Name: _____ **Date:** _____

Metabolic Gauntlet: A 10th Grade Exercise Physiology Challenge

Sophomores will synthesize data on bioenergetic pathways and homeostatic disruptions to evaluate athletic performance and cellular adaptation strategies.

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1. A marathon runner hitting 'the wall' at mile 20 is likely experiencing a metabolic shift due to the depletion of which specific substrate?

A. Intramuscular phosphocreatine stores
B. Liver and muscle glycogen
C. Adipose tissue triglycerides
D. Plasma free fatty acids

2. Concentric cardiac hypertrophy, characterized by thickened ventricular walls, is a common chronic adaptation specifically associated with long-term aerobic endurance training.

A. True
B. False

3. During the transition from rest to steady-state exercise, the temporary lag in oxygen uptake is known as _____.

A. Oxygen debt
B. EPOC
C. Oxygen deficit
D. Ventilatory threshold

4. An elite track cyclist performs a 30-second all-out sprint. Which enzyme is most likely the rate-limiting factor for their primary energy system during this bout?

A. Isocitrate dehydrogenase
B. Phosphofructokinase (PFK)
C. Cytochrome oxidase
D. Creatine kinase

5. The Frank-Starling Law of the Heart explains that increased venous return leads to a more forceful ventricular contraction by stretching the myocardium.

A. True
B. False

6. Type IIx muscle fibers are characterized by high _____ capacity but low fatigue resistance.

A. Oxidative
B. Glycolytic
C. Mitochondrial
D. Myoglobin

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7. If an athlete is training at high altitude, their body compensates for lower partial pressure of oxygen by increasing the production of:

A. Antidiuretic hormone (ADH)
B. Insulin-like growth factor
C. Erythropoietin (EPO)
D. Thyroxine

8. During incremental exercise, the point where blood lactate begins to accumulate exponentially is identical for both trained and sedentary individuals.

A. True
B. False

9. The respiratory exchange ratio (RER) of 1.0 indicates that the body is primarily metabolizing _____ for fuel.

A. Proteins
B. Fats
C. Carbohydrates
D. Ketones

10. Which of the following best describes the 'Size Principle' of motor unit recruitment during a progressively heavy lift?

A. Large motor units are recruited first to save energy
B. Motor units are recruited randomly regardless of load
C. Small, slow-twitch units are recruited before large, fast-twitch units
D. Only large motor units are used for movements lasting over 10 seconds