

## **KUS Sample Tests**

April 14th, 2023

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## 100-Level Courses

### KIN 110

- Which of the following statements is false?
  - The axial skeleton has 80 bones.
  - The appendicular skeleton has 126 bones.
  - The axial skeleton is composed of the bones that run through the axis of the body.
  - Children have more bones than adults.
  - The appendicular skeleton does not include the pelvic and pectoral girdles.**
- Which of the following bones is NOT part of the axial skeleton?
  - hyoid
  - ribs
  - vertebrae
  - carpals**
  - Sternum
- Which of the following bones is part of the axial skeleton?
  - tarsals
  - tibia
  - sphenoid - skull/eye facial bones** (butterfly-shaped, holds the pituitary gland)
  - scapula - shoulder bone/shoulder blade
  - clavicle - collarbone (part of pectoral)
- Which of the following is NOT true of surface markings on bone?
  - They allow the passage of nerves and blood vessels.
  - They provide sites of attachment for muscles.
  - They allow bones to shorten or lengthen.**
  - They help form joints.
  - They can be depressions or projections.
- An opening or hole in a bone through which blood vessels, nerves and ligaments pass is called a:
  - fissure.
  - foramen.**
  - fossa.
  - meatus.
  - Sulcus.
- A rounded articular projection supported on a constricted portion (neck) of a bone is called a...
  - Foramen

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- b. Condyle
  - c. **Tuberosity**
  - d. Head
  - e. Trochanter
7. A prominent ridge or elongated projection on a bone is called a
- a. **crest.**
  - b. trochanter.
  - c. sulcus.
  - d. Fossa.
  - e. Tubercle.
8. The humerus is an example of a \_\_\_\_\_ bone. It articulates with the ulna to form the humeroulnar joint: a \_\_\_\_\_ joint, which is classified as a/n \_\_\_\_\_.
- a. flat, ball-and-socket, amphiarthrosis
  - b. long, condyloid, diarthrosis
  - c. irregular, saddle, synarthrosis
  - d. **long, hinge, diarthrosis**
  - e. flat, pivot, amphiarthrosis
9. What passes through the vertebral foramen?
- a. Spinal cord
10. Which bony landmark is unique to C2 (axis)?
- a. Dens
11. What articulates with the superior articular facet of C1?
- a. Occipital condyles
12. Scoliosis is an abnormal \_\_\_\_\_ curvature in the spine.
- a. Lateral
13. What passes through the intervertebral foramen?
- a. Spinal nerves
14. The sacrum and coccyx are generally fused by age \_\_\_\_\_.
- a. 30
15. The vertebral column is composed of \_\_\_ cervical, \_\_\_ thoracic, \_\_\_ lumbar vertebrae, the sacrum, and the coccyx.
- a. 7 cervical, 12 thoracic, 5 lumbar
16. The shoulder is a \_\_\_\_\_ joint.
- a. Ball & socket
17. The shoulder permits triaxial movements. What are the 3 types of movements, and what planes are they associated with?
- a. Rotation (external/internal); transverse plane
  - b. Abduction/adduction; frontal plane
  - c. Flexion/extension; sagittal plane
18. The shoulder joint is formed by the articulation of the humerus and glenoid. Which types of bones are the humerus? The scapula?

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- a. Humerus: long bone
  - b. Scapula: flat bone
19. The olecranon fossa is located on which bone?
- a. Ulna
  - b. Radius
  - c. Scapula
  - d. Humerus**
  - e. Sternum
20. The suture between 2 parietal bones is called \_\_\_\_\_
- a. Sagittal suture
21. Name the 3 muscles that are supplied by the musculocutaneous nerve
- a. Biceps brachii
  - b. Coracobrachialis
  - c. Brachialis
22. The fascial sheet that spans over top of the forearm is called the \_\_\_\_\_
- a. Bicipital aponeurosis
23. Which head in the bicep brachii helps prevent dislocation of the shoulder?
- a. Short head
24. Name all the carpal bones
- a. Scaphoids, lunates, triquetrum, pisiforms, trapezium, trapezoid, capitate, hamates
25. What is the largest carpal bone?
- a. The capitate
26. Which carpal bone has the highest likelihood of fracturing?
- a. Scaphoid
27. Which finger does not have a middle phalanx?
- a. Thumb/Digit 1
28. Name the superficial muscles of the forearm
- a. Pronator teres, palmaris longus, flexor carpi radialis, flexor carpi ulnaris
29. What is the muscle in the intermediate layer of the forearm called?
- a. Flexor digitorum superficialis
30. Which muscle flexes the thumb?
- a. Flexor pollicis longus
31. Name the origin, insertion, innervation, and function of the palmaris longus.
- a. Origin: medial epicondyle of humerus
  - b. Insertion: palmar aponeurosis & distal half of flexor retinaculum
  - c. Innervation: medial nerve
  - d. Function: wrist flexion and tenses the palmar aponeurosis
32. Name the origin, insertion, innervation, and function of the pronator teres.
- a. Origin: medial epicondyle of humerus & coronoid process of ulna
  - b. Insertion: lateral surface of radius

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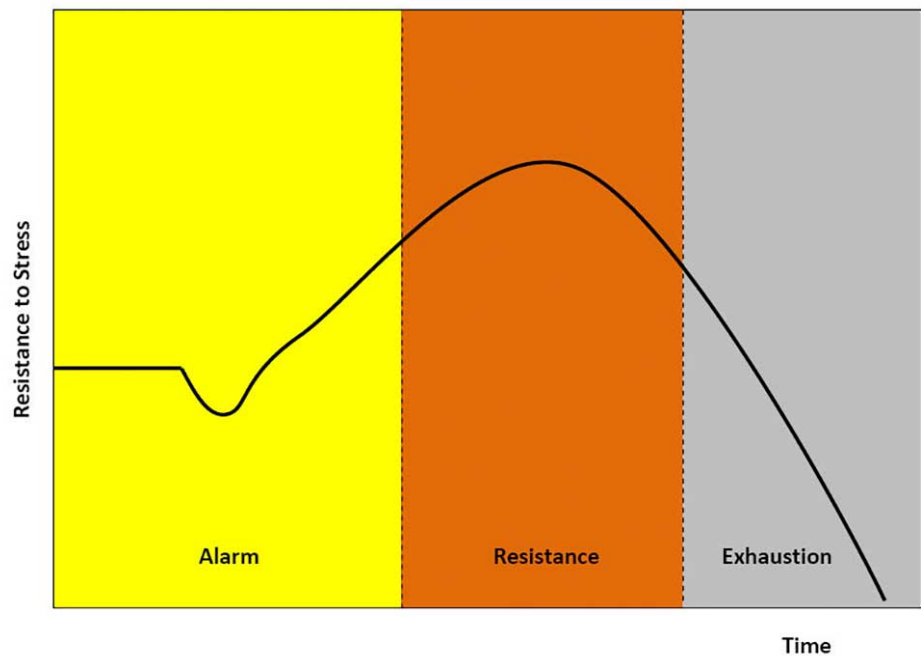
- c. Innervation: median nerve
  - d. Function: pronates forearm and elbow flexion
33. Name the muscles in the posterior superficial layer of the forearm.
- a. Extensor Carpi Radialis Longus
  - b. Extensor Carpi Radialis Brevis
  - c. Extensor Digitorum
  - d. Extensor Carpi Ulnaris
  - e. Extensor Digiti Minimi
  - f. Anconeus
34. Name the muscles in the posterior deep layer of the forearm.
- a. Extensor Indicis
  - b. Supinator
  - c. Extensor Pollicis Longus (EPL)
  - d. Abductor Pollicis Longus (APL)
  - e. Extensor Pollicis Brevis (EPB)
35. Name the muscles that form the anatomical snuffbox
- a. Abductor Pollicis Longus
  - b. Extensor Pollicis Longus
  - c. Extensor Pollicis Brevis
36. What are the two muscles used for extension of the thumb?
- a. Extensor pollicis longus
  - b. Extensor pollicis brevis
37. What is the purpose of the sacral promontory?
- a. Interacts with the L5 intervertebral disc to accept the weight of the torso
38. What is the purpose of the anterior sacral foramina?
- a. Allows the anterior sacral roots to exit the spinal canal
39. What is the purpose of the sacral canal?
- a. It is the continuation of the spinal canal, contains remnants of the cauda equina
40. What is the purpose of the auricular surface?
- a. Smoother surface of the sacroiliac joint lined with hyaline cartilage
41. Does the pelvis sit flat in the human body?
- a. No; it is tilted forward. In healthy individuals, you should be able to draw a straight vertical line from the ASIS down to the pubic tubercle.
42. What 2 joints connect the tibia and fibula?
- a. Superior and inferior tibiofibular joints
43. What bone does the calcaneus never articulate with?
- a. Navicular
44. Name all the ligaments that make up the subtalar (talocalcaneal) joint
- a. Lateral talocalcaneal ligament
  - b. Medial talocalcaneal ligament
  - c. Posterior talocalcaneal ligament

- d. Intereosseous talocalaneal ligament
- 45. Describe the function of interphalangeal joints
  - a. Flexion/extension of digits
- 46. Which suture unites the frontal and parietal bones
  - a. Coronal suture
- 47. What is the main function of the hamstring muscles?
  - a. Hip extension and knee flexion
- 48. Name all the main muscles involved in hip adduction
  - a. Pectineus
  - b. Adductor Brevis
  - c. Adductor Longus
  - d. Adductor Magnus
  - e. Gracilis
- 49. What is the main nerve innervation for Hip Adductors? What is the exception?
  - a. Obturator nerve
  - b. Adductor magnus is supplied

**KIN 120**

1. A physical or psychological event or condition that produces physical and emotional reactions is a?
  - a. **Stressor**
  - b. Stress Response
  - c. Stress
2. The branch of the peripheral nervous system that controls basic body processes; consists of the sympathetic and parasympathetic divisions?
  - a. **The Autonomic Nervous System**
  - b. The Central Nervous System
  - c. The Brain
3. A neurotransmitter released by the sympathetic nervous system onto specific tissues to increase their function; involved in arousal, as well as in learning and mood regulation. Also a hormone, released by adrenal gland?
  - a. Acetylcholine
  - b. **Norepinephrine**
  - c. Epinephrine
  - d. gamma-Aminobutyric acid
4. A steroid hormone secreted by the cortex (outer layer) of the adrenal gland; also called hydrocortisone; depletes dopamine, which decreases activity in the pleasure pathways of the brain. Also exacerbates anxiety?
  - a. Testosterone
  - b. Estrogen
  - c. Progesterone
  - d. **Cortisol**
5. \_\_\_\_\_ is a state of stability and consistency in a person's physiological functioning?
  - a. Homeostasis

6. The General Adaptation Syndrome is a pattern of stress responses consisting of three stages: alarm, resistance, and exhaustion, please draw the graph for this.



- a.
7. What is stress resulting from an unpleasant stressor?
- Distress**
  - Eustress
  - Negative stress resulting in a negative feedback loop
8. Sugar production is done through the process of \_\_\_\_\_?
- Glucogenesis
9. When the heart muscle does not receive enough blood, causing severe pain in the chest, arm and/or shoulder, what is it called?
- Angina Pectoris**
  - Sudden Cardiac Death
  - Congestive Heart Failure
  - Heart attack
10. What is it called when you have a sustained abnormally high BP?
- Hypertension

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11. A lipoprotein containing relatively little cholesterol that helps transport cholesterol out of the arteries; "good" cholesterol?
  - a. **HDL**
  - b. LDL
  - c. Cholesterol
12. A scraping of cells from the cervix for examination under a microscope to detect cancer?
  - a. Pap Test
13. The HDL Range for men in danger and women in danger are...?
  - a. 50 mg/dl, 40 mg/dl
14. What are the exercise per week recommendations?
  - a. 150 mins/week overall
  - b. 30 mind of moderate-intensity physical activity 5 days/wk or 20 min of vigorous activity 3 days/wk, if not every day
  - c. 8-10 muscular strengthening exercises (8-12 reps, 2-3 sets) at least 2 days per week
15. a measure of relative body weight correlate highly with more direct measures of body fat, calculated by dividing total body weight (in kilograms) by the square of body height (in meters)?
  - a. **BMI**
  - b. Fat Free Mass
  - c. Waist to Hip Ratio
16. an eating disorder characterized by recurrent episodes of binge eating and then purging to prevent weight gain?
  - a. **Bulimia Nervosa**
  - b. Anorexia Nervosa
  - c. Restrictive Eating
17. The ability to have an open mind, and the desire to learn and improve?
  - a. **Intellectual Wellness**
  - b. Interpersonal Wellness
  - c. Cultural Wellness
  - d. Spiritual Wellness
18. What % of people have high BP?
  - a. 38%

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- b. 12%
  - c. 57%
  - d. **20%**
19. How many Canadians older than 20 have chronic disease?
- a. 1 in 8
  - b. 2 in 4
  - c. **3 in 5**
  - d. 16 in 20
20. How many years does smoking cut down your lifespan?
- a. 1-4
  - b. 12-16
  - c. **8-10**
  - d. 5-7
21. What are the enabling factors for physical activity (Select all that apply)?
- a. **goal setting**
  - b. **Self-assessment**
  - c. **Self-monitoring**
  - d. **Self-planning**
  - e. **coping skills**
  - f. **time management**
22. theory used to predict and understand behaviours; behaviours are immediately determined by behavioural intentions, which in turn are determined by a combination of three factors: attitude toward the behaviour, subjective norms, and perceived behavioural control?
- a. Health Action Process Approach
  - b. Trans-theoretical Theory
  - c. Cusp Catastrophe Theory
  - d. **Theory of Planned Behaviour**
23. What is stress determined by?
- a. stress is determined by the balance between perceived demands of the environment and the individual's resources to meet those demands
24. Training, caffeine, injuries, disease, nutritional status?
- a. **Physiological stressors**
  - b. Environmental stressors

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- c. Major stressors
  - d. Minor stressors
25. The SAM axis primary uses what?
- a. The sympathetic nervous system
  - b. The parasympathetic nervous system
  - c. **The central nervous system**
  - d. The peripheral nervous system
26. Please explain epigenetics
- a. "nature vs. nurture"; people looking at how you can overcome your genes
27. What are the risk factors of high blood pressure (select all that apply)?
- a. Age
  - b. gender
  - c. family history
  - d. overweight
  - e. inactivity
  - f. smoking
  - g. high sodium
  - h. low potassium
  - i. low vit D
  - j. Alcohol
  - k. Stress
  - l. Other chronic conditions
28. Please go over the steps of diabetes prevention?
- a. regular physical activity and weight training
  - b. moderate diet rich in whole grains, fruits, vegetables, legumes. fish and poultry
  - c. modest weight loss: A 5% decrease in body weight = 25-50% decrease in risk of T2D
  - d. Quit smoking
  - e. For people with pre-diabetes, lifestyle changes are more effective than medication in preventing diabetes
29. Please go over the steps of diabetes treatment?
- a. monitor blood sugar levels and if needed use medication
  - b. lose weight if overweight
  - c. surgery that removes some of the small intestine and diabetes symptoms decrease within days

**KIN 131**

1. slow oxidative fibres contain?
  - a. (type 1) combine low myosin-ATPase activity with high oxidative capacity
2. Fast-oxidative-glycolytic fibers
  - a. (type 2A) combine high myosin-ATPase activity with high oxidative capacity and intermediate glycolytic capacity.
3. Fast-glycolytic fibers
  - a. (type 2X) combine high myosin-ATPase activity with high glycolytic capacity.
4. What is epimysium?
  - a. outermost layer surrounding entire muscle
5. 4 types of cells
  - a. epithelial, connective-tissue, muscle, nervous
6. True or false, muscle cells can be attached to your face
  - a. True
7. What are neurons specialized for?
  - a. Specialized to initiate, integrate and conduct electrical signals to other cells, sometimes over long distances
8. What is epithelial tissue specialized for?
  - a. Selective absorption and secretion of ions and organic molecules, and for protection.
9. Troponin interacts with (select all that apply)
  - a. Actin
  - b. Tropomyosin
  - c. Calcium
  - d. Sodium
10. troponin interacts with
  - a. one troponin molecule
  - b. Actin
  - c. Tropomyosin
11. each tropomyosin is bound by
  - a. sarcoplasmic reticulum (SR)
12. source of Ca in skeletal muscle (select all that apply)
  - a. motor neuron axon terminal
  - b. T-tubule,
  - c. dihydropyridine receptor (DHP),
  - d. ryanodine receptor,

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- e. sarcoplasmic reticulum
  - f. terminal cisternae,
  - g. Cytosol,
  - h. troponin
13. List the places when muscle contraction occurs (select all that apply)
- a. terminal cisternae
  - b. enlarged areas of the sarcoplasmic reticulum surrounding the transverse tubules.
  - c. sliding filament mechanism
  - d. the process in which myosin cross-bridges pull/"row" attached actin molecules closer to the midpoint of the sarcomere; therefore shortening sarcomere
  - e. actin binding sites remain exposed
  - f. cross-bridge cycling will repeat as long as
  - g. attachment, movement, detachment, reenergize (with ATP)
14. Step \_\_\_ of the cross bridge cycle changes during isometric and concentric contraction
- a. 2
15. Reminder: isometric: the cross-bridges do not move, and repeatedly rebind to the same actin molecule (muscle is in same position, holding a calf raise)
16. eccentric: the excess load pulls the cross-bridges backwards (b/c load > tension) (Muscle is stretched/extended, lowering phase of bicep curl)
17. What is latent period
- a. directly after the action potential, when the processes of excitation-contraction coupling occur
18. heavier loads cause isotonic contractions to have:
- a. 1. longer latent period
  - b. 2. slower velocity of shortening
  - c. 3. smaller shortening distance
19. smooth muscle does not have
- a. Troponin**
  - b. Actin
  - c. Myosin
  - d. Calcium
20. Why is skin used as the pain and temp receptors (use relevant vocabulary)
- a. Skin contains free nerve endings that are bare dendrites (conveys pain and temperature sensations)
  - b. Vocab: Merkel discs, meissner corpuscles, ruffini corpuscle, pacinian corpuscl.

21. In humans, the nervous system is initially divided into the \_\_\_\_\_ and \_\_\_\_\_ nervous systems.
- afferent;
  - sympathetic;
  - somatic;
  - central; peripheral**
22. Efferent nerves are associated with \_\_\_\_\_ functions, whereas afferent nerves are associated with \_\_\_\_\_ functions.
- sensory; motor
  - external; internal;
  - motor; sensory**
  - internal; external
23. The somatic and autonomic nervous systems control \_\_\_\_\_ and \_\_\_\_\_ movements, respectively.
- involuntary; voluntary
  - automatic; reflexive
  - volitional; willful
  - voluntary; involuntary**
24. Which system is responsible for preparing a hiker to act quickly when she sees a bear run onto the path in front of her?
- sympathetic nervous system**
  - central nervous system
  - parasympathetic nervous system
  - efferent neurons
25. Which system is engaged while relaxing after a large meal?
- sympathetic nervous system
  - central nervous system
  - efferent neurons
  - parasympathetic nervous system**
26. A person with damage to the occipital lobe will likely have trouble with which sense?
- Hearing
  - Taste
  - Touch
  - Vision**
27. What is the name of the specialized receptors that are sensitive to stretch and that are located among your skeletal muscles?

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- a. Meissner's corpuscles.
  - b. Acetylcholine receptors.
  - c. free nerve endings.
  - d. joint receptors.
  - e. **muscle spindles.**
28. At the junction of muscle and tendon, in series with extrafusal fibres, lie small 'organs' which monitor changes in muscle tension. These small 'organs' are called **Golgi Organs**
29. What is the function of the GTO
- a. To assist and amplify the myotatic reflex
  - b. **To bring about muscle relaxation in response to extreme muscle tension**
  - c. To send 'help' signals to synergistic muscles in times of extreme muscle tension
30. How are endothelial cells in the brain different from endothelial cells in the rest of the body?
- a. **Endothelial cells in the brain are tightly linked together to prevent toxins in the blood from entering the brain**
  - b. Endothelial cells in the brain are loosely linked together to let red blood cells enter brain tissue
  - c. Smooth muscle cells outside the endothelial cells are tightly linked, preventing things in the blood from entering the brain
  - d. Astrocytes help endothelial cells transport red blood cells from the blood into the brain to deliver oxygen
31. What type of brain cell helps the endothelial cells form the blood-brain barrier?
- a. **Astrocytes**
  - b. Neurons
  - c. Smooth Muscle
  - d. Schwann Cells
32. All are components of the blood brain barrier except?
- a. Astrocytes
  - b. Ependymal cells
  - c. Endothelial cells
  - d. **Pericytes**
33. Ependymal cells:
- a. are associated with the blood-brain barrier.
  - b. **are associated with the production of cerebral spinal fluid.**
  - c. are associated with the production of myelin.
  - d. are associated with the healing of damaged tissue.

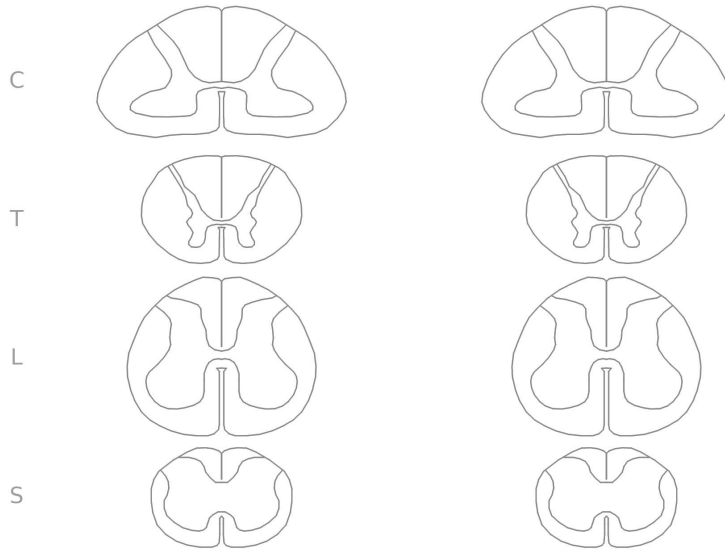
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34. Walk me through the formation and flow for CSF.
- a. Central nervous system consists of brain and spinal cord
  - b. CNS= Brain + spinal cord
  - c. Lined by meningeal membranes (MENINGES)
  - d. Dura mater
  - e. Arachnoid mater
  - f. Pia mater (inside mater)
  - g. subarachnoid space containing cerebral spinal fluid (CSF)
  - h. CSF flows between the ARACHNOID mater and PIA mater
  - i. Produced by CHOROID PLEXUS CELLS and EPENDYMAL LINING CELLS (blood-brain barrier)
  - j. Cerebrospinal fluid flows from the lateral ventricles, to the third ventricle, and then to the fourth ventricle before leaving the brain and entering the central canal of the spinal cord or into the subarachnoid space.
  - k. CSF covers: Cerebrum, cerebellum, brain stem, completely covers surface of brain and spinal cord
  - l. CSF IS MADE FROM THE CHOROID PLEXUS AND LINED WITH THE EPENDYMAL CELLS.

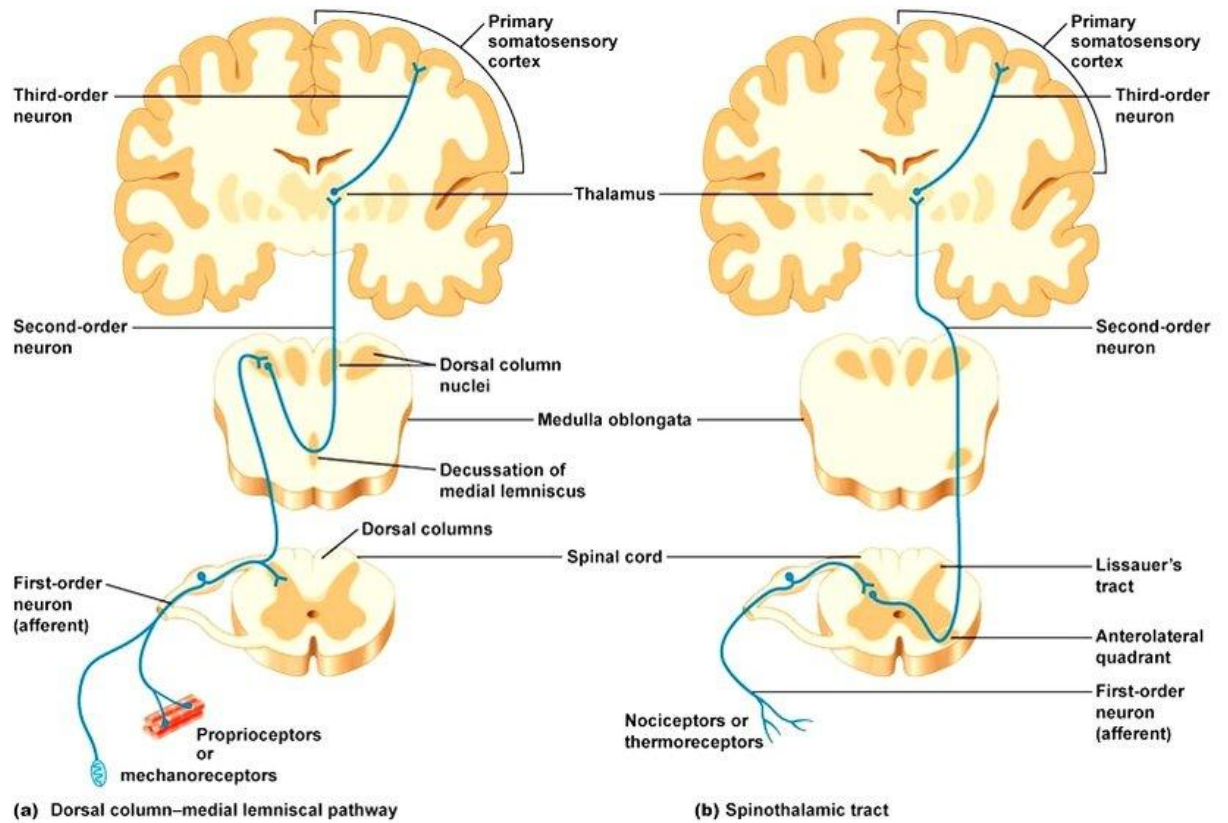


35. Draw the somatosensory pathway:



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**KIN 132**

1. The right side of the heart is the driving force for \_\_\_\_ circulation, while the left side is the driving force for \_\_\_\_ circulation.
  - a. Systemic; Pulmonary
  - b. Pulmonary; systemic**
2. What are the types of cellular components/elements found in blood?
  - a. Red Blood Cells (Erythrocytes), White Blood Cells (Leukocytes), Platelets (Thrombocytes), Plasma
3. Where do red blood cells come from?
  - a. **Myeloid stem cell**
  - b. Lymphoid
4. The major function of erythrocytes is:
  - a. Distributing blood across the body
  - b. Delivering nutrients to working muscles
  - c. Gas transport of oxygen and carbon dioxide**
5. What are the precursor steps to becoming an erythrocyte?
  - a. A proerythroblast must become a reticulocyte
6. True or false: red blood cells have nuclei and vesicles
  - a. False
7. What can be found inside erythrocytes?
  - a. Large amounts of hemoglobin (an oxygen binding protein)
8. Does carbon dioxide (CO<sub>2</sub>) bind to the globin portion or the heme disc?
  - a. Globin portion
9. What is systole (contraction)?
  - a. Ventricular contraction and blood is ejected out into the circulation
10. What is diastole?
  - a. Ventricular relaxation and blood is filling up and coming back into the heart
11. Isovolumetric ventricular contraction belongs to the \_\_\_\_ phase
  - a. Systolic
12. Isovolumetric ventricular relaxation belongs to the \_\_\_\_ phase
  - a. Diastolic
13. Describe what happens when the kidneys receive a decreased amount of oxygen.
  - a. Refer to figure 12.4
  - b. Decreased O<sub>2</sub> delivery to kidneys → kidneys increase erythropoietin secretion → increased plasma erythropoietin → bone marrow has increased production of

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erythrocytes → increased blood Hb concentration → increased blood O<sub>2</sub>-carrying capacity → restored O<sub>2</sub> delivery

14. What are the 3 requirements for normal erythrocyte production?
  - a. Iron, folic acid, vitamin B12
15. Anemia is a decrease in the O<sub>2</sub>-carrying capacity of blood due to what reasons?
  - a. A decrease in the total number of erythrocytes (each having a normal quantity of Hb), a diminished concentration of Hb per erythrocyte, or a combination of both.
16. Define sickle-cell disease.
  - a. A disease in which a genetic mutation alters one amino acid in the hemoglobin chain.
17. How does vessel damage trigger the formation of a platelet plug and vasoconstriction?
  - a. Refer to figure 12.70
  - b. Vessel damage causes an altered endothelial surface where collagen is exposed. Platelets are activated and aggregate to form a platelet plug, discharging mediators that trigger chemical mediators, as well as causing synthesis of thromboxane A<sub>2</sub>. Chemical mediators and thromboxane A<sub>2</sub> create positive feedback on the platelets (to increase amount of activation and aggregation). Then, blood vessels will contract to cause vasoconstriction.
18. Distinguishing characteristics of veins include which of the following?
  - a. All veins carry deoxygenated blood
  - b. All veins carry blood toward the heart**
  - c. All veins have thick, elastic walls
  - d. Veins have walls consisting only of endothelial cells
19. The plateau of the action potential in cardiac ventricular cells results from the opening of voltage-gated long-lasting \_\_\_\_ channels in the plasma membrane of the cell.
  - a. Sodium
  - b. Potassium
  - c. Calcium**
  - d. Chloride
20. What is the term that describes the production of red blood cells?
  - a. Erythropoietin
  - b. Anemia
  - c. Erythropoiesis**
  - d. Hemostasis
21. Which of the following statements about the cardiac cycle is TRUE?
  - a. The duration of systole is greater than that of diastole in a subject at rest

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- b. During isovolumetric ventricular relaxation, blood flows from the atria into the ventricles
  - c. Closure of the atrioventricular valves occurs at the beginning of ventricular systole**
  - d. The QRS complex occurs at approximately the same time as the closure of the semilunar valves
22. Sally has had too many alcoholic drinks. Alcohol is a systemic vasodilator and it increases urine volume, thereby decreasing blood volume. In order to maintain cardiac output, what can her body do?
- a. Decrease heart rate
  - b. Increase heart rate**
  - c. Increase stroke volume
  - d. Decrease stroke volume
23. During exercise, there is a decreased flow of blood to the:
- a. Brain
  - b. Skin
  - c. Abdominal organs**
  - d. Skeletal muscles
24. At rest a blood flow rate was measured at 20 mL/min between an area starting at 180 mmHg pressure and finishing at 90 mmHg. If the only change were to increase the starting pressure to 240 mmHg and resistance remained unchanged what would the blood flow rate be? (short answer).
- a. Step 1: determine the pressure gradient:  $180 \text{ mmHg} - 90 \text{ mmHg} = 90 \text{ mmHg}$
  - b. Step 2: determine resistance at the start:  $R = 90 \text{ mmHg} / 20 \text{ mL/min} = 4.5 \text{ mmHg min/mL}$
  - c. Step 3: substitute in new starting pressure:  $F = 240 \text{ mmHg} - 90 \text{ mmHg} / 4.5 \text{ mmHg min/mL}$
  - d. ANS: 33.3 mL/min**
25. List the events from the start of isovolumetric contraction till the end. In your explanation define what this isovolumetric phase represents (short answer).
- a.** (1) Starts with the left ventricular pressure exceeding the left atrial pressure and the bicuspid valve closes
  - b.** (2) Pressure is rising in the left ventricle but the aortic valve is still closed (aortic pressure still greater than left ventricle pressure)

- c. (3) This is now the isovolumetric contraction as both the bicuspid and aortic valves are closed and even though pressure is rising the volume in the ventricle is not changing.
  - d. (4) When left ventricular pressure exceeds aortic pressure the aortic valve opens and ventricular ejection begins ending the isovolumetric contraction phase
26. Which is TRUE regarding the regulation of heart rate?
- a. Stimulation of parasympathetic nerves to the heart causes a slowing of heart rate
  - b. Stimulation of sympathetic nerves to the heart causes an increase in heart rate
  - c. A person whose heart lacks autonomic innervation likely has a faster heart rate at rest than a person with a normally innervated heart
  - d. **All of the choices are true**
27. Which of the following occurs first in hemostasis?
- a. Activation of the fibrinolytic system
  - b. **Platelet aggregation**
  - c. A clotting cascade that leads to the conversion of fibrinogen to stable fibrin
  - d. Conversion of prothrombin to thrombin
28. Which of the following occurs first in hemostasis?
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  - d. Conversion of prothrombin to thrombin
29. When the arterioles vasodilate the blood pressure as you enter the capillaries will be:
- a. **Higher**
  - b. Lower
  - c. Unchanged
30. Elizabeth had heart surgery to repair the pacemaker of her heart, into which structure did the surgeon need access?
- a. **Sinoatrial node**
  - b. Atrioventricular node
  - c. Bicuspid valve
  - d. Bundle of HIs
31. What would be the effect of an increase in transpulmonary pressure? Outline the steps involved. (Short answer)
- a. Increased transpulmonary pressure causes the lungs to expand (increase in volume)
  - b. This results in the alveolar pressure becoming less than atmospheric pressure

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- c. A gradient exists with atmospheric pressure being higher than alveolar so air flows into the alveoli (inspiration).
32. During a yoga class you take a deep breath, then relax and let the breath out slowly. During that exhalation, which would **not** be true?
- a. **Intrapleural pressure is greater than alveolar pressure**
  - b. Lung volume decreases
  - c. The diaphragm relaxes
  - d. Alveolar pressure is greater than atmospheric pressure
33. In which form is most of the oxygen carried in arterial blood?
- a. Converted to HCO<sub>3</sub><sup>-</sup>
  - b. **Bound to hemoglobin**
  - c. Dissolved in the plasma
  - d. Dissolved in the cytosol of erythrocytes
34. Define the 3 volumes that make up vital capacity. How do they change with increases from rest to submaximal exercise? (short answer)
- a. Inspiratory reserve volume = amount of air in excess of tidal inspiration that can be inhaled with maximum effort
  - b. Expiratory reserve volume = amount of air in excess of tidal expiration that can be exhaled with maximum effort
  - c. Tidal volume = amount of air inhaled or exhaled in one breath
  - d. Tidal volume increases / both reserve volumes decrease
35. Which of the following would cause a decrease in the binding affinity of Hb to O<sub>2</sub>?
- a. Increased pH of blood
  - b. **Increased temperature of blood**
  - c. Decreased DPG levels in erythrocytes
  - d. Decreased concentration of H<sup>+</sup> in blood
36. How does the Hering-Breuer reflex work? (short answer).
- a. Large lung inflation triggers pulmonary stretch receptors
  - b. Sends an inhibitory signal to medullary respiratory center
  - c. Stops inspiration and prevent too big an increase in tidal volume
37. A decrease in metabolism without a similar, compensatory decrease in alveolar ventilation will have what effect on the systemic pH?
- a. No change to pH is expected in this circumstance
  - b. It is impossible to predict the effect on pH without first understanding why metabolism decreased
  - c. pH will decrease

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- d. pH will increase**
38. What brain center has neurons that fire mainly during inspiration and have input to the spinal motor neurons that activate the diaphragm and inspiratory intercostal muscles?
- The pre-Botzinger complex
  - The pneumotaxic center of the pons
  - The ventral respiratory group of the medulla oblongata
  - The dorsal respiratory group of the medulla oblongata**
39. Using only constriction or dilation involving the arterioles how can you get decreased glomerular filtration rate? (Short answer)
- Must decrease the glomerular capillary blood pressure
  - Constrict the afferent arteriole with no change in efferent arteriole
  - Dilate the efferent arteriole with no change in the afferent arteriole
40. Which of the following statements about renal control of blood acid-base balance is TRUE?
- H<sup>+</sup> that binds to filtered bicarbonate in the tubular fluid is excreted in the urine
  - Excretion in the urine of hydrogen bound to phosphate buffers decreases plasma bicarbonate concentration
  - Increased metabolism of glutamine by renal tubular cells increases the plasma bicarbonate concentration**
  - The kidneys compensate for a metabolic alkalosis by increasing CO<sub>2</sub> production
  - When hypoventilation occurs at the lungs, the kidneys compensate by reducing glutamine metabolism
41. Yolanda was born with a rare genetic disease in which the proximal tubules of her nephrons express half the number of aquaporins as is typical. What will be the result?
- Reduced reabsorption of all materials in the proximal tubules
  - Reduced reabsorption of water, although as much reabsorption of Na<sup>+</sup> as is typical**
  - Reduced reabsorption of water, Na<sup>+</sup>, and glucose in the proximal tubules
  - No change to reabsorption at this site
  - Reduced reabsorption of both water and Na<sup>+</sup> in equal proportions
42. Explain the steps by which glutamine contributes to new bicarbonate (short answer).
- Tubular epithelial cells take up glutamine from filtered and interstitial fluid
  - Glutamine is metabolized into ammonium and bicarbonate
  - Ammonium is secreted into tubule lumen and excreted in urine
  - Bicarbonate will move into interstitial fluid and ultimately into plasma
43. What are the steps of the enterohepatic circulation? (short answer)

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- a. Bile salts are secreted into bile and enter the duodenum via the common bile duct
  - b. Bile salts are reabsorbed from the lumen of the ileum into the portal vein
  - c. Liver cells (hepatocytes) reclaim the bile salts from the portal vein blood
44. Which of the following molecules crosses the luminal membrane of intestinal cells by facilitated diffusion?
- a. Maltose
  - b. Glucose
  - c. Galactose**
  - d. Fructose
  - e. Lactose
45. During the postabsorptive phase of metabolism
- a. Triacylglycerols (or triglycerides) in adipose tissue are broken down to glucose by lipolysis
  - b. The liver exports lactate to the muscles, which use it for fuel
  - c. Glycogen in muscle cells is broken down to glucose, which is released into the blood
  - d. Glycerol and fatty acids are rapidly assembled into triglycerides in adipose tissue
  - e. Liver glycogen is broken down to glucose, which is released into the blood**
46. A protein molecule will be digested by enzymes made by:
- a. The mouth, stomach, and large intestine
  - b. The stomach, liver, and small intestine
  - c. The pancreas, stomach, and small intestine**
  - d. The small intestine, mouth, and liver
47. Which occurs mainly in the small intestine?
- a. Acidic chyme is neutralized**
  - b. Pepsinogen is activated
  - c. Gastrin is secreted
  - d. H<sup>+</sup> is secreted from epithelial cells into the lumen
  - e. Bile salts are manufactured
48. Which of the following statements about the transport of the absorbed products of fat digestion is true?
- a. Free fatty acids and monoglycerides are transported to the liver via the hepatic portal vein
  - b. Products of fat digestion are absorbed in the distal portion of the ileum, bound to intrinsic factor

- c. Triglycerides are transported to the liver via the hepatic portal vein to be processed
  - d. Products of fat digestion first go to the lymph system, and then to the veins leading to the heart**
49. Which is true regarding meiosis in a single germ cell?
- a. It results in 4 cells with 46 chromosomes each
  - b. It results in 2 cells with 46 chromosomes each
  - c. It results in 4 cells with 46 pairs of chromosomes each
  - d. It results in 4 cells with 23 chromosomes each**
50. Which is true regarding the immune system cells?
- a. Plasma cells are derived from T cells
  - b. Neutrophils are classified as lymphoid cells
  - c. Macrophages are derived from monocytes**
  - d. Macrophages are derived from basophils
51. If the granulosa cells are deficient in enzymes needed for estrogen production how are they helped during the early and middle follicular phases? (short answer)
- a. Under the influence of luteinizing hormone the theca cells secrete androgens
  - b. These androgens diffuse to the granulosa cells
  - c. Under the influence of follicle stimulating hormone these granulosa cells can convert the androgens into estrogens
52. What is a true statement about events occurring in the menstrual cycle?
- a. Progesterone is low during the first half of the cycle, and rises to a peak during the second half**
  - b. Each peak in estrogen concentration is accompanied by an even greater peak in progesterone concentration
  - c. The corpus luteum normally degenerates on day 14 of the cycle
  - d. FSH reaches its highest concentration 3 days before menstruation begins
53. What are the 4 functions of activated complement proteins? (short answer)
- a. Direct destruction of invading microbes by membrane attack complex
  - b. Vasodilation and increased permeability of capillaries and venules to proteins
  - c. Chemotaxis
  - d. Enhancement of phagocytosis (opsonization)
54. Which of these correctly describes a systemic response to infection?
- a. Appetite generally increases compared to normal
  - b. The liver retains iron and zinc so plasma levels are decreased from normal**
  - c. Secretion of cortisol by the adrenal cortex is decreased

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- d. The body's set point temperature is reset so that body temperature is maintained lower than normal
55. Cytotoxic T cells
- a. Secrete perforin, which kills bacteria and viruses by perforating the membrane or coat that surrounds them
  - b. Are activated by interleukin 1
  - c. Are converted to plasma cells when activated by MHC proteins
  - d. **Require Class I MHC proteins to recognize foreign antigens**

### KIN 140

1. If a person has a 3-year old and a 10-month old, you can say the person has
  - a. A pre-schooler and a toddler
  - b. A kindergartener and an infant
  - c. **A pre-schooler and an infant**
2. When people develop motor skills, they are also developing intellectually, emotionally, and physically. This is called:
  - a. Multidirectional development
  - b. **Multidimensional development**
  - c. Multifactorial development
3. A girl on the merry-go-around is learning about rotational forces. This type of development is a change in the \_\_\_\_\_ domain.
  - a. **Cognitive**
  - b. Affective
  - c. Physical
  - d. Motor
4. Series of abrupt changes, which elevate person to new, more advanced level of functioning is referred to as:
  - a. Cumulative growth
  - b. **Discontinuous growth**
  - c. Continuous growth
5. Example of a history-graded influence on human development includes:
  - a. Obtaining a driver's license at 16-years old
  - b. Starting school at 6-years old
  - c. **Use of apps for tracking diet and physical activity levels**
6. (FILL IN THE BLANK) Typical age periods of development represent \_\_\_\_\_ during which certain behaviours may be observed

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- a. Approximate time ranges
7. Acquiring independent walking later than one's peers because the child falls in the 98th percentile for weight can be explained according to Newell's Model of Constraints, whereby weight is a(n) \_\_\_\_\_ constraint.
  - a. Structural (individual)
8. Wearing equipment while playing ice hockey is shown to increase aggression and confidence in young 5 and 6 year old boys in comparison to playing with no equipment during floor hockey. Increased perception of confidence in one's ability is what type of constraint?
  - a. functional (confidence is a psychological construct of the individual)
9. Identify the functional constraint in the following sentence: "The children became very frustrated because they were unable to hit the tennis ball. Their racquets were too heavy for them."
  - a. Frustration
10. Identify the structural constraint in the following sentence: "The children became very frustrated because they were unable to hit the tennis ball. Their racquets were too heavy for them."
  - a. Muscular strength
11. Identify the task constraint in the following sentence: "The children became very frustrated because they were unable to hit the tennis ball. Their racquets were too heavy for them."
  - a. Type of racquets
12. Anomalies present at birth are called:
  - a. Chromosomal defects
  - b. Genetic defects
  - c. Teratogenic defects
  - d. **Congenital defects**
13. The most common neural tube defect is:
  - a. Congenital rubella syndrome
  - b. **Spina bifida**
  - c. Arthrogyriposis
  - d. Cerebral palsy
14. Medical gestation for a full term human infant is considered to be:
  - a. 20 weeks
  - b. 35 weeks
  - c. **40 weeks**

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- d. 42 weeks
- 15. Fetal movements are needed for (check all that apply):
  - a. developing communication
  - b. developing tendons**
  - c. developing body's joints**
  - d. developing neural pathways**
- 16. Use figure 4.2 in textbook. If a significant teratogen was introduced at 13 weeks conceptional age, major anomalies may occur in the:
  - a. Upper limb
  - b. Eyes
  - c. Heart
  - d. Central nervous system**
- 17. What does interdisciplinary refer to?
  - a. an integrative mixture of scientific disciplines, wherein the work analyzes, synthesizes, and harmonizes links between disciplines into a coordinated and coherent whole when working in a relationship.**
  - b. a non-integrative mixture of scientific disciplines, wherein each discipline retains its methodologies and assumptions (stays within their respective boundaries) when working in a relationship; knowledge generated is additive.
  - c. an integrative mixture of scientific disciplines, practitioners, and non-scientific sources to go beyond traditional boundaries by developing a new kind of knowledge involving the cooperation amongst different parts of society.
- 18. What is the difference between motor development and motor learning?
  - a. Motor development is the study of the underlying process involved in movement, whereas motor learning is the science that examines how we learn, control, and develop a motor skill.
  - b. Motor development is the study of the changes in human motor behavior as we proceed through the life span, the processes that underlie these changes, and the factors that affect them. Motor learning is the study of the processes involved in acquiring the capability to execute a motor skill whereby there is a relatively permanent change in behavior resulting from practice or experience.**
- 19. What does developmental perspective refer to?
  - a. the collective description of distinct behaviours as they occur across time; a series of transformations.

- b. a view that refers to development as an additive process that occurs gradually and continuously, without sudden changes; often discussed from the perspective of quantitative change.
  - c. **a research focus, which serves to understand changes in movement across the lifespan in an attempt to explain how and why a particular movement emerges from a previous behaviour, as well as predict and explain the emergence of a future movement behaviour; the focus of study goes beyond just examining motor behaviour in the present.**
20. What does neonate refer to?
- a. **A newborn child within the first 28 days of life.**
  - b. A stage in the early childhood period of the lifespan.
  - c. A child within the age of 0 to 6 years.
21. Define affordance
- a. the global constraints (physical or sociocultural) related to the world outside our body, around us
  - b. **the function, opportunity, or action possibilities an environmental object, surface, place, or event provides to an individual in relation to the individual's own capabilities**
  - c. constraints that are external to the body and consist of goals of the movement, as well as the rules and equipment use
22. Define phocomelia. What is it a side effect of?
- a. a major birth defect caused by the atypical development of the neural tube (gives rise to the central nervous system) during the embryonic period; Thalidomide
  - b. **a congenital malformation in which the hands or feet are attached close to a major joint and the limb is underdeveloped or absent; Thalidomide**
  - c. a condition where there are congenital joint contractures in two or more areas of the body, which causes reduced mobility of multiple joints, wherein the joints are fixated in extension or flexion; Folic acid
  - d. a major birth defect caused by the atypical development of the neural tube (gives rise to the central nervous system) during the embryonic period; Folic acid
23. Define Parkinson's Disease
- a. a progressive, autoimmune disease of the central nervous system, where the immune system attacks myelin causing inflammation and often damage to the myelin, which results in an interrupted or distorted flow of nerve impulses
  - b. a disease which will continue to worsen, grow, or spread over time

- c. a progressive, degenerative disorder of the central nervous system that primarily impairs motor function due to a loss of dopamine-producing brain cells**
24. Which of the following refer to synaptogenesis?
- the process of eliminating synapses that largely occurs between early childhood and puberty, the purpose of which is to increase networking capacity within the brain by removing neurons that have been damaged, degraded, or not needed to maintain efficiency of brain function
  - the formation of synapses between neurons in the central nervous system; is highly active in early life, but continues to occur throughout the lifespan**
  - a change in function or structure of the brain from the use of cognitive functions and via experience
25. What is the form of rudimentary locomotion called when the body is moved on hands and knees in prone position with the abdomen well off the ground?
- Cruising
  - Creeping**
  - Crawling
  - Cycling
26. What term refers to a terrestrial animal that stands or walks with the toes, sole, and heel flat on the ground (heel to toe pattern)?
- Digitigrade
  - Plantigrade**
  - Bipedalism
  - Quadrupedalism
27. What term refers to the phase in walking in which both feet are in contact with the supporting surface?
- Double support phase**
  - Quiet stance
  - Support phase
  - Swing phase
28. What term refers to the fundamental locomotor pattern consisting of a forward step followed by a leap onto the trailing foot?
- Gallop**
  - Hopping
  - Jumping
  - Skipping

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29. What term refers to the fundamental locomotor skill characterized by a forward step followed by a hop on the same foot with an alternating leading leg?
- a. Sliding
  - b. Jumping
  - c. Skipping**
  - d. Hopping
30. What term refers to a horizontal movement of the body around the centre of gravity?
- a. Location
  - b. Quadrupedalism
  - c. Postural sway**
  - d. Postural control



### KIN 150

1. What is the difference between the terms stress and stressors?
  - a. Stress refers to biological markers of damage in the body; stressors refer to the training that causes damage to the body.
  - b. Stressors refer to an experience; stress refers to situations that are potentially stressful.
  - c. Stress refers to the objective stimulus demands placed on the body; stressors refer to the perception of such objective demands.
  - d. **Stress refers to an experience; stressors refer to situations that are potentially stressful.**
  
2. Which of the following is not one of the best ways to determine the best evidence-based practice?
  - a. conduct peer-reviewed research studies
  - b. consider practitioner level of competence
  - c. **test out the practice**
  - d. consider ethical guidelines
  
3. Research hypotheses are defined as
  - a. directional educated guesses about the nature of the relationship
  - b. among scientific constructs given specific conditions.
  - c. **educated guesses about the nature of the relationship among scientific constructs given specific conditions.**
  - d. the results of a study.
  - e. non-directional educated guesses about the nature of the relationship among scientific constructs given specific conditions.
  
4. What was a key event for sport and exercise psychology that happened in 1986?
  - a. the formation of the Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS)
  - b. the formation of the Canadian Code of Ethics for Psychologists (CPA)
  - c. the formation of the Canadian Sport Psychology Association (CSPA)
  - d. **the formation of the Association for Applied Sport Psychology (AASP)**
  
5. Differences between an independent variable (IV) and a dependent variable (DV) are mostly used to examine

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- a. **causal relationships.**
  - b. negative relationships.
  - c. positive relationships.
6. What is a common assumption in many trait models of personality?
- a. **Traits have a normal distribution throughout the population.**
  - b. Traits have an atypical distribution throughout the population.
  - c. Traits are skewed throughout the population.
  - d. There is no trend in the distribution throughout the population.
7. Individuals higher in \_\_\_\_\_ and \_\_\_\_\_ are more likely to meet their intentions to exercise.
- a. agreeableness; extraversion
  - b. openness to experience; extraversion
  - c. **extraversion; conscientiousness**
  - d. conscientiousness; openness to experience
8. The social learning theory posits that people are active agents in shaping their \_\_\_\_\_, influenced by their inner drives and environments.
- a. thoughts
  - b. behaviours, emotions, and thoughts
  - c. emotions
  - d. **behaviours**
9. Which of the following is consistent with the cognitive-behavioural approach to understanding motivated behaviour?
- a. **Thoughts and emotions influence our behaviour, and our behaviour influences our thoughts and emotions.**
  - b. Thoughts and emotions influence our behaviour.
  - c. Learning from others is key to understanding motivated behaviour.
  - d. Our behaviour influences our thoughts and emotions.
10. Jessica is considering the implications of an inactive lifestyle on her health. Her thoughts centre on her lack of energy and that she can't participate in certain activities with her family. According to the transtheoretical model, what process of change dimension is she in?
- a. contemplation

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- b. decisional balance
- c. behavioural
- d. experimental/cognitive process of change**

11. The intention-behaviour gap is a term that has been developed to describe the observation that people don't always do what they say they are going to do. Which variable was not identified as influencing the intention-behaviour gap in exercise?

- a. habit or past exercise behaviour
- b. identity linked to being an exerciser
- c. gender**
- d. affective response to exercise

12. A personal trainer who provides clients with a variety of exercise options for engaging in moderate- or vigorous-intensity physical activity during each workout session is displaying

- a. autonomy support.**
- b. competence.
- c. structure.
- d. controlled motivation.

13. Meghan is a marathon runner and exercises every day. According to dual-process models, Meghan is likely to respond to environmental cues supporting physical activity through

- a. non-conscious processes.**
- b. both conscious and non-conscious processes.
- c. conscious processes.
- d. deliberate processes.

14. Which of the following approaches to understanding motivated behaviour has been used most frequently by sport psychologists?

- a. psychodynamic approach
- b. cognitive-behavioural approach**
- c. cognitive approach
- d. behavioural approach

15. What is a key distinction between coping and emotion regulation?

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- a. Emotion regulation includes voluntary, conscious efforts to deal with stressors or the emotions resulting from stressors; coping includes voluntary and automatic, unconscious responses to an emotion or situation.
  - b. Coping refers to behaviours to manage stressors; emotion regulation refers to thoughts to manage stressors.
  - c. Coping refers only to strategies to deal directly with problems; emotion regulation refers only to strategies to deal directly with emotions.
  - d. **Coping includes conscious efforts to deal with stressors or the emotions resulting from stressors; emotion regulation includes voluntary and automatic, unconscious responses to an emotion or situation.**
16. Lashing out spontaneously at a referee after receiving a penalty would be considered a form of
- a. **emotion regulation.**
  - b. internal affect-worsening.
  - c. external affect-worsening.
  - d. emotion-focused coping.
17. Which of the following is true about the temporal patterning of the intensity of anxiety prior to sport competition?
- a. Somatic anxiety increases and cognitive anxiety decreases in the time leading up to competition.
  - b. **Somatic anxiety increases significantly starting several hours before competition, while cognitive anxiety is relatively constant prior to competition.**
  - c. Both cognitive and somatic anxiety remain low until just after competition begins, then they increase rapidly before they gradually decline.
  - d. Both cognitive and somatic anxiety peak just after competition begins and then drop off rapidly.
18. Some studies have shown that social physique anxiety leads to lower levels of physical activity only in those who are low in self-presentational efficacy. This finding has been demonstrated in all but which of the following groups?
- a) This is true in all groups.
  - b) **college students**
  - c) adolescent girls
  - d) older women

19. The attentional focus and selectivity hypothesis states that
- a) **when athletes experience competitive state anxiety, they are less able to pay attention to and process large amounts of information.**
  - b) athletes high in trait anxiety are unable to pay attention to relevant cues in the environment.
  - c) anxiety is unrelated to performance.
  - d) somatic anxiety interferes with the type of information processed.
20. According to the cusp catastrophe theory, when does a catastrophe occur?
- a) **when physiological arousal is moderately high and cognitive state anxiety is high**
  - b) when physiological arousal and cognitive state anxiety are both high
  - c) when physiological arousal and cognitive state anxiety are both low
  - d) when physiological arousal is moderately high and cognitive state anxiety is low
21. Which of the following statements best describes our understanding of the concept of stress?
- a) Stress is universally experienced by athletes involved in competitive sports.
  - b) Stress is detrimental for sport performance.
  - c) The term stress refers to an external event or situation that has the potential to be interpreted as taxing or exceeding the person's resources.
  - d) **The term stress refers to a process that involves cognitive appraisals of a person-situation relationship and the physiological, cognitive, emotional, and behavioural reactions that people have to heavy demands.**
22. Which of the following is not a guiding principle for implementing coping interventions in sport and exercise?
- a) Athletes should be able to have meaningful choices about the strategies they are offered to cope with stress.
  - b) **Athletes learn best to cope with stress when exposed to frequent, high-stress situations.**
  - c) Coping interventions should be backed by empirical evidence.
  - d) The effectiveness of coping interventions can be evaluated based on a variety of outcomes, not just performance.
23. An athlete who compares her current situation and stressors in sport to other athletes and their experiences to try and see similarities in their experiences is adopting what aspect of self-compassion?

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- a) desire to alleviate suffering
- b) mindfulness
- c) self-kindness
- d) common humanity**

24. The relationships among emotions, physiological processes, and performance are complex.

In research examining the relationship between anger and performance, most athletes report

- a) they could not control anger and perceived that it undermined performance.
- b) they could control their angry feelings and consequently perceived anger to be advantageous for performance.**
- c) there was no relationship between anger and performance.
- d) anger produced changes in dopamine levels in the brain, so it interfered with muscle coordination.

25. An intercollegiate figure skater is getting ready to compete. She has five minutes until she has to be on the ice, and right now she is extremely nervous. She is especially nervous about how the judges will score her performance and if they will like her routine. Which type of anxiety is she experiencing?

- a) state anxiety
- b) state anxiety and competitive anxiety**
- c) competitive anxiety
- d) trait anxiety

26. An exerciser is getting ready to do a high-intensity interval training class. She has never done the class before, but she's heard it's a killer and most people don't make it through the first time they try it. She's a little worried, because everyone else waiting looks extremely fit, and it's been

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a while since she worked out—she knows she's not in the best shape right now. In this case, the difficulty of the class represents the \_\_\_\_\_ and her low fitness level is an example of \_\_\_\_\_.

**a) task demands; resources**

b) task demands; poor priorities

c) group needs; individual needs

d) resources; individual needs

27. Which of the following statements would you expect from an exerciser who has high self-presentational efficacy?

a) I know others must think that I don't belong in a gym.

**b) I know others will see me as someone who is fit.**

c) I am not sure if others will see me as strong or not.

d) I'm worried about embarrassing myself at the gym because I look so unskilled.

28. Which of the following is an example of self-handicapping?

a) An athlete says to his tennis coach, "I really think I will lose my match today because I've been sick all last week and haven't been able to practice."

b) A baseball player says to his teammates, "There's no way our team can win today—everyone knows that umpire is the worst in the league."

c) A golfer tells her parents, "Don't expect much today. I'm teeing off last, and the weather is supposed to be terrible as the day goes on—it's going to get very windy and might even rain. The people teeing off this morning got a real lucky break."

**d) All of the above**

29. Two friends on a soccer team are chatting before the game, and one says, "I am way more anxious than you." His friend asks him how he knows that, and he replies, "Because you are always excited about competing, and say those butterflies in your stomach just mean you are ready to get out on the field. I experience those same butterflies, but for me they just make me feel sick and all I can think about is how I'm not prepared to play." Which dimension of anxiety are they talking about?

a) timing of symptoms

b) frequency of cognitive intrusions

**c) directional interpretation of symptoms**

d) intensity of symptoms

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30. According to the individual zones of optimal functioning hypothesis, which of the following is true?

- a) When anxiety is higher than the optimal bandwidth, performance is poorer, but when anxiety is lower than the optimal bandwidth, performance is improved.
- b) All athletes playing the same position on the same team will have the same optimal bandwidth since the performance requirements are the same.
- c) Each individual has an optimal bandwidth of anxiety—any athlete in that bandwidth should have an optimal performance.**
- d) For high-level athletes, moderate levels of facilitative anxiety are best.

31. According to the cusp catastrophe theory, when does enhanced performance occur?

- a) when physiological arousal is high and cognitive state anxiety is low
- b) when physiological arousal and cognitive state anxiety are both high
- c) when physiological arousal and cognitive state anxiety are both low
- d) when physiological arousal is low and cognitive state anxiety is high**

32. When anxiety is high, switching to conscious control of movements during competitive sport situations

- a) enhances performance because mistakes are minimized, and athletes pay attention to all the details needed to perform movements.
- b) enhances performance, since athletes pay attention to all the details needed to perform movements.
- c) enhances performance because mistakes are minimized.
- d) leads to decrements in performance because the coordination that normally occurs automatically in well-learned skills becomes disrupted.**

33. A golfer is about to hit a drive off the tee. Which of the following needs to occur for her to have a good shot?

- a) She must consider information about the course, such as where to place the drive, how wide the fairway is, the direction and speed of the wind, and how much roll she will get.
- b) She must not pay attention to irrelevant information like what her group members are doing.
- c) She must make a smooth swing in which all the muscles of the body are coordinated properly and are activated appropriately.
- d) All of the above**

34. Which of the following would be considered examples of choking?

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- a) A swimmer in the finals of the U Sports Championships places second, finishing behind only the number 1 seeded swimmer.
- b) The world number 1 ranked snowboard cross racer fails to even reach the finals at the Winter Olympics after having medalled at every other event that season.**
- c) A marathon runner who has been having the best season of her career is not able to finish the Boston Marathon because she has been sick in the week leading up to the event.
- d) All of the above are examples of choking.

35. What kind of intervention approach(es) does positive psychology in sport and exercise psychology utilize?

- a)emotional
- b)behavioural
- c)cognitive
- d)all of the above**

36. Ethics is concerned with

- a) moral responsibility as it relates to human behaviour.
- b) right and wrong actions.
- c) matters of right and wrong as they relate to human behaviour.**
- d) moral decisions.

37. Which of the following is not one of the codes of ethics particularly relevant to sport and exercise psychologists?

- a) AASP Ethical Principles and Standards
- b) APA Code of Ethics**
- c) CPA Canadian Code of Ethics for Psychologists
- d) CSPA Code of Ethics

38. In the late 1970s and the 1980s, which discipline did sport psychology separate from?

- a) sociology
- b) motor learning**
- c) counselling
- d) physiology

39. Which of the following is not one of the three factors required to determine causation?

- a) the relationship must be replicated in another study**

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- b) other plausible and reasonable explanations must be ruled out
- c) a clear temporal order between the IV and DV
- d) a systematic statistical relationship between the IV and DV

40. What are the main tenets of humanistic psychology?

- a) personal striving, individual dignity, thriving, and resilience
- b) human growth, personal striving, and individual dignity
- c) personal responsibility, human growth, and resilience
- d) personal responsibility, human growth, personal striving, and individual dignity**

41. According to the cognitive-behavioural approach, what does learning involve?

- a) beliefs, expectancies, and goals**
- b) beliefs, experiences, and capabilities
- c) goals, optimism, capabilities
- d) expectancies, modelling, and success

42. According to Gill and Deeter (1988), what three dimensions make up a multidimensional achievement orientation?

- a) competitiveness, win orientation, and goal orientation**
- b) win orientation, motivation, goal orientation
- c) motivation, competitiveness, resilience
- d) competitiveness, motivation, goal orientation

43. What are the two dimensions of perfectionism?

- a) harmonious perfectionism and obsessive perfectionism
- b) perfectionistic control and perfectionistic criticism
- c) commitment perfectionism and confidence perfectionism
- d) perfectionistic strivings and perfectionistic concerns**

44. Reinforcement is linked to which approach to understanding motivated behaviour?

- a) cognitive approach
- b) behavioural approach**
- c) cognitive-behavioural approach
- d) all approaches

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45. Over the last month, Mary has started exercising five days a week for 30 minutes each day. According to the transtheoretical model, what stage of change is Mary in?

- a) temptation
- b) action**
- c) contemplation
- d) maintenance

46. Martin finds that his childcare responsibilities often act as a barrier to his exercise program. In order to succeed in reaching his exercise goals for the week, Martin arranges for childcare so that he can make sure he has an opportunity to exercise. This is an example of

- a) self-efficacy.
- b) action planning.
- c) behavioural intention.
- d) coping planning.**

47. The most prominent approaches to understanding motivation are grounded in

- a) conscious processes.**
- b) intention.
- c) self-efficacy.
- d) non-conscious processes.

48. Physiological reactions occur in which stage of the stress process?

- a) Stage 1 (environmental demand)
- b) stage 2 (perception of environmental demand)
- c) stage 3 (stress response)**
- d) stage 4 (behavioral consequence)

49. Hanin's Individual Zones of Optimal Functioning (IZOF) model suggests which of the following?

- a) The zone of optimal functioning is the same for all individuals
- b) Each individual has a specific optimal level of efficiency**
- c) Performance is best when arousal is high
- d) Performance is best when arousal is moderate

50. Cognitive restructuring attempts to

- a) Improve attentional focus

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- b) Identify different strategies for mental preparation
- c) Improve problem-solving ability
- d) Identify and modify stress-inducing self-statements**

51. Which of the following best describes how relaxation (anxiety reduction) techniques are usually classified?

- a) state and trait
- b) cognitive and somatic**
- c) sport specific and general
- d) cognitive and appraisal

52. Which of the following terms best describes an electronic monitoring device that can detect and amplify internal responses not ordinarily available to us?

- a) biofeedback**
- b) biological mapping
- c) classical conditioning
- d) systematic desensitization

53. Imagery involves which of the following senses?

- a) kinesthetic
- b) visual
- c) all of these**
- d) auditory

54. In terms of the timing of imagery, it is best to imagine the scene in which of the following?

- a) fast motion
- b) slow motion
- c) real time**
- d) a combination of slow motion and fast motion

55. "Vividly imagined events produce an innervation in muscles that is similar to the innervation produced by physically practicing the movement." This is an illustration of which of the following theories?

- a) Psychoneuromuscular theory**
- b) innervation theory
- c) muscular contraction theory

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d) symbolic learning theory

56. Which of the following is NOT a way in which imagery should be used?

- a) building confidence
- b) improving concentration
- c) controlling emotional responses
- d) reducing the amount of physical practice time**

57. Imagery involves which of the following senses?

- a) visual
- b) kinesthetic
- c) auditory
- d) all of these**

58. The concept of attentional alertness operates under the assumption that increases in arousal will cause which of the following to occur?

- a) disrupted attention
- b) attention to broaden
- c) attention to narrow**
- d) enhanced attention

59. If just before a tee shot, a golfer shifts her attention from the length of the fairway and the direction of the wind to focusing only on the ball, her attention has shifted from \_\_\_\_\_ to \_\_\_\_\_.

- a) broad-external; narrow-external**
- b) broad-internal; narrow-external
- c) broad-internal; narrow-internal
- d) broad-external; narrow-internal

60. Using a trigger word to stop negative self-statements can be best described by which of the following options?

- a) peripheral narrowing
- b) attentional narrowing
- c) external attentional focus
- d) thought stopping**

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61. Which of the following would NOT be an example of an internal distractor?

- a) Attending to past or future events
- b) choking under pressure
- c) people or objects in your visual field**
- d) inadequate motivation

62. "Ironic processes in sport" refers to which of the following?

- a) Doing something an athlete is not trained to do
- b) The idea that trying not to perform an action can trigger its occurrence accidentally**
- c) Performing well even with little experience
- d) ironically performing movement

63. One's confidence can change as the situation changes. This is known as which of the following?

- a) trait self-confidence
- b) situational self-confidence
- c) naturally occurring self-confidence
- d) state self-confidence**

64. Sport self-confidence is currently viewed as which of the following?

- a) an affective variable
- b) a state variable
- c) a trait variable
- d) state-like or trait-like depending on the situation**

65. Confidence is seen as multidimensional, consisting of confidence in which of the following areas?

- a) one's level of fitness

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**b) all of these**

- c) one's ability to execute physical skills
- d) one's psychological skills

66. Coaches often form expectations of athletes based on which of the following items?

- a) person cues and media reports
- b) performance information and person cues**
- c) scouting and media reports
- d) performance information and media reports

67. Self-efficacy has been used interchangeably with which of the following?

- a) self-confidence**
- b) self-esteem
- c) self-concept
- d) self-fulfilling prophecy

68. Female volleyball players who must wear tight uniforms may experience stressors related to self-presentation and body-related concerns. These concerns may lead them to use coping strategies that male athletes do not have to develop. This is an example of

- a) cultural norms in sport.
- b) role constraint theory.**
- c) sex-role stereotyping.
- d) the dispositional hypothesis.

## 200-Level Courses

### KIN 205

1. What is research
  - a. A method of obtaining observations, and producing results and analysis in helping the greater good
  - b. A prescribed sequence of activities : purpose, methods, data collection, results

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- c. A method of gather novel data
  - d. **A process of gathering information, analyzing information, and that contributes to new knowledge**
2. What are the dimensions of research (Select all that apply)
- a. **Topic**
  - b. **Novelty**
  - c. **Technology**
  - d. **Scope**
  - e. **Mode**
  - f. **Methodology**
  - g. **Ideology**
  - h. **Politics**
  - i. **Utility**
3. What type of research is quantitative
- a. Synthesis research
  - b. **Meta-analysis**
  - c. Case studies
  - d. Systematic review
4. What is scope
- a. Nature of the researcher's belief about how we acquire knowledge about truth and reality
  - b. basic vs applied research continuum
  - c. Understand and change/impact health behaviour, typically field-based
  - d. **Focus on a single case or large sample**
5. How is quantitative data generated?
- a. **surveys/questionnaires**
  - b. Case Studies



- c. Observational Research
  - d. Interviews
6. How is qualitative data generated?
- a. Performance measures
  - b. Motion analysis
  - c. Questionaired
  - d. Open ended responses on surveys**
7. What are examples of performance measures
- a. Reaction time**
  - b. BMI
  - c. FFM
  - d. Body Composition
8. Which of the following is a type of interview
- a. Semi-structured**
  - b. Random assignment
  - c. Equitable selection
  - d. One on one
9. Which of the following is the best definition of epistemology?
- a. Nature of the researcher's belief about how we acquire knowledge about truth and reality**
  - b. basic vs applied research continuum
  - c. Understand and change/impact health behaviour, typically field-based
  - d. Focus on a single case or large sample
10. What is pragmatism?
- a. Researchers are concerned with solutions to problems, incorporate all research approaches that are required to best address their research question

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11. What is the transformative worldview?
  - a. Research needs to have an agenda to advocate for marginalized peoples, focus on reform and change through research, researchers and participants work together to create meaningful change for participants, work with individuals who have a disability and stakeholders to improve inclusivity in sport contexts
  
12. What is an inductive approach
  - a. Observe phenomenon to data collection to developing a theory
  
13. What is experimental research?
  - a. Gathering data via observation
  - b. Observing research trends via correlation
  - c. studies that aim to evaluate interventions but that do not use randomization
  - d. **A study which seeks to isolate cause and effect by manipulating proposed casual variables**
  
14. Study design: Hanna and Janice are the principal investigators, and have stated the purpose statement as, “In line with the Restorative Model of Sleep, the purpose of this exercise intervention is to test the type of running and its influence on sleep quality, which is mediated by muscle fatigue. Age, sex, time of exercise, time of sleep, duration of exercise, duration of sleep, and external stressors are controlled among novice kayakers, 21 years old.” “The hypothesis for this study is, if an individual partakes in a higher intensity running, then, their sleep quality will be greater as their muscles will be more fatigued.”
  - a. Identify the Dependent variable, predictor variable, two extraneous variables, 1 mediator
    - i. **Sleep patterns, amount of fatigue the participant has from the given exercise, athleticism, anxiety, muscle fatigue**
  
15. How can you control for threats to internal validity
  - a. **Randomization, placebos and blinding, standardizing experieemnst and instruments**

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16. How can you control for external validity
  - a. Selecting participants, treatments, experimental situation, and tests to represent a broader population and researcher might restrict claims about groups to which the results cannot be generalized
17. Random assignment controls for (Select all that apply)
  - a. **Past history**
  - b. **Testing**
  - c. **Maturation**
  - d. Extraneous variables
18. Which of the following designs should the researcher use if he is interested in studying causal relationships that exist between events that have already occurred?
  - a. **Ex post facto**
  - b. Analytical
  - c. Quasi-experimental
  - d. Correlational
19. What is a grounded theory
  - a. **A systematic, yet flexible methodology for collecting and analyzing qualitative data to construct theories that are grounded in the data themselves, to develop a theory about a process, Ultimate goal is to explain how something occurs with a theoretical model a Commonly used to gain an in-depth understanding of a particular case, different methods of data collection to study the case, identify a bounded case to define sample/parameters**
20. A Commonly used to gain an in-depth understanding of a particular case, different methods of data collection to study the case, identify a bounded case to define sample/parameters
  - a. **Case Study**
21. What are the three characteristics of community based research
  - a. **Commitment to liberationist movements**
  - b. **Commitment to honouring the lived experience and knowledge of the people involved (usually from oppressed groups)**
  - c. **Commitment to genuine collaboration**
22. The characteristics of mixed methods are (select all that apply)

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- a. **Qualitative and quantitative data are collected and analyzed rigorously (based on research questions)**
  - b. **The two forms of data are mixed/integrated/linked**
  - c. **Priority is given to one or both forms of data**
  - d. **Procedures are used in a single study or in a multiple phases of a program of study**
  - e. **Procedures are framed within philosophical worldviews**
  - f. **Procedures are combined into specific research designs that direct the plan for conducting the study**
23. Why should you use the mixed methods research type (select all that apply)
- a. **One data source may be insufficient**
  - b. **To explain initial results**
  - c. **Generalize exploratory findings**
  - d. **Enhance a study with a second method**
  - e. **Understand a research objective through multiple phases**
24. Why should you use the mixed methods research type (select all that apply)
- a. **One data source may be insufficient**
  - b. **To explain initial results**
  - c. **Generalize exploratory findings**
  - d. **Enhance a study with a second method**
  - e. **Understand a research objective through multiple phases**
25. What are the challenges with mixed methods (select all that apply)
- a. **Need to be skilled in both quantitative and qualitative approaches**
  - b. **Time and resources**
  - c. Externally validity insights of only quantitative data
  - d. High reliability
26. What are the key decisions to guide mixed methods
- a. **Level of interaction between quantitative and qualitative strands**
  - b. **Priority of quantitative and qualitative strands**
  - c. **Timing of the quantitative and qualitative strands**
  - d. **Where and how to mix the quantitative and qualitative strands**
27. What is the exploratory sequential design
- a. **Qualitative -> Quantitative -> Interpretation**
  - b. Qualitative -> Quantitative -> Observation -> Interpretation -> Conclusion
  - c. Qualitative -> Quantitative -> Conclusion
  - d. Quantitative -> Qualitative -> Interpretation

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28. What is the specific criteria for mixed methods
- The mixed methods design must be relevant for the research question**
  - A clearly stated rationale for using mixed methods**
  - Strands are mixed to understand more about the research problem**
  - Uses a mixed methods research design and includes features of that design**
  - Study is framed within philosophical assumptions**
29. Please define the post-positivist worldview and give an example. What type of approach is it? What are two assumptions?

*assumptions of post positivism:*

- Ontology - critical realist: there is a single reality or objective truth to be discovered through research. Try to come as close as possible to this objective truth through research but recognize researchers may never discover it**
    - This recognition makes them a critical realist rather than just a realist**
  - Epistemology - Modified objectivist: researchers try to be as objective as possible but acknowledge that researchers still may have some influence over the research process**
    - **Come with luggage/baggage and bring that to the table but try to be objective - more about the approach to research**
    - **Distances the researcher**
- related to a quantitative approach - cause + effort, using measurement tools, stats, etc
- Determinism: causes determine effect**
  - Reflected by stats, defining variables, having a control, causal direction within quantitative approach**
  - Reductionism: ideas can be reduced to small testable research questions**
- **Reduce context to see relationship between x and y - only able to look at a portion of what we're doing**

30. If I believe that friends are always nice and meet a new person who is always nice to me, I may refer to them as a friend, assimilating them into my schema. Maybe I'll meet a different person who sometimes pushes me to try harder and isn't always nice. I might change my schema to accommodate this person by deciding that a friend doesn't always have to be nice if they have my best interests at heart. This may also cause me to reconsider whether the first person still fits into my friend schema. What worldview would be best suited for this, and why? Have one guiding research question and

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hypothesis based on this world view. Be sure to label relevant variables (DV,IV, etc.).  
What source of data will you be using?

## **KIN 211**

### Midterm 1 Questions:

1. Define the following:
  - a. Motor Behaviour
  - b. Motor Control
  - c. Motor Learning
  - d. Reaction Time
  - e. Movement Time
  - f. Total Response Time
  - g. Simple RT
  - h. Choice RT
  - i. Discrimination or Go/No-Go RT
  - j. Absolute Error
  - k. Constant Error
  - l. Variable Error
  - m. Mental Chronometry
  - n. Chunking
  - o. Declarative Memory
  - p. Procedural Memory
  - q. Stroop Effect
  - r. Cocktail Party Effect
  - s. Dichotic Listening Paradigm
  - t. Psychological Refractory Period
  - u. M1
  - v. M2
  - w. M3
2. Identify three sub-disciplines of motor behavior
  - a. (1) Motor Control, (2) Motor Learning / Skill Acquisition, (3) Motor Development.
3. List 4 reasons why we study motor behavior and where it can be applied
  - a. (1) “Organize practice for efficient learning of skills to promote high-level performance.
  - b. (2) Enhance instruction & coaching (sport, military clinical).
  - c. (3) Aid in (re)learning human movements (physio, occupational therapy, rehabilitation).

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- d. (4) Understand why people act, predict how they will act and prevent errors (human factors).”
4. Contrast measures of brain and behaviour and determine when one measure would be better than another
  - a. (1) Movement and Eye Tracking
  - b. (2) Electromyography (EMG)
  - c. (3) Electroencephalography (EEG)
  - d. (4) Functional Magnetic Resonance Imaging (fMRI)
  - e. (5) Transcranial Magnetic Stimulation (TMS)
5. What are the 4 criterias of a motor skill?
  - a. (1) “Goal-oriented (different to movements, a goal is not necessary);
  - b. (2) Movement must be voluntary (not reflexive);
  - c. (3) Body and/or limb movements are required to accomplish the goal (different to cognitive skills);
  - d. (4) Result of practice. Needs to be learned/relearned.”
6. Describe three motor skill classification systems and be able to place skills along a continuum.
  - a. (1) Gross (use of large musculature) vs. Fine (greater control of small muscles)
  - b. (2) Discrete (brief, well-defined start and end) vs. Serial (discrete skills strung together) vs. Continuous (repetitive skill, arbitrary start and end).
  - c. (3) Open (unpredictable, object in motion, externally paced) vs. Closed (predictable, the object does not change, self-paced)
7. Describe differences between performance outcome measures & performance production/process measures.
  - a. From a performance perspective, we look at the spectrum of low skill (or novice) to highly skilled (expert). Performance outcome = Were they fast? Accurate? Consistent? Performance production = How did they achieve the outcome?
8. Be familiar with the terminology and equipment needed to separate and measure RT and MT.
  - a. Electromyography (EMG): Records electrical activity in the muscle(s), this allows us to discriminate “Pre-motor RT” from “Motor RT” (when muscle activity begins). When the movement begins it is MT.
9. AE refers to which of the following?
  - a. **Represents the mean error score for a person across a series of trials.**
  - b. Represents average magnitude and deviation.
  - c. Measures how consistent (or, conversely, variable) you were.

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10. Describe 3 kinematic measures of movement process (i.e., measure of movement form).
  - a. (1) Displacement (distance/time) = “change in spatial position in one or more dimensions.”
  - b. (2) Velocity (speed/time), Note: at peak velocity, acceleration is “0” because it is changing from acceleration to deceleration.
  - c. (3) Acceleration (velocity/time)
11. Describe the computer analogy (“humans as information processors”).
  - a. We process information much like a computer would (Input/Stimulus → Storage → Output/Response). Humans that performed calculations or computations used to be called “computers”.
12. Describe the IP (information processing) approach to thinking about motor control.
  - a. “Internal and external input comes to the performer, it is processed, resulting in some kind of output.” Simple information processing model = Input (Stimulus) → Black Box → Output (Response).
13. Deciding on a plan of action falls under which stage of information processing?
  - a. Stimulus Identification
  - b. Response Selection**
  - c. Response Programming
14. Movement complexity influences which stage of information processing?
  - a. Stimulus Identification
  - b. Response Selection
  - c. Response Programming**
15. Which memory system is most resistant to decay and has an unlimited capacity?
  - a. Short-Term Sensory Store
  - b. Iconic Memory
  - c. Long-Term Memory**
  - d. Short-Term Memory
16. What are the 4 things that affect LTM/retention?
  - a. (1) “Degree/amount of original learning
  - b. (2) Motivation
  - c. (3) Type of task (continuous, serial, discrete)
  - d. (4) Retention Interval or recalling information (consolidation/interference)”
17. What are the 3 key characteristics of attention?
  - a. (1) Limited and Selective
  - b. (2) Intentional (“Top-Down Processing”) or Incidental (“Bottom-Up Processing”)

- c. (3) Directionally Focused: Internal (body-focused, associated with choking under pressure and the focus of novices) or External (environment/effects' focused, different from distraction, associated with the focus of experts)
18. Differentiate between structural and capacity interference (think about measures, probes/visual gaze).
  - a. Structural interference is related to competition for physical structures whereas capacity interference is limiting the central attentional capacity. Probe tasks could be either.
19. Know the 2 main types of directional focus of attention and how they might interact with skill (drawing on study evidence).
  - a. (1) Internal - attending to your own movements. Internal cues can be disruptive when you're skilled because you pay less attention to your own body. "Choking under pressure" is associated with an expert shifting their attention from external to internal, or questioning their "automatic" skills. A novice would not be disrupted by internal cues since they are already focused on their own body.
  - b. (2) External - attending to the effect of your movement on the environment. Both novices and experts show interference when given external cues, but the interference is much less for skilled individuals.
20. Identify and describe the components of the closed-loop control system.
  - a. "(1) Executive: determines the actions to be taken to achieve the desired goal state (decision making)
  - b. (2) Effector: carries out the decision/desired action
  - c. (3) Comparator: compares feedback of desired goal state to feedback of actual state (the error detection mechanism/reference of correctness)
  - d. (4) Error Signal: Information acted on by the executive; carry on doing what you're doing or change what you're doing."
21. Provide a mechanical and human example of a closed-loop control system.
  - a. Mechanical = Central Air Conditioning
  - b. Human = Walking on a Balance Beam
22. Know how to distinguish skills based on open-loop and closed-loop control.
  - a. Closed-Loop Control = "Online/moment-to-moment control of movement - involving constant processing of feedback."
    - i. Continuous
    - ii. Fine/Precise
    - iii. Open

- b. Open-Loop Control = “Movement is pre-programmed fully in advance and does not rely on feedback.” Just Input → Executive → Effector → Output
    - i. Discrete
    - ii. Gross
    - iii. Closed/Predictable
23. Identify benefits and limitations of a closed-loop model.
- a. Benefits: Consciously controlled.
  - b. Limitations: Slow! Error detection and correction takes a long time.

### Midterm 2 Questions:

1. Define the following:
  - a. Tau
  - b. The McGurk Effect
  - c. Motor Program
  - d. Generalized Motor Program
  - e. Speed-Accuracy Trade-Off
  - f. Motor Learning
  - g. Positive/Negative Transfer
  - h. Proactive/Retroactive Transfer
2. Describe the role of the ventral and dorsal streams for movement control and planning.
  - a. Ventral Stream:
    - i. Vision for Perception (what?)
    - ii. Conscious identification of objects, primarily in center of field-of-vision
    - iii. Object/stimulus identification & planning
  - b. Dorsal Stream:
    - i. Vision for Action (where/how?)
    - ii. Online movement control involving the entire visual field.
    - iii. Object interactions & guiding actions
    - iv. Ensures an action was completed in an accurate way
    - v. Almost reflexive, non-conscious, closed-loop control, and is used to make minor adjustments in our movements. Naturally creates these movements based on time to contact and gap analysis.
3. Be able to discern evidence supporting the separation of these two-streams.
  - a. We know that these two streams exist due to:
    - i. (1) “Dissociations” in patients with brain injuries
      - 1. Optic Ataxia

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2. Visual Form Agnosia
  - ii. (2) “Dissociations” in seeing and doing in visual illusion research
    1. Ebbinghaus Illusion
4. Understand and know the results showing empirical evidence for influence of vision (fast/non-conscious processing of vision) on postural control.
  - a. The Moving Room Experiment
    - i. Optic flow causes a person to think they are falling or swaying forward and despite the conflict with other senses, the person compensates
5. Identify, describe and differentiate between sensory receptors that provide proprioceptive information to the CNS.
  - a. Vestibular Apparatus
    - i. Otolith Organs
    - ii. Semicircular Canals
  - b. Muscle Spindles
  - c. Golgi Tendon Organs (GTOs)
  - d. Joint Receptors
  - e. Cutaneous Receptors
6. Know how the Dewhurst experiment illustrates M1 and M2.
  - a. The Dewhurst experiment shows M1, M2, and M3, by showing what happens when a conscious closed-loop response would take too long. This is the experiment where a participant is told to maintain a 90 degree angle arm, and something heavy is dropped onto the hand.
7. Contrast closed-loop and open-loop models.
  - a. Closed-loop - Requires feedback to guide and control the movement
  - b. Open-loop - Feedback is not needed to guide and control the movement, unaffected by external events, no mechanism for detection and correction of error.
8. Describe deafferentation (Ian Waterman) and how this provides support for the concept of motor programs.
  - a. Ian Waterman caught a virus that destroyed his proprioception. He is unable to mentally sense the relative positions of his limbs in space and whether or not they are in motion. He developed new neural pathways to allow himself to function relatively normally, although he must focus all his efforts on even simple tasks.
    - i. This provides evidence that we can move without feedback (open-loop control); no afferent sources of information.
    - ii. Motor programs are pre-structured and open-loop.

9. Describe studies and be able to interpret results from 4 streams of evidence in support of motor programs
  - a. RT and movement complexity;
    - i. RT increases with more components/increased duration/precision demands, even if it is a simple task.
  - b. Anticipation and stopping;
    - i. We have difficulty inhibiting anticipated reactions - stopping a pre planned response requires sufficient time before response initiation.
  - c. Deafferented movements
    - i. The blocking experiment would look exactly the same for someone like Ian Waterman who has no proprioception, because a motor program is open-loop and therefore requires no feedback.
  - d. Start-react effect
    - i. When a loud, startling tone results in a startle response and releases whatever movement is prepared (the motor program) with a much-reduced RT.
10. Identify benefits and limitations of the early notion of a motor program.
  - a. Benefits: tasks are less demanding because we don't have to control each muscle and joint individually.
  - b. Limitations: Not enough time to make corrections through closed-loop control, we would need a lot of individual motor programs if they don't generalize, which would lead to the storage problem and the novelty problem.
11. List & describe the invariant features and parameters thought to characterize a GMP.
  - a. Invariant Features are fixed features that define the Motor Program (this is the GMP). Includes relative timing, relative force, and the order of events.
  - b. Parameters are the flexible features that define how the Motor Program will be executed. Includes absolute duration, absolute force, and muscle selection.
12. Know how to calculate relative timing to determine whether an action is from the same class of actions.
  - a. The proportion of relative timing is an invariant feature, so it stays the same. If it takes you 1600ms to pitch in baseball, and the elbow flexion portion of that was 300ms, if you pitch in 800ms instead, the elbow flexion portion will be 150ms.
13. Know how schemas help solve the novelty and storage problem.
  - a. The more experiences we accumulate of different relations between outcomes and parameters the stronger our schemas are; rules/relations are stored rather than individual movements.

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14. Define Fitts' Law and the variables of the Fitts' Law equation.
  - a. Fitts' Law is the relationship between Movement Time (MT), Amplitude (A), and Target Width (W);  $MT = a + b [\text{Log}_2(2A/W)]$ .
    - i.  $a$  = the y-intercept (MT when ID is 0),  $b$  = slope (rise/run)
    - ii. Index of Difficulty (ID) =  $\text{Log}_2(2A/W)$ 
      1. As A increases, or W decreases, ID increases.
      2. An increase in ID, results in increased Movement Time.
      3. To solve for this, determine what you need to raise 2 to the power of to get A/W.
    - iii. Fitts' Law generalizes to discrete aiming movements. Slope and intercept changes.
      1. MT increases as accuracy constraints increase.
15. Know how to calculate index difficulty and MT based on the Fitts equation.
  - a.  $2^{\text{bits}} = N$ ,  $2^{\text{ID}} = 2A/W$ ,  $\text{Log}_2(N) = \text{bits}$ ,  $\text{Log}_2(2A/W) = \text{ID}$ .
16. Differentiate between the Logarithmic and Linear Speed-Accuracy Trade-Off relationships.
  - a. Logarithmic Speed-Accuracy Tradeoff (Fitts' Law)
  - b. Linear Speed-Accuracy Tradeoff (Schmidt's Law)
17. Explain how manual aiming movements are controlled depending on the movement speed.
  - a. In Logarithmic (Fitts' Law) speed-accuracy trade-offs, the slower the movement is done, the more the closed-loop control can assist in better accuracy, or meet higher precision demands.
  - b. In Linear (Schmidt's Law) speed-accuracy trade-offs, movements are done very quickly using open-loop, which leads to more variability, or less accuracy.
18. Know the relation between force and variability (& force & spatial accuracy) in the context of impulse timing models of motor control.
  - a. As force increases (or MT decreases), variability in forces also increases (up to a point, about 70%) with the exception of very fast movements,  $W_e$  increases linearly with force/MT.
19. Distinguish performance from learning.
  - a. Motor Learning is not directly observable, whereas performance is, so measures are taken based on performance, but this is not a direct measure of learning.
20. Describe performance curves.
  - a. Performance curves are created by measuring performance across practice. They are affected by temporary factors and aren't an indicator of retention.

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21. Identify factors that affect the shape of performance curves.
  - a. Between-Subject Variability
  - b. Within-Subject Variability
  - c. Scoring Sensitivity
  - d. Ceiling and Floor Effects
22. Describe methods to assess motor skill learning.
  - a. Taking measurements throughout the practicing of a skill, tracking tasks and tracking time-on-target.
23. Know why we implement a retention interval in motor learning experiments.
  - a. Because performance at any given moment throughout practice does not indicate relatively permanent retention - this can indicate temporary effects or short term retention.
24. Calculate absolute retention and relative retention (difference score, saving score).
  - a. Absolute Retention = What does performance look like in retention? This is the performance attained (measured on the y-axis) during the 1st or initial trials of retention.
  - b. Relative Retention = Difference score (what's been forgotten relative to attained?), and Savings score (how many trials/time saved when retested?).
    - i. Difference Score = End of practice - start of retention test
    - ii. Savings score = The amount of trials it took before leveling off in practice - the amount of trials it took to achieve the same measure of performance.
25. Differentiate between retention tests and transfer tests and transfer tasks and how we use them to assess learning.
  - a. Retention Tests are typically the same task as practiced in the acquisition phase (but in the absence of manipulation/intervention/training aid). Assesses how well information was retained.
  - b. Transfer Tests are typically a different task to the one practiced in the acquisition phase. If it is a similar task, that means it's a near transfer, and if it is a more different task, it is a far transfer. Transfer tests assess performance in different environments, skill variations or related skills; adaptability/generalizability of learning.
26. Calculate savings score related to transfer/previous practice.
  - a. The # of trials it takes the control group to achieve the level of proficiency achieved by the experimental group (the group that also practices another skill).
27. Describe the pattern of retention for discrete vs. continuous tasks.



- a. Continuous Tasks are often well retained, usually performance is not that different in the retention task compared to the end of acquisition.
  - b. Discrete Tasks are often not very well retained, unless rehearsed, it is usually forgotten.
28. Identify reasons for differences in retention between discrete and continuous tasks.
- a. Verbal-cognitive (declarative memory) & spatial aspects (aiming/accuracy) easily forgotten, often defines discrete tasks.
  - b. Amount of practice probably greater for continuous than discrete tasks (duration/no breaks). Continuous tasks involve a lot more repetition; practice.
  - c. Better retention of Invariant Features vs. Parameters (of GMPs), and the learning of invariant features is more central to continuous tasks, whereas parameter learning is more central to discrete tasks. Absolute features will decay more quickly than relative features.
29. 4 things that affect LTM and retention
- a. Degree/amount of original learning
  - b. Motivation
  - c. Type of Task (Continuous, serial, discrete)
  - d. Retention Interval (Consolidation vs Interference)

### Final Questions:

1. Define the following:
  - a. Deliberate Practice
  - b. Practice Variability
  - c. Recall Schema
  - d. Recognition Schema
  - e. Contextual Interference
  - f. Knowledge of Results
  - g. Knowledge of Performance
2. Distinguish between massed and distributed/spaced practice
  - a. Massed Practice:
    - i. Practice periods run close together, with little or no rest between periods
    - ii. Time spent practicing is typically higher than rest
  - b. Distributed (Spaced) Practice:
    - i. Practice periods run with longer intervals of rest between periods
    - ii. Time spent practicing is typically the same or less than rest
3. Describe practice-distribution effects on performance and learning and know evidence

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- a. As practice becomes more distributed (longer rests), performance improves; distributed practice is better than massed practice. Why? Because of fatigue, you need to separate/avoid temporary effects for better learning.
4. What are the 3 hypotheses as to why massed practice might impair learning compared to distributed practice?
  - a. Fatigue Hypothesis
  - b. Cognitive-Effort Hypothesis
  - c. Memory Consolidation Hypothesis
5. Distinguish between variable vs. constant practice
  - a. Constant Practice:
    - i. Only one variation of the criterion task is practiced
    - ii. Criterion task is practiced under identical environmental conditions
  - b. Variable Practice:
    - i. Multiple variations of the criterion task are practiced
    - ii. Variability achieved by practicing criterion tasks under different environmental conditions and at different speeds, distances, etc.
6. Know why schema theory explains variable practice effects and the especial skill exception
  - a. Practicing a variety of movements with the same GMP (different parameters, initial conditions) will form strong schemas. Production of new movement, requires application of schema(s). Extensive parameter exploration results in less uncertainty and error, due to more accurate estimations of outcomes and sensory consequences or parameters.
  - b. “Especial Skill” = Constant practice of one parameter variation resulting in better performance than the assumed performance based on other parameters; doesn’t generalize well.
    - i. Lots of practice on one parameter and outcome does not improve transfer
    - ii. It becomes its own action, separate from the other generalizations
7. Know 2 explanations for the CI effect
  - a. Elaboration Hypothesis
  - b. Forgetting and Reconstruction Hypothesis
8. Understand data showing benefits of “hybrid methods”
  - a. Hybrid schedules can be better than high CI schedules, although they may not be the best until you reach a certain skill level, best to start with a blocked schedule.
9. Distinguish part and whole practice methods
  - a. Whole Practice = A practice strategy that involves practicing a skill in its entirety.

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- b. Part Practice = A practice strategy that involves practicing a skill broken down into small units.
10. Identify task constraints on the effectiveness of part-whole practice (i.e., know the task conditions when part practice is thought to be effective)
- a. 2 reasons for breaking down a skill into smaller parts:
    - i. Efficiency in practice
    - ii. Ease of practice
11. Identify task constraints on the effectiveness of part-whole practice
- a. How complex is the task?
    - i. If it's simple (low complexity), use whole practice
    - ii. If it's difficult (high complexity), use part practice
  - b. What is the nature of the movement's organization?
    - i. Discrete (ballistic or short) or Continuous, use whole practice
    - ii. Longer Discrete or Serial, use part practice
  - c. Are there interactions/interrelatedness between the components (gaps and transitions or pauses?)
    - i. High interaction (more connected or faster), use whole practice
    - ii. Low interaction (there is a pause or slower), use part practice
12. The following pattern represents which practice method? A, A, AB, AB, ABC, ABC, ABC, ABCD, ABCD, ABCD, ABCD
- a. Fractionation
  - b. Segmentation**
  - c. Reverse-Chaining Method
  - d. Simplification
13. Relate the simplification idea to simulation training and detail important considerations for maximizing transfer and decide whether to have simulation training (pros and cons)
- a. The transferability of skills acquired in a simulation strongly depend on the “fidelity” of the simulator. The fidelity is the degree to which the simulator represents a real scenario.
    - i. Consider physical fidelity and psychological fidelity
  - b. Pros: Can be cost effective, Time effective, Safe and convenient
  - c. Cons: May not work (poor transfer), Difficulty in capturing true realism, Create over-reliance on “helps”
14. Explain how data from the physical guidance literature has provided evidence to support the Guidance Hypothesis and detail reasons why physical guidance fails to aid learning
- a. Physical Guidance fails to aid learning for 4 reasons:

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- i. No error in guided movement - hence no opportunities for error detection (part of learning is learning to detect errors)
  - ii. Passive learner is not generating their own motor commands to initiate and execute movement - hence no error-based corrections (no overall detect and correct)
  - iii. Lack of transfer across practice conditions because test and practice conditions are different (with and without guidance) - no practice without feedback
  - iv. \*Learner becomes over-dependent on guidance if it is always available - prevents you from engaging in active learning
- b. The guidance hypothesis (Schmidt, 1991) predicts that the guiding properties of augmented feedback are beneficial for motor learning when used to reduce error, but detrimental when relied upon. \*
15. Distinguish between 2 methods of physical guidance practice and be able to identify examples which fall at these extremes from complete passive guidance to a more active assist
- a. Passive Guidance (you aren't really doing anything, something is fully guiding you)
  - b. "Active-Assist" or Partial Guidance (you are doing the action, but supported)
16. Know how to interpret challenge-point performance/learning graphs (identify optimal challenge point, know how this may differ for beginners vs experts)
- a. Inverted-U Relationship - the peak of the U represents the optimal difficulty
17. Identify techniques that can help to encourage "learning" (at the expense of performance) as well as principles to encourage transfer to the game
- a. Those with easier practice conditions (blocked, guided, or constant) tend to suffer more in retention and transfer tests since tougher conditions encourage more learning.
  - b. Maximum practice fidelity will also encourage transfer to the actual game or real life scenario.
18. Distinguish intrinsic and extrinsic/augmented feedback
- a. Inherent Feedback (Intrinsic/Response-Produced Sensory):
    - i. Touch (cutaneous receptors)
    - ii. Proprioception (muscle spindles, GTOs, some cutaneous afferents, vestibular apparatus)
    - iii. Vision
    - iv. Audition

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- b. Augmented Feedback (Extrinsic/Not Naturally Occuring):
  - i. Knowledge of Results (KR)
  - ii. Knowledge of Performance (KP)
  - iii. Thought to add to the intrinsic feedback, and is typically under the control of the instructor/therapist/parent/self-control (fitbit)/etc
- 19. Know the 4 functions of augmented feedback
  - a. Informational Role
  - b. Motivational Role
  - c. Attention Directing Role
  - d. Dependency Role
- 20. Be able to calculate absolute and relative frequency of feedback
  - a. Absolute Frequency = the total number of feedback presentations
  - b. Relative Frequency = % of trials in which FB was given ( $[\text{total \# of feedback presentations} / \text{total \# of movement attempts}] \times 100$ )
- 21. List and describe methods which result in reduced feedback frequency, yet aid learning
  - a. Faded Schedule (more feedback earlier on, less later on)
  - b. Bandwidth Feedback (only given when errors outside criterion)
- 22. Be able to describe effects of reducing feedback in terms of the guidance hypothesis
  - a. Less feedback benefits learning because it allows the learner to engage in detect and correct motions / process intrinsic feedback. The Guidance Hypothesis relates to a failure to process intrinsic feedback, which will only happen if feedback is given too frequently.
- 23. Describe bandwidth KR and provide 3 reasons for its efficacy
  - a. Bandwidth KR refers to the bandwidth feedback method, in which the learner only receives feedback when the errors fall outside of a predetermined bandwidth.
  - b. 3 Reasons Why Bandwidth Feedback is More Effective than Feedback on Every Trial:
    - i. Results in reduced frequency of feedback, preventing dependency (guidance hypothesis)
    - ii. Frequency of being “correct” increases with practice, potentially increasing motivation.
    - iii. Increases consistency by limiting “maladaptive” or unnecessary corrections. Precise corrections may cause instability in performance, whereas bandwidth feedback will result in more consistent performance.
- 24. Be able to define and relate concurrent feedback to physical guidance and interpret data showing their similarities

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- a. Concurrent Feedback = Feedback given during performance
  - b. Concurrent feedback is quite similar to physical guidance, with performance being strong in acquisition, but much worse in retention or transfer tests.
25. Know whether short or long feedback delays are good for learning and why (relate to guidance)
- a. If this interval is long, learning is enhanced. If the interval is short, there is not enough time to evaluate the intrinsic feedback.

**KIN 232**

1. The 2 biochemical reactions that make up metabolism are
  - a. Catabolism and Aerobic Respiration
  - b. Anabolism and the Krebs cycle
  - c. Catabolism and Anabolism**
  - d. Catabolism and glycogenesis
2. Glycolysis is the breakdown of
  - a. Glucagon to pyruvate
  - b. Glycogen to glucose
  - c. Glycogen to glucagon
  - d. Glucose to pyruvate**
3. Beta oxidation is the breakdown of \_\_\_\_\_ into \_\_\_\_\_ to be used in the \_\_\_\_\_ cycle
  - a. Cholesterol, acetyl COA, krebs
  - b. Cholesterol, lactate, Nitrogen Fixation cycle
  - c. Fatty acids, acetyl COA, krebs**
  - d. Fatty acids, lactate, nitrogen fixation cycle
4. Triglycerides are stored in the
  - a. Adipocyte**
  - b. Neuronal tissue
  - c. Lipoprotein lipase
  - d. Skeletal muscle tissue
5. A male eats oats, berries, flax (11g fibre), 2 granola bars (3g fibre each), and pasta and broccoli (5g fibre). Does he have enough fiber to meet his RDA?
  - a. No, he eats 22g but needs 38g**
  - b. No, he eats 22g, but needs 25g
  - c. Yes.
6. Walk me through the steps of digestion and absorption of a carbohydrate
  - a. Mouth: mechanical and chemical digestion. Salivary amylase breaks down polysachardies.**
  - b. Stomach: Stomach and enzymes prepare sugar for delivery to SI**
  - c. SI: Chemical digestion and absorption. Breaks carbs into monosacharides and they move into bloodstream**
7. What is the treatment of celiac disease
  - a. Ingestion of excess hydrogen

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- b. Avoidance of gluten**
  - c. Avoidance of products like almond milk
  - d. Dietary changes, increases in exercise, surgery
- 8. Which compound is similar to cholesterol
  - a. Phospholipids
  - b. Plant sterol**
  - c. Lecithin
  - d. Triglyceride
- 9. Which of the following is not a function of polyunsaturated fats
  - a. Epithelial cell function
  - b. Regulation of gene expression
  - c. Synthesis of epinephrine**
- 10. The following occurs to your body at the start of ketosis
  - a. Decreases rate of protein breakdown
  - b. Thyroid hormone T3 falls, metabolic rate decreases
  - c. Gluconeogenesis increases
  - d. Decrease in circulating glucose**
- 11. What are the 3 BCAA's
  - a. Leucine, isoleucine and valine**
- 12. The RDA for protein in adults is..
  - a. 0.7 g/kg
  - b. 0.97 g/kg
  - c. 0.8 g/kg**
  - d. 1.29 g/kg
- 13. A protein can be denatured due to..
  - a. Due to very high heat in the environment**
  - b. Due to the R chain
  - c. Due to the Nitrogen in protein
- 14. Iron is needed in how much per day (add units)
  - a. <100mg/ day
- 15. Which of the following people are at risk for iron deficiency
  - a. Vegans**
  - b. A recreational hockey player
  - c. Sedentary individual
- 16. An athlete loses 3L of sweat during his track workout, how much Na<sup>+</sup> is lost?
  - a. 3000mg

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17. The RDA for women for MG is
  - a. 4700mg
  - b. 320mg**
  - c. 420mg
  - d. 1500mg
18. How much liquid does a female require
  - a. 2.7L/day
19. In soccer what should you eat or drink
  - a. Water
  - b. Water and a banana
  - c. Gatorade**
  - d. Gatorade and a granola bar
20. If a sports drink has 36g CHO, and is a volume of 591mL, what is the CHO%, and what type of drink is it
  - a. 6.1%, isotonic**
21. What are not one of the different tastes
  - a. Sweet
  - b. Umami
  - c. Bitter
  - d. Salty
  - e. Sour
  - f. Tangy**



## KIN 235

### Module 1 Questions:

1. Define Energy, Work, and Power
  - a. Energy is the “capacity to do work” or “stored work”. Energy can only really be measured when it is being used, or when energy transfer is taking place. As the work demands increase, so does the transfer of energy. Work is Force x Distance. Work is also a measure of energy transfer.
2. How do the Laws of Thermodynamics apply to human movement?
  - a. The first law of thermodynamics is the law against perpetual motion. This is an expression of the conservation of energy principle. This applies to human movement in that our energy is transformed into the energy we need for mechanical work for the most part, and the rest is transformed into energy for other types of work (chemical and transport), and some is expended as inefficiencies, shown through heat, for example.
  - b. The second law of thermodynamics is the law that every time we transfer energy, we are reducing our capacity to do work. With every reaction, entropy, or, randomness and disorder, will increase. The potential energy represents the inefficiencies as catabolic or anabolic reactions proceed. This potential energy is transformed into unusable forms of energy such as kinetic or heat energy. For example, sweating!
3. Describe the 4 types of Enzymatic Regulation:
  - a. Equilibrium - The ratio of substrates to products will affect the rate at which the enzyme works.
  - b. Competitive Binding - This is when an enzyme binds with substrates and doesn't allow anything else to bind.
  - c. Allosteric - Something binds to the enzyme to make it better or worse.
  - d. Covalent - When an enzyme has two forms - active and inactive.
4. Identify sources of Metabolic Inefficiency
  - a. Kinetic or heat energy
5. Describe the 4 types of basic reactions in human metabolism:
  - a. Hydrolysis - A type of catabolic reaction (complex to not complex) that splits chemical bonds by adding H<sup>+</sup> and OH<sup>-</sup> to the reaction byproducts.
  - b. Condensation - A type of anabolic reaction (not complex to complex) that binds nutrients together to form more complex molecules and compounds.

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- c. Oxidation - Always involves electron loss and always happens with a reduction reaction.
- d. Reduction - Always involves electron gain and always happens with an oxidation reaction.

Module 2 Questions:

1. Your TA is walking to the bus, he realizes he is late and runs as fast as possible for 2 min to make his bus. Does he generate more pyruvate running or walking?
  - a. More pyruvate is generated while running since the energy demands of running are greater than walking.
  - b. The rate of energy transfer is greater during running than walking.
  - c. More ATP will need to be synthesized when running and thus more pyruvate is generated
  - d. Walking: pyruvate  $\rightarrow$  acetyl CoA
  - e. Running: pyruvate  $\rightarrow$  lactate
2. Your TA is walking to the bus, he realizes he is late and runs as fast as possible for 2 min to make his bus. What determines if aerobic or anaerobic glycolysis will occur?
  - a. The presence of oxygen & the demands of the task.
  - b. - If oxygen is present within the muscle cells, aerobic glycolysis will occur.
  - c. - If oxygen is not present, NADH will accumulate. Not converting NADH back to NAD<sup>+</sup> quick enough (no glycolysis)
3. Your TA is walking to the bus, he realizes he is late and runs as fast as possible for 2 min to make his bus. What molecule is required for mechanical work to occur?
  - a. ATP!
4. Your TA is walking to the bus, he realizes he is late and runs as fast as possible for 2 min to make his bus. Which form of glycolysis can generate the most mechanical work per glucose molecule?
  - a. Aerobic glycolysis (95% of energy from glucose is released)
  - b. Anaerobic glycolysis (only 5% of energy is released)
5. A student rides an exercise bike where the workload increases 50W every 2 min until they are exhausted (progressive exercise test; VO<sub>2</sub> max test) How do ATP demands change over time?
  - a. Increased mechanical work  $\rightarrow$  increased ATP demands
  - b. A student rides an exercise bike where the workload increases 50W every 2 min until they are exhausted (progressive exercise test; VO<sub>2</sub> max test)
6. What is the primary signal to increase ATP production?

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- a. ADP/ATP concentrations
7. A student rides an exercise bike where the workload increases 50W every 2 min until they are exhausted (progressive exercise test; VO<sub>2</sub> max test). Where is energy to generate ATP coming from, how does this change?
  - a. ATP not generated as quickly in aerobic metabolism.
  - b. Increased workload → takes time for aerobic metabolism to match the demands of the task, so anaerobic metabolism is used during transitions (oxygen deficit)
8. A student rides an exercise bike where the workload increases 50W every 2 min until they are exhausted (progressive exercise test; VO<sub>2</sub> max test). What regulates the change in energy source?
  - a. Presence of oxygen and the workload
9. A student rides an exercise bike where the workload increases 50W every 2 min until they are exhausted (progressive exercise test; VO<sub>2</sub> max test) Why not use the same energy source at all times?
  - a. Carbohydrates are a limited resource and must be conserved for use by the brain; using fat as an energy source is much more efficient but takes more time
  - b. Short periods of time (when the workload is increased → ATP or PCr used as an energy source)
10. Without warming up a runner goes on a hilly 10 km run and maintains a constant velocity of 10 km/h. Sketch their oxygen consumption over the run. What physiological mechanism accounts for differences over time?
  - a. Hills → Work rate will change (go up and down)
  - b. Therefore, the demand for ATP is going to change & demand for O<sub>2</sub> is going to change
  - c. Work rate transition - O<sub>2</sub> deficit
  - d. Get to steady state
  - e. Reach a hill - O<sub>2</sub> deficit
  - f. Downhill - decrease work rate (O<sub>2</sub> deficit repaid - EPOC during exercise)

Module 3 Questions:

1. Myoglobin is affected by Bohr effect: T/F
  - a. False
2. \_\_\_ has highest O<sub>2</sub> PP, \_\_\_ has least O<sub>2</sub> PP
  - a. Air, myoglobin
3. % of CO<sub>2</sub> bound to Hb for buffering
  - a. 20%
4. What is the main cause for getting the urge to breathe?

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- a. buildup of CO<sub>2</sub> - need to expel (but if it is at onset, it is central command)
- 5. Where is the point of gas exchange?
  - a. Alveoli
- 6. inspiration/expiration are dependant on \_\_\_\_\_ to lead air in/out
  - a. pressure difference
- 7. Define minute ventilation
  - a. How much air one breathes in 1 minute
- 8. How can ventilation increase?
  - a. increasing frequency of breathe
  - b. increase volume of ventilation
  - c. Both
- 9. This lung volume( \_\_\_ ) tends to increase first with exercise, unless you are stressed, in which case \_\_\_\_\_ will also increase
  - a. Tidal volume. Breathing frequency
- 10. What is an increase in intrathoracic pressure above atmospheric pressure from full inspiration, no exhale
  - a. Valsalva Maneuver

Module 4 Questions:

- 1. Given an example of feed forward & feedback control of cardiovascular activity
  - a. Feed-forward:
  - b. HR & myocardial contractility increase from feed-forward input from CV center which depresses parasympathetic activation
  - c. Descending control from central command acts at the onset or prior to exercise to increase HR
  - d. Feed-back:
  - e. aortic & carotid baroreceptors detect the stretch/force exerted on arteries, & send negative feedback to the brain to either decrease HR or vasodilate in order to reduce BP
- 2. Give an example of tissue which receives more, less & the same amount of blood during exercise
  - a. More: muscle, heart, skin
  - b. Less: kidneys, liver, GI tract
  - c. Same: brain
- 3. How is blood flow directed away from inactive tissue?
  - a. Systemic vasoconstriction (norepinephrine from sympathetic system)
  - b. Local vasodilation

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- c. Withdrawal of parasympathetic stimulation
4. How is cardiac output increased during exercise after heart transplant? By which mechanisms can exercise training improve  $VO_2\max$  after heart transplant?
  - a. Q increase:
  - b. Release epi & norpei (Increased contractility)
  - c. SV increase (even without autonomic input by increasing venous return)
  - d. Exercise training (Improve  $VO_2\max$ ):
  - e. Increase the sensitivity/efficiency of response to chemical factors
  - f. Better shunting blood to active tissue
  - g. ANS reinnervation of the heart (slight)
  - h. number & efficiency of mitochondria
5. Which components of the Fick equation change when measured at rest before & after training?
  - a. Untrained: higher HR & lower SV
  - b. Trained: lower HR & higher SV
  - c. Other components of Fick equation do not change AT REST between trained & untrained individuals
6. Which component of the Fick equation explains most training induced increase in  $VO_2\max$ ?
  - a. SV  $\rightarrow$  main limiter of  $VO_2\max$
7. How do components of the Fick equation change during prolonged steady state exercise & why? (cardiac drift)
  - a. SV decreases
  - b. HR increases
  - c. Build up of catecholamines in the blood (epinephrine)
8. Other than changing SV how might training alter  $VO_2\max$ ?
  - a. Increased number & size of mitochondria  $\rightarrow$  slightly increase a- $VO_2$  diff
  - b. Blood volume
  - c. More red blood cells (hemoglobin)  $\rightarrow$  allows more  $O_2$  to be carried in blood
  - d. Higher percentage of blood directed to active muscles  $\rightarrow$  increases whole body a- $VO_2$ diff
9. How might a heart rate/GPS watch estimate  $VO_2\max$ ? (think HHR & Mets)
  - a. Watch knows both max & resting HR
  - b. Watch calculates speed & translates that to METs
  - c. Knows how fast you at running at percent of  $VO_2\max$  & then uses METs to convert to mL/kg/min

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- d. Inefficient running causes watch to indicate lower VO<sub>2</sub>max
10. A student cycles at 100 W for 10 min & then hand bikes at 100 W for 10 min. How does their CV response differ?
- Power output the same
  - Increased HR
  - Increased VO<sub>2</sub> (recruit stabilizing muscles)
  - SV slightly higher → more O<sub>2</sub> demands to do the same work
  - Lower HR
  - Lower VO<sub>2</sub>

#### Module 5 Questions

- Name 2 locations where ATP is used during muscle contraction?
  - Detach actin/myosin crossbridge - cock myosin
  - Pump calcium back in
  - Depolarization of whole muscle fiber - active transport
- What locations within a muscle cell could sarcomeres be added in increases in muscle force?
  - Sarcomeres must be added in parallel to increase muscle force
  - Myofibrils (groups of sarcomeres) added or made bigger
  - Grow from outside
- How does ACh released into the NMJ lead to muscle contraction?
  - ACh binds to receptors on sarcolemma → AP depolarization → transmitted along T-tubule → Ca release from SR → troponin → tropomyosin → actin/myosin cross bridge cycling
- Explain how crossbridge cycling leads to force production/movement (analogy)
  - Climbing a rope - myosin is a multiarmed molecule
  - Myosin arms each have force/movement
  - Alternating pull/power stroke - move along rope
- What are the advantages & disadvantages of increasing the angle of pennation in a muscle?
  - Advantages
    - More sarcomeres in a smaller amount of space (greater force production)
  - Disadvantages:
    - Decreases range of motion
    - Some of the force from the fiber is lost to lateral movement due to angle
- What are the advantages of a longer fascicle length?
  - Higher velocity

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- b. Create force across greater ROM
- 7. Explain how adding sarcomeres in series & parallel would alter muscle force production characteristics
  - a. Sarcomeres in parallel → more force !
  - b. Sarcomeres in series → better ROM to generate force, higher velocity
- 8. Athlete A has 60% type I fibers, Athlete B has 60% type II fibers. Explain the mechanism which would affect their performance in the 100 M dash & 10 000 M race
  - a. Athlete B → 100 M dash
    - i. Faster cross-bridge cycling (generates force more quickly)
    - ii. Faster reuptake of Ca<sup>2+</sup> allows for faster relaxation & subsequent contraction
    - iii. More glycogen, PCr, anaerobic enzymes
  - b. Athlete A → 10 000 M race
    - i. More mitochondria: produce less lactate & metabolize it
    - ii. More capillaries around muscle fibers → O<sub>2</sub> in & waste (lactate) out
    - iii. Fatigue resistant
- 9. Why do successful Olympic rock climbers tend to be small & lean rather than larger & lean?
  - a. Performance is dictated by relative strength
  - b. Higher strength to bodyweight ratio in smaller people
  - c. Muscle volume & mass increases faster than CSA & strength
- 10. You fall asleep in class, your head begins to drop then jerks back to an upright position, why?
  - a. Stretch reflex
  - b. Eccentric contraction → involuntary stimulation of afferents → contraction

#### Module 6 Questions:

- 1. Two identical twins with the same baseline strength are randomized to complete 12 week resistance training programs where each set is performed to failure. One twin trains at 30% 1RM, the other at 80%. What adaptations would you expect to occur following training? Explain the physiological mechanism involved.
  - a. Assuming they have a similar training history and diet/protein intake, muscle fiber type distribution, strength, and body composition should also be similar
  - b. Hypertrophy
    - i. One of the most important factors in increasing muscle size is completing workouts until failure

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- c. Strength
    - i. Greatest increase in strength gains in the twin that trains with a heavier load
  - d. Endurance - the # of repetitions you can perform before failure.
    - i. Relative Endurance
      - 1. Increases by training with a light load for several repetitions
    - ii. Absolute Endurance (set weight)
      - 1. Increases the same amount regardless of training load, or may slightly increase with a heavier load. That being said, training with a heavy load is likely better for both muscle strength and endurance, as absolute endurance is applicable to more sports than relative endurance.
2. A student undergoes 16 weeks of resistance exercise, they get stronger, why?
- a. Neural adaptations are responsible for the initial increase in muscle strength - being able to recruit more fibers and increasing their motor unit recruitment threshold
  - b. Increase in motor unit firing rate with resistance training as contraction intensity increases
  - c. Muscle Hypertrophy
    - i. Fiber Type Transition
    - ii. Type 2 fibers increase in size
  - d. Training Schedule/Type of Training
    - i. Likely followed an ideal plan that maximized strength gains (as opposed to hypertrophy or muscular endurance) - focus would be on lifting a heavier load for fewer repetitions (<5 reps)
    - ii. Find the “sweet-spot” to allow for muscle supercompensation; consider the Goldilocks Principle
    - iii. Engaging in the next workout when fatigue has gone back to baseline but fitness is still above baseline; maximizing the window of preparedness
    - iv. Consuming a minimum of 1.6g of protein/kg of body mass to engage muscle protein synthesis; leaving a few hours between meals and continuing to engage in exercise to increase our sensitivity
3. The winning time for the 2016 Men’s Olympic marathon was 2:08:44. The time of the 50th place finisher was 2:18:36. What physiological differences might explain the differences in finishing time?
- a. Aerobic Capacity

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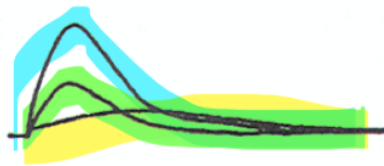
- b. Lactate Threshold
  - c. Muscle Fatigue
4. An untrained student cycles at 130 w which requires O<sub>2</sub> consumption of 50% of their VO<sub>2</sub>max They then complete 3 months of aerobic training. After training, they again cycle at 130 W, what physiological differences occur between the pre and post training cycling bouts?
- a. Improved LT
  - b. Decreased Lactate Accumulation
  - c. Increased Fatigue Resistance
  - d. Decreased Perceived Effort
  - e. Decreased HR
  - f. Increased SV
  - g. Decreased CHO Oxidation
  - h. Increased Fat Oxidation
  - i. Decreased Ventilation
  - j. Decreased Work of Breathing
  - k. Increased Efficiency
  - l. Increased a-vO<sub>2</sub> Difference

**300-Level Courses**

**KIN 313**

Midterm #1 (Short answer):

1. Define a motor neuron pool, a motor unit, and a muscle unit.
  - a. Motor neuron pool: all the motor neurons innervating a particular muscle
  - b. Motor unit: the cell body and dendrites of a motor neuron, the multiple branches of its axons, and the muscle fibers it innervates
  - c. Muscle unit: all the muscle fibers belonging to a motor unit.
2. Define the innervation ratio and give an example of a muscle with a large innervation ratio, as well as one with a small innervation ratio
  - a. The number of muscle fibers innervated by a single motor neuron; varies for different muscles
  - b. Gastroc 1:1900, eye muscles 1:15
3. Compare the differences in (a) input resistance, (b) rheobase, (c) conduction velocity, and (d) afterhyperpolarization between large motor neurons and small motor neurons.
  - a. Input resistance: small motor neurons have higher input resistance
  - b. Rheobase: low in small motor neurons
  - c. Conduction velocity: slower in small motor neurons
  - d. Afterhyperpolarization: shorter in large motor neurons
4. Define a 'twitch'. Draw and label one single force-time graph of the 3 different types of motor neurons: type S, type FR, and type FF. Compare the differences in twitch characteristics of these 3 types.
  - a. Twitch: the physiological, quantal response of a motor unit to stimulation. This is a force time response to a single input.

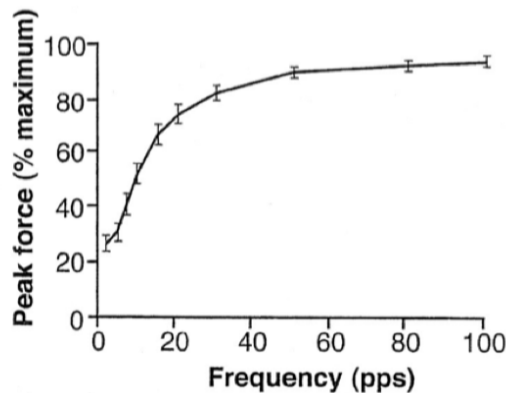


- b.
- c. Type S: yellow; Type FR: green; Type FF: blue
- d. Twitch characteristics:
  - i. Contraction time (shortest to longest): FF, FR, S
  - ii. Half relaxation time (shortest to longest): FF, FR, S
  - iii. Peak (smallest to largest): S, FR, FF
5. What are two methods of recording the activity of motor units?
  - a. Metal microelectrode
  - b. Fine wires

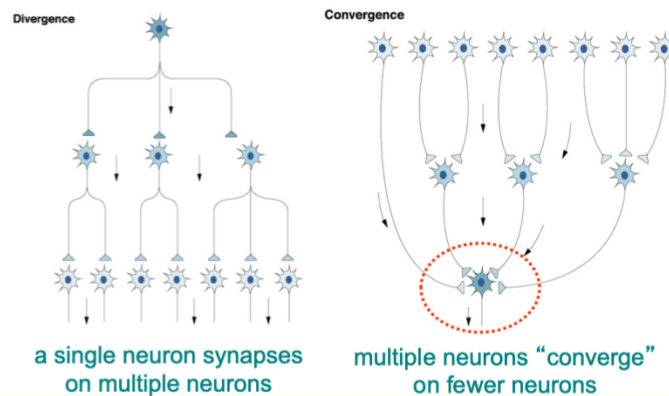
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6. Why is it important to recruit according to the Henneman's size principle?
  - a. The sequence of recruitment is predetermined (larger, more powerful motor units added near the end of a contraction when the increment of increase will have an effect on net force). The brain doesn't have to contend with 445 switches, but instead with just the control of the level of the input/drive to the motor pool.
7. Draw the force-frequency relationship. What shape is it in?



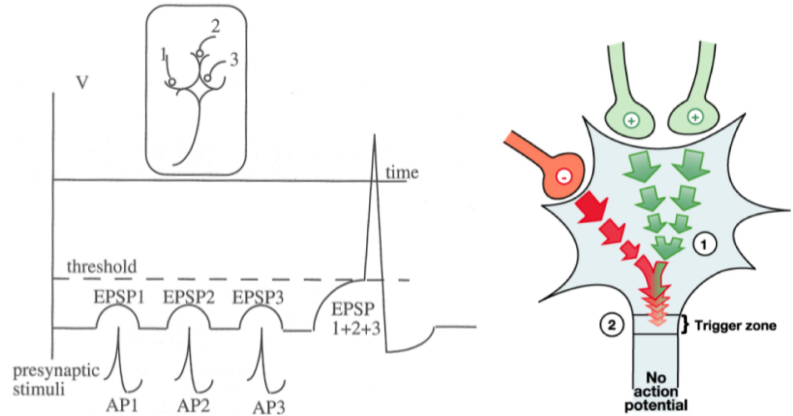
- a.
  - b. Sigmoidal
8. Name and describe 2 discharge patterns that are altered to affect force production.
    - a. Double discharge: After a first discharge by a motor unit (usually between 7-35 Hz), a second discharge is injected (within 10 ms) to get a big jump in force production
    - b. Synchrony: The degree to which two motor units within a muscle fire together at the same time to produce a larger force production.
  9. How are excitatory postsynaptic potentials (EPSPs) different from action potentials?
    - a. EPSP is local and graded: it is not propagated; it is not an all-or-none reaction. The magnitude of EPSP is directly proportional to the amount of neurotransmitter released
    - b. EPSP is not followed by a refractory period: they can summate
  10. Draw a diagram of divergence vs. convergence



a.

11. Draw diagrams of spatial summation & temporal summation.

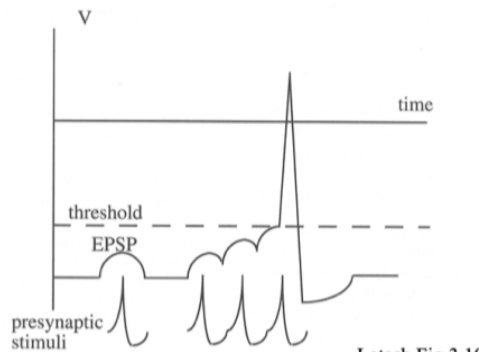
a. Spatial summation:



i.

b. Temporal summation:

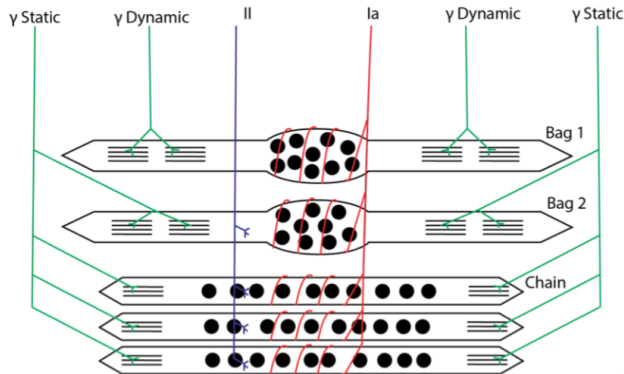
**summation causing action potential**



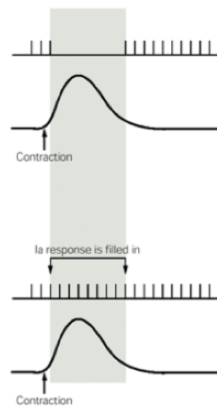
i.

Latash Fig 3.10

12. Draw and label the intrafusal fibers of a muscle spindle. Be sure to include bag fibers, chain fibers, the afferents innervating the fibers, and the efferent system.



13. What does the primary afferent and secondary afferent primarily code for in muscle spindles? Do they code for anything else? Are these fast- or slow-adapting?
- Primary afferent: velocity; also codes slightly for length
  - Secondary afferent: length; also codes slightly for velocity
  - Both are slow-adapting (if they were fast adapting, they would only code for velocity)
14. Draw a diagram of the discharge pattern of Ia afferent when the muscle shortens. Draw another diagram of the discharge pattern when the gamma system is turned on as the muscle shortens.



15. Give an example of how the fusimotor system is task dependent.
- Cat activity: when the cat walks on the ground vs. walks on a beam, it needs the same amount of motor activity. However, its sensory system is tuned up when it walks on the beam, and the fusimotor system is selectively activated to code very well for velocity.
16. Describe the two ascending pathways that carry sensory information from muscle, joint, and skin receptors.
- Medial lemniscus system - relays information for discriminative aspects of sensation (perception of body position & movement) and tactile recognition of textures/change in stimuli position

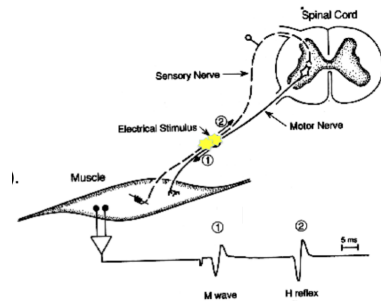
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- b. Spinothalamic system - relays information for conscious perception of pain, temperature, and less discriminative tactile sensation (light touch, pressure)

Midterm #2 (Short answer):

1. What do GTOs code for? How are they oriented in comparison to the muscle spindle?
  - a. Muscle force or tension
  - b. GTOs in parallel; spindle in series
2. Describe where the 4 types of joint receptors are located.
  - a. Type I: superficial layers of joint capsule; more densely in proximal vs distal joints & cervical vs lumbar spine
  - b. Type II: located mainly in deep layers of joint capsule & articular fat pads; more numerous in distal vs proximal articulations
  - c. Type III: Located primarily in intrinsic and extrinsic joint ligaments
3. What are the 2 limitations of joint receptors?
  - a. Responds primarily at the limits of joint movement
  - b. Code ambiguously for joint movements
4. Do high or low threshold joint receptors have strong projections on alpha motor neurons? Which receptors have strong projections on gamma motorneurons?
  - a. High threshold (mainly nociceptors) → alpha MN
  - b. Low threshold → gamma MN
5. What is mechanotransduction?
  - a. The process whereby mechanical energy gets converted into a voltage change in sensory afferent neurons
6. Describe what each cutaneous receptor responds to?
  - a. Merkel cells SA1 - edges and curvature, texture
  - b. Ruffini endings SA2 - lateral skin stretch
  - c. Pacinian corpuscle FA2 - acceleration and high frequencies; feeling through objects and perception of fine texture
  - d. Meissner's corpuscle FA1 - motion detection & grip control
7. What is the difference between kinesthesia and proprioception?
  - a. Kinesthesia involves consciousness, whereas proprioception is more a reflexive issue
8. Why is there a problem with the code from muscle spindles? How does the brain solve this?
  - a. The code may be ambiguous due to gamma input. The brain subtracts the gamma drive going to the spindle from the afferent feedback coming back from the spindle.
9. Draw the Hoffman or H-reflex. What is an antidromic propagation?



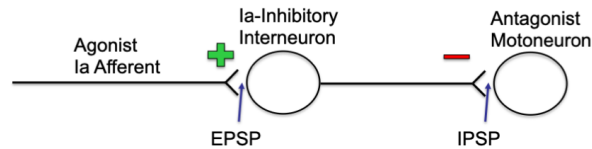
a.

b. Antidromic propagation: backwards propagation of the potential

10. Define a reflex

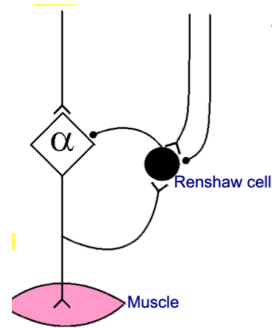
a. An automatic, stereotyped motor response to a sensory stimulus

11. Draw a simple diagram for reciprocal inhibition



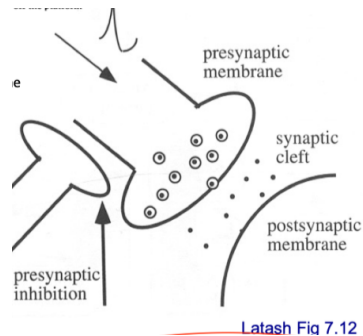
a.

12. Draw a simple diagram for the renshaw cell



a.

13. Draw a diagram of pre-synaptic inhibition



a.

14. Explain phase-dependent reflex reversal

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- a. The reflex response to an obstacle depends on the phase. If you stimulate the top of the foot during the swing phase, the limb will flex. If you do so during the stance phase, the limb will extend/

Final (Cumulative): Remaining lectures

1. How does tonic descending input modulate reflexes?
  - a. Descending neurons can make synaptic connections with neurons in the reflex arc to change the background level of activity. The level of tonic excitability can be increased when the motor neuron almost needs to fire.
2. What do otoliths and receptors in semicircular ducts code for receptively?
  - a. Otoliths - linear acceleration; semicircular ducts - angular acceleration
3. What is galvanic vestibular stimulation? What action does it cause?
  - a. It is a type of stimulation using electrodes placed over the mastoid processes. It is used to detect vestibular deficiency or to activate the vestibular system artificially. The stimulation increases the firing of peripheral vestibular afferents on the cathodal side, while decreasing firing on the anodal side.
  - b. Causes sway towards the anode electrode

### **KIN 320**

Test #1 Questions

1. When looking at the Canadian demographic, what do the statistics tell us about Canadians' health and fitness?
  - a. Most Canadians are sedentary - this is often attributed to the fact that PA is difficult and hard to adhere to.
2. What are some common misconceptions about physical activity? How might we rephrase those?
  - a. "It's still healthy to sit all day, so long as we exercise" - High levels of PA can offset extended sitting time, but would require a lot of PA.
  - b. "We need to hit 10,000 steps/day to reap health benefits" - False, more is better, but we still see health benefits <10,000 steps/day.
  - c. "We need to exercise at high intensities to reap health benefits" - False, more is better, but all PA intensities are associated with a reduced risk of morbidity.
  - d. "When prescribing to my clients, the main health behaviors we should be concerned about are physical activity and diet" - False, reducing sedentary time and sleeping well are both very important as well.
3. What are the 24-Hour Movement Guidelines?
  - a. Move more (<150 mins/week)

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- b. Reduce sedentary time (<8 hrs)
- c. Sleep well (7-9 hrs of good quality sleep)
- 4. What changes to the 24-Hour Movement Guidelines have been made? Why?
  - a. “Several hours of light physical activity, including standing” was added to emphasize that light intensity physical activity still counts.
  - b. No longer include the minimum of 10 mins for exercise bouts to reap health benefits - anything counts!
- 5. What is the difference between “Evidence-Informed Practice” and “Evidence-Based Practice”?
  - a. Researchers often prefer “Evidence-Based Practice” because the word “based” puts evidence at the forefront and doesn’t give us any sense that there’s anything other than the evidence. If the practice is just “informed” by the evidence, that suggests that there is more to it.
- 6. What are the 4 Pillars of Evidence-Informed Practice? / Define the evidence-informed practice model.
  - a. 1 - Research Evidence (of the best quality and fit)
  - b. 2 - Expertise (your own, colleagues’, managers, etc.)
  - c. 3 - Target user’s values, circumstances, etc. (their goals, experiences, and individuality)
  - d. 4 - Info from Context (feasibility - e.g., equipment, culture, cost, think of how you may deliver an intervention in a hospital vs. a community setting)
- 7. What aside from the actual intervention itself is important to consider when prescribing exercise?
  - a. The delivery style! Your prescription starts from the second you walk into the room and interact with the client. The goal should be to build a partnership and rapport with the client - when you have a connection with someone, you hold a lot more weight and value to their opinion. Be sure to consider tailoring and behavior change techniques.
- 8. What are the Stages of Motivation (also called the Transtheoretical Model)? What should this model be used for? Motivational interviewing is used for individuals in which stage(s)?
  - a. The Stages of Motivation
    - i. Precontemplation = “I have zero interest”
    - ii. Contemplation = Open to it but undecided
    - iii. Preparation = “I haven’t done it yet, but I’m ready to”
    - iv. Action = Is actually engage in the behavior

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- v. Maintenance = Arbitrary 6 months of maintenance - essentially, you've sustained the behavior over a long period of time.
  - b. This model is useful in determining where your client is at, but lacks evidence in terms of actually changing behavior.
  - c. MI is for people in the precontemplation and contemplation stages.
9. What is Motivational Interviewing?
- a. Directive, client-centered therapeutic style that elicits behavior change by assisting clients to identify and resolve ambivalence.
10. What is the difference between Sustain Talk and Change Talk?
- a. Sustain talk refers to statements that give no indication of wanting to change their current behavior(s).
  - b. Change talk refers to statements that indicate the individual wants or would be willing to change a behavior.
11. What is the difference between Preparatory Change Talk and Mobilizing Change Talk? Use the acronyms.
- a. Preparatory Change Talk: Statements that indicate someone is preparing to change a behavior. Acronym = DARN
  - b. Mobilizing Change Talk: Statements that indicate someone is shifting to the preparation phase. Acronym = CATS
12. What is the "Spirit of MI"? Use the acronym.
- a. The spirit of MI essentially means to be a good person/not be a robot - it guides MI, is the foundation of MI, and is important for the ethical practice of MI. The spirit of MI refers to the humane aspects of MI; not the techniques, strategies and tools. Acronym = CAPE
13. What are the Fundamental Processes of MI?
- a. Engaging
  - b. Focusing
  - c. Evoking
    - i. OARS
  - d. Planning
14. What is the Intention-Behaviour Gap? How prevalent is this issue?
- a. The gap between intending to do something and actually doing it.
15. Which behavior change model targets the Intention-Behaviour gap?
- a. The Health Action Process Approach (HAPA) Model
    - i. Action planning and coping planning
16. What is SMART goal setting?

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- a. Specific = ex: moderate to vigorous intensity cycle
  - b. Measurable = ex: at least 20 mins in duration, twice per week, every week
  - c. Attainable = ex: the above example, assuming the client had already been doing this 1x per week
  - d. Relevant = why is the goal important? Relevance to the client's goal(s).
  - e. Time-based = ex: over the next month.
17. What does Brief Action Planning entail?
- a. Ask about their willingness to chat about PA
  - b. Ask about what they would like to do to get active in the next week or two
    - i. Ask-Tell-Ask
    - ii. SMART Goals
    - iii. Check back or use MI
  - c. Ask them to rate their confidence with following through with the plan
  - d. Make a plan to check back in
18. Highlight the key aspects of clearing someone for exercise
- a. informed consent,
  - b. exercise preparticipation health screening,
  - c. health history, and
  - d. cardiovascular risk factor analysis procedures

Test #2 Questions:

1. Who can administer pre-exercise evaluations? Use EIP to explain your answer.
  - a. Research evidence:
    - i. ACSM Guidelines tell us that the practitioner's role is not to diagnose, and that we want to decrease barriers to PA
  - b. Info from the context:
    - i. Potentially not feasible to have an exercise professional administer for every individual.
  - c. Expertise:
    - i. Have seen others who are not exercise professionals administer clearance (however, this is not always a reason that holds much weight)
  - d. Target user values, circumstances, etc.:
    - i. Client safety is #1 → Who administers could depend on the population (e.g., cardiac clients).
2. What is Cardiorespiratory Fitness (CRF)?

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- a. CRF is the ability to perform moderate to vigorous intensity exercise using large muscle groups in a dynamic and continuous manner for prolonged periods of time (or, the ability to sustain activity over a long period of time and at increasingly high levels).
3. Identify the different types of Maximal or Near Maximal Cardiorespiratory Fitness (CRF) assessments.
  - a. Open Circuit Spirometry
  - b. Field Tests
4. Identify the different types of Submaximal Cardiorespiratory Fitness (CRF) assessments.
  - a. Single-stage treadmill protocols
  - b. Cycle ergometer protocols
  - c. Step test protocols
5. Compare the advantages and disadvantages of different assessments and use EIP to select an appropriate Ax method.
  - a. EX: Step Testing
    - i. Advantages: free, accessible
    - ii. Disadvantages: Not great for those with poor coordination, hearing impairments, and/or lower mobility issues
6. When do you use a submaximal test and when do you use a maximal test?
  - a. The decision to use a maximal or submaximal exercise test depends largely on the reasons for the test, risk level of the individual (is it appropriate to reach volitional fatigue?), and availability of appropriate equipment and personnel
    - i. Submaximal testing is often cheaper, lower risk, and requires less time
7. Should we always assess client weight and body composition?
  - a. No - determine if this is truly important or needed
8. Define obesity, weight bias, stigma, body composition and sarcopenia.
  - a. Obesity = “A complex disease in which abnormal or excess body fat (adiposity) impairs health.”
  - b. Weight bias = “Thinking that people with obesity do not have enough willpower or are not cooperative.”
  - c. Stigma = “Acting on weight-biased beliefs.”
  - d. Body composition = “Amount of relative proportions of fat mass (FM) and fat-free mass (FFM) in the human body.”
  - e. Sarcopenia = low muscle strength, low muscle quantity or quality, and/or low physical performance
9. What’s more important for health? Aerobic fitness or strength training? Or both?

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- a. Strength training is equally as important and in some cases is more important than aerobic activity - we want to be able to promote and prescribe both!
10. What is muscular fitness?
- a. Muscular strength (how strong we are/how much can we lift), endurance (how long can we lift loads), and power (how fast can we move that weight over a given amount of time) are all health-related fitness components.
11. How do we pick the appropriate modality for strength training?
- a. Free-weights; weight machines; body weight; pneumatic resistance machines; resistance bands
12. Define muscular strength, muscular endurance, muscular power, static strength, and dynamic strength.
- a. Muscular strength: Muscle's ability to exert maximal force on one occasion.
  - b. Muscular endurance: The ability of a muscle group to execute repeated (or sustained) muscle contractions against a submaximal load.
  - c. Muscular power: Muscle's ability to exert force per unit of time (i.e. rate); how fast can you move a force.
  - d. Static strength (Isometric): Muscular action where the length of the muscle does not change (no sliding of muscle filaments).
  - e. Dynamic strength (Isotonic): Involves both concentric and eccentric muscle actions when the muscle actions are shortened or lengthened (sliding of muscle filaments occurs).
13. What is a 1RM test? Is it used for prescription? What are the general principles?
- a. A 1RM test is the highest load that can be lifted through a full ROM using correct form. You can use that to prescribe by using % of 1RM. But, unless you have ample time - this is rarely used unless prescribing for teams (doesn't make sense to use for the community). 1RM changes very quickly, especially for beginners, meaning you'd have to reassess constantly.
14. What are some of the sources of error when conducting 1RM tests?
- a. Motivation, different equipment, mindset, fatigue
15. Which aspect of muscular fitness is most important to older adults? Why?
- a. Muscular power; aids in fall prevention
16. What measures of flexibility do we use?
- a. Sit and reach test; goniometer; inclinometer
17. When should you NOT assess ROM? (contraindications to ROM)
- a. Immediately after injury; after surgery that has disrupted tissue; while on pain medications; while taking muscle relaxants; regions of osteoporosis or bone

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fragility; dislocated joints or unhealed fractures; any test that causes pain or discomfort.

18. What are the Principles of Training?
  - a. Principle # 1: Progressive overload
  - b. Principle # 2: Specificity
  - c. Principle # 3: Diminishing returns
  - d. Principle # 4: Reversibility
  - e. Principle # 5: Individuality
  - f. Principle # 6: Rest
19. What is FITT-VP?
  - a. Frequency: How often
  - b. Intensity: How hard
  - c. Time: How long
  - d. Type: What
  - e. Volume: Product of FIT
  - f. Progression: How will you make it harder
  - g. Pattern: Intervals, bouts, rest
20. What should a warm-up consist of?
  - a. Goal, ROM, dynamic stretching, warm-up sets for resistance training
21. How do you administer a HR assessment?
  - a. HR palpation
  - b. Max HR (220 - age)
22. What is a rating of perceived exertion?
  - a. Allows exerciser to subjectively express their physical exertion level
    - i. Borg Category Scale
    - ii. Category Ratio Scale
    - iii. OMNI Scale
23. How do you target strength/power/endurance/hypertrophy with varying rep ranges?
  - a. Endurance = > 12 reps
  - b. Hypertrophy = 6-12 reps
  - c. Strength = < 6 reps
  - d. Power = < 5 reps
24. What can we use to prescribe instead of %1RM?
  - a. Reps in reserve
25. What is Time Under Tension?
  - a. The duration of the applied load - how long is the load applied for?

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26. Why do we do a Cool-Down?
  - a. To avoid post-exercise hypotension (a drop in blood pressure)
  - b. To feel positive affect
  - c. To increase ROM via stretching
27. When someone is starting a program, how would you typically program for them?
  - a. High reps (due to working at low loads, but can also work at lower reps)
  - b. Low weight
  - c. General (rather than specific to the task)
  - d. Basic strength (rather than power)
28. What is periodization and programming?
  - a. Periodization = A means of organizing the planning of a training intervention or phase into partitioned time periods.
  - b. Programming = Drives the periodization phases (makes the phases within the periodized plan happen) and includes exercise selections, loading parameters, rest periods, etc.
29. What is the General Adaptation Syndrome (GAS)?
  - a. This describes the physiological stages the body goes through in response to stress/stimulus.
30. Why do we use periodization?
  - a. It allows us to continually change the stimulus so that we continue to see adaptations. We don't get stuck or don't get to the point where we're overtraining.
31. What are the 7 Strength Training Programming Variables?
  - a. Needs analysis
  - b. Exercise selection
  - c. Training frequency
  - d. Exercise order
  - e. Training load and repetitions
  - f. Volume
  - g. Rest periods

Test 3 Questions:

1. What happens in a SCI?
  - a. "Spinal cord injuries cause damage to the neural elements within the spinal canal and occur as a result of traumatic events or non-traumatic pathologies."
2. How do we classify SCIs?
  - a. Quadriplegia vs. Paraplegia

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- b. Complete vs. Incomplete
- c. AIS Grade or ASIA Level
- 3. How do we grade motor function?
  - a. Grade 1 = Can see the muscle contract, but they can't perform the muscle action.
  - b. Grade 2 = Able to complete the muscle action when gravity is eliminated.
  - c. Grade 3 = Able to complete the muscle action against gravity.
  - d. Grade 4 = Not quite full function. The clinician is able to overpower them, but there is some ability to push back.
  - e. Grade 5 = Normal function. If the clinician is resisting a movement, they should be able to really push back.
- 4. Identify considerations for prescribing exercise for individuals with SCI
  - a. Pressure Sores/Ulcers
  - b. Autonomic Dysreflexia
  - c. Orthostatic Hypotension
  - d. Fracture
  - e. Spasticity
  - f. Incontinence
  - g. Temperature Dysregulation
  - h. HR response
  - i. Overuse Injuries
- 5. What are the differences in the principles of exercise prescription for those with SCI versus able-bodied prescriptions?
  - a. Can be very similar, some exceptions may include:
    - i. HR-based intensities → Use subjective measures of intensity
    - ii. ROM
    - iii. Equipment used
    - iv. Balancing push motions
- 6. What modality would you use to assess CRF for someone with stroke (hemiplegia)?
  - a. Full body recumbent stepper; the functional side can help drive the machine
  - b. Arm Ergometer; can be used with just one side of the body.
    - i. This may not always be available; it depends on the context.
    - ii. When testing one side, we are often limited by power (not CRF).
  - c. Strength may be more applicable to assess over CRF.
- 7. Identify exercise testing considerations for clients with SCI.
  - a. Core stability
  - b. Body composition - do not use able-bodied values

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- c. CRF - formulas to predict VO<sub>2</sub>max may not be valid
  - d. Muscular strength testing - Use adaptive equipment
  - e. Flexibility - ROM may be altered with spasticity; make sure muscles are warm beforehand
8. What bodily cues should we use/not use when describing PA intensity for someone with SCI?
- a. Autonomic responses like sweating can be affected, some do not sweat at all below the level of injury - sweating should not be used as a cue of intensity
  - b. Talk test can be used
  - c. Focus more on breathing rate than HR
  - d. Can monitor how the muscles feel (loose, warm, burning, etc)
9. If two people both have a T9 incomplete injury, will their injury experience be the same?
- a. NO! Even with the same injury, an incomplete injury can look vastly different in another individual. It is relatively the same between individuals for complete injuries.
10. What is FES? What is it used for? Who should use FES? How long do the benefits of FES last?
- a. Treatment entails low energy electrical currents applied to a peripheral nerve to help a weak muscle contract.
  - b. Can help functionally strengthen weak muscles, drive positive neuroplasticity, enhance a movement pattern, prevent secondary complications.
  - c. Benefits last for as long as you use FES
11. Why is physical activity important for older adults?
- a. For health outcomes and sustained independence
12. How do we define “Older Adults”?
- a. >65 years old
  - b. 50 to 64 years old with clinically significant conditions or physical limitations
13. What health benefits to resistance training may be important to my client?
- a. Improved muscle strength and tone, which can help to protect joints from injury
  - b. Maintaining flexibility and balance, which can help to maintain independence
  - c. Weight management and increased muscle-to-fat ratio - more muscle is linked to burning more kilojoules at rest
  - d. May help reduce or prevent cognitive decline in older people
  - e. Greater stamina - with increased strength individuals will tire less easily
  - f. Prevention or control of chronic conditions (e.g., diabetes, heart disease, arthritis, back pain, depression, and obesity)

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- g. Pain management
  - h. Improved mobility
  - i. Improved posture
  - j. Decreased risk of injury
  - k. Increased bone density and strength and reduced risk of osteoporosis
  - l. Improved sense of wellbeing - resistance training may boost self-confidence, improve body image and mood
  - m. Improved sleep and avoidance of insomnia
  - n. Increased self-esteem
  - o. Enhanced performance of everyday tasks
14. Describe what happens to muscle strength as we age.
- a. Age-related decline in muscle / Sarcopenia
15. What are the rates of PA among older adults?
- a. The least physically active of all age groups despite the importance of PA in this population.
16. Describe what we typically see happen to physiologic and health-related variables as people age.
- a. Resting HR = unchanged (ACSM) or increased
  - b. Max HR = decreased
  - c. Max Cardiac Output = decreased
  - d. Resting and Exercise BP = increased
  - e. Absolute and relative max oxygen uptake reserve (oxygen uptake at a given workload minus resting oxygen uptake) = decreased
  - f. Residual volume (what is left in the lung after exhalation) = increased (unable to expel as much of your lung capacity)
  - g. Vital capacity (how much air you exhale) = decreased
  - h. Reaction time = slower
  - i. Muscular strength = lower
  - j. Flexibility = lower
  - k. Bone mass = lower
  - l. FF body mass = lower
  - m. % Body Fat = higher
  - n. Glucose tolerance = decreased
  - o. Recovery time = longer
17. What do we use to assess functional status in older adults?

- a. Physical performance testing has largely replaced exercise stress testing for the assessment of functional status of older adults. The focus is on independence, discharge from hospital, and generally performance/function. EX: Timed up and go test.
18. What are the FITT recommendations for older adults?
- a. Very similar to the general population, which special consideration given to the following:
    - i. Can start at lighter intensities (for resistance training)
    - ii. Emphasizes power training (for resistance training); move the movement faster and at ~30-60% of 1RM.
    - iii. Lighter impact exercise (for aerobic training), but not all impact is bad - some can be good to help build some resilience in your joints!
19. What can we do to help prevent falls?
- a. Neuromotor activities
  - b. Progressively difficult postures that reduce the base of support
  - c. Dynamic movements that perturb the center of gravity
  - d. Stressing postural muscle groups
  - e. Reducing sensory input
  - f. Tai Chi
20. What is the difference between Alzheimer's Disease and Dementia?
- a. Dementia is the umbrella term for loss of memory and other thinking abilities severe enough to interfere with daily life. Dementia encompasses the following:
    - i. Alzheimer's Disease (60-80%)
      1. The reason we hear more about Alzheimer's is because it makes up the majority of dementia cases.
    - ii. Lewy Body Dementia (5-10%)
    - iii. Vascular Dementia (5-10%)
    - iv. Frontotemporal Dementia (5-10%)
    - v. Others: Parkinson's, Huntington's
    - vi. Mixed Dementia: Dementia from more than one cause.
21. Describe the pathology of Alzheimer's (AD).
- a. The accumulation of:
    - i. The protein fragment beta-amyloid (plaques) outside neurons
    - ii. Twisted strands of the protein tau (tangles) inside neurons
  - b. Changes are accompanied by the death of neurons (at its core, Alzheimer's is the death of neurons)

- c. It is a slowly progressive brain disease that begins many years (thought to begin 20 years or more) before symptoms emerge.
22. Understand the ATN...V Model.
- a. A = b-amyloid biomarker (amyloid PET or CSF Ab42)
  - b. T = tau biomarker (CSF phospho tau or tau PET)
  - c. N = biomarkers of neurodegeneration or neuronal injury ([18F] - fluorodeoxyglucose-PET, structural MRI, or CSF total tau)
  - d. Recent work suggests the need to add a V (vascular) component to the ATN model.
23. Identify the stages of Alzheimer's Disease.
- a. Preclinical AD
  - b. Mild Cognitive Impairment (MCI)
  - c. Dementia
24. Why have we shifted away from focusing on when individuals are diagnosed with dementia/AD in research settings?
- a. Because we now know that this is too late - there is very little that can be done for individuals that have already been diagnosed.
25. How do mobility and cognition interact ("the intersection")? What does this test allow us to do/what does it indicate?
- a. Dual-Tasking
  - b. Allows us to measure how automatic a task is
26. What is the linea alba? The Distasis Recti?
- a. Linea Alba = Soft connective tissue down the midline of the belly, where the abdominal muscles connect into with their fascia.
  - b. Diastasis Recti = the growth of the linea alba when the rectus abdominis muscles separate (or when there's a space between them).
27. What incisions are made in a C-section?
- a. Initial incision to the skin, then the abdominal muscles, fascia, and uterus. The baby is then removed from the uterus. Afterwards, you can only see the outermost scar on the skin, but so much more is healing.
28. Many women return to work 6 weeks after birth in the US? Is this enough time?
- a. NO! The body has barely recovered at this stage. Caring for a child after the birth is demanding enough as well. We need to respect the healing process as much as possible.
29. Describe the tearing that can occur from vaginal births.
- a. First Degree Vaginal Tear

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- b. Second Degree Vaginal Tear
  - c. Third Degree Vaginal Tear
  - d. Fourth Degree Vaginal Tear
30. What is a pelvic organ prolapse? Name the types of pelvic organ prolapse that can occur.
- a. A pelvic organ prolapse is when 1 or more of the pelvic organs (bladder, uterus, rectum) start to slump or descend in the pelvis or vaginal walls. Commonly occurs in women postpartum, but can occur in pregnant women too.
  - b. Types:
    - i. Rectocele (Rectum Prolapse)
    - ii. Cystocele / Cystourethrocele (Bladder Prolapse)
    - iii. Uterine Prolapse (Uterus Prolapse)
    - iv. Enterocele (Small Intestine Prolapse)
    - v. Vaginal Vault Prolapse
31. What is arthritis?
- a. Arthritis and rheumatic diseases are the leading cause of pain and disability. Arthritis is a broad encompassing term for diseases or disability that affects the joint.
32. How do we treat arthritis?
- a. Pharmaceutical treatment of arthritis primarily involves analgesics (for pain), glucocorticoids (steroid for inflammation), and nonsteroidal anti-inflammatory drugs or NSAIDs (particularly for those with an inflammatory form of arthritis, which require a pharmacological intervention, like RA or OA), and for RA only, disease-modifying antirheumatic drugs or DMARDs (suppress inflammation caused by overactive or abnormal immune responses).
33. What is osteoarthritis? What is the pathophysiology? What are the risk factors for OA?
- a. Osteoarthritis is a structural deformity, whether it is from chronic overuse, microtrauma or an injury that didn't heal well.
  - b. It comes from abnormal biomechanical forces (micro - for ex, mini vibrations from being in a truck if you are a truck driver; macro - ACL/MCL injury) leads to the release of inflammatory enzymes, which leads to abnormal joint tissue metabolism, which leads to cartilage loss, bone remodeling, osteophyte formation, joint inflammation, and loss of normal joint function.
  - c. Risk factors
    - i. Modifiable: Previous joint injury, unhealthy levels of fat, muscle weakness
    - ii. Non-modifiable: sex, older age, and genetic factors or bone deformities
34. Identify exercise considerations for people with OA.

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- a. Osteoporotic bones are at risk for fractures
  - b. Minimize joint stress
35. What is Rheumatoid Arthritis? What is the pathophysiology?
- a. RA is an autoimmune disease where the immune system attacks one's own body.
  - b. A densely cellular membrane (pannus) spreads over the articular cartilage and erodes the underlying cartilage and bone. The bone becomes osteopenic, ligaments and tendons are damaged or ruptured, and surrounding musculature deteriorates leaving the joints unstable and prone to deformity.
36. What are some of the biggest barriers to exercise among people with arthritis? How would you address those barriers? Prescription considerations for people with arthritis.
- a. Stiffness, pain, fear, fatigue, flare-ups, medication side-effects
37. How do we employ exercise testing in the arthritic population?
- a. General exercise testing guidelines apply to both OA and RA
    - i. Pain may impair maximum voluntary muscle contraction
    - ii. Do not test during a flare
38. What are the components of an Injury Prevention Program?
- a. Dynamic warm-up
  - b. Physical preparation
  - c. Sport specific skills
  - d. Individual preparation
39. Identify evidence-based exercise programs for people with arthritis.
- a. Prep to play
  - b. FIFA 11+ and FIFA Kids
  - c. SOAR
  - d. Get Set
  - e. GLA:D
40. What are the RAMP principles?
- a. Raise – Increase muscle temperature, core temperature, blood flow, muscle elasticity and neural activation.
  - b. Activate – Engage the muscles in preparation for the upcoming session
  - c. Mobilize – Focus on movement patterns which will be used during the game.
  - d. Potentiate – Gradually increasing the stress on the body in preparation for the upcoming competition/session
41. What should we research when doing our homework on an unfamiliar disease or disability?
- a. Pathophysiology (what the disease/disability is and what causes it)

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- b. Other management strategies (like medication - how might their med affect their exercise program? Does it hinder or help?)
  - c. Exercise considerations/contraindications (is there anything we should NOT prescribe)
  - d. Guidelines for dose (FITT)
  - e. Evidence-based programs
  - f. Resources from reputable sources (clinician and patient - handouts, websites; so that the patient can figure out what they want to do for their health).
  - g. Colleagues with expertise (see what their opinions are!)
  - h. Other
42. What are some things we should be mindful of when considering a patient with Diabetes?
- a. Some have a very different experience with the healthcare system due to socioeconomic status, ability to speak the native language, etc.
  - b. Diabetes is a serious disease, but it does not necessarily imply that they are unhealthy.
  - c. Oftentimes someone with Diabetes may be overweight or obese, but we never want to assume that it's someone's choice to be overweight or obese.
43. What is Diabetes?
- a. Diabetes is defined as an elevated blood glucose (BG) concentration (i.e., hyperglycemia) resulting from defects in insulin release, action, or both (or, higher levels of glucose in the blood, chronically).
44. What are the signs and symptoms of Diabetes?
- a. More frequent urination; feeling tired; wounds taking longer to heal; blurry vision/eyesight
45. Define the 4 types of Diabetes.
- a. Type 1 Diabetes
  - b. Type 2 Diabetes
  - c. Gestational Diabetes
  - d. Other
46. Describe the pre diabetes stage of diabetes.
- a. Pre-diabetes is the stage before you actually develop diabetes. Individuals with pre-diabetes are at a very high risk of developing diabetes because the capacity of the beta cells to hyper-secrete insulin diminishes over time and becomes insufficient to restrain elevations in BG.
47. What are the benefits of regular exercise in those with Diabetes?
- a. Type 2 Diabetes:

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- i. May prevent diabetes-related health complications, insulin resistance, and Type 2 diabetes
    - ii. Improved glucose tolerance, increased insulin sensitivity, and decreased glycolated hemoglobin.
  - b. All:
    - i. Improvements in CVD risk factors and well-being
    - ii. Prevent or delay the transition to Type 2 Diabetes for individuals with prediabetes at high risk for developing the disease.
    - iii. Moderate intensity exercise totaling 150 mins/week is associated with reduced morbidity and mortality in observational studies.
- 48. Describe contraction induced glucose uptake.
  - a. With exercise, we can bypass the insulin receptor binding (which we know is a problem for type 2, and we don't have insulin whatsoever in type 1) and still get Glut 4 translocation into the cell membrane simply through contraction!
- 49. Exercise testing considerations for individuals with diabetes.
  - a. Use pre screening tools
  - b. ECG stress testing may be indicated
  - c. Silent ischemia in individuals with diabetes often goes undetected
- 50. What are the 2 biggest concerns we have as exercise professionals when working with someone with diabetes?
  - a. Hypoglycemia
  - b. Hyperglycemia
- 51. Define common types of cardiovascular disease (CVD).
  - a. CVD is an umbrella term that includes: hypertension, coronary heart disease, heart failure, coronary valvular disease, cerebrovascular disease, etc.; it includes but is not limited to atherosclerotic (ischemic) disease.
- 52. What is heart failure (HF)? What exercise training considerations are there for this population?
  - a. Chronic HF is characterized by exertional dyspnea and fatigue in the setting of reduced ejection fraction (i.e., systolic dysfunction), a preserved left ventricular ejection fraction (i.e., diastolic dysfunction), or a combination of the two.
  - b. Expect a reduced exercise capacity, and use an exercise protocol that starts at a lower work rate
- 53. Identify some procedures or medical devices that may be associated with individuals with CVD across a number of different populations.
  - a. Left Ventricular Assist Device

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- b. Sternotomy
  - c. Pacemaker
  - d. Implantable Cardioverter Defibrillator
  - e. Cardiac Transplantation
54. What are some general considerations for those with CVD?
- a. Should be concealed to identify abnormal signs and symptoms of exercise intolerance; attenuated HR from beta-blockers; depression

### KIN 335

#### Midterm - MC

1. What substrate possesses the most potential energy?
  - a. Glucose
  - b. Glycerol
  - c. Amino acids
  - d. Fatty acids**
2. Which anaerobic system changes occur with training:
  - a. Increased capacity to generate & tolerate high levels of blood lactate during all-out effort**
  - b. Decreased quantity & activity of the glycolytic phase of glucose metabolism
  - c. Reduced levels of anaerobic substrates
  - d. None of the above
3. Endurance training lowers blood lactate levels and extends exercise before onset of blood lactate accumulation during exercise of increasing intensity by:
  - a. Increasing the amount of O<sub>2</sub> in arterial blood
  - b. Increasing rate of lactate formation during exercise**
  - c. Decreasing rate of lactate clearance during exercise
  - d. Combined effects of decreasing lactate formation and increasing lactate removal
4. Producing high blood lactate levels during maximal exercise increases with specific sprint-power anaerobic training and decreases when training ceases due to:
  - a. Reduced motivation during training
  - b. Increased intramuscular glycogen stores with training**
  - c. Training-induced reductions in glycolytic-related enzymes
  - d. Higher O<sub>2</sub> in arterial blood
5. Which of the following does not augment lipase activation and subsequent lipolysis and free fatty acid mobilization from adipose tissue:
  - a. Epinephrine
  - b. Norepinephrine
  - c. Oxaloacetate**

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- d. Glucagon
  - e. Growth hormone
6. During maximum effort exercise (E.g. cycling, running), the rate of glycolysis is limited by:
- a. **Phosphofructokinase**
  - b. ATPase
  - c. Lipase
  - d. Glycogen synthase
7. Which enzyme catalyzes the following reaction of pyruvate → lactate:
- a. Pyruvate dehydrogenase
  - b. Pyruvate hydrogenase
  - c. **Lactate dehydrogenase**
  - d. Lactate hydrogenase
8. Following an extended period of aerobic training (E.g. 3 months), which of the following is an aerobic training adaptation that would facilitate the rate of aerobic metabolism when exercise begins:
- a. Increased reliance on amino acid metabolism
  - b. **A more rapid increase in muscle bioenergetics**
  - c. Reduced end-diastolic volume
  - d. A lower plasma volume
9. Regarding the citric acid cycle, which statement is false?
- a. FAD is involved in only one operation in the cycle
  - b. The formation of acetyl CoA from pyruvate is irreversible
  - c. **Oxygen participates directly in the reactions**
  - d. An acetyl group joins with oxaloacetate to produce citrate
10. With respect to Poiseuille's Law, which factor influences blood flow the most:
- a. Blood viscosity
  - b. **Vessel radius**
  - c. Vessel length
  - d. Gradient in pressure

Midterm - Short Answer

1. Name the 3 prerequisites for continual re-synthesis of ATP during coupled oxidative phosphorylation.
- a. Tissue availability of the reducing agent NADH or FADH<sub>2</sub>
  - b. Presence of oxidizing agent oxygen in the tissues
  - c. Sufficient concentration of enzymes and mitochondria to ensure that energy transfer reactions proceed at the appropriate rate
2. Name the 3 specific energy sources for fat catabolism.
- a. Triacylglycerols from the muscle mitochondria
  - b. Circulating triacylglycerols in lipoprotein complexes

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- c. Circulating free fatty acids mobilized from triacylglycerols in adipose tissue
3. Name the four key enzymes that help regulate glycolysis.
  - a. Hexokinase
  - b. Phosphorylase
  - c. Phosphofructokinase
  - d. Pyruvate kinase
4. Explain the difference between lactic acid vs. lactate.
  - a. Lactic acid is formed from anaerobic glycolysis, and quickly dissociates to release H<sup>+</sup>. The remaining compound binds with a positively-charged sodium or potassium ion to form lactate, an acid salt.

Midterm - Long Answer Essay

1. Compare and contrast the energy systems used by an athlete completing a 200 m running sprint (21 seconds) and another athlete competing in an ironman triathlon (9 hours; 3.8 km swim, 180 km cycle, 42 km run). Explain the difference with respect to ATP turnover, substrate utilization and the key physiological and biochemical features that permit energy turnover in each event.

Final - MC

1. Which of the following would NOT be considered part of the collective changes known as “the athlete’s heart”?
  - a. Increase in heart mass & volume
  - b. Reduced left ventricular end diastolic volume during rest and exercise**
  - c. Myocardial cell enlargement
  - d. Increased LV cavity
2. Which aspects of cardiovascular function decline as a function of aging (>65 y)?
  - a. Maximum cardiac output
  - b. Compliance of large arteries
  - c. Capillary muscle fibre ratio
  - d. All of the above**
3. Increase in blood’s oxygen-carrying capacity provides the most important longer-term adjustment to high altitude exposure. What factors account for this adaptation?
  - a. Initial decrease in plasma volume
  - b. Increase in erythrocytes and hemoglobin synthesis
  - c. The lactate paradox
  - d. A and B**

Final - Short answer

1. There are six mechanisms for how ergogenic aids might work. Name one.
  - a. Act as a central or peripheral nervous system stimulant
  - b. Increase storage and/or availability of limiting substrate
  - c. Act as a supplemental fuel source
  - d. Reduce or neutralize performance-inhibiting metabolic by-products

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- e. Facilitate recovery
- f. Enhance resistance training responsiveness
2. Three factors influence the total amount of sweat vaporized from the skin and pulmonary surfaces. Name one.
  - a. Surface exposed to the environment
  - b. Temperature and relative humidity of the ambient air
  - c. Convective air currents about the body

Final - Long answer

1. Summarize the potential mechanisms for impaired cardiac function during prolonged exercise.
2. Based on the in-class debate and reading regarding “live-high, train-low,” compare and contrast the physiological changes observed in short-term altitude exposure versus long-term altitude exposure.

**400-Level Courses**

**KIN 411**

Midterm 1:

1. What are the different planes?
  - a. Horizontal, Coronal, Sagittal
2. What are the different orientations?
  - a. Absolute terms: Superior = Above; Inferior = Below; Anterior = Front; Posterior = Behind
  - b. Relative terms: Venter = Towards the belly; Dorsal = Towards the back; Rostral = Towards the nose or beak; Caudal = Towards the tail
  - c. Above the midbrain: Anterior = Rostral; Posterior = Caudal; Superior = Dorsal; Inferior = Ventral
  - d. In or below the midbrain: Anterior = Ventral; Posterior = Dorsal; Superior = Rostral; Inferior = Caudal
3. Describe the organization of the human nervous system.
  - a. Understand the CNS and PNS
4. Describe the anatomy of a neuron.
  - a. Cell body, nucleus, dendrites, axon, myelin sheath, axon terminals
5. What are the 3 different kinds of connections within the brain?
  - a. Projection fibers, commissural fibers, association fibers
6. Describe the anatomy of the brain.

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- a. Cerebral cortex; major lobes (frontal, temporal, occipital, parietal); landmarks (interhemispheric fissure, central sulcus, pre and post central gyrus, lateral sulcus, parietal-occipital sulcus, cingulate sulcus and gyrus)
7. Describe the anatomy of the central structures of the brain (the thalamus and brainstem).
  - a. Thalamus, interthalamic adhesions, brainstem - midbrain, pons, medulla, cervicomedullary junction
8. Describe how the inferior portions of the brain align with it's "carrying case".
  - a. Foramen magnum, anterior fossa, middle fossa, posterior fossa
9. What are the protective layers of the brain?
  - a. Skin/scalp, skull, dura mater, arachnoid mater, pia mater
10. What is a herniation? How do the meningeal layers play a role here?
  - a. A herniation occurs when the brain is displaced/pushed/squished under or around these meningeal layers, and goes where it's not supposed to
  - b. Understand the difference between a subfalcine herniation and an uncocal transtentorial herniation
11. What is cerebrospinal fluid (CSF)? How is it created? Where is it found? What is its purpose?
  - a. Created by choroid plexus; spreads throughout the CNS in the subarachnoid space and out via venous sinus systems; key functions - protection, removing waste, buoyancy, nutrient and hormone transport
12. What is the ventricular system in the brain?
  - a. Lateral ventricles, interventricular foramina of munro, third ventricle, cerebral aqueduct, fourth ventricle, foramen of magendie, foramen of luschka, central canal
13. Describe the basic anatomy of the SC.
  - a. Know how many nerves and vertebrae there are for each section
  - b. Know what the conus medullaris, filum terminale, and cauda equina are
  - c. Know where grey and white matter is in the SC, along with how to identify the ventral and dorsal sides
14. Where do spinal nerves exit?
  - a. C1 to C7 nerves come out above their same numbered vertebrae
  - b. C8 and all nerves inferior to C8 come out below their same numbered vertebrae
15. Identify the clinically significant nerve roots and their myotomes.
  - a. All the shoulder muscles (e.g., deltoids) receive innervation from the C5 spinal cord segment/nerve

- b. All of the elbow flexors (e.g., biceps brachii) receive innervation from both the C5 and C6 spinal cord segment/nerves
  - c. All of the wrist extensors receive innervation from the C6 spinal segment/nerve
  - d. All of the elbow extensors (e.g., triceps) receive innervation from the C7 spinal segment.
  - e. L4 spinal segment/nerve innervates the muscles for knee extensors (e.g., quadriceps)
  - f. L5 spinal segments/nerve innervate the muscles that dorsiflex the foot (e.g. tibialis anterior)
  - g. S1 spinal segments/nerve innervate the muscles that plantarflex the foot (e.g. soleus, gastrocnemius)
16. What is a lower motor neuron? Why is it called the ‘Final Common Pathway’?
- a. A LMN is any motor neuron found in the SC that projects out via the ventral roots through the spinal nerve and eventually innervates the muscle directly.
  - b. It is called the final common pathway because it is the last communication between the CNS and the muscle.
17. What symptoms do we see in LMN lesions?
- a. Muscle weakness, fasciculations, atrophy, decreased reflexes, decreased tone
18. What is “Foot Drop”?
- a. Occurs when we have LMN lesions that are affecting the L5 nerve/spinal segment
  - b. 3 key features:
    - i. Excessive flexion of the knee in swing (ipsilateral to the injury)
    - ii. Lack of ankle dorsiflexion in swing (ipsilateral to the injury)
    - iii. Foot lands toe first and set down carefully
19. What are the causes or mechanisms of a LMN lesion?
- a. An injury or disease that affects any of the...
    - i. Motor nuclei in the anterior horn of the gray matter
    - ii. Ventral nerve roots (“radiculopathy”)
    - iii. Spinal nerves
20. What are upper motor neurons?
- a. Upper motor neurons have their cell bodies located up in the cortex of the brain, and those MNs have axons that project down through the brain, brain stem, and continue to travel down through the columns of white matter to synapse onto cell bodies of LMNs
21. Outline the neuroanatomical names for the bundles of white matter as they travel through the brain and brainstem (via the corticospinal tracts).

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- a. Corona radiata, internal capsule, basis pedunculi, pyramids
22. Describe the 2 corticospinal tracts.
- a. Lateral Corticospinal Tract
    - i. Function: Primarily controls distal muscles of the hands and feet on the contralateral side
    - ii. Originates in the primary motor cortex (mostly, also parts of the frontal and parietal lobes) → corona radiata → posterior limb of the internal capsule → basis pedunculi → pyramids → at the medulla, crosses the midline through the pyramidal decussation at the cervicomedullary junction → enters the SC → travels through the lateral column of the SC on the contralateral side until it gets to the level it will innervate → enters the gray matter and synapses onto a LMN
  - b. Anterior Corticospinal Tract
    - i. Function: Primarily controls bilateral axial muscles and girdle muscles
    - ii. Route: Originates in the primary motor cortex (and its supplementary motor area) → corona radiata → posterior limb of the internal capsule → basis pedunculi → pyramids → enters the SC on the ipsilateral side → travels down the SC in the anterior column → bifurcates (via the anterior commissure) at the level it innervates → enters the gray matter and innervates the cell bodies on both the ipsilateral and contralateral side of the SC (sometimes it doesn't bifurcate because we can control just one side of these muscles)
23. Describe the corticobulbar tract.
- a. Function: Controls muscles used for facial expression
  - b. UMNs originate in the face region of the primary motor cortex (more lateral aspect) bilaterally for muscles above the eyes, and contralaterally for muscles below the eyes → to the pons in the brainstem → UMNs synapse on LMNs that project out to muscles that control facial expression (facial nuclei that extend out as the facial nerve/cranial nerve VII/7); LMNs project out ipsilaterally from the pons → branches off to the lower part of the face and the upper part of the face
  - c. Symptoms will present differently depending on whether it is an UMN or LMN lesion
24. Describe the somatotopic organization of the corticospinal and corticobulbar tracts.
- a. Understand how the tracts twist and know where different axons enter into the grey matter and synapse onto LMN in the SC
25. Describe the rubrospinal tract

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- a. Function: Promotes arm flexion and inhibits arm extension
  - b. Route: Red nucleus in midbrain → Immediately crosses the midline at the level of the midbrain (in the ventral tegmental decussation) → travels down on the contralateral side through the pons and medulla and then into the lateral column of the SC. They enter into the gray matter and synapse on the LMNs at the level they innervate.
26. Describe the reticulospinal tract
- a. Function: Automatic posture and gait-related movements, modulating different reflexes, triggering the startle-reflex response
  - b. Route: pontine/medullary reticular formation → travels ipsilaterally down the SC → acts on the entire SC.
27. Describe the vestibulospinal tract
- a. Function:
    - i. Medial VST: Axial reflexes and control of the neck, trunk and head (axial) muscles
    - ii. Lateral VST: Facilitates extensor muscle tone in the arms and legs; extra excitation to the LMNs that act on the arm/leg extensors
  - b. Route:
    - i. Medial VST: medial/inferior vestibular nuclei → bifurcates → travels down the medial part of the anterior column → synapses on the LMNs of the proximal/axial muscles of the neck and trunk
    - ii. Lateral VST: lateral vestibular nucleus → projects ipsilaterally down to the SC → synapses throughout the SC on many LMNs, primarily of the distal limbs
28. Describe the tectospinal tract
- a. Function: Involved in relating visual information to controlling movement
  - b. Route: Originates from the superior colliculus (there is an area high up in the midbrain called the tectum, part of that area is called the superior colliculus) and projects down to the SC
29. What are the causes or mechanisms of an UMN lesion?
- a. An injury or disease influencing...
    - i. Upper motor nuclei in the motor cortex
    - ii. Axons descending through brain, brainstem or SC
30. What are the symptoms of an UMN lesion?
- a. Muscle weakness, increased muscle reflexes, increased muscle tone, positive babinski sign



31. Describe Hemiplegic Gait?
  - a. Key features: abnormal arm swing, abnormal swing phase of extended leg, hip hiking
32. What are the 2 diseases that affect the UMNs?
  - a. Primary lateral sclerosis, amyotrophic lateral sclerosis

Midterm 2:

1. What are the 5 types or modalities of sensory input?
  - a. Proprioception, touch information, vibration, pain, temperature
2. What are dermatomes? Where are they globally located? Name the clinically significant dermatomes.
  - a. Dermatomes refer to cutaneous regions or sensory regions of the body that are associated with a specific spinal segment
  - b. Global regions of dermatomes:
    - i. Face → Brainstem via the trigeminal nerve
    - ii. Upper region of the arms, plus the neck, shoulders and back of the head → Cervical SC
    - iii. Lower region of the arms, trunk/thoracic region → Thoracic SC
    - iv. Front and side of the hips/waist and legs → Lumbar SC
    - v. Back of the legs, glutes, heels, and bottoms of feet → Sacral SC
  - c. Clinically significant dermatomes
    - i. C5 = Delts/shoulder, upper part of upper arm
    - ii. C6 = Upper half of lower arm (forearm)
    - iii. C7 and C8 = Hand
    - iv. T4 = Horizontal line across nipple region
    - v. T10 = Horizontal line across belly button
    - vi. L2 = Front/lateral thigh
    - vii. L3 = Knee region
    - viii. L4 = Medial lower leg
    - ix. L5 = Lateral lower leg
    - x. S1 = Achilles heel
3. What are the 2 main ascending pathways?
  - a. Posterior Column-Medial Lemniscus Pathway (PCML Pathway)
    - i. Function: Carries information regarding vibration, proprioception, and light touch

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- ii. Understand the route of the primary, secondary, and third order sensory neurons
- b. Antero-Lateral Pathway (AL Pathway)
  - i. Function: Carries information regarding pain, temperature, and crude touch
  - ii. 3 smaller subsections of the AL pathway
    - 1. Spinothalamic tract
    - 2. Spinoreticular tract
    - 3. Spinomesencephalic tract
- 4. Where is the primary somatosensory cortex?
  - a. The primary somatosensory cortex is located posterior to the central sulcus
- 5. Describe the symptoms associated with damage to the PCML pathway.
  - a. Loss of proprioceptive input or a loss of position sense; Loss of vibration sensation; Loss of light or discriminatory touch sensation; Complex symptoms associated with loss of proprioception/light touch information - astereognosis and sensory ataxia; loss of deep tendon reflexes (if there is damage to the primary sensory neuron); paresthesia; radicular pain (if there is damage to the primary sensory neuron)
- 6. Describe Tabetic (Ataxic) Gait
  - a. Abnormal gait associated with damage to the PCML pathway respective to the legs.
    - i. Very unsteady and uncoordinated
    - ii. Normal strength allows the foot to dorsiflex and be placed heel to toe, but we have no sensation guiding the movement of the foot during the swing/landing phases
      - 1. Excessive knee/hip flexion; foot slaps onto the ground; knee locks during stance
- 7. Describe the symptoms associated with damage to the spinothalamic (AL) pathway.
  - a. Loss of pain sensation; Loss of temperature sensation; Loss of deep touch (crude or deep pressure) sensation; Hyperpathia; Allodynia; Radicular Pain (if there is damage to the primary sensory neuron)
- 8. Describe the trigeminal nuclei
  - a. Mesencephalic Trigeminal Nucleus
    - i. Sits within the midbrain
    - ii. Responsible for processing proprioceptive information from mainly the jaw and teeth

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- b. Chief Trigeminal Sensory Nucleus
    - i. Sits at the level of the pons
    - ii. Responsible for processing fine or light touch sensations
  - c. Spinal Trigeminal Nucleus
    - i. A long nucleus; its cell bodies are found in the caudal medulla and extend all the way down into the upper cervical regions of the SC
    - ii. Responsible for processing crude touch, pain, and temperature information
9. Describe the symptoms associated with damage to the sensory inputs from the face.
- a. Damage to the facial region of the somatosensory cortex → Loss of pain, temperature, and touch information on the contralateral side of the face
  - b. Damage to the brainstem → Loss of sensory information on the ipsilateral side of the face
  - c. Negative symptoms related to a loss of touch, pain, and temperature information for the facial regions, along with positive symptoms.
10. Describe the 5 different spinal cord syndromes and how they present.
- a. Transverse cord lesion
  - b. Central cord syndrome
  - c. Posterior cord syndrome
  - d. Anterior cord syndrome
  - e. Hemicord lesion
11. Describe other sensory disorders that are known to affect sensory function.
- a. Herpes zoster / shingles
  - b. Tabes dorsalis
12. What is neuropathy? What are the types of neuropathies?
- a. Neuropathy = A general term for a nerve disorder.
  - b. Diabetic neuropathy; overdose of pyridoxine; ganglionopathies; polyneuritis
13. What is the vestibular system? Describe where the vestibular system is found.
- a. The vestibular system is a sensory system we use in everyday functions - it is critical for balance, locomotion, proprioception, and how we move through space.
  - b. The vestibular system is part of the inner ear, and the inner ear is found deep within the petrous ridge (the border separating the middle fossa from the posterior fossa) of the temporal bone
  - c. 3 parts - outer ear, middle ear, and inner ear
14. Describe the anatomy of the vestibular system.

- a. Otolith organs - the utricle and saccule; the macula - otolithic membrane, otoconia, hair cells; kinocilia and stereocilia; 3 semicircular canals - anterior, posterior and horizontal with ampullae and endolymph fluid; crista ampullaris
15. Describe how the vestibular system codes for head movement within the semicircular canals.
- a. Angular acceleration or rotation of the head causes endolymph fluid to lag behind (due to inertia)
    - i. If the stereocilia moves towards the kinocilia, the hair cell will depolarize and increase its firing rate (excitation)
    - ii. If the stereocilia moves away from the kinocilia, the hair cell will hyperpolarize and decrease its firing rate (inhibition)
16. Describe how the vestibular system codes for head movement within the otolith organs.
- a. Otolith organs can detect linear acceleration and orientation of the head relative to gravity. Both will pull on the heavier mass of the otoconia, while will pull the gelatinous material or the otolithic membrane in one direction, causing the cilia of the hair cells to deflect.
17. Describe the vestibular sensory neurons and their pathways.
- a. Vestibular nuclei
    - i. Lateral Vestibular Nucleus (LVN)
    - ii. Medial Vestibular Nucleus (MVN)
    - iii. Superior Vestibular Nucleus (SVN)
    - iv. Inferior Vestibular Nucleus (IVN)
  - b. Vestibular Pathways
    - i. Lateral Vestibulospinal Tract (LVST)
    - ii. Medial Vestibulospinal Tract (MVST)
    - iii. Medial Longitudinal Fasciculus (MLF)
    - iv. Cortex via thalamus
    - v. Reciprocal projections with the cerebellum
18. Describe the vestibulo-ocular reflex (VOR).
- a. VOR allows your gaze to be maintained on a target by rapidly adjusting the eye reflexively opposite to the direction of your head acceleration
19. Describe the difference between a peripheral/central vestibular lesion. How can we test if someone has a peripheral/central lesion?
- a. Peripheral = Damage to the labyrinths/primary vestibular sensory neuron; Central = Damage to the vestibular nuclei, the pathways projecting from the vestibular nuclei to the brainstem/thalamus/cerebellum/SC

- b. VOR test or opto-kinetic reflex
20. What is a unilateral vestibular lesion? Describe the symptoms, tests, and causes.
- a. A unilateral vestibular lesion refers to damage only on one side or to only one of the vestibular systems.
  - b. The symptoms include: vertigo, nausea, and postural instability.
  - c. Tests: abnormal VOR, abnormal VEMPs
  - d. Causes: tumors; vestibular neuritis; surgery; meniere's disease; perilymph fistula; Benign Paroxysmal Peripheral Nystagmus or Benign Paroxysmal Peripheral Vertigo
21. What is bilateral vestibular loss? Describe the symptoms and causes
- a. Bilateral vestibular loss (BVL) is when you have a complete loss of vestibular function on both sides. This is very rare; unilateral is much more common
  - b. Symptoms: postural instability and blurry vision when moving and fixating on an object
  - c. Causes: Ototoxic Medication (gentamicin); Meningitis; Meniere's Disease
22. What is association cortex? What are the types of association cortex?
- a. Unimodal Cortex:
    - i. Found adjacent to the corresponding primary area
    - ii. Purpose of a more complex assessment of the information being received by its respective primary cortical area.
  - b. Multimodal or Heteromodal Association Cortex:
    - i. Found adjacent to unimodal cortices from multiple sensations
    - ii. Purpose of integrating several sensory modalities
23. Describe the motor association cortex generally.
- a. The motor association cortex is located anterior to the primary motor cortex and is made up of the premotor cortex (PMC) and the supplementary motor area (SMA).
  - b. The motor-association cortex is responsible for a higher level of processing for motor planning and formulating motor programs of complex movements.
24. Describe the role of the premotor cortex of the motor-association cortex.
- a. Planning and coordinating activity of muscles and movements of multiple joints within a single limb; Preparing the onset of voluntary movements
25. Describe the role of the supplementary motor area of the motor-association cortex.
- a. Programming complex sequences of movement that require coordination between multiple joints (like in the hand) within a single limb; Coordinating bilateral movements on both sides of the body
26. Describe the Somatosensory Association Cortex.

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- a. Responsible for higher-level processing of somatosensory input; to take all the information from the different parts of the body received from the primary somatosensory cortex and add some more interpretation of that information - put the elements together as a greater whole.
27. What might we see if there is damage to the somatosensory association cortex?
- a. Agnosia

Final:

1. What are multimodal or heteromodal association areas?
  - a. Multimodal or heteromodal association areas pull together multiple sensory inputs and provide a higher level of processing integration and understanding of your environment based on all the information coming in from the different sensory areas.
2. Describe the asymmetry of the multimodal association areas.
  - a. Some areas in the brain, primarily these higher association areas, have an asymmetry in the function between one side of the brain and the other. This creates functional specializations between the left and right hemispheres. Primary and unimodal association areas are represented bilaterally.
3. Describe what Apraxia is.
  - a. Apraxia = a loss of the ability to do skilled motor formulation or perform complex sequences of movements.
4. Describe what hemispatial neglect (or hemineglect) is.
  - a. Hemispatial Neglect = An inability to attend to sensory information on the contralateral side of the body.
5. Describe what Alien Hand is.
  - a. This is a symptom involved in damage to the non-dominant hemisphere (right), particularly when it involves the supplementary motor area (SMA) on the non-dominant side, or when there is damage to the corpus callosum.
  - b. Because you are damaging the right hemisphere, symptoms will present on the left side. This often presents in the hand (some evidence of it also occurring in the leg) and is described as if someone else is controlling that hand.
6. Describe the anatomy of the cerebellum.
  - a. Know the location, lobes, functional regions, and cerebellar nuclei
7. Describe how the cerebellum is connected to and communicates with the brain stem.
  - a. All of the information carried to and from the cerebellum travels through the large tracts of white matter called the cerebellar peduncles (CP).

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8. Describe the 3 key input pathways that send information to the cerebellum.
  - a. Pontocerebellar pathway
  - b. Spinocerebellar pathways
  - c. Vestibular inputs
9. Describe the main cerebellar output pathways from the cerebellum and their functions.
  - a. Lateral Hemispheres
    - i. Function: the lateral region of the cerebellum is involved in higher-level motor planning and motor learning
  - b. Intermediate Hemispheres
    - i. Function: the intermediate region helps coordinate ongoing movements of the distal limbs.
  - c. Vermis
    - i. Function: Involved in controlling coordination of the trunk, neck, and more proximal parts of the limbs via the ACST.
  - d. Inferior Vermis and Flocculo-Nodular Lobe
    - i. Function: The F-N Lobe has a sole output to the vestibular nuclei giving it an important role in controlling and modulating balance reflexes, including modulating VOR via the medial longitudinal fasciculus (MLF ascending pathway).
10. Describe the somatotopic organization of the cerebellum.
  - a. In the posterior lobe, in the intermediate zone, the head is the most superior/anterior, followed by the arms, and the legs are the most inferior/posterior.
  - b. In the anterior lobe (above the primary fissure), the head is the most inferior, followed by the arms, and the legs are most superior.
11. Describe the general role of the cerebellum.
  - a. The general role of the cerebellum is to act as a comparator.
    - i. It receives corollary discharge and external feedback
12. Describe what the “double crossover” is.
  - a. When we have a cerebellar lesion or damage, the symptoms associated with the injury (particularly to the intermediate zone, because it has control over the limbs) will present on the ipsilateral side to the injury in the cerebellum. This is due to the “double crossover” that occurs when we consider where the cerebellum receives its motor information, where it is projecting back to, and which pathways it is eventually controlling.

13. Describe what symptoms will present when there is damage to the intermediate hemisphere of the cerebellum.
  - a. Pendular reflexes, ataxia
14. Describe what symptoms will present when there is damage to the midline of the cerebellum.
  - a. Truncal ataxia, ataxic gait
15. Describe what symptoms will present when there is damage to the flocculo-nodular lobe of the cerebellum.
  - a. Instability when standing and walking, difficulty with visual tracking of moving objects
16. Describe the anatomy of the basal ganglia
  - a. 5 interconnected nuclei - caudate, globus pallidus, putamen, subthalamic nucleus, substantia nigra - Substantia Nigra Pars Reticulata / Substantia Nigra Pars Compacta
17. Describe the cortical inputs to the basal ganglia.
  - a. The primary input to the basal ganglia is from the cortex
    - i. The different types of information from the cortex can be divided into 4 major modalities/channels:
      1. Movement or motor function channels involve areas like the somatosensory cortex, primary motor cortex, and the premotor cortex
      2. Oculomotor function or movements of the eye channel receives input from the posterior parietal cortex and the prefrontal cortex, and projects to the caudate (body)
      3. Prefrontal channel or the function of cognitive control/higher-level cognitive functions receives input from the posterior parietal cortex and the premotor cortex and projects to the caudate (head)
      4. Limbic channel or emotional function receives input from the temporal cortex, hippocampus, and the amygdala, and projects to both the caudate and the putamen
    - b. Another key input to the striatum comes from the thalamus
    - c. The third major input comes from the SNc.
18. Describe the outputs from the basal ganglia.
  - a. The outputs from the basal ganglia come from the GPi, which projects to: the thalamus on the ipsilateral side; the reticular formation (reticulospinal tract); and



- the superior colliculus (an area responsible for controlling eye movements - the tectospinal tract).
- b. Another major output from the basal ganglia is the SNr, which projects to the same 3 areas
19. How does the basal ganglia process the information it receives?
- a. Direct Pathway
  - b. Indirect Pathway
  - c. Consider the effect of dopamine on the direct/indirect pathways
20. What are the functions of the basal ganglia?
- a. In general, the basal ganglia adds reinforcement and contributes to the facilitation of triggering the intended movements, along with ensuring that the ongoing amplitude and speed of the movements is at the right level.
    - i. Affects contralateral movements
    - ii. “Go” signal for internally triggered movement
    - iii. Predictive control over movement
21. Describe what Parkinson’s Disease (PD) is and how it relates to the basal ganglia.
- a. PD is one of the most common disorders that involves the basal ganglia.
  - b. Mechanism: Caused by the degeneration of dopaminergic neurons in the Substantia Nigra pars compacta (SNc).
22. What are the treatments for PD?
- a. Drug replacement of dopamine (Levodopa / Levodopa or L-dopa)
  - b. Surgical removal of the basal ganglia nuclei
  - c. Deep Brain Stimulation
  - d. Replacing deteriorated cells in the SNc with cells that can produce dopamine
23. What is Huntington’s Disease (HD) and how does it relate to the basal ganglia?
- a. This is a known genetic disorder; an autosomal dominant gene is affected - this means that if one parent has the gene, the child is 50% likely to develop the disease; if both patients have the gene, then the child has a 100% likelihood of having the disease
  - b. Mechanism: HD involves a degeneration of the striatum cells relative to the indirect pathway.
24. How do we rank movement disorders by movement speed?
- a. Continuum of Hypokinesia (movements are absent or slow) - Hyperkinesia (movements are very fast and reactive):
    - i. Bradykinesia (Hypokinesia)
    - ii. Rigidity

- iii. Dystonia
- iv. Athetosis
- v. Chorea
- vi. Ballismus
- vii. Tics
- viii. Myoclonus
- ix. Tremor (Hyperkinesia)

25. What is Athetosis?

- a. Athetosis is a symptom that sits on the border and shows elements of dystonia – the unwanted sustained tonic posturing of the joint, and chorea – the writhing, fidgeting movements of the joint.

26. What is Hemiballismus?

- a. On the more hyperkinetic spectrum, we have hemiballismus – this is often caused by damage (strokes or injuries) due to the subthalamic nucleus. We've completely damaged the indirect pathway, and there is significant direct pathway that causes excessive movement that is involuntary and very fast – almost violent or ballistic

27. What is Tourette's Syndrome and how does it relate to the basal ganglia?

- a. 2 potential mechanisms: Both involve excessive dopamine effects on the striatal cells; resulting in excessive excitation of the direct pathway and too much inhibition of the indirect pathway → unwanted, unintended, fast movements.

28. Describe the anatomy of the vascular supply of blood to the brain.

- a. Aorta →
  - i. R Brachiocephalic Artery
    - 1. R Common Carotid Artery (see below\*)
    - 2. R Subclavian Artery (see below\*\*)
  - ii. R\*/L Common Carotid Artery
    - 1. R/L External Carotid Artery → blood supply to the external head and face
    - 2. R/L Internal Carotid Artery → continues to project upwards through the Carotid Foramen in the base of the skull
      - a. R/L Anterior Cerebral Artery (ACA) → travels along the interhemispheric fissure
        - i. Anterior Communicating Artery (connects the R/L ACAs)
      - b. R/L Middle Cerebral Artery (MCA)
  - iii. R\*\*/L Subclavian Artery

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1. R/L Vertebral Artery → travels up through the Foramina Transversaria (the small openings in the vertebral processes of each of the vertebrae) until they get to the top of the vertebrae, travel along the ventral medulla, when they enter into the base of the skull through the large foramen magnum and join together to form the...
    - a. Basilar Artery → travels along the ventral pons, several branches wrap around the pons and go to the cerebellum (cerebellar arteries)
      - i. R/L Posterior Cerebral Artery (PCA)
        1. R/L Posterior Communicating Artery (connects the PCA to the Internal Carotid Artery, creating the Circle of Willis)
    - b. Arteries in the subarachnoid space
      - i. ACA
      - ii. PCA
      - iii. MCA
        1. Superior division
        2. Inferior division
        3. Deep branch division
29. Describe the anatomy of the venous system in the brain.
- a. Blood is brought to areas of the brain by the arteries → it's used by the brain → used blood exits via the small veins → dump blood into larger veins that run through the subarachnoid space → small bridging veins that project through the arachnoid layer and meningeal layer of the dura and dump venous blood into the large venous sinuses (superior sagittal, inferior sagittal, transverse)
30. How do vascular injuries occur?
- a. Blocking or occluding the artery that is carrying the arterial blood to the brain
    - i. Development of Thrombosis
    - ii. Embolism
  - b. A hemorrhage or brain bleed
    - i. Trauma
    - ii. Aneurysm

### **KIN 420**

Midterm Questions:

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1. Be aware of relevant foot and ankle anatomy
2. What is the difference between patient-oriented outcome measures and disease-oriented outcome measures?
  - a. Patient-oriented = tend to be self-reported by the patient; more holistic
  - b. Disease-oriented = objective measures; do not necessarily reflect changes in health status
3. What are the 2 evaluation templates?
  - a. SOAP
  - b. HOPS
4. What are the aspects of a physical examination?
  - a. Inspection
  - b. Palpation
  - c. Range of motion
  - d. Strength Testing/Power
  - e. Special Tests
  - f. Neurovascular exam
5. What has RICE been replaced with in recent years?
  - a. POLICE
  - b. PEACE & LOVE
6. What are the Ottawa Ankle Rules?
  - a. Use these rules to determine whether the injury can be treated at home or if it requires imaging
7. Know the MOI, risk factors, special tests, signs and symptoms, treatment, RTP, and other potential diagnoses for the following: Lateral Ankle Sprain; Medial Ankle Sprain; Ankle Dislocation; High Ankle Sprain; Plantar Fasciopathy; Turf Toe; Lisfranc Injuries; MTP joint injury; Hallux valgus; Fractures
8. Know the relevant knee and lower leg anatomy
9. Know the MOI, risk factors, special tests, signs and symptoms, treatment, RTP, and other potential diagnoses for the following: ACL injuries; MCL injuries; patellar dislocation; patellar tendon rupture; meniscus injuries; chronic knee pain; patellar tendinopathy; patellofemoral pain syndrome; achilles tendon injuries; medial tibial stress syndrome; chronic exertional compartment syndrome; tibial stress fracture; anterior tibial stress fracture
10. Know the relevant hamstring anatomy

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11. Know the MOI, risk factors, grades, diagnosis, differential diagnosis, acute injury management, subacute management, and prevention methods for hamstring injuries/strains.
12. Know the relevant pelvic/hip anatomy
13. Know the MOI, risk factors, special tests, signs and symptoms, treatment, RTP, and other potential diagnoses for the following: Femoral stress fracture, femoroacetabular impingement, tears to the labrum, pubic bone stress,
14. Know the relevant low back anatomy
15. Know the MOI, risk factors, special tests, signs and symptoms, treatment, RTP, and other potential diagnoses for the following: Low back pain, acute low back pain, acute low back pain (with and without radicular pain), and fractures.
16. Know the relevant elbow anatomy
17. Know the MOI, risk factors, special tests, signs and symptoms, treatment, RTP, and other potential diagnoses for the following: Lateral elbow pain, medial elbow pain, elbow dislocations, UCL injuries, ulnar nerve injury.

Final Questions:

1. Know the difference between the sensitivity and specificity of special tests
2. Be aware of injury relevant hand anatomy
3. Know the MOI, sx's, prevention practices, and treatment for an A2 Pulley Injury, Mallet Finger, Skier's/Gamekeeper's Thumb, Stener Lesion, Boxer's Fx
4. How do you take a Hx of the shoulder?
5. How do you take a physical exam of the shoulder?
6. What are the 3 special tests for shoulder impingement?
7. What is the special test for the AC joint?
8. What are the special tests for shoulder instability?
9. What special test did we learn about for the labrum?
10. What is the special test for scapular dyskinesis?
11. Identify the movements to assess shoulder ROM.
12. Be aware of injury relevant shoulder anatomy
13. Know the MOI, sx's, criteria for diagnosis, and treatment for an AC Joint Separation, Shoulder Dislocation, Rotator Cuff Tendinopathy, Scapular Dyskinesis, Scapular Winging, Labral Tears of the Shoulder
14. Know the 2 bony injuries that are commonly seen with a shoulder dislocation
15. Know what Shoulder Impingement is and the types often associated with RCT
16. Know how we test the strength of the rotator cuff muscles

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17. Discuss the normal movements that occur at the scapula and scapulohumeral rhythm
18. Know what the Thrower's 10 Program is
19. What is a therapeutic modality? What are the types of modalities?
20. Why do we use therapeutic modalities?
21. How do we choose a therapeutic modality?
22. What are the basics/principles of orthopedic injury rehabilitation?
23. What are the goals of rehabilitation? Which modalities target each goal?
24. Know how to distinguish between inflammation, swelling, and edema.
25. Describe the basic inflammatory reaction
26. What is the secondary injury model?
27. What is chronic inflammation?
28. Describe the experience of DOMS, the proposed theories for why it occurs, and its relation to injury risk.
29. Describe Thermotherapy in greater detail (define, types, use, contraindications).
30. Describe Cryotherapy in greater detail (define, types, use, contraindications).
31. What is a muscle spasm?
32. What are contrast baths?
33. What are the 2 primary methods of recovery cryotherapy? Is recovery cryotherapy beneficial?
34. What modality should we use in the subacute injury stage?
35. How do we care for chronic pain?
36. What are lymphedema pumps?
37. What is a therapeutic ultrasound?
38. What are the treatment parameters for ultrasound use?
39. Outline the effects of thermal ultrasound treatment versus nonthermal ultrasound treatment.
40. How does the ultrasound exert nonthermal/mechanical effects?
41. What is TENS?
42. Describe the following manual therapies: therapeutic massage, bodywork, and somatic therapy.
43. What is the difference between a "concussion" and "mild traumatic brain injury"?
44. Identify the MOIs for concussions.
45. What is the pathophysiology of a concussion?
46. How do we diagnose a concussion?
47. How does a concussion typically present?
48. How do we quantify concussions? / How do we measure the mechanics of a concussion?

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49. How do we assess concussions?
50. What concussion signs indicate that we should remove an athlete from play?
51. Describe RTP/RTS protocols after sustaining a concussion.
52. Describe some of the “new developments” in concussion research.
53. Know the injury relevant neck anatomy.
54. Know the MOI, sx/s, criteria for diagnosis, and treatment for a Brachial Plexus Injury, Thoracic Outlet Syndrome, Acceleration-Deceleration Injury, Cervical Spine Injury, Intracranial Hemorrhage
55. Outline how to do a Nerve Root Exam
56. Know the injury relevant brain anatomy
57. Describe the 2 types of severe head injuries
58. Know what the long-term athlete development model is
59. What is the difference between specialization and sampling?
60. How do we avoid burnout? Define physical literacy.
61. What are the musculoskeletal differences between adults and children?
62. What are the 4 stages of overuse injuries (from most acute to most severe)
63. How do we manage overuse injuries?
64. Know what apophysitis is and types of apophysitis. How are these injuries managed?
65. Know what growth plate injuries are and how we treat them
66. How do we generally prevent pediatric injuries?
67. What is the FIFA 11+ Program?
68. Is resistance training safe for children and adolescents?
69. What are the leading causes of sudden death in sport? How do we recognize, treat, and prevent them?
70. What issues do we see in the management of asthma?
71. Diabetic individuals can also experience a hyperglycemic (high blood sugar) event. What are the signs/sxs and causes?
72. What should you do in a diabetic emergency (decision tree)?
73. What is sickle cell disease/trait? How do you get it? How prevalent is it? What can cause death?
74. Describe the debate around mandatory screening for SCT in the NCAA.
75. How do we cool the body during exercise in the heat?
76. What is the protocol for heat acclimatization in football?
77. Know the injury relevant anatomy of the heart
78. What are the causes of sudden cardiac death?
79. Define HCM. Describe the detection, prevalence, and risk characteristics.

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80. Describe the important aspects of an EAP and its importance. Describe the importance/prevalence of AEDs as well.

### **KIN 424**

#### Midterm Guiding Study Questions:

1. What is EBP? Why is it important?
2. Understand the hierarchy of evidence.
3. How do we characterize a study?
4. Understand the different study designs (RCT; Case-Control; Cohort; Cross-sectional survey; Meta-analysis)
5. Understand different sources of bias and provide an example of each (selection, measurement, interviewer, response, referral, and reporting).
6. Understand sensitivity and specificity, know how to calculate them.
7. What are the weaknesses in Sport Science Research?
8. Understand the difference between surrogate and meaningful outcomes.
9. Understand and describe the significant decrease in aerobic capacity at altitude
10. Be aware of Altitude Illness Syndromes
11. How do we prevent/treat altitude illnesses?
12. Discuss some other health effects that are important to consider at altitude.
13. How do we optimize sleep?
14. Describe the different pre-acclimatization strategies
15. Differentiate between asthma and exercise-induced bronchospasm (EIB)
16. Define an approach to the treatment of EIB and discuss the doping related considerations
17. Differentiate between EIB and other key conditions causing dyspnoea during exercise including EILO and Pulmonary embolism
18. Explain different modes of heat loss during exercise
19. Describe the key elements of diagnosing thermal illness and injury (Heat Stroke/Heat Exhaustion; Hyponatremia; Hypothermia; Frostbite).
20. Understand acclimatization to both heat and cold.
21. Understand the constituents of air pollution.
22. Be able to compare the benefits and drawbacks of different types of pollution research.
23. Summarize the effects of diesel exhaust and traffic related air pollution on exercise in healthy people.
24. Summarize the effects of ozone during exercise.
25. Name some key strategies to reduce pollution effects with exercise.

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Final Guiding Study Questions:

1. What are the types of Hyperbaric Exposures?
2. Understand the Physics of Diving Illness.
3. Understand why asthma might be contraindicated and the evidence around this.
4. Understand the following conditions: Decompression Sickness; AGE; Immersion Pulmonary Edema; Squeezes.
5. What is Doping?
6. Why do athletes dope?
7. Describe the Doping Control Process.
8. What substances/methods are prohibited?
9. What is an Athlete Biological Passport and what is the purpose?
10. What should athletes do when they want to take a substance?
11. What is the issue with supplement use? Is food safe?
12. What are Social Drugs of Abuse?
13. How do exceptions or TUEs work?
14. Have a good basic understanding of the anatomy of the GI tract.
15. Understand the effects of exercise on the gastrointestinal tract.
16. How can nutrition affect GI distress? NSAIDs? FODMAPs?
17. Understand the clinical presentation and management of Upper GI issues with exercise.
18. Understand the clinical presentation and management of Lower GI issues with exercise.
19. What should the pre-event protocol entail for someone with GI issues?
20. Describe Infectious Diarrhea / Traveler's Diarrhea.
21. What is the difference between overtraining and overreaching?
22. What is the difference between Jet Lag and Travel Fatigue?
23. What CV changes have been found in the literature with regard to aging?
24. What causes the decline in exercise performance as we age?
25. Describe the relationship between strength/fitness and mortality.
26. Describe the conditions associated with aging

Test your knowledge:

1. A test comes up with the following results: There are 42 sick people and 53 healthy people. 32 sick people are correctly diagnosed as sick. 10 sick people are incorrectly diagnosed as healthy. 50 healthy people are correctly diagnosed as healthy. 3 healthy people are incorrectly diagnosed as sick. Calculate the sensitivity and specificity of the test.
  - a. Sensitivity =  $32 / (32 + 10) \times 100 = 76.19\%$

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- b. Specificity =  $50 / (50 + 3) \times 100 = 94.34\%$
2. Bloody cough or pink frothy sputum is a symptom of which of the following?
    - a. AMS
    - b. HAPE
    - c. EIB
    - d. HACE
  3. Which of the following tests aims to mimic breathing during exercise without exercise?
    - a. Exercise challenge and spirometry
    - b. Eucapnic voluntary hyperpnea**
    - c. Osmotic challenge tests
    - d. Chemical challenge test
  4. Which of the following would be the most ideal form of activity for someone with EIB?
    - a. Long-distance running
    - b. Powerlifting**
    - c. Triathlon
    - d. HIIT
  5. Which mode of heat loss helps us understand why cotton kills?
    - a. Evaporation
    - b. Radiation
    - c. Conduction
    - d. Convection
  6. A race has regular water stations set up throughout the race. One individual is running quite slowly and is drinking lots of water at every water station. What could they be at risk of developing?
    - a. Hyponatremia
  7. Which of the following is the best methodology for getting meaningful outcomes when studying air pollution?
    - a. Real World Epidemiology Studies**
    - b. Real World Acute Exposures
    - c. Laboratory Acute Exposures
  8. Several things occur that increase our exposure to air pollution during intense exercise - which of the following does NOT reflect this?
    - a. Increased nasal breathing**
    - b. Increased ventilation
    - c. Deposition further down the bronchial tree
    - d. Higher metabolism

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9. Which of the following does not improve sleep quality?
  - a. Zaleplon
  - b. Acetazolamide
  - c. Ginkgo Biloba**
  - d. Zolpidem
10. Bringing growth hormone across the border is an example of
  - a. Possession of prohibited substances
  - b. Administration of a prohibited substance
  - c. Trafficking a prohibited substance**
  - d. Tampering with doping control
11. A company decides to add growth hormone to their product without listing it so that it will support their claim of “helping athletes grow muscle”. This is an example of
  - a. Adulteration**
  - b. Substitution
  - c. Unlisted Ingredients
  - d. Contamination

**KIN 432**

- 1.

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