

# Comments on Midterm #2

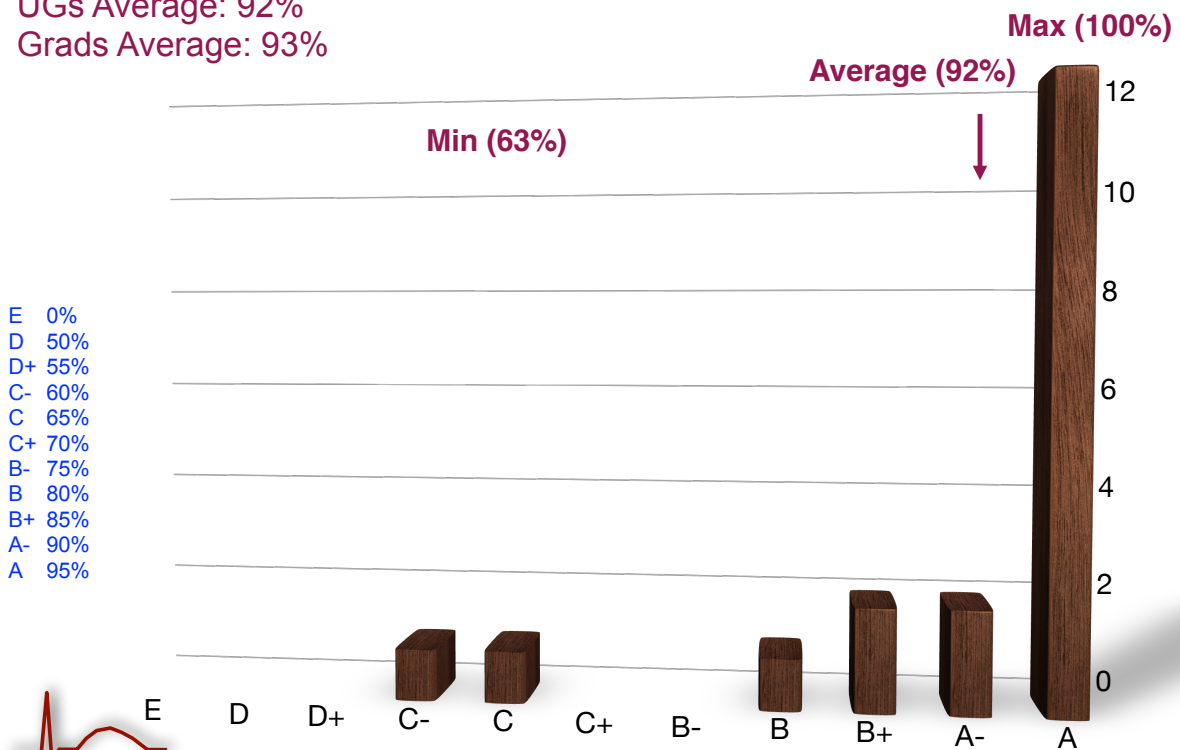


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## Results

UGs Average: 92%  
Grads Average: 93%



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## True/False I

- 1. False
  - Frank-Starling is a tissue manifestation of a cellular phenomenon
- 2. True (or False with right explanation)
  - RBC production is controlled indirectly by ambient air pressure
- 3. True
  - Definition of local control
- 4. False

$$R = \frac{8\eta l}{\pi r^4}$$

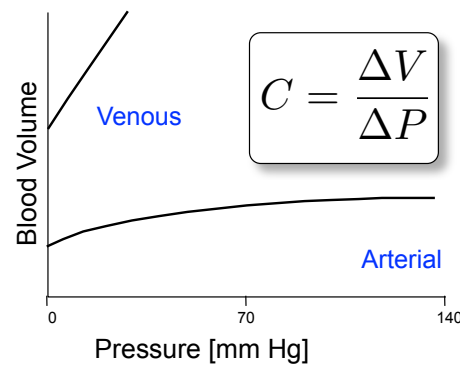
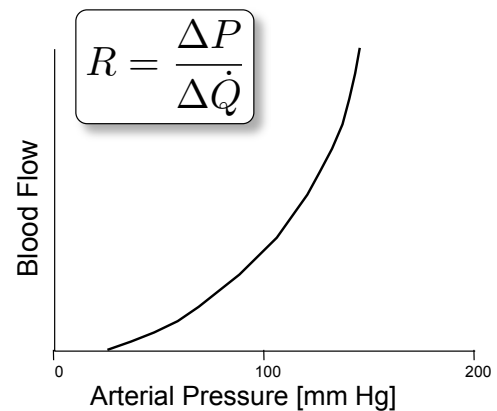


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## True/False II

- 5. False: Resistance vs. Compliance

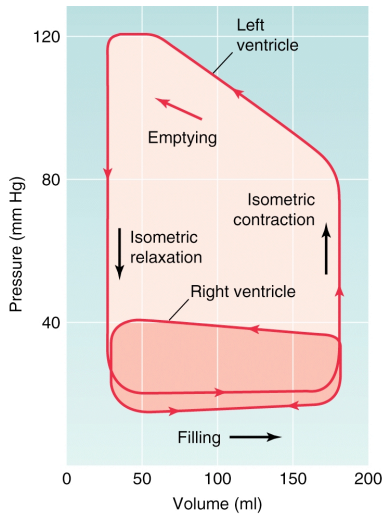


Midterm #2

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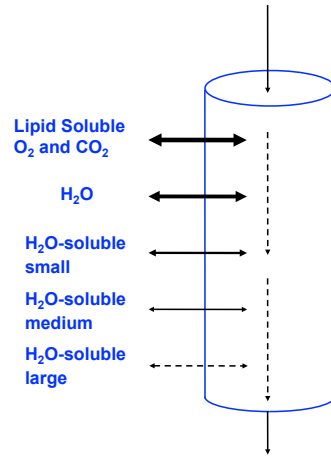
# True/False III

- 6. True
  - Diffusion effective in this case
- 7. False



## Diffusion through Capillaries

- Dominant mechanism, rate varies by tissue
- Diffusion of water 40-80 times faster than flow
- 2/3 of blood volume diffuses per minute
- Driven by concentration gradient:  
 $J = -DA \frac{dc}{dx}$   
 D = diffusion constant, A = area, c = concentration
- Flow limited: transport rate is fast enough for equilibrium
- Diffusion limited: equilibrium never established



Microcirculation

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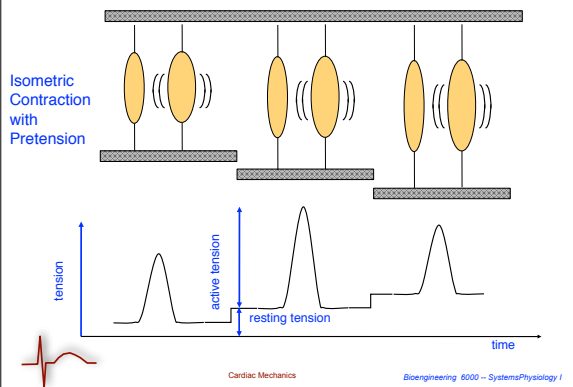
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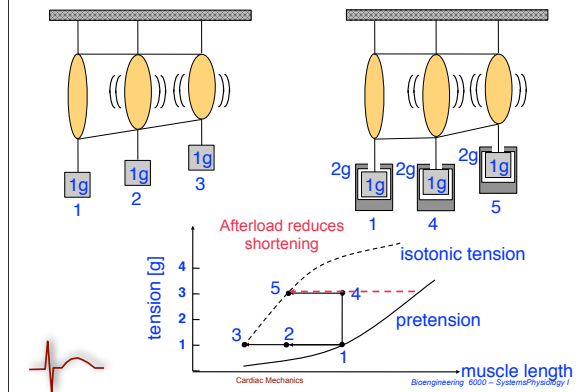
# True/False IV

- 8. False: Preload and afterload have different effects

## Pretension of Muscle (Explain?)



## Isotonic Contraction and Afterload

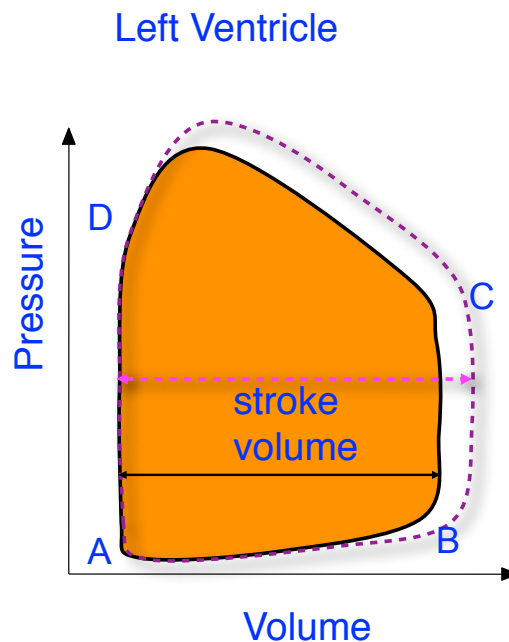


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# 1) Pressure Volume Loops

- A-D-A: describe events w.r.t contraction and valve actions
  - differentiate events from periods, e.g., valve opening from diastole
  - learn “systole” and “diastole”
- Increased filling causes increased stroke volume
- Supplement: if C marks opening and D closing of aortic valve, why do these events happen at different pressures?



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# 2) Tone

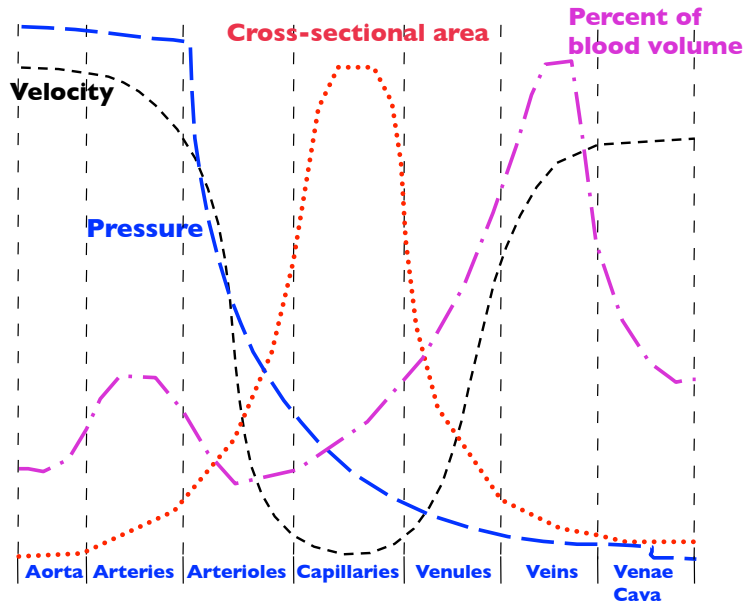
- (a) Equilibrium involves consistent stimulus
- (b) Consequences of loss of tone: for BP, consequences of loss of tone are fatal.
- (c) Central regulation:
  - (a) Baroreceptors
  - (b) Feedback through the brain
  - (c) Actuation through sympathetics and endocrine



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### 3) Blood Distribution



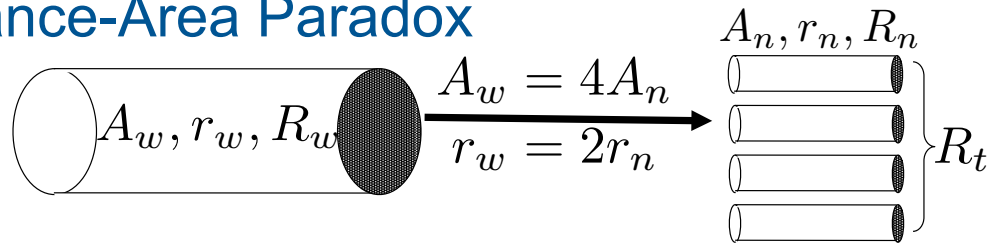
- Pressure
- - - Velocity (NOT flow)
- ..... Cross-sectional area
- · - · - Percent of blood volume



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### Resistance-Area Paradox



$$R = \frac{8\eta l}{\pi r^4} = \frac{k}{r^4} \quad \begin{cases} \frac{1}{R_t} = \sum_{n=1}^4 \frac{1}{R_n} = \frac{4}{R_n} \\ R_t = \frac{R_n}{4} = \frac{k}{4r_n^4} \end{cases}$$

$$R_w = \frac{k}{r_w^4} = \frac{k}{(2r_n)^4} = \frac{k}{16r_n^4} = \frac{1}{4} * \frac{k}{4r_n^4} = \frac{R_t}{4}$$

$$R_t = 4R_w!$$

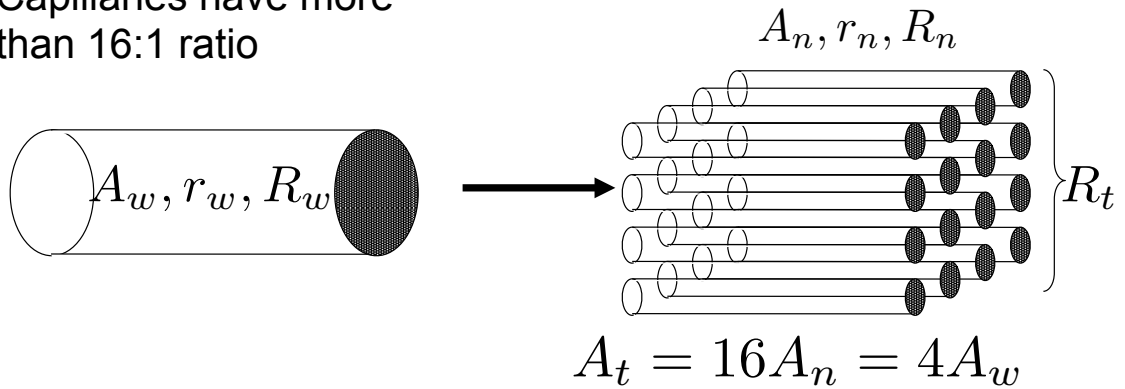


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# Resistance Break Even Point

- Break-even point at 16 to 1 (for  $R_w = R_t$ ).
- Capillaries have more than 16:1 ratio



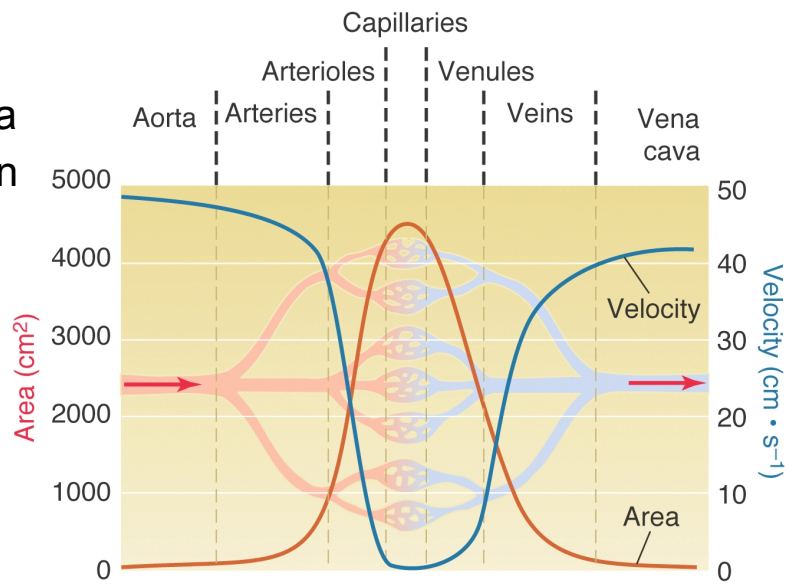
$$R_w = R_t$$

Midterm #2

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# Velocity vs. Area

- Flow is constant throughout
- Flow = velocity \* area
- Product is constant in order to maintain constant flow.



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# Take Home Messages

- True/False Questions
  - No substitute for hard work: cover all the material
  - Read and think carefully before answering
  - In case of ambiguity, cover bases.
- Essay Questions
  - Pay attention to what is asked
  - Make sure to cover descriptive phase of the question
  - Use diagrams!!!
  - Give yourself space on paper!
- Preparation
  - Check understanding of terms/concepts in topics list

