**Mammalian Anatomy**

**Objectives**

1. Become familiar with mammalian anatomy in general and sea lion anatomy in particular.
2. Identify key characteristics of the major organ systems.
3. Identify certain characteristics that are unique to marine mammals.
4. Prepare for the necropsy of a marine mammal later in the course.

**Introduction to the Shutterbug website**

To explore mammalian anatomy, you will be utilizing the Sea Lion Gallery on UCSC’s Shutterbug website: [http://shutterbug.ucsc.edu/sealion/albums.php](http://shutterbug.ucsc.edu/sealion/albums.php). This gallery is entitled “The Visible Sea Lion: An Introduction to Sea Lion Anatomy, Necrospy & Pathology.” The website provides an overview of sea lion pathology. It was created not only for wildlife biologists who perform gross necropsies of sea lions in the field, but also for the general public in an effort to foster greater understanding of sea lion anatomy and pathology. You will be using the website to familiarize yourself with mammalian anatomy, so that you can connect form and function, and to prepare yourself for the necropsy of a sea lion at the end of this course.

Go to [http://shutterbug.ucsc.edu/sealion/hrefs/instructions.htm](http://shutterbug.ucsc.edu/sealion/hrefs/instructions.htm) for instructions on how to navigate the site. The easiest way to keep track of where you are in the site is to look at the “breadcrumb” trail at the upper and lower right corners of your viewing window.

**Laboratory Exercise**

We will navigate through much of the “Normal Sea Lion Anatomy” together, identifying key characteristics of the major organ systems as we go. Your assignment for this lab will be to fill out a worksheet based on the website. You will be asked to identify certain anatomical features by searching through the Shutterbug website. In addition, you will examine common causes of death, to prepare yourself for our necropsy of a marine mammal.
**Mammalian Anatomy Worksheet**

It is important to know your way around an animal, and to be familiar with the terms used to describe certain conditions and locations. **Match the following terms with their definitions.**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Dorsal</td>
<td>_____ Large enough to be visible to the naked eye.</td>
</tr>
<tr>
<td></td>
<td>_____ Pertaining to the head or to the anterior (in animals) or superior</td>
</tr>
<tr>
<td></td>
<td>(in humans) end of the body.</td>
</tr>
<tr>
<td>B. Ventral</td>
<td>_____ Denoting a position away from the midline of the body or of a structure; toward the side.</td>
</tr>
<tr>
<td>C. Caudal</td>
<td>_____ Denoting a position toward the back surface; same as posterior in human anatomy, superior in the anatomy of quadrupeds.</td>
</tr>
<tr>
<td>D. Cranial</td>
<td>_____ Any pathological or traumatic discontinuity of tissue or loss of function of a part.</td>
</tr>
<tr>
<td>E. Medial</td>
<td>_____ Denoting a position toward the belly surface; same as anterior in human anatomy.</td>
</tr>
<tr>
<td>F. Lateral</td>
<td>_____ Something artificial, a distortion that does not reflect normal anatomy or pathology, not usually found in the body.</td>
</tr>
<tr>
<td>G. Gross</td>
<td>_____ Denoting a position toward the tail; same as inferior in human anatomy.</td>
</tr>
<tr>
<td>H. Lesion</td>
<td>_____ The side of the body or body part that is nearer to the middle or center of the body.</td>
</tr>
<tr>
<td>I. Rostral</td>
<td>_____ Word meaning “beak,” and referring to the cranial or anterior (in animals).</td>
</tr>
<tr>
<td>J. Artifact</td>
<td>____</td>
</tr>
</tbody>
</table>
Fill in the blanks.

1. What is the **pinna** of a sea lion? ________________________________

2. The **blubber layer** is formed from a dense meshwork of __________________________
   __________________________ and __________________________.

3. A sea lion **brain**, similar to a human brain, contains raised and twisted areas called
   __________________________, and adjacent depressed areas called __________________________. These
   features are characteristic of what part of the brain? __________________________

4. What is the **third eyelid** called? ________________________________

5. The **whiskers** of a sea lion are called __________________________, and are highly
   sensitive to __________________________ and __________________________.

6. The ________________________ glands are located on either side of the **trachea** just distal
   to the **larynx**.

7. The ________________________ glands are located just __________________________ and
   __________________________ to the **kidneys**.
8. **Turbinate bones** are fine, epithelium-lined bones that ________ and ________ incoming air and help trap ____________________.

9. The **trachea** has __________________________, which act to reinforce the airway.

10. The **left lung** of a sea lion has ______ lobe(s), while the **right lung** has ______ lobe(s).
    Why? ____________________________________________________________
    How many lobes does the left lung of a human have? ______
    How many lobes does the right lung of a human have? ______

11. Cartilage rings in the conducting airways allow **lung collapse**, protecting sea lions from the bends. This collapse is called _________________ _________________.

12. In the developing fetus, the _________________ _________________ shunts blood from the **right** to the **left** side of the heart, bypassing the _________________.

13. The _________________ carries (circle one) **oxygenated** / **deoxygenated** blood as it leaves the **left** side of the heart.

14. The _________________ serves a critical role in the early “education” of **T lymphocytes** (T cells) to recognize self from nonself.
15. What “educates” B lymphocytes? ______________________________

16. What is the largest discreet lymphoid organ in the body? _______________________

17. What is the oxygen-carrying protein in the skeletal muscle? ________________

18. Sea lion flippers have bones similar to those in our hands. This is an example of
   (choose one) analogous / homologous structures.

19. Marine mammals have ________________ kidneys, meaning: instead of two bean-shaped
   kidneys (like in humans), each kidney is made up of grapelike clusters of smaller,
   independent kidney units called ________________.

20. The tubes that lead from the kidneys to the bladder are called the ________________.

21. The tube leading from the bladder out of the body is called the ________________.

22. The bladder is a highly ________________ sac, which accommodates large
   volumes of ________________.

23. The developing sea lion embryo attaches to and develops in the ________________
    ________________ in the female reproductive tract.
24. California sea lion gestation lasts approximately _________ weeks.

   Compare this to human gestation, which lasts about 36 weeks.

25. The opening for the sea lion penis, located halfway between the anus and the umbilicus on the ventral side, is called the _________________________________.

26. Marine mammals have a specialized bone forming the core of the penis, known as the os penis or ______________________.

27. Name three functions of the spleen.

   1.) ______________________________________________________

   2.) ______________________________________________________

   3.) ______________________________________________________

When we necropsy a sea lion, we will be helping to investigate its cause of death. Answer the following questions regarding common causes of illness and death in sea lions.

28. What injuries can often be detected prior to necropsy via a radiograph (X-ray)?

   1.) ______________________________________________________

   2.) ______________________________________________________

29. What two major trauma wound injuries look very similar upon initial examination?

   ______________________________________________________ and ______________________________________________________
30. Name three signs of **leptospirosis** infection seen during necropsy.

1. __________________________________________________________

2. __________________________________________________________

3. __________________________________________________________

31. What are **abcesses**?

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

32. Sea lions are commonly infected with two types of **external parasites**: 

   ______________________ and ______________________

33. Worms, which are **internal parasites**, can infect four major organ tissues:

   1. ______________________________________________________

   2. ______________________________________________________

   3. ______________________________________________________

   4. ______________________________________________________

34. What is the single most important **toxic** cause of illness and mortality in sea lions? 

   __________________________________________________________

   What part of the **brain** is the main target for this toxin? 

   __________________________________________________________

   What other organ can sustain damage from this toxin? 

   __________________________________________________________
35. Name the two most common diseases of the urinary tract of sea lions.

1.) ________________________________

2.) ________________________________

36. Name three signs that drowning may have been the cause of death.

1.) ___________________________________________________

2.) ___________________________________________________

3.) ___________________________________________________

37. Note the major characteristics of entrance wounds from gunshots.

1.) shape of the hole: ________________________________

2.) direction of hair and tissues: ________________________________

38. Note the major characteristics of exit wounds from gunshots.

1.) shape of the hole: ________________________________

2.) direction of hair and tissues: ________________________________