

Student Name:

Student Number:

EDKP-206B Biomechanics of Human Movement
Department of Kinesiology & Physical Education
McGill University

FINAL EXAM (40%)

Thursday April 27, 2006
14h00 to 17h00

Instructors: David J. Pearsall

Instructions:

Write name and student number at the top of front page.

Calculators permitted. *DICTIONARIES PERMITTED. NO NOTES OR TEXT ALLOWED.*

Answer all questions within exam booklets provided.

THIS EXAM CONSISTS OF 5 (FIVE) PAGES.

1. HIP and KNEE a) or b)
2. SPINE and POSTURE a) or b)
3. FOOT and ANKLE a) or b)
4. SHOULDER a) or b)
5. ELBOW, FOREARM, WRIST and HAND a) or b)
6. MUSCLE and TENDON a) or b)
7. GAIT a) or b)
8. JOINT REACTION CALCULATION a) or b)

Grand Total

/ 80

1) HIP and KNEE

Answer one of the following two questions

- a) Which side of the femoral neck and which side of the femoral shaft are subjected to compressive stresses during weight-bearing? <Why does this occur?> How does the bone respond to these stresses? <How does muscle contraction change these stresses?>

- OR -

- b) Describe the intra-articular movement of the femur on the tibia, as the femur moves from full extension into flexion.

2) SPINE and POSTURE

Answer one of the following two questions

- a) What is the relationship between the GRFV, LoG and CoM in the erect static posture?

- OR -

- b) Compare interdiskal pressure in erect standing with erect, slumped, and relaxed sitting. Compare sitting postures with pressure in lying postures.

3) FOOT and ANKLE

Answer one of the following two questions

- a) Describe the axis of the subtalar motion. What movements take place around that axis, and how are these motions defined?

- OR -

- b) What is the general function of the transverse tarsal joint in relation to the subtalar joint? How does extension of the MTP joints contribute to stability of the foot?

4) SHOULDER

Answer one of the following two questions

- a) Identify five factors that play a role in the dynamic stabilization of the glenohumeral joint in either flexion or abduction of that joint.

- OR -

- b) Describe why electromyographic activity of the deltoid in normal adduction shows a gradual rise in activity to between 90 degrees and 120 degrees, with a plateau thereafter.

5) ELBOW, FOREARM, WRIST and HAND

Answer one of the following two questions

- a) Compare the biceps brachii with the brachialis on the basis of structure and function. <What effect does the position of the shoulder, elbow and forearm have on their respective functions?>

- OR -

- b) What is the total ROM normally available at the wrist complex? How are the motions distributed between the radiocarpal and midcarpal joints of the complex?

6) MUSCLE and TENDON

Answer one of the following two questions

- a) Explain what happens to a <tendon> material when hysteresis occurs. <Use a graph to help explain this phenomenon.>

- OR -

- b) Compare closed chain with an open chain and give examples of each < with regards to the knee>. What is difference in terms of muscle function of the quadriceps?

7) GAIT

Answer one of the following two questions

- a) What are the major muscle groups that contribute to the positive work of walking, and when in the gait cycle do their contributions occur?

- OR -

- b) What are the approximate values of maximum flexion and extension required for normal gait at the knee, hip and ankle? <How does this compare > with the range of motion required for running and stair gait?

8) JOINT REACTION CALCULATION

Answer one of the following two questions

- a) Calculate the minimum joint reaction force (total hip compression) at the right hip joint that would occur for a $<900\text{ N}>$ person standing symmetrically on both legs versus one leg (assuming a gravitational MA of $<10\text{ cm}>$ and the abductor muscle MA of $<5\text{ cm}>$). NOTE: line of action of abductor muscle is 40 degrees from vertical.

- OR -

- b) From the figure (i) below, calculate the muscle force and joint reaction force necessary to maintain static equilibrium. Note $BW = 800\text{ N}$. How would these values change if the weight at the hand was directly over the shoulder as in figure (ii)?

Figure (i)

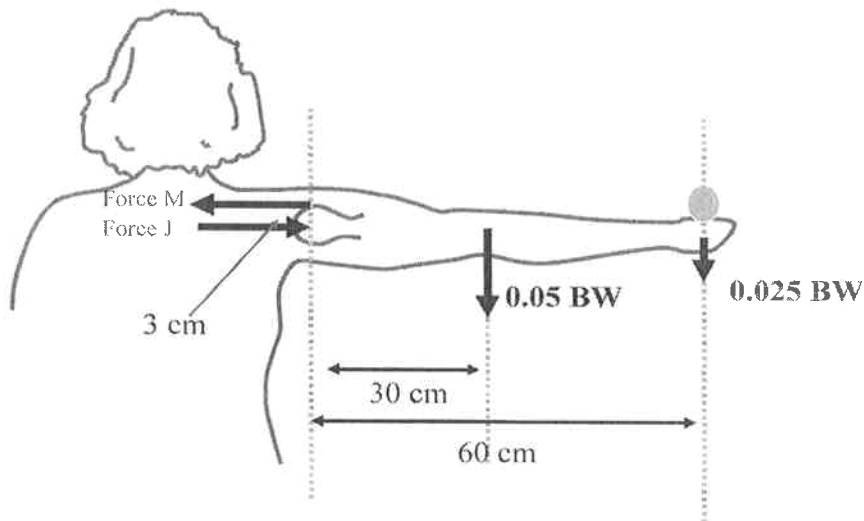


Figure (ii)

