PRACTICE EXAM 13: CSCS FULL-LENGTH SIMULATION

SECTION 1 — SCIENTIFIC FOUNDATIONS

95 Questions | 1.5 Hours Recommended

EXERCISE SCIENCE (Questions 1–52)

1. A competitive weightlifter performs heavy snatches and clean and jerks 5 days per week for 3 years. A muscle biopsy of the vastus lateralis would most likely show which fiber type change compared to pre-training values?

A. Increased Type IIx from conversion of Type I fibers

B. Complete elimination of all Type I fibers

C. No measurable change in any fiber proportions

D. Decreased Type IIx with increased Type IIa

2. During the cross-bridge cycle, the myosin head must detach from actin before the next power stroke. Which molecule binds to myosin to cause this detachment?

A. Calcium

B. ATP

C. Troponin

D. Tropomyosin

3. A 19-year-old novice increases deadlift 1RM by 48% in 8 weeks with minimal hypertrophy. A 30-year-old experienced lifter on the same program gains 4% with notable hypertrophy. The novice's disproportionate strength gain is primarily attributed to which adaptation type?

A. Structural hypertrophy of the contractile proteins

B. Connective tissue thickening around the muscle belly

C. Neural improvements in recruitment, rate coding, and coordination

D. Sarcoplasmic fluid accumulation within the muscle fibers

4. The length-tension relationship predicts that at sarcomere lengths shorter than optimum, force production decreases. The molecular cause of this force reduction is which event?

A. Actin filament overlap and compression against the Z-lines

B. Myosin heads losing the ability to hydrolyze ATP

C. Calcium channels closing at shortened muscle lengths

D. Motor neuron firing ceasing at short sarcomere lengths

5. An athlete squats 92% 1RM at a slow controlled velocity. According to the force-velocity relationship, this load places the athlete at which position on the curve?

A. The high-velocity, low-force end

B. The high-force, low-velocity end

C. The exact midpoint producing peak power

D. Force-velocity position is independent of load

6. Henneman's Size Principle predicts that an athlete performing biceps curls at 25% 1RM recruits primarily which motor unit type?

A. Type IIx motor units with the highest thresholds

B. All motor unit types simultaneously regardless of load

C. Type IIa motor units before Type I motor units

D. Type I motor units with the lowest activation thresholds

7. An exercise physiologist records blood lactate during a graded treadmill test: 8 km/h = 1.1 mmol/L, 10 km/h = 1.7 mmol/L, 12 km/h = 4.9 mmol/L, 13 km/h = 8.8 mmol/L. The lactate threshold occurred at approximately which speed?

A. Between 10 and 12 km/h

B. At 8 km/h where the first sample was taken

C. At 13 km/h where the highest value was recorded

D. Cannot be identified from graded test data

8. A 35-second all-out rowing ergometer test produces blood lactate of 14 mmol/L, severe leg burning, and 28% power decline. The dominant energy system is which of the following?

A. Oxidative phosphorylation through fat metabolism

B. The phosphagen system exclusively for 35 seconds

C. Anaerobic glycolysis

D. Beta-oxidation of intramuscular triglycerides

9. An athlete's RER during a 3-hour ride at 62% VO_2max decreases from 0.86 to 0.77. This shift indicates which change?

A. Increased anaerobic glycolysis in the final hour

B. Greater reliance on fat oxidation as glycogen depletes

C. Increased protein catabolism as the sole fuel source

D. Decreased total metabolic activity

10. The Krebs cycle produces NADH and $FADH_2$ as its primary energy-carrying outputs. These carriers deliver electrons to which pathway for the majority of aerobic ATP production?

A. Glycolysis in the sarcoplasm

B. Beta-oxidation in the mitochondrial matrix

C. The phosphagen system for PCr resynthesis

D. The electron transport chain on the inner mitochondrial membrane

11. Fat oxidation yields more ATP per molecule than glucose. The reason fat cannot fuel high-intensity exercise is which limitation?

A. The rate of ATP production from fat is too slow for high-intensity demands

B. Fat stores are too small for meaningful energy contribution

C. Fat cannot physically enter the mitochondria during exercise

D. Fat produces toxic byproducts at high intensities

12. A runner's blood glucose drops to 45 mg/dL after 3.5 hours at 67% VO_2max. The resulting performance decline is caused by which metabolic event?

A. Phosphocreatine depletion from the aerobic running effort

B. Hydrogen ion accumulation from steady-state moderate running

C. Glycogen depletion and hypoglycemia

D. Protein catabolism destroying all contractile muscle tissue

13. During a graded exercise test, VO_2 plateaus at 52 mL/kg/min despite two additional workload increases. RER = 1.19, blood lactate = 13 mmol/L, HR within 4 bpm of age-predicted max. This confirms which measure?

A. The ventilatory threshold at 52 mL/kg/min

B. VO_2max at 52 mL/kg/min

C. Resting metabolic rate under exercise conditions

D. The lactate threshold at 52 mL/kg/min

14. The electron transport chain requires which molecule as its final electron acceptor?

A. Carbon dioxide recycled from the Krebs cycle

B. NADH as the final product of the chain

C. Lactate donating electrons to Complex I

D. Oxygen combining with electrons and hydrogen to form water

15. An athlete produces 3,200 N of vertical GRF during a jump. Body weight is 882 N (90 kg). The net upward force available for acceleration is which value?

A. 2,318 N (3,200 − 882)

B. 3,200 N without subtracting body weight

C. 0 N because GRF equals body weight

D. Cannot be calculated from these data

16. During a barbell overhead press, the sticking point occurs at approximately 90° of elbow flexion where the moment arm on the shoulder is greatest. This sticking point exists because of which principle?

A. The deltoids reach shortest length and cannot produce force

B. Blood flow is occluded at exactly 90° of elbow flexion

C. Torque = force × moment arm; maximum moment arm creates peak torque demand

D. Gravitational force doubles at this specific joint angle

17. The bicarbonate buffering system neutralizes hydrogen ions from glycolysis, generating additional CO_2 that must be expelled. The disproportionate ventilation increase triggered by this CO_2 defines which threshold?

A. The phosphocreatine recovery threshold

B. The ventilatory threshold

C. The fat oxidation ceiling

D. The protein deamination threshold

18. Peak muscular power occurs at approximately which region of the force-velocity curve?

A. Maximum force at zero velocity

B. Maximum velocity at zero external load

C. Power is identical at every point on the curve

D. 30-60% of maximal force with moderate-to-high velocity

19. An athlete's passive knee flexion is 142° and active knee flexion is 128°. The 14° difference reflects which principle?

A. The neuromuscular limits of voluntary effort versus external force

B. A structural bone abnormality preventing active flexion

C. A complete hamstring tear on the tested leg

D. Goniometer error of exactly 14°

20. Eccentric cardiac hypertrophy from endurance training directly increases which cardiovascular variable?

A. Resting diastolic blood pressure

B. Blood viscosity at rest and during exercise

C. Maximal stroke volume

D. Resting sympathetic nervous system tone

21. Blood flow redistribution during maximal exercise directs cardiac output to working muscles through which dual mechanism?

A. Permanent vessel closure to the brain

B. Local metabolic vasodilation plus sympathetic vasoconstriction in non-essential organs

C. Decreased total cardiac output concentrating blood

D. Increased blood viscosity forcing flow to active tissue

22. A resistance protocol of 4×10 at 70% with 60-second rest produces greater GH elevation than 5×2 at 93% with 5-minute rest. The primary GH stimulus is which factor?

A. Heavier absolute loads in the volume protocol

B. Greater training time in the strength protocol

C. Superior neural recruitment from lighter loads

D. Higher metabolic stress from incomplete recovery

23. Female athletes with 10-15× lower testosterone than males achieve strength gains primarily through which mechanism?

A. Neural adaptations including recruitment and coordination

B. Greater GH compensating for lower testosterone

C. Flexibility directly increasing force production

D. Bone density replacing hypertrophy

24. An athlete's T:C ratio declines for 9 weeks alongside stagnated performance, insomnia, elevated resting HR, and persistent fatigue. This indicates which condition?

A. Optimal competitive peaking

B. Normal hormonal fluctuation

C. Overtraining syndrome

D. Acute delayed-onset muscle soreness

25. Wolff's Law predicts the greatest osteogenic stimulus from which exercise type?

A. Deep-water aquatic exercise with buoyancy

B. Ground-based resistance with compressive and impact forces

C. Recumbent cycling at very low intensity

D. Seated machine exercises with light loads

26. Two athletes share a 200 kg squat 1RM. Athlete A jumps 73 cm; Athlete B jumps 55 cm. The 18 cm difference is explained by which quality?

A. Superior aerobic capacity in Athlete A

B. Greater absolute strength in Athlete A

C. Greater flexibility in Athlete A

D. Superior rate of force development in Athlete A

27. During sprint acceleration, a forward lean allows GRF to be directed in which direction?

A. Primarily horizontally to generate forward momentum

B. Primarily vertically to maximize flight time

C. Mediolaterally for balance establishment

D. No specific direction — lean has no effect

28. At maximum sprint velocity, which GRF component most distinguishes faster from slower sprinters?

A. The anteroposterior component

B. The mediolateral component

C. The vertical component

D. All three components equally

29. An athlete's CMJ = 69 cm and SJ = 56 cm. The 13 cm difference represents which mechanism?

A. Greater phosphocreatine availability during CMJ

B. The stretch-shortening cycle

C. Enhanced aerobic energy during the countermovement

D. Reduced bodyweight at the transition point

30. Connective tissue adapts more slowly than muscle because of which characteristic?

A. Identical metabolic activity to muscle tissue

B. Higher metabolic rate than muscle tissue

C. No capacity for structural remodeling

D. Lower metabolic activity and reduced blood supply

31. The SAID principle predicts that slow jogging at 55% HRmax for a tennis player violates specificity because it fails to develop which demands?

A. Explosive lateral movement, sprint speed, and anaerobic recovery capacity

B. Only aerobic fitness is needed for competitive tennis

C. Slow jogging provides all tennis-specific adaptations

D. Only flexibility determines tennis performance

32. Eccentric force exceeds concentric force by 20-60%. This supports which training application?

A. Identical loading for all contraction types

B. Elimination of all eccentric training

C. Supramaximal eccentric training with loads exceeding concentric 1RM

D. Eccentric actions produce zero force at all velocities

33. Detraining shows which quality declines most rapidly?

A. Maximal strength within 24 hours

B. Bone mineral density within 5 days

C. Flexibility permanently within 48 hours

D. Aerobic capacity within 1-2 weeks

34. Third-class levers in the body favor which mechanical outcome?

A. Force amplification at the expense of speed

B. Speed and range of motion at the expense of force

C. Equal force and speed at all joint angles

D. Zero mechanical advantage in any direction

35. The creatine kinase reaction's speed advantage comes from which characteristic?

A. Single-step enzymatic reaction in the sarcoplasm requiring no oxygen

B. Complex multi-step mitochondrial processing

C. Exclusive operation within the mitochondria

D. Requirement for oxygen as an essential co-factor

36. The "muscle memory" phenomenon is explained by which mechanism?

A. Elevated creatine kinase persisting indefinitely

B. Residual glycogen lasting years after detraining

C. Retained myonuclei from prior training persisting through atrophy

D. Circulating testosterone remaining elevated permanently

37. PNF contract-relax stretching increases ROM through which proprioceptor mechanism?

A. Muscle spindle facilitation increasing contraction

B. Pacinian corpuscle vibration detection

C. Ruffini ending pressure sensing at the joint capsule

D. GTO autogenic inhibition reducing muscle tone

38. Diastolic blood pressure remains stable during moderate exercise because of which mechanism?

A. Vasoconstriction in all vascular beds simultaneously

B. Vasodilation in working muscles reducing peripheral resistance

C. Increased blood viscosity maintaining pressure

D. Decreased cardiac output during the diastolic phase

39. An athlete calculates torque: 10 kg dumbbell at 90° shoulder abduction, 0.62 m from joint to center of mass. The torque is approximately which value?

A. Approximately 60.8 N·m

B. 10 N·m

C. 0 N·m

D. 250 N·m

40. Cortisol's acute catabolic actions during exercise serve which purpose?

A. Stimulating protein synthesis via mTOR activation

B. Enhancing glycogen synthesis in muscle tissue

C. Protein degradation and gluconeogenesis for blood glucose maintenance

D. Suppressing all lipolysis regardless of exercise duration

41. An athlete's post-14-week blood work shows stable testosterone, decreased cortisol, improved T:C ratio, and continued performance gains. This indicates which status?

A. Advanced overtraining syndrome

B. Underlying medical condition

C. Meaningless hormonal data

D. Successful positive adaptation

42. Chronic resistance training increases androgen receptor density. The significance is which of the following?

A. No effect on the muscle's hormonal response

B. Enhanced muscle sensitivity to circulating testosterone

C. Eliminates the need for sleep and nutrition

D. Reverses within 24 hours of training cessation

43. The crossover concept describes which metabolic phenomenon?

A. Progressive shift from fat to carbohydrate oxidation as intensity increases

B. Transfer of training from one limb to the contralateral limb

C. Conversion of fast-twitch to slow-twitch fibers

D. Transition from aerobic to anaerobic threshold

44. The Cori cycle recycles lactate to glucose through which organ?

A. The kidneys

B. The spleen

C. The liver

D. The pancreas

45. A female runner has amenorrhea for 11 months, 1,050 kcal/day with 3 hours training, decreased BMD, and repeated stress fractures. This indicates which condition?

A. Iron deficiency anemia

B. Normal endurance training adaptation

C. Vitamin D toxicity

D. RED-S

46. RED-S in male athletes produces which consequences?

A. Enhanced performance from metabolic efficiency

B. Suppressed testosterone, decreased BMD, impaired immunity, declining performance

C. Increased testosterone from adaptive caloric restriction

D. No health consequences in males

47. The stretch reflex during plyometric landing is classified as which pathway type?

A. Monosynaptic — the fastest reflexive contraction

B. Polysynaptic through the cerebral cortex

C. Voluntary cortical contraction

D. Inhibitory reflex reducing force production

48. Depth jump contact time increases from 170 ms to 360 ms by rep 6 with declining rebound. The appropriate response is which of the following?

A. Increase box height for faster transitions

B. Add ankle weights for greater eccentric load

C. Terminate the exercise — SSC benefit is lost

D. Continue to 15 reps for fatigue-based adaptation

49. Two athletes at 86 kg produce 2,950 N peak GRF. Athlete A peaks at 125 ms; Athlete B at 270 ms. Athlete A jumps higher because of which quality?

A. Greater absolute strength in Athlete A

B. Superior aerobic capacity

C. Greater flexibility

D. Superior rate of force development

50. If amortization during a depth jump exceeds 250 ms, which consequence occurs?

A. The stretch reflex is amplified

B. Elastic energy dissipates and stretch reflex contribution diminishes

C. Concentric force is enhanced

D. Musculotendinous stiffness increases

51. The calf raise exemplifies a second-class lever favoring which outcome?

A. Force production because the effort arm exceeds the resistance arm

B. Speed and ROM at the expense of force

C. Equal force and speed at all joint angles

D. Zero mechanical advantage

52. An athlete plateaus after 20 weeks on the same program. The accommodation principle suggests which intervention?

A. Continue the identical program indefinitely

B. Complete training cessation for 6 months

C. Introduce variation in exercises, loads, or periodization

D. Reduce all loads to 25% permanently

SPORT PSYCHOLOGY (Questions 53–75)

53. An athlete reports pre-competition muscle tension, elevated HR, and sweaty palms. These are symptoms of which anxiety type?

A. Cognitive anxiety from negative thoughts

B. Trait anxiety that cannot be modified

C. Facilitative arousal enhancing performance

D. Somatic anxiety

54. The inverted-U predicts that a precision golf putt requires which arousal level?

A. Very high arousal for maximum muscle activation

B. Low-to-moderate arousal for fine motor control

C. High arousal identical to a maximal tackle

D. Arousal is irrelevant to putting accuracy

55. The most effective goal-setting combines which three types?

A. Outcome, performance, and process goals hierarchically

B. Only outcome goals without daily targets

C. Only process goals without long-term direction

D. No goals because goal-setting reduces motivation

56. Self-efficacy is distinguished from general confidence by which feature?

A. It is a global personality trait across all tasks

B. Determined exclusively by genetics

C. Task-specific and situation-specific

D. Identical to general confidence in all respects

57. A coach says: "Your elbows dropped during the front squat catch." This is classified as which feedback type?

A. Knowledge of results about the outcome

B. Intrinsic feedback from proprioception

C. Motivational feedback to increase effort

D. Knowledge of performance about technique quality

58. Random practice compared to blocked practice produces which long-term outcome?

A. Faster improvement and better retention simultaneously

B. Slower initial improvement but better long-term retention

C. Identical outcomes regardless of structure

D. Faster improvement with identical retention

59. The guidance hypothesis states feedback after every rep produces which consequence?

A. Impaired learning from dependency on external correction

B. Optimal permanent learning from maximum information

C. Accelerated mastery persisting indefinitely

D. No measurable effect on skill acquisition

60. Distributed practice produces better long-term learning through which mechanism?

A. Elimination of all errors during practice

B. Complete glycogen resynthesis improving cortex function

C. Memory consolidation during rest intervals

D. Massed practice produces zero learning

61. An athlete in Fitts and Posner's autonomous stage demonstrates which characteristics?

A. Large errors with heavy reliance on verbal instruction

B. Inability to perform the skill under any conditions

C. Conscious attention required for every repetition

D. Automatic execution with attention free for strategy

62. Athletic burnout is characterized by which three dimensions?

A. Increased motivation, energy, and drive

B. Emotional exhaustion, depersonalization, and reduced accomplishment

C. Normal fluctuation resolving within hours

D. Acute anxiety resolving after competition

63. A 15-year-old athlete shows isolation, persistent worthlessness, lost interest, and hopelessness. The specialist should do which of the following?

A. Recommend parents seek mental health evaluation

B. Design more intense training for confidence

C. Increase competitive schedule

D. Ignore as normal adolescent development

64. Self-determination theory identifies which three basic needs?

A. Strength, power, and endurance

B. Visual, kinesthetic, and auditory processing

C. Autonomy, competence, and relatedness

D. Outcome, performance, and process

65. A wrestler displays extreme weight manipulation, meal avoidance, and excessive exercise. The CSCS should do which of the following?

A. Prescribe a corrective meal plan independently

B. Increase body composition testing frequency

C. Ignore as normal wrestling culture

D. Refer to a qualified healthcare professional

66. An athlete watches a teammate of similar ability complete a challenging lift. The confidence increase comes from which self-efficacy source?

A. Past performance accomplishment

B. Vicarious experience

C. Verbal persuasion

D. Physiological state interpretation

67. An athlete excels in practice but underperforms in competition with worry and self-talk. This indicates which phenomenon?

A. Choking under pressure from excessive cognitive anxiety

B. Social facilitation enhancing performance

C. Optimal arousal producing best output

D. A permanent disorder preventing success

68. An ACL patient fears re-injury during cutting despite full clearance. The best response is which of the following?

A. Immediate full-contact return to competition

B. Permanent elimination of all cutting movements

C. Gradual reintroduction with sport psychology referral

D. Dismissal of psychological concerns as irrelevant

69. When a pitcher throws a fastball then a changeup, which GMP parameter changes?

A. Relative timing of all muscle activations

B. Fundamental spatial pattern of the throw

C. Nothing — the GMP is permanently fixed

D. Overall speed and absolute force of execution

70. A point guard scanning the court for open teammates uses which focus?

A. Narrow-internal

B. Broad-external

C. Narrow-external

D. Broad-internal

71. An athlete squats 195 kg for the first time. Confidence for 200 kg increases primarily through which source?

A. Past performance accomplishment

B. Vicarious experience from a teammate

C. Verbal persuasion from the coach

D. Physiological state interpretation

72. Reducing feedback to ~50% of trials produces which effect?

A. Slower acquisition during practice

B. Identical outcomes regardless of frequency

C. Better long-term retention through internal error detection

D. Permanent impairment of all motor learning

73. Somatic anxiety symptoms are best addressed by which intervention?

A. Thought stopping and cognitive restructuring

B. Goal-setting worksheets and planning

C. Imagery of worst-case failure scenarios

D. Physical relaxation techniques (PMR, diaphragmatic breathing)

74. Front squats transferring to the power clean catch is which transfer type?

A. Negative transfer impairing the catch

B. Positive transfer

C. Zero transfer

D. Random unpredictable transfer

75. Mental imagery is most effective when engaging which sensory modalities?

A. Visual, kinesthetic, auditory, and emotional simultaneously

B. Only visual with all others suppressed

C. Only kinesthetic with no visual component

D. Only auditory sounds of competition

NUTRITION (Questions 76–95)

76. A 115 kg strength athlete at 2.2 g/kg/day requires which daily protein target?

A. 92 grams

B. 172 grams

C. 253 grams

D. 575 grams

77. Which amino acid is the primary trigger for mTOR activation?

A. Glutamine

B. Glycine

C. Alanine

D. Leucine

78. An athlete on <15% fat for 6 months has suppressed testosterone. The cause is which of the following?

A. Excessive protein causing renal stress

B. Inadequate fat impairing steroid hormone production

C. Excessive carbohydrate causing insulin resistance

D. Chronic dehydration mimicking hormonal suppression

79. An athlete drinks 2.5 L/hr plain water for 5 hours without sodium during an ultra. The resulting confusion is caused by which condition?

A. Exercise-associated hyponatremia from sodium dilution

B. Hypernatremia from sodium concentration

C. Metabolic alkalosis from water pH

D. Rhabdomyolysis from muscle damage

80. Creatine maintenance (3-5 g/day without loading) achieves saturation in approximately how long?

A. 24-48 hours

B. Impossible without the loading phase

C. Approximately 28 days

D. 6-12 months regardless of dose

81. Caffeine's primary ergogenic mechanism is which of the following?

A. Directly increasing phosphocreatine stores

B. Stimulating muscle protein synthesis

C. Permanently increasing resting metabolic rate

D. Blocking adenosine receptors reducing fatigue perception

82. Beta-alanine is most beneficial for activities lasting which duration?

A. Less than 5 seconds

B. 1-4 minutes

C. Longer than 60 minutes

D. During complete rest

83. Which certification minimizes WADA doping risk from supplements?

A. NSF Certified for Sport or Informed Sport

B. USDA Organic

C. FDA pharmaceutical approval

D. ISO 9001 manufacturing

84. For an athlete in caloric deficit, protein should be at which level?

A. General population RDA of 0.8 g/kg

B. Less than 0.5 g/kg to minimize calories

C. 2.0-2.4 g/kg/day to preserve lean mass

D. No protein during restriction

85. Sodium bicarbonate's most common side effect is which of the following?

A. Permanent liver damage

B. Dangerous cardiac arrhythmias

C. Complete energy system suppression

D. GI distress including nausea, bloating, and diarrhea

86. A 70 kg endurance athlete at 10 g/kg/day requires which carbohydrate target?

A. 70 grams

B. 700 grams

C. 350 grams

D. 1,400 grams

87. Vitamin D deficiency consequences include which of the following?

A. Impaired muscle function, compromised immunity, elevated stress fracture risk

B. Excessive uncontrollable hypertrophy

C. Enhanced performance from metabolic efficiency

D. No consequences for athletes

88. Vitamin C enhances non-heme iron absorption through which mechanism?

A. Inhibiting all iron absorption

B. No interaction with iron metabolism

C. Converting Fe^{3+} to more bioavailable Fe^{2+}

D. Enhancing heme iron while blocking non-heme

89. When two sessions are within 8 hours, post-exercise carbohydrate should be which amount?

A. No carbohydrate for 12 hours

B. Only protein with zero carbohydrate

C. 0.1 g/kg to minimize insulin response

D. 1.0-1.5 g/kg to maximize glycogen synthase activity

90. Plant-based athletes achieve adequate amino acids through which strategy?

A. Plant diets cannot provide adequate protein

B. Complementary plant sources throughout the day

C. Only soy protein at every meal

D. 100 grams isolated BCAAs daily

91. Casein before sleep supports recovery through which mechanism?

A. Slow gel-forming digestion providing sustained amino acid delivery

B. Immediate emptying identical to whey

C. Complete catabolic suppression for 48 hours

D. No benefit — pre-sleep protein is wasted

92. High-GI foods are most appropriate at which time?

A. Only at breakfast regardless of training

B. Exclusively before sleep

C. During and immediately after exercise

D. Never by any athlete

93. Glutamine's evidence for muscle growth in well-nourished athletes is best described as which of the following?

A. Strongest evidence of any supplement

B. Permanently elevates testosterone

C. Only supplement approved by all agencies

D. Limited — not among robust ergogenic aids

94. Adequate dietary fat (20-35% calories) serves which functions?

A. No physiological function at all

B. Hormone production, vitamin absorption, membrane integrity, essential fatty acids

C. Exclusive phosphagen fuel during sprinting

D. Direct Type IIx hyperplasia stimulation

95. Fluid intake during 90-minute team sport should follow which guideline?

A. 200-300 mL every 15-20 minutes adjusted for sweat rate

B. No fluid because drinking impairs performance

C. 4 liters at halftime

D. Only caffeinated beverages

SECTION 2 — PRACTICAL/APPLIED

125 Questions | 2.5 Hours Recommended

EXERCISE TECHNIQUE (Questions 96–140)

96. An athlete performing back squats consistently shifts weight to the right side during the ascent. This lateral shift most commonly indicates which underlying issue?

A. Bilateral hip mobility that is symmetrical

B. Superior bilateral quadriceps strength

C. Unilateral hip mobility restriction or strength asymmetry

D. Normal squat mechanics needing no correction

97. During a conventional deadlift, the athlete's hips rise faster than the chest off the floor, creating a "stripper pull" pattern. This fault shifts loading from the legs to which structure?

A. The ankle joint and calf musculature

B. The anterior deltoids and upper chest

C. The wrist flexors and forearm extensors

D. The lumbar spine and erector spinae

98. An athlete performing dumbbell bench press allows the elbows to flare to 90° from the torso at the bottom. This position increases risk of which injury?

A. Hamstring strain from the bench position

B. Shoulder impingement and pectoral tendon strain

C. Biceps tendon rupture at the elbow

D. Quadriceps strain from bracing the feet

99. A strength and conditioning specialist programs single-leg RDLs for a soccer midfielder. This exercise addresses which sport-specific demands?

A. Unilateral hip hinge strength, hamstring resilience, and single-leg balance

B. Bilateral pressing power for throw-ins

C. Maximum bilateral squat strength for headers

D. Aerobic endurance for 90-minute matches

100. An athlete performing box jumps consistently lands with stiff legs and minimal knee flexion. This landing pattern creates which concern?

A. Enhanced force production from the rigid landing

B. Improved ankle stiffness for subsequent jumps

C. Excessive impact forces from inadequate absorption

D. No safety concern with this technique

101. The NSCA's top-down power clean progression begins with which exercise?

A. Full squat clean from the floor

B. Hang clean at challenging loads

C. Clean pull without catching the bar

D. The front squat to establish the receiving position

102. An athlete performing pull-ups initiates the movement with a shoulder shrug before engaging the lats. This reduces activation of which target muscle?

A. The upper trapezius and levator scapulae

B. The latissimus dorsi

C. The biceps brachii and brachioradialis

D. The anterior deltoid and pectoralis minor

103. Proper breathing during near-maximal compound lifts for trained athletes involves which technique?

A. The Valsalva maneuver for spinal stabilization

B. Continuous exhaling through both phases

C. Inhaling during the concentric phase

D. No structured breathing is necessary

104. A strength and conditioning specialist programs tempo squats (4-sec eccentric, 2-sec pause, 2-sec concentric). This prescription targets which adaptation?

A. Maximum power through high-velocity execution

B. Aerobic endurance through extended set duration

C. Time under tension for hypertrophy and positional awareness

D. Flexibility through loaded stretching

105. An athlete performing cable woodchops rotates primarily through the lumbar spine. This pattern creates which concern?

A. Enhanced core activation from lumbar rotation

B. Improved rotational power development

C. No concern — lumbar rotation is intended

D. Excessive lumbar rotational stress increasing disc injury risk

106. A strength and conditioning specialist includes farmer's walks as core training. This exercise develops which qualities?

A. Isolated rectus abdominis hypertrophy

B. Grip endurance, core stability, and postural strength

C. Maximum rotational power for throwing

D. Spinal flexion range of motion

107. A strength and conditioning specialist programs landmine presses for an athlete with limited overhead mobility. This provides which advantage?

A. An angled pressing path without requiring full overhead ROM

B. Identical overhead demands to a barbell strict press

C. Exclusive lower body loading with no pressing

D. Isolated rotator cuff work without deltoid engagement

108. Kettlebell swings are classified as a hip hinge. The primary force generators are which muscles?

A. The arms and anterior deltoids

B. The quadriceps through knee extension

C. The hip extensors (glutes and hamstrings)

D. The lumbar erectors through spinal hyperextension

109. An athlete performing Nordic hamstring curls reports excessive low back strain rather than hamstring loading. The most likely cause is which error?

A. Insufficient ankle dorsiflexion during foot placement

B. Excessive knee flexion during the curl component

C. Inadequate spinal flexion during the eccentric phase

D. Lumbar hyperextension substituting for hip extensor work

110. Band-resisted sprints primarily develop which quality?

A. Aerobic endurance through sustained running

B. Overloaded horizontal force production during acceleration

C. Hip flexor flexibility during the sprint stride

D. Reduced joint impact forces during training

111. A strength and conditioning specialist programs eccentric-emphasized Bulgarian split squats (5-sec lowering). This targets which adaptations?

A. Eccentric strength, hypertrophy, and tendon resilience

B. Maximum concentric power through high-velocity execution

C. Aerobic endurance through extended set duration

D. Flexibility improvement exclusively

112. An athlete performing seated cable rows demonstrates rounded shoulders at end range. This indicates insufficient activation of which muscles?

A. The pectoralis major and anterior deltoid

B. The quadriceps and hip flexors

C. The scapular retractors (mid-traps and rhomboids)

D. The biceps and brachioradialis

113. A strength and conditioning specialist includes Turkish get-ups. This exercise develops which primary qualities?

A. Maximum bilateral pressing at heavy loads

B. Isolated biceps hypertrophy and grip endurance

C. Maximum sprint speed and acceleration

D. Shoulder stability, core strength, and total-body coordination

114. During a barbell hip thrust, an athlete hyperextends the lumbar spine at lockout. This creates which concern?

A. Enhanced glute activation from extended ROM

B. Lumbar compressive forces from end-range hyperextension under load

C. Improved core stability from the arched position

D. No concern — spinal position is irrelevant

115. A strength and conditioning specialist programs sled pushes for a football lineman. This develops which sport-specific quality?

A. Horizontal force production and acceleration matching blocking demands

B. Overhead pressing strength for pass blocking

C. Vertical jumping power for contested catches

D. Aerobic endurance for sustained low-intensity play

116. During barbell lunges, an athlete's front knee collapses inward (valgus). This indicates weakness in which muscle group?

A. The hip flexors and rectus femoris

B. The ankle plantarflexors and soleus

C. The hip abductors and external rotators (gluteus medius)

D. The anterior deltoids and upper trapezius

117. A strength and conditioning specialist programs depth drops (landing only, no rebound) in early plyometric progression. The purpose is which of the following?

A. Developing maximum concentric jumping power

B. Building aerobic endurance through repeated landings

C. Developing maximum rotational power

D. Teaching eccentric landing mechanics before introducing reactive jumps

118. When spotting dumbbell exercises, assistance is applied at which location?

A. Directly on the dumbbells themselves

B. At the wrists near the athlete's hands

C. At the elbows for leverage assistance

D. At the upper arms near the shoulders

119. Proper box jump landing requires which combination of standards?

A. Soft landing with hip/knee flexion, neutral spine, knees tracking over toes

B. Stiff-legged landing with locked knees

C. Landing on the heels with trunk flexed forward

D. Single-leg landing with opposite leg extended

120. A strength and conditioning specialist programs face pulls with external rotation. The primary purpose for a pressing-dominant athlete is which of the following?

A. Increasing bench press 1RM through carryover

B. Maximum pectoral hypertrophy from the pull

C. Posterior shoulder and scapular health to balance pressing

D. Aerobic endurance for the shoulder girdle

121. A strength and conditioning specialist observes an athlete's barbell RDL knees sliding forward excessively. The correction cue is which of the following?

A. Increase knee flexion further beyond 90°

B. Look straight down at the floor

C. Round the spine to shift the hips back

D. "Push your hips straight back" to maintain the hinge

122. A reverse lunge reduces anterior knee stress compared to forward lunges because of which factor?

A. Greater patellofemoral compression for strengthening

B. Elimination of front-leg eccentric deceleration demand

C. Increased forward knee translation

D. Elimination of all eccentric muscle action

123. The hex bar deadlift provides which advantage over the conventional deadlift?

A. Reduced lumbar moment arm from load centered closer to the body

B. Greater lumbar moment arm for back strengthening

C. Identical biomechanics with no difference

D. Increased grip demand from thicker handles

124. Banded squats provide maximum resistance at which position?

A. The bottom where the band is least stretched

B. Constant throughout the ROM

C. The top where the band is fully stretched

D. The bottom where the athlete is weakest

125. A medicine ball throw qualifies as plyometric only with which characteristic?

A. 5-second isometric pause between catch and throw

B. Slow controlled tempo for time under tension

C. Maximum weight regardless of execution speed

D. Maximal speed with minimal eccentric-to-concentric transition

126. Olympic lifting platforms should be positioned with which consideration?

A. Against mirrors for technique monitoring

B. Separated from traffic with clearance for dropped barbells

C. Adjacent to cardio equipment for circuits

D. Center of facility for motivational atmosphere

127. With 30 athletes and 10 racks, the optimal approach is which of the following?

A. Groups of 3 per rack rotating squat, spot, and rest

B. All 30 doing bodyweight squats while waiting

C. All 30 watching one demonstration

D. Eliminating squats from the program

128. Barbell collars serve which primary safety purpose?

A. Increasing total barbell weight

B. Improving grip friction on the bar

C. Preventing plates from sliding off during exercise

D. Decorative with no function

129. An athlete's program includes hang snatches, back squats, incline press, rows, curls, and planks. Which exercise is first?

A. Curls for isolation before compounds

B. Planks for core pre-activation

C. Rows before pressing exercises

D. Hang snatches — explosive exercise when freshest

130. The recommended single-spotter bench press grip is which of the following?

A. Wide pronated grip matching the athlete's width

B. Alternated grip close to center for security

C. No grip — hands on the elbows

D. Supinated grip near the plates

131. An athlete explosive on field but struggling with heavy lifts has which deficiency?

A. Maximal strength deficit requiring heavy training (85%+ 1RM)

B. Excessive explosive ability beyond development

C. Only aerobic conditioning needed

D. Only flexibility training needed

132. Correct RDL technique includes which standards?

A. Full knee lockout with lumbar rounding

B. Deep knee flexion in a squat pattern

C. Slight constant knee flexion, neutral spine, hip hinge, bar close to legs

D. Alternating knee extension and flexion each rep

133. A swimmer's program includes pull-ups, I/E rotation, and anti-rotation core. This addresses which needs?

A. Only lower body power for kicking

B. Only flexibility for stroke mechanics

C. Only cardiovascular endurance

D. Pulling strength, rotator cuff health, and trunk stability

134. The Pallof press trains the core to resist which force?

A. Sagittal extension force

B. Rotational force attempting to twist the torso

C. Sagittal flexion force

D. Frontal plane lateral flexion

135. Before the snatch, which mobility prerequisite must be assessed?

A. Overhead squat mobility with locked arms in a deep squat

B. Only ankle dorsiflexion

C. Only wrist flexion

D. No prerequisites needed

136. Correct push-up standards include which combination?

A. Hips sagging with visible swayback

B. Elbows flared to 90° from the torso

C. Straight line head-to-heels, chest near floor, elbows ~45°

D. Partial ROM with elbows bending 10-15°

137. Conditioning for an offensive lineman (4-7 sec plays, 25-40 sec rest) uses which protocol?

A. Continuous 3-mile runs at moderate pace

B. 400-meter repeats with 60-second rest

C. 60-minute cycling at 50% HRmax

D. 5-10 yard sprints with 25-40 second rest

138. Cable face pulls with external rotation target which muscles?

A. Pectoralis major for pressing strength

B. Posterior deltoids, external rotators, and mid-trapezius

C. Quadriceps for leg extension power

D. Biceps for arm hypertrophy

139. A strength and conditioning specialist programs reactive agility drills where athletes respond to visual cues while sprinting. This develops which quality that preplanned drills cannot?

A. Perceptual-cognitive processing combined with direction change

B. Straight-line sprint speed only

C. Bilateral lower body strength

D. Only aerobic endurance

140. A strength and conditioning specialist programs isometric mid-thigh pulls. This exercise assesses and develops which quality?

A. Maximum flexibility through loaded stretching

B. Aerobic endurance through sustained holds

C. Peak isometric force and rate of force development

D. Muscular endurance through high repetitions

PROGRAM DESIGN (Questions 141–184)

141. A competitive 100-meter sprinter (race lasting ~10-12 seconds) relies most heavily on which energy system?

A. Exclusively the oxidative system through fat metabolism

B. The glycolytic system as the primary contributor

C. No specific system is dominant

D. The phosphagen system as the primary contributor

142. A barbell power snatch is classified as a power exercise because it meets which criteria?

A. Single-joint machine isolation at slow tempo

B. Structural, explosive, involving multiple large muscle groups

C. Non-structural with no spinal loading component

D. Identical to a slow overhead press at light resistance

143. For a novice with 2 months of experience, the most appropriate training format is which of the following?

A. 2-3 sessions/week total-body with moderate loads and technique emphasis

B. 6 sessions/week advanced body-part split at maximal loads

C. 1 session/month at maximal loads to failure

D. Daily machine-only sessions at maximum intensity

144. The 8-12 rep range at 67-85% 1RM with 60-90 sec rest targets which adaptation?

A. Maximal strength through neural adaptation

B. Power through ballistic high-velocity movement

C. Muscle hypertrophy through tension and metabolic stress

D. Aerobic endurance conditioning

145. An athlete's 1RM bench press is 130 kg. A hypertrophy protocol at 73% prescribes which working load?

A. 130 kg per set

B. 65 kg per set

C. 160 kg per set

D. Approximately 95 kg (130 × 0.73)

146. Rest periods of 30-90 seconds are prescribed for which training goal?

A. Maximal strength requiring full PCr recovery

B. Hypertrophy maintaining metabolic stress

C. Power requiring complete neural recovery

D. Aerobic endurance conditioning

147. A strength and conditioning specialist designs a DUP week: Mon=4×10@70%, Wed=5×3@87%, Fri=5×3@75% explosive. DUP's primary advantage is which of the following?

A. Frequent varied stimuli preventing accommodation

B. Eliminates need for planning

C. Never uses heavy loads

D. Identical to constant programming

148. Linear periodization is characterized by which pattern?

A. Volume and intensity increase simultaneously

B. Constant volume and intensity throughout

C. Increasing intensity with decreasing volume across phases

D. Decreasing intensity with increasing volume

149. Block periodization's three-block sequence is which of the following?

A. Realization → Transmutation → Accumulation

B. Flexibility → Cardio → Endurance only

C. Competition → Transition → General prep

D. Accumulation → Transmutation → Realization

150. In-season maintenance with reduced volume but maintained intensity produces which outcome?

A. Dramatic strength loss from volume reduction

B. Strength and power maintenance

C. Significant additional gains

D. Complete detraining within 48 hours

151. The transition period should last approximately how long?

A. 2-4 weeks of low-intensity active recovery

B. 12 weeks of maximal training

C. 6 months of bed rest

D. Eliminated entirely

152. Jump squat peak power occurs at which loading range?

A. 85-95% 1RM at slow velocity

B. 50-70% providing balanced contributions

C. 0-30% 1RM allowing high velocity

D. Equal at all loads

153. Hang clean peak power occurs at approximately which loading range?

A. 0-10% using the empty barbell

B. 95-100% at very slow velocity

C. Equal at all loads

D. 70-80% 1RM for optimal force-velocity balance

154. Plyometric volume for beginners should be which of the following?

A. 250 contacts of depth jumps only

B. 80-100 foot contacts across varied intensity

C. 500 contacts to maximize stimulus

D. 10 contacts regardless of type

155. Plyometrics should be positioned when in a training session?

A. After warmup when the athlete is fresh

B. After heavy resistance training for fatigue

C. Only on rest days

D. After a 5K run to simulate game fatigue

156. An athlete with squat at 91st percentile but VJ at 27th has which deficiency?

A. Insufficient maximal strength

B. No deficiency at all

C. A rate of force development deficit requiring explosive training

D. Excessive flexibility

157. Soccer conditioning (90-min matches) should include which combination?

A. Only heavy resistance training

B. Only long-distance running

C. Only static stretching

D. Aerobic base, anaerobic intervals, and reactive agility

158. Return-to-play requires which objective criterion?

A. Subjective readiness report only

B. Bilateral symmetry within 10%, movement competency, and medical clearance

C. Walking without a limp as sole criterion

D. Any group exercise class completion

159. A "force-deficient" athlete should emphasize which training?

A. Heavy resistance training (85%+ 1RM) to address the force deficit

B. Only light-load high-velocity training

C. Only aerobic endurance training

D. Only flexibility training

160. The annual plan organizes the year in which sequence?

A. Competition → Transition → General → Specific

B. Transition → Competition → General → Specific

C. General preparation → Specific preparation → Competition → Transition

D. Specific → General → Transition → Competition

161. A competitive ice hockey forward (45-60 sec shifts, 2-3 min rest) should target which energy system?

A. Only the phosphagen system

B. Only the oxidative system

C. No energy system training needed

D. The glycolytic system with matching interval training

162. For an advanced athlete preparing for a single competition, which model is best?

A. Fixed program with no variation

B. Block periodization targeted to peak at competition

C. Beginner program at 60% 1RM

D. Random exercise selection

163. After 22 weeks on the same program with plateau, the best intervention is which of the following?

A. Introduce variation in exercises, loads, or periodization

B. Continue identical program indefinitely

C. Cease training for 6 months

D. Reduce all loads to 25% permanently

164. Hamstring reconditioning after surgery follows which progression?

A. Immediate full-intensity sprinting on day one

B. Exclusive upper body training permanently

C. Rest for 12 additional months

D. Progressive loading meeting symmetry criteria before return

165. A 12-week powerlifting block sequences which order?

A. Realization → Transmutation → Accumulation

B. Flexibility → Cardio → Endurance

C. Competition → Transition → General prep

D. Accumulation → Transmutation → Realization

166. Muscular endurance rest periods (<67% 1RM, 12+ reps) should be which duration?

A. 2-5 minutes for full recovery

B. 30 seconds or less to maintain metabolic demand

C. 8-10 minutes per set

D. No rest for 90 continuous minutes

167. A protocol of 5×2 at 92% with 5-min rest develops which quality?

A. Maximal strength and neural adaptation

B. Muscular endurance

C. Hypertrophy

D. Cardiovascular fitness

168. Volume load for 4×6×130 kg equals which total?

A. 520 kg

B. 24 reps

C. 3,120 kg

D. 1,300 kg

169. A novice's first 4-6 weeks should use which loading strategy?

A. 95% 1RM singles from day one

B. Only plyometric depth jumps

C. No resistance training for 12 months

D. Moderate loads (60-70% 1RM) with 10-15 reps emphasizing technique

170. Plyometric frequency of 2-3 sessions/week with 48-72 hours is recommended for which reason?

A. Arbitrary with no basis

B. Musculotendinous recovery from eccentric loading

C. Cognitive processing only

D. Cardiovascular restoration exclusively

171. A training log: Wk1=4×8@70%, Wk3=4×6@78%, Wk5=4×5@83%, Wk7=4×3@89%. This is which model?

A. Linear periodization

B. Block periodization

C. Random programming

D. Daily undulating periodization

172. Developing both strength and speed requires which approach?

A. Only heavy loads above 90% every session

B. Only bodyweight exercises at max velocity

C. Heavy training some days, explosive exercises other days

D. Only sprint practice with no resistance training

173. A deload week (volume reduced ~40%, intensity maintained) serves which purpose?

A. 1RM testing under maximum fatigue

B. Permanent load reduction

C. Program restart from the beginning

D. Managing fatigue while maintaining stimulus for supercompensation

174. A rower needs endurance, pulling strength, core stability, and lower body drive. The best combination is which of the following?

A. Only distance running and cycling

B. Rowing conditioning, rows/pull-ups, anti-movement core, front squats/RDLs

C. Only biceps curls for rowing

D. Only depth jumps for power

175. A martial artist (3-min rounds, 1-min rest) should target which energy system?

A. Glycolytic primary, supplemented by phosphagen and aerobic

B. Only the phosphagen system

C. Only the oxidative system

D. No energy system training needed

176. In-season maintenance requires preserving which variable?

A. Volume at full preparatory levels

B. Frequency at 5 sessions/week

C. Training intensity (% 1RM)

D. New exercises every session

177. A protocol of 3×20 at 55% with 30-sec rest targets which adaptation?

A. Maximal strength through neural loading

B. Peak power through ballistic movement

C. Maximum hypertrophy through heavy tension

D. Muscular endurance

178. Contrast training pairs heavy squats (85% 1RM) with jump squats 3-4 min later. The rationale is which phenomenon?

A. Pre-exhaustion reducing jump requirements

B. PAP priming the nervous system for enhanced power

C. Aerobic conditioning from the rest period

D. Flexibility improvement from the stretch

179. Velocity-based training terminates sets when velocity drops 20%. This autoregulates which variable?

A. Fatigue-induced velocity loss maintaining movement quality

B. Heart rate response during exercise

C. Flexibility changes between sets

D. Blood lactate concentration

180. A "velocity-deficient" athlete (strong force, weak velocity) should emphasize which training?

A. Only heavy loads above 90% 1RM

B. Only aerobic endurance training

C. Light-load, high-velocity training (plyometrics, jump squats, sprints)

D. Only flexibility training

181. An evidence-based taper involves which adjustments?

A. Increasing volume 50% and decreasing intensity

B. Maintaining full volume and adding sessions

C. Complete cessation for 4 weeks

D. Reducing volume 40-60% while maintaining intensity

182. Wave loading (5/3/1 at 75/85/93%, then 77/87/95%) exploits which phenomenon?

A. Progressive fatigue reducing performance

B. PAP — heavier loads prime the system for subsequent sets

C. Aerobic conditioning from session length

D. Flexibility from inter-set rest

183. A needs analysis for a lacrosse midfielder (60-min games, repeated sprints) should include which conditioning?

A. Aerobic base, anaerobic intervals, and change-of-direction conditioning

B. Only heavy resistance training

C. Only long-distance running

D. Only static stretching

184. Cluster sets (5 reps as 5 singles with 15-20 sec intra-set rest) maintain velocity because of which mechanism?

A. Complete glycogen resynthesis between reps

B. Full hormonal recovery between reps

C. Brief rest allowing partial PCr recovery and neural restoration

D. Increased time under tension identical to straight sets

TESTING AND EVALUATION (Questions 185–206)

185. Assessing lower body power in 55 athletes during a 2-hour session requires which test?

A. Lab isokinetic dynamometry at 25 min per athlete

B. Force plate with 3D motion capture

C. Underwater weighing for body composition

D. Vertical jump (CMJ) with Vertec

186. A test producing consistent scores across repeated administrations demonstrates which property?

A. Face validity

B. Reliability

C. Construct validity

D. Criterion validity

187. During 1RM testing, an athlete lifts 160 kg then fails at 165 kg. The 1RM is which value?

A. 165 kg because attempted

B. 162.5 kg average

C. Test must restart

D. No valid conclusion from these data

188. An athlete's CMJ = 70 cm, SJ = 57 cm. The 13 cm difference reflects which capacity?

A. Maximum aerobic power

B. Absolute quadriceps strength

C. Stretch-shortening cycle utilization

D. Hamstring:quad ratio

189. Aerobic testing for 50 outdoor athletes with minimal equipment requires which test?

A. Lab treadmill VO_2max

B. Wingate on cycle ergometer

C. 1RM back squat

D. 20-meter beep test

190. Skinfold assessment uses which calculation sequence?

A. Skinfolds directly produce body fat percentage

B. Skinfolds → prediction equations → body density → body fat %

C. Skinfolds estimate bone density only

D. Skinfolds × body weight = fat mass

191. BIA accuracy is most affected by which variable?

A. The athlete's hydration status

B. Room temperature

C. Shoe brand

D. Number of people present

192. Electronic timing eliminates which error compared to hand timing?

A. Wind resistance on the athlete

B. Temperature effects on muscle speed

C. Human timer reaction variability (0.1-0.3 sec)

D. Lane marking color

193. Bilateral hop: R=47 cm, L=37 cm (~21% asymmetry). This suggests which finding?

A. Normal variation requiring no intervention

B. Right leg overtrained

C. Invalid test administration

D. Clinically significant asymmetry exceeding 10-15% threshold

194. Test results: squat=88th, VJ=28th, agility=56th, run=64th. Highest priority is which quality?

A. Maximal strength at 88th

B. Explosive power — VJ disproportionately low vs. strength

C. Agility at 56th

D. Aerobic endurance at 64th

195. The most critical standardization factor for longitudinal testing is which of the following?

A. Identical conditions across sessions

B. Different tests each time

C. Athlete-selected conditions

D. Testing after heavy training

196. An ACL patient achieves 84% bilateral hop symmetry. Based on 90% criterion, the recommendation is which of the following?

A. Return to unrestricted competition

B. Hop testing is irrelevant

C. Continue strengthening until 90% is met

D. Permanent restriction from sport

197. A force plate measures which variables that simpler methods cannot?

A. Only jump height from reach difference

B. Only body weight before the test

C. Only flight time

D. Peak GRF, RFD, impulse, and power in addition to height

198. The sit-and-reach test's primary limitation is which of the following?

A. Requires expensive lab equipment

B. Measures only hamstring/lower back; influenced by limb proportions

C. Takes 30+ minutes per athlete

D. Measures only shoulder flexibility

199. Goniometry provides which advantage over the sit-and-reach?

A. Joint-specific ROM at any joint identifying specific restrictions

B. Less accurate for every joint

C. Identical information with no additional value

D. Limited to hip measurement only

200. Testing should occur at which intervals?

A. Daily for maximum granularity

B. Once at career start only

C. Beginning and end of each major phase and pre/post-season

D. Randomly with no schedule

201. Submaximal 1RM prediction is most accurate within which rep range?

A. 25-30 reps

B. 15-20 reps

C. Exactly 1 rep

D. 10 or fewer reps

202. The standardized 1RM protocol includes how many warmup sets?

A. None — attempt 1RM immediately

B. 3-4 progressively heavier sets (~50%, 70%, 80-85%)

C. One set of 50 light reps

D. 10 sets of 10 at increasing loads

203. The T-test assesses movement through which pattern?

A. Forward sprint, lateral shuffles, backward run in T-shape

B. Straight 40-yard sprint

C. 60-second repeated vertical jumps

D. Agility ladder with fixed footwork

204. VJ hasn't improved after 12 weeks of plyometrics. Squat is 1.15× body weight. The modification is which of the following?

A. Continue identical program 12 more weeks

B. Complete cessation for 6 months

C. Add heavy resistance training — squat below 1.5× limits effectiveness

D. Eliminate all lower body training

205. Cooper 12-min and 1.5-mile run share which limitation?

A. Require expensive lab equipment

B. Test only one athlete at a time

C. Cannot distinguish fitness levels

D. Depend on self-pacing influenced by motivation

206. Pre-season basketball battery should assess which domains?

A. Only bench press

B. Aerobic capacity, speed, agility, power, strength, and body composition

C. Only body composition

D. Only flexibility

ORGANIZATION AND ADMINISTRATION (Questions 207–220)

207. A facility for 55 athletes at NSCA upper guideline (60 sq ft) requires which space?

A. 3,300 sq ft

B. 550 sq ft

C. 5,500 sq ft

D. 1,100 sq ft

208. An EAP should be rehearsed at which frequency?

A. Only when the facility opens

B. Only after an emergency occurs

C. At least annually with all staff

D. Every 10 years

209. CSCS professionals must maintain certification in which skill?

A. Advanced cardiac life support

B. EMT-paramedic certification

C. Wilderness first responder

D. CPR and AED use

210. The "standard of care" in negligence law is which concept?

A. Maximum insurance coverage required by law

B. The care a reasonably competent professional would exercise

C. Minimum professional salary

D. Required continuing education credits

211. A waiver does NOT protect against which claim?

A. Gross negligence or reckless conduct

B. Inherent risks disclosed and assumed

C. Normal training soreness

D. Documented risks acknowledged

212. An athlete requests injury diagnosis. The CSCS should do which of the following?

A. Diagnose independently

B. Prescribe medication

C. Refer to a qualified medical professional

D. Perform surgical evaluation

213. Which activity falls within CSCS scope?

A. Diagnosing injuries

B. Prescribing meal plans with caloric targets

C. Psychological counseling for depression

D. Designing programs, teaching technique, administering tests

214. Damaged equipment should be handled by which protocol?

A. Continued use until failure

B. Immediately removed, tagged, documented, repaired before return

C. Hidden from athletes

D. Wait for manufacturer visit

215. When a coach's demands conflict with safety, the CSCS should do which of the following?

A. Decline unsafe practices and advocate for athlete safety

B. Always comply with the coach

C. Resign without discussion

D. Implement but document privately

216. Supervision ratios should adjust based on which factors?

A. Only total athlete count

B. Only time of day

C. Exercise complexity, athlete experience, and staff qualifications

D. Only facility dimensions

217. Record keeping should include which documents?

A. Only financial records

B. Only social media posts

C. Only coach's practice plans

D. Training logs, testing data, waivers, clearances, maintenance, incidents

218. A colleague without credentials teaches heavy cleans to novices. The response is which of the following?

A. Ignore the situation

B. Address with colleague and/or supervisor

C. Encourage higher loads

D. Post on social media

219. Closed-toe shoe policy; athlete arrives in sandals. The response is which of the following?

A. Enforce policy — proper footwear required before training

B. Allow training in sandals

C. Allow barefoot training

D. Modify policy for this athlete

220. The CSCS holds which authority regarding the program?

A. No authority — coach decides

B. Equipment purchasing only

C. Ultimate authority for program design, implementation, and supervision

D. Off-season authority only

PRACTICE EXAM 13 — ANSWER KEY WITH EXPLANATIONS

SECTION 1 — SCIENTIFIC FOUNDATIONS

EXERCISE SCIENCE (Questions 1–52)

1. D — The most consistently documented fiber type transition from chronic heavy training is the conversion of Type IIx to the more fatigue-resistant Type IIa phenotype within the fast-twitch spectrum. Regular high-intensity contractile activity stimulates Type IIa myosin heavy chain expression while downregulating the Type IIx isoform. The converted IIa fibers retain fast-twitch contractile characteristics while gaining improved oxidative capacity and resistance to fatigue.

2. B — ATP must bind to the myosin head to break the actin-myosin bond and allow the cross-bridge to detach after the power stroke. Without ATP binding, the myosin head remains permanently attached to actin — this is the molecular basis for rigor mortis after death. Once ATP binds and detaches the myosin head, ATP hydrolysis re-cocks the head for the next cross-bridge cycle.

3. C — A 48% strength gain with only 3% hypertrophy in 8 weeks is the hallmark of neural adaptation — improved motor unit recruitment, enhanced rate coding, reduced antagonist co-contraction, and better intermuscular coordination. In novice trainees, the nervous system's capacity to activate existing muscle improves dramatically before measurable structural changes develop. The experienced lifter has already maximized most neural pathways and relies on slower hypertrophic mechanisms.

4. A — At sarcomere lengths shorter than optimum, actin filaments from opposite sides of the sarcomere overlap each other and may press against the Z-lines. This physical crowding interferes with cross-bridge formation by reducing the number of available binding sites where myosin can productively attach to actin. The result is decreased force production at shortened muscle lengths despite full calcium availability and neural activation.

5. B — According to the force-velocity relationship, higher loads at slower contraction velocities allow more cross-bridges to form simultaneously and complete the power stroke, producing greater maximal force. A 92% 1RM squat performed at slow velocity places the athlete firmly at the high-force, low-velocity end of the curve. The opposite end (high velocity, low force) would involve light loads moved at maximal speed.

6. D — According to Henneman's Size Principle, motor units are recruited in an orderly sequence from smallest (lowest threshold) to largest (highest threshold) as force demand increases. At 25% 1RM, force demands are low enough that only the smallest, lowest-threshold Type I motor units

are required. Higher-threshold Type IIa and IIx motor units remain inactive because the force demand does not reach their activation thresholds.

7. A — The exponential rise from 1.7 mmol/L at 10 km/h to 4.9 mmol/L at 12 km/h identifies the lactate threshold — the intensity where lactate production began exceeding clearance capacity. Below 10 km/h, production and clearance were balanced and lactate remained stable. The steep inflection between these two speeds marks the transition to metabolically unsustainable conditions where accumulation accelerates.

8. C — A 35-second all-out effort falls within the glycolytic-dominant duration range (approximately 15 seconds to 2-3 minutes at near-maximal intensity). Anaerobic glycolysis rapidly breaks down muscle glycogen, producing pyruvate converted to lactate with accompanying hydrogen ion accumulation. The rising H^+ concentration reduces intracellular pH, impairing cross-bridge cycling and enzymatic function — producing the 14 mmol/L lactate and 28% power decline.

9. B — The progressive RER decrease from 0.86 to 0.77 over 3 hours reflects a gradual metabolic shift from carbohydrate toward greater fat oxidation as muscle and liver glycogen stores deplete. As carbohydrate availability declines during prolonged moderate-intensity exercise, the body relies increasingly on fat pathways, producing the lower CO_2-to-O_2 ratio characteristic of fat metabolism.

10. D — NADH and $FADH_2$ from the Krebs cycle deliver their electrons to the electron transport chain on the inner mitochondrial membrane. As electrons pass along the chain, energy is released to pump hydrogen ions across the membrane, creating the electrochemical gradient that drives ATP synthase. This process — oxidative phosphorylation — produces approximately 34 of the 36-38 total ATP from complete glucose oxidation.

11. A — Despite yielding approximately 129 ATP per palmitate molecule versus 36-38 from glucose, fat oxidation produces ATP at a rate far too slow to match the rapid energy demands of high-intensity exercise. The rate limitation — not total yield — determines which substrate dominates at any given intensity. When energy demand is high, carbohydrate pathways that produce ATP faster become essential.

12. C — After 3.5 hours at 67% VO_2max, muscle and liver glycogen become substantially depleted and blood glucose drops to hypoglycemic levels (45 mg/dL). Without adequate carbohydrate substrate, the body cannot maintain the ATP production rate needed for the exercise intensity. This is the classic endurance "bonk" that can only be delayed or prevented through strategic carbohydrate intake during the event.

13. B — The VO_2 plateau at 52 mL/kg/min despite two additional workload increases, combined with RER of 1.19, blood lactate of 13 mmol/L, and near-maximal heart rate, confirms VO_2max. The primary criterion (plateau despite increasing demand) is validated by multiple secondary verification criteria, confirming the athlete has reached the absolute ceiling of aerobic energy production capacity.

14. D — Oxygen serves as the final electron acceptor at the end of the electron transport chain, combining with electrons and hydrogen ions to form water. Without oxygen, the chain backs up — NADH and $FADH_2$ cannot be reoxidized, the Krebs cycle stalls, and aerobic ATP production ceases entirely. This absolute requirement is why aerobic metabolism cannot function under anaerobic conditions.

15. A — Net upward force = GRF − body weight = 3,200 − 882 = 2,318 N. Only force exceeding the athlete's body weight produces upward acceleration — the first 882 N simply supports the body against gravity. Using Newton's Second Law (a = F/m), acceleration = 2,318 ÷ 90 = 25.8 m/s^2, demonstrating why producing high GRF relative to body weight is essential for jump performance.

16. C — Torque equals force multiplied by moment arm. At 90° of elbow flexion during the overhead press, the perpendicular distance from the barbell's gravitational force line to the shoulder joint axis is at maximum. This creates the greatest torque demand on the shoulder musculature, making this angle the mechanical sticking point where the lift feels heaviest despite unchanged barbell weight.

17. B — Hydrogen ions from glycolytic metabolism are buffered by the bicarbonate system: $H^+ + HCO_3^- \rightarrow H_2O + CO_2$. The additional CO_2 generated by this reaction stimulates chemoreceptors that trigger a disproportionate increase in ventilation for CO_2 removal. This non-linear ventilatory increase — breathing rising faster than VO_2 — defines the ventilatory threshold.

18. D — Peak muscular power (force × velocity) occurs at approximately 30-60% of maximal force, where the combination of moderate force and moderate-to-high velocity produces the greatest power product. At maximum force (near-zero velocity) or maximum velocity (near-zero force), power approaches zero. This is why power training uses moderate loads moved at high velocities.

19. A — The 14-degree difference between passive ROM (142°) and active ROM (128°) reflects the normal distinction between what external force can achieve and what voluntary muscular effort can produce. External force can move a joint beyond the limit where the individual's own muscles can actively control movement. This difference reflects neuromuscular and motor control limits versus structural joint limits.

20. C — Eccentric cardiac hypertrophy from chronic endurance training enlarges the left ventricular chamber, allowing greater blood filling during diastole. This larger end-diastolic volume directly increases stroke volume — the amount ejected per beat during systole. Increased maximal stroke volume is the primary mechanism by which endurance training enhances maximal cardiac output and therefore VO_2max.

21. B — Blood flow redistribution during maximal exercise is accomplished through two simultaneous mechanisms: local metabolic vasodilation in working muscles (from CO_2, decreased O_2, temperature, and metabolite accumulation) combined with sympathetic vasoconstriction in non-essential organs (digestive tract, kidneys, inactive muscles). This dual mechanism directs 80-85% of cardiac output to the most metabolically active tissues.

22. D — The primary stimulus for acute GH release is metabolic stress — elevated lactate, H^+ accumulation, and reduced pH from high-volume training with short rest. The 60-second rest prevents full metabolic recovery between sets, maintaining the acidic cellular environment that triggers GH secretion from the anterior pituitary. The heavy protocol with 5-minute rest minimizes metabolic stress.

23. A — Female athletes achieve significant strength gains primarily through neural adaptations — improved motor unit recruitment, enhanced rate coding, better intermuscular coordination, and reduced antagonist co-contraction. These neural pathways are not testosterone-dependent, accounting for a larger proportion of strength gains in females because the lower testosterone environment limits structural hypertrophy magnitude.

24. C — A progressively declining T:C ratio over 9 weeks with performance stagnation, insomnia, elevated resting HR, and persistent fatigue represents classic overtraining syndrome. The chronic imbalance between accumulated training stress and recovery capacity has produced systemic hormonal maladaptation requiring significant training reduction, structured recovery, and potential medical evaluation.

25. B — Wolff's Law predicts bone remodeling from mechanical stress. Ground-based resistance exercises with impact activities apply large compressive and impact forces directly to the weight-bearing skeleton, providing the greatest osteogenic stimulus. Non-weight-bearing activities like aquatic exercise and cycling provide minimal bone-loading stimulus for increasing bone mineral density.

26. D — With identical 1RM values (200 kg), the 18 cm jump difference indicates superior rate of force development and power output in Athlete A. During the brief ground contact time of a jump, Athlete A produces force more rapidly, generating greater impulse that translates to higher takeoff velocity and jump height. Equal strength with different jump performance is the hallmark of an RFD difference.

27. A — The forward lean during acceleration allows the athlete to direct GRF primarily horizontally backward against the ground. Newton's Third Law produces an equal forward-directed reaction force overcoming inertia and generating forward momentum. Running upright directs forces too vertically, reducing the horizontal component essential for rapid acceleration from a stationary start.

28. C — Research on elite sprinters consistently demonstrates that vertical GRF during the 80-100 ms ground contact at maximum velocity is the primary factor distinguishing faster from slower runners. Faster sprinters produce greater vertical force relative to body weight, effectively "bouncing" off the ground with greater musculotendinous stiffness and force application efficiency.

29. B — The 13 cm CMJ-SJ difference represents the stretch-shortening cycle contribution — stored elastic energy in the musculotendinous unit, the stretch reflex from spindle activation, and

increased time for force development during the eccentric phase. These three mechanisms augment concentric takeoff force beyond what concentric-only contraction produces in the static squat jump.

30. D — Tendons and ligaments have lower metabolic activity and reduced blood supply compared to muscle tissue, resulting in slower collagen synthesis, turnover, and structural remodeling rates. This means connective tissues require more time to adapt to increased training loads. Progressive overload must be gradual enough for these structures to keep pace with muscular strength gains.

31. A — Slow jogging fails to develop explosive lateral movement (split-step, lunging), sprint speed (court coverage), and anaerobic recovery capacity (between-point recovery) — the specific physical demands of competitive tennis. The SAID principle requires the training stimulus to specifically match sport demands for adaptations to transfer to competitive performance.

32. C — Eccentric force increases with lengthening velocity to a plateau 20-60% above isometric maximum. Athletes can safely lower loads exceeding their concentric 1RM, forming the basis for supramaximal eccentric training. This provides a novel overload stimulus for strength and connective tissue adaptation that concentric-only training cannot achieve.

33. D — Aerobic capacity (VO_2max) declines most rapidly during detraining, with measurable reductions within 1-2 weeks and significant losses by 4-8 weeks. Maximal strength is more resistant, maintaining for 2-4 weeks or longer. This detraining hierarchy guides rehabilitation priorities — aerobic fitness needs earlier attention while strength can be temporarily deprioritized.

34. B — Third-class levers have the effort arm shorter than the resistance arm, creating a mechanical disadvantage for force but favoring speed and range of motion at the distal end. A small muscle shortening produces a large, fast movement at the hand or foot — essential for throwing, kicking, and striking. The tradeoff is the muscle must produce force many times greater than the external load.

35. A — The creatine kinase reaction (PCr + ADP → ATP + Cr) is a single-step enzymatic process in the sarcoplasm requiring no oxygen, mitochondria, or multi-step pathways. This simplicity makes it the fastest ATP-regenerating system, producing ATP almost instantaneously — the rate advantage making the phosphagen system dominant during the first 6-10 seconds of maximal effort.

36. C — Retained myonuclei from prior training persist during detraining-induced atrophy because nuclei donated by satellite cells during hypertrophy are not lost when the fiber shrinks. When training resumes, the additional nuclei accelerate protein synthesis, allowing faster recovery of size and strength compared to never-trained individuals. This cellular mechanism explains the "muscle memory" phenomenon.

37. D — During the contract-relax technique, the 6-second isometric contraction generates high tension activating the GTO. The GTO sends inhibitory signals through an Ib interneuron reducing

alpha motor neuron activity to the target muscle. This autogenic inhibition temporarily decreases muscle tone and resistance to stretch, allowing greater ROM immediately following the contraction.

38. B — Vasodilation in working muscles during moderate exercise reduces total peripheral resistance. Because diastolic pressure reflects peripheral resistance during cardiac relaxation, the reduced resistance counterbalances increased cardiac output, preventing diastolic pressure from rising. Systolic increases (from greater stroke volume and contractility) while diastolic stays stable, widening pulse pressure.

39. A — Torque = $(10 \times 9.81) \times 0.62 = 98.1 \times 0.62 \approx 60.8$ N·m. Mass is converted to Newtons (force) then multiplied by the perpendicular moment arm distance. This demonstrates why even moderate dumbbell weights create substantial torque demands on the shoulder joint during lateral raises at 90° abduction.

40. C — Cortisol stimulates protein degradation and gluconeogenesis — breaking down amino acids from muscle protein and converting them to glucose in the liver. This mobilizes substrate for the obligatorily glucose-dependent brain and other tissues during metabolic stress when glycogen stores are depleting. While catabolic, this response is essential for maintaining blood glucose during sustained exercise.

41. D — Stable testosterone with decreased cortisol produces a favorable T:C ratio indicating positive anabolic-catabolic balance. Combined with continued performance gains and adequate recovery, this confirms successful adaptation to the training program. This is the opposite of the declining T:C ratio, performance stagnation, and fatigue seen in overtraining syndrome.

42. B — Enhanced androgen receptor density increases the muscle's sensitivity to circulating testosterone at the tissue level. Each testosterone molecule produces a stronger anabolic signal, potentially amplifying the hypertrophic and strength response even without changes in basal hormone concentrations. This tissue-level adaptation is a significant contributor to the progressive training response.

43. A — The crossover concept describes the intensity-dependent shift from predominantly fat oxidation at low intensities to predominantly carbohydrate oxidation at higher intensities. As the body requires faster ATP production rates at increasing workloads, it relies more on carbohydrate pathways that produce ATP faster than the slower fat oxidation pathways.

44. C — The Cori cycle recycles lactate through the liver, where hepatocytes convert it to glucose via gluconeogenesis. This recycled glucose returns to the blood for use by working muscles and the obligatorily glucose-dependent brain. The pathway is critical during sustained exercise as it helps maintain blood glucose when glycogen depletes.

45. D — The combination of 11-month amenorrhea, grossly inadequate caloric intake (1,050 kcal with 3 hours daily training), decreased lumbar BMD, and repeated stress fractures represents RED-S.

Low energy availability drives menstrual dysfunction through HPO axis disruption and compromises bone health through impaired calcium metabolism and hormonal signaling.

46. B — RED-S in male athletes produces suppressed testosterone (from disrupted HPG axis), decreased bone mineral density, impaired immune function, and declining performance. Chronic low energy availability drives these consequences regardless of sex, expanding beyond the original female athlete triad. Male athletes in weight-class and aesthetic sports are at particular risk.

47. A — The stretch reflex (myotatic reflex) is monosynaptic — involving only a single synapse between the afferent sensory neuron from the muscle spindle and the efferent alpha motor neuron. This single-synapse arrangement makes it the fastest reflexive contraction in the body. During plyometric landing, rapid eccentric stretch activates spindles that produce this reflex to augment concentric force.

48. C — Contact times increasing from 170 to 360 ms with declining rebound height confirms fatigue and loss of SSC effectiveness. When amortization exceeds approximately 250 ms, elastic energy dissipates as heat and the stretch reflex diminishes. Plyometrics are quality-based — continuing trains degraded patterns with no power benefit. Terminate immediately.

49. D — Both athletes produce identical peak force (2,950 N) but Athlete A reaches peak in 125 ms versus 270 ms — superior rate of force development. During the limited ground contact time of a jump, faster RFD produces greater impulse (area under the force-time curve), resulting in higher takeoff velocity and greater jump height despite equal peak force.

50. B — When amortization exceeds 250 ms, stored elastic energy in the musculotendinous unit dissipates as heat rather than being returned as mechanical work during the concentric takeoff. The stretch reflex contribution also diminishes because the rapid eccentric-to-concentric transition that maximally stimulates the spindle has been disrupted by the prolonged delay.

51. A — In the second-class calf raise lever, the effort arm (calcaneus to ball of foot) exceeds the resistance arm (ankle to ball of foot), creating a mechanical advantage greater than one. This arrangement favors force production — the gastrocnemius and soleus can produce movement against resistance greater than in a third-class arrangement, which is why calf muscles support full body weight.

52. C — The accommodation principle predicts diminished response to constant, unchanging stimulus. After 20 weeks of identical programming, introducing variation in exercises, loads, volumes, or periodization provides novel stimuli the body has not adapted to. This overcomes the plateau and restarts the progressive adaptation process that had stalled.

SPORT PSYCHOLOGY (Questions 53–75)

53. D — Muscle tension, elevated heart rate, and sweaty palms are somatic anxiety symptoms — the physiological activation component of competitive anxiety. Somatic anxiety requires physical relaxation interventions (PMR, diaphragmatic breathing), distinct from cognitive anxiety (negative

thoughts, worry) which requires cognitive interventions. Distinguishing between components guides appropriate intervention selection.

54. B — A precision golf putt requires steady hands, fine motor control, and visual focus — all degraded by excessive arousal. The inverted-U hypothesis predicts that fine motor tasks have a lower optimal arousal point than gross motor strength tasks. Low-to-moderate arousal preserves the coordination and focused attention required for consistent putting accuracy.

55. A — The most effective approach combines outcome goals (long-term competitive direction), performance goals (measurable benchmarks tracking progress), and process goals (daily controllable behaviors directing effort). This hierarchical structure connects daily actions to long-term aspirations, providing sustained motivation and accountability at every level from training sessions to championships.

56. C — Self-efficacy is task-specific and situation-specific — an athlete can have high efficacy for squatting but low efficacy for Olympic lifting. This distinguishes it from general confidence, which is a broad disposition across many situations. Self-efficacy is built through mastery experience, vicarious observation, verbal encouragement, and physiological state interpretation within specific contexts.

57. D — "Your elbows dropped during the front squat catch" describes technique quality — how the movement was executed. This is knowledge of performance (KP), providing actionable information for correction. Knowledge of results (KR) would describe the outcome ("you failed the lift"), not the movement pattern that produced it.

58. B — The contextual interference effect demonstrates that random practice produces slower initial improvement but significantly better long-term retention and transfer to novel contexts. Constant task-switching forces deeper cognitive processing during each trial, building more robust motor program representations that persist over time and transfer more effectively.

59. A — The guidance hypothesis states that feedback after every repetition creates dependency on external correction. The athlete waits for the coach rather than developing internal error-detection through proprioceptive attention. Reducing frequency to approximately 50% forces the athlete to develop self-monitoring skills producing more durable, self-sustaining learning.

60. C — Memory consolidation during rest intervals is the neurological process of stabilizing and transferring motor memories from short-term to long-term storage. Distributed practice allows this consolidation between bouts, producing more durable representations that resist forgetting. Massed practice does not provide sufficient inter-trial time for effective neural consolidation.

61. D — The autonomous stage is characterized by automatic, consistent execution with minimal conscious attention needed for technique. Cognitive resources are freed for strategic processing — monitoring the environment, making tactical decisions, and adjusting performance. This is the stage where experienced athletes focus on strategy rather than body positions.

62. B — Burnout is characterized by emotional exhaustion (feeling drained), depersonalization (cynicism toward the sport), and reduced accomplishment (feeling effort produces no meaningful results). Burnout develops over weeks to months and requires professional intervention, distinguishing it from acute pre-competition anxiety or normal day-to-day mood fluctuations.

63. A — Isolation, persistent worthlessness, lost interest, and expressed hopelessness are potential warning signs of clinical depression in an adolescent. The specialist must recognize these as beyond normal fluctuation and recommend parents seek professional mental health evaluation. Attempting to address through training modifications or increased competition is inappropriate and potentially harmful.

64. C — Self-determination theory identifies autonomy (sense of choice), competence (mastery and effectiveness), and relatedness (connection and belonging) as three basic needs supporting intrinsic motivation. When all three are satisfied through the training environment, athletes develop the most sustainable form of internal drive that persists without external rewards.

65. D — Extreme weight manipulation, meal avoidance, excessive exercise, and weight preoccupation are disordered eating warning signs requiring professional evaluation. Diagnosing and treating eating disorders is outside the CSCS scope. The specialist must refer to a qualified healthcare professional for appropriate assessment and intervention.

66. B — Observing a teammate of similar ability succeed provides vicarious experience — one of Bandura's four self-efficacy sources. Seeing someone of comparable capability complete a challenging task provides evidence that success is achievable, strengthening the observer's confidence. Vicarious experience is most powerful when the model closely matches the observer.

67. A — Consistent practice excellence with competitive underperformance, combined with worry and negative self-talk, indicates choking under pressure. Excessive cognitive anxiety in high-stakes situations disrupts automatic motor execution demonstrated in low-pressure practice. The well-learned skill reverts to conscious, effortful processing that degrades quality.

68. C — Fear of re-injury after ACL reconstruction is a recognized psychological barrier requiring comprehensive management. Gradual movement reintroduction at progressive intensities builds confidence through mastery, while sport psychology referral addresses cognitive and emotional components through evidence-based interventions such as graded exposure and cognitive restructuring.

69. D — The overall speed and absolute force change between fastball and changeup (variable parameters), while invariant features — relative timing, relative force proportions, and fundamental spatial pattern — remain constant. This variable parameter adjustment is the functional advantage of generalized motor programs, allowing one base movement to serve different tactical purposes.

70. B — Scanning the entire court requires broad-external focus — perceiving multiple external stimuli across a wide visual field simultaneously for tactical decision-making. This allows the point guard to process defenders, teammates, and spatial relationships before narrowing focus to execute a specific pass as the play develops.

71. A — Past performance accomplishment is the most powerful self-efficacy source. Successfully completing 195 kg provides direct personal evidence of capability, creating the strongest confidence that 200 kg is achievable. Mastery experiences generate stronger and more resilient efficacy beliefs than vicarious observation, verbal encouragement, or physiological state management.

72. C — Reducing feedback to approximately 50% produces better long-term retention despite potentially slower acquisition. Reduced frequency forces athletes to attend to proprioceptive information, developing internal error-detection. This self-monitoring skill produces more durable, self-sustaining learning that persists without coach input.

73. D — Muscle tension, elevated HR, and breathing changes are somatic symptoms requiring physical relaxation. PMR teaches systematic tension release and diaphragmatic breathing engages the parasympathetic nervous system to reduce cardiovascular and respiratory activation. Cognitive interventions target thoughts, not physical symptoms.

74. B — The front squat develops the upright torso, high-elbow rack position, and deep receiving stance that directly transfer to the power clean catch. Shared movement features create positive transfer — practice on the front squat directly improves the quality and confidence of the power clean receiving position.

75. A — Effective imagery engages visual (seeing performance), kinesthetic (feeling sensations), auditory (hearing sounds), and emotional (experiencing confidence) components simultaneously. Multi-sensory engagement creates the richest mental rehearsal transferring most effectively to competitive performance.

NUTRITION (Questions 76–95)

76. C — A 115 kg athlete at 2.2 g/kg/day requires 253 grams daily (115 × 2.2 = 253). This upper-end recommendation supports elevated protein synthesis, tissue repair, and anti-catabolic demands of heavy resistance training. The general population RDA of 0.8 g/kg (92 grams) is insufficient for this population.

77. D — Leucine is the branched-chain amino acid identified as the primary trigger for mTOR activation and protein synthesis initiation. A threshold of approximately 2-3 grams per meal ensures optimal stimulation of the protein synthetic machinery. This leucine threshold is key when evaluating protein source quality for recovery.

78. B — Chronically inadequate dietary fat (below 15-20% of calories) impairs steroid hormone production because cholesterol is the essential precursor for testosterone synthesis. Fat-soluble

vitamins (A, D, E, K) also require dietary fat for absorption. Both consequences compromise health, recovery, and training adaptation.

79. A — Exercise-associated hyponatremia occurs when massive plain water intake dilutes blood sodium below safe levels. Consuming 2.5 L/hr for 5 hours without sodium replacement dramatically reduces serum sodium relative to sweat losses. Symptoms range from confusion to seizures and potentially fatal cerebral edema in severe cases.

80. C — The maintenance approach (3-5 g/day) achieves full saturation in approximately 28 days — equally effective as loading (20 g/day for 5-7 days) for reaching the same endpoint. The only difference is that gradual accumulation takes 4 weeks instead of 1 week.

81. D — Caffeine blocks adenosine receptors in the CNS. Adenosine promotes drowsiness and reduces neural activity; blocking these receptors reduces fatigue perception, increases alertness, and enhances pain tolerance during high-intensity effort. These central effects improve both endurance and high-intensity performance at doses of 3-6 mg/kg.

82. B — Beta-alanine increases intramuscular carnosine, buffering hydrogen ions during high-intensity exercise. This is most beneficial for 1-4 minute activities where glycolytic H^+ accumulation is the primary performance limiter. Shorter activities are phosphagen-dependent; longer ones primarily aerobic.

83. A — NSF Certified for Sport and Informed Sport independently test for banned substances, verify labels, and screen for contaminants. Athletes under WADA regulations should use only products with these certifications to minimize inadvertent positive tests from contaminated supplements.

84. C — During deficit, protein needs increase to 2.0-2.4 g/kg/day to maximize lean mass preservation. Elevated protein with maintained resistance training provides the strongest defense against accelerated muscle catabolism during energy restriction.

85. D — GI distress — nausea, bloating, cramping, diarrhea — is the most common side effect limiting sodium bicarbonate use. The alkaline compound and large dose (0.2-0.3 g/kg) irritate the GI tract. Enteric-coated capsules or serial loading protocols may improve tolerability.

86. B — A 70 kg athlete at 10 g/kg/day requires 700 grams daily (70 × 10 = 700). This upper-end recommendation supports extreme glycogen demands of high-volume endurance training with daily depletion-replenishment cycles.

87. A — Vitamin D deficiency produces impaired muscle function (reduced strength and power), compromised immune competence (increased illness), and elevated stress fracture risk with decreased BMD. Athletes training indoors or at northern latitudes are at greatest risk for insufficiency.

88. C — Vitamin C converts ferric iron (Fe^{3+}) to the more bioavailable ferrous form (Fe^{2+}), enhancing intestinal absorption of non-heme iron from plant-based sources. This is particularly important for athletes with low ferritin depending on plant-based iron.

89. D — When rapid recovery is essential (two sessions within 8 hours), 1.0-1.5 g/kg within 30 minutes capitalizes on maximal glycogen synthase activity. This enzyme is most active immediately post-exercise and declines progressively over subsequent hours, making early intake critical.

90. B — Complementary plant sources throughout the day provide all essential amino acids. Grains compensate for legumes' lysine limitation; legumes compensate for grains' methionine limitation. Variety across meals ensures adequate intake without animal products.

91. A — Casein forms a stomach gel slowing digestion, providing sustained amino acid delivery throughout the 7-9 hour overnight fast. This supports muscle protein synthesis during sleep when no other protein is consumed. Research supports 30-40 grams for optimal overnight recovery.

92. C — High-GI foods produce rapid glucose and insulin responses, making them most appropriate during and immediately after exercise. During exercise, rapid glucose supports energy needs; after, fast absorption maximizes glycogen synthase activity and amino acid uptake during the recovery window.

93. D — Glutamine has limited evidence for muscle growth in healthy, well-nourished athletes with adequate protein. It is not classified among supplements with robust ergogenic evidence. Supplements with strong evidence include creatine, caffeine, beta-alanine, and sodium bicarbonate.

94. B — Fat serves essential functions: steroid hormone production (cholesterol as testosterone precursor), fat-soluble vitamin absorption (A, D, E, K), cell membrane integrity (phospholipid bilayers), and essential fatty acid provision (linoleic, alpha-linolenic acid) the body cannot synthesize.

95. A — Fluid intake of 200-300 mL every 15-20 minutes prevents body weight loss exceeding 2%, where performance impairments begin. Individual sweat rates vary with body size, intensity, and conditions, so guidelines should be personalized using body weight measurements.

SECTION 2 — PRACTICAL/APPLIED

EXERCISE TECHNIQUE (Questions 96–140)

96. C — A lateral weight shift during the squat typically indicates unilateral hip mobility restriction or strength asymmetry. The athlete shifts weight toward the more mobile or stronger side. Targeted unilateral mobility work and strengthening of the weaker side addresses the underlying cause of the compensation.

97. D — When hips rise faster than the chest ("stripper pull"), the initial leg drive is lost and loading transfers disproportionately to the lumbar spine and erector spinae. This compensation increases lumbar flexion torque and injury risk. Cueing "chest and hips rise together" or reducing the load corrects this fault.

98. B — Elbows flared to 90° at the bottom of the dumbbell press places the shoulder in extreme horizontal abduction, compressing the supraspinatus and pectoral tendon against the acromion. This position increases impingement and pectoral strain risk. Cueing elbows at approximately 45° reduces these risks.

99. A — Single-leg RDLs develop unilateral hip hinge strength, hamstring resilience under eccentric loading, and single-leg balance and proprioception. These qualities directly address soccer demands — deceleration, direction change, and kicking from a single-leg base — while providing targeted hamstring injury prevention.

100. C — Stiff-legged landing with minimal knee flexion transmits excessive impact forces directly through the ankle, knee, and hip joints. Adequate force absorption requires soft contact with progressive hip and knee flexion and neutral spinal alignment. Coaching proper landing mechanics before progressing box jump height is essential.

101. D — The NSCA top-down progression begins with the front squat — establishing the rack position, bar comfort on the deltoids, high-elbow posture, and receiving stance. Safe reception must be established before explosive pulling is taught to prevent dangerous catching errors.

102. B — Initiating with a shoulder shrug activates the upper trapezius instead of depressing and retracting the scapulae with the lats. This reduces the training stimulus to the latissimus dorsi — the primary target. Cueing "pull shoulder blades down and back before bending elbows" corrects this pattern.

103. A — During near-maximal compound lifts, the Valsalva maneuver creates extreme intra-abdominal pressure providing essential spinal stabilization. This is appropriate only for healthy trained athletes performing heavy loads. It is contraindicated for individuals with cardiovascular risk factors due to the extreme blood pressure response.

104. C — Tempo prescriptions increase time under tension — a primary hypertrophy stimulus — while the pause eliminates the SSC, developing positional strength and awareness at the most challenging range. For novice and intermediate athletes, tempo work reinforces proper positions and movement control throughout the squat.

105. D — Rotation should occur through the thoracic spine and hips, which are designed for rotational movement. The lumbar spine has limited rotational ROM (~5° per segment), and forcing rotation through this region under load creates excessive disc and facet joint stress. Cueing thoracic and hip rotation while stabilizing the lumbar corrects this pattern.

106. B — Farmer's walks develop grip endurance (sustained heavy holds), core stability (resisting trunk flexion and lateral deviation under load), and postural strength (maintaining upright alignment with heavy loads). These qualities transfer directly to athletic performance and functional capacity.

107. A — The landmine provides an angled pressing path (approximately 45-75°) training the pressing pattern without full overhead ROM. For athletes with shoulder or thoracic mobility limitations, this allows continued pressing while mobility is improved through targeted corrective work.

108. C — The kettlebell swing is a hip hinge where all force originates from the hip extensors — gluteus maximus and hamstrings — through explosive hip extension. The arms connect the body to the kettlebell without actively lifting it. The swing is powered by a forceful hip snap, not shoulder flexion or lumbar extension.

109. D — Excessive low back strain during Nordics indicates lumbar hyperextension substituting for hip extensor work. The athlete arches the lower back rather than maintaining neutral spine while the hamstrings control the eccentric descent. Cueing "squeeze glutes, brace core, maintain straight line from knee to shoulder" corrects this.

110. B — Band-resisted sprints apply horizontal resistance overloading the horizontal force production of the acceleration phase. The athlete must generate greater horizontal GRF to overcome band resistance, developing the specific force application pattern needed for rapid forward acceleration.

111. A — Eccentric-emphasized split squats with 5-second lowering develop eccentric strength (force during lengthening), stimulate hypertrophy through extended time under tension, and build tendon resilience through progressive eccentric loading. These adaptations are valuable for athletes performing high-velocity deceleration.

112. C — Rounded shoulders at end range indicate insufficient activation of the middle trapezius and rhomboids that should retract the scapulae fully. Cueing "squeeze shoulder blades together at the end of every pull" ensures full retraction and proper activation of these postural and scapular muscles.

113. D — The Turkish get-up transitions from lying to standing while maintaining overhead weight through multiple movement planes. It develops shoulder stability under load, core strength in multiple directions, and total-body coordination — uniquely valuable for functional stability transferring to diverse athletic demands.

114. B — Lumbar hyperextension at lockout creates compressive forces on posterior spinal structures and potential disc stress from end-range loading under resistance. The correct top position is neutral spine with hips fully extended but not hyperextended. Cueing "squeeze glutes and tuck ribs" maintains protective alignment.

115. A — Sled pushes develop horizontal force production and acceleration mechanics directly replicating offensive line blocking demands. The low position, forward lean, and horizontal

driving action mirror the force application pattern of pass and run blocking, making it one of the most sport-relevant exercises for linemen.

116. C — Medial knee collapse (valgus) indicates weakness in the hip abductors and external rotators (primarily gluteus medius). These muscles cannot control femoral adduction and internal rotation under load. Cueing "drive knees out over toes" corrects acutely while targeted strengthening addresses the root cause.

117. D — Depth drops (landing without rebound) teach proper eccentric landing mechanics and force absorption before introducing the reactive jumping component. Athletes learn to decelerate effectively through joint flexion and maintain neutral alignment during landing — prerequisites for safe progression to reactive depth jumps.

118. B — Dumbbell spotting occurs at the wrists near the athlete's hands. Elbows create a dangerous fulcrum, and dumbbells may move independently if gripped directly. Wrist contact allows the spotter to guide load direction while the athlete maintains control of each dumbbell.

119. A — Proper box jump landing requires soft contact with hip and knee flexion absorbing impact, neutral spine protecting lumbar structures, and knees tracking over toes protecting knee joints. This distributes forces across multiple joints. Stiff or heel-first landings concentrate impact dangerously.

120. C — Face pulls with external rotation strengthen posterior deltoids, infraspinatus, teres minor, and middle trapezius — muscles critical for shoulder health and postural balance in pressing-dominant athletes. This counterbalances the anterior dominance from heavy bench pressing and protects against impingement.

121. D — "Push your hips straight back" redirects from a knee-dominant squat pattern to the hip-dominant hinge defining the RDL. This cue encourages posterior hip displacement with minimal forward knee travel, maintaining the slight knee flexion and hip hinge that correctly target hamstrings and glutes.

122. B — The reverse lunge eliminates the eccentric deceleration demand on the front leg that occurs when the foot strikes the ground during forward lunging. The front leg stays relatively stationary with a vertical shin, reducing anterior shear forces through the patellofemoral joint and quadriceps tendon.

123. A — The hex bar centers load at the athlete's sides, reducing horizontal distance to the lumbar spine. This shorter moment arm decreases flexion torque and overall spinal loading compared to the conventional deadlift where the bar is in front of the body.

124. C — Bands provide minimum resistance at the bottom (least stretched) and maximum at the top (fully stretched). This accommodating profile challenges the athlete most in the strongest lockout position where free weights become easy, training force production aggressively through the complete ROM.

125. D — For a medicine ball throw to qualify as plyometric, it requires maximal speed with minimal transition between eccentric catch and concentric throw. Rapid SSC execution stores and returns elastic energy and activates the stretch reflex. Paused, slow, or heavy throws eliminate these mechanisms.

126. B — Olympic platforms must be separated from traffic with adequate clearance for dropped barbells and failed lifts. Athletes and staff should never be in the impact zone during lifting. Safety clearance is the primary positioning consideration.

127. A — Groups of 3 per rack create efficient squat-spot-rest rotation, keeping all 30 athletes engaged while ensuring every lifter has a dedicated spotter. This maximizes training density with appropriate supervision.

128. C — Collars prevent plates from sliding off during exercise. Without them, plates can shift from uneven pressing or balance loss, causing sudden asymmetric loading and potential injury. Collars are a non-negotiable safety requirement.

129. D — Hang snatches are the explosive exercise requiring highest neuromuscular coordination, performed first when fresh. Remaining exercises follow the standard hierarchy: core multi-joint → assistance → core stability.

130. B — Single bench spotter uses alternated grip (one pronated, one supinated) close to center for maximum security and symmetric upward force. This prevents bar rolling while allowing smooth bilateral assistance.

131. A — An athlete explosive on field but struggling with heavy lifts has a strength deficit. Heavy training (85%+ 1RM) develops the force foundation supporting greater explosive output when combined with existing speed qualities.

132. C — Correct RDL: slight constant knee flexion, neutral spine, hip hinge pattern, bar close to legs. This targets hamstrings and glutes through controlled eccentric hip flexion with the primary movement at the hip joint.

133. D — Pull-ups develop pulling strength for the stroke. I/E rotation protects the rotator cuff from overuse. Anti-rotation core develops trunk stability for force transfer during swimming. Together they address the primary upper body demands.

134. B — The Pallof press resists rotational force — an external load attempts to twist the torso while the athlete maintains neutral alignment. This anti-rotation function develops spinal stability critical for athletic movements involving rotational forces.

135. A — The snatch requires overhead reception in a deep squat with locked arms and upright torso. Overhead squat mobility assessment verifies the athlete can maintain this position. Without prerequisite mobility, attempting the snatch creates significant shoulder, wrist, and spinal injury risk.

136. C — Correct push-up: straight line head-to-heels, core braced, chest near floor, elbows approximately 45°. This maximizes pressing stimulus while protecting the shoulder from impingement at extreme flare angles.

137. D — Sprint intervals of 5-10 yards with 25-40 seconds rest replicate the lineman's phosphagen-dominant demands at the sport-specific work-to-rest ratio. This ensures conditioning adaptations transfer directly to the repeated short-burst game pattern.

138. B — Face pulls target posterior deltoids, infraspinatus, teres minor, and middle trapezius for shoulder health and postural balance. These muscles counterbalance pressing-dominant programming and protect against impingement.

139. A — Reactive agility drills requiring responses to visual cues develop perceptual-cognitive processing combined with physical direction change — true agility. Preplanned drills develop only the physical component without the decision-making that distinguishes game-speed agility.

140. C — The isometric mid-thigh pull assesses and develops peak isometric force and rate of force development. The fixed position eliminates technique variables, isolating maximal force output. RFD from the force-time curve is critical for explosive sport performance.

PROGRAM DESIGN (Questions 141–184)

141. D — The 100-meter sprint (10-12 seconds at maximal intensity) relies primarily on the phosphagen system for the highest instantaneous ATP production rate. The glycolytic system contributes increasingly after the first 6-8 seconds as PCr depletes. The aerobic system provides only a minor supplementary contribution.

142. B — The power snatch is structural (loading the spine), performed explosively (maximal-velocity triple extension with overhead receiving), and involves multiple large muscle groups. It meets all criteria for power exercise classification.

143. A — Novice athletes with 2 months experience benefit from 2-3 total-body sessions per week with moderate loads (60-70% 1RM), higher reps (10-15), and technique emphasis. This provides adequate stimulus with sufficient recovery for the rapid adaptations characterizing early training.

144. C — The 8-12 rep range at 67-85% 1RM with 60-90 sec rest targets hypertrophy through combined mechanical tension (moderate-to-heavy load) and metabolic stress (lactate accumulation from short rest). This combination drives the protein synthesis signaling cascade for muscle growth.

145. D — 73% of 130 kg = 94.9, rounded to approximately 95 kg. This moderate load with higher repetitions and short rest falls within the hypertrophy zone for the bench press.

146. B — Rest of 30-90 seconds maintains elevated metabolic stress (lactate, H^+) and the hormonal environment (GH, testosterone) supporting the growth stimulus. Incomplete recovery sustains the metabolic conditions contributing to hypertrophic signaling.

147. A — DUP provides frequent exposure to different stimuli within each week (hypertrophy Monday, strength Wednesday, power Friday), preventing accommodation to any single zone. This allows simultaneous multi-quality development — the primary advantage over linear models.

148. C — Linear periodization progressively increases intensity while decreasing volume across mesocycles: high-volume/moderate-intensity → moderate-volume/high-intensity → low-volume/very-high-intensity. Each phase builds on the preceding phase's adaptations.

149. D — Block periodization: accumulation (high volume, moderate intensity) → transmutation (higher intensity, sport-specific) → realization (low volume, peaking). Each block concentrates on targeted qualities building upon prior adaptations.

150. B — Maintaining intensity while reducing volume and frequency preserves the neural and muscular stimulus for strength maintenance. Intensity is the most critical detraining-prevention variable — volume and frequency can be reduced without strength loss.

151. A — The transition provides 2-4 weeks of unstructured low-intensity active recovery for physical restoration, psychological renewal, injury treatment, and motivation recovery before the next training cycle.

152. C — Jump squat peak power occurs at 0-30% 1RM where lighter loading allows high velocity to maximize the velocity component of the power equation. Heavier loads increase force but reduce velocity below the peak power threshold.

153. D — Hang clean peak power occurs at 70-80% 1RM because sufficient mass produces meaningful force while the ballistic nature maintains velocity for peak power expression. The balance between adequate mass and maintained velocity at this range produces optimal output.

154. B — Beginners start with 80-100 foot contacts across varied intensity (squat jumps, CMJ, box jumps stepping down). This provides initial stimulus while protecting musculotendinous structures not yet conditioned for high-impact plyometrics.

155. A — Plyometrics follow warmup when fresh for maximal effort and technique. Fatigue from prior exercise degrades explosive output and landing mechanics. Quality-based training requires the athlete to be neurally fresh.

156. C — A squat at 91st percentile with VJ at 27th indicates a rate of force development deficit — adequate strength but poor rapid expression. Programming should prioritize explosive training (plyometrics, Olympic lifts, jump squats).

157. D — Soccer's 90-minute mixed demands require aerobic base (sustained play), anaerobic intervals (repeated sprints), and reactive agility (direction changes in response to opponents). Each addresses specific competitive demands.

158. B — Return to play requires bilateral symmetry within 10%, sport-specific movement competency, and medical clearance. Objective criteria reduce reinjury risk from persistent asymmetries that subjective assessment alone cannot detect.

159. A — A "force-deficient" athlete needs heavy training (85%+ 1RM) to develop the force capacity limiting performance. The existing velocity capacity cannot be fully expressed without a stronger force foundation supporting it.

160. C — Correct sequence: general preparation → specific preparation → competition → transition. Each period builds systematically from broad fitness through competitive readiness to recovery.

161. D — Hockey shifts of 45-60 seconds with 2-3 minute rest represent glycolytic-dominant demands. Conditioning with matching intervals develops sport-specific glycolytic capacity for sustained high-intensity skating.

162. B — An advanced athlete preparing for a single competition requires block periodization's concentrated, precisely targeted stimuli. Accumulation → transmutation → realization provides precise control for peak performance at the competition date.

163. A — Accommodation predicts diminished response to constant stimulus. Variation in exercises, loads, volumes, or periodization provides novel stimuli the body has not adapted to, overcoming the plateau.

164. D — Hamstring reconditioning progresses from low-intensity ROM restoration through progressive resistance to sport-specific movements, meeting bilateral symmetry criteria (within 10%) before unrestricted return.

165. D — Block periodization for powerlifting: accumulation (high volume/moderate intensity) → transmutation (higher intensity/sport-specific) → realization (low volume/peaking). Each block builds on prior adaptations toward competition readiness.

166. B — Muscular endurance uses 30 seconds or less rest to maintain elevated metabolic demand. Short rest prevents recovery, forcing sustained work under fatigue — the specific adaptation being developed.

167. A — Five sets of 2 at 92% with 5-minute rest develops maximal strength through neural adaptation. Near-maximal loading ensures full motor unit recruitment with complete recovery for maximal force on every repetition.

168. C — Volume load = 4 × 6 × 130 = 3,120 kg. Standard calculation quantifying total work for tracking overload and comparing training phases.

169. D — Novice athletes use moderate loads (60-70% 1RM) with 10-15 reps for the first 4-6 weeks. This develops technique, work capacity, and connective tissue adaptation before heavier loading.

170. B — The 48-72 hour recovery allows musculotendinous structures to recover from significant eccentric loading. Tendons have lower metabolic activity and blood supply than muscle, requiring longer recovery to prevent overuse injury.

171. A — Progressive intensity increases (70% → 78% → 83% → 89%) with volume decreases (4×8 → 4×6 → 4×5 → 4×3) across phases characterizes linear periodization.

172. C — Combining heavy training (85%+) some days with explosive exercises (Olympic lifts, plyometrics, jump squats at 30-50%) other days addresses both ends of the force-velocity continuum within the week.

173. D — The deload manages accumulated fatigue while maintaining neuromuscular stimulus through preserved intensity. Volume reduction allows recovery and supercompensation before the next loading cycle.

174. B — Rowing conditioning for endurance, rows/pull-ups for pulling, anti-movement core for stability, and front squats/RDLs for lower body drive address all identified needs comprehensively.

175. A — Three-minute rounds are glycolytic-dominant. The glycolytic system provides primary ATP during each round, supplemented by phosphagen for explosive techniques and aerobic for between-round recovery.

176. C — Training intensity (% 1RM) is the most critical detraining-prevention variable. Volume and frequency can be reduced while maintained intensity preserves neural and muscular adaptations.

177. D — Three sets of 20 at 55% with 30-second rest targets muscular endurance through high reps, low load, and minimal rest maximizing sustained metabolic demand and fatigue resistance.

178. B — Post-activation potentiation describes enhanced explosive performance following a heavy conditioning stimulus. The heavy squat primes neural activation; 3-4 minutes rest allows fatigue dissipation while potentiation persists for enhanced jump squat power.

179. A — VBT terminates sets when velocity drops 20%, controlling fatigue-induced velocity loss. This maintains movement quality and maximal intent, preventing degraded reps that provide suboptimal power stimulus.

180. C — A "velocity-deficient" athlete needs light-load, high-velocity training — plyometrics, jump squats at 30-40% 1RM, and sprint work — to develop the velocity component limiting performance while the existing force foundation supports it.

181. D — Evidence-based tapering reduces volume 40-60% while maintaining or slightly increasing intensity over 1-3 weeks. Volume reduction dissipates fatigue while maintained intensity preserves neural and muscular adaptations.

182. B — Wave loading exploits PAP — heavier loads in each wave prime the nervous system for subsequent sets. The second wave begins at loads the system is better prepared to handle from the first wave's potentiation effect.

183. A — Lacrosse's 60-minute mixed demands require aerobic base, anaerobic intervals, and change-of-direction conditioning. Each component addresses specific competitive demands of repeated sprints with varied intensity.

184. C — Brief 15-20 second intra-set rest allows partial PCr recovery and neural restoration between repetitions. This prevents progressive velocity decline, maintaining bar speed and movement quality across all reps for superior power stimulus.

TESTING AND EVALUATION (Questions 185–206)

185. D — The vertical jump (CMJ) with Vertec is valid, reliable, practical for 55 athletes in 2 hours, and directly measures lower body explosive power. Multiple athletes are tested efficiently with a single device.

186. B — Reliability is consistency and reproducibility across repeated administrations under identical conditions. High reliability ensures observed changes reflect true performance improvement rather than measurement variability.

187. C — The 1RM is defined as the last weight successfully lifted with acceptable technique through full ROM. The athlete completed 160 kg successfully, so 160 kg is the recorded 1RM. Failed attempts at 165 kg are never counted. Note: the correct answer (160 kg) should have been included as an option.

188. C — The 13 cm CMJ-SJ difference reflects stretch-shortening cycle utilization — stored elastic energy and stretch reflex from the countermovement enhancing concentric force production. These SSC mechanisms augment takeoff beyond concentric-only capacity in the static jump.

189. D — The 20-meter beep test requires only cones and sound system, administered to groups, providing valid aerobic capacity estimates. Its externally paced progressive protocol is practical for the described large-group outdoor scenario.

190. B — Two-step calculation: skinfolds enter prediction equations estimating body density, then body density converts to body fat percentage via equations such as the Siri formula. Both steps are required.

191. A — BIA accuracy is most affected by hydration status because water is the primary electrical conductor. Dehydration overestimates fat; hyperhydration underestimates it — potentially by several percentage points. Consistent hydration protocols are essential.

192. C — Electronic timing eliminates human timer reaction variability of 0.1-0.3 seconds. In short sprints, this error is a substantial proportion of total time, obscuring real performance differences between athletes.

193. D — A 21% asymmetry exceeds the 10-15% clinical threshold, warranting corrective programming emphasizing the weaker limb and possible medical evaluation for underlying pathology contributing to the persistent deficit.

194. B — VJ at 28th percentile is disproportionately low relative to 88th percentile squat, indicating a rate of force development deficit. The athlete has strength but cannot express it rapidly. Programming should prioritize explosive training.

195. A — Identical conditions across sessions — same warmup, equipment, test order, time of day, environment — is the most critical factor ensuring changes reflect true performance rather than procedural variability.

196. C — At 84%, the surgical leg has not met the 90% threshold. Continued progressive strengthening is needed because persistent asymmetries below 90% are associated with elevated re-injury risk during competitive sport.

197. D — Force plates measure peak GRF, rate of force development, impulse, and power in addition to height — comprehensive biomechanical data impossible with simpler methods like Vertec or jump mats.

198. B — The sit-and-reach primarily measures hamstring and lower back flexibility, doesn't assess other joints, and is influenced by limb proportions. Goniometry provides superior diagnostic specificity for identifying joint-specific restrictions.

199. A — Goniometry provides joint-specific ROM at any joint, identifying specific restrictions the sit-and-reach cannot detect. This allows targeted intervention for the exact limiting joint or tissue.

200. C — Testing at the beginning and end of each major phase and pre/post-season provides sufficient data for tracking progress and evaluating programs without excessive disruption.

201. D — Prediction equations are most accurate with 10 or fewer reps because the rep-to-1RM relationship becomes less linear at higher counts. Endurance, motivation, and pain tolerance introduce error above 10 reps.

202. B — The protocol includes 3-4 progressively heavier sets (~50%, 70%, 80-85% of estimated 1RM) before maximal attempts. This progressive loading prepares the neuromuscular system at incrementally higher intensities.

203. A — The T-test includes forward sprint, lateral shuffles both directions, and backward run in a T-shaped pattern. It assesses multidirectional movement including forward, lateral, and backward capabilities.

204. C — A squat at 1.15× body weight falls below the 1.5× threshold for plyometric effectiveness. Heavy resistance training develops the strength foundation enabling plyometrics to produce further power gains.

205. D — Both depend on self-pacing at maximal effort, influenced by motivation and experience. Athletes unfamiliar with self-pacing may underestimate true aerobic capacity.

206. B — A comprehensive battery assesses aerobic capacity, sprint speed, agility, lower body power, upper body strength, and body composition — domains matching basketball's diverse physical demands.

ORGANIZATION AND ADMINISTRATION (Questions 207–220)

207. A — NSCA upper guideline: 55 × 60 = 3,300 sq ft. This ensures adequate space for movement, equipment clearance, emergency access, and supervision visibility during peak training periods.

208. C — EAPs should be rehearsed at least annually with all staff, ideally more frequently. Unrehearsed plans fail under emergency stress because staff may not know roles, equipment locations, or communication procedures.

209. D — CPR and AED certification ensures immediate life-saving capability for cardiac emergencies. Survival declines approximately 7-10% per minute without CPR and defibrillation. This competency is non-negotiable.

210. B — The standard of care is the degree of care a reasonably competent professional with similar training would exercise under similar circumstances. It represents the minimum expected competence for safe, effective practice.

211. A — Waivers do not protect against gross negligence or reckless conduct — willful safety disregard beyond ordinary carelessness. Waivers document inherent risk disclosure but cannot absolve reckless professional behavior.

212. C — Diagnosis and rehabilitation are outside the CSCS scope, requiring medical training and licensure. The specialist must refer to a physician, athletic trainer, or physical therapist for clinical evaluation.

213. D — The CSCS scope encompasses designing programs, teaching technique, administering tests, and managing the facility. Diagnosis, rehabilitation, meal planning, and counseling require separate credentials.

214. B — Damaged equipment must be immediately removed, tagged out of order, documented, and repaired or replaced before return. Continued use violates the duty to maintain a safe training environment.

215. A — The CSCS must decline unsafe practices, explain the evidence-based rationale, and advocate for athlete safety. The certified professional holds ultimate program responsibility.

216. C — Ratios adjust based on exercise complexity (Olympic lifts need closer supervision), athlete experience (novices need more guidance), and staff qualifications (experienced staff manage larger groups safely).

217. D — Records include training logs, testing data, waivers, medical clearances, equipment maintenance, and incident reports. These support programming decisions and provide legal documentation.

218. B — Unqualified instruction of demanding exercises to novices creates significant safety and liability risk. The concern must be addressed through professional channels immediately.

219. A — Footwear policies protect against dropped weights and equipment contact. Open-toed sandals provide zero protection. The policy must be enforced — proper footwear required before training.

220. C — The NSCA establishes that the CSCS holds ultimate professional authority and responsibility for program design, implementation, and supervision based on specialized expertise in exercise science.