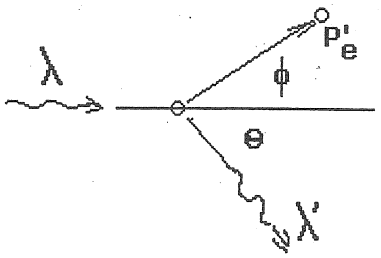
( ) 3.6. Shown below is a Compton photon scattering experiment. The difference between the wavelength λ' of the scattered photon and the wavelength λ of the incident photon is related to the scattering angle θ of the photon by the relation $\lambda' - \lambda = (\,h/mc\,)(\,1 - \cos\theta\,)$. The incident X-ray photon has a wavelength of 1.5×10^{-3} nm.



($m = 9.1 \times 10^{-31}$ kg , and $h/mc = 2.43 \times 10^{-12}$m)
If an X-ray photon is scattered at an angle of 25.0 degrees, then what is the momentum of the scattered electron?

A) 1.88×10^{-22} kg m/s
B) 2.54×10^{-22} kg m/s
C) 3.13×10^{-22} kg m/s
D) 3.62×10^{-22} kg m/s
E) Correct answer not given. My answer is_____

( ) 3.7 What is the angle ϕ at which the electron is scattered in the above problem?

A) 36.3 degrees
B) 42.7 degrees
C) 50.4 degrees
D) 59.9 degrees
E) Correct answer not given. My answer is_____

( ) 3.8. The nucleus of the $^{3}_{1}H$ atom has a mass of 3.016049u. What is the binding energy of the nucleus? (m_p= 1.007825u, m_n = 1.008665u, 1 u = 931.5 Mev)

A) − 32.0 Mev
B) − 28.3 Mev
C) − 8.5 Mev
D) − 2.2 Mev
E) Correct answer not given. My answer is_____

( ) 3.9. In the nuclear reaction $^{4}_{2}He + ^{9}_{4}Be = ^{1}_{0}n + ^{12}_{6}C$ + Energy, how much energy is released or absorbed? The mass of $^{4}_{2}He$ is 4.002603 u, the mass of $^{9}_{4}Be$ is 9.012182 u, the mass of $^{1}_{0}n$ is 1.008665 u, and the mass of $^{12}_{6}C$ is 12.000000 u. (1 u = 1.660540×10^{-27}kg = 931.5 MeV)

A) 0.63 Mev released, absorbed (CIRCLE released or absorbed)
B) 1.19 Mev released, absorbed (CIRCLE released or absorbed)
C) 4.96 Mev released, absorbed (CIRCLE released or absorbed)
D) 5.70 Mev released, absorbed (CIRCLE released or absorbed)
E) Correct answer not given. My answer is_____

( ) 3.10 The $^{27}_{14}Si$] nucleus under goes radioactive decay by emitting a positive beta particle.What is the resulting nucleus?

A) $^{22}_{10}Ne$ B) $^{24}_{12}Mg$ C) $^{27}_{13}Al$ D) $^{31}_{15}P$

E) Correct answer not given. My answer is_____

( ) 3.1 Chris has a lifetime of 75 years in her own frame of reference. If Chris moves at 0.7c relative to the earth, then what is her lifetime measured by an observer on earth? Or to put it another way:

There once was a sailor named Sears,
whose lifetime was 75 years.
She sailed or'e the sea at 0.7c.
Folks on the dock said she lived _____ years.

A) 84 years
B) 91 years
C) 98 years
D) 105 years
E) Correct answer not given. My answer is_____

( ) 3.2. The rest energy of a proton is 939.38 Mev. If the proton has a kinetic energy of 300 Mev, then what is the velocity of the proton ? ($1eV = 1.6 \times 10^{-19}$ Joules, $1\ MeV = 10^6 eV$, $c = 3 \times 10^8 m/s$)
A) 0.65 c
B) 0.71 c
C) 0.76 c
D) 0.79 c
E) Correct answer not given. My answer is_____

( ) 3.3 A stretch limo with a proper length of 5.0 m speeds by a stationary policeman at a speed of 0.86c as recorded on his radar. The policeman uses his stopwatch to measure the time it takes for the limo to pass by him. What is the time that the policeman measures on his stopwatch?
A) 10.8 nanoseconds
B) 9.9 nanoseconds
C) 9.0 nanoseconds
D) 8.1 nanoseconds
E) correct answer not given. My answer is_____

( ) 3.4 What is the wavelength of a photon emitted when an electron in hydrogen goes from the n = 5 state to the n = 2 state?
A) 658 nanometers
B) 488 nanometers
C) 435 nanometers
D) 411 nanometers
E) Correct answer not given. My answer is _____

( ) 3.5 What is the energy of a photon that has the same wavelength as an electron with a kinetic energy of 16.0 eV? ($h = 6.63 \times 10^{-34}$ Js, $c = 3 \times 10^8 m/s$, $m_e = 9.1 \times 10^{-31} kg$, $e = 1.6 \times 10^{-19} C$)
A) 3.20 keV
B) 3.50 keV
C) 3.78 keV
D) 4.04 keV
E) Correct answer not given. My answer is _____