PRACTICE EXAM 2: CSCS FULL-LENGTH SIMULATION

SECTION 1 — SCIENTIFIC FOUNDATIONS

95 Questions | 1.5 Hours Recommended

EXERCISE SCIENCE (Questions 1–52)

1. A 22-year-old male collegiate wrestler completes 12 weeks of heavy resistance training. A post-training muscle biopsy reveals increased myofibrillar protein content and greater cross-sectional area of individual fibers with no evidence of new fiber formation. This structural change is best described as which of the following?

A. Hyperplasia resulting in new muscle fiber generation from satellite cell fusion

B. Sarcoplasmic hypertrophy from increased non-contractile protein content

C. Neural adaptation from enhanced motor unit recruitment without structural change

D. Myofibrillar hypertrophy from increased contractile protein within existing fibers

2. The connective tissue layer that surrounds entire fascicles — bundles of muscle fibers — within a skeletal muscle is called which of the following?

A. Perimysium

B. Epimysium

C. Endomysium

D. Sarcolemma

3. Which structural protein spans from the Z-line to the M-line within the sarcomere and contributes to the passive elastic properties of muscle by helping return the sarcomere to its resting length?

A. Actin

B. Titin

C. Tropomyosin

D. Nebulin

4. During a sustained isometric wall sit, an athlete's quadriceps maintain a fixed knee angle of 90 degrees. As the hold continues beyond 60 seconds, the burning sensation and progressive inability to maintain the position are primarily caused by which metabolic event?

A. Depletion of intramuscular myoglobin stores within the quadriceps fibers

B. Complete exhaustion of all available Type IIx motor units in the vastus lateralis

C. Excessive calcium accumulation that permanently damages the sarcoplasmic reticulum

D. Hydrogen ion accumulation from anaerobic glycolysis reducing intracellular pH and impairing cross-bridge function

5. An athlete has a skeletal muscle composed of approximately 70% Type I fibers and 30% Type II fibers in the gastrocnemius. Based on this fiber type distribution, which sport would this athlete's musculature be best suited for?

A. Olympic weightlifting requiring maximal force production in single efforts

B. 100-meter sprinting requiring explosive speed over a short distance

C. Marathon running requiring sustained low-to-moderate intensity endurance

D. Shot put requiring explosive power in a single throwing effort

6. The A-band within a sarcomere contains which filament arrangement, and how does its width change during muscle contraction?

A. The A-band contains the full length of thick filaments, including overlap zones, and remains constant in width during contraction

B. The A-band contains only thin filaments and narrows significantly during contraction

C. The A-band spans from one Z-line to the next and represents the entire sarcomere length

D. The A-band contains only the H-zone and disappears completely during maximal contraction

7. A strength and conditioning specialist notices that two athletes of identical body weight and limb length perform the bench press, but one can lift 20% more weight despite having similar muscle cross-sectional area on MRI. Which factor most likely explains this strength difference?

A. Differences in muscle fiber pennation angle reducing the weaker athlete's tendon stiffness

B. Superior neural factors including greater motor unit recruitment and rate coding in the stronger athlete

C. Greater bone density in the stronger athlete providing more rigid lever arms

D. Higher circulating insulin levels in the stronger athlete stimulating acute force production

8. During excitation-contraction coupling, the T-tubules play which specific role in transmitting the signal from the surface of the muscle fiber to the interior?

A. The T-tubules release acetylcholine into the synaptic cleft at the neuromuscular junction

B. The T-tubules store and release calcium ions directly into the sarcoplasm to initiate contraction

C. The T-tubules conduct the action potential from the sarcolemma deep into the fiber's interior to trigger calcium release from the sarcoplasmic reticulum

D. The T-tubules synthesize ATP through oxidative phosphorylation within their membrane walls

9. After death, the absence of ATP in skeletal muscle results in permanent cross-bridge attachment between actin and myosin, producing a condition known as rigor mortis. This occurs because ATP is required for which specific step of the cross-bridge cycle?

A. Binding of calcium to troponin C to expose the myosin binding sites on actin

B. The power stroke that generates force by pivoting the myosin head

C. The enzymatic hydrolysis of phosphocreatine by creatine kinase

D. Detachment of the myosin head from actin, allowing the cycle to continue or the muscle to relax

10. An athlete with a high proportion of Type IIa fibers in their vastus lateralis would be expected to demonstrate which performance characteristic compared to an athlete with predominantly Type IIx fibers?

A. Greater fatigue resistance during repeated high-intensity efforts due to the higher oxidative capacity of Type IIa fibers

B. Faster maximal contraction velocity and greater peak force during single maximal efforts

C. Reduced force production at all contraction velocities compared to Type IIx

D. Lower recruitment threshold requiring less neural drive for maximal activation

11. A physical therapist performs a manual muscle test on an athlete's shoulder and determines that the infraspinatus is weakened. During a seated cable row, the infraspinatus would normally function in which muscle role?

A. Agonist producing the primary pulling motion during the rowing movement

B. Antagonist opposing the pulling motion of the latissimus dorsi

C. Stabilizer contracting isometrically to maintain glenohumeral joint integrity during the pull

D. Synergist assisting the biceps brachii in elbow flexion during the rowing stroke

12. During the lowering phase of a Romanian deadlift, the hamstrings are actively generating tension while the hip flexion angle increases. Which type of muscle action are the hamstrings performing?

A. Concentric, because the hamstrings are the primary movers during the lowering phase

B. Eccentric, because the hamstrings are lengthening under tension to control the rate of hip flexion

C. Isometric, because the knee angle remains relatively constant throughout the movement

D. Isokinetic, because the movement is performed at a constant angular velocity

13. The length-tension relationship predicts that a muscle produces maximal force at which sarcomere length?

A. At the optimal length where actin-myosin overlap is greatest, allowing the maximum number of cross-bridges to form simultaneously

B. At the shortest possible length where the actin filaments are maximally compressed against the Z-lines

C. At the longest possible length where the sarcomere is stretched to the point of minimal filament overlap

D. At any length, because cross-bridge force production is independent of sarcomere length

14. A sprinter performing a 60-meter dash accelerates for the first 30 meters and maintains near-maximal velocity for the final 30 meters. During the maximal velocity phase, the ground contact time per stride is approximately 80 to 100 milliseconds. Which energy system contributes the greatest percentage of ATP during this 7-second sprint?

A. The oxidative system through mitochondrial electron transport chain activity

B. Glycolysis through the breakdown of muscle glycogen to pyruvate and lactate

C. Beta-oxidation of intramuscular triglycerides within the working muscle fibers

D. The phosphagen system through phosphocreatine hydrolysis catalyzed by creatine kinase

15. An exercise physiologist measures blood lactate in a cyclist during a graded exercise test. At 150 watts, blood lactate is 1.2 mmol/L. At 200 watts, it rises to 2.0 mmol/L. At 250 watts, it jumps to 5.8 mmol/L. The intensity at which lactate began its exponential rise most closely represents which physiological threshold?

A. The phosphocreatine depletion point marking exhaustion of the phosphagen system

B. The VO_2max ceiling representing the absolute limit of oxygen consumption

C. The lactate threshold marking the onset of blood lactate accumulation exceeding clearance capacity

D. The ventilatory equivalent threshold for oxygen representing hyperventilation onset

16. During prolonged exercise at 50% of VO_2max lasting 3 hours, which substrate provides the majority of ATP production throughout the activity?

A. Muscle glycogen metabolized exclusively through anaerobic glycolysis

B. Fat metabolized through beta-oxidation and oxidative phosphorylation

C. Blood glucose metabolized through the phosphagen system

D. Protein metabolized through transamination and the urea cycle

17. The Krebs cycle occurs in which cellular compartment and produces which primary outputs that are subsequently used by the electron transport chain?

A. The Krebs cycle occurs in the sarcoplasm and produces lactate and hydrogen ions

B. The Krebs cycle occurs on the sarcolemma and produces phosphocreatine for immediate energy

C. The Krebs cycle occurs in the cytoplasm and directly produces 36 ATP molecules per glucose

D. The Krebs cycle occurs in the mitochondrial matrix and produces NADH, $FADH_2$, and a small amount of ATP (or GTP)

18. An 800-meter runner completes their race in 1 minute and 55 seconds. Based on the duration and intensity of this event, which energy system provides the dominant contribution to ATP production?

A. The glycolytic system, because the effort lasts approximately 2 minutes at near-maximal intensity, falling within the glycolytic-dominant range

B. The phosphagen system, because the event requires explosive speed from the starting blocks

C. The oxidative system, because any event lasting longer than 60 seconds is exclusively aerobic

D. Beta-oxidation of fatty acids, because the athlete must conserve glycogen for the final sprint

19. The enzyme lactate dehydrogenase converts pyruvate to lactate during fast glycolysis. This conversion serves which critical metabolic purpose?

A. It produces 4 additional ATP molecules per pyruvate molecule converted to lactate

B. It regenerates NAD^+ from NADH, which is essential for glycolysis to continue operating

C. It directly activates the electron transport chain within the mitochondrial membrane

D. It permanently removes pyruvate from the metabolic pathway to prevent oxidative damage

20. A strength and conditioning specialist is designing a conditioning program for a 100-meter sprinter. Phosphocreatine stores are substantially depleted after a maximal 10-second sprint. What is the minimum rest period needed for near-complete phosphocreatine replenishment?

A. 10 to 15 seconds of passive standing rest between sprint efforts

B. 30 to 45 seconds of active jogging recovery between repetitions

C. 60 to 90 seconds of light stretching between sprints

D. 3 to 5 minutes of passive rest between maximal sprint efforts

21. Which of the following statements accurately describes the oxidation of fatty acids as a fuel source during exercise?

A. Fatty acids can be metabolized anaerobically through glycolysis when oxygen is limited

B. Fatty acids produce fewer ATP molecules per molecule than glucose and are therefore an inefficient fuel

C. Fatty acids are metabolized aerobically through beta-oxidation and produce substantially more ATP per molecule than glucose but at a slower rate

D. Fatty acids can only be used as fuel during maximal-intensity exercise above 90% of VO_2max

22. A recreational athlete increases their running speed from 60% to 85% of VO_2max during a training session. How does the relative contribution of carbohydrate and fat as fuel substrates change with this intensity increase?

A. Carbohydrate contribution increases and becomes the dominant substrate as the reliance on fat oxidation decreases

B. Fat contribution increases because higher intensities require more calorie-dense fuel sources

C. Both substrates contribute equally at all exercise intensities regardless of metabolic demand

D. Protein becomes the dominant fuel source at any intensity above 80% of VO_2max

23. A strength and conditioning specialist calculates that a 100 kg athlete performing a vertical jump must produce a net upward force exceeding 981 Newtons (100 kg × 9.81 m/s^2) to leave the ground. This calculation applies which of Newton's Laws of Motion?

A. Newton's First Law (Law of Inertia) regarding an object at rest remaining at rest

B. Newton's Third Law (Law of Action-Reaction) regarding equal and opposite forces

C. The Law of Conservation of Energy regarding energy transformation during the jump

D. Newton's Second Law (F = ma) regarding the relationship between force, mass, and acceleration

24. During the acceleration phase of a sprint, research consistently shows that faster sprinters produce greater horizontal ground reaction forces relative to body weight. According to Newton's Third Law, how is the ground reaction force generated?

A. The ground generates force independently of the sprinter through gravitational attraction

B. The sprinter pushes against the ground, and the ground pushes back with an equal and opposite force

C. Ground reaction force is generated by elastic energy stored in the running surface

D. The ground reaction force is created by air resistance pushing the sprinter forward

25. A strength and conditioning specialist observes that an athlete's deadlift becomes most difficult when the bar is at knee height with the torso inclined approximately 45 degrees forward. Which biomechanical factor is primarily responsible for this sticking point?

A. The quadriceps are at their shortest length and cannot generate additional force

B. The hamstrings transition from eccentric to concentric action at this joint angle

C. The moment arm of the external load relative to the lumbar spine is near its maximum at this torso angle, creating the greatest demand on the hip and back extensors

D. The grip strength required to hold the bar exceeds the forearm flexor capacity

26. An athlete performing a front raise with a 5 kg dumbbell at shoulder height with the arm fully extended creates a certain torque about the shoulder joint. If the same athlete held the same 5 kg dumbbell in a biceps curl position with the elbow flexed to 90 degrees at the same shoulder height, what would happen to the torque demand on the shoulder?

A. Torque on the shoulder would decrease because the center of mass of the forearm-dumbbell system is closer to the shoulder joint, reducing the moment arm

B. Torque would increase because the additional elbow flexion activates more motor units

C. Torque would remain exactly the same because the dumbbell weight has not changed

D. Torque would increase because elbow flexion adds the weight of the forearm to the calculation

27. A second-class lever system in the human body favors force production over speed because it has which structural characteristic?

A. The fulcrum is positioned between the effort and the resistance forces

B. The effort is positioned between the fulcrum and the resistance forces

C. The resistance and effort forces are applied at the same distance from the fulcrum

D. The effort arm is longer than the resistance arm, providing a mechanical advantage greater than one

28. Which proprioceptor is responsible for detecting changes in muscle length and the rate of length change, and where is it located?

A. Golgi tendon organ located at the musculotendinous junction, arranged in series with extrafusal fibers

B. Muscle spindle located within the muscle belly, arranged in parallel with extrafusal fibers

C. Pacinian corpuscle located in deep subcutaneous tissue, detecting vibration and pressure

D. Ruffini ending located in joint capsules, detecting sustained pressure and joint position

29. An athlete is performing PNF (proprioceptive neuromuscular facilitation) stretching on their hamstrings. The contract-relax technique involves a voluntary isometric contraction of the hamstrings against resistance before the stretch is applied. Which proprioceptive mechanism is primarily exploited to achieve a greater range of motion?

A. Autogenic inhibition from the Golgi tendon organ, which reflexively inhibits the hamstrings after the contraction, allowing a greater stretch

B. Reciprocal inhibition from the muscle spindle, which activates the quadriceps to push the hamstrings into a deeper stretch

C. The withdrawal reflex from nociceptors, which causes rapid relaxation in response to pain

D. Gamma motor neuron resetting from the central nervous system, which permanently reduces resting muscle tone

30. During a sudden unexpected stretch of the quadriceps — such as when an athlete's foot catches on an obstacle while running — the stretch reflex produces which immediate response?

A. Relaxation of the quadriceps to allow the leg to move freely with the external force

B. Contraction of the hamstrings to flex the knee and protect the quadriceps from overstretching

C. Reflexive contraction of the quadriceps to resist the stretch and protect the muscle from excessive lengthening

D. Bilateral contraction of both quadriceps and hamstrings to completely immobilize the knee joint

31. At rest, cardiac output in a healthy adult is approximately 5 liters per minute. During maximal exercise in a highly trained endurance athlete, cardiac output may increase to which approximate range?

A. 6 to 8 liters per minute representing a modest 20% increase from resting values

B. 10 to 12 liters per minute representing a doubling of resting cardiac output

C. 15 to 18 liters per minute representing a threefold increase from rest

D. 20 to 40 liters per minute representing a four- to eight-fold increase from resting values

32. During progressive exercise, stroke volume typically increases up to approximately 40% to 60% of VO_2max and then plateaus. After this plateau, further increases in cardiac output during the final phase of progressive exercise are primarily achieved through which mechanism?

A. Continued increases in stroke volume through greater venous return and Frank-Starling response

B. Continued increases in heart rate through increased sympathetic nervous system activation

C. Increased oxygen extraction at the tissue level without any change in cardiac output

D. Redistribution of blood from the brain to the working muscles to increase delivery

33. A strength and conditioning specialist is working with a client who has controlled hypertension. During resistance exercise, the client performs heavy leg presses using the Valsalva maneuver. Which acute cardiovascular response is the primary concern for this client?

A. Dramatic acute increases in both systolic and diastolic blood pressure that may exceed safe limits for a hypertensive individual

B. Dangerous decreases in heart rate below 40 beats per minute causing loss of consciousness

C. Complete cessation of blood flow to the brain resulting in immediate stroke during the exercise

D. Permanent structural damage to the left ventricle from the single bout of elevated blood pressure

34. The Frank-Starling mechanism describes the heart's ability to increase stroke volume in response to which physiological stimulus?

A. Increased sympathetic nervous system activation from the medulla oblongata

B. Decreased venous return during the transition from supine to standing position

C. Increased venous return that stretches the ventricular walls, causing a more forceful contraction

D. Elevated circulating epinephrine from the adrenal medulla during intense exercise

35. During moderate-intensity aerobic exercise, blood flow to working skeletal muscles increases dramatically while blood flow to the digestive organs decreases. This redistribution is achieved through which cardiovascular mechanism?

A. Decreased total cardiac output that redirects the reduced blood volume to priority tissues

B. Increased blood viscosity that prevents blood from flowing to non-essential organs

C. Structural changes in the vascular system that permanently close vessels to the digestive tract

D. Selective vasodilation in working muscles and vasoconstriction in non-essential organs mediated by local metabolic signals and sympathetic nervous system activity

36. A collegiate swimmer has been performing high-volume endurance training for 8 years. An echocardiogram reveals increased left ventricular chamber size with only modest wall thickening. This cardiac adaptation is best classified as which of the following?

A. Pathological cardiac hypertrophy requiring immediate medical intervention

B. Eccentric cardiac hypertrophy, which is the characteristic cardiac adaptation to chronic endurance training

C. Concentric cardiac hypertrophy, which is the characteristic cardiac adaptation to chronic resistance training

D. Cardiac atrophy resulting from overtraining-induced deconditioning

37. Testosterone promotes muscle growth primarily through which physiological mechanism?

A. Stimulating muscle protein synthesis and inhibiting protein degradation in skeletal muscle tissue

B. Directly activating the phosphagen system to increase intramuscular phosphocreatine stores

C. Increasing mitochondrial density to enhance oxidative capacity in Type I muscle fibers

D. Suppressing cortisol release from the adrenal cortex through negative feedback inhibition

38. An exercise physiologist collects blood samples from an athlete before, during, and after a high-volume resistance training session (4 exercises, 4 sets of 10 reps, 60-second rest periods). Which acute hormonal response pattern would be expected?

A. Decreased testosterone and decreased growth hormone throughout the session

B. Elevated testosterone with no change in growth hormone or cortisol

C. Decreased cortisol with no change in testosterone or growth hormone

D. Elevated testosterone, significantly elevated growth hormone, and elevated cortisol

39. Insulin-like growth factor-1 (IGF-1) produced locally within muscle tissue in response to mechanical loading is particularly important for which adaptive process?

A. Directly inhibiting all protein synthesis pathways in the loaded muscle fibers

B. Reducing satellite cell activity to prevent excessive muscle fiber repair

C. Activating satellite cells and stimulating muscle protein synthesis through the mTOR signaling pathway

D. Increasing bone resorption to release calcium for muscle contraction during exercise

40. A female athlete presents with chronically suppressed estrogen levels, irregular menstrual cycles, and a recent tibial stress fracture. Her training diary reveals energy intake averaging 1,200 calories per day despite training 3 hours daily. This presentation is most consistent with which condition?

A. Iron deficiency anemia from inadequate dietary iron absorption during heavy training

B. Relative Energy Deficiency in Sport (RED-S) characterized by low energy availability, menstrual dysfunction, and decreased bone mineral density

C. Creatine kinase elevation from acute rhabdomyolysis following a single intense session

D. Normal physiological adaptation to high-volume endurance training in female athletes

41. Which of the following resistance training variables has the greatest influence on the magnitude of the acute growth hormone response following a training session?

A. The degree of metabolic stress created by training volume and short rest periods

B. The number of exercises performed for the biceps in a single training session

C. The maximum barbell velocity achieved during the concentric phase of each repetition

D. The athlete's chronological age at the time of the training session

42. An athlete training at high intensity with insufficient recovery for six consecutive weeks demonstrates declining performance, persistent fatigue, elevated resting cortisol, and suppressed testosterone. These chronic hormonal disruptions are characteristic of which condition?

A. Acute delayed-onset muscle soreness from a single novel training session

B. Normal supercompensation occurring during a planned functional overreaching phase

C. Metabolic alkalosis from chronic supplementation with sodium bicarbonate

D. Overtraining syndrome resulting from chronic imbalance between training stress and recovery

43. The SAID principle (Specific Adaptations to Imposed Demands) has which direct implication for a strength and conditioning specialist designing a program for a volleyball player?

A. Identical training programs should be used for all athletes regardless of their sport

B. The program should consist exclusively of endurance running to build general fitness

C. Training should include exercises and modalities that replicate the movement patterns, velocities, and energy system demands of volleyball

D. The athlete should train only with machines to reduce the risk of volleyball-related injuries

44. Chronic resistance training has been shown to increase androgen receptor density in skeletal muscle tissue. What is the practical significance of this adaptation?

A. It reduces the athlete's need for testosterone by making the hormone less important

B. It enhances the muscle's sensitivity and responsiveness to circulating testosterone, potentially amplifying the anabolic signal

C. It eliminates the need for post-exercise protein intake to stimulate muscle protein synthesis

D. It converts Type I fibers to Type IIx fibers through direct hormonal receptor stimulation

45. A 35-year-old male beginner starts a resistance training program. After 4 weeks, his bench press 1RM increases from 60 kg to 78 kg — a 30% increase. His body weight and arm circumference measurements have not changed. What is the most likely explanation?

A. Neural adaptations including improved motor unit recruitment, rate coding, and intermuscular coordination

B. Significant myofibrillar hypertrophy that is not yet detectable by circumference measurement

C. Sarcoplasmic hypertrophy that increased glycogen storage without changing fiber diameter

D. Increased circulating testosterone levels that enhanced contractile protein density

46. During a maximal voluntary contraction, the nervous system can increase the force produced by an already-recruited motor unit by increasing the frequency of action potentials delivered to that motor unit. At which firing frequency do individual twitches fuse into a smooth, sustained maximal contraction called tetanus?

A. At the lowest possible firing frequency where only single twitches are produced

B. At a moderate frequency that produces wave summation with visible oscillation

C. At the recruitment threshold frequency where the motor unit first becomes active

D. At a sufficiently high frequency that successive twitches overlap completely and individual twitches are no longer distinguishable

47. Wolff's Law and the principle of bone remodeling indicate that resistance training is one of the most effective interventions for increasing bone mineral density. Which population benefits most from this osteogenic effect?

A. Exclusively male athletes under the age of 18 during peak growth velocity

B. Only professional athletes competing in contact sports with impact loading

C. All populations including young athletes building peak bone mass, adults maintaining density, and older adults attenuating age-related bone loss

D. Only individuals diagnosed with osteoporosis who have already experienced fractures

48. An athlete performs a plyometric depth jump from a 60 cm box. During the landing phase before the explosive takeoff, which muscle action are the quadriceps primarily performing?

A. A rapid eccentric action as they lengthen under the high impact forces to decelerate the body before the concentric takeoff

B. A concentric action as they shorten to push the body upward immediately upon ground contact

C. An isometric action as they maintain a fixed knee angle throughout the entire ground contact phase

D. No muscle action because the ground reaction forces are absorbed entirely by the skeletal system

49. A university athletic department is evaluating two athletes for a sprint position. Both athletes weigh 85 kg and have identical squat 1RM values. However, Athlete A produces peak ground reaction force 40% faster than Athlete B during a vertical jump. Which performance variable gives Athlete A the advantage?

A. Greater absolute maximal strength reflected in a higher 1RM per unit of body weight

B. Superior rate of force development, meaning Athlete A can produce peak force in less time

C. Higher aerobic capacity allowing Athlete A to recover faster between sprint efforts

D. Greater flexibility enabling Athlete A to achieve a deeper countermovement before takeoff

50. The neuromuscular junction is the synaptic connection between a motor neuron and a muscle fiber. Which neurotransmitter is released at this junction to initiate the action potential on the muscle fiber's sarcolemma?

A. Norepinephrine released from sympathetic nerve terminals

B. Gamma-aminobutyric acid (GABA) released from inhibitory interneurons

C. Dopamine released from the substantia nigra of the basal ganglia

D. Acetylcholine released from the motor neuron's terminal into the synaptic cleft

51. An athlete recovering from a period of complete bed rest following surgery has experienced significant detraining. According to the principle of reversibility, which physiological capacity is lost most rapidly during detraining?

A. Maximal strength, which declines within the first 24 to 48 hours of inactivity

B. Bone mineral density, which decreases by 50% within the first week of bed rest

C. Aerobic endurance and cardiovascular fitness, which show measurable declines within 1 to 2 weeks of detraining

D. Flexibility, which is permanently lost after any period exceeding 72 hours without stretching

52. A strength and conditioning specialist observes that an experienced weightlifter can recruit a greater percentage of their total motor unit pool during a maximal effort compared to a novice lifter with similar muscle size. This difference is attributed to which training-induced adaptation?

A. Reduced Golgi tendon organ inhibition and increased voluntary activation capacity developed through chronic heavy loading

B. Increased number of motor neurons through neurogenesis stimulated by resistance training

C. Greater circulating testosterone levels in experienced lifters compared to novice lifters

D. Enhanced mitochondrial density in Type IIx fibers from chronic high-intensity loading

SPORT PSYCHOLOGY (Questions 53–75)

53. A strength and conditioning specialist wants to improve an athlete's commitment to a 16-week off-season training program. According to goal-setting research, which type of goal would be most effective for maintaining daily adherence and directing attention to specific training behaviors?

A. An outcome goal such as "Win the starting position next season"

B. Process goals such as "Complete all prescribed sets with proper technique and full effort every session"

C. An ego-oriented goal comparing the athlete's performance to their teammates

D. A long-term goal with no intermediate benchmarks to allow maximum flexibility

54. An Olympic diver preparing for a competition imagines the complete sequence of their dive — the approach, the takeoff, the aerial maneuvers, and the entry — while also feeling the muscular sensations, hearing the crowd, and experiencing the confidence associated with a perfect dive. This psychological technique is best described as which of the following?

A. Progressive muscle relaxation targeting the muscles involved in the dive

B. Biofeedback using physiological monitoring to control autonomic responses

C. External attentional focus training using environmental cue recognition

D. Multisensory mental imagery engaging visual, kinesthetic, auditory, and emotional components

55. According to the inverted-U hypothesis, a competitive powerlifter preparing for a maximal deadlift attempt should aim for which arousal level to optimize performance on this gross motor, high-force task?

A. Very low arousal to minimize muscle tension and promote relaxation

B. Moderate arousal identical to the optimal level for fine motor precision tasks

C. Relatively high arousal because gross motor power tasks benefit from heightened physiological activation

D. No specific arousal level because the inverted-U hypothesis applies only to endurance events

56. A baseball pitcher who was previously performing well suddenly begins overthrowing and making control errors after learning that a professional scout is in the stands. This decline in performance due to excessive cognitive anxiety is best explained by which psychological phenomenon?

A. Choking under pressure, where excessive cognitive anxiety disrupts well-learned motor patterns

B. Social facilitation, where the presence of observers always improves performance

C. State anxiety reduction from the motivational influence of an important audience

D. Detraining effects from inadequate physical preparation during the preceding week

57. A strength and conditioning specialist designs a 12-week training program that begins with simple bodyweight exercises in the first week and progressively introduces complex barbell movements by week six. This progressive introduction of complexity aligns with which motor learning principle?

A. The contextual interference effect requiring random practice of all skills simultaneously

B. The massed practice principle requiring maximum repetitions with no rest between attempts

C. Blocked practice where the same drill is repeated 500 times before any skill progression

D. Appropriate task complexity progression that matches skill difficulty to the learner's current stage of development

58. An athlete in the associative stage of learning the power snatch can perform the basic movement pattern but occasionally makes errors in the transition from the second pull to the overhead catch. Compared to the cognitive stage, how has the athlete's performance changed?

A. Performance is now completely automatic with no errors and no need for coaching feedback

B. Errors have become smaller and less frequent, and the athlete can detect some errors independently

C. Performance has deteriorated because the associative stage represents regression from initial learning

D. The athlete has lost all conscious awareness of the movement and cannot describe what they are doing

59. A basketball coach asks the strength and conditioning specialist whether practice drills should be organized in a blocked format (practicing free throws for 20 minutes, then layups for 20 minutes, then three-pointers for 20 minutes) or a random format (intermixing all three skills throughout the practice). Based on the contextual interference effect, which recommendation optimizes long-term retention and game-day transfer?

A. Blocked practice because it produces both the fastest initial improvement and the best long-term retention

B. Neither format affects learning outcomes because basketball skill development is genetically determined

C. Random practice because the constant task-switching forces deeper cognitive processing that enhances retention and transfer despite slower initial improvement

D. Alternating between blocked and random practice on successive days for equal effect

60. A strength and conditioning specialist provides an athlete with extrinsic feedback about their squat technique after every single repetition during a training session. According to the guidance hypothesis, what is the likely long-term consequence of this feedback schedule?

A. Optimal long-term learning because maximum feedback frequency always produces the best retention

B. Accelerated skill acquisition with no negative consequences for long-term retention

C. The athlete may develop no lasting effect because immediate gains are unrelated to feedback frequency

D. Impaired long-term learning due to the athlete's dependence on external feedback rather than developing their own internal error-detection capabilities

61. Knowledge of results (KR) provides information about the outcome of a movement attempt. Which of the following is an example of KR provided by a strength and conditioning specialist?

A. "Keep your chest up and drive through your heels on the next rep"

B. "Your elbows dropped below parallel during the catch phase of that clean"

C. "Focus on engaging your lats before initiating the pulling motion"

D. "Your 40-yard dash time was 4.62 seconds"

62. A strength and conditioning specialist is working with a soccer team that trains 5 days per week. One effective strategy for developing agility involves using reactive drills where athletes respond to unpredictable stimuli from a partner. Why are these drills superior to predetermined cone patterns for developing game-relevant agility?

A. Predetermined cone patterns are more physically demanding than reactive drills

B. Cone patterns develop sprint speed more effectively than reactive drills

C. Reactive drills develop both the physical and perceptual-cognitive components of agility, replicating the decision-making demands of competition

D. Predetermined cone patterns develop superior eccentric deceleration strength

63. An athlete reports feeling overwhelmed by the magnitude of their goal to qualify for the national team. The strength and conditioning specialist recommends breaking this goal into smaller, measurable benchmarks. This approach applies which goal-setting principle?

A. Setting only outcome goals because they provide the strongest motivational drive

B. Eliminating all long-term goals to prevent performance anxiety

C. Using only process goals while avoiding any measurement of objective performance

D. Abandoning goal-setting entirely because it creates unnecessary pressure for the athlete

64. Self-determination theory identifies three psychological needs that support intrinsic motivation. A training environment where the coach makes every decision without athlete input, provides no positive feedback, and isolates athletes who underperform would likely undermine which psychological need most directly?

A. All three needs simultaneously — autonomy, competence, and relatedness

B. Only competence, because the lack of feedback prevents athletes from feeling capable

C. Only relatedness, because the punitive environment damages interpersonal connections

D. Only autonomy, because the coach-centered approach prevents athletes from having any input

65. A track and field athlete consistently performs well in practice but underperforms during competition. The athlete reports intense pre-competition worry, negative self-talk, and fear of failure. These symptoms suggest elevated levels of which specific component of competitive anxiety?

A. Somatic anxiety manifesting as physical tension, elevated heart rate, and sweating

B. Trait anxiety that is a permanent personality characteristic unresponsive to intervention

C. Cognitive anxiety characterized by worry, negative thoughts, and self-doubt about performance outcomes

D. Facilitative anxiety that enhances performance through increased physiological readiness

66. Which psychological intervention would be most appropriate for an athlete whose primary pre-competition symptoms include muscle tension in the shoulders and neck, rapid shallow breathing, and an elevated resting heart rate?

A. Cognitive restructuring to replace negative thought patterns with positive affirmations

B. Goal-setting worksheets to redirect focus from outcome to process objectives

C. Imagery focusing on worst-case scenario rehearsal to prepare for potential failures

D. Progressive muscle relaxation and diaphragmatic breathing to reduce somatic anxiety symptoms

67. Transfer of training is highest when the practiced skill and the target skill share which characteristics?

A. Identical equipment brands and training facility environments

B. Common movement patterns, timing structures, force requirements, and perceptual demands

C. The same coach providing instruction for both the practiced and target skills

D. An identical number of total practice hours regardless of practice content

68. In Fitts and Posner's three-stage model of motor learning, which stage is characterized by the athlete's ability to perform the skill with minimal conscious attention, freeing cognitive resources for strategic and environmental processing?

A. The autonomous stage where the skill has become largely automatic and self-correcting

B. The cognitive stage where the athlete relies heavily on verbal instructions and demonstrations

C. The associative stage where errors are becoming smaller and the athlete is refining technique

D. The preparatory stage where the athlete visualizes the movement before physical execution

69. A high school football coach implements a conditioning program where players run 400-meter repeats until they vomit, believing this builds mental toughness. From a sport psychology and evidence-based coaching perspective, this approach is most likely to produce which outcome?

A. Enhanced intrinsic motivation and improved team cohesion through shared suffering

B. Optimal physiological adaptation to the demands of football's energy system requirements

C. Decreased motivation, increased risk of overtraining, potential psychological harm, and no evidence of improved mental toughness

D. Improved pain tolerance that directly transfers to competitive performance gains

70. Which motor learning concept explains why a tennis player's well-practiced forehand may temporarily deteriorate when they begin learning a new backhand technique that conflicts with established movement patterns?

A. Positive transfer of training enhancing both the forehand and backhand simultaneously

B. The spacing effect requiring distributed practice for optimal retention

C. Proactive interference where a previously established skill interferes with the execution of a different skill

D. Negative transfer where the new backhand skill temporarily disrupts the existing forehand motor program

71. A youth athlete's parents approach the strength and conditioning specialist concerned that their 14-year-old seems increasingly withdrawn, has lost interest in their sport, and has been making self-deprecating comments about their abilities. The specialist should respond by doing which of the following?

A. Designing a more challenging training program to rebuild the athlete's confidence through physical accomplishment

B. Recognizing these as potential warning signs of depression or burnout and recommending that the parents seek evaluation from a qualified mental health professional

C. Ignoring the concerns because mood fluctuations are normal for adolescents and always resolve without intervention

D. Increasing the athlete's competitive schedule to provide more opportunities for success

72. An athlete who has recently suffered a serious knee injury is struggling with the psychological aspects of rehabilitation, including fear of re-injury, frustration with slow progress, and feelings of isolation from the team. The strength and conditioning specialist can best support this athlete by doing which of the following?

A. Maintaining the athlete's involvement in team training activities where safe, setting achievable short-term rehabilitation goals, and facilitating referral to a sport psychologist if needed

B. Telling the athlete to ignore their psychological concerns and focus exclusively on physical rehabilitation

C. Prescribing anti-anxiety medication to help the athlete cope with fear of re-injury

D. Removing the athlete from all team activities until they have achieved full physical recovery

73. The concept of self-efficacy is task-specific and situation-specific. An athlete who reports high confidence in their back squat but low confidence in the power clean is demonstrating which characteristic of self-efficacy?

A. The athlete has low general self-esteem that requires psychological counseling

B. The athlete lacks intrinsic motivation for Olympic lifting and should only train with exercises they enjoy

C. Self-efficacy varies across different tasks and is not a global personality trait, so high confidence in one exercise does not automatically transfer to all exercises

D. The athlete's low confidence in the power clean indicates a neurological deficit in motor coordination

74. In the context of the inverted-U hypothesis, an athlete preparing for a fine motor precision task — such as an archery shot — who notices their hands trembling and heart racing should employ which strategy to optimize their arousal level?

A. Increase arousal further through aggressive self-talk and loud music to maximize focus

B. Perform a maximal-intensity exercise immediately before the shot to redirect nervous energy

C. Use relaxation techniques such as diaphragmatic breathing and progressive muscle relaxation to reduce arousal toward the lower optimal zone for precision tasks

D. Ignore the physiological symptoms because arousal level has no effect on precision performance

75. A strength and conditioning specialist observes that a normally energetic and dedicated athlete has become increasingly apathetic, cynical, and emotionally exhausted despite no change in training load. These symptoms are most consistent with which psychological condition?

A. Acute performance anxiety that will resolve after the next competition

B. Athletic burnout characterized by emotional exhaustion, depersonalization, and reduced sense of accomplishment

C. Normal adaptation to a well-designed periodized training program

D. Overtraining syndrome that is exclusively physiological with no psychological component

NUTRITION (Questions 76–95)

76. A 90 kg strength athlete is planning daily protein intake to support muscle recovery and growth during a heavy training phase. According to current evidence-based recommendations for strength and power athletes, what is the appropriate daily protein target?

A. 144 to 198 grams per day, based on the recommended range of 1.6 to 2.2 g/kg/day for strength athletes

B. 72 grams per day based on the general population RDA of 0.8 g/kg/day

C. 450 grams per day to ensure maximum saturation of all amino acid pathways

D. 36 grams per day consumed in a single post-workout meal for optimal absorption

77. An athlete consumes a meal containing chicken breast, brown rice, and broccoli approximately 3 hours before a resistance training session. By the time the training session begins, which macronutrients from this meal are being digested, absorbed, and available to support the workout?

A. Only the broccoli has been digested because vegetables are processed faster than protein or carbohydrate

B. None of the meal has been absorbed because 3 hours is insufficient for any digestion to occur

C. Only the chicken breast protein has been absorbed while the carbohydrate and fiber remain undigested

D. All three macronutrients are in various stages of digestion and absorption, with amino acids and glucose becoming available to support the training session

78. Which of the following vitamins plays essential roles as a coenzyme in the enzymatic reactions of glycolysis, the Krebs cycle, and the electron transport chain, and must be consumed regularly because it is not stored in significant amounts?

A. Vitamin A, which is stored in the liver and supports vision and immune function

B. Vitamin D, which is fat-soluble and stored in adipose tissue for skeletal health

C. B-complex vitamins, which are water-soluble coenzymes in energy metabolism pathways

D. Vitamin K, which is fat-soluble and primarily involved in blood clotting mechanisms

79. An athlete is preparing for a 10-kilometer race on a hot summer day (temperature 35°C, humidity 80%). Pre-race hydration guidelines recommend consuming approximately how much fluid at least 4 hours before the event?

A. No fluid intake is recommended before endurance events to prevent gastrointestinal distress

B. 5 to 7 milliliters per kilogram of body weight to ensure adequate pre-exercise hydration

C. A minimum of 2 liters consumed in a single bolus immediately before the starting gun

D. Only caffeinated beverages to simultaneously hydrate and enhance performance

80. A marathon runner loses 2.5% of their body weight through sweat during a race. At this level of dehydration, which performance consequences are expected?

A. Enhanced thermoregulation due to reduced body mass and lower metabolic heat production

B. No measurable performance impairment because significant effects only occur above 5% loss

C. Improved endurance performance because lighter body weight reduces the energetic cost of running

D. Performance benefits have been documented at dehydration levels below 1% body weight loss

81. During a triathlon lasting 4 hours in a hot environment, an athlete consumes only plain water without any sodium-containing fluids or food. This hydration strategy places the athlete at risk for which dangerous condition?

A. Hypernatremia from excessive sodium concentration caused by consuming too little fluid

B. Metabolic alkalosis from the elevated pH of the consumed plain water

C. Rhabdomyolysis from the mechanical stress of prolonged exercise on skeletal muscle

D. Hyponatremia from dilution of blood sodium concentration by excessive plain water intake relative to sodium losses

82. An athlete is in a caloric deficit of 500 kilocalories per day to reduce body fat before the competitive season. To minimize lean mass loss during this deficit, protein intake should be adjusted to which range?

A. Reduced to 0.4 g/kg/day because caloric restriction requires proportional reduction in all macronutrients

B. Maintained at the general population RDA of 0.8 g/kg/day regardless of training status

C. Increased to the upper end of recommendations at 2.0 to 2.4 g/kg/day to provide maximum protection against lean mass loss

D. Eliminated entirely because protein contributes unnecessary calories during a weight loss phase

83. Creatine monohydrate supplementation increases intramuscular phosphocreatine stores. An alternative to the standard loading protocol (20 g/day for 5–7 days) is to skip the loading phase and begin with the maintenance dose. How long does it typically take to achieve full muscle creatine saturation using the maintenance-only approach?

A. 24 to 48 hours of consistent supplementation at 3 to 5 grams per day

B. Approximately 28 days of consistent supplementation at 3 to 5 grams per day

C. 6 to 12 months of supplementation regardless of the daily dose

D. Full saturation cannot be achieved without completing the loading phase first

84. Beta-alanine supplementation produces a characteristic side effect that is harmless but can be uncomfortable. Which side effect should the strength and conditioning specialist inform the athlete about before beginning supplementation?

A. Paresthesia — a tingling or prickling sensation on the skin, typically in the face and hands

B. Significant hair loss within the first week of supplementation

C. Permanent reduction in taste sensation affecting all food and beverage consumption

D. Severe joint pain and inflammation requiring discontinuation of all resistance training

85. The effective ergogenic dose of caffeine for enhancing exercise performance is typically within which range, consumed approximately 30 to 60 minutes before exercise?

A. 0.5 to 1 milligram per kilogram of body weight for minimal effect

B. 10 to 15 milligrams per kilogram of body weight for maximal neural stimulation

C. 3 to 6 milligrams per kilogram of body weight for optimal performance enhancement

D. 20 to 30 milligrams per kilogram of body weight to ensure saturation of all adenosine receptors

86. An athlete asks the strength and conditioning specialist about testosterone booster supplements marketed as "natural anabolic enhancers." Based on the current scientific evidence, which response is most accurate?

A. Testosterone boosters are well-supported by research and reliably increase circulating testosterone

B. The evidence strongly supports testosterone boosters for athletes under the age of 25

C. Testosterone boosters should be taken in combination with anabolic steroids for synergistic effects

D. Most commercially available testosterone boosters lack rigorous scientific evidence supporting their marketed claims for increasing testosterone or enhancing performance

87. A team of 25 collegiate football players needs to gain lean mass during the off-season. The strength and conditioning specialist recommends a caloric surplus combined with resistance training. What is the recommended daily caloric surplus for promoting lean mass gains while minimizing excessive fat accumulation?

A. A surplus of 2,000 or more kilocalories per day to maximize the rate of muscle growth

B. A moderate surplus of approximately 300 to 500 kilocalories per day combined with progressive resistance training

C. No caloric surplus is needed because resistance training alone produces muscle growth without additional calories

D. A caloric deficit of 500 kilocalories per day because excess energy always converts to fat tissue

88. An athlete who avoids all dairy products, restricts caloric intake, and follows a vegan diet without appropriate planning is at elevated risk for deficiency of which mineral that is critical for bone health and muscle contraction?

A. Calcium, because dairy products are a primary source and restrictive diets may not provide adequate alternatives

B. Sodium, because vegan diets contain no sodium from any food source

C. Phosphorus, because plant-based foods contain no bioavailable phosphorus

D. Chloride, because only animal-based foods contain this essential electrolyte

89. A strength and conditioning specialist advises a female endurance athlete whose blood work reveals ferritin levels of 12 ng/mL (below the recommended threshold for athletes). Consuming vitamin C alongside non-heme iron sources serves which purpose?

A. Vitamin C inhibits all iron absorption to prevent iron overload toxicity

B. Vitamin C converts non-heme iron to a more absorbable form and enhances its uptake

C. Vitamin C has no interaction with iron metabolism under any circumstances

D. Vitamin C enhances the absorption of heme iron from plant sources while blocking non-heme iron

90. Post-exercise protein intake of 20 to 40 grams has been shown to maximize the muscle protein synthetic response. Which protein source would provide the fastest digestion rate and highest leucine content per serving?

A. Casein protein, which forms a gel in the stomach and is digested very slowly over 6 to 8 hours

B. Soy protein, which has the highest leucine content of all plant and animal protein sources

C. Whey protein, which is rapidly digested and has a high leucine content relative to other protein sources

D. Collagen protein, which contains all essential amino acids in optimal proportions for muscle growth

91. An athlete subject to WADA anti-doping regulations tests positive for a banned substance that was found to be a contaminant in a supplement they purchased without third-party certification. Under strict liability anti-doping rules, who bears responsibility for the positive test?

A. The supplement manufacturer bears sole responsibility and the athlete faces no consequences

B. The athlete bears responsibility under strict liability rules regardless of intent, which is why third-party certified supplements are strongly recommended

C. The testing laboratory bears responsibility because the contamination should have been detected during analysis

D. No party bears responsibility because contamination is considered an acceptable risk in sports

92. During a 90-minute soccer match, a midfielder should consume fluids at what general rate to prevent body weight loss exceeding 2%?

A. Approximately 200 to 300 milliliters every 15 to 20 minutes, adjusted for individual sweat rate and environmental conditions

B. No fluid intake during the match because drinking during exercise causes gastrointestinal distress

C. A minimum of 2 liters consumed at halftime in a single large bolus to fully rehydrate

D. Fluid intake should be restricted to prevent hyponatremia during events shorter than 2 hours

93. A strength athlete weighing 100 kg is prescribed carbohydrate intake at 5 g/kg/day for moderate training load support. What is the total daily carbohydrate target in grams?

A. 100 grams per day based on dividing body weight by the prescription factor

B. 250 grams per day based on multiplying body weight by 2.5 g/kg

C. 750 grams per day based on the upper range of endurance athlete recommendations

D. 500 grams per day based on 100 kg multiplied by the prescribed 5 g/kg/day

94. High-glycemic index foods consumed 2 to 3 hours before exercise may cause which undesirable physiological response in some sensitive individuals?

A. Excessive protein catabolism reducing available amino acids for muscle function

B. Permanent insulin resistance that persists long after the exercise session ends

C. Reactive hypoglycemia from a rapid insulin spike followed by a sharp drop in blood glucose before exercise begins

D. Enhanced gastric emptying that accelerates nutrient delivery and always improves performance

95. Which of the following dietary fat recommendations is most appropriate for athletes, and what is the primary rationale?

A. Less than 10% of total calories from fat to minimize body fat storage and maximize leanness

B. Fat should comprise 20% to 35% of total caloric intake to support hormone production, fat-soluble vitamin absorption, and cell membrane integrity

C. Greater than 50% of total calories from fat because fat is the most efficient fuel at all exercise intensities

D. Fat intake is irrelevant and should not be considered in any athlete's nutritional planning

SECTION 2 — PRACTICAL/APPLIED

125 Questions | 2.5 Hours Recommended

EXERCISE TECHNIQUE (Questions 96–140)

96. A strength and conditioning specialist is teaching a group of high school athletes the barbell back squat. Before loading any weight, the specialist should first assess each athlete's ability to perform which movement?

A. A heavy single-repetition maximum attempt to establish baseline strength levels

B. An unloaded bodyweight squat to assess mobility, motor control, and basic movement competency

C. A barbell overhead press to determine if the athlete has adequate core stability for squatting

D. A seated leg extension to isolate the quadriceps before introducing a compound movement

97. During a high-bar back squat, an athlete descends to a depth where the hip crease drops below the top of the knee. The strength and conditioning specialist observes that the athlete's lumbar spine transitions from lordosis to flexion (posterior pelvic tilt) at the bottom of the squat — a fault commonly called "butt wink." This error is most likely caused by which limitation?

A. Excessive upper body strength that shifts the center of gravity too far forward

B. Inadequate grip width on the barbell creating excessive tension in the posterior shoulder

C. Superior ankle mobility that allows the knees to track too far forward during the descent

D. Inadequate hip flexion mobility and/or hamstring flexibility that causes the pelvis to posteriorly tilt as the athlete approaches full depth

98. A novice athlete performing the overhead press is observed pressing the bar in a forward arc rather than vertically over the midfoot. Which coaching cue is most appropriate to correct this bar path error?

A. "Lean your entire torso backward as far as possible to create space for the bar"

B. "Close your eyes and press based on feel rather than visual alignment"

C. "Press the bar straight up, moving your head slightly back as the bar passes your face, then press your head forward once the bar clears"

D. "Hold your breath for the entire set and do not exhale until all repetitions are complete"

99. During a conventional deadlift, the athlete's shoulders should be positioned in which relationship to the barbell in the starting position?

A. Directly over or slightly in front of the bar with the arms hanging straight down from the shoulder joints

B. Behind the bar with the torso nearly vertical and the hips at knee height

C. Directly behind the bar with the arms angled forward at approximately 45 degrees

D. As far in front of the bar as possible to maximize the first pull distance

100. An athlete performing barbell bent-over rows consistently uses excessive momentum by jerking the torso upward at the initiation of each pull. Which modification should the strength and conditioning specialist implement?

A. Increase the load to force the athlete to use more body English for each repetition

B. Reduce the load to a weight the athlete can control and cue a rigid torso position with the pull initiated by scapular retraction

C. Switch to a standing upright row instead to eliminate the need for hip hinge stability

D. Have the athlete perform the rows while standing on a balance board to increase core demand

101. A high school athlete performing a front squat consistently drops the elbows during the descent, causing the bar to roll forward off the anterior deltoids. Which corrective strategy is most appropriate?

A. Switching to a low-bar back squat position to avoid the front rack position entirely

B. Increasing the load to force the athlete to engage the upper back more aggressively

C. Adding crunches and sit-ups to strengthen the rectus abdominis for holding the bar in position

D. Cueing "elbows up" throughout the movement and incorporating front rack mobility drills and upper back strengthening exercises

102. During a dumbbell incline bench press, the strength and conditioning specialist observes one arm pressing significantly faster and higher than the other, with the barpath of the weaker arm drifting medially. This observation most likely indicates which issue?

A. The athlete's dominant arm is compensating for a bilateral strength or motor control asymmetry

B. Normal dumbbell pressing mechanics where asymmetric movement is expected

C. The incline bench angle is incorrect and should be changed to flat bench position

D. The dumbbells are different weights and should be weighed to verify they match

103. When performing a Romanian deadlift (RDL), the athlete should lower the bar by hinging at the hips while maintaining which knee and spinal position?

A. A slight knee flexion maintained throughout with a flat, neutral spine and the bar tracking close to the legs

B. Full knee lockout with no flexion and an intentional rounding of the thoracic spine

C. Deep knee flexion to approximately 90 degrees with the hips dropping below the knees

D. Alternating between knee flexion and extension during each repetition of the lowering phase

104. An athlete completing a set of pull-ups is observed kipping — using a swinging hip extension to generate momentum for each repetition rather than pulling with the upper body muscles. In a strength training context (not competitive fitness), why should this technique be corrected?

A. Kipping reduces the training stimulus to the target muscles and increases injury risk to the shoulders

B. Kipping always produces superior upper body strength gains compared to strict pull-ups

C. Kipping is the preferred technique for all athletes because it allows more repetitions per set

D. Kipping activates the latissimus dorsi more effectively than strict form by adding hip extension

105. The power clean teaching progression recommended by the NSCA begins with which exercise to establish the catch position before introducing the pulling phases?

A. Clean pull from the floor without a catch to develop pulling strength

B. Hang power clean from knee height to teach the transition phase first

C. Full squat clean from the floor at 80% of estimated 1RM

D. Front squat to establish the front rack receiving position and develop comfort with the bar on the anterior deltoids

106. During the first pull of the power clean (bar from floor to knee height), which technical principle must be maintained to position the body correctly for the explosive second pull?

A. The arms should be actively bent to keep the bar as close to the body as possible

B. The knees should extend completely while the hips remain stationary

C. The back angle should remain relatively constant with the shoulders staying over or in front of the bar as the knees extend

D. The torso should become fully vertical before the bar reaches knee height

107. A strength and conditioning specialist observes an athlete performing the power clean who initiates the second pull by bending the elbows and curling the bar upward rather than driving through triple extension of the hips, knees, and ankles. What is the primary consequence of this error?

A. The error has no effect on performance because the arms are the primary movers in the clean

B. The athlete will recruit more muscle mass and generate greater bar velocity

C. The error is the preferred technique for heavier loads above 80% of 1RM

D. Pulling with the arms reduces the contribution of the more powerful hip extensors and limits the weight that can be successfully cleaned

108. The snatch requires the bar to be received overhead with arms fully locked. If an athlete consistently receives the bar with bent elbows and must press it out to full extension, which correction is most appropriate?

A. Increasing the load to force the athlete to pull harder and lock the arms faster

B. Reducing the load and practicing the snatch balance and overhead squat to develop confidence and speed dropping under the bar with locked arms

C. Having the athlete perform only biceps curls to strengthen the arms for the overhead catch position

D. Switching permanently to the power clean because the snatch is too technically demanding

109. A plyometric box jump is performed correctly when the athlete does which of the following upon landing on the box?

A. Lands with stiff, straight legs to maximize the eccentric loading stimulus on the quadriceps

B. Lands with excessive forward lean and the feet positioned at the very edge of the box

C. Lands in a controlled position with hips and knees flexed to absorb force, maintaining balance with the full foot on the box surface

D. Immediately jumps off the box to perform a rebound depth jump without pausing

110. An athlete performing depth jumps demonstrates ground contact times that have progressively increased over the last three sets from 180 milliseconds to 350 milliseconds. What does this trend indicate, and what action should the strength and conditioning specialist take?

A. The athlete is improving technique and should continue performing additional sets

B. The trend is expected and desirable because longer ground contact produces greater force

C. The athlete should increase the box height to provide a greater eccentric stimulus

D. The athlete is fatiguing and losing the ability to rapidly transition through the stretch-shortening cycle, so the exercise should be terminated for the session

111. Which of the following exercises is classified as a low-intensity plyometric appropriate for a warmup or for introducing plyometric training to a novice athlete?

A. Single-leg depth jumps from a 42-inch box

B. Weighted plyometric squat jumps with 40% of 1RM

C. Maximum-effort alternate-leg bounding for 60 meters

D. Weighted depth drops from a 36-inch box with immediate rebound

112. For upper body plyometrics to qualify as true plyometric exercises, the catch-and-throw cycle during medicine ball exercises must possess which characteristic?

A. A deliberate 3-second pause between catching and throwing to maximize isometric force development

B. Maximal speed with minimal transition time between the eccentric catch and the concentric throw

C. Slow, controlled tempo with emphasis on time under tension during both the catch and throw phases

D. Exclusive focus on the concentric throwing phase with no emphasis on the catching phase

113. During the acceleration phase of a sprint (first 10 meters), an athlete is observed running with a fully upright torso rather than the expected forward lean. What is the consequence of this positional error?

A. The upright position optimizes horizontal force production by directing ground reaction forces forward

B. The upright position has no effect on acceleration because body lean is irrelevant to sprint mechanics

C. The upright position improves stride frequency which compensates for any reduction in horizontal force

D. The upright position limits horizontal ground reaction force production, impairing acceleration because the force vector is directed more vertically

114. An athlete training for a sport that requires repeated short sprints with brief recovery periods would benefit most from which type of conditioning?

A. Long slow distance running at 60% of maximum heart rate for 45 minutes

B. Single maximal-effort 400-meter time trials performed once per week

C. Interval sprints of 10 to 30 meters with work-to-rest ratios of 1:5 to 1:12 replicating the sport's phosphagen-dominant demands

D. Yoga sessions focused exclusively on flexibility and mindfulness with no cardiovascular component

115. The pro agility shuttle (5-10-5) tests change of direction but not true agility. To develop actual game-relevant agility, the strength and conditioning specialist should incorporate drills that add which element to change-of-direction training?

A. Longer rest periods between repetitions to allow full metabolic recovery

B. Reactive decision-making in response to unpredictable stimuli such as a partner's movement or a visual cue

C. Predetermined movement patterns repeated at increasingly faster speeds

D. Heavy resistance bands attached to the athlete to increase the force required for direction changes

116. Before a heavy resistance training session, the optimal warmup sequence should progress in which order?

A. General warmup → dynamic stretching → movement preparation → specific warmup with progressive loading in the training exercises

B. Heavy working sets → static stretching → cooldown jog → foam rolling

C. Prolonged static stretching → maximal sprint efforts → heavy barbell lifts → slow cooldown

D. No warmup is necessary if the athlete has trained within the previous 48 hours

117. Research on static stretching performed immediately before explosive exercise has consistently demonstrated which acute effect?

A. Enhanced sprint speed and jump height for up to 2 hours following the stretch

B. No measurable effect on any performance variable regardless of duration or intensity

C. Improved rate of force development and enhanced muscle spindle sensitivity

D. Transient reductions in force production, power output, and sprint performance due to decreased musculotendinous stiffness and reduced neural activation

118. Foam rolling as a pre-training preparation tool provides which advantage compared to static stretching?

A. Foam rolling permanently restructures fascial tissue to increase range of motion

B. Foam rolling produces identical acute decrements in force production as static stretching

C. Increased range of motion without the acute decrements in force production and power associated with static stretching

D. Foam rolling replaces the need for any general warmup before resistance training

119. An athlete asks whether cold water immersion after every resistance training session will help their recovery. Based on current evidence, the strength and conditioning specialist should advise which of the following?

A. Chronic cold water immersion after resistance training may blunt the inflammatory signaling necessary for hypertrophy and strength adaptation, so it should be used selectively rather than routinely

B. Cold water immersion after every session is recommended because it consistently accelerates all aspects of training adaptation

C. Cold water immersion has no effect on any recovery variable under any circumstances

D. Cold water immersion should only be used before training sessions as a pre-activation strategy

120. Which recovery variable has the strongest evidence base and should be prioritized above all external recovery modalities?

A. Pneumatic compression boots worn for 60 minutes after every training session

B. Adequate sleep of 7 to 10 hours per night combined with appropriate post-exercise nutrition

C. Cryotherapy chamber sessions at minus 110 degrees Celsius performed twice daily

D. Transcutaneous electrical nerve stimulation applied to all major muscle groups nightly

121. A strength and conditioning specialist designs a conditioning protocol for a basketball team using 300-yard shuttle runs with 4-minute rest periods between repetitions. This protocol primarily targets which energy system?

A. The phosphagen system through short-duration maximal efforts lasting less than 10 seconds

B. The oxidative system through sustained moderate-intensity continuous activity

C. Beta-oxidation of intramuscular triglycerides during prolonged low-intensity exercise

D. The glycolytic system through high-intensity efforts lasting approximately 60 to 90 seconds

122. A soccer goalkeeper primarily performs explosive diving saves, rapid directional changes, and short sprints lasting 2 to 5 seconds during match play, with variable rest periods between actions. Which work-to-rest ratio best replicates these sport-specific demands for conditioning purposes?

A. 1:1 ratio with equal work and rest for aerobic system development

B. 1:3 ratio targeting the glycolytic system with moderate recovery

C. 1:8 to 1:12 ratio targeting the phosphagen system with near-complete recovery between explosive efforts

D. No structured rest periods because the goalkeeper should train with continuous activity for 90 minutes

123. Aerobic conditioning develops the recovery capacity that supports repeated high-intensity efforts in team sport athletes. Which specific physiological mechanism explains this recovery benefit?

A. Aerobic fitness reduces the amount of phosphocreatine used during each sprint effort

B. The aerobic system replenishes phosphocreatine, clears metabolic byproducts, and restores homeostasis between high-intensity bouts

C. Aerobic conditioning eliminates the need for the glycolytic system during team sport play

D. Aerobic fitness increases the maximum duration of each individual sprint effort by 50%

124. Long slow distance (LSD) training at 60% to 70% of maximum heart rate for 30 or more minutes is most appropriate during which phase of the annual training plan?

A. Early preparatory phases for establishing a foundational aerobic base in deconditioned athletes

B. The competition phase as the primary conditioning method immediately before games

C. The peaking phase when sport-specific power and speed are the priority

D. The transition period as the exclusive training modality for maintaining peak fitness

125. Fartlek training — alternating between higher and lower intensity periods within a continuous session — provides which advantage over steady-state aerobic training for team sport athletes?

A. Fartlek training eliminates all aerobic adaptation and develops only anaerobic capacity

B. Fartlek training is less physiologically demanding than walking and provides no training stimulus

C. Fartlek training produces identical physiological adaptations to complete rest with no exercise

D. Fartlek training introduces pace variability that more closely replicates the intermittent demands of team sports while developing both aerobic and anaerobic fitness

126. A strength and conditioning specialist prescribes active recovery sessions for the day after a heavy resistance training session. Active recovery involves performing low-intensity exercise below 50% of maximum heart rate. What is the primary proposed benefit of active recovery compared to complete passive rest?

A. Active recovery eliminates all muscle soreness within 30 minutes of initiation

B. Active recovery permanently increases muscle protein synthesis rates above baseline

C. Active recovery promotes blood flow to recovering tissues and facilitates metabolic waste removal

D. Active recovery is identical to a high-intensity training session in its adaptive stimulus

127. For an athlete performing a single-arm dumbbell row, which coaching point is critical for maximizing the training stimulus to the target muscles while protecting the lumbar spine?

A. Maintaining a neutral spine and stable torso position throughout the pulling motion without excessive trunk rotation

B. Maximizing trunk rotation toward the pulling arm to increase the range of motion

C. Rounding the thoracic spine to increase the stretch on the latissimus dorsi at the bottom of the pull

D. Performing the exercise with both feet on the same side of the bench to increase instability

128. During a Bulgarian split squat (rear foot elevated), the athlete reports excessive stress on the front knee. Which technique modification is most likely to reduce anterior knee loading?

A. Moving the front foot further from the bench to create a more vertical shin angle and shift loading to the hip extensors

B. Moving the front foot closer to the bench to increase forward knee translation

C. Raising the rear foot to a higher bench to increase the range of motion and knee loading

D. Adding a forward torso lean to shift the center of gravity over the front knee

129. A strength and conditioning specialist observes that an athlete's barbell is not loaded evenly — the left side has 5 kg more than the right side. This imbalance creates which safety hazard?

A. No hazard because the athlete's body will compensate automatically for the asymmetric load

B. The bar will spin freely in the athlete's hands, making it easier to control

C. The imbalance will improve the athlete's proprioception and bilateral coordination

D. The asymmetric load may cause the bar to tip or rotate during the lift, potentially causing the athlete to lose control and drop the weight

130. Collars must be used on all barbell exercises during training. What is the primary safety purpose of barbell collars?

A. Collars increase the weight of the barbell to provide additional resistance

B. Collars improve grip strength by adding friction to the bar surface

C. Collars prevent weight plates from sliding off the ends of the barbell during exercise, which could cause loss of control and injury

D. Collars are decorative accessories with no functional safety purpose

131. A strength and conditioning specialist is spotting a barbell bench press with a single spotter position behind the head of the bench. The spotter should use which grip on the barbell?

A. A wide pronated grip matching the athlete's grip width on the bar

B. An alternated grip (one pronated, one supinated) close to the center of the bar to assist effectively

C. No grip on the bar — the spotter should place their hands on the athlete's elbows instead

D. A supinated grip at the very ends of the bar near the weight plates

132. When spotting a standing overhead press, the single spotter should be positioned where relative to the athlete, and assistance should be applied at which location?

A. Behind the athlete, with hands positioned near the athlete's wrists to assist the bar upward if the lift fails

B. In front of the athlete, pulling the bar forward and downward to help rack it

C. To the side of the athlete, supporting the bar from underneath at one end

D. No spotting is necessary because the overhead press is a low-risk exercise that never requires assistance

133. An athlete performing a barbell back squat in a power rack has the safety pins set too low — well below the depth the athlete would reach even on a failed repetition. This setup error negates which primary safety feature of the power rack?

A. The ability to attach resistance bands to the rack for accommodating resistance

B. The rack's ability to store weight plates between sets for convenience

C. The safety pins' purpose of catching the bar and preventing the athlete from being trapped under a failed lift

D. The rack's ability to hold multiple barbells for circuit training purposes

134. The Valsalva maneuver is appropriate for a healthy 25-year-old Division I football player performing 3RM back squats but contraindicated for which population?

A. Professional powerlifters competing in sanctioned meets with medical supervision

B. Collegiate wrestlers performing heavy compound lifts during the preparatory phase

C. Experienced Olympic weightlifters performing competition lifts at 90% of 1RM

D. A 58-year-old client with uncontrolled hypertension participating in a general fitness program

135. An anti-rotation exercise such as the Pallof press trains the core musculature to perform which specific function?

A. Produce maximal trunk rotation at high velocity for throwing and striking sports

B. Resist rotational forces and maintain spinal stability while an external load attempts to twist the torso

C. Generate lateral flexion of the trunk to improve frontal plane athletic movement

D. Produce trunk flexion against heavy resistance to develop the rectus abdominis

136. A strength and conditioning specialist is selecting core exercises for a collegiate baseball pitcher. Which combination best addresses the pitcher's need for rotational power and anti-rotation stability?

A. Medicine ball rotational throws for power development and Pallof press variations for anti-rotation stability

B. Weighted sit-ups exclusively because trunk flexion is the primary core demand in pitching

C. Only isometric plank holds for 5 minutes because pitchers need endurance rather than power

D. No core training is necessary because the pitching motion inherently develops all core functions

137. During a lateral lunge, the athlete should maintain which body position to ensure proper loading of the hip and lower extremity?

A. An upright torso with a valgus knee position to increase adductor stretch

B. A rounded thoracic spine with the stepping foot externally rotated beyond 90 degrees

C. Complete knee extension in the stepping leg throughout the entire range of motion

D. A hip hinge position with the torso inclined forward, neutral spine maintained, and the knee tracking over the toes of the stepping leg

138. An athlete's training program includes both barbell exercises and resistance band exercises. When performing a banded squat, the resistance profile differs from a free weight squat in which specific way?

A. Banded squats provide constant resistance that matches the free weight resistance profile exactly

B. Banded squats provide minimal resistance at the bottom and maximum resistance at the top, creating an accommodating resistance curve

C. Banded squats provide maximum resistance at the bottom and minimal resistance at the top

D. Banded squats eliminate all resistance below 90 degrees of knee flexion

139. A collegiate athlete reports chronic anterior knee pain during barbell lunges. After medical clearance confirms no structural pathology, the strength and conditioning specialist should consider substituting which exercise variation that reduces anterior knee stress while maintaining the training stimulus?

A. Deep barbell front squats with maximum forward knee translation to strengthen the painful area

B. Reverse lunges, which reduce the eccentric deceleration demand on the front knee compared to forward lunges

C. Heavy leg extensions at maximal load to isolate and strengthen the quadriceps tendon

D. Repeated jump squats on concrete to increase impact tolerance of the knee joint

140. A strength and conditioning specialist is training a group of 20 athletes and needs to teach proper push-up technique before progressing to barbell bench press. Which technical standard indicates a properly performed push-up?

A. The athlete's body forms a straight line from head to heels with the core braced, the chest touches or nearly touches the floor, and the elbows track at approximately 45 degrees from the torso

B. The athlete's hips sag toward the floor while the upper body rises, creating a swayback position

C. The athlete performs partial range of motion with the elbows barely bending beyond 10 degrees

D. The athlete's elbows flare to 90 degrees from the torso to maximize chest activation at the expense of shoulder safety

PROGRAM DESIGN (Questions 141–184)

141. A needs analysis for a competitive wrestler reveals that matches consist of three 2-minute periods with high-intensity grappling, explosive takedowns, and brief rest. Which energy system combination is most important for this athlete?

A. Exclusively the oxidative system because the total match duration exceeds 5 minutes

B. Exclusively the phosphagen system because individual efforts last less than 10 seconds

C. Only the glycolytic system because wrestling has no aerobic component

D. All three systems with primary emphasis on the glycolytic system for sustained high-intensity work during each period, supported by the phosphagen system for explosive efforts and the aerobic system for between-period recovery

142. A strength and conditioning specialist classifies the back squat as a core exercise, a structural exercise, and — when performed at a controlled tempo — a non-power exercise. The power clean is classified as a core, structural, and power exercise. What additional criterion must the power clean meet that the controlled-tempo back squat does not?

A. The power clean must involve fewer than 5 repetitions per set to qualify as a power exercise

B. The power clean must be performed on a lifting platform rather than in a power rack

C. The power clean must be performed explosively with rapid force production throughout the lifting movement

D. The power clean must use a load exceeding 90% of 1RM to qualify for the power classification

143. For a training session that includes the power snatch, front squat, bench press, barbell row, dumbbell lateral raise, and front plank, the correct exercise order following NSCA guidelines would place which exercise first?

A. Front plank to pre-activate the core stabilizers before any compound movements

B. Power snatch because power/explosive exercises are performed first when the athlete is fresh

C. Bench press because it is the most popular exercise and should be prioritized for psychological reasons

D. Dumbbell lateral raise because isolation exercises require the least recovery between sets

144. An advanced athlete training 4 days per week would benefit from which program structure to distribute volume while allowing adequate recovery?

A. Four identical total-body sessions performing the same exercises at the same intensity each day

B. A random selection of exercises each day with no planned structure

C. A split routine such as upper/lower alternation across the four training days

D. Performing only cardiovascular exercise on all four days with no resistance training

145. The repetition maximum continuum indicates that training with loads less than 67% of 1RM for 12 or more repetitions primarily develops which physical quality?

A. Maximal strength through increased motor unit recruitment of high-threshold units

B. Explosive power through enhanced rate of force development

C. Muscular endurance through improved fatigue resistance at submaximal loads

D. Muscle hypertrophy through maximal mechanical tension on each repetition

146. An athlete's tested 1RM on the back squat is 150 kg. The training program prescribes 4 sets of 8 repetitions at 80% of 1RM. What is the prescribed training load and the total volume load for this exercise?

A. Load = 120 kg per set; Volume load = 120 kg × 8 reps × 4 sets = 3,840 kg

B. Load = 100 kg per set; Volume load = 3,200 kg

C. Load = 150 kg per set; Volume load = 4,800 kg

D. Load = 120 kg per set; Volume load = 120 kg × 4 sets = 480 kg

147. When training for maximal strength, the recommended combination of load, repetitions, and rest period is which of the following?

A. Less than 67% of 1RM, 12 or more repetitions, 30 seconds of rest

B. 85% or greater of 1RM, 6 or fewer repetitions, 2 to 5 minutes of rest

C. 50% of 1RM, 20 to 30 repetitions, no rest between sets

D. Body weight only, as many repetitions as possible, with continuous effort for 30 minutes

148. A training protocol calls for 3 sets of 12 repetitions at 70% of 1RM with 60-second rest periods. Based on the load, repetition range, and rest period, this protocol primarily targets which training adaptation?

A. Hypertrophy through moderate loading with metabolic stress from short rest periods

B. Maximal strength through heavy loading with complete neural recovery

C. Explosive power through ballistic movement at submaximal velocities

D. Phosphagen system development through brief, maximal-intensity efforts

149. A linear periodization model for a 16-week preparatory period would typically progress through which sequence of mesocycle phases?

A. Power/peaking → strength → hypertrophy → muscular endurance

B. Competition → transition → general preparation → specific preparation

C. Strength → hypertrophy → muscular endurance → active rest

D. Hypertrophy/endurance → strength → power/peaking, with volume decreasing and intensity increasing across the phases

150. Daily undulating periodization (DUP) within a single training week might structure Monday, Wednesday, and Friday sessions in which manner?

A. All three sessions use identical loads, repetitions, and rest periods with no variation

B. Monday focuses on heavy singles at 95% 1RM, Wednesday on 50-repetition sets at 30% 1RM, and Friday on a 5-kilometer run

C. Monday targets hypertrophy (4×10 at 70%), Wednesday targets strength (5×4 at 85%), and Friday targets power (5×3 at 75% with explosive tempo)

D. Each session randomly selects exercises from a hat with no planned progression

151. Block periodization is most appropriate for which athletic population?

A. Complete beginners who respond to any training stimulus regardless of specificity

B. Advanced athletes who require concentrated, targeted training stimuli to produce further adaptation beyond a well-developed base

C. Elderly individuals in a general wellness program with no competitive goals

D. Recreational athletes who train once per week with no periodized structure

152. During the competitive in-season period, a strength and conditioning specialist reduces training frequency from 4 sessions to 2 sessions per week and reduces volume from 4 sets to 2 sets per exercise. If the intensity is maintained at the same percentage of 1RM used during the preparatory period, what is the expected outcome?

A. Strength and power levels will be maintained because intensity — the most critical variable — has been preserved

B. Significant detraining will occur because both volume and frequency were reduced

C. The athlete will gain significant additional strength from the reduced training load

D. The athlete will need to increase volume to 6 sets per exercise to compensate for the reduced frequency

153. A strength and conditioning specialist is designing an annual training plan for a collegiate football team. The season runs from September through December, with spring practice in April. The preparatory period should be scheduled during which months?

A. September through December, concurrent with the competitive season

B. December through January, during the transition period immediately after the season

C. January through August, encompassing the off-season and summer training through fall camp

D. Only April, limited to the 3-week spring practice period

154. Research on optimal loading for power development indicates that peak power output during the hang clean is typically achieved at which loading range?

A. 0% to 10% of 1RM using only the empty barbell or body weight

B. 30% to 40% of 1RM using very light loads moved at maximum velocity

C. 90% to 100% of 1RM using near-maximal loads moved at very slow velocity

D. 70% to 80% of 1RM because the hang clean is a ballistic exercise where the load is accelerated throughout the full range of motion

155. The recommended plyometric training volume for an advanced athlete is which of the following?

A. 40 to 60 foot contacts per session consisting exclusively of depth jumps

B. 120 to 140 foot contacts per session distributed across exercises of varying intensity

C. 500 or more foot contacts per session to maximize the training stimulus

D. 10 foot contacts per session regardless of exercise intensity or the athlete's training level

156. Plyometric training sessions should be performed at which point relative to other training components within a training day?

A. At the beginning of the session after a thorough warmup, when the athlete is fresh and can perform each repetition with maximal effort and proper technique

B. At the end of the session after heavy resistance training to maximize fatigue-induced adaptation

C. Immediately after a high-volume conditioning session to simulate game-day fatigue

D. Only during rest days with no other physical activity performed within 48 hours

157. A strength and conditioning specialist is designing a program for a sprinter and wants to develop both maximal strength and explosive speed. Which approach best addresses both ends of the force-velocity continuum within a weekly training plan?

A. Training exclusively with heavy loads above 90% of 1RM for all exercises every session

B. Training exclusively with body weight exercises at maximum velocity for every session

C. Combining heavy strength training (85%+ 1RM) on some days with explosive exercises (Olympic lifts, plyometrics, jump squats at 30-50% 1RM) on other days within the same week

D. Eliminating all resistance training and relying solely on sprint practice for strength development

158. A needs analysis reveals that a basketball point guard requires agility, vertical jumping power, aerobic endurance for sustained play, and upper body strength. The strength and conditioning specialist should design a program that addresses which of these qualities?

A. Only vertical jumping power because it is the single most important quality in basketball

B. Only aerobic endurance because basketball games last 48 minutes

C. Only upper body strength because the point guard position requires physicality

D. All identified qualities in a periodized plan that prioritizes them based on the competitive calendar and individual needs

159. A collegiate swimmer asks the strength and conditioning specialist why their training program includes exercises like pull-ups, lat pulldowns, and internal/external rotation exercises when swimming is a full-body activity. Which rationale best justifies this exercise selection?

A. The exercises target the specific muscle groups and movement patterns used during swimming strokes, and the rotator cuff work provides injury prevention for the repetitively stressed shoulder

B. The exercises were randomly selected and have no specific relationship to swimming performance

C. Resistance training has no transfer to swimming performance and should be eliminated entirely

D. Only lower body exercises should be included because kicking is the primary propulsive mechanism in swimming

160. For a novice athlete beginning a strength training program, which load and repetition combination is most appropriate during the first 2 to 4 weeks of training?

A. 90% to 100% of estimated 1RM for 1 to 3 repetitions to establish maximal strength immediately

B. Moderate loads of 60% to 70% of estimated 1RM for 10 to 15 repetitions to develop movement proficiency, build work capacity, and allow connective tissue adaptation

C. No external load should be used for the first 6 months of any training program

D. Maximum weight for maximum repetitions performed to absolute failure on every set

161. An athlete performing 5 sets of 5 repetitions at 87% of 1RM with 4-minute rest periods is training for which primary physical quality?

A. Muscular endurance through high-repetition, short-rest training

B. Muscle hypertrophy through moderate loading with metabolic stress

C. Maximal strength through heavy loading with complete rest for neural recovery

D. Aerobic conditioning through sustained moderate-intensity resistance exercise

162. Which periodization model involves varying intensity and volume within each training week — such as a hypertrophy day, a strength day, and a power day — rather than progressing sequentially across multi-week phases?

A. Linear periodization with progressive increases in intensity across mesocycles

B. Block periodization with concentrated emphasis on one quality per multi-week block

C. No periodization model allows within-week variation of training variables

D. Daily undulating periodization (DUP) with intensity and volume varied across training sessions within the same week

163. An ice hockey forward requires explosive skating speed, upper body strength for body checking, and the ability to sustain high-intensity efforts for 45-second shifts followed by 2- to 3-minute rest periods on the bench. Which conditioning approach best replicates these demands?

A. Long-distance running at low intensity for 60 minutes three times per week

B. Interval training with 30- to 45-second high-intensity efforts followed by 2- to 3-minute rest periods to replicate the glycolytic demands of each shift

C. Single maximal-effort sprints with 10-minute rest periods between efforts

D. Continuous cycling at 50% of VO_2max for 90 minutes per session

164. A strength and conditioning specialist is working with a 17-year-old high school athlete who has no prior resistance training experience. Which programming approach is most appropriate for the first 8 weeks?

A. A beginner program with 2 to 3 total-body sessions per week using moderate loads, higher repetitions, and emphasis on learning proper technique for fundamental movement patterns

B. An advanced 6-day body-part split routine identical to what a professional bodybuilder would follow

C. Maximal-effort 1RM testing on the first day followed by peaking protocols for the remaining 7 weeks

D. Exclusive plyometric training with depth jumps from 42-inch boxes and no foundational strength work

165. During the transition (off-season) period following the competitive season, the primary training emphasis should be on which objectives?

A. Maximizing training volume and intensity to begin preparing immediately for the next season

B. Introducing entirely new sports that the athlete has never practiced before

C. Physical and psychological recovery, addressing minor injuries, and restoring motivation before the next preparatory period

D. Complete cessation of all physical activity for a minimum of 12 weeks

166. A volleyball team's competitive season runs from September through November, with a conference tournament in late November. Using a linear periodization approach, the peaking phase should be timed to coincide with which period?

A. June and July during the early off-season training period

B. January and February during the late off-season training period

C. Late November, coinciding with the conference tournament for optimal competitive performance

D. The peaking phase should occur in March when no competitions are scheduled

167. An athlete who has been training with the same program — same exercises, same loads, same sets and reps — for 16 weeks reports that their strength gains have stalled. Which training principle explains this stagnation?

A. The principle of reversibility, which states that training effects are lost without continued training

B. Wolff's Law, which states that bone adapts to the loads placed upon it

C. The overtraining principle, which states that any training beyond 12 weeks produces negative adaptation

D. The principle of accommodation, which states that the response to a constant training stimulus diminishes over time, requiring variation to continue producing adaptation

168. For optimal power development in the jump squat, research indicates that peak power output occurs at approximately which percentage of back squat 1RM?

A. 0% to 30% of 1RM, where the lighter loading allows for high velocity

B. 50% to 60% of 1RM, representing moderate loading with moderate velocity

C. 85% to 95% of 1RM, representing near-maximal loading with very slow velocity

D. 100% of 1RM, representing maximal loading with no concentric velocity

169. A needs analysis for a marathon runner reveals the following priorities: aerobic endurance, injury prevention, and maintenance of lean mass. Which exercise combination best addresses these needs?

A. Exclusively heavy powerlifting with no aerobic training component

B. Only sprint interval training with no resistance exercises or endurance work

C. A combination of progressive long-distance running, moderate-load resistance training targeting running-specific muscles, and flexibility work for injury prevention

D. Exclusively upper body resistance training because runners only need upper body strength

170. A strength and conditioning specialist working with a collegiate lacrosse team designs an annual training plan. Which sequence correctly organizes the training year from start to finish?

A. Competition → transition → general preparation → specific preparation

B. Transition → competition → general preparation → specific preparation

C. Specific preparation → general preparation → competition → transition

D. General preparation → specific preparation → competition → transition

171. During the general preparation phase, the primary training objectives include building which foundational qualities?

A. Sport-specific power and speed for immediate competitive readiness

B. A broad base of hypertrophy, general strength, work capacity, and aerobic fitness

C. Exclusively technical sport skill practice with no physical training

D. Complete physical rest with no training stimulus of any kind

172. A strength and conditioning specialist calculates that an athlete's training program should produce a total weekly volume load of approximately 50,000 kg distributed across 4 training sessions. If each session uses an average load of 100 kg, approximately how many total repetitions should the athlete perform across all four sessions?

A. 500 total repetitions distributed across the four training sessions (50,000 kg ÷ 100 kg per rep)

B. 200 total repetitions distributed across the four training sessions

C. 1,000 total repetitions distributed across the four training sessions

D. 50 total repetitions distributed across the four training sessions

173. An athlete who has been resistance training consistently for 6 months asks why their rate of strength improvement has slowed compared to the first 2 months. The strength and conditioning specialist should explain which concept?

A. The athlete has reached their absolute genetic potential and cannot make any further gains

B. All strength improvements beyond 2 months are exclusively from pharmaceutical enhancement

C. Novice athletes experience rapid initial gains primarily from neural adaptation, and continued progress requires more advanced programming to stimulate structural adaptation, which occurs at a slower rate

D. The athlete should restart their program from the very beginning with bodyweight exercises

174. A 12-week block periodization program for an advanced powerlifter preparing for a single competition would typically structure the three blocks in which sequence?

A. Realization → transmutation → accumulation

B. Competition → transition → general preparation

C. Muscular endurance → flexibility → aerobic conditioning

D. Accumulation (high volume/moderate intensity) → transmutation (higher intensity/sport-specific) → realization (peaking for competition)

175. An athlete recovering from a grade II hamstring strain has been cleared by the medical team to begin reconditioning. The strength and conditioning specialist should begin with which approach?

A. Low-intensity exercises for the hamstrings at reduced loads, progressing gradually through sport-specific movements before returning to full activity based on objective criteria

B. Immediate return to full-intensity sprinting and heavy deadlifts on the first day of clearance

C. Exclusive upper body training with no lower body exercises for the remainder of the season

D. Continued complete rest for 6 additional months regardless of the medical team's clearance

176. A return-to-play protocol for an athlete recovering from ACL reconstruction should include which objective performance criteria before unrestricted competition is permitted?

A. Subjective report of feeling "ready" with no objective testing required

B. Bilateral strength and functional symmetry within 10% on relevant tests, sport-specific movement competency, and medical clearance

C. The ability to walk without a limp for 5 minutes on level ground

D. Completion of any 30-minute group exercise class regardless of intensity or content

177. A strength and conditioning specialist notices that a tennis player has significantly stronger right-sided hip and shoulder musculature compared to the left side due to the repetitive unilateral demands of the sport. Which programming strategy best addresses this bilateral asymmetry?

A. Ignoring the asymmetry because it is a normal and desirable adaptation to the sport

B. Eliminating all tennis practice until the asymmetry resolves through exclusive resistance training

C. Incorporating unilateral exercises with additional volume or load on the weaker side to reduce the bilateral strength deficit

D. Prescribing only bilateral exercises because unilateral exercises are less effective for addressing asymmetries

178. An athlete whose training program has produced a back squat 1RM of 2.0 times body weight but who has a relatively poor 10-meter acceleration time should receive which programming modification to address this deficiency?

A. Additional heavy back squat volume at 90% to 100% of 1RM to further increase maximal strength

B. Removal of all lower body resistance training to allow more time for sprint practice

C. Exclusive long-distance running at moderate intensity to develop the aerobic base for sprinting

D. Addition of explosive exercises — sled sprints, resisted acceleration drills, and short sprint intervals — to develop the ability to express strength rapidly during acceleration

179. A strength and conditioning specialist is programming conditioning for an American football wide receiver whose position demands include repeated 20- to 40-yard sprints (lasting 3 to 5 seconds each) with 25 to 35 seconds between plays. Which interval protocol most closely replicates these demands?

A. 400-meter repeats with 1-minute rest periods targeting the glycolytic system

B. 20- to 40-yard sprint repetitions with 25- to 35-second rest periods replicating the sport's actual work-to-rest ratio and phosphagen-dominant demands

C. 5-kilometer continuous running at 70% of maximum heart rate

D. 10-minute sustained efforts at 80% of VO_2max with 10-minute passive rest periods

180. When prescribing rest periods for a muscular endurance training protocol, which duration is most appropriate?

A. 30 seconds or less to maintain elevated metabolic demand and cardiovascular stress throughout the training session

B. 2 to 5 minutes to allow complete phosphocreatine recovery between sets

C. 8 to 10 minutes to ensure full systemic recovery before each endurance set

D. No rest periods — all exercises should be performed continuously for 60 minutes without stopping

181. A needs analysis for a competitive rock climber identifies grip endurance, upper body pulling strength, core stability, and body composition optimization as the primary physical qualities. Which exercise selection best addresses these identified needs?

A. Exclusively lower body exercises because leg strength is the primary determinant of climbing ability

B. Only cardiovascular training on a stationary bicycle for 60 minutes per session

C. Pull-up and rowing variations for upper body pulling, dead hang and farmer's carry for grip endurance, anti-extension and anti-rotation core exercises, and nutritional planning for body composition

D. Exclusively bench press and overhead press because pushing strength transfers directly to pulling performance in climbing

182. An athlete's program calls for training the back squat twice per week. Session 1 prescribes 4 sets of 4 at 87% 1RM with 4-minute rest, and Session 2 prescribes 4 sets of 10 at 72% 1RM with 90-second rest. This within-week variation in loading is characteristic of which periodization model?

A. Linear periodization where volume and intensity change only across multi-week mesocycles

B. Block periodization where each block focuses on a single training quality

C. No recognized periodization model incorporates within-week variation of the same exercise

D. Daily undulating periodization (DUP) where intensity and volume vary between sessions targeting the same movement pattern

183. An injured athlete who cannot perform lower body resistance training due to a tibial stress fracture should have their program modified to include which components?

A. Complete cessation of all training until the fracture has fully healed over 12 to 16 weeks

B. Upper body resistance training, core stability work, and any non-weight-bearing conditioning that does not load the injured tibia

C. High-impact lower body plyometrics to stimulate bone healing through Wolff's Law

D. Heavy lower body resistance training because loading the fracture will accelerate healing

184. A strength and conditioning specialist is asked to design a 4-week introductory program for a group of 30 high school freshmen with no resistance training experience. Which programming approach is most appropriate?

A. A structured total-body program performed 2 to 3 times per week emphasizing technique instruction on fundamental movement patterns, moderate loads, higher repetitions, and progressive complexity

B. An advanced powerlifting peaking program designed for experienced competitive lifters

C. Exclusive maximal-effort 1RM testing for the entire 4-week period with no structured training

D. A 6-day body-part split routine with heavy loads and forced repetitions on every exercise

TESTING AND EVALUATION (Questions 185–206)

185. A strength and conditioning specialist wants to assess lower body explosive power in a group of 40 athletes during a single 90-minute testing session. Which test is the most practical and valid field assessment for this purpose?

A. Laboratory-based isokinetic dynamometry requiring 30 minutes per athlete

B. Force plate analysis with synchronized video motion capture requiring specialized software

C. The vertical jump test (countermovement jump) using a Vertec device, which is valid, reliable, practical, and can be administered efficiently to large groups

D. Underwater weighing to assess body composition as a proxy for power output

186. A test is considered reliable if it meets which fundamental criterion?

A. It measures the construct it claims to measure with demonstrated validity coefficients

B. It appears relevant to the sport being tested based on surface-level inspection

C. It requires expensive laboratory equipment and specialized research personnel

D. It produces consistent, reproducible scores when the same athlete is tested under the same conditions on different occasions

187. A strength and conditioning specialist administers a 1RM bench press test following a standardized protocol. The athlete completes successful lifts at 85 kg, 90 kg, and 95 kg, but fails at 100 kg. What is the athlete's 1RM, and what is the appropriate action?

A. The 1RM is 100 kg because the athlete attempted but failed at this weight

B. The 1RM is 95 kg — the last weight successfully lifted with acceptable technique through the full range of motion

C. The 1RM cannot be determined because the athlete did not complete enough attempts

D. The 1RM is the average of all four attempts: (85+90+95+100)/4 = 92.5 kg

188. An athlete completes 6 repetitions at 90 kg on the back squat before reaching failure. Using the Brzycki prediction formula (1RM = weight ÷ [1.0278 – (0.0278 × reps)]), the estimated 1RM is approximately which value?

A. 90 kg because the prediction formula always returns the test weight as the estimated 1RM

B. Approximately 104 kg based on the Brzycki formula calculation

C. Approximately 150 kg based on multiplying the weight by the number of repetitions

D. Cannot be calculated because the Brzycki formula only works with fewer than 3 repetitions

189. The difference between an athlete's countermovement jump (CMJ) height and their static (squat) jump (SJ) height provides an estimate of which neuromuscular capacity?

A. Maximal aerobic power as measured by VO_2max during the jump test

B. Absolute maximal strength of the quadriceps independent of contraction velocity

C. The athlete's stretch-shortening cycle utilization — the ability to use stored elastic energy and the stretch reflex to enhance concentric force production

D. Hamstring-to-quadriceps strength ratio as a predictor of ACL injury risk

190. A strength and conditioning specialist needs to assess aerobic capacity in a team of 50 soccer players during an outdoor preseason testing session. The equipment available includes cones, a measuring tape, and a sound system. Which test is most appropriate?

A. Direct VO_2max measurement using a metabolic cart on a laboratory treadmill

B. Wingate anaerobic power test using a cycle ergometer

C. 1RM back squat test to assess maximal lower body strength

D. 20-meter multistage shuttle run (beep test), which requires only cones and a sound system, can be administered to groups, and estimates aerobic capacity

191. Sprint testing accuracy is most affected by which factor when conducted in a field setting?

A. The color of the athlete's running shoes and compression garments

B. The use of hand timing versus electronic timing, where hand timing introduces reaction time variability of approximately 0.1 to 0.3 seconds

C. Whether the sprint is conducted on a track versus a football field, which has no measurable effect

D. The time of year the test is administered, which affects sprint performance by up to 20%

192. Skinfold body composition assessment requires which standardized procedures to maximize reliability across repeated measurements?

A. Using the same trained technician, the same calibrated calipers, the same anatomical sites, and the same population-specific prediction equations for all testing sessions

B. Using a different technician and different calipers at each session to reduce systematic bias

C. Measuring only one anatomical site regardless of the prediction equation requirements

D. Performing measurements immediately after a heavy training session when the muscles are engorged

193. The sit-and-reach test measures flexibility of which primary muscle group and body region?

A. The quadriceps and anterior thigh muscles exclusively

B. The shoulder girdle and upper back musculature

C. Hamstring and lower back flexibility, though it does not assess other joints and is influenced by limb proportions

D. The hip adductors and groin musculature exclusively

194. A bilateral comparison reveals that an athlete's single-leg hop for distance is 95 cm on the right leg and 78 cm on the left leg. The bilateral difference is approximately 18%. Based on commonly cited clinical thresholds, what does this asymmetry suggest?

A. Normal bilateral variation that requires no intervention

B. The athlete's right leg is overtrained and should be detrained

C. A clinically significant asymmetry exceeding the 10% to 15% threshold that warrants corrective programming and possible medical evaluation

D. The athlete should cease all training and rest for 6 months before retesting

195. An athlete's performance test results show a 1RM back squat at the 85th percentile for their sport, a vertical jump at the 40th percentile, and a 1.5-mile run time at the 60th percentile. Which physical quality represents the athlete's most significant deficit relative to their sport peers?

A. Maximal lower body strength based on the back squat ranking

B. Lower body explosive power based on the vertical jump ranking relative to the high strength level

C. Aerobic endurance based on the 1.5-mile run ranking

D. Upper body pressing strength, which was not directly tested

196. Test results should be interpreted using normative data tables that are matched to the athlete's specific population. Using an NFL combine normative table to evaluate a Division III college soccer player would produce which type of error?

A. Accurate results because all athletes perform similarly regardless of sport or competitive level

B. No error because normative tables are universally applicable across all sports and levels

C. An overestimate of the athlete's relative performance compared to their actual peer group

D. Misleadingly poor percentile rankings because the reference population is an inappropriate comparison group of elite professional football prospects

197. Performance testing should be conducted under standardized conditions. Which variable is most important to control across repeated testing sessions to ensure valid comparisons?

A. The brand of athletic shoes worn by the athlete during each testing session

B. The number of spectators present during the testing session

C. The music playlist used during the testing session for motivational purposes

D. Testing protocol consistency — same warmup, same equipment, same test order, same time of day, and same environmental conditions

198. A force plate during vertical jump testing can measure which performance variables that simpler methods (Vertec, jump mat) cannot?

A. Only jump height calculated from standing reach minus jumping reach

B. Only the athlete's body weight measured before the jump attempt

C. Peak ground reaction force, rate of force development, impulse, and power output in addition to jump height

D. Only flight time measured from the moment of takeoff to the moment of landing

199. A strength and conditioning specialist conducts the T-test to assess an athlete's multidirectional movement ability. The T-test involves which movement pattern?

A. A straight-line sprint of 40 yards followed by an immediate 180-degree turn and return sprint

B. Forward sprint, lateral shuffle in both directions, and backward run arranged in a T-shaped pattern

C. Repeated vertical jumps for 60 seconds to assess lower body muscular endurance

D. An agility ladder drill performed at maximum speed with predetermined footwork patterns

200. An athlete recovering from hamstring surgery completes return-to-play testing. The injured leg's single-leg hop for distance is 88% of the uninvolved leg. Based on the commonly cited 90% bilateral symmetry criterion, what is the appropriate recommendation?

A. The athlete has met all criteria and should return to unrestricted competition immediately

B. The athlete should continue further hamstring training with progressive loading because the injured leg has not yet reached the 90% symmetry threshold

C. Bilateral hop testing is not relevant for return-to-play decisions after hamstring surgery

D. The athlete should be permanently restricted from competition due to the 12% asymmetry

201. The Cooper 12-minute run test and the 1.5-mile run test both estimate VO_2max from field performance. Which limitation applies to both tests?

A. They require laboratory-grade metabolic analysis equipment to administer

B. They cannot distinguish between athletes of different fitness levels

C. They cannot be performed outdoors and require indoor facilities

D. They depend on the athlete's ability to self-pace at maximal effort, which is influenced by motivation and pacing experience

202. When conducting 1RM testing, the athlete should perform approximately how many progressive warmup sets before beginning maximal attempts?

A. No warmup is necessary — the athlete should attempt their estimated 1RM on the first set

B. One set of 50 repetitions at a very light weight to maximize blood flow

C. Three to four progressively heavier warmup sets (approximately 50%, 70%, and 80-85% of estimated 1RM) before attempting single repetitions at near-maximal loads

D. Ten sets of 10 repetitions at increasing loads to ensure complete physiological readiness

203. An athlete whose vertical jump has not improved despite 12 weeks of plyometric training might need which program modification based on their testing data?

A. Continued identical plyometric programming for an additional 12 weeks without any modification

B. A reassessment of maximal strength — if the athlete lacks an adequate strength base (less than 1.5× body weight squat), heavy resistance training may be needed before plyometrics can produce further power gains

C. Complete elimination of all training for 6 months to allow full recovery

D. Substitution of distance running for all plyometric exercises to develop aerobic capacity

204. A goniometer measures range of motion at a specific joint in degrees. What advantage does goniometric assessment offer compared to the sit-and-reach test for flexibility evaluation?

A. Goniometry is less accurate than the sit-and-reach test for all joints

B. Goniometry provides joint-specific range of motion data that can identify specific restrictions at individual joints, unlike the sit-and-reach which assesses only the hamstrings and lower back

C. Goniometry can only measure shoulder range of motion and has no application for other joints

D. Goniometry and the sit-and-reach test provide identical information about flexibility

205. Bioelectrical impedance analysis (BIA) for body composition assessment is sensitive to which factor that can significantly affect the accuracy of results?

A. The color of the athlete's clothing during the measurement session

B. The ambient noise level in the testing facility

C. The number of people present in the room during the measurement

D. The athlete's hydration status, which affects the body's electrical conductivity and can alter body fat estimates by several percentage points

206. A strength and conditioning specialist establishes a testing schedule that includes assessments at the beginning of the preparatory period, the end of the preparatory period, the beginning of the competitive season, and the end of the competitive season. What is the primary purpose of this testing schedule?

A. To provide sufficient data points to track progress, evaluate program effectiveness, and identify persistent deficiencies across each phase of the annual plan

B. To generate testing data exclusively for the athletic department's marketing materials

C. To fulfill NCAA compliance requirements that mandate monthly body composition testing

D. To penalize athletes whose performance declines by reducing their playing time

ORGANIZATION AND ADMINISTRATION (Questions 207–220)

207. A strength and conditioning facility with 4,800 square feet of usable training floor space wants to determine maximum safe occupancy. Using the NSCA guideline of 40 to 60 square feet per athlete, what is the occupancy range?

A. 80 to 120 athletes training simultaneously

B. 200 to 300 athletes using the higher-density standard

C. 10 to 20 athletes assuming extensive equipment footprint

D. 400 to 600 athletes using a minimal space allocation model

208. Olympic lifting platforms should be positioned within the training facility with which primary consideration?

A. Adjacent to the facility entrance for convenient access by athletes arriving for training

B. Separated from general traffic areas with adequate clearance on all sides for dropped barbells and failed lifts

C. In the center of the largest open floor space surrounded by all other training stations

D. Directly in front of mirrors so athletes can monitor their technique during heavy lifts

209. An emergency action plan (EAP) for a strength and conditioning facility should be rehearsed at which minimum frequency?

A. Only once at the time the facility initially opens with no subsequent rehearsals necessary

B. Only when a new staff member is hired and needs orientation to the facility

C. Every 5 years aligned with facility lease renewal cycles

D. At least annually with all staff members participating, and ideally more frequently

210. The NSCA requires all CSCS-credentialed professionals to maintain current certification in which specific emergency response skill?

A. Advanced cardiac life support (ACLS) requiring physician-level training

B. Emergency medical technician certification at the paramedic level

C. CPR and AED use from a recognized provider

D. Wilderness first responder certification for outdoor training environments

211. Negligence, the most common legal theory under which strength and conditioning professionals are sued, requires the plaintiff to prove which four elements?

A. Duty, breach, causation, and damages — all four must be established for the claim to succeed

B. Intent, malice, conspiracy, and profit motive behind the negligent action

C. Criminal activity, fraud, misrepresentation, and breach of written contract

D. Malpractice insurance, license revocation, facility closure, and public apology

212. A signed waiver (release of liability) provides which type of legal protection for the strength and conditioning facility?

A. Absolute immunity from all lawsuits regardless of the severity of negligence

B. Some legal protection documenting that the participant acknowledged risks, though it generally does not protect against claims of gross negligence

C. No legal protection in any jurisdiction and is a waste of time to collect

D. Protection only in criminal proceedings and not in civil negligence lawsuits

213. An athlete asks the strength and conditioning specialist to diagnose their shoulder pain and prescribe rehabilitation exercises. According to scope of practice guidelines, the specialist should respond by doing which of the following?

A. Diagnosing the injury based on their anatomical knowledge and prescribing rehabilitation exercises

B. Ignoring the athlete's complaint entirely because injuries are not relevant to strength training

C. Referring the athlete to a qualified medical professional such as an athletic trainer, physical therapist, or physician for diagnosis and rehabilitation prescription

D. Prescribing anti-inflammatory medications to address the pain before the athlete's next training session

214. An athlete on a collegiate team asks the strength and conditioning specialist to create a personalized meal plan with specific calorie targets, macronutrient prescriptions, and supplement recommendations. This request falls within whose scope of practice?

A. The strength and conditioning specialist's scope because nutrition is part of athletic performance

B. The head sport coach's scope because they oversee all aspects of the athlete's development

C. The team equipment manager's scope because they handle all athlete supplies

D. A registered dietitian's scope because individualized dietary counseling and meal planning require dietetic credentialing

215. Equipment inspection and maintenance should be performed at which frequency, and records of these inspections should be maintained for which purpose?

A. Regularly on a scheduled basis, with documented records demonstrating compliance with the duty to maintain safe equipment and providing legal evidence of standard of care

B. Only after an injury has occurred to determine whether equipment was involved

C. Never, because manufacturer warranties cover all equipment defects and maintenance

D. Only by the equipment manufacturer's service technicians with no involvement from facility staff

216. A sport coach demands that the strength and conditioning specialist add an additional heavy training session during game week despite the specialist's professional judgment that this additional volume increases injury risk and will impair competitive performance. How should the specialist respond?

A. Comply with the coach's demand without question because the sport coach always has final authority

B. Decline the additional session, explaining the evidence-based rationale for the current program and the professional responsibility to protect athlete safety

C. Resign immediately without attempting to resolve the disagreement

D. Add the session but reduce the intensity to levels that provide no training stimulus

217. The NSCA's professional standards establish that the CSCS-credentialed professional has which authority regarding the strength and conditioning program?

A. No authority because all training decisions are made exclusively by the sport coach

B. Authority limited to equipment purchasing and facility decoration decisions

C. Ultimate professional authority and responsibility for the design and implementation of the strength and conditioning program

D. Authority only during the off-season, with all in-season decisions deferred to the sport coach

218. Record keeping in a strength and conditioning program should include which documents to support both effective programming and legal protection?

A. Only financial records documenting facility revenue and expenses

B. Only the head coach's practice plans and game film analysis notes

C. Only social media posts documenting training sessions for public relations

D. Athlete training logs, testing data, signed waivers, medical clearance forms, equipment maintenance records, and incident reports

219. A strength and conditioning specialist observes that a facility staff member who holds a personal training certification but not the CSCS is teaching Olympic lifting technique to a group of varsity athletes. Based on professional standards, what concern should be raised?

A. The staff member's qualifications should be evaluated to determine whether they are competent and credentialed to teach technically demanding exercises to competitive athletes, as this may fall outside their scope

B. Any certification holder is equally qualified to teach all exercises to all populations

C. Olympic lifts should never be taught to any athlete regardless of the instructor's qualifications

D. The personal training certification automatically includes advanced Olympic lifting competency

220. Supervision ratios in a strength and conditioning facility should be adjusted based on which factors to ensure adequate safety and instruction quality?

A. Only the total number of athletes in the facility regardless of the exercises being performed

B. The complexity of the exercises being performed, the experience level of the athletes, and the qualifications of the supervisory staff

C. Only the time of day the training session takes place

D. Only the physical size of the facility without considering the training activities

PRACTICE EXAM 2 — ANSWER KEY WITH EXPLANATIONS

SECTION 1 — SCIENTIFIC FOUNDATIONS

EXERCISE SCIENCE (Questions 1–52)

1. D — Myofibrillar hypertrophy is the increase in contractile protein (actin and myosin) content within existing muscle fibers, directly increasing the fiber's force-producing capacity. The biopsy confirmed greater cross-sectional area with no new fiber formation, ruling out hyperplasia. This is the dominant structural adaptation to heavy resistance training in strength and power athletes.

2. A — The perimysium is the connective tissue layer that surrounds fascicles — bundles of individual muscle fibers grouped together within the muscle. The endomysium surrounds individual fibers, the epimysium surrounds the entire muscle, and the sarcolemma is the cell membrane of an individual muscle fiber.

3. B — Titin is a giant elastic protein that spans from the Z-line to the M-line within the sarcomere, functioning as a molecular spring. It contributes to passive elastic tension when the muscle is stretched and helps return the sarcomere to its resting length after contraction. Titin also plays a role in maintaining the structural integrity of the sarcomere during eccentric loading.

4. D — During sustained high-intensity isometric work, anaerobic glycolysis produces hydrogen ions that accumulate within the muscle fiber, reducing intracellular pH. This acidosis impairs cross-bridge cycling, inhibits calcium release from the sarcoplasmic reticulum, and reduces enzymatic function — producing the burning sensation and progressive inability to maintain the contraction.

5. C — A fiber type distribution of 70% Type I fibers indicates a musculature optimized for sustained, low-to-moderate intensity activity with high fatigue resistance. Marathon running relies predominantly on Type I fibers for prolonged aerobic energy production over 2 to 4 hours of continuous effort. Sports requiring explosive power (weightlifting, sprinting, shot put) favor higher proportions of Type II fibers.

6. A — The A-band contains the full length of the thick (myosin) filaments, including the zones where thick and thin filaments overlap. During contraction, the A-band remains constant in width because the myosin filaments themselves do not shorten — only the thin filaments slide over them. The I-band and H-zone narrow during contraction.

7. B — When two athletes have similar muscle size but different strength levels, the stronger athlete likely has superior neural factors — greater motor unit recruitment, higher rate coding, better

intermuscular coordination, and reduced antagonist co-contraction. Neural efficiency determines how effectively an athlete can activate their existing muscle mass to produce force.

8. C — The transverse tubules (T-tubules) are invaginations of the sarcolemma that extend deep into the muscle fiber's interior. Their primary function is to conduct the action potential from the surface membrane to the sarcoplasmic reticulum, triggering calcium release. Without T-tubules, the signal could not reach the interior of the fiber quickly enough for synchronous contraction.

9. D — ATP is required for the myosin head to detach from actin after the power stroke. When ATP binds to the myosin head, it causes a conformational change that breaks the cross-bridge bond. Without ATP — as occurs after death — the myosin heads remain permanently attached to actin, producing the rigid state known as rigor mortis.

10. A — Type IIa fibers have greater oxidative capacity (more mitochondria, higher capillary density) than Type IIx fibers, giving them moderate fatigue resistance during repeated high-intensity efforts. While Type IIx fibers produce greater peak force and faster contraction velocity in single efforts, Type IIa fibers sustain performance better across repeated bouts due to their mixed aerobic-anaerobic metabolic profile.

11. C — The infraspinatus is a rotator cuff muscle that externally rotates the humerus and stabilizes the glenohumeral joint. During a seated cable row, the primary movers are the latissimus dorsi and rhomboids; the infraspinatus contracts isometrically to maintain glenohumeral joint integrity against the pulling forces. This stabilizer role is critical for preventing shoulder injury during heavy rowing movements.

12. B — During the lowering phase of a Romanian deadlift, the hamstrings are actively generating tension to control the rate of hip flexion while the muscle lengthens. This defines an eccentric muscle action — force production during muscle lengthening. The hamstrings act as a brake against gravity, preventing the torso from falling forward uncontrollably.

13. A — The length-tension relationship predicts that maximal force production occurs at the muscle's optimal resting length, where the overlap between actin and myosin filaments is greatest and the maximum number of cross-bridges can form simultaneously. At lengths shorter or longer than optimal, fewer cross-bridges can form and force output declines.

14. D — A 7-second sprint at near-maximal intensity falls within the time domain where the phosphagen system is the dominant ATP contributor (0 to approximately 10–15 seconds of maximal effort). Phosphocreatine hydrolysis, catalyzed by creatine kinase, provides the fastest rate of ATP regeneration for brief, all-out activities. Glycolysis contributes increasingly as PCr stores deplete.

15. C — The exponential rise in blood lactate between 200 and 250 watts represents the lactate threshold — the intensity at which lactate production in working muscles begins to exceed clearance capacity. This threshold is a critical physiological marker that separates sustainable from unsustainable exercise intensities and is used to prescribe aerobic training zones.

16. B — During prolonged exercise at 50% of VO_2max, fat is the dominant fuel substrate because the moderate intensity allows sufficient oxygen delivery for beta-oxidation and the slow rate of energy demand is well-matched to the oxidative system's ATP production capacity. The body preferentially uses its virtually unlimited fat reserves at this intensity to conserve limited glycogen stores.

17. D — The Krebs cycle (citric acid cycle) occurs in the mitochondrial matrix and produces NADH and $FADH_2$ (electron carriers that deliver electrons to the electron transport chain), a small amount of ATP (or GTP), and carbon dioxide as a byproduct. The NADH and $FADH_2$ produced are the primary substrates for the electron transport chain, where the majority of aerobic ATP is generated.

18. A — An 800-meter race lasting approximately 2 minutes at near-maximal intensity falls squarely within the glycolytic-dominant time range (15 seconds to 2 minutes). The glycolytic system rapidly breaks down muscle glycogen to regenerate ATP at an intermediate rate, making it the primary energy contributor for sustained high-intensity efforts of this duration.

19. B — The conversion of pyruvate to lactate by lactate dehydrogenase regenerates NAD^+ from NADH. NAD^+ is an essential substrate for glycolysis — without its regeneration, glycolysis would stall and anaerobic ATP production would cease. This reaction allows glycolysis to continue operating when the mitochondria cannot process pyruvate fast enough to keep pace with energy demand.

20. D — Full phosphocreatine replenishment requires approximately 3 to 5 minutes of passive rest following maximal-effort exercise. Approximately 50% of PCr is restored within 30 seconds, but the remaining 50% requires several additional minutes. This recovery timeline is the physiological basis for the long rest periods prescribed between heavy strength and power sets.

21. C — Fatty acids are metabolized exclusively through aerobic pathways (beta-oxidation → Krebs cycle → electron transport chain) and produce substantially more ATP per molecule than glucose — approximately 129 ATP from a single palmitate molecule compared to 36–38 from glucose. However, the rate of ATP production from fat oxidation is much slower than from carbohydrate, limiting its contribution during high-intensity exercise.

22. A — As exercise intensity increases from 60% to 85% of VO_2max, the body shifts toward greater reliance on carbohydrate as a fuel source because carbohydrate can be metabolized at a faster rate than fat. Fat oxidation peaks at approximately 60% to 65% of VO_2max and then declines as intensity increases beyond this point, with carbohydrate becoming the dominant substrate.

23. D — Newton's Second Law ($F = ma$) states that force equals mass multiplied by acceleration. To accelerate the 100 kg athlete upward (against gravity at 9.81 m/s^2), the net upward ground reaction force must exceed 981 N (the gravitational force). Any force above this threshold produces upward acceleration, enabling the athlete to leave the ground.

24. B — Newton's Third Law states that for every action there is an equal and opposite reaction. When a sprinter pushes backward against the ground, the ground pushes back with an equal force in the

opposite direction — forward and upward. This ground reaction force, not the athlete's push itself, is what accelerates the sprinter. Greater horizontal push force produces greater forward acceleration.

25. C — When the bar is at knee height with the torso inclined 45 degrees, the horizontal distance from the bar to the lumbar spine (the moment arm) is near its maximum. This creates the greatest flexion torque on the lumbar spine, placing maximum demand on the hip and back extensors to resist spinal flexion. As the torso becomes more vertical approaching lockout, the moment arm shortens and the demand decreases.

26. A — Flexing the elbow to 90 degrees moves the center of mass of the forearm-dumbbell system closer to the shoulder joint, reducing the moment arm (perpendicular distance from the shoulder axis to the line of gravitational force). Because torque equals force multiplied by moment arm, a shorter moment arm reduces the torque demand on the shoulder abductors even though the external weight remains the same.

27. D — In a second-class lever, the resistance is positioned between the fulcrum and the effort, which means the effort arm is always longer than the resistance arm. This structural arrangement provides a mechanical advantage greater than one, favoring force production — the lever amplifies the applied force at the expense of speed and range of motion.

28. B — Muscle spindles are sensory receptors located within the muscle belly, arranged in parallel with the extrafusal (regular) muscle fibers. They detect changes in muscle length and the rate of length change, sending afferent signals to the spinal cord that trigger the stretch reflex. This makes them essential for proprioceptive control during both movement and static posture.

29. A — PNF contract-relax stretching exploits autogenic inhibition from the Golgi tendon organ. The voluntary isometric contraction of the hamstrings generates tension in the muscle-tendon unit, activating the GTO. The GTO then sends inhibitory signals that reflexively reduce hamstring tension, allowing a greater stretch to be achieved immediately after the contraction.

30. C — The stretch reflex (myotatic reflex) is a protective response that causes the stretched muscle to contract reflexively when the muscle spindle detects a rapid, unexpected increase in length. This monosynaptic reflex arc is the fastest reflex in the body and serves to protect the muscle from excessive lengthening that could cause injury.

31. D — During maximal exercise in a highly trained endurance athlete, cardiac output can increase from approximately 5 L/min at rest to 20 to 40 L/min — a four- to eight-fold increase. This dramatic increase is achieved through combined increases in heart rate (up to maximum) and stroke volume (through the Frank-Starling mechanism and increased contractility).

32. B — After stroke volume plateaus at approximately 40% to 60% of VO_2max, further increases in cardiac output during progressive exercise depend almost entirely on continued increases in heart rate. Increasing sympathetic nervous system activation and withdrawal of parasympathetic tone drive heart rate progressively higher until the age-predicted maximum is approached.

33. A — The Valsalva maneuver produces dramatic acute spikes in both systolic and diastolic blood pressure during heavy resistance exercise, with recorded values exceeding 400/300 mmHg in some studies. For a hypertensive client, these extreme pressure spikes may exceed safe limits and increase the risk of cardiovascular events. A rhythmic breathing pattern without breath-holding is recommended for this population.

34. C — The Frank-Starling mechanism describes the heart's intrinsic ability to increase stroke volume in response to increased venous return. When more blood fills the ventricles during diastole, the ventricular walls stretch further, producing a more forceful contraction that ejects a greater volume of blood. This mechanism is particularly important during the early phase of exercise when venous return increases.

35. D — Blood flow redistribution during exercise is achieved through selective vasodilation in working muscles (mediated by local metabolic signals including increased CO_2, decreased O_2, increased temperature, and metabolite accumulation) and vasoconstriction in non-essential organs (mediated by the sympathetic nervous system). This ensures that the limited cardiac output is preferentially directed to the tissues with the greatest metabolic demand.

36. B — Eccentric cardiac hypertrophy — characterized by increased left ventricular chamber size with modest wall thickening — is the characteristic cardiac adaptation to chronic endurance training. The increased chamber size allows greater filling volume and increased stroke volume, which is the primary mechanism for the higher maximal cardiac output observed in endurance athletes.

37. A — Testosterone promotes muscle growth by directly stimulating muscle protein synthesis through activation of androgen receptors in skeletal muscle tissue and simultaneously inhibiting protein degradation. This dual anabolic-anticatabolic effect makes testosterone the most potent natural hormonal stimulus for muscle hypertrophy and is the primary factor explaining sex-based differences in muscle mass and strength.

38. D — A high-volume, moderate-intensity resistance training session with short rest periods (60 seconds) produces elevated testosterone, significantly elevated growth hormone (due to the high metabolic stress), and elevated cortisol (as a stress response). This combined anabolic and catabolic hormonal response is characteristic of high-volume hypertrophy-oriented training protocols.

39. C — Muscle-derived IGF-1, particularly the splice variant mechano-growth factor (MGF), plays a direct role in activating satellite cells and stimulating muscle protein synthesis through the mTOR signaling pathway. This local IGF-1 production in response to mechanical loading is believed to be a key mediator of the hypertrophic response, independent of systemic IGF-1 levels.

40. B — The combination of low energy availability (1,200 calories with 3 hours daily training), menstrual dysfunction (irregular cycles), and decreased bone mineral density (stress fracture with suppressed estrogen) is the classic presentation of Relative Energy Deficiency in Sport (RED-S), formerly known as the female athlete triad. This condition requires referral to a multidisciplinary medical team.

41. A — The magnitude of the acute growth hormone response is most strongly influenced by the degree of metabolic stress created during the training session. High-volume protocols with short rest periods (60 to 90 seconds) produce the greatest metabolic stress — elevated blood lactate, hydrogen ion accumulation, and reduced intramuscular pH — which are the primary triggers for GH release from the anterior pituitary.

42. D — Persistently declining performance, chronic fatigue, elevated resting cortisol, and suppressed testosterone over six weeks of excessive training without adequate recovery are hallmark indicators of overtraining syndrome. This condition represents a chronic maladaptive response where the cumulative training stress has overwhelmed the body's recovery capacity, producing systemic hormonal disruption.

43. C — The SAID principle dictates that training must replicate the specific demands of the target sport to produce the most transferable adaptations. For a volleyball player, this means including exercises that develop explosive jumping power, overhead shoulder strength, lateral agility, and the specific energy system demands of volleyball's intermittent, high-intensity play pattern.

44. B — Increased androgen receptor density enhances the muscle's sensitivity and responsiveness to circulating testosterone, potentially amplifying the anabolic signal even without changes in basal testosterone levels. This adaptation means that trained muscle tissue may extract greater benefit from the same circulating testosterone concentration compared to untrained tissue.

45. A — A 30% increase in bench press 1RM within 4 weeks with no change in body weight or arm circumference is a textbook example of neural adaptation. Improved motor unit recruitment, enhanced rate coding, better intermuscular coordination, and reduced antagonist co-contraction allow the existing muscle mass to produce more force without any structural change in the muscle itself.

46. D — Tetanus occurs when the firing frequency of action potentials is high enough that successive twitches overlap completely, producing a smooth, sustained contraction with no visible oscillation between individual twitches. This represents the maximum force output from a single motor unit and is achieved through the rate coding mechanism of the nervous system.

47. C — The osteogenic benefits of resistance training apply across the lifespan: young athletes benefit by building peak bone mass during development, adults benefit by maintaining bone density against age-related decline, and older adults benefit by attenuating the progression of osteopenia and osteoporosis. Ground-based, weight-bearing exercises provide the greatest bone-loading stimulus at all ages.

48. A — During the landing phase of a depth jump, the quadriceps perform a rapid eccentric action as they lengthen under the high ground reaction forces to decelerate the body before the explosive concentric takeoff. This eccentric loading stores elastic energy in the muscle-tendon unit and activates the stretch reflex, both of which augment the subsequent concentric jump.

49. B — Rate of force development (RFD) — the speed at which an athlete can produce peak force — is the distinguishing variable when two athletes have identical maximal strength but different explosive performance. Athlete A's 40% faster achievement of peak force means they can produce a greater impulse during the limited ground contact time of a sprint or jump.

50. D — Acetylcholine is the neurotransmitter released by the motor neuron at the neuromuscular junction. It binds to receptors on the sarcolemma of the muscle fiber, generating an action potential that propagates along the fiber surface and initiates excitation-contraction coupling. Without acetylcholine release, the muscle fiber cannot be voluntarily activated.

51. C — Aerobic endurance and cardiovascular fitness decline more rapidly during detraining than any other physical quality, with measurable decrements in VO_2max observable within 1 to 2 weeks of inactivity. Maximal strength is more resistant to detraining, typically maintaining for 2 to 4 weeks or longer. This rapid loss of cardiovascular fitness underscores the importance of maintaining some aerobic activity during injury recovery.

52. A — Chronic heavy resistance training reduces the inhibitory influence of the Golgi tendon organ on maximal voluntary contraction, allowing trained athletes to recruit a greater percentage of their total motor unit pool. This disinhibition, combined with improved rate coding and intermuscular coordination, enables experienced lifters to produce force closer to the structural capacity of their muscle-tendon units.

SPORT PSYCHOLOGY (Questions 53–75)

53. B — Process goals direct attention to specific daily behaviors and techniques — "complete all prescribed sets with proper technique and full effort" — making them the most effective goal type for maintaining daily adherence. They are the most controllable goal type and translate long-term objectives into actionable daily practices that the athlete can execute every session.

54. D — Multisensory mental imagery engages visual (seeing the dive), kinesthetic (feeling the muscular sensations), auditory (hearing the crowd), and emotional (experiencing confidence) components simultaneously. Research consistently shows that imagery engaging multiple sensory modalities is more effective than visual-only imagery for enhancing skill learning and pre-competition preparation.

55. C — According to the inverted-U hypothesis, gross motor, high-force tasks like a maximal deadlift have relatively high optimal arousal levels because the heightened physiological activation supports maximal muscle recruitment, force production, and aggressive effort. Fine motor precision tasks, by contrast, require lower optimal arousal to maintain the fine coordination needed for accuracy.

56. A — Choking under pressure occurs when excessive cognitive anxiety — triggered by the high-stakes situation of a scout observing — disrupts the automatic execution of well-learned motor

skills. The athlete shifts from autonomous, fluid execution to conscious, overthought movement, causing performance deterioration despite having previously demonstrated competency.

57. D — Progressively introducing complexity — starting with simple bodyweight exercises and advancing to complex barbell movements over time — matches the difficulty of training tasks to the learner's current stage of development. This approach aligns with motor learning principles by building foundational competency before adding the complexity that demands higher levels of coordination and motor control.

58. B — In the associative stage, the athlete has moved beyond the large, frequent errors of the cognitive stage. Performance becomes more consistent, errors become smaller and less frequent, and the athlete begins developing the ability to detect some of their own errors independently. However, execution is not yet fully automatic — conscious attention to technique is still required.

59. C — The contextual interference effect demonstrates that random practice — intermixing free throws, layups, and three-pointers throughout the session — produces slower initial improvement but significantly better long-term retention and game-day transfer. The constant task-switching forces deeper cognitive processing during each trial, building more robust and flexible skill representations.

60. A — The guidance hypothesis states that providing feedback after every trial, while improving immediate performance, impairs long-term learning because the athlete develops dependency on external correction. They never learn to attend to their own intrinsic feedback or develop independent error-detection capabilities, resulting in performance that deteriorates when the coach is not providing constant guidance.

61. D — "Your 40-yard dash time was 4.62 seconds" is knowledge of results (KR) — information about the outcome of the performance. KR tells the athlete what the result was, not how the movement was executed. Knowledge of performance (KP), by contrast, would describe aspects of the movement pattern itself, such as arm mechanics or stride technique.

62. C — Reactive drills develop both the physical component of agility (eccentric deceleration, explosive reacceleration, lateral movement) and the perceptual-cognitive component (perceiving stimuli, making decisions, and executing appropriate responses under time pressure). Predetermined cone patterns develop only the physical component and lack the decision-making demands that define true game-relevant agility.

63. A — Breaking a large, intimidating goal into smaller, measurable benchmarks is the hierarchical goal-setting approach. The outcome goal (national team qualification) provides long-term direction, while performance goals (specific benchmarks) and process goals (daily behaviors) make the path manageable and provide regular evidence of progress that sustains motivation.

64. A — A training environment where the coach makes all decisions (undermining autonomy), provides no positive feedback (undermining competence), and isolates underperformers

(undermining relatedness) simultaneously violates all three basic psychological needs identified by self-determination theory. This environment would systematically suppress intrinsic motivation and likely produce disengagement, resentment, and burnout.

65. C — Intense pre-competition worry, negative self-talk, and fear of failure are the defining features of cognitive anxiety — the mental component of competitive anxiety. Cognitive anxiety involves thought-based distress rather than physical symptoms. The distinction matters because cognitive anxiety responds best to cognitive interventions (imagery, self-talk, cognitive restructuring) rather than physical relaxation techniques.

66. D — Muscle tension, rapid shallow breathing, and elevated heart rate are somatic (physical) anxiety symptoms. Progressive muscle relaxation teaches the athlete to identify and release physical tension, while diaphragmatic breathing activates the parasympathetic nervous system to reduce heart rate and respiratory rate. These techniques directly target the physiological symptoms the athlete is experiencing.

67. B — Transfer of training is maximized when the practiced skill and the target skill share common movement patterns, timing structures, force requirements, and perceptual demands. The greater the similarity between training exercises and competitive movements, the greater the likelihood that training adaptations will translate to improved performance in the target activity.

68. A — The autonomous stage is the final stage in Fitts and Posner's model, characterized by automatic, efficient skill execution with minimal conscious attention. The athlete can perform the movement while simultaneously processing strategic information, scanning the environment, and making decisions — cognitive resources are freed because the motor program runs automatically.

69. C — Punitive conditioning protocols with no evidence-based rationale decrease intrinsic motivation, increase the risk of overtraining and injury, and can cause lasting psychological harm including exercise aversion, resentment toward coaching, and burnout. No scientific evidence supports the concept that training athletes to the point of vomiting develops "mental toughness" that transfers to competitive performance.

70. D — Negative transfer occurs when learning a new skill temporarily disrupts the execution of a previously established skill due to conflicting movement patterns. The new backhand technique may interfere with the well-practiced forehand because the motor programs for the two strokes contain conflicting wrist mechanics that compete for expression during execution.

71. B — Withdrawal, loss of interest, and self-deprecating comments in a 14-year-old are potential warning signs of depression or burnout that warrant professional evaluation. The strength and conditioning specialist should recognize these signs and recommend that the parents seek assessment from a qualified mental health professional, as diagnosis and treatment are outside the specialist's scope.

72. A — Supporting an injured athlete's psychological recovery includes maintaining their involvement in team activities where safe (preserving relatedness and identity), setting achievable short-term rehabilitation goals (building competence and self-efficacy), and facilitating referral to a sport psychologist for fear of re-injury and emotional distress that exceeds the specialist's scope of practice.

73. C — Self-efficacy is task-specific and situation-specific, not a global personality trait. High confidence in the back squat does not automatically transfer to the power clean because the two exercises involve different movement patterns, skill demands, and performance histories. Building self-efficacy for the power clean requires specific mastery experiences and progressive skill development in that movement.

74. C — For a fine motor precision task like archery, the optimal arousal level is relatively low. Trembling hands and a racing heart indicate the athlete is over-aroused beyond the optimal zone. Relaxation techniques — diaphragmatic breathing and progressive muscle relaxation — reduce physiological arousal toward the lower level that supports the fine motor control and steady focus required for precision shooting.

75. B — Emotional exhaustion, cynicism (depersonalization), and reduced sense of accomplishment are the three hallmark dimensions of athletic burnout. Burnout is a psychological syndrome resulting from chronic stress in the sport environment — it is distinct from overtraining syndrome (which has primarily physiological markers) and from acute performance anxiety (which is situation-specific).

NUTRITION (Questions 76–95)

76. A — For a 90 kg strength athlete, the recommended protein intake of 1.6 to 2.2 g/kg/day translates to 144 to 198 grams per day ($90 \times 1.6 = 144$; $90 \times 2.2 = 198$). This range substantially exceeds the general population RDA of 0.8 g/kg/day and reflects the increased protein turnover and repair demands of heavy resistance training.

77. D — A mixed meal consumed 3 hours before training has had sufficient time for substantial digestion and absorption. Amino acids from the chicken breast, glucose from the brown rice, and micronutrients from the broccoli are all in various stages of processing and becoming available to support the training session. This is why pre-exercise meals are recommended 2 to 4 hours before training.

78. C — B-complex vitamins (thiamin, riboflavin, niacin, B6, B12, folate, pantothenic acid, biotin) are water-soluble coenzymes essential for the enzymatic reactions of glycolysis, the Krebs cycle, and the electron transport chain. Because they are water-soluble and not stored in significant quantities, they must be consumed regularly through the diet.

79. B — Pre-exercise hydration guidelines recommend consuming approximately 5 to 7 milliliters per kilogram of body weight at least 4 hours before exercise. This allows adequate time for absorption

and urinary excretion of any excess fluid, ensuring the athlete begins exercise in a euhydrated state without the discomfort of an overly full stomach.

80. A — At 2.5% body weight loss through dehydration, performance impairments are well-documented, including reduced endurance capacity, decreased strength and power output, compromised thermoregulation (reduced sweat rate and elevated core temperature), increased cardiovascular strain, and heightened perceived exertion. Performance decrements begin at as little as 2% body weight loss.

81. D — Consuming only plain water during a 4-hour event in the heat without replacing sodium losses creates the conditions for exercise-associated hyponatremia — dangerous dilution of blood sodium concentration. The excessive water intake relative to sodium loss reduces serum sodium below 135 mmol/L, which can cause symptoms ranging from confusion to seizures and death.

82. C — During caloric restriction, protein needs increase to protect lean mass against catabolism. Intakes of 2.0 to 2.4 g/kg/day at the upper end of recommendations provide maximum protection when combined with maintained resistance training. Reducing protein during a deficit accelerates lean mass loss and compromises recovery.

83. B — Skipping the loading phase and using only the maintenance dose of 3 to 5 grams per day achieves full intramuscular creatine saturation in approximately 28 days. This approach avoids the gastrointestinal discomfort some athletes experience during loading and is equally effective for achieving saturated phosphocreatine stores — it simply takes longer.

84. A — Paresthesia — a harmless tingling or prickling sensation typically affecting the face, ears, and hands — is the characteristic side effect of beta-alanine supplementation. It results from beta-alanine binding to sensory nerve receptors in the skin. Dividing the daily dose into smaller portions (0.8 to 1.6 grams per dose) minimizes the intensity of this sensation.

85. C — The effective ergogenic dose of caffeine is 3 to 6 milligrams per kilogram of body weight, consumed 30 to 60 minutes before exercise. Doses within this range consistently enhance performance across endurance, strength, and power tasks. Higher doses do not produce proportionally greater benefits and increase the risk of anxiety, GI distress, and insomnia.

86. D — The vast majority of commercially available "testosterone booster" supplements lack rigorous, peer-reviewed scientific evidence supporting their marketed claims for increasing circulating testosterone levels or enhancing athletic performance. The CSCS exam expects candidates to distinguish between supplements with strong evidence (creatine, caffeine, beta-alanine) and those with insufficient support.

87. B — A moderate caloric surplus of approximately 300 to 500 kilocalories per day combined with progressive resistance training promotes lean mass accretion while minimizing excessive fat gain. Larger surpluses do not accelerate muscle growth beyond a certain threshold and result in disproportionate fat accumulation that must later be lost.

88. A — Calcium is critical for bone health and muscle contraction, and dairy products are a primary dietary source. Athletes who avoid dairy, restrict calories, and follow a vegan diet without appropriate calcium-rich alternatives (fortified plant milks, leafy greens, tofu processed with calcium sulfate) are at elevated risk for calcium deficiency and its downstream consequences.

89. B — Vitamin C enhances the absorption of non-heme iron (the form found in plant sources and fortified foods) by converting ferric iron (Fe^{3+}) to the more absorbable ferrous form (Fe^{2+}). This is particularly important for athletes with low ferritin levels who need to maximize iron absorption from their diet to address deficiency without relying solely on supplementation.

90. C — Whey protein is the most rapidly digested protein source and contains the highest leucine content per serving among commonly consumed proteins. Its fast absorption rate produces a rapid peak in blood amino acid levels, and the high leucine content optimally triggers the mTOR pathway for muscle protein synthesis, making it the preferred post-exercise protein choice.

91. B — Under strict liability anti-doping rules, the athlete bears full responsibility for any substance found in their body, regardless of intent or knowledge of contamination. This is precisely why third-party certified supplements (NSF Certified for Sport, Informed Sport) are strongly recommended — they provide independent verification that the product is free of banned substances.

92. A — During a 90-minute soccer match, fluid intake of approximately 200 to 300 milliliters every 15 to 20 minutes, adjusted for individual sweat rate and environmental conditions, helps prevent body weight loss from exceeding 2%. This general guideline should be personalized based on the athlete's measured sweat rate and the specific heat and humidity of the match environment.

93. D — A 100 kg athlete prescribed 5 g/kg/day of carbohydrate requires 500 grams of carbohydrate per day (100 kg × 5 g/kg = 500 g). This intake level supports moderate training loads and can be distributed across meals and snacks throughout the day to maintain glycogen availability.

94. C — High-glycemic index foods consumed 2 to 3 hours before exercise can trigger a large insulin spike that rapidly clears blood glucose, potentially causing reactive hypoglycemia — a sharp drop in blood glucose that may produce lightheadedness, weakness, and impaired performance at the onset of exercise. Some individuals are more sensitive to this response than others.

95. B — Dietary fat should comprise 20% to 35% of total caloric intake for athletes to support hormone production (particularly testosterone and other steroid hormones), absorption of fat-soluble vitamins (A, D, E, K), cell membrane integrity, and provision of essential fatty acids. Intakes below 20% may impair hormonal function and training adaptation.

SECTION 2 — PRACTICAL/APPLIED

EXERCISE TECHNIQUE (Questions 96–140)

96. B — Before loading any weight, the specialist should assess each athlete's ability to perform an unloaded bodyweight squat to evaluate mobility (ankle dorsiflexion, hip flexion, thoracic extension), motor control (knee tracking, spinal neutrality), and basic movement competency. This screening identifies limitations that must be addressed before adding external load.

97. D — "Butt wink" — posterior pelvic tilt at the bottom of the squat — is most commonly caused by inadequate hip flexion mobility and/or hamstring flexibility. When the hips cannot flex further, the pelvis compensates by posteriorly tilting, pulling the lumbar spine into flexion. Addressing hip mobility and hamstring flexibility while potentially limiting depth to a position that maintains lumbar neutrality is the appropriate correction.

98. C — Pressing the bar in a forward arc rather than vertically is corrected by cueing the athlete to press straight up while moving the head slightly backward as the bar passes the face, then pressing the head forward through the "window" created by the arms once the bar clears. This creates a vertical bar path while keeping the head and neck safe.

99. A — In the conventional deadlift starting position, the shoulders should be positioned directly over or slightly in front of the barbell with the arms hanging straight down from the shoulder joints. This positioning ensures that the bar can be pulled vertically along the shins and thighs without drifting forward, minimizing the moment arm on the lumbar spine.

100. B — Reducing the load to a weight the athlete can control without momentum, and cueing a rigid torso position with the pull initiated by scapular retraction, addresses both the root cause (excessive load) and the technique error (momentum-driven pulling). The bent-over row should be a controlled pulling movement driven by the upper back, not a whole-body jerking motion.

101. D — Dropping elbows during the front squat is a common error caused by insufficient thoracic extension, wrist and lat flexibility, or upper back strength. Cueing "elbows up" provides an immediate correction, while front rack mobility drills (wrist stretches, lat stretches, thoracic extensions) and upper back strengthening exercises address the underlying limitations.

102. A — Asymmetric pressing speed and bar path between arms during a dumbbell exercise typically indicates a bilateral strength or motor control asymmetry. The dominant arm compensates for the weaker arm's deficiency. This observation should prompt assessment for bilateral strength differences and incorporation of unilateral corrective exercises in the training program.

103. A — The Romanian deadlift requires a slight, constant knee flexion maintained throughout the movement with a flat, neutral spine, and the bar tracking close to the legs. The movement is a hip hinge — not a squat — so the knees remain in their slightly flexed position while the hips push backward and the torso lowers under control.

104. A — In a strength training context, kipping reduces the training stimulus to the target muscles (latissimus dorsi, biceps, posterior deltoids) by using momentum from hip extension to bypass the need for upper body muscular effort. This also increases injury risk to the shoulders from the ballistic swinging forces. Strict pull-ups maximize the training stimulus and minimize joint stress.

105. D — The NSCA's recommended teaching progression for the power clean begins with the front squat to establish the front rack receiving position and develop comfort with the bar on the anterior deltoids. This top-down approach ensures the athlete can safely receive the bar before introducing the pulling phases that will deliver it to that position.

106. C — During the first pull, the back angle must remain relatively constant with the shoulders staying over or slightly in front of the bar as the knees extend. This ensures that the legs do the initial lifting work while the torso maintains its position over the bar, properly setting up the body for the explosive second pull.

107. A — The arms are force transmitters, not force generators, during the power clean. Pulling with the arms (early arm bend) bypasses the explosive hip extension that generates the vast majority of the bar's upward velocity. This dramatically reduces the power applied to the bar and limits the weight that can be successfully cleaned.

108. B — Reducing the load and practicing the snatch balance and overhead squat develops the speed, confidence, and positional strength needed to drop under the bar and receive it with locked arms. The error indicates insufficient pulling speed or dropping speed — not insufficient arm strength — so the correction targets the ability to get under the bar quickly.

109. C — A properly executed box jump landing involves the athlete arriving on the box in a controlled, balanced position with hips and knees flexed to absorb force, the full foot on the box surface, and an upright torso. Stiff-legged landings, edge positioning, and immediate rebound jumps are all technique errors or separate exercise variations.

110. D — Progressively increasing ground contact times (from 180ms to 350ms) indicate that the athlete is fatiguing and losing the ability to rapidly transition through the stretch-shortening cycle. Since plyometric training is a quality-based modality requiring maximal effort and minimal ground contact, the exercise should be terminated to prevent practicing degraded movement patterns.

111. A — Squat jumps from a standing position are classified as low-intensity plyometrics because they involve moderate ground reaction forces, bilateral landing, and a self-generated countermovement without the added eccentric loading of a drop or depth component. They are appropriate for warmups and for introducing plyometric training to novice athletes.

112. B — For a medicine ball exercise to qualify as truly plyometric, the catch-and-throw cycle must be performed with maximal speed and minimal transition time between the eccentric catch and the concentric throw. If the athlete catches, pauses, and then throws, the stretch-shortening cycle benefit is lost because elastic energy dissipates and the stretch reflex contribution diminishes.

113. D — An upright torso during the acceleration phase directs ground reaction forces more vertically rather than horizontally. Since acceleration requires primarily horizontal force to overcome inertia and generate forward momentum, the upright position limits the athlete's ability to push backward against the ground effectively, impairing acceleration performance.

114. C — Short sprint intervals of 10 to 30 meters with work-to-rest ratios of 1:5 to 1:12 replicate the phosphagen-dominant demands of repeated short sprints with brief recovery. This conditioning approach is specific to the energy system and movement pattern the athlete uses in competition, following the SAID principle.

115. B — Adding reactive decision-making to change-of-direction drills — requiring the athlete to respond to unpredictable stimuli such as a partner's movement, a visual signal, or an auditory cue — develops the perceptual-cognitive component that distinguishes true agility from preplanned directional changes. This replicates the decision-making demands of actual competition.

116. A — The optimal warmup sequence progresses from general (low-intensity whole-body activity) to dynamic stretching (session-specific movement patterns) to movement preparation (activation drills) to specific warmup (progressive loading in the training exercises). This progression systematically increases physiological readiness while matching preparation specificity to the session demands.

117. D — Research consistently demonstrates that static stretching immediately before explosive exercise acutely reduces force production, power output, and sprint performance. The mechanism involves decreased musculotendinous stiffness (reducing elastic energy storage) and reduced neural activation (decreasing motor unit recruitment). Dynamic stretching is the preferred alternative.

118. C — Foam rolling provides increased range of motion comparable to static stretching but without the acute decrements in force production and power output. This makes it a superior pre-training preparation tool because it enhances mobility while preserving the musculotendinous stiffness and neural activation needed for explosive performance.

119. A — Chronic cold water immersion after resistance training may blunt the inflammatory signaling cascades (including prostaglandin and cytokine release) that are necessary for stimulating muscle protein synthesis, satellite cell activation, and the tissue remodeling processes that drive hypertrophy and strength adaptation. Selective use during competition phases is more appropriate than routine post-training application.

120. B — Sleep (7 to 10 hours nightly) and post-exercise nutrition (adequate protein and carbohydrate) are the foundational recovery practices with the strongest evidence base. During sleep, growth hormone peaks, protein synthesis is elevated, and neural recovery occurs. No external modality can compensate for deficits in these fundamental recovery requirements.

121. D — 300-yard shuttle runs lasting approximately 60 to 90 seconds at high intensity target the glycolytic energy system. The work duration falls within the glycolytic-dominant range (15 seconds to 2 minutes), and the 4-minute rest periods provide partial recovery consistent with glycolytic conditioning prescriptions.

122. C — A soccer goalkeeper's explosive diving saves and short sprints (2 to 5 seconds) with variable rest periods between actions represent phosphagen-dominant efforts. Work-to-rest ratios of 1:8 to 1:12 allow near-complete phosphocreatine recovery between efforts, enabling maximal-quality explosive performance on each action.

123. B — The aerobic system replenishes phosphocreatine stores, clears lactate and hydrogen ions, and restores metabolic homeostasis between high-intensity efforts. Athletes with superior aerobic fitness recover faster between sprints and high-intensity plays, maintaining higher performance quality across repeated bouts throughout an entire game.

124. A — Long slow distance training at 60% to 70% of maximum heart rate is most appropriate during early preparatory phases for establishing a foundational aerobic base, particularly in deconditioned athletes or those returning from off-season rest. It builds the fundamental cardiovascular and metabolic adaptations upon which more intense conditioning will be built.

125. D — Fartlek training introduces pace variability — alternating between higher and lower intensity periods — within a continuous session. This intermittent pattern more closely replicates the variable-intensity demands of team sports than steady-state training, developing both aerobic and anaerobic fitness while improving the athlete's ability to change pace on demand.

126. C — Active recovery at low intensity promotes blood flow to recovering tissues, facilitating the delivery of nutrients and oxygen while accelerating the removal of metabolic waste products. This circulatory benefit is the primary proposed mechanism by which active recovery may improve subjective recovery compared to complete passive rest.

127. A — During a single-arm dumbbell row, maintaining a neutral spine and stable torso throughout the pull prevents excessive trunk rotation that would shift the exercise from a targeted upper back pull into a rotational momentum movement. A rigid torso ensures the latissimus dorsi and scapular retractors perform the work while protecting the lumbar spine.

128. A — Moving the front foot further from the bench creates a more vertical shin angle, reducing the forward translation of the knee and shifting the load from the knee extensors to the hip extensors. This modification decreases the shear forces acting on the anterior knee structures while maintaining an effective training stimulus for the glutes and hamstrings.

129. D — An unevenly loaded barbell creates an asymmetric center of gravity that may cause the bar to tip, rotate, or shift unexpectedly during the lift. This can cause the athlete to lose control, drop the weight, or be pulled off balance — a preventable safety hazard that underscores the importance of verifying equal loading before every set.

130. C — Barbell collars prevent weight plates from sliding off the ends of the bar during exercise. Without collars, plates can shift during uneven pressing, racking, or loss of balance, causing sudden weight redistribution that may lead to loss of control, dropped weights, or direct injury to the athlete or bystanders.

131. B — A single spotter behind the bench press should use an alternated grip (one pronated, one supinated) close to the center of the bar. The alternated grip provides superior grip security compared to a double overhand grip, and the center positioning allows the spotter to apply upward force symmetrically to assist the athlete in reracking the bar.

132. A — When spotting the standing overhead press, the single spotter stands behind the athlete with hands positioned near the wrists. If the lift fails, the spotter assists by pushing the athlete's wrists (and therefore the bar) upward and helping guide it back to the rack position. This positioning allows immediate assistance without interfering with the pressing movement.

133. C — Safety pins set too low cannot catch the bar if the athlete fails a squat repetition, defeating their primary purpose. The pins should be set at a height just below the athlete's lowest controlled squat depth so they can catch the bar and prevent the athlete from being trapped underneath. Verifying pin height before every squatting session is a critical safety check.

134. D — The Valsalva maneuver produces extreme blood pressure spikes that are contraindicated for individuals with uncontrolled hypertension due to the elevated risk of cardiovascular events. A 58-year-old client with uncontrolled hypertension should use a rhythmic breathing pattern without breath-holding during resistance exercise, even though this provides less spinal stabilization.

135. B — The Pallof press is an anti-rotation exercise that trains the core musculature — particularly the obliques and transverse abdominis — to resist rotational forces imposed by the cable or band. The athlete must maintain a neutral trunk position while the external resistance attempts to rotate the torso, developing the stabilizing capacity needed for force transfer in athletic movements.

136. A — A baseball pitcher needs both rotational power (for the throwing motion) and anti-rotation stability (to control deceleration and protect the spine). Medicine ball rotational throws develop explosive rotational power, while Pallof press variations develop the anti-rotation stability that protects the spine during the high-velocity rotational demands of pitching.

137. D — During a lateral lunge, the athlete should maintain a hip hinge position with the torso inclined forward and a neutral spine, with the knee of the stepping leg tracking over the toes. This position loads the hip extensors and adductors while protecting the knee from valgus stress. The non-stepping leg remains relatively extended.

138. B — Resistance bands provide minimal resistance at the bottom of the squat (where the band is least stretched) and maximum resistance at the top (where the band is fully stretched). This accommodating resistance curve means that the load increases through the range of motion, challenging the athlete most in the mechanically strongest position.

139. B — Reverse lunges reduce anterior knee stress compared to forward lunges because the athlete steps backward rather than forward, eliminating the eccentric deceleration demand on the front knee. The front leg remains relatively stationary with a more vertical shin angle, reducing the shear forces that contribute to anterior knee pain.

140. A — A properly performed push-up maintains a straight line from head to heels with the core braced, the chest touching or nearly touching the floor at the bottom, and the elbows tracking at approximately 45 degrees from the torso. This position maximizes the training stimulus to the chest, shoulders, and triceps while protecting the shoulder joint from impingement.

PROGRAM DESIGN (Questions 141–184)

141. D — Wrestling demands all three energy systems: the glycolytic system dominates during sustained grappling within each 2-minute period, the phosphagen system powers explosive takedowns and escapes, and the aerobic system supports recovery between periods. A comprehensive conditioning program must develop all three with primary emphasis on glycolytic capacity.

142. C — A power exercise must be performed explosively with rapid force production throughout the lifting movement. The power clean meets this criterion because the entire lift involves maximal-velocity force application. A controlled-tempo back squat, while structural and core, lacks the explosive execution required for the power classification.

143. B — The power snatch is the explosive/power exercise in this group and must be performed first in the exercise order when the athlete is fresh. Power exercises require the highest levels of neuromuscular coordination and rate of force development — qualities that deteriorate rapidly with fatigue.

144. A — An advanced athlete training 4 days per week benefits from a split routine such as upper/lower alternation that distributes volume while allowing 48 to 72 hours of recovery between sessions targeting the same muscle groups. This structure enables higher per-session volume for each body region while maintaining adequate recovery.

145. C — Training with loads less than 67% of 1RM for 12 or more repetitions primarily develops muscular endurance — the muscle's ability to sustain repeated contractions at submaximal intensities. This loading zone does not provide sufficient mechanical tension for maximal strength development or optimal hypertrophy stimulation.

146. D — 80% of 150 kg = 120 kg per set. Volume load = 120 kg × 8 reps × 4 sets = 3,840 kg. This calculation is the standard method for quantifying total training work and is used for tracking progressive overload and comparing training phases.

147. B — Maximal strength training requires heavy loads (≥85% 1RM), low repetitions (≤6), and long rest periods (2 to 5 minutes). This combination forces recruitment of high-threshold motor units,

allows adequate phosphocreatine recovery and neural restoration between sets, and provides the intensity stimulus necessary for neural strength adaptation.

148. A — Three sets of 12 repetitions at 70% 1RM with 60-second rest periods is a classic hypertrophy protocol. The moderate load and repetition range provide sufficient mechanical tension, the short rest periods maintain elevated metabolic stress, and the combined stimulus drives the protein synthesis and cellular signaling that produce muscle growth.

149. D — A 16-week linear periodization preparatory period progresses from hypertrophy/endurance (high volume, moderate intensity) through strength (moderate volume, high intensity) to power/peaking (low volume, very high intensity). Volume decreases and intensity increases across the phases, with each phase building on the adaptations produced by the preceding one.

150. C — A DUP week might structure Monday for hypertrophy (4×10 at 70%), Wednesday for strength (5×4 at 85%), and Friday for power (5×3 at 75% with explosive tempo). This within-week variation provides frequent exposure to different training stimuli, potentially producing broader adaptation than single-focus training within a given week.

151. B — Block periodization is most appropriate for advanced athletes who have already developed a substantial fitness base and require concentrated, targeted training stimuli to produce further adaptation. Beginners respond well to general training and do not need the specialized loading that block periodization provides.

152. A — When training intensity is maintained at preparatory-period levels while volume and frequency are reduced, strength and power are typically well-maintained during the in-season. Research consistently demonstrates that intensity is the most critical variable for maintaining neuromuscular adaptations, while volume and frequency can be substantially reduced without detraining.

153. C — For a collegiate football team with a September-December season and April spring practice, the preparatory period encompasses January through August. This window allows for a complete general preparation phase (off-season), specific preparation phase (summer training), and pre-season conditioning leading into fall camp.

154. D — Peak power output during the hang clean is typically achieved at 70% to 80% of 1RM because the hang clean is a ballistic exercise where the load is accelerated throughout the full range of motion. This loading range provides sufficient resistance to generate high force while allowing the velocity needed for peak power expression.

155. B — The recommended plyometric volume for advanced athletes is 120 to 140 foot contacts per session, distributed across exercises of varying intensity. This volume provides a robust training stimulus while staying within the recovery capacity of an athlete with an established plyometric training base.

156. A — Plyometric sessions should be performed at the beginning of the training session after a thorough warmup, when the athlete is fresh and can produce maximal effort with proper technique on every repetition. Performing plyometrics in a fatigued state reduces explosive output, degrades landing mechanics, and defeats the purpose of quality-based power training.

157. C — Combining heavy strength training (≥85% 1RM) on some days with explosive exercises (Olympic lifts, plyometrics, jump squats at 30-50% 1RM) on other days addresses both ends of the force-velocity continuum within the same week. This approach develops maximal force capacity and high-velocity power simultaneously.

158. D — A comprehensive program for a basketball point guard should address all identified qualities — agility, vertical power, aerobic endurance, and upper body strength — in a periodized plan that prioritizes them based on the competitive calendar. Addressing only one quality neglects the multifaceted demands of the sport and position.

159. A — Pull-ups and lat pulldowns target the latissimus dorsi and scapular stabilizers used during pulling phases of swimming strokes. Internal/external rotation exercises strengthen the rotator cuff, providing injury prevention for the shoulder joint that is repetitively stressed during thousands of stroke cycles per session. This exercise selection directly supports swimming performance and shoulder health.

160. B — Novice athletes benefit most from moderate loads (60-70% of estimated 1RM) at higher repetition ranges (10-15 reps) during the first 2 to 4 weeks. This approach allows the athlete to develop movement proficiency through multiple repetitions of each pattern, builds initial work capacity, and allows connective tissues to begin adapting before heavier loads are introduced.

161. C — Five sets of 5 at 87% 1RM with 4-minute rest periods is a maximal strength protocol. The heavy load (>85%), low repetitions (≤6), and long rest periods (2-5 minutes) target neural adaptation — increased motor unit recruitment, improved rate coding, and enhanced intermuscular coordination — while allowing adequate recovery for maximal force production on each set.

162. D — Daily undulating periodization varies intensity and volume across training sessions within the same week — such as a hypertrophy session, a strength session, and a power session within a single week. This contrasts with linear periodization (changes across mesocycles) and block periodization (concentrated focus within multi-week blocks).

163. B — Ice hockey shifts lasting 30 to 45 seconds with 2 to 3 minutes of bench rest represent a glycolytic-dominant energy demand. Interval training with matching work durations and rest periods replicates these demands specifically. The conditioning protocol should mirror the sport's actual work-to-rest ratio to produce the most transferable physiological adaptations.

164. A — A 17-year-old novice should begin with a structured total-body program performed 2 to 3 times per week, emphasizing technique instruction on fundamental movements (squat, hinge,

press, pull), using moderate loads and higher repetitions, with progressive complexity introduced as competency develops. Safety, movement quality, and skill development are the priorities.

165. C — The transition period provides essential physical recovery from the competitive season's accumulated fatigue, psychological restoration of motivation after months of intense competition, an opportunity to address minor nagging injuries, and mental preparation for the next training cycle. Active recovery activities are typically unstructured and low-intensity for 2 to 4 weeks.

166. D — The peaking phase should be timed to coincide with the most important competition — the conference tournament in late November. Using linear periodization, the preceding months would progress from general preparation through specific preparation, with the peaking (realization) phase producing optimal performance at the target competition date.

167. A — The principle of accommodation states that the physiological response to a constant, unchanging training stimulus diminishes over time as the body adapts to that specific stress. After 16 weeks of identical programming, the training stimulus no longer represents a sufficient challenge to drive further adaptation. Variation in exercises, loads, volumes, or periodization structure is needed to overcome this plateau.

168. A — Research indicates that peak power output during the jump squat occurs at approximately 0% to 30% of back squat 1RM. The lighter loading allows for the high contraction velocities needed to maximize the velocity component of the power equation during a movement where the load is projected into the air.

169. C — A marathon runner's program should combine progressive long-distance running (aerobic endurance), moderate-load resistance training targeting running-specific muscles — quadriceps, hamstrings, calves, hip stabilizers — (injury prevention and lean mass maintenance), and flexibility work (injury prevention and range of motion). This combination addresses all three identified priorities.

170. D — The correct annual training plan sequence is: general preparation (broad fitness base) → specific preparation (sport-specific development) → competition (peaking and maintenance) → transition (recovery). Each period builds on the preceding one, progressing from general to specific to competitive readiness.

171. B — The general preparation phase builds a broad foundation of hypertrophy (increased muscle cross-sectional area), general strength (multi-joint and multi-planar force capacity), work capacity (tolerance for training volume), and aerobic fitness (cardiovascular and metabolic base). This foundation supports the more intense, sport-specific training that follows.

172. A — Volume load = total repetitions × average load. If the target volume load is 50,000 kg and the average load is 100 kg per repetition, the athlete needs 500 total repetitions (50,000 ÷ 100 = 500) distributed across the four training sessions, or approximately 125 repetitions per session.

173. C — Novice athletes experience rapid initial strength gains primarily from neural adaptations (improved motor unit recruitment, rate coding, and coordination), which occur quickly. As these neural improvements plateau, continued progress requires structural adaptation (muscle hypertrophy), which occurs more slowly and requires more advanced programming strategies to stimulate.

174. D — A 12-week block periodization program for an advanced powerlifter progresses through: accumulation block (high volume, moderate intensity for work capacity and hypertrophy), transmutation block (higher intensity for converting structural gains into sport-specific strength), and realization block (low volume, very high intensity for peaking maximal strength at the competition).

175. A — Reconditioning after a grade II hamstring strain begins with low-intensity exercises at reduced loads, progressing gradually through sport-specific movements and increasing intensity based on symptom response and objective performance criteria. Rushing back to full-intensity activity increases reinjury risk, while excessive restriction delays return unnecessarily.

176. B — Return-to-play after ACL reconstruction requires objective criteria: bilateral strength and functional symmetry within 10% on relevant tests, demonstrated competency in sport-specific movements (cutting, jumping, landing, pivoting), and medical clearance. Subjective feelings alone are insufficient, and persistent asymmetries exceeding 10% are associated with elevated reinjury risk.

177. C — Incorporating unilateral exercises with additional volume or load on the weaker (left) side addresses the bilateral asymmetry by providing a targeted corrective stimulus. Single-leg exercises, single-arm pressing and pulling movements, and rotational core work with emphasis on the deficient side progressively reduce the strength differential.

178. D — An athlete with a 2.0× body weight squat has more than adequate maximal strength for sprint acceleration. The deficiency is in the ability to express that strength rapidly. Adding explosive exercises — resisted sled sprints, acceleration drills, and short sprint intervals — develops the rate of force development needed to translate high strength into fast acceleration.

179. B — The most sport-specific conditioning for this wide receiver replicates the actual distances (20-40 yards), durations (3-5 seconds), and rest periods (25-35 seconds) experienced during games. This protocol targets the phosphagen system that dominates during each sprint while providing the sport-specific recovery intervals between efforts.

180. A — Muscular endurance training uses rest periods of 30 seconds or less to maintain elevated metabolic demand and cardiovascular stress throughout the session. Short rest intervals prevent full recovery between sets, forcing the muscles to sustain work under metabolic fatigue — the specific adaptation being trained.

181. C — Pull-up and rowing variations develop upper body pulling strength, dead hangs and farmer's carries develop grip endurance, anti-extension and anti-rotation core exercises develop the trunk stability needed for maintaining body position on the wall, and nutritional planning supports the body composition optimization that directly affects climbing performance through improved strength-to-weight ratio.

182. D — Having two sessions per week for the same exercise with different loading parameters (Session 1: heavy/low-rep/long rest; Session 2: moderate/higher-rep/shorter rest) is characteristic of daily undulating periodization. The same movement pattern is trained at different intensities within the same week, providing varied stimuli for broader adaptation.

183. B — An injured athlete who cannot load the tibia should continue training all non-affected regions — upper body resistance training, core stability work, and non-weight-bearing conditioning (swimming, upper body ergometer). This maintains strength and muscle mass in non-injured areas, preserves cardiovascular fitness, and supports psychological engagement during recovery.

184. A — A 4-week introductory program for novice high school freshmen should use a structured total-body approach performed 2 to 3 times per week, emphasizing proper technique on fundamental movement patterns at moderate loads with higher repetitions. The priority is building movement competency and establishing safe training habits before progressing to more advanced programming.

TESTING AND EVALUATION (Questions 185–206)

185. C — The vertical jump (countermovement jump) using a Vertec device is the most practical and valid field test of lower body explosive power for large groups. It requires minimal equipment, can be administered quickly to many athletes, has strong construct validity for measuring lower body power, and produces reliable results with standardized procedures.

186. D — Reliability is the consistency and reproducibility of test results across repeated administrations under identical conditions. A reliable test produces similar scores when the same athlete is tested multiple times without any change in their actual fitness level. High reliability means that observed score changes are more likely to reflect true performance changes rather than measurement error.

187. A — The 1RM is defined as the last weight successfully lifted with acceptable technique through the complete range of motion. Since the athlete successfully completed 95 kg but failed at 100 kg, the 1RM is 95 kg. A failed attempt is never recorded as the 1RM regardless of how close the athlete came to completing it.

188. B — Using the Brzycki formula: $1RM = 90 \div (1.0278 - 0.0278 \times 6) = 90 \div (1.0278 - 0.1668) = 90 \div 0.861 \approx 104.5$ kg. The estimated 1RM is approximately 104 kg. Prediction equations provide estimates that are most accurate when repetitions completed are 10 or fewer.

189. C — The difference between CMJ and SJ height reflects the athlete's ability to utilize the stretch-shortening cycle — stored elastic energy and the stretch reflex contribution from the rapid countermovement. A larger difference indicates greater SSC proficiency, while a small difference may indicate that the athlete is not effectively exploiting the rapid eccentric-to-concentric transition.

190. D — The 20-meter multistage shuttle run (beep test) requires only cones and a sound system, can be administered to large groups simultaneously, and provides a valid estimate of aerobic capacity through an externally paced, progressive intensity protocol. It is the most practical field test of aerobic fitness for the described scenario.

191. B — Hand timing introduces reaction time variability of approximately 0.1 to 0.3 seconds per measurement, which can represent a significant proportion of total sprint time (especially in shorter sprints). Electronic timing using infrared sensors or laser gates eliminates this human error, producing substantially more accurate and reliable sprint times.

192. A — Maximizing skinfold reliability requires using the same trained technician, the same calibrated calipers, the same anatomical site locations, and the same population-specific prediction equations across all testing sessions. Any variation in these factors introduces error that can obscure true changes in body composition.

193. C — The sit-and-reach test primarily measures hamstring and lower back flexibility. Its limitations include not assessing flexibility at other joints, being influenced by the athlete's limb proportions (arm length relative to trunk and leg length), and not distinguishing between hamstring flexibility and lumbar spine mobility.

194. C — An 18% bilateral asymmetry substantially exceeds the commonly cited 10% to 15% threshold for clinical significance. This magnitude of difference warrants targeted corrective programming with additional volume and load for the weaker limb, and may warrant medical evaluation to identify any underlying pathology or incomplete rehabilitation.

195. B — The athlete's vertical jump ranking (40th percentile) is disproportionately low relative to their high strength ranking (85th percentile). This discrepancy between strength and power suggests a rate of force development deficit — the athlete can produce high force but cannot produce it quickly enough for explosive performance. Power development training should be prioritized.

196. A — Using NFL combine normative data to evaluate a Division III soccer player would produce misleadingly poor percentile rankings because the reference population consists of elite professional football prospects — a drastically different athletic population. Normative tables must be matched to the athlete's sport, competitive level, sex, and age for meaningful interpretation.

197. D — Standardizing the testing protocol — same warmup, same equipment, same test order, same time of day, same environmental conditions, and same instructions — across all repeated testing

sessions is the most critical factor for ensuring valid comparisons. Any variation in these conditions introduces confounding variables that may be mistaken for true performance changes.

198. C — Force plates measure peak ground reaction force, rate of force development (how quickly force is produced), impulse (total force applied over time), and power output in addition to jump height. This comprehensive data set provides a detailed biomechanical profile of the jump that cannot be obtained from simpler methods like the Vertec or jump mat.

199. B — The T-test involves sprinting forward 10 yards, shuffling laterally 5 yards, shuffling laterally 10 yards in the opposite direction, shuffling back 5 yards to center, and backpedaling 10 yards to the start — forming a T-shaped movement pattern. It assesses multidirectional movement ability including forward sprinting, lateral shuffling, and backward running.

200. D — At 88%, the injured leg has not yet reached the commonly cited 90% bilateral symmetry threshold. The athlete should continue progressive hamstring strengthening until the symmetry criterion is met. Returning to unrestricted competition with a 12% asymmetry is associated with elevated reinjury risk.

201. D — Both the Cooper 12-minute run and the 1.5-mile run require the athlete to self-pace at maximal effort for the entire test duration. Performance depends heavily on the athlete's motivation, pacing experience, and willingness to tolerate the discomfort of sustained maximal effort — factors that can cause underestimation of true aerobic capacity.

202. C — A standardized 1RM testing protocol includes three to four progressively heavier warmup sets at approximately 50%, 70%, and 80-85% of estimated 1RM before beginning single-repetition maximal attempts. This progressive loading prepares the neuromuscular system, increases tissue temperature, and rehearses the movement pattern at increasing intensities.

203. A — If plyometric training alone has not improved the vertical jump after 12 weeks, the athlete may lack the strength foundation needed for plyometrics to be effective. Reassessing maximal strength — and implementing heavy resistance training if the squat falls below the 1.5× body weight threshold — may be necessary before plyometrics can produce further power gains.

204. B — Goniometry provides joint-specific range of motion measurements at any joint in the body, identifying specific restrictions that the sit-and-reach test cannot detect. While the sit-and-reach provides only a global assessment of hamstring and lower back flexibility, goniometry can pinpoint whether a limitation exists at the hip, knee, ankle, shoulder, or any other individual joint.

205. D — BIA estimates body composition by measuring the body's resistance to a low-level electrical current. Hydration status significantly affects this resistance — dehydration increases impedance and overestimates body fat, while hyperhydration decreases impedance and underestimates body fat. Testing should be performed in a consistent hydration state for reliable results.

206. A — A testing schedule at the beginning and end of each major phase provides multiple data points to track progress, evaluate whether the training program is producing the expected adaptations,

identify persistent deficiencies, and inform modifications for subsequent phases. This systematic approach ensures that programming decisions are based on objective data rather than assumption.

ORGANIZATION AND ADMINISTRATION (Questions 207–220)

207. A — Using the NSCA guideline: 4,800 ÷ 60 = 80 athletes at the most conservative estimate, or 4,800 ÷ 40 = 120 athletes at the minimum allocation. The safe occupancy range is 80 to 120 athletes training simultaneously, depending on equipment layout and the activities being performed.

208. B — Olympic lifting platforms must be separated from general traffic areas with adequate clearance on all sides to account for dropped barbells during failed lifts. Athletes and staff should never walk behind or beside someone performing Olympic lifts. This separation is the primary safety consideration for platform placement in facility design.

209. D — Emergency action plans should be rehearsed at least annually with all staff members participating, and ideally more frequently. An unrehearsed plan will fail under the stress of an actual emergency because staff may not know their roles, equipment locations, or emergency procedures. Regular rehearsal builds the familiarity and confidence needed for effective emergency response.

210. C — The NSCA requires all CSCS-credentialed professionals to maintain current CPR and AED certification from a recognized provider. This ensures that every certified professional can provide immediate life-saving intervention for cardiac emergencies. It is both a certification prerequisite and an ongoing recertification requirement.

211. A — Negligence requires proof of all four elements: duty (obligation to provide safe training), breach (failure to meet the standard of care), causation (the breach directly caused the injury), and damages (actual harm was suffered). If any single element cannot be proven, the negligence claim fails. This four-element framework is the foundational legal concept tested in this domain.

212. B — A signed waiver documents that the participant was informed of the inherent risks of training and voluntarily agreed to participate. This provides some legal protection, but waivers generally do not protect against claims of gross negligence or reckless conduct, and their enforceability varies by jurisdiction. They remain an important risk management tool despite their limitations.

213. C — Diagnosing shoulder pain and prescribing rehabilitation exercises falls outside the strength and conditioning specialist's scope of practice. These functions require the training and licensure of medical professionals — athletic trainers, physical therapists, or physicians. The specialist should refer the athlete to the appropriate qualified professional.

214. D — Creating individualized meal plans with specific calorie targets, macronutrient prescriptions, and supplement recommendations falls within the scope of a registered dietitian. The strength and conditioning specialist can provide general nutrition education but should not provide individualized dietary counseling that crosses into the dietetic scope of practice.

215. A — Equipment inspections should be performed regularly on a scheduled basis, with documented records maintained for two purposes: ensuring that equipment is safe and functional for daily use, and providing legal evidence that the facility has met its duty to maintain safe equipment — which is a critical component of demonstrating standard of care if a liability claim arises.

216. B — The CSCS-credentialed professional has the professional authority and responsibility for safe, evidence-based program design. When a sport coach's demand conflicts with athlete safety and evidence-based practice, the specialist should decline, explain the rationale, and propose an appropriate alternative. Compliance with unsafe demands violates professional standards and increases liability.

217. C — The NSCA's professional standards establish that the CSCS-credentialed professional has ultimate authority and responsibility for the design and implementation of the strength and conditioning program. While collaboration with sport coaches is essential, the certified professional makes final training decisions based on their specialized education, certification, and expertise.

218. D — Comprehensive records should include athlete training logs, testing data, signed waivers, medical clearance forms, equipment maintenance records, and incident reports. These documents serve both programming purposes (tracking progress, informing decisions) and legal protection (demonstrating standard of care, documenting informed consent, recording incidents).

219. A — The staff member's qualifications should be evaluated to determine whether their certification and competency are appropriate for teaching technically demanding Olympic lifts to competitive athletes. Personal training certifications vary widely in their coverage of complex movements, and teaching Olympic lifts to varsity athletes may exceed the scope of some entry-level certifications.

220. B — Supervision ratios should be adjusted based on the complexity of exercises being performed (Olympic lifts and heavy compound movements require closer supervision than machine exercises), the experience level of the athletes (novices need more supervision than experienced lifters), and the qualifications of the supervisory staff (more qualified supervisors can safely manage larger groups).