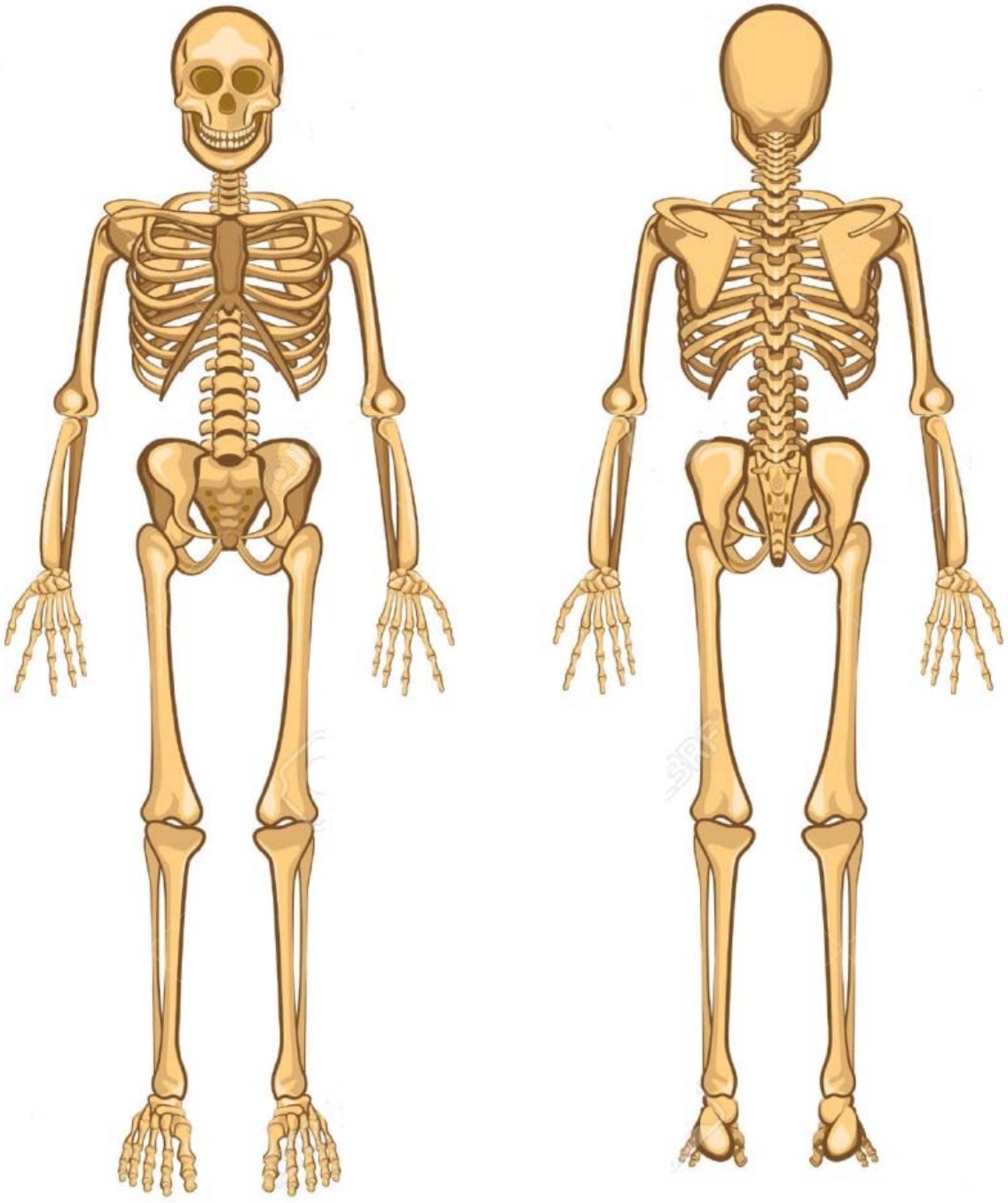
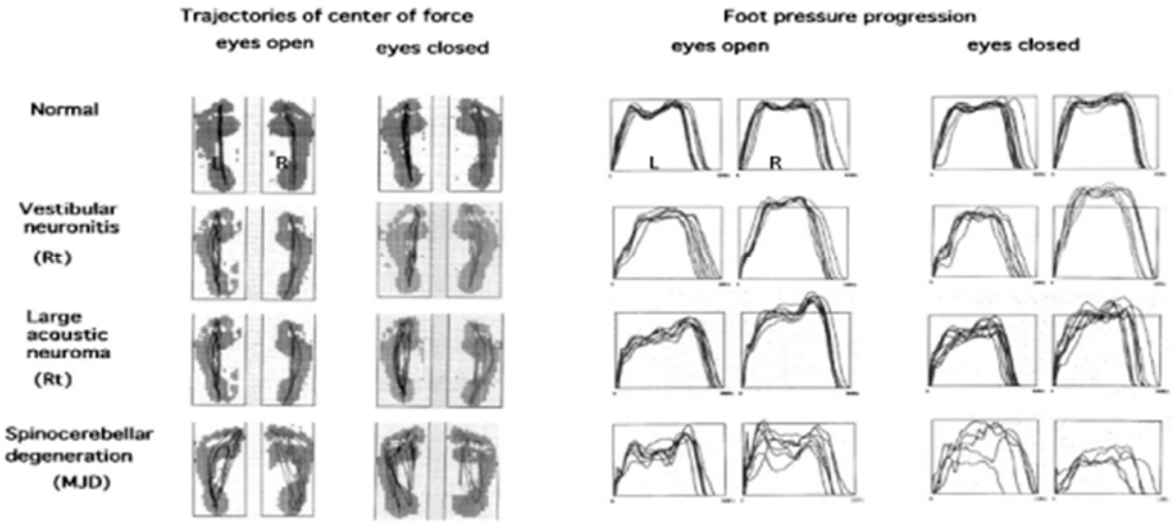
HMHC EXAM **Name :**

1) What are body segment parameters? How are they estimated?

2) On the schematic representation of a human skeleton,
   a. place the markers according to ISB (International Society of Biomechanics) recommendations
   b. For the left leg only, represent the local frames related to the markers



3) The figure thereafter represents the trajectory of the center of pressure under the foot (left, “trajectory of center of force”) and the vertical component of the ground reaction force (right, “foot pressure progression”) during a walking exercise, in four cases: one for normal walking, and three cases of pathologic walking mentioned on the left of the figure. In each case, 20 subjects performed the walking; their data were normalized with time, weight and geometry. Two situations were studied: walking with open eyes, and walking with closed eyes. On the figure, “L” refers to “left”, and “R” refers to “right”.



a) Describe the proposed results
b) What are the main characteristics of the studied pathological cases?
c) How would you characterize the effect of the vision during walking?

4) Calculate the equation of motion of a simple pendulum moving along a rotational joint in 2D, with an arbitrary joint trajectory (input) $\boldsymbol{q}(t)$. Give the algorithm of a program to perform this calculation numerically.