Cosmic Biomechanics and Sports Science

Space Sports Science · Practice Test · 18 Questions

1. What is the primary physiological mechanism leading to the loss of bone mineral density in astronauts during long-duration spaceflight?

A) Increased osteoclast activity due to lack of mechanical loading
B) Excessive consumption of sodium in the ISS diet
C) Ionizing radiation damaging the bone marrow
D) Decreased production of vitamin K in microgravity

2. Which specific cardiovascular adaptation occurs in astronauts upon returning to Earth's gravity after extended spaceflight?

A) Irreversible hypertrophy of the left ventricle
B) Orthostatic intolerance due to reduced plasma volume
C) Increased baroreceptor sensitivity
D) Systemic hypertension

3. What is the effect of microgravity on the human vestibular system's role in spatial orientation during athletic-like maneuvers?

A) Otolith organs signal constant acceleration
B) Semicircular canals become hyper-sensitive
C) Neural sensory reweighting leads to space motion sickness
D) Permanent damage to the vestibulocochlear nerve

4. Which exercise modality is scientifically proven to be most effective at preventing muscle atrophy during extended orbital missions?

A) Isometric contraction training
B) High-intensity resistance exercise with loading devices
C) Aerobic capacity training on a cycle ergometer
D) Electrical muscle stimulation

5. During a parabolic flight, what is the physiological consequence of the brief transition from hypergravity to microgravity on blood pressure regulation?

A) Carotid sinus reflex initiates immediate bradycardia
B) Blood shifts towards the cephalad region
C) Vasoconstriction occurs in the lower extremities
D) Total cessation of cardiac output

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6. What role does the 'ARED' (Advanced Resistive Exercise Device) play in space physiology?

A) Simulates atmospheric pressure on the ISS
B) Provides up to 600 lbs of load via vacuum cylinders
C) Monitors real-time VO2 max during EVA
D) Adjusts internal gravity via centrifugal force

7. In microgravity, why does the human spine undergo elongation?

A) Reduced hydrostatic pressure on intervertebral discs
B) Expansion of the nucleus pulposus due to fluid shifts
C) Increased bone marrow density
D) Degeneration of spinal ligaments

8. Which muscle group experiences the most significant rapid atrophy during spaceflight according to electromyography studies?

A) Biceps brachii
B) Soleus and other postural extensors
C) Rectus abdominis
D) Deltoids

9. How does space radiation exposure impact the metabolic rate of an athlete-astronaut compared to Earth-based training?

A) It increases metabolic efficiency
B) It induces oxidative stress, potentially impacting mitochondrial function
C) It has no impact on metabolic pathways
D) It significantly increases the rate of glycogen synthesis

10. What happens to the distribution of body fluids in the human body within the first few hours of exposure to microgravity?

A) Fluid shifts toward the lower limbs
B) Fluid shifts toward the thoracic and cranial regions
C) Equilibrium is maintained through the renin-angiotensin system
D) Intracellular dehydration occurs instantaneously

11. What is the 'Ocular-Vestibular' effect observed in astronauts performing physical tasks in space?

A) Increased intraocular pressure leading to permanent vision loss
B) Impairment of smooth pursuit eye movements
C) Enhanced depth perception due to lack of atmospheric haze
D) Total loss of accommodation reflex

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12. Which biomarker is commonly measured to track muscle protein catabolism in astronauts during long-term space endurance missions?

A) Serum creatinine
B) 3-Methylhistidine
C) C-reactive protein
D) Myoglobin

13. What is the impact of long-duration spaceflight on maximal aerobic capacity (VO2 max) upon immediate return to gravity?

A) It significantly decreases
B) It increases due to blood volume concentration
C) It remains statistically unchanged
D) It increases due to improved efficiency

14. How do proprioceptive signals from the limbs change during orbital flight when performing physical movements?

A) They become more accurate without gravity's constant load
B) They diminish due to the lack of gravitational sensory input
C) They shift to reliance on auditory feedback
D) They increase significantly to compensate for visual lag

15. Which sensory system is the primary contributor to 'Spatial Disorientation' when astronauts perform physical exercise without visual references?

A) Proprioception
B) Vision
C) Vestibular system
D) Tactile pressure

16. What is the term for the fluid shift-induced change in facial morphology common in spaceflight?

A) Puffy-face syndrome
B) Microgravity-induced cranial swelling
C) Orbital edema
D) Fluid-shift dysmorphia

17. Which physiological system is least affected by the transition from Earth gravity to microgravity?

A) Skeletal muscular system
B) Cardiovascular system
C) Digestive motility
D) Vestibular system

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18. How does the 'SANS' (Spaceflight-Associated Neuro-ocular Syndrome) affect performance during high-intensity cognitive-physical tasks?

A) It improves visual reaction time
B) It causes structural changes including optic disc edema
C) It leads to permanent deafness
D) It has no impact on physical output

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