fiber tracts)
Regions and Organization of the CNS

• Brain
  – Similar pattern with additional areas of gray matter
Open Spaces – Ventricles and their connections

(a) Anterior view
(b) Left lateral view

Lateral ventricle
Anterior horn
Inferior horn
Lateral aperture
Interventricular foramen
Third ventricle
Inferior horn
Cerebral aqueduct
Fourth ventricle
Central canal
Posterior horn
Median aperture
Lateral aperture

Marieb
Choroid Plexuses – make CSF

Choroid plexus

Arachnoid villus
Subarachnoid space
Arachnoid mater
Right lateral ventricle (deep to cut)
Choroid plexus of fourth ventricle

Third ventricle
Cerebral aqueduct
Fourth ventricle
Central canal of spinal cord
Choroid Plexuses

- Clusters of capillaries enclosed by pia mater + a layer of ependymal cells
Choroid Plexuses

• Clusters of capillaries enclosed by pia mater + a layer of ependymal cells
  – Hang from the roof of each ventricle
Cerebral Hemispheres

• Surface markings
  – Ridges (**gyri**), shallow grooves (**sulci**), and deep grooves (**fissures**)
  – Five lobes
    1. Frontal
    2. Parietal
    3. Temporal
    4. Occipital
    5. Insula
Central sulcus

Frontal lobe

Central sulcus

Gyri of insula

Temporal lobe (pulled down)
Cerebral Hemispheres

• Surface markings
  – Central sulcus
    • Separates the frontal lobe and the parietal lobe
Cerebral Hemispheres

- Surface markings
  - Longitudinal fissure
    - Separates the two hemispheres
Cerebral Hemispheres

- Surface markings
  - Transverse cerebral fissure
    - Separates the cerebrum and the cerebellum
Figure 12.7b Functional and structural areas of the cerebral cortex.
The Cerebellum

Subconsciously provides precise timing and appropriate patterns of skeletal muscle contraction.

Cerebellar peduncles
• Superior
• Middle
• Inferior

Medulla oblongata (b)

Anterior lobe

Cerebellar cortex

Arbor vitae

Posterior lobe

Choroid plexus of fourth ventricle

Flocculonodular lobe

Marieb
Anatomy of the Cerebellum

- Two hemispheres connected by vermis
Anatomy of the Cerebellum

• Two hemispheres connected by vermis

• Each hemisphere has three lobes
  – Anterior, posterior, and flocculonodular
Anatomy of the Cerebellum

• Two hemispheres connected by vermis

• Each hemisphere has three lobes
  – Anterior, posterior, and flocculonodular

• Arbor vitae—distinctive treelike pattern of the cerebellar white matter
Diencephalon

- Thalamus
- Pineal gland (part of epithalamus)
- Hypothalamus
Brain Stem

- Thalamus (encloses third ventricle)
- Pineal gland (part of epithalamus)
- Corpora quadrigemina
- Cerebral aqueduct
- Hypothalamus
- Pons
- Medulla oblongata
- Cerebellum
- Spinal cord
- Midbrain
"Oh Once One Takes The Anatomy Final, Very Good Vacations Are Heavenly"

<table>
<thead>
<tr>
<th>Cranial nerves</th>
<th>Sensory function</th>
<th>Motor function</th>
<th>PS+ fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>I - VI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I  Olfactory</td>
<td>Yes (smell)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>II Optic</td>
<td>Yes (vision)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>III Oculomotor</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IV Trochlear</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>V  Trigeminal</td>
<td>Yes (general sensation)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>VI Abducens</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cranial nerves VII – XII</th>
<th>Sensory function</th>
<th>Motor function</th>
<th>PS+ fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII Facial</td>
<td>Yes (taste)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>VIII Vestibulocochlear</td>
<td>Yes (hearing and balance)</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>IX Glossopharyngeal</td>
<td>Yes (taste)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>X  Vagus</td>
<td>Yes (taste)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>XI Accessory</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>XII Hypoglossal</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

*PS = parasympathetic
"Oh Once One Takes The Anatomy Final, Very
Figure 13.6a Location and function of cranial nerves.

- Filaments of olfactory nerve (I)
- Olfactory bulb
- Olfactory tract
- Optic nerve (II)
- Optic chiasma
- Optic tract
- Oculomotor nerve (III)
- Trochlear nerve (IV)
- Trigeminal nerve (V)
- Abducens nerve (VI)
- Cerebellum
- Medulla oblongata
- Frontal lobe
- Temporal lobe
- Infundibulum
- Facial nerve (VII)
- Vestibulocochlear nerve (VIII)
- Glossopharyngeal nerve (IX)
- Vagus nerve (X)
- Accessory nerve (XI)
- Hypoglossal nerve (XII)
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- Over the weekend, once you are feeling confident with the pictures here, do the brain model quizzes in PAL (from the Pearson website) to get practice with new pictures that you haven’t seen.
Brain Anatomy

**There are two several brain models so there is a lot of repetition, but it is good to practice with all of the pictures.**
This model can only be midsagitally sectioned.

Its open spaces are empty so it will be easier to find open spaces on the model that has clear/blue plastic representing the CSF (starting on Slide #72).
Take care, this model comes apart in more pieces!!
Superior portion of cerebrum removed.
Cerebrum sectioned into 4 major pieces with deep lobes still in surrounding diencephalon. All other major regions in tact.
This model is very similar to the picture in Slide #83.

The only difference is that the open spaces are not filled with clear/blue plastic to represent CSF.
Use the following pictures to help you identify terms from the lab term handout.

Don’t forget that to watch the videos first!! See Unit 4 Lab Terms handout for details.
Sheep Brain Virtual Dissection
FIGURE 19.13 Photograph of sagittal section of the sheep brain showing internal structures.
FIGURE 19.12 Means of exposing the dorsal midbrain structures of the sheep brain.
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Sheep Brain Virtual Dissection
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Sensory Anatomy
Figure 15.3 Extrinsic eye muscles.

(a) Lateral view of the right eye

(b) Superior view of the right eye

(c) Anterior view of the right eye

**Summary of muscle actions and innervating cranial nerves**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Action</th>
<th>Controlling cranial nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral rectus</td>
<td>Moves eye laterally</td>
<td>VI (abducens)</td>
</tr>
<tr>
<td>Medial rectus</td>
<td>Moves eye medially</td>
<td>III (oculomotor)</td>
</tr>
<tr>
<td>Superior rectus</td>
<td>Elevates eye and turns it medially</td>
<td>III (oculomotor)</td>
</tr>
<tr>
<td>Inferior rectus</td>
<td>Depresses eye and turns it medially</td>
<td>III (oculomotor)</td>
</tr>
<tr>
<td>Inferior oblique</td>
<td>Elevates eye and turns it laterally</td>
<td>III (oculomotor)</td>
</tr>
<tr>
<td>Superior oblique</td>
<td>Depresses eye and turns it laterally</td>
<td>IV (trochlear)</td>
</tr>
</tbody>
</table>
Figure 15.3a Extrinsic eye muscles.

(a) Lateral view of the right eye
Figure 15.3b Extrinsic eye muscles.

(b) Superior view of the right eye
Figure 15.3c Extrinsic eye muscles.

(c) Anterior view of the right eye
Figure 15.4a Internal structure of the eye (sagittal section).

(a) **Diagrammatic view.** The vitreous humor is illustrated only in the bottom part of the eyeball.
Figure 15.6a Microscopic anatomy of the retina.
Figure 15.4b Internal structure of the eye (sagittal section).

- Ciliary body
- Ciliary processes
- Iris
- Margin of pupil
- Anterior segment
- Lens
- Cornea
- Ciliary zonule (suspensory ligament)
- Vitreous humor in posterior segment
- Retina
- Choroid
- Sclera
- Fovea centralis
- Optic nerve
- Optic disc

(b) Photograph of the human eye.
Aqueous humor forms by filtration from the capillaries in the ciliary processes.

Aqueous humor flows from the posterior chamber through the pupil into the anterior chamber. Some also flows through the vitreous humor (not shown).

Aqueous humor is reabsorbed into the venous blood by the scleral venous sinus.
Figure 15.24a Structure of the ear.

(a) The three regions of the ear

- External ear
  - Auricle (pinna)
  - Helix
  - Lobule
- Middle ear
  - External acoustic meatus
- Internal ear (labyrinth)
  - Tympanic membrane
  - Pharyngotympanic (auditory) tube
Figure 15.24b Structure of the ear.

(b) Middle and internal ear

- Oval window (deep to stapes)
- Entrance to mastoid antrum in the epitympanic recess
- Auditory ossicles
  - Malleus (hammer)
  - Incus (anvil)
  - Stapes (stirrup)
- Tympanic membrane
- Round window
- Semicircular canals
- Vestibule
- Vestibular nerve
- Cochlear nerve
- Cochlea
- Pharyngotympanic (auditory) tube

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Figure 15.26 Membranous labyrinth of the internal ear.
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Sensory Anatomy

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