

**Exam 4.00**  
21 April 2006  
College Physics II (PHYS 2020)  
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**REMOVE THIS COVER SHEET ONLY WHEN  
TOLD TO DO SO. MAKE SURE TO PUT YOUR  
NAME ON THE FIRST PAGE OF THE EXAM  
BEFORE YOU TURN IT IN.**

**Formulae:**

$$K = \frac{1}{2}mv^2, \quad p = mv, \quad P = \frac{E}{t}, \quad E_0 = m_0c^2$$

$$E_n = nhf, \quad E = hf, \quad c = \lambda f, \quad K_{\max} = hf - W_0, \quad p = \frac{h}{\lambda}, \quad \lambda = \frac{h}{p}$$

$$\Delta p_y \Delta y \geq \frac{h}{2\pi}, \quad \Delta E \Delta t \geq \frac{h}{2\pi}, \quad \frac{1}{\lambda} = R \left( \frac{1}{n'^2} - \frac{1}{n^2} \right), \quad E_n = -(13.6eV) \frac{Z^2}{n^2}$$

$$N = N_0 e^{-\lambda t}, \quad R = \frac{\Delta N}{\Delta t} = \lambda N = R_0 e^{-\lambda t}, \quad T_{1/2} = \frac{\ln 2}{\lambda}$$

**Constants and conversions:**

$$|q_e| = 1.60 \times 10^{-19} \text{ C}, \quad k = 8.99 \times 10^9 \text{ N} \cdot \text{m}^2 / \text{C}^2, \quad m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s}, \quad 1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}, \quad c = 3.00 \times 10^8 \text{ m/s}$$

$$1 \text{ Ci} = 3.70 \times 10^{10} \text{ decays/second}$$

$$m_{\text{electron}} = 9.11 \times 10^{-31} \text{ kg} = 5.486 \times 10^{-4} \text{ u} = .511 \text{ MeV}/c^2$$

$$m_{\text{proton}} = 1.007276 \text{ u}, \quad m_{\text{neutron}} = 1.008665 \text{ u}$$

$$1 \text{ u} = 1.660540 \times 10^{-27} \text{ kg} = 931.5 \text{ MeV}/c^2$$

**Advice/Info:**

A diet complete with dairy and whole grains will help you maintain a healthy weight and . . . oh, you wanted some *other* kinds of advice.

You know what to do. Make sure your name and your seat number are in the appropriate places, or else you will lose 5 points. Show your work clearly for full credit. Ask questions if you have them. Circle your answers if you want me to find them. All numeric values are good to at least 3 significant figures. Take a deep breath and have fun. **You should have three (3) pages in this exam, not including the cover sheet.** 100 points are possible.

Now it is time to say what you have to say  
The room is quiet,  
The whirring fan has been unplugged,  
and the girl who was tapping  
a pencil on her desktop has been removed.

So tell us what is on your mind.  
We want to hear the sound of your foliage,  
the unraveling of your tool kit,  
your songs of loneliness,  
your songs of hurt.

The trains are motionless on the tracks,  
the ships at rest in the harbor.  
The dogs are cocking their heads  
and the gods are peering down from their balloons.  
The town is hushed,

and everyone here has a copy.  
So tell us about your parents—  
your father behind the steering wheel,  
your cruel mother at the sink.  
Let's hear about all the clouds you saw, all the trees.

Read the poem you brought with you tonight.  
The ocean has stopping sloshing around,  
and even Beethoven  
is sitting up in his deathbed,  
his cold hearing-horn inserted in one ear.