

Advanced Exercise Science Concepts

Exercise Science · Practice Test · 19 Questions

1. Which of the following cellular adaptations is primarily responsible for the enhanced fatigue resistance observed in endurance-trained individuals, mediated by increased mitochondrial density and oxidative enzyme activity?

- A) Hypertrophy of fast-twitch muscle fibers
- B) Increased satellite cell proliferation
- C) Enhanced capacity for aerobic ATP production
- D) Upregulation of sarcoplasmic reticulum calcium ATPase (SERCA)

2. During high-intensity interval training (HIIT), the predominant energy system utilized to sustain repeated bursts of maximal effort, especially those lasting 30-60 seconds, is:

- A) Oxidative phosphorylation
- B) The phosphagen system (ATP-PCr)
- C) Glycolysis (anaerobic)
- D) Lipolysis

3. The phenomenon of post-exercise oxygen consumption (EPOC), often referred to as the "afterburn effect," is largely attributed to the energetic cost of:

- A) Increased metabolic rate due to elevated body temperature
- B) Replenishing intramuscular ATP and PCr stores
- C) Clearing accumulated lactate and restoring oxygen reserves
- D) Increased hormone secretion, such as adrenaline and noradrenaline

4. In the context of resistance training, the concept of "progressive overload" is most effectively achieved by systematically increasing:

- A) The number of repetitions per set
- B) The duration of rest periods between sets
- C) The intensity (e.g., weight lifted) or volume (e.g., sets x reps)
- D) The frequency of training sessions per week

5. Which neurotransmitter plays a crucial role in initiating and controlling voluntary muscle contractions by binding to acetylcholine receptors at the neuromuscular junction?

- A) Serotonin
- B) Dopamine
- C) GABA (Gamma-aminobutyric acid)
- D) Acetylcholine

6. The lactate threshold is a physiological marker that represents the exercise intensity at which:

- A) Glycogen stores are completely depleted
- B) Blood lactate accumulation begins to increase exponentially
- C) Oxygen uptake plateaus
- D) Heart rate reaches its maximum

7. Which principle of biomechanics describes the tendency of a body to resist changes in its state of motion, and is directly related to the mass of the object being moved?

- A) Action-reaction
- B) Leverage
- C) Inertia
- D) Torque

8. During prolonged aerobic exercise, the primary fuel source shifts from predominantly carbohydrates to fats due to:

- A) Decreased circulating insulin levels
- B) Increased activity of hormone-sensitive lipase
- C) Reduced availability of intramuscular glycogen
- D) All of the above

9. The "size principle" of motor unit recruitment states that motor units are recruited in order of:

- A) Their speed of contraction, from slow to fast
- B) Their force-producing capacity, from low to high
- C) Their fatigability, from fatigue-resistant to easily fatiguing
- D) Their location within the muscle belly

10. Which ergogenic aid, when ingested and supplemented with carbohydrates, has been scientifically proven to enhance high-intensity, short-duration exercise performance by increasing the phosphocreatine stores in muscles?

- A) Beta-alanine
- B) Sodium bicarbonate
- C) Creatine monohydrate
- D) Caffeine

11. The "all-or-none" principle of muscle fiber contraction refers to the fact that:

- A) A muscle fiber will either contract to its full extent or not at all
- B) An entire motor unit will fire simultaneously
- C) A muscle group will contract with maximum force or not at all
- D) A muscle fiber can only contract if stimulated by a motor neuron

12. Which of the following hormonal responses is typically observed after acute resistance exercise, contributing to muscle protein synthesis and repair?

- A) Increased cortisol levels
- B) Decreased insulin-like growth factor 1 (IGF-1) levels
- C) Increased testosterone and growth hormone levels
- D) Decreased insulin levels

13. The primary mechanism for heat dissipation during exercise in a cool environment is:

- A) Conduction
- B) Convection
- C) Evaporation
- D) Radiation

14. Which type of muscle contraction involves the generation of force without a change in muscle length, often seen when holding a weight stationary?

- A) Isotonic (concentric)
- B) Isotonic (eccentric)
- C) Isometric
- D) Isokinetic

15. Cardiovascular adaptations to endurance training, such as increased stroke volume and reduced resting heart rate, are primarily mediated by:

- A) Increased sympathetic nervous system activity
- B) Increased myocardial contractility and improved ventricular filling
- C) Reduced blood volume
- D) Decreased capillary density in skeletal muscle

16. The rate of perceived exertion (RPE) scale, such as the Borg scale, is a subjective measure used to quantify:

- A) The absolute workload being performed
- B) The individual's physiological response to exercise
- C) The intensity of exercise based on subjective feeling
- D) The efficiency of oxygen utilization

17. Which of the following is a key determinant of the potential for skeletal muscle hypertrophy (growth)?

- A) Increased mitochondrial biogenesis
- B) Sufficient mechanical tension and metabolic stress
- C) Enhanced aerobic enzyme activity
- D) Reduced satellite cell activation

18. The "FITT principle" is a framework for designing exercise programs. What does the 'T' in FITT stand for?

- A) Target Heart Rate
- B) Temperature
- C) Time
- D) Type

19. During strenuous exercise, the body primarily relies on which substrate for energy when oxygen availability is limited?

- A) Free fatty acids
- B) Ketone bodies
- C) Glucose (via glycolysis)
- D) Amino acids