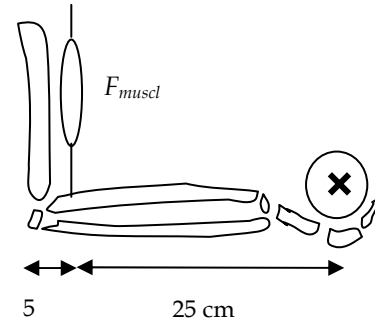


**W6.07d**

## Energy

### Simple Machines-Mechanical Advantage

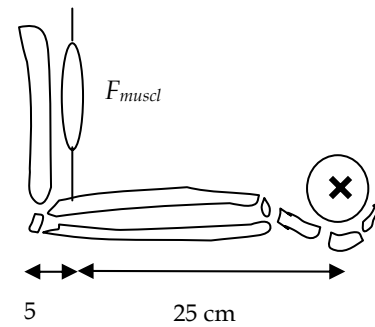
1. The human forearm acts like a lever, with the muscle providing the input force and the load carried by the hand acting as the output force. A typical arm is shown.
  - a. What is the ideal mechanical advantage for the human arm?
  - b. Assuming that the arm is 100% efficient, with how much force must the bicep muscle pull so that the hand can lift a 5.0-kilogram object?
  - c. Why is the human arm designed with a mechanical advantage less than 1?



**W6.07d****Energy-KEY**

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- a.  $IMA = .1666 : 1$  [5cm / 30 cm]
- b.  $F_{bicep} = 300$  newtons [100% eff.--- $IMA = AMA = 1 : 0.1666$  ]
- c.  $\Delta s_{out} > \Delta s_{in}$  so large movement of hand verses small movement of muscle.