WebAssign
CH06-HW03-SP12 (Homework)

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PHYS 172-SPRING 2012, Spring 2012
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Current Score : 26 / 26 **Due :** Thursday, February 16 2012 11:59 PM EST

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1. 2/2 points | Previous Answers MI3 6.7.P.068

You push a box out of a carpeted room and along a hallway with a waxed linoleum floor. While pushing the crate 3 m out of the room you exert a force of 26 N; while pushing it 5 m along the hallway you exert a force of 20 N. To bring it to a stop you exert a force of 7 N through a distance of 1.1 m, opposite to the motion. How much work do you do in all?

170.3 ✓ J

- *Read the eBook*
- Section 6.7

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2. 4/4 points | Previous Answers MI3 6.7.P.069

A crate with a mass of 70 kg glides through a space station with a speed of 3 m/s. An astronaut speeds it up by pushing on it from behind with a force of 250 N, continually pushing with this force through a distance of 5 m. The astronaut moves around to the front of the crate and slows the crate down by pushing backwards with a force of 220 N, backing up through a distance of 4 m. After these two maneuvers, what is the speed of the crate?

final speed = 4.42 ✓ m/s

- *Read the eBook*
- Section 6.7

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3. 4/4 points | Previous Answers MI3 6.4.P.059

A mass of 0.084 kg hangs from a vertical spring in the lab room. You pull down on the mass and throw it vertically downward. The speed of the mass just after leaving your hand is 4.40 m/s.

(a) While the mass moves downward a distance of 0.11 m, how much work was done on the mass by the Earth? Include the appropriate sign.

Work done by Earth = 0.091 ✓ J

(b) At the instant in part (a) when the mass has moved downward a distance of 0.11 m, the speed of the mass has decreased to 2.07 m/s. How much work was done on the mass by the spring? Include the appropriate sign.

Work done by spring = -0.724 ✓ J

- *Read the eBook*
- Section 6.4

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4. 7/7 points | Previous Answers MI3 6.15.P.102.alt02

In a location in outer space far from all other objects, a nucleus whose mass is 3.747616e-25 kg and which is initially at rest undergoes spontaneous "alpha" decay. The original nucleus disappears, and two new particles appear: a He-4 nucleus of mass 6.640678e-27 kg (an "alpha particle" consisting of two protons and two neutrons) and a new nucleus of mass 3.681123e-25 kg. These new particles move far away from each other, because they repel each other electrically (both are positively charged).

Because the calculations involve the small difference of (comparatively) large numbers, you need to keep 7 significant figures in your calculations, and you need to use the more accurate value for the speed of light, 2.99792e8 m/s.

Choose all particles as the system.
Initial state: Original nucleus, at rest.
Final state: Alpha particle + new nucleus, far from each other.

What is the rest energy of the original nucleus? *Give 7 significant figures*.
rest energy = 4.0 3.368179e-8 J
What is the sum of the rest energies of the alpha particle and the new nucleus? *Give 7 significant figures*.
sum of rest energies = 4.0 3.368102e-8 J
The portion of the total energy of the system contributed by rest energy: decreased
Therefore the portion of the total energy of the system contributed by kinetic energy:
increased

What is the sum of the kinetic energies of the alpha particle and the new nucleus?
$K_{alpha} + K_{new\ nucleus}$ = 7.749383e-1 J

- *Read the eBook*
- Section 6.15

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5. 6/6 points | Previous Answers MI3 6.4.X.052

A boron nucleus has mass 8.5e-27 kg. If its speed $|\vec{v}|$ is 0.952*c* (that is, $|\vec{v}|/c$ = 0.952), what are the following values?

particle energy = 2.50e-9 J

rest energy = 7.65e-10 J

kinetic energy = 1.735e-9 J

Next an electric force acts on the boron nucleus and does 3.9×10^{-9} J of work on the particle. Now what are the following values?

particle energy = 6.4e-9 ✓ J

rest energy = 7.65e-10 ✓ J

kinetic energy = 5.635e-9 ✓ J

- *Read the eBook*
- Section 6.4

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6. 3/3 points | Previous Answers MI2e 5.RQ.55

A positron is a particle of "antimatter"; it has the same mass as an electron (9e-31 kg), but its charge is positive instead of negative. At research facilities such as the Cornell Electron Positron Storage Ring at Cornell University in New York, high energy beams of positrons can be produced.

When a positron encounters an electron, the two particles annihilate each other, and produce two high energy photons (gamma rays), which travel away from each other.

$$e^- + e^+ \rightarrow \gamma + \gamma$$

Suppose that a positron traveling at a speed of $0.92c$ collides head on with an electron traveling at the same speed.

What is the sum of the energies of the two photons which are produced when the positron and the electron annihilate?

sum of photon energies = 4.134e-13 ✓ J