



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)
MAIN CAMPUS
UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR
SECOND YEAR, SECOND TRIMESTER EXAMINATIONS
FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN PHYSIOTHERAPY**

COURSE CODE: BSP 224

COURSE TITLE: BIOMECHANICS I

DATE: THURSDAY 13TH APRIL 2023

TIME: 2:00-4:00 PM

INSTRUCTIONS TO CANDIDATES

Answer all Questions

Sec A: Multiple Choice Questions (MCQ) 60 Marks

Sec B: Short Answer Questions (SAQ) (40 Marks)

Sec C: Long Answer Questions (LAQ) (40 Marks)

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

SECTION A MULTIPLE CHOICE QUESTIONS

20 MARKS

1. In general, when does injury or failure of a tissue occur?
 - A. Whenever a load is applied to the tissue
 - B. When the applied load exceeds the failure tolerance of the tissue
 - C. When the applied load is followed by a period of rest
 - D. When the failure tolerance of the tissue exceeds the applied load
2. What action does the serratus anterior have on the scapula?
 - A. It depresses and retracts.
 - B. It retracts and rotates to depress the glenoid cavity.
 - C. It depresses and rotates the scapula downward.
 - D. It protracts and holds the scapula against thoracic wall.
3. Which task will be most limiting for a person with a supraspinatus injury?
 - A. Abduction
 - B. Flexion
 - C. Extension
 - D. Horizontal adduction
4. A worker is required to perform precise work tasks, such as writing or drawing, from a standing position. Which working height is considered most desirable to perform these tasks?
 - A. Above-elbow height
 - B. At-elbow height
 - C. Slightly below-elbow height
 - D. Significantly below-elbow height
5. Which movement is most likely to become limited following damage to the gracilis muscle?
 - A. Hip abduction
 - B. Hip external rotation
 - C. Hip adduction
 - D. Knee extension
6. What is a mechanism of an anterior cruciate ligament (ACL) sprain?
 - A. Knee hyperextension with rotation
 - B. Falling onto a flexed knee
 - C. Impact to the medial side of the knee
 - D. Degenerative disorder
7. A basketball player presents to you after sustaining an injury. The ankle was forced into inversion while plantar flexed upon landing on an opponent's foot. Which ligament is most likely injured?
 - A. Calcaneofibular
 - B. Anterior tibiofibular
 - C. Tibiocalcaneal
 - D. Anterior talofibular
8. What is the mechanism of injury for a herniated intervertebral disc in the lumbar region of the spine?
 - A. Repeated compressive loading of the spine
 - B. Repeated or prolonged hip extension
 - C. Sustained contraction of the erector spinae

- D. Repeated or prolonged flexion of the lumbar spine
9. Scapular winging happens along which axis?
- A. Lateral axis
 - B. Vertical axis
 - C. AP axis
 - D. Horizontal axis
10. Which of the following statements is true about ankle biomechanics?
- A. Talus rolls posteriorly and glides anteriorly during plantar flexion
 - B. Talus rolls anteriorly and glides posteriorly during plantar flexion
 - C. Talus rolls and glides on the tibiofibular surface in the same surface
 - D. None of the above.
11. Which one of the following statements is not true about ankle movements during gait cycle?
- A. The ankle plantar flexes during loading response
 - B. The ankle dorsiflexes gradually during midstance
 - C. The ankle plantar flexes during terminal stance
 - D. The ankle plantar flexes during swing phase
12. Scapular winging happens along which axis?
- A. Lateral axis
 - B. Vertical axis
 - C. AP axis
 - D. Horizontal axis
13. Which one of the following is not true about the biomechanics of lumbar flexion?
- A. Compression of anterior fibers
 - B. Stretching of posterior fibers
 - C. Nucleus pulposus moves posteriorly
 - D. There is a shear stress for annulus
14. The following are biomechanical changes of a forward head posture except?
- A. Shifting of the CoG
 - B. Upper body drifts backward
 - C. The hips tilt forward
 - D. The hips tilt backward
15. In closed kinetic chain pelvic motions, the following movements happens in frontal plane except?
- A. Side bending
 - B. Left hip joint adduction
 - C. Right hip joint abduction
 - D. Hip flexion
16. If acceleration is zero, then the body:
- A. Must be motionless
 - B. Must be moving with a constant speed
 - C. Has a constant velocity
 - D. More information is needed to answer this question

17. A skater gliding on ice will continue to move in the same direction and with the same speed (in the absence of the action of additional forces). This exemplifies which of the following laws?
- Newton's first law of motion
 - Newton's second law of motion
 - Newton's third law of motion
 - The law of force
18. In the human body, the lever systems formed by muscles pulling on bones are:
- First class
 - Second class
 - Third class
 - No one class predominates
19. One of the following movements does not happen in vertical axis, which one?
- Internal rotation
 - External rotation
 - Supination/pronation
 - Horizontal adduction/abduction
20. Scapular winging happens along which axis?
- Lateral axis
 - Vertical axis
 - AP axis
 - Horizontal axis

SECTION B: SHORT ANSWER QUESTIONS

40 MARKS

- The body is made up of linked segments where each segment is a mass. Discuss these masses 5 marks
- During a group discussion Connie was not recall where the LOG falls when her friend is in a proper posture in anatomical position. Help her to answer 5 marks
- Explain the differences between OKC and CCK as applied in physiotherapy rehabilitation 5Marks
- With the acquired biomechanical knowledge, justify with evidence the best lifting position to your clients 5 marks
- Discuss the clinical significance of lateral pelvic tilts 5 marks
- Naming the muscles involved discuss the force couple effect at the hip joint 5 marks
- Explain the functional changes in a shortened muscle 5 marks
- Discuss the kinematics of ribcage 5 marks

LONG ANSWER QUESTIONS

40 MARKS

- Discuss the abnormal spine curvature giving their causes and management 20 Marks
- A woman is standing with a weight. Her head, trunk, and arms weigh 50Lbs and have a LOG passing 1inches in from her lumbar spine. The 45 lbs weight she is holding is 12 inches from her spine. She then bends with LOG passing 10 inches in from her lumbar spine. Finally she lowers the object, with her knees flexed and a neutral lumbar spine, LOG passes at 7 inches in from her lumbar spine.
Calculate what flexion moment do her back muscles need to overcome in these three positions and advice best position to lift the load? 20 marks