Chapter 2: Mechanical Principles: Kinetics

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ 1. Motion that occurs about the x-axis takes place in the _____ plane.
   a. sagittal
   b. frontal
   c. coronal
   d. transverse

_____ 2. Motion that occurs about the y-axis takes place in the _____ plane.
   a. sagittal
   b. frontal
   c. coronal
   d. transverse

_____ 3. The z-axis may also be referred to as the _____ axis.
   a. anterior-posterior
   b. medial-lateral
   c. superior-inferior
   d. vertical

_____ 4. Velocity of rotary motion is best expressed in:
   a. meters/second
   b. meters/second^2
   c. feet/second
   d. degrees/second

_____ 5. If excessive, this source of force may retard joint motion:
   a. gravity
   b. muscular
   c. externally applied resistance
   d. friction

_____ 6. If insufficient, this source of force may promote instability:
   a. gravity
   b. muscular
   c. externally applied resistance
   d. friction

_____ 7. The perpendicular distance from the force vector to a joint's axis of motion is referred to as the:
   a. moment
   b. lever arm
   c. moment arm
   d. torque

_____ 8. Your patient is having difficulty performing shoulder abduction from 0 to 90° with a cuff weight around his forearm while sitting in a chair. To make the exercise *as easy as possible* you recommend that he or she move the cuff weight _____ and perform the activity in a _____ position.
   a. further distal; side-lying
   b. more proximal; side-lying
   c. further distal; standing
   d. more proximal; standing

_____ 9. According to Newton's First Law of Motion:
   a. Acceleration is directly proportional to the net force applied to a body.
   b. Acceleration is inversely proportional to the mass of the moving object.
   c. A body at rest will remain at rest.
   d. For every action, there is an equal and opposite reaction.

_____ 10. According to Newton's Second Law of Motion:
   a. Acceleration is directly proportional to the net force applied to a body.
   b. Acceleration is directly proportional to the mass of the moving object.
   c. A body at rest will remain at rest.
   d. For every action, there is an equal and opposite reaction.

_____ 11. Related to first class lever systems, which of the following is most accurate?
   a. The point of resistance application lies between the force and the axis.
   b. They are the most common lever system in the human body.
   c. They exhibit a force advantage so large weights can be supported or moved by a smaller force.
   d. The axis of rotation is located between the force and resistance arms.

_____ 12. Your patient is performing shoulder flexion from 0 to 180° in a standing position with his elbow extended while holding a 5-pound weight in his hand. The torque imposed by the 5-pound weight is greatest at _____°.
   a. 0
   b. 45
   c. 90
   d. 135
   e. 180

_____ 13. The "normal" force vector is primarily responsible for producing:
   a. compression
   b. distraction
   c. rotation
   d. tangential motion

_____ 14. Assuming a right triangle, to calculate the cosine of theta one should:
   a. divide the opposite side by the hypotenuse
   b. divide the adjacent side by the hypotenuse
   c. divide the adjacent side by the opposite side
   d. divide the hypotenuse by the adjacent side

_____ 15. To reduce the effect of weight on a joint a clinician could:

a. have the patient perform movements of the affected joint parallel to the Earth
b. incorporate the use of a sling
c. encourage the use of crutches
d. recommend aquatic therapy
e. All of the above

_____ 16. The center of gravity of a body is:
a. the theoretical point around which the mass of the object is balanced
b. easier to find in asymmetrical objects than it is in symmetrical objects
c. the point of origin for gravity's vector force
d. A and C
e. All of the above

_____ 17. The center of gravity of the adult body in the anatomic position is:
a. anterior to the border of the 11th thoracic vertebra
b. anterior to second sacral vertebra
c. just below the xiphoid process of the sternum
d. just above the knee joint

_____ 18. Archimedes' principle states that a body submerged in a liquid is buoyed up by a force _____ the weight of the liquid displaced.
a. less than
b. equal to
c. greater than
d. two times

_____ 19. Theoretically as it relates to lever arms, sit-ups are most difficult when the arms are positioned _____ of the individual.
a. at the side
b. on the stomach
c. across the chest
d. clasped behind the head

_____ 20. A person being propelled in a wheelchair is an example of _____ equilibrium.
a. static
b. dynamic
c. neutral
d. stable

_____ 21. Which of the following represents the *least* degree of *stability*?
a. high center of gravity; large base of support
b. low center of gravity; large base of support
c. high center of gravity; small base of support
d. low center of gravity; small base of support

_____ 22. Your patient had an above knee amputation on the left. In which direction did the patient's center of gravity shift?
a. Up and to the right
b. Down and to the right

     c. Up and to the left
     d. Down and to the left

____ 23. A body is stable when the line of gravity runs _____ the center of its base of support.
     a. above
     b. next to
     c. through
     d. below

____ 24. Using crutches _____ an individual's base of support.
     a. increases
     b. decreases
     c. does not alter
     d. negatively influences

____ 25. Most levers in the body are classified as _____ class levers.
     a. first
     b. second
     c. third
     d. fourth

True/False
Indicate whether the statement is true or false.

____ 26. The terms, "weight" and "mass" are defined the same and may be used interchangeably.

____ 27. Muscles can only produce force on their bony segments when they contract.

____ 28. Vector forces can be combined when more than one force is applied to a body or segment.

____ 29. The resultant force is the simplest force that produces the same effect as all the forces acting together.

____ 30. Whenever the force arm of the muscle working is shorter than the resistance arm of the segment moved by the muscle, the muscle must exert less force to lift the segment.

____ 31. Third class levers, although mechanically inefficient, offer the benefit of a large excursion in range of motion with little or small changes in muscle length.

____ 32. If a torque produces or tends to produce a counterclockwise motion of the coordinate system, the sign is positive.

____ 33. When a body part is positioned and supported to move in a plane perpendicular to the earth, the effects of gravity are reduced so a muscle weaker than 3/5 is able to move a segment.

____ 34. The center of gravity rises when an individual elevates his or her arms overhead.

____ 35. The direction of gravity is always going to be a vertically downward pull from the center of mass toward the center of the earth.

____ 36. In athletics, a large base of support is always advantageous.

____ 37. Force is bidirectional and torque is unidirectional.

____ 38. Small forces imparted to the distal aspect of an extremity (i.e., ankle) create large torques to the proximal joints (i.e., hip).

____ 39. A torque's greatest magnitude occurs when the direction of application is at a right angle or 90° to the segment or extremity.

____ 40. When the body or a body segment moves over a surface, friction also is a torque that affects movement.

Chapter 2: Mechanical Principles: Kinetics
Answer Section

MULTIPLE CHOICE

1.	ANS:	A	PTS:	1
2.	ANS:	D	PTS:	1
3.	ANS:	A	PTS:	1
4.	ANS:	D	PTS:	1
5.	ANS:	D	PTS:	1
6.	ANS:	D	PTS:	1
7.	ANS:	C	PTS:	1
8.	ANS:	B	PTS:	1
9.	ANS:	C	PTS:	1
10.	ANS:	A	PTS:	1
11.	ANS:	D	PTS:	1
12.	ANS:	C	PTS:	1
13.	ANS:	C	PTS:	1
14.	ANS:	B	PTS:	1
15.	ANS:	E	PTS:	1
16.	ANS:	D	PTS:	1
17.	ANS:	B	PTS:	1
18.	ANS:	B	PTS:	1
19.	ANS:	D	PTS:	1
20.	ANS:	C	PTS:	1
21.	ANS:	C	PTS:	1
22.	ANS:	A	PTS:	1
23.	ANS:	C	PTS:	1
24.	ANS:	A	PTS:	1
25.	ANS:	C	PTS:	1

TRUE/FALSE

26.	ANS:	F	PTS:	1
27.	ANS:	F	PTS:	1
28.	ANS:	T	PTS:	1
29.	ANS:	T	PTS:	1
30.	ANS:	F	PTS:	1
31.	ANS:	T	PTS:	1
32.	ANS:	F	PTS:	1
33.	ANS:	F	PTS:	1
34.	ANS:	T	PTS:	1
35.	ANS:	T	PTS:	1
36.	ANS:	F	PTS:	1
37.	ANS:	F	PTS:	1

38. ANS: T   PTS: 1
39. ANS: T   PTS: 1
40. ANS: F   PTS: 1