This is NOT intended to be a parallel nor fully comprehensive representation of Exam 1, neither is it intended to thoroughly address every topic listed in the Exam 1 study guide. However, it should definitely help you determine if you are understanding a portion of the material that will be tested on Exam 1.

1. According to the convex/concave rule:
   a. arthrokinematic slide of the bone surface occurs in the same direction as osteokinematic (whole bone) movement if the bone surface is convex moving on a concave surface.
   b. arthrokinematic slide of the bone surface occurs in the same direction as osteokinematic (whole bone) movement if the bone surface is concave moving on a convex surface.

2. Abbreviation terminology: In physical therapy, the abbreviation "HHD" refers to
   a. an examination technique for measuring muscle strength.
   b. an examination technique for measuring joint AAROM.
   c. a treatment technique for restoring a patient’s muscle strength to WNL.
   d. Testing DTRs of the AC jt of the R UE during PROM.

3. Muscle fibers . . . .
   a. are grouped into bundles called myofilamentium by a type of connective tissue know as epicardiomyosium
   b. are bound together to form myofilament proteins.
   c. are synonymous with myofibrils
   d. are synonymous with muscle cells.

4. Abbreviation terminology: In physical therapy, DIP jt. refers to
   a. The proximal joint of a finger or toe.
   b. The distal joint of a finger or toe.
   c. The knee
   d. The wrist

5. Abbreviation terminology: In physical therapy, the UE includes
   a. the hand only
   b. the entire arm.
   c. the entire leg.
   d. the entire trunk.

6. Medial rotation of the shoulder joint occurs
   a. around a transverse (medial-lateral) axis and in the sagittal plane.
   b. in the frontal plane
   c. around an anteroposterior axis and in the horizontal plane.
   d. in the sagittal plane
   e. around a longitudinal axis & in the transverse plane.

7. Abbreviation terminology: In physical therapy, PF refers to the motion of
   a. closing the hand (sagittal plane movement).
   b. raising the arm over head (frontal plane movement).
   c. partial flexion.
   d. pointing the foot caudally/inferiorly (sagittal plane movement).

8. An example of a joint with 1 degree of freedom is . . .
   a. a biaxial joint.
   b. the frontal and parietal bone articulation of the skull.
   c. the shoulder (glenohumeral joint).
   d. the elbow (humeroulnar joint)

9. A typical synovial joint . . .
   a. contains hyaline cartilage covering the bony surfaces that articulate to form the joint.
   b. is most often a triaxial condyloid joint.
   c. has a fibrocartilage disk inside the joint.
   d. is classified as a cartilaginous joint.
10. The sternoclavicular joints are  
   a. inferior to the knee.  
   b. part of the LE.  
   c. only palpable with the mouth open.  
   d. medial to the clavicles.

11. Adduction means  
   a. away from the midline of the body.  
   b. toward the floor.  
   c. to grade a force  
   d. toward the midline of the body.

12. Which of the following joints has at least 2 degrees of freedom (df), but no more than 2 df?  
   a. ball and socket joint  
   b. pivot joint  
   c. condyloid joint  
   d. hinge joint  
   e. plane joint

13. (Torque vs force). If a person is successfully holding a 2 Newton (N) weight stationary (isometric contraction) at 90 degrees of shoulder abduction (elbow extended), . . .  
   a. then the muscle force required from the deltoid is greater than 2N  
   b. then the muscle force required from the deltoid is less than 2N  
   c. then the internal torque created by the deltoid ms force is the same as the torque exerted by the resistance forces (weight of the arm plus the 2N weight).  
   d. answers a & c are both correct

14. Standing with both feet on the ground and then performing a squat is what type of kinematic chain movement?  
   a. open kinematic chain  
   b. closed kinematic chain  
   c. both

15. Which of the following movements does not occur in the sagittal plane?  
   a. ankle dorsiflexion  
   b. sidebending of the spine  
   c. shoulder flexion  
   d. hip extension

16. A plane synovial joint typically is described as ____________.  
   a. uniaxial  
   b. biaxial  
   c. multiaxial

17. Which of the following structures is distal to the forearm when holding your hand behind your back?  
   a. wrist and hand  
   b. ankle joint  
   c. humerus bone  
   d. elbow joint  
   e. trunk of the body

18. Which of the following types of submaximal muscle contractions (eg. used during submaximal isotonic exercise against gravity) results in a torque produced by the muscle force (ie. internal torque) that is greater than the torque produced by the resistance force (ie. external torque)?  
   a. eccentric  
   b. concentric  
   c. isometric

19. If a muscle is shortened beyond its ability to perform a contraction that yields MAXIMAL force output, it is  
   a. actively insufficient  
   b. passively insufficient
20. During class, you raise your right arm as high as you can to signal to the instructor that you have a question. While your right arm is raised, which of its joints is in the anatomical position?
   a. shoulder
   b. elbow
   c. forearm
   d. none of the above

21. When representing a vector force by using an arrow, the base of the arrow represents:
   a. the direction of the force
   b. the line of application of the force (ie. line of push/pull)
   c. the magnitude of the force
   d. the point of application of the force

22. Elbow flexion occurs in this plane.
   a. frontal plane
   b. sagittal plane
   c. transverse plane

23. Movement in this plane occurs around a longitudinal axis.
   a. frontal plane
   b. sagittal plane
   c. transverse plane

24. Movement in this plane occurs around an anteroposterior axis.
   a. frontal plane
   b. sagittal plane
   c. transverse plane

25. Forearm pronation occurs in this plane.
   a. frontal plane
   b. sagittal plane
   c. transverse plane

26. External Rotation movement is the same as
   a. medial rotation.
   b. internal rotation.
   c. horizontal abduction.
   d. horizontal adduction.
   e. none of the above.

27. The examination for flexibility of a muscle is best accomplished by
   a. goniometry
   b. muscle length testing
   c. palpation
   d. manual muscle testing
   e. handheld dynamometry

28. During abduction of the glenohumeral joint (when the humerus is the moving bone and glenoid fossa is stable),
   a. the proximal end of the humerus (humeral head) rolls AND slides in the SAME direction that the whole bone is moving.
   b. the proximal end of the humerus (humeral head) rolls in the SAME direction and slides in the OPPOSITE direction that the whole bone is moving.
   c. the humerus bone is stable and the scapula (shoulder blade) moves.
   d. both a & b

29. Which of the following types of data is classified as kinetic data?
   a. 90 degrees shoulder abduction AROM
   b. 150 N contraction of biceps with mechanical advantage of 0.1
   c. anterior glide/slide of the humeral head during glenohumeral external rotation
   d. posterior tilt of the pelvis with concentric contraction of the rectus abdominus
30. A patient is seated on a table with the legs hanging off the side. The therapist then positions one of the patient’s knees in 20 degrees flexion and asks the patient to hold that position while the therapist tries to flex the patient’s knee by applying resistance anteriorly just proximal to the ankle (i.e., resistance test for the quadriceps). What type of lever is at work in the patient as they create an internal torque to counteract the PTs external torque? Note: This question is fair game b/c you should know enough basic information about the location of the knee joint and the location of the quadriceps attachment on the tibia to determine the design of the lever system.
   a. 1st class
   b. 2nd class
   c. 3rd class

31. A patient is supine with the shoulder abducted to 90 degrees. The therapist is using a hand-held dynamometer (HHD) to test the strength of the patient’s abduction, focusing on middle deltoid. The dynamometer is placed 22 cm from the approximate center (axis) of rotation of the shoulder joint. The patient exerts an isometric contraction against the HHD. Upon successful completion of the test, the dynamometer reads 120 N. How much external torque was exerted at the patient’s shoulder joint?
   a. 2.64 Nm
   b. 26.4 Nm
   c. 264 Nm
   d. 2640 Nm

32. Regarding the deltoid MMT (using the HHD) above, what type of lever is at work in the patient’s GH joint as the patient’s holds the shoulder in 90 degrees of abduction against the force of the PT & HHD?
   a. 1st class
   b. 2nd class
   c. 3rd class

33. A 7 yr old patient is standing with the elbow flexed to 90 degrees (isometric contraction) and a 15N cuff weight strapped to the wrist at 13 cm from the center of rotation of the elbow joint. The patient’s forearm-wrist-hand weighs 10N and it’s COG is also 13cm from the center of rotation of the elbow. What is the external torque being exerted by combined weight of the forearm & cuff weight?
   a. 195 Nm
   b. 3.25 Nm
   c. 0.65 Nm
   d. 325 Nm
   e. 1.95 Nm

34. A patient who was unable to abduct the hip against gravity (no AROM) and was able to abduct the hip through only a small partial range of motion in a gravity-eliminated position should be assigned a muscle test grade of:
   a. 1
   b. 2-
   c. 2
   d. 2+
   e. 3-

35. Performance of a biceps curl exercise with a dumbbell is an example of:
   a. closed kinetic chain movement
   b. arthrokinematic movement
   c. open kinetic chain movement
   d. closed-packed movement
36. A person is performing a scapular elevation (shrug) exercise when standing with a dumbbell in each hand; this specifically targets the Upper Traps and Levator Scap. The up and down phase of the movement is being done in a slow, controlled manner. Eccentric contraction of these muscles would occur during
   a. the up and down phase of the shrug movement.
   b. the up phase only
   c. the down phase only
   d. neither the up or down phase.

37. Given: The anterior deltoid is typically called a "shoulder flexor". Q: What type of muscle contraction of the anterior deltoid is occurring as the shoulder moves from anatomical position to a flexed position (shown)?
   a. Eccentric
   b. Concentric
   c. Isometric
   d. Isokinetic
   e. None of the above

Given this diagram (below) of a labeled, anatomical lever system; isometric hold position at 90 degrees of elbow flexion, submaximal effort being exerted by the biceps while holding a dumbbell:
   • R= 120 N for the combined force of gravity on the mass of the dumbbell and arm (combined COG)
   • EF= 960 N for the magnitude of force being exerted by the biceps (considered the only ms active strictly for the purposes of this problem).
   • EA= 0.05 m (the distance for the elbow axis of rotation to the attachment of the biceps)
   • RA= ____ m (the distance from the elbow axis of rotation to R)

38. identify the type of lever

39. solve for the missing variable (RA)

40. calculate mechanical advantage

41. how can EF and R be so different but the torques be equal?

42. From this position: What torque is required to initially lower the weight? To slightly raise the weight?

43. Will the external torque from the weight in the hand VARY throughout the elbow ROM if the elbow were moving? Explain.

44. What is the effect of moving the weight proximal up the arm?

45. If the task was changed to a max effort isokinetic strength test through the entire ROM (no dumbbell): Give 2 reasons why the internal torque would VARY throughout the elbow ROM?
Tissue Properties (the focus of these practice questions is the reading info in Neumann). The notes/lecture are likely more important for the exam.

Matching: Match the terms below with the descriptions in numbers 1-5. Each term (letter) may be used once, more than once or not at all. Refer to the figure at the right.


___ 46. Illustrated in Zone C of the curve; tissue experiences microscopic failure and is permanently deformed.
___ 47. X-axis of the curve and illustrates the amount of tissue stretch (or size change if being compressed), expressed as a percentage of its original length/size.
___ 48. Y-axis of the curve and illustrates the internal resistance generated as a tissue resists stretch, compression, etc..
___ 49. Illustrated in Zones D & E of the curve; tissue is torn/disrupted beyond microscopic failure.
___ 50. Illustrated in Zone B of the curve; tissue can still return to its original length or shape after the deforming force is removed (ie. deformation is not permanent).

Continue to refer to the figure above . . .

___ 51. (True/False) The ratio of stress to strain is a property called “viscoelasticity”.
___ 52. (True/False) If you compare two stress-strain curves, the tissue with a greater slope on the stress-strain curve (ie. a more vertical Zone B), can be characterized as a tissue with more “stiffness”.
___ 53. Which of the following is true of the yield point on a stress-strain curve?
   a. Release of the stress beyond this point will not result in permanent deformation
   b. It is typically the point of highest stress
   c. There is a linear relationship between stress and strain preceding this point
   d. It marks the transition between the toe region and elastic region.
   e. All of the above are true
1. B
2. A
3. D
4. B
5. B
6. E
7. D
8. D
9. A
10. D
11. D
12. C
13. D; 3rd class lever system; draw it out in detail
14. B
15. B
16. C
17. A
18. B; during submaximal isotonic exercise (such as bicep curls or pushups), we know that the up phase (i.e. move the body part vertically against gravity) is a concentric contraction and the down (lowering) phase is eccentric (same ms). In this context, when the internal ms. torque exceeds the external gravity torque, then the body part moves up (which is during the concentric contraction). When the internal ms. torque is less than the external gravity torque, then the body part would move down (which is during the eccentric contraction). The key to answering this is to realize the question is about a submaximal activity, not max effort contraction. Eccentric only exceeds concentric in a maximal effort activity and more readily occurs during isokinetic (i.e. accommodating resistance) exercise or testing rather than isotonic.
19. A
20. B
21. D
22. B
23. C
24. A
25. C
26. E
27. B
28. B
29. B
30. C
31. B
32. C; the Axis is the shoulder joint, R is the HHD, EF the deltoid muscle attachment on the humerus. This would cause the EF to be between the Axis and R, to make a 3rd class lever.
33. B
34. B
35. C
36. C
37. B
38. 3rd class
39. 0.4m
40. 0.125
41. b/c the moment arms EA and RA (mechanical advantage) are equally as different. Since MA = 1/8”, then EF must be 8X as great as R
42. <48Nm, >48Nm
43. YES; b/c RA will vary/change thru the ROM
44. External torque will reduce b/c RA is less; thus internal torque will also reduce
45. 1) b/c of the length-tension relationship (i.e. # of crossbridges formed in each sarcomere) AND 2) b/c the moment arm of the muscle attachment (i.e. effort arm distance) will vary throughout the ROM.
46. D
47. B
48. A
49. E
50. C
51. B
52. A
53. C