

Physio ex exercise essay



**ASSIGN
BUSTER**

Lab 1: Simple Diffusion Activity 1: Simulating Simple diffusion 1. What is the molecular weight of Na^+ ? 22.99 2. What is the molecular weight of Cl^- ? 35.45 3. Which MWCO dialysis membranes allowed both of these ions through? 50/100/200 4. Which materials diffused from the left beaker to the right beaker? 50/100/200 5. Which did not? Why? 20 MWCO Activity 2: Simulating

Dialysis 1. What happens to the urea concentration in the left beaker (the patient)? The urea equally distributed between the two beakers. 2. Why does this occur? The urea has diffused from the left beaker to the right beaker.

The urea moved from an area of higher concentration (the left beaker) to an area of lower concentration (the right beaker, which originally contained no urea).

Facilitated Diffusion Activity 3: Facilitated Diffusion 1. At a given glucose concentration, how does the amount of time it takes to reach equilibrium change with the number of carriers used to "build" the membranes? As the glucose carrier proteins increase the amount of time it takes to reach equilibrium decreases. 2. Does the diffusion rate of Na^+/Cl^- change with the number of receptors? No 3. What is the mechanism of the Na^+/Cl^- transport?

It's simple diffusion because the glucose that's actively transported not the salt. If it did the amount of NaCl transported would increase with the number of receptors. The receptors are specific for glucose. 4. If you put the same amount of glucose in the right beaker as in the left, would you be able to observe any diffusion? No 5. Does being unable to observe diffusion necessarily mean that diffusion is not taking place? No

Osmosis Activity 4: Osmosis 1. Did you observe any pressure changes during the experiment? If so, in which beaker(s), and with which membranes?

Pressure changes occurred in the 20 MWCO 2. Why? This is due to osmotic pressure 3. Did the Na⁺/Cl⁻ diffuse from the left beaker to the right beaker? If so, with which membrane(s)? No 4. Why? 5. Explain the relationship between solute concentration and osmotic pressure? Osmotic Pressure is the amount of pressure that needs to be supplied to the 2nd beaker in order to prevent water entry from the 1st beaker. Solute concentration depends on osmosis. 6. Does diffusion allow osmotic pressure to be generated? No 7. Would pressure be generated if solute concentrations were equal on both sides of the membrane?

No 8. Why or why not? They are isotonic, they do not contribute to the tonicity of a solution as they pass through 9. Would pressure be generated if you had 9 mM glucose on one side of a 200 MWCO membrane and 9 mM NaCl on the other side? If so, which solution was generating the pressure? No 10. Would pressure be generated if you had 9 mM albumin on one side of a 200 MWCO membrane and 9 mM NaCl on the other side? If so, which solution was generating the pressure? Yes, the albumin Filtration Activity 5: Filtration 1. What were the results of your initial membrane analysis?

The concentration in filtrate was 0 for all and the membrane residue analysis showed all were present. 2. Does the membrane MWCO affect filtration rate? Yes 3. Does the amount of pressure applied affect the filtration rate? No 4. Did all solutes pass through all the membranes? Yes and no. There were traces of the powdered charcoal on the residue analysis, but the charcoal did not show up on the concentration. 5. If not, which one(s) did not? Charcoal 6. Why? The sizes of the pores 7. How can the body selectively increase the filtration rate of a given organ or organ system?

By increasing blood vessel radius to increase fluid flow and thus pressure in the vessel going to a given organ. Active Transport Activity 6: Active Transport 1. At the end of this experimental run, did the Na^+/Cl^- move from the left vessel to the right vessel? No 2. Why? Sodium transport does not occur because what ion is not available? The Na^+/K^+ pump requires both a sodium and _____ presence on opposite sides of the membrane. 3. As the run progresses, the concentrations of the solutes will change in the windows next to the two beakers. The rate will slow down markedly, then stop before completed. Why? Lack of ATP 4.

Does the amount of NaCl/KCl transported change? Yes, more solute is transported. -2pts 5. Does the amount of solute transported across the membrane change with an increase in carriers or pumps? The rate of active transport will decrease if fewer pumps 6. Is one solute more affected than the other? No 7. Does the membrane you "built" allow simple diffusion? Yes Try this, add different amounts of glucose to both beakers and observe what happens. 8. If you placed 9 mM NaCl on one side of the membrane and 15 mM on the other side, would there be movement of the NaCl ? Why? No, Because like in #2 above there is no potassium present.

The Na^+/K^+ pump requires both a sodium and potassium presence on opposite sides of the membrane. 9. Does the amount of ATP added make any difference? yes Lab 2: Single Stimulus Activity 1: Identifying the Latent Period 1. How long is the latent period? 2. 22 msec 2. Does the latent period change with different stimulus voltages? No Activity 2: Identifying the Threshold Voltage 1. What do you see in the Active Force display? 0 2. What is the threshold voltage? .8 V 3. How does the graph generated at the

threshold voltage differ from the graphs generated at voltages below the threshold? There is a small rise in the graph indicating activity

Activity 3: Effect of Increases in Stimulus Intensity 1. How did the increases in voltage affect the peaks in the tracings? At first there was a noticeable difference in the peaks increasing, but as the voltage increased the peaks began to look the same. 2. How did the increases in voltage affect the amount of active force generated by the muscle? The Active Force increased then leveled off at 1.82 3. What is the voltage beyond which there were no further increases in active force? Maximal voltage: 8.5 V 4. Why is there a maximal voltage? What has happened to the muscle at this voltage?

At the maximal voltage, all muscle fibers are responding (contracting) to the stimulus applied. Below this voltage, some fibers remain that will not be stimulated by the applied stimulus. 5. An individual muscle fiber follows the all-or-none principle—it will either contract 100% or not at all. Does the muscle we are working with exhibit the all-or-none principle? Think about this, the muscle we are working with consists of many, many fibers—not one individual fiber. And because the all or none only applies to individual fibers and motor units (all fiber in a motor unit contract when the nerve is stimulated).

As whole muscle force increases more motor units are recruited. If the all-or-none principle applied to the whole muscle what would you have observed?

Multiple Stimulus Activity 4: Treppe 1. What do you observe? Each time the single stimulus button was hit the force in gms gets higher. The rises in the graph are also slightly different. Activity 5: Summation 1. What is the active

force of the contraction? 1. 82 gms 2. What is the active force now? 2. 76 gms 3. Was there any change in the force generated by the muscle? yes 4. Was there any change in the force generated by the muscle? yes 5.

Why has the force changed? The force changed because the fibers that responded to the first stimulus were still recovering & not able to respond to the second stimuli 6. Do you see the same pattern of changes in the force generated? yes 7. Does the force generated change with each additional stimulus? If so, why? Yes, the force increases with each stimuli Activity 6:

Tetanus 1. What begins to happen at around 80 msec? The rises begin to level off and the active force begins to decrease 2. What is this condition called? Tetanus 3. How does the trace at 130 stimuli/sec compare with the trace at 50 stimuli/sec? . What is this condition called? Fused tetanus 5. At what stimulus frequency is there no further increase in force? 146 6. What is this stimulus frequency called? Maximal Titanic Tension Activity 7: Fatigue 1.

In fatigue, what happens to force production over time? The Active Force decreases. Isometric and Isotonic Contractions Activity 8: Isometric Contractions 1. Looking at your graph, what muscle lengths generated the most active force? (provide a range) 70 to 80 mm 2. At what muscle length does passive force begin to play less of a role in the total force generated by the muscle? 0 mm 3. Looking at your graph, at what muscle length does passive force begin to play a role in the total force generated by the muscle? 80 mm 4. The graph shows a dip at muscle length = 90 mm. Why is this? 5.

What is the key variable in an isometric contraction? Total Force Activity 9: Isotonic Contractions 1. How much time does it take for the muscle to generate 0.5 grams of force? 3.77 msec 2. At what point in the trace does

the muscle shorten? At the very beginning 3. You can observe from the trace that the muscle is rising in force before it reaches the plateau phase.

Why doesn't the muscle shorten prior to the plateau phase? 4. Did it take any longer for the muscle to reach the force it needed to move the weight? No 5. How does this trace differ from the trace you generated with the 0.5 gram weight attached? The tracing is flat, it stays the same. 6. Examine the plot data and your numerical data. At what weight was the velocity of contraction the fastest? 2.0 grams 7. What happened when you attached the 2.0 gram weight to the muscle and stimulated the muscle? How did this trace differ from the other traces? What kind of contraction did you observe? Isometric? 8.

What kind of trace did you get? A flat line 9. What was the force of the contraction? .5 grams -passive 10. With the 1.0 gram weight, what kind of trace did you get? What was the force of the contraction? 1.0 grams - passive / Flat line 11. With the 1.5 gram weight, what kind of trace did you get? What was the force of the contraction? 1.51 Grams - passive / Flat line 12. With the 2.0 gram weight, what kind of trace did you get? What was the force of the contraction? ? 1.86 grams ? Small rise in the beginning then leveled off 13. Describe your four tracings and explain what has happened in each of them. The lines for the 90 and 60 length were both similar creating a rise in the line. Lines for the 80 and the 70 were the same, leveling off the active force for a few seconds before decreasing 14. What muscle length(s) generated the fastest contraction velocity? 90 and 60 Lab 10: Respiratory Acidosis and Alkalosis Activity 1: Normal Breathing 1. At 20 seconds, pH = 7.41 2. At 40 seconds, pH = 7.41 3. At 60 seconds, pH = 7.41 4. Did the pH

<https://assignbuster.com/physio-ex-exercise-essay/>

level of the blood change at all during normal breathing? If so, how? No, not at all. 5. Was the pH level always within the “ normal” range for the human body? yes 6.

Did the PCO₂ level change during the course of normal breathing? If so, how? No Activity 2a: Hyperventilation - Run 1 1. At 20 seconds, pH = 7.68 2. At 40 seconds, pH = 7.68 3. At 60 seconds, pH = 7.68 4. Maximum pH = 7.68 5. Did the pH level of the blood change at all during this run? If so, how? Yes, it went extremely high then low. 6. Was the pH level always within the “ normal” range for the human body? If not, when was the pH value outside of the normal range, and what acid/base imbalance did this pH value indicate? No, Alkalosis 7. Did the PCO₂ level change during the course of this run? If so, how?

Yes, the levels were as high as 40 and as low as 19. 7 8. If you observed an acid/base imbalance during this run, how would you expect to renal system to compensate for this condition? By retaining more H⁺ This is correct below in Activity 3, here you want to retain H⁺, excrete HCO₃⁻ 9. How did the hyperventilation trace differ from the trace for the normal breathing? Did the tidal volumes change? The tidal volumes were different than those of normal. The waves were a lot larger than those of the normal breathing. 10. What might cause a person to hyperventilate? Anxiety Activity 2b: Hyperventilation - Run 2 . What happened to the trace after the 20-second mark when you stopped the hyperventilation? Did the breathing return to normal immediately? Explain your observation. The breathing did not return to normal immediately after returning to normal breathing. The pH level stayed the same for a few seconds before returning to the normal breathing

patterns. Activity 3: Rebreathing 1. At 20 seconds, pH = 7.41 2. At 40 seconds, pH = 7.41 3. At 60 seconds, pH = 7.24 4. Did the pH level of the blood change at all during this run? If so, how? Yes, the pH level increased as time passed. 5.

Was the pH level always within the "normal" range for the human body? If not, when was the pH value outside of the normal range, and what acid/base imbalance did this pH value indicate? No, Acidosis 6. Did the PCO₂ level change during the course of this run? If so, how? Yes, the levels varied between 40 and 53.02 7. If you observed an acid/base imbalance during this run, how would you expect the renal system to compensate for this condition? Excrete more H⁺ 8. How did the rebreathing trace differ from the trace for normal breathing? Did the tidal volumes change? The tidal volumes became larger as the time passed. 9.

Give examples of respiratory problems that would result in pH and PCO₂ patterns similar to what you observed during rebreathing? Breathing into a bag Renal System Compensation Activity 4: Renal Response to Normal Acid/Base Balance 1. At normal PCO₂ and pH levels, what level of H⁺ was present in the urine? Normal 2. What level of [HCO₃⁻] was present in the urine? Normal 3. Why does the blood pH value change as PCO₂ changes? Because the Pco₂ has an effect on the pH. 4. How does the blood pH value change as Pco₂ changes? The pH value either decreases or increases with the Pco₂ value. Activity 5: Renal Response to Respiratory Alkalosis . What level of [H⁺] was present in the urine at each of these PCO₂/pH levels? Normal 2. What level of [HCO₃⁻] was present in the urine at each of these PCO₂/pH levels? Normal 3. Assuming that enough time has passed for the

<https://assignbuster.com/physio-ex-exercise-essay/>

renal system to fully compensate for respiratory alkalosis, would you expect PCO₂ levels to increase or decrease? Would you expect blood pH levels to increase or decrease? 4. Which type of breathing resulted in PCO₂ levels closest to the ones we experimented with in this activity - normal breathing, hyperventilation, or rebreathing? 5. Explain why this type of breathing resulted in alkalosis.

Too little carbon dioxide Activity 6: Renal Response to Respiratory Acidosis 1.

What level of [H⁺] was present in the urine at each of these PCO₂/pH levels?

Elevated 2. What level of [HCO₃⁻] was present in the urine at each of these

PCO₂/pH levels? Decreased 3. Assuming that enough time has passed for the

renal system to fully compensate for respiratory acidosis, would you expect

PCO₂ levels to increase or decrease? Would you expect blood pH levels to

increase or decrease? 4. Which type of breathing resulted in PCO₂ levels

closest to the ones we experimented with in this activity - normal breathing,

hyperventilation, or rebreathing? . Explain why this type of breathing

resulted in acidosis. Too much CO₂ Metabolic Acidosis and Alkalosis Activity

7: Respiratory Response to Normal metabolism 1. What is the respiratory

rate? 15 2. What is the blood pH? 7.4 3. Are the blood pH and PCO₂ values

within normal ranges? yes Activity 8: Respiratory Response to Increased

Metabolism 1. How did respiration change? Increased to 17 2. How did blood

pH change? Decreased to 7.34 3. How did PCO₂ change? Increased to 45 4.

How did [H⁺] change? Increased to 47 5. How did [HCO₃⁻] change?

Decreased to 20 I did not understand the next 4 questions and how to

answer them. . Explain why these changes took place as metabolic rate

increased? As the body's metabolic rate decreased, less carbon dioxide was

formed as a metabolic waste product. This caused a decrease in $[H^+]$ generation, which increased the plasma pH, causing respiration to decrease in order to retain more carbon dioxide in the blood and restore pH to a normal value. -1. 5pts

7. Which metabolic rates caused pH levels to decrease to a condition of metabolic acidosis? 8. What were the pH values at each of these rates? At metabolic rate = 30, the pH value was about 7. 47. At metabolic rate = 20, the pH value was about 7. 1. Alkalosis occurs at pH values above 7. 45. (The pH values will vary slightly from run to run.) -1. 5pt

9. By the time the respiratory system fully compensated for acidosis, how would you expect the pH values to change? By the time the respiratory system fully compensated for alkalosis, you would expect pH levels to decrease to normal values. -1. 5pts

Activity 9: Respiratory Response to Decreased Metabolism

1. How did respiration change? Decreased to 13

2. How did blood pH change? Increased to 7. 43

3. How did PCO_2 change? Decreased to 37

4. How did $[H^+]$ change? Decreased to 38

5. How did $[HCO_3^-]$ change? Increased to 26

6. Explain why these changes took place as metabolic rate decreased? 7. Which metabolic rates caused pH levels to increase to a condition of metabolic alkalosis? 8. What were the pH values at each of these rates? 9. By the time the respiratory system fully compensated for alkalosis, how would you expect the pH values to change?

Eliciting a Nerve Impulse Activity 1: Electrical Stimulation

1. Do you see any kind of response on the oscilloscope screen? No

2. What was the threshold voltage, or the voltage at which you first saw an action potential? . 0V

3. How does this tracing compare to the one that was generated at the threshold voltage? This tracing moved in the same pattern however it was slightly

higher at the top peak and slightly lower at the bottom peak. 4. What reason can you give for the change? As the voltage increases the range of the trace will expand until the threshold is reached. 5. Record this maximal voltage here: 4. 0V Activity 2: Mechanical Stimulation 1. When the glass rod is touching the nerve, what do you see on the oscilloscope screen? The oscilloscope shows the nerve's reaction to stimulus 2.

How does this tracing compare with the other tracings you have generated?

The tracing travelled in the same pattern as the other tracings and was at the same high and low as the 3. 0V test. Activity 3: Thermal Stimulation 1.

What happens when the heated rod touches the nerve? The trace shows a slightly higher reaction to the heated glass rod as opposed to the cold glass rod. 2. How does this trace compare to the trace that was generated with the unheated glass bar? This trace had an approx. 0. 5V higher reaction. 3. What explanation can you provide for this? Since the glass rod was heated it generated a slightly higher nerve impulse.

Activity 4: Chemical Stimulation 1. Does the sodium chloride generate an action potential? Yes. 2. Does this tracing differ from the original threshold stimulus tracing? If so, how? Yes, it is 1. 0V lower than the original threshold from activity 1. 3. Does the hydrochloric acid generate an action potential? Yes. 4. Does this tracing differ from the original threshold stimulus tracing? If so, how? Yes, it is 1. 0V lower than the original threshold from activity 1. 5.

To summarize your experimental results, what kinds of stimuli can elicit an action potential? A direct electric pulse of 3. 0V to 4. V as well as chemical stimuli, such as sodium chloride or a physical stimuli, such as heat. Inhibiting a Nerve Impulse Activity 5: Testing the Effects of Ether 1. What sort of trace

do you see? The trace is a flat line. 2. What has happened to the nerve? The ether blocked the nerve transmission. 3. How long does it take for the nerve to return to normal? The nerve returns to normal at 6 minutes and then flat lines and returns to normal every two minutes following the initial vertical spike. Activity 6: Testing the Effects of Curare 1. Does this generate an action potential? There is no change. 2. What explains this effect?

The nerve impulse is unchanged, due to curare affecting the synaptic ends of the nerve. 3. What do you think would be the overall effect of Curare on the organism? Ultimately the organism would die, due to curare inhibiting nerve transmissions. Activity 7: Testing the Effects of Lidocaine 1. Does this generate a trace? No. 2. What sort of tracing is seen at the threshold voltage? The trace is flat lined. 3. Why does Lidocaine have this effect on nerve fiber transmission? Lidocaine is sodium based and prohibits the channel from opening, stopping any action potential from initiating. Nerve Conduction Velocity

Activity 8: Measuring Nerve Conduction Velocity 1. Which nerve in the group has the slowest conduction velocity? Earthworm. 2. What was the speed of the nerve? 8.94m/sec 3. Which nerve of the four has the fastest conduction velocity? Rat2 4. What was the speed of the nerve? 53.09m/sec 5. What is the relationship between nerve size and conduction velocity? What are the physiological reasons for this relationship? The nerve is similar to a water pipe, the larger the pipe the faster the flow. For the nerve, a larger the nerve has greater conduction velocity than a smaller nerve and myelinated nerves are faster than unmyelinated nerves. . Based on the results, what is your conclusion regarding the effects of myelination on conduction velocity? What

are the physiological reasons for your conclusion? The action potential of myelinated nerves jumps from the nodes to the Ranvier to the next node, as opposed to continuous conduction in the unmyelinated nerves. 7. What are the evolutionary advantages achieved by the myelination of neurons?

Myelinated nerves allow for faster conduction, which would result in faster impulses and action potential, which would allow for faster reaction.

Osmosis = The diffusion of water across a selectively permeable membrane (with the concentration gradient, ie from areas of high concentration to an area of low concentration). As it is diffusion, the rate of osmosis relies on the concentration gradient (among other things). Active transport = The movement of molecules AGAINST the concentration gradient with the use of energy (eg, ATP) As sodium is transported, that would alter the concentration of water in that area, for example, if sodium was being transported into the cell, the concentration of water would decrease. This would allow for more rapid osmosis of water into the cell.