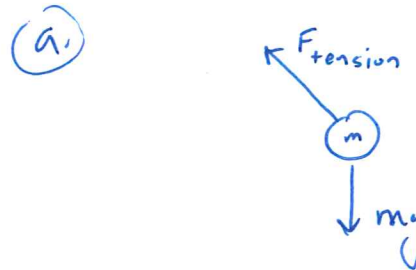
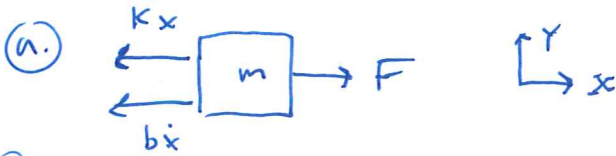
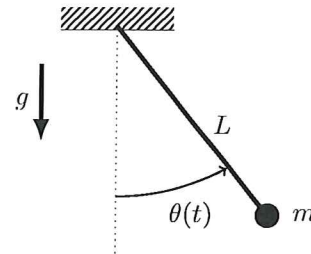
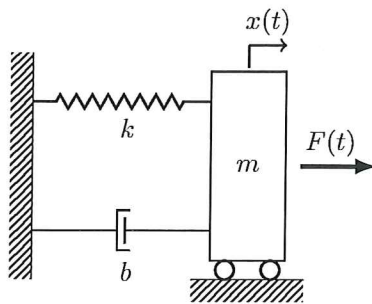


Knowledge Probe - BIOEN 440 / ME 445 - Spring 2016

1. Dynamics

For each mechanical systems below:

- (a) Draw a free body diagram
- (b) Derive the system of equations



(b.)

$$\sum F = m\ddot{x}$$

$$F - b\dot{x} - kx = m\ddot{x}$$

$$\rightarrow \boxed{m\ddot{x} + b\dot{x} + kx = F}$$

$$\sum M_o = I\ddot{\theta}$$

(sum of moments about axis of rotation)

$$-mgL \sin \theta = I\ddot{\theta}$$

for mass w/ massless rod: $I = mL^2$

$$mL^2 \ddot{\theta} + mgL \sin \theta = 0$$

$$\rightarrow \boxed{\ddot{\theta} + \frac{g}{L} \sin \theta = 0}$$

2. Cell Biology

Match the organelle with its primary function.

- | | |
|--------------------------|---|
| a. nucleus | <u>c</u> energy production: glucose to ATP |
| b. ribosome | <u>e</u> post translational modification and sorting protein |
| c. mitochondria | <u>f</u> degradation of carbohydrates and proteins |
| d. endoplasmic reticulum | <u>g</u> extracellular transport and trafficking |
| e. golgi apparatus | <u>a</u> DNA repository site, site of transcription |
| f. lysosome | <u>d</u> site of translation and some post translational modification and folding protein |
| g. vesicle | <u>b</u> responsible for mRNA to protein translation |

3. Mechanics of Materials

Label (a)-(f) in the figure below.

~~plasma~~

a. elastic region

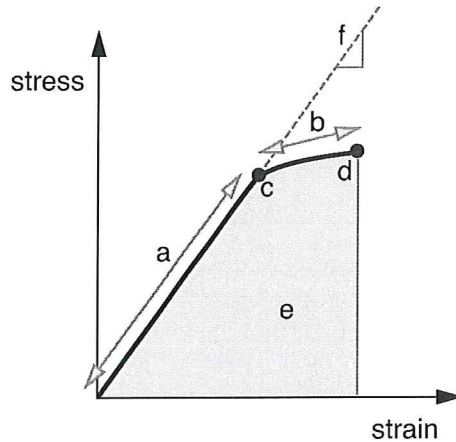
b. plastic region

c. yield point

d. fracture point

e. toughness (energy)

f. modulus of elasticity



4. Miscellaneous

(a) Describe your motivations for taking this course.

(b) Describe what you expect to learn from this course.

(c) Specify three preferred office hour times (weekday + time).

(d) Are you currently working on a capstone project? If so, describe the project.