**PHYS 206:** **KOÇ UNIVERSITY** **Spring Semester 2013**

**College of Arts and Sciences**

**Sectiong** **Quiz 7** **29 March 2013**

**Closed book. No calculators are to be used for this quiz.**
**Quiz duration: 10 minutes**

**Name:** **Student ID:** **Signature:**

For a particular cathode material in a photoelectric-effect experiment, you measure stopping potentials $V_0$=1.0 V for light of wavelength $\lambda$=600 nm, 2.0 V for 400 nm, and 3.0 V for 300 nm. Determine the work function $\varphi$ for this material and the implied value of Planck's constant *h*.

**PHYS 206:** **KOÇ UNIVERSITY** **Spring Semester 2013**

**College of Arts and Sciences**

**Sectionh** **Quiz 7** **29 March 2013**

**Closed book. No calculators are to be used for this quiz.**
**Quiz duration: 10 minutes**

**Name:** **Student ID:** **Signature:**

The photoelectric threshold wavelength of a tungsten surface is 272 nm. Calculate the maximum kinetic energy of the electrons ejected from this tungsten surface by ultraviolet radiation of frequency $1.45\times10^{15}$ Hz Express the answer in electron volts.

**PHYS 206:** **KOÇ UNIVERSITY** **Spring Semester 2013**

**College of Arts and Sciences**

**Sectioni** **Quiz 7** **29 March 2013**

**Closed book. No calculators are to be used for this quiz.**
**Quiz duration: 10 minutes**

**Name:** **Student ID:** **Signature:**

Protons are accelerated from rest by a potential difference of 4.00 kV and strike a metal target. If a proton produces one photon on impact, what is the minimum wavelength of the resulting X-rays? How does your answer compare to the minimum wavelength if 4.00keV electrons are used instead? Why do x-ray tubes use electrons rather than protons to produce x rays?

**PHYS206: General Physics IV KOÇ UNIVERSITY Spring Semester 2013**

**College of Arts and Sciences**

**Sectionj Quiz 7 29 March 2013**

**Closed book. No calculators are to be used for this quiz.**
**Quiz duration: 10 minutes**

**Name: Student ID: Signature:**

If a photon of wavelength 0.04250 nm strikes a free electron and is scattered at an angle of $35.0^0$ from its original direction, find a) the change in the wavelength of this photon; b) the wavelength of the scattered light: c) the change in energy of the photon (is it a loss or a gain?); d) the energy gained by the electron.

$$\lambda' - \lambda = \frac{h}{mc}(1 - cos\varphi)$$

**PHYS206: General Physics IV KOÇ UNIVERSITY Spring Semester 2013**

**College of Arts and Sciences**

**Sectionk Quiz 7 29 March 2013**

**Closed book. No calculators are to be used for this quiz.**
**Quiz duration: 10 minutes**

**Name: Student ID: Signature:**

Many varieties of lasers emit light in the form of pulses rather than a steady beam. A tellurium-sapphire laser can produce light at wavelength of 800 nm in ultrashort pulses that last only $4.00 \times 10^{-15}$s (4.00 femtoseconds, or 4.00 fs). The energy in a single pulse produced by one such laser is 2.00 μJ = $2.00 \times 10^{-6}$ J, and the pulses propagate in the positive x-direction. Find a) the frequency of the light; b) the energy and minimum energy uncertainty of a single photon in the pulse; c) the minimum frequency uncertainty of the light in the pulse; d) the spatial length of the pulse, in meters and as a multiple of the wavelength; e) the momentum and minimum momentum uncertainty of a single photon in the pulse and f) the approximate number of photons in the pulse.

**PHYS206: General Physics IV KOÇ UNIVERSITY Spring Semester 2013**

**College of Arts and Sciences**

**Sectionl Quiz 7 29 March 2013**

**Closed book. No calculators are to be used for this quiz.**
**Quiz duration: 10 minutes**

**Name: Student ID: Signature:**

The photoelectric work functions for particular samples of certain metals are as follows: cesium, 2.1 eV; copper, 4.7 eV; potassium, 2.3 eV; and zinc, 4.3 eV. a) What is the threshold wavelength for each metal surface? b) Which of these metals could not emit photoelectrons when irradiated with visible light (380-750 nm)?