Physiological Challenges in Maritime Technology

Maritime Technology · Answer Key · 8 Questions

1. In the context of confined maritime spaces, prolonged exposure to elevated levels of carbon dioxide (CO_2) can impair cognitive function. What is the approximate CO_2 concentration (in percentage) at which noticeable decrements in performance on vigilance and attention tasks typically begin?

A) 0.5%
B) 1.5%
C) 3.0%
D) 5.0%

2. Naval submariners can experience shifts in their circadian rhythm due to the absence of natural light cues. This desynchronization can lead to sleep disturbances and reduced performance. Which hormone is primarily responsible for regulating the sleep-wake cycle and is significantly affected by light exposure?

A) Cortisol
B) Melatonin
C) Serotonin
D) Adrenaline

3. The intense vibrations experienced on certain vessels, particularly high-speed craft or during heavy seas, can have cumulative effects on the human body. Which of the following is a known long-term health consequence associated with chronic exposure to whole-body vibration?

A) Increased bone density
B) Degenerative changes in the lumbar spine
C) Enhanced cardiovascular efficiency
D) Improved vestibular function

4. Deep-sea divers and submariners face increased ambient pressure. Under such conditions, nitrogen narcosis can occur. Which physiological mechanism best describes the effect of high partial pressures of nitrogen on the central nervous system?

A) Increased neurotransmitter reuptake
B) Enhanced neuronal membrane fluidity and altered ion channel function
C) Reduced blood flow to the brain
D) Stimulation of GABA receptors

5. The auditory system is vulnerable to damage in noisy maritime environments. Continuous exposure to sound levels above a certain threshold can lead to permanent hearing loss. What is the typical daily noise exposure limit (in decibels, dBA) above which hearing protection is generally recommended for occupational settings?

A) 70 dBA
B) 85 dBA
C) 100 dBA
D) 115 dBA

6. Long-duration space missions, often likened to isolated and confined environments, share some physiological challenges with long-term maritime deployments. A significant concern is bone demineralization. Which primary physiological process contributes most to this bone loss in microgravity or prolonged immobility?

A) Increased osteoblast activity
B) Reduced osteoclast activity
C) Lack of mechanical loading on bones
D) Enhanced calcium absorption

7. Maritime personnel operating in hot and humid environments are at risk of heat-related illnesses. The body's ability to dissipate heat is crucial. Which of the following is the primary mechanism by which the body loses heat in such conditions?

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

8. In the event of a submarine emergency involving a rapid ascent, divers and submariners are at risk of decompression sickness ('the bends'). This condition is caused by the formation of gas bubbles in tissues. Which gas is most commonly implicated in decompression sickness due to its solubility in body fluids?

A) Oxygen
B) Carbon Dioxide
C) Nitrogen
D) Helium