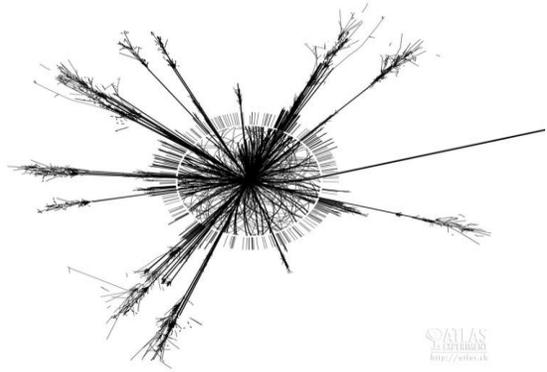


MODERN PHYSICS



1. The energy of a photon is 2.11 eV. What is the energy of the photon in J? Frequency? Color?
2. In which part of the electromagnetic spectrum does a photon have the least energy?
3. Photon energy varies inversely with what?
4. A photon has an energy of 8.0×10^{-19} Joule. What is this energy equal to in eV?
5. The slope of a graph of photon energy versus photon frequency represents what quantity?
6. How much energy does a 600 GHz photon have? What is its wavelength?
7. X-ray collides with an electron in an atom, ejecting the electron and emitting another photon. During the collision there is a conservation of what?
8. What are the energy emissions of the following electron transitions of hydrogen $n = 1$ to $n = 2$, $n = 3$ to $n = 2$, $n = 5$ to $n = 3$
9. How much energy does it take to ionize a hydrogen in the $n = 3$ energy state?
10. Which photon energy could be absorbed by a hydrogen atom in the $n = 2$ state?
11. Hydrogen atoms transition from the $n = 3$ the ground state. What is the total number of different photon energies that may be emitted?
12. A photon having an energy of 9.40 eV strikes a hydrogen atom in the ground state. Why is the photon not absorbed by the hydrogen atom?
13. A photon with 14.60 eV of energy collides with an Hg atom in the ground state. Calculate the frequency of the incident photon.

Note: for $E=mc^2$, if $m=kg$, $E=J$, or if $m=AMU$, $E=eV$

14. One AMU equals 1.66×10^{-27} kg. Calculate the MeV equivalent of 1 AMU.

15. If a deuterium nucleus has a mass of 1.53×10^{-3} AMU less than its components, this represents how much energy?
16. What is the total number of quarks in a He nucleus consisting of 2 proton and 2 neutrons.

For 17 and 18: $Neutron \rightarrow proton + e^- + electron$
 $neutrino + energy$

17. Based on conservation laws, how does the mass of the neutron compare to the mass of the proton?
18. Since charge must be conserved in the reaction shown, what charge must an electron antineutrino carry?
19. Which of these charges can a baryon have: $-1/3 e$, $0 e$, $+2/3 e$, $+4/3 e$
20. Which quarks make up an antibaryon?
21. What is the electric charge on a pion having a quark composition of $u\bar{d}$.
22. What is the electric charge on a particle having a quark composition of $d\bar{b}$.
23. A particle has a quark composition of dds . What is the charge on and classification of the particle?
24. What is the mass of an antineutron in kg?