2002 exam key
(Zool. 121, Human Physiology)
Exam III

1. C
2. A
3. C
4. A
5. C
6. D
7. C (not applicable to ~~this~~ 2003 exam)
8. B
9. C
10. B
11. D
12. A
13. see next page
14. a motor neuron and all of the muscle fibers it innervates
15. see next page
16. more
17. 1. Na^+ IN
    2. Ca^{++} IN
    3. K^+ OUT
18. Heart Rate x Stroke Volume
19. Cardiac Output x Peripheral Resistance
20. Right / Left
21. Pores
22. much slower
23. decrease
24. increase
25. increase
26. CO_2
27. central chemoreceptors (in medulla)

2002 exam key, continued

B

	Sk.	Card.	Smooth
13.	Y	Y	N
	Y	Y	N
	neuron.	auto.	auto.
	N	Y	Y

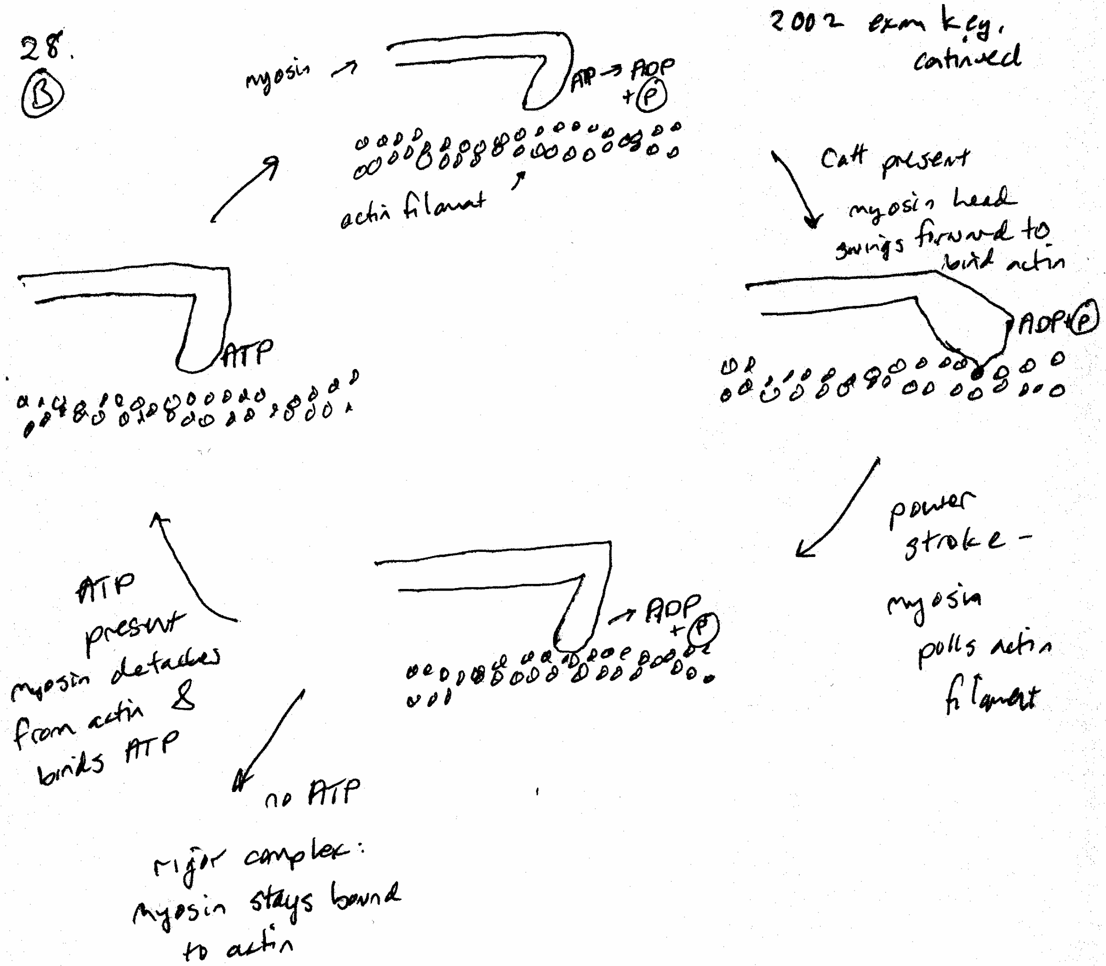
	Slow Ox.	Fast Ox	Fast Gly
15.	red	red	white
	lots	lots	little
	lots	lots	little
	slow	fast	fast

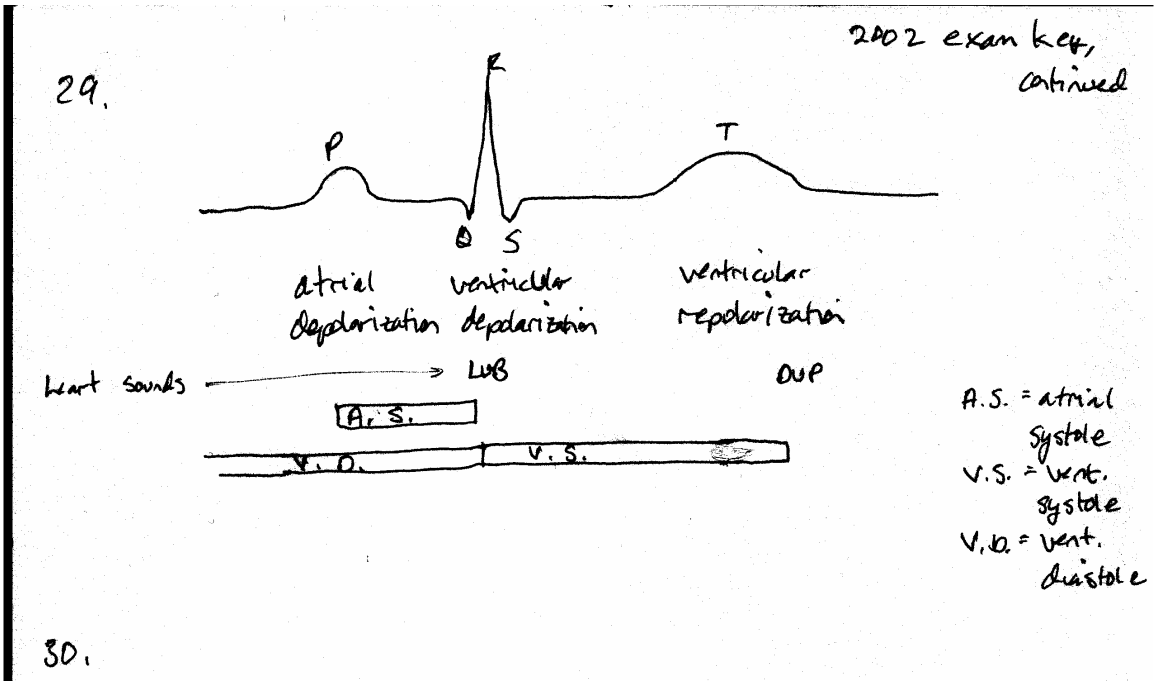
28.

(A) ACh release from motor neuron
ACh binds ACh-receptors
Flow of Na+ into muscle = end plate potential (EPP)
EPP always results in AP
AP travels down T-tubules & causes shape change in DHP receptor
DHP receptor causes Ca++ channel on adjacent sarcoplasmic reticulum to open
Ca++ is released from SR
Ca++ binds tropoin, causing tropomyosin to move, and expose myosin binding sites on actin
Cross-bridge cycling can occur
Ca++ pump on SR removes Ca++ from cytosol to allow relaxation when there is no AP

28.
(B)

2002 exam key, continued

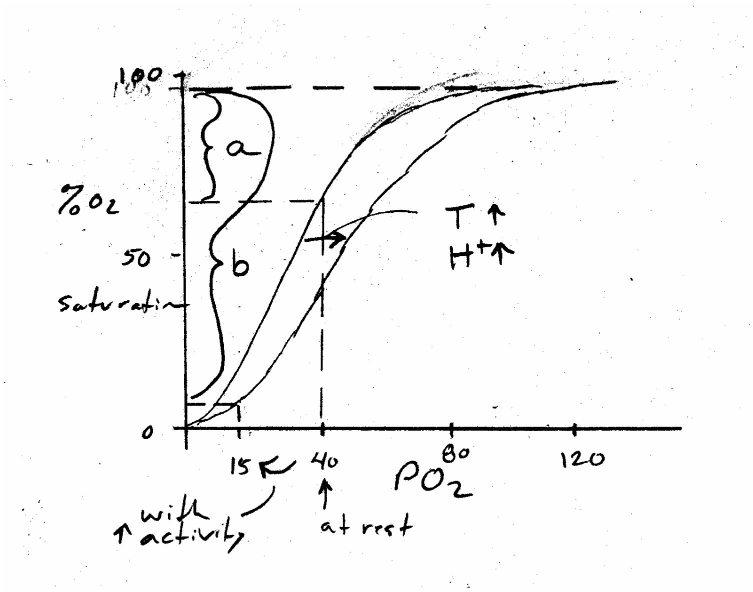




A.

1. One cannot tell. Diffusion will occur down a partial pressure gradient. Since you do not know the partial pressures of gas X above the solution and within the solution, you do not know whether diffusion will occur and if so, in what direction.
2. Since diffusion occurs down a partial pressure gradient and the partial pressure of the gas is greater in the gas than in the liquid, there will be net diffusion of gas X into the fluid from the gas above it.

B. Blood is particularly effective in delivering oxygen to metabolically active, rather than inactive, tissues for several reasons. 1) The P O_2 of metabolically active tissues is lower than that of inactive tissues and this results in a greater extraction of oxygen. 2) Metabolically active tissues release H^+ and CO_2 into the blood. The CO_2 reacts with water to generate H^+ and bicarbonate. The increase in H^+ right shifts the oxygen equilibrium curve – the Bohr effect -- increasing its ability to unload oxygen. 3) Metabolically active tissues generate heat which also right shifts the oxygen equilibrium curve. The combined effects of a lowering of tissue P O_2 and right shifts in the oxygen equilibrium curve are the basis that active tissues can extract 80-85% of the oxygen within the blood. In the diagram, the % O_2 delivered to resting tissues is represented by ‘a’ while the % O_2 delivered to metabolically active tissues is represented by ‘b’.



Extra Credit:

Keep in mind that:

Intracellular (primarily in the RBC) carbonic anhydrase rapidly catalyzes the reaction:

$CO_2 + H_2O \leftrightarrow H^+ + HCO_3^-$

This reaction occurs on its own, slowly, in the absence of carbonic anhydrase.

Acetazolamide blocks this reaction.

About 70% of CO2 is removed from the tissues in the form of bicarbonate; less than 10% is removed as dissolved CO_2 gas.

Therefore, taking high levels of acetazolamide reduces or eliminates the ability of the RBC to produce bicarbonate from CO_2 generated by metabolically active tissues. This eliminates the generation of the primary form in which CO_2 is carried to the lungs and removed from the system. Consequently, CO_2 levels in the tissues rise and slowly, within the tissues, this CO_2 generates protons (and bicarbonate). This leads to an acidification (reduced pH) of the tissues that can result in altered tissue function as well as in tissue damage and death.