Name: _____ **Date:** _____

Answer Key: Feeling the Burn: 7th Grade Biomechanics & Muscle Mayhem Quiz

Calculate metabolic shifts and analyze cardiac output to solve high-pressure athletic scenarios using advanced physiological reasoning.

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1. A mountain biker transitions from a flat trail to a 45-degree vertical incline. To maintain power, their Stroke Volume (SV) increases. This is a primary example of which physiological concept?

Answer: B) Acute response to increased workload

Acute responses are immediate adjustments the body makes to meet the demands of physical stress, such as increasing stroke volume to pump more blood during a sudden climb.

2. An athlete training at high altitudes for three months experiences an increase in red blood cell count to transport more oxygen. This long-term change is known as ____.

Answer: C) Chronic Adaptation

Chronic adaptations are the structural and functional changes that occur over weeks or months of consistent training or environmental exposure.

3. The Phosphagen System (ATP-CP) is the primary energy pathway used by a cross-country runner during the steady-state middle miles of a 5K race.

Answer: B) False

The Phosphagen system only lasts about 10 seconds; steady-state running relies on the Aerobic system, which uses oxygen to break down fats and carbs.

4. Why does a 7th-grade student's Tidal Volume (the amount of air moved in/out per breath) increase significantly during a vigorous game of soccer?

Answer: C) To facilitate gas exchange and remove excess carbon dioxide

Increased breathing depth (tidal volume) allows for more efficient exchange of oxygen into the blood and the removal of CO_2 produced as a byproduct of muscle metabolism.

5. During a heavy lifting session, 'Microtrauma' occurs in the sarcomeres. The process involving protein synthesis that builds the muscle back stronger is called ____.

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Answer: A) Hypertrophy

Hypertrophy is the increase in muscle size resulting from the repair of micro-tears (microtrauma) through protein synthesis during recovery.

6. Venous Return, the rate of blood flow back to the heart, is generally higher when a person is performing active recovery (walking) than when they sit down immediately after a sprint.

Answer: A) True

The 'skeletal muscle pump' helps push blood back to the heart during movement, preventing blood pooling and speeding up the removal of metabolic waste.

7. If an athlete's VO2 Max (maximum oxygen uptake) increases after a year of swimming, what has fundamentally changed in their physiology?

Answer: B) Their body has become more efficient at delivering and using oxygen

VO2 Max is the gold standard for aerobic fitness; an increase means the cardiovascular and muscular systems are better at transporting and extracting oxygen.

8. As body temperature rises during a basketball game, vessels near the skin widen to release heat. This physiological process is known as ____.

Answer: A) Vasodilation

Vasodilation is the widening of blood vessels, which increases blood flow to the skin's surface to help cool the body through radiation and sweat.

9. Which energy system would be primarily responsible for a gymnast performing a 30-second high-intensity floor routine involving explosive tumbling passes?

Answer: C) Anaerobic Lactic (Fast Glycolytic)

The Anaerobic Lactic system provides energy for high-intensity activities lasting between 30 seconds and 2 minutes by breaking down glycogen without oxygen.

10. Mitochondria density increases in muscle cells as a chronic adaptation to regular endurance training, such as long-distance cycling.

Answer: A) True

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Increasing the number of 'powerhouses' (mitochondria) allows the muscle to produce more ATP through aerobic pathways, improving endurance.