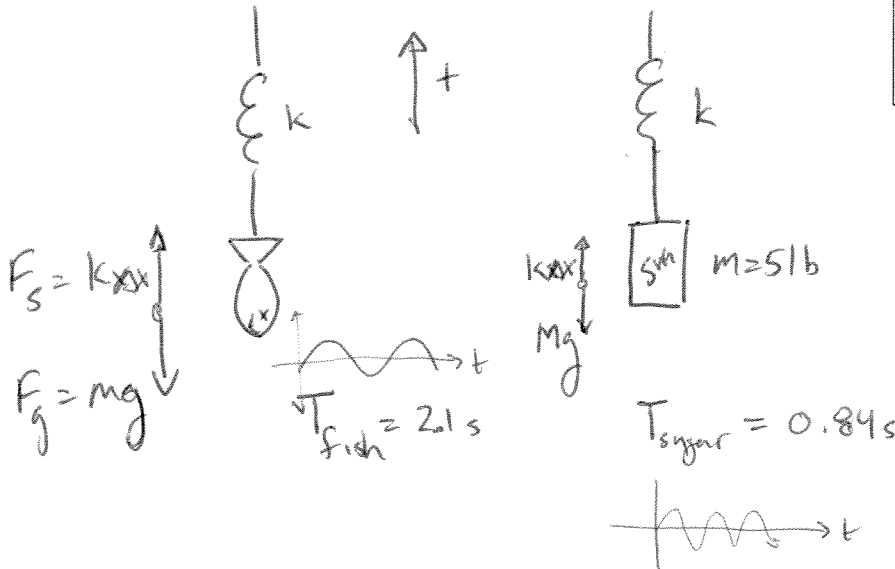


General Problem Solving Guide

Name: Key
 Lab Time:
 Date: EXAM 1
 Test Code:
 Problem #: 21

List given information, define variables, sketch picture:



3 pt

Simplify question, list target quantity:

1/2 pt

Find MASS OF FISH. -

List all related quantitative relationships:

2 pt

$$F_s = k\Delta x$$

$$F_g = mg$$

SHO

$$T = 2\pi \left(\frac{m}{k} \right)^{1/2}$$

Outline approach, sketch diagrams if needed (or sketch next to pictures above):

1/2 pt

Find oscillation for fish

Find oscillation for sugar (known mass)

Divide equations

Solve for mass of fish

Obtain a general solution:

$$T_f = 2\pi \left(\frac{m_f}{k} \right)^{1/2}$$

$$T_s = 2\pi \left(\frac{m_s}{k} \right)^{1/2}$$

$$\frac{T_f}{T_s} = \frac{2\pi (m_f/k)^{1/2}}{2\pi (m_s/k)^{1/2}}$$

cancel and simplify

$$\frac{T_f}{T_s} = \left(\frac{m_f}{m_s} \right)^{1/2}$$

$$\left(\frac{T_f}{T_s} \right)^2 = \frac{m_f}{m_s}$$

$$m_f = m_s \left(\frac{T_f}{T_s} \right)^2$$

$$= 5 \text{ lbs} \left(\frac{2.1}{0.84} \right)^2$$

$$m_f = 31.25 \text{ lbs} = 14.2 \text{ kg}$$

Check Units:

$$\text{kg} = \text{kg} \left(\frac{\text{sec}}{\text{sec}} \right)^2 \quad \checkmark \quad \boxed{1 \text{ pt}}$$

$$\text{kg} = \text{kg} \quad \text{or} \quad (1 \text{ b} = 1 \text{ b})$$

Check Limiting Cases:

$$T_f \uparrow \quad m_f \uparrow \quad \checkmark$$

$$m_s \uparrow \quad m_f \uparrow \quad \checkmark \quad \boxed{1 \text{ pt}}$$

$$\cancel{T_s} \uparrow \quad m_f \downarrow \quad \checkmark \quad (\text{They would match})$$

$$T_f \rightarrow \infty \quad m_f \rightarrow \infty$$

Obtain a numeric solution:

(i.e. plug in the numbers)

$$31.25 \text{ lbs}$$

or

$$14.2 \text{ kg}$$

$\boxed{1 \text{ pt}}$

Why is solution reasonable? Explain.

- units check
- limiting cases checks
- Answer seems reasonable (though would need to know fish species to be certain)

$\boxed{1 \text{ pt}}$