10. Respiration

Marguerite Butler

2024-11-12

Pre-class materials

Read ahead

Before class, you can prepare by reading the following materials:

1. Tuesday we will cover aerial and aquatic respiration.
2. Watch both podcasts, look over the reading assignments, and the handouts. These will be very helpful for the homework and the design project.
3. Look over the homework and come to class with your questions. Start your homework early, the design project will come up quickly.
4. Have fun doing your independent lab this week! [you can refer to the toad muscle manual]!

    - No graded prelab or quiz.
    - Just prepare for your brilliant experiment (and write notes to help yourself)!
    - *Make sure you are clear on the anatomy for the muscles you are going after.* Do a little literature search if you need more information
        - Research the mechanism you want to explore with your hypothesis.
        - Take some time to refine your hypothesis and state it clearly.
        - Know the anatomy for the muscles you are going after, and how you will mount it. (Fish hook? String? Clamp? etc.)
        - Figure out which macros or settings you will use to test your ideas.
    - As always, feel free to ask your TA for feedback.

Announcements/Reminders

- Due Thursday in class – Homework 6 Respiration [schedule]
- Do discussion TEAMMATES eval, released each Friday, due by Monday.

Week 12 Discussion Groups

Group	Partner 1	Partner 2	Partner 3
1	Hao	Abby	Christian
2	Ashton	Ilan	Mohamad
3	James	Sean	Adam
4	Kylee	Veronica	Vivian

Tuesday - Gas Exchange in Air vs Water and Aquatic Respiration

We will start with Question 3 on page 1 on Ficks Law, then jump to Aerial Respiration.

- Diffusion (Fick's Law) vs. Bulk Flow [discussion Question 3]
  - How to increase rate of ventilation

Aerial Respiration

- **Reading assignment:** Withers pp. 609-631 OR HWA chapter 23 + Withers 626-632, skip invertebrates
- [discussion pg 3-4, Q1-6] [slide deck2]
- **Aerial Respiration Topics:**
  - Air flow patterns of vertebrates
  - Lung Volumes
    - Lung Volume (VL or VT)
    - tidal volume (Vt)
    - Dead space volume (VD)
    - Alveolar ventilation volume (VA or Va)
    - Alveolar Minute Volume (VAE)
  - Breath Rate (BR)
  - Oxygen Extraction and Pulmonary Diffusing Capacity

Respiration the Movie

https://youtu.be/clyu9h810n4

Thursday - Air Flow Patterns and Pumps, Fish Gills

- **Reading assignment:** Withers Aquatic respiration: skim 565-72, read 573-4, 585-99, supplement 12-2. ALTERNATIVELY, read HWA chapter 22 + HWA 586-587 (counter-curr) + HWA 590-594 (fish).
- [discussion pg 2-3] [slide deck] [slide deck2]
- We will start with question 3.
- **Topics:**
  - Air vs water (Q1)
  - Partial pressures of gasses and pO2 at sea level - the starting point.
    - Influences of relative humidity
    - Altitude (total pressure)
    - Henry s Law - dissolved O2 in water
  - Flow patterns: Countercurrent vs. Concurrent
  - Fish Gills
    - Ventilatory pumps in fish (breathing patterns)

Respiratory Pumps

https://youtu.be/2GPfu8ebZac

> **Coming up Next Week**
>
> - Design 3 first draft due next Friday 11/22.