

Answer a total of 5 questions

- Hypoxia can be classified in four general categories.
 - List the four categories and give an example for each category (4%)
 - Describe the cause for each category (4%)
 - What will happen to PaO₂ and O₂ content in each category (increase, decreased, or no change) when compared to the normal control? (4%)
 - Which category cannot be ameliorated by inspired oxygen treatment? Why? (8%)
- Patients with sever uncontrolled diabetes mellitus (DM) produce large quantities of certain organic acids.
 - Based on your knowledge about carbohydrate metabolism, please explain why the patients produce large quantities of organic acids.(5%)
 - Please predict the possible changes in their respiration pattern and explain why the respiration pattern changes (5%)
 - Please describe the changes in the arterial concentrations of hydrogen ion, bicarbonate, and carbon dioxide (3%)
 - Please draw a picture to explain how the kidney handles the large quantities of organic acids (7%)
- Molecular transport from extracellular to intracellular compartments requires various mechanisms.
 - List 4 transportation mechanisms and explain how a molecule passes through the membrane. (4%)
 - Provide an example for each mechanism and explain how each mechanism works under physiological conditions. (8%)
 - What will happen to cell volume (increased, decreased, or no change) if a cell is placed in each of the following solutions? And explain its change. (Osmotic pressure for normal cells is about 300 mosmo/L) (8%)

	Concentrations (mM)		Cell volume	Explanation
	NaCl	Urea		
A	150	100		
B	100	150		
C	200	100		
D	100	50		

4. There are three types of muscles. Please compare their characteristics and put your answer to the blanks below. (16%)

	Skeletal muscle	Smooth muscle		Cardiac muscle
		Single unit	Multiunit	
Site of calcium regulation (name the sites)				
Stretch of fiber produces contractions (yes or no)				
Spontaneous production of action potential (yes or no)				
Type of neural inhibition (name the neurotransmitter)				

5. Knee jerk reflex is the most familiar examination in the routine medical examination.
- Please draw a picture to explain the neural pathway involved in this reflex (4%).
 - Both knee jerk reflex and baroreflex cause muscle contractions. Please explain the differences between these reflexes (10%)
 - Please explain what changes would occur in the knee jerk reflex after destruction of the gamma motor neurons. (5%)
 - What changes would occur in the knee after a cross section of the spinal cord? Based on the neural regulation on body movement, please explain it happens (5%).