WebAssign
CH07-HW04-SP12 (Homework)

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PHYS 172-SPRING 2012, Spring 2012
Instructor: Virendra Saxena

Current Score : 14 / 14 **Due :** Thursday, March 1 2012 11:59 PM EST

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1. 6/6 points | Previous Answers MI3 7.9.X.042

Review of the woman, the barbell, and the Earth (Section 7.9 in the textbook).

Starting from rest, a woman lifts a barbell with a constant force F through a distance h, at which point she is still lifting, and the barbell has acquired a speed v. Let E_{woman} stand for the following energy terms associated with the woman:

$$E_{\text{woman}} = E_{\text{chemical,woman}} + K_{\text{woman (moving arms etc.)}} + U_{\text{grav,woman+Earth}} + E_{\text{thermal,woman}}$$

The change in the kinetic energy of the barbell is $(1/2)mv^2 - 0 = (1/2)mv^2$.
The general statement of the energy principle is $\Delta E_{\text{sys}} = W_{\text{ext}}$. We'll consider terms on the left side of the equation (the ΔE_{sys} side, changes in the energy inside the system) and terms on the right side (the W_{ext} side, energy inputs from the surroundings).

I. System: Woman + barbell + Earth

For the system consisting of the woman, the barbell, and the Earth, which of the following terms belong on the left side of the energy equation (the ΔE_{sys} side)?

- [ ] Fh
- [ ] $-mgh$
- [x] $(1/2)mv^2$
- [ ] $-(1/2)mv^2$
- [ ] $-Fh$
- [x] $+mgh$
- [x] ΔE_{woman}
- [ ] none of these terms (left side is 0)

For the system consisting of the woman, the barbell, and the Earth, which of the following terms belong on the right side of the energy equation (the W_{ext} side)?

- [ ] ΔE_{woman}
- [ ] $+mgh$
- [ ] $-mgh$
- [ ] $(1/2)mv^2$
- [x] none of these terms (right side is 0)
- [ ] $-(1/2)mv^2$
- [ ] $-Fh$
- [ ] Fh

II. System: barbell only

For the system consisting of the barbell only, which of the following terms belong on the left side of the energy equation (the ΔE_{sys} side)?

- [ ] $+mgh$
- [x] $(1/2)mv^2$
- [ ] Fh
- [ ] $-Fh$
- [ ] $-mgh$
- [ ] $-(1/2)mv^2$
- [ ] none of these terms (left side is 0)
- [ ] ΔE_{woman}

For the system consisting of the barbell only, which of the following terms belong on the right side of the energy equation (the W_{ext} side)?

- [x] $-mgh$
- [ ] $(1/2)mv^2$
- [ ] $+mgh$
- [ ] ΔE_{woman}
- [ ] $-Fh$
- [ ] $-(1/2)mv^2$
- [x] Fh
- [ ] none of these terms (right side is 0)

III. System: barbell + Earth

For the system consisting of the barbell and the Earth, which of the following terms belong on the left side of the energy equation (the ΔE_{sys} side)?

- [ ] $-Fh$
- [ ] $-mgh$
- [ ] ΔE_{woman}
- [ ] none of these terms (left side is 0)
- [x] $+mgh$
- [x] $(1/2)mv^2$
- [ ] $-(1/2)mv^2$
- [ ] Fh

For the system consisting of the barbell and the Earth, which of the following terms belong on the right side of the energy equation (the W_{ext} side)?

- [ ] $+mgh$
- [ ] none of these terms (right side is 0)
- [ ] $-Fh$
- [ ] $(1/2)mv^2$
- [ ] ΔE_{woman}
- [x] Fh
- [ ] $-(1/2)mv^2$
- [ ] $-mgh$

- *Read the eBook*
- Section 7.9

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2. 3/3 points | Previous Answers MI3 7.10.X.056

A coffee filter of mass 1.4 grams dropped from a height of 3 m reaches the ground with a speed of 0.7 m/s. How much kinetic energy K_{air} did the air molecules gain from the falling coffee filter? Start from the Energy Principle, and choose as the system the coffee filter, the Earth, and the air.

0.040817 J

- *Read the eBook*
- Section 7.10

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3. 5/5 points | Previous Answers MI3 7.10.P.062

You drop a single coffee filter of mass 1.2 grams from a very tall building, and it takes 54 seconds to reach the ground. In a small fraction of that time the coffee filter reached terminal speed.

(a) What was the upward force of the air resistance while the coffee filter was falling at terminal speed?

F_{air} = 0.01176 N

(b) Next you drop a stack of 3 of these coffee filters. What was the upward force of the air resistance while this stack of coffee filter was falling at terminal speed?

F_{air} = 0.03528 N

(c) Again assuming again that the stack reaches terminal speed very quickly, about how long will the stack of coffee filters take to hit the ground? (Hint: Consider the relation between speed and the force of air resistance.)

Fall time is approximately 31.18 s

- *Read the eBook*
- Section 7.10