WebAssign
CH10-HW02-SP12 (Homework)

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PHYS 172-SPRING 2012, Spring 2012
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Current Score : 20 / 20 **Due :** Tuesday, March 27 2012 11:59 PM EDT

1. 2/2 points | Previous Answers MI3 10.1.X.010

In a collision between an electron and a hydrogen atom, it is useful to select both objects as the system because:

- [ ] The sum of the final kinetic energies must equal the sum of the initial kinetic energies for a two-object system
- [x] The forces the objects exert on each other are internal to the system and don't change the total momentum of the system
- [x] During the time interval just before to just after the collision, external forces are negligible
- [x] The total momentum of the system does not change during the collision
- [ ] The kinetic energy of a two-object system is nearly zero

- *Read the eBook*
- Section 10.1

2. 2/2 points | Previous Answers MI3 10.4.X.019

Consider a head-on elastic collision between two objects. Object 1, which has mass m_1, is initially in motion, and collides head-on with object 2, which has mass m_2, and is initially at rest. Which of the following statements about the collision are true?

- [x] $|\vec{p}_{1,final}| < |\vec{p}_{1,initial}|$
- [x] If $m_2 >> m_1$, then the final speed of object 1 is greater than the final speed of object 2.
- [ ] If $m_1 >> m_2$, then the final speed of object 2 is less than the initial speed of object 1.
- [ ] If $m_2 >> m_1$, then $|\Delta\vec{p}_1| > |\Delta\vec{p}_2|$
- [x] $\vec{p}_{1,initial} = \vec{p}_{1,final} + \vec{p}_{2,final}$

- *Read the eBook*
- Section 10.4

3. 6/6 points | Previous Answers MI3 10.5.X.016

In outer space a rock with mass 7 kg, and velocity < 3200, -3200, 2600 > m/s, struck a rock with mass 15 kg and velocity < 270, -300, 240 > m/s. After the collision, the 7 kg rock's velocity is < 3000, -2600, 3000 > m/s.

What is the final velocity of the 15 kg rock?

$\vec{v}_f$ = ✓ m/s

What is the change in the internal energy of the rocks?

$\Delta E_{\text{internal}}$ = 6.79932894 ✓ J

Which of the following statements about Q (transfer of energy into the system because of a temperature difference between system and surroundings) are correct? (Ignore heat transfer by radiation.) Check all that apply:

- [x] $Q \approx 0$ because there are no significant objects in the surroundings.
- [x] $Q \approx 0$ because the duration of the collision was very short.
- [ ] $Q = \Delta K$ of the rocks.
- [ ] $Q = \Delta E_{internal}$ of the rocks.

✓

- *Read the eBook*
- Section 10.5

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4. 10/10 points | Previous Answers MI3 10.5.X.020

A bullet of mass 0.08 kg traveling horizontally at a speed of 100 m/s embeds itself in a block of mass 2.5 kg that is sitting at rest on a nearly frictionless surface.

(a) What is the speed of the block after the bullet embeds itself in the block?

v = 3.1 ✓ m/s

(b) Calculate the kinetic energy of the bullet plus the block before the collision:

K_i = 400 ✓ J

(c) Calculate the kinetic energy of the bullet plus the block after the collision:

K_f = 12.3969 ✓ J

d) Was this collision elastic or inelastic?

- not enough information to tell
- inelastic
- elastic

(e) Calculate the rise in thermal energy of the bullet plus block as a result of the collision:

$\Delta E_{\text{thermal,bullet}} + \Delta E_{\text{thermal,block}} =$ 387.6031 J

(f) What was the transfer of energy Q (microscopic work) from the surroundings into the block+bullet system during the collision? (Remember that Q represents energy transfer due to a temperature difference between a system and its surroundings.)

$Q =$ 0 J

- *Read the eBook*
- Section 10.5