Name: _____ **Date:** _____

When the Bio-Engine Overclocks: 6th Grade Exercise Physiology Challenge

Evaluate how cellular energy systems and structural adaptations respond to physical stress through comparative analysis of athletic performance scenarios.

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1. A cross-country skier competing for two hours relies heavily on mitochondrial biogenesis. Which chronic adaptation best explains their increased efficiency?

A. Enhanced capillary density for better nutrient exchange
B. Temporary increase in blood pressure during the race
C. Immediate release of adrenaline to the bloodstream
D. Rapid buildup of lactic acid in the quadriceps

2. True or False: Hypertrophy occurs when muscle fibers increase in number rather than increasing in individual size.

A. True
B. False

3. During a 400-meter dash, the body transitions from stored phosphocreatine to _____, breaking down glycogen without using oxygen.

A. Aerobic Respiration
B. Anaerobic Glycolysis
C. Beta-Oxidation
D. Photosynthesis

4. Which scenario demonstrates an acute response to a single bout of plyometric (jumping) exercises?

A. A decrease in resting heart rate over three months
B. Increased bone mineral density in the lower limbs
C. Immediate recruitment of Type II 'fast-twitch' muscle fibers
D. Permanent thickening of the left ventricle wall

5. To prevent 'blood pooling' and assist the venous return of blood to the heart after a vigorous workout, an athlete should perform a _____.

A. Static stretch
B. Power nap
C. Active cool-down
D. Heavy lift

6. True or False: Stroke volume—the amount of blood ejected per beat—increases as a chronic adaptation to cardiovascular training.

A. True
B. False

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7. Analyze the role of Myoglobin in exercise. Why would a deep-sea diver or an endurance athlete have higher concentrations of this protein?

A. It stores oxygen directly within the muscle tissue
B. It increases the speed of nerve impulses
C. It acts as a primary fuel source like glucose
D. It prevents the muscles from getting too warm

8. The 'Overload Principle' suggests that for a _____ adaptation to occur, the system must be stressed beyond its normal limits.

A. Acute
B. Psychological
C. Chronic
D. Retroactive

9. True or False: During high-intensity intervals, the respiratory exchange ratio (RER) indicates the body is burning primarily fats instead of carbohydrates.

A. True
B. False

10. A student notices they are breathing heavily even after they stop running. This physiological phenomenon is known as EPOC. What is the body primarily doing?

A. Storing excess carbon dioxide for later use
B. Restoring oxygen debt and clearing metabolic byproducts
C. Trying to increase the body's core temperature
D. Breaking down muscle proteins for immediate energy