Pratt, Scott **Section 999**

–Introductory Physics II - EXAM 4 - Apr. 29, 1998

CAPA ID is **4835**

1. [3pt] An electron has a kinetic energy of 20 eV. What is its wavelength in meters? DATA: $m_e = 9.11 \times 10^{-31}$ kg.

A) 1.17×10^{-10} B) 1.32×10^{-10} C) 1.49×10^{-10} D) 1.68×10^{-10}
E) 1.90×10^{-10} F) 2.15×10^{-10} G) 2.43×10^{-10} H) 2.74×10^{-10}

2. [3pt] Now imagine that such an electron is incident on a pair of slits separated by 3.29×10^{-9} m. What is the angle (in degrees) between the central maximum and the first-order maximum.

A) 3.55×10^{-1} B) 5.14×10^{-1} C) 7.46×10^{-1} D) 1.08
E) 1.57 F) 2.27 G) 3.30 H) 4.78

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3. [3pt] Consider a single electron in the ground state of a helium nucleus. (For each statement select G Greater than, L Less than, E Equal to).

A) The wavelength of a photon emitted from the n=2 to the n=1 level in Helium is (GLE) to the wavelength of a photon emitted from the same levels in Hydrogen.

B) The magnitude of the electron's binding energy to Helium is (GLE) to the magnitude of an electron's binding energy in the ground state of Hydrogen.

C) The radius of the electron's orbit around the helium is (GLE) than the radius of an electon's orbit around Hydrogen.

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4. [3pt] A particle of mass m, confined to a box of size L, is in the lowest possible energy state (ground state). (For each statement select T True, F False).

A) If the size of the box is reduced, the kinetic energy of the particle must increase.

B) If the mass of the particle is increased, the kinetic energy of the particle must increase.

C) If the particle is an electron, no more than two electrons can occupy the ground state of the box.

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5. [3pt] An electron falls from the n=6 to the n=5 level in hydrogen. What is the energy (in eV) of the associated photon?

A) 1.66×10^{-1} B) 2.21×10^{-1} C) 2.94×10^{-1} D) 3.91×10^{-1}
E) 5.20×10^{-1} F) 6.92×10^{-1} G) 9.20×10^{-1} H) 1.22

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6. [3pt] A radioactive sample initially has 7.0×10^9 radioactive nuclei. After 24 hours, there are only 2.0×10^6 radioactive nuclei remaining. What is the half-life? Give answer in seconds.

A) 5.06×10^3 B) 7.34×10^3 C) 1.06×10^4 D) 1.54×10^4
E) 2.24×10^4 F) 3.24×10^4 G) 4.70×10^4 H) 6.82×10^4

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7. [3pt] The nucleus of a neutral atom is described by the symbol: ${}^{14}_{7}C$. (For each statement select T True, F False).

A) There are 14 neutrons in the nucleus.

B) The ground state electronic configuration is $1s^2 2s^2 2p^6 3s^2 3p^2$.

C) The number of electrons equals the number of protons.

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8. [3pt] Radioactive materials can be harmful to your health because radiation (choose the single best answer)

A) removes quarks from your protons

B) removes neutrons from your nuclei

C) removes protons from your nuclei.

D) raises the temperature of your cells

E) removes electrons from your atoms

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9. [3pt] A nucleus undergoes a gamma decay, releasing a photon of energy 9.3 MeV. What is the change in the mass (in atomic mass units, u) of the nucleus?

A) 3.27×10^{-3} B) 4.09×10^{-3} C) 5.11×10^{-3} D) 6.39×10^{-3}
E) 7.99×10^{-3} F) 9.98×10^{-3} G) 1.25×10^{-2} H) 1.56×10^{-2}

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10. [3pt] Consider the following statements regarding nuclear reactions and decays. (For each statement select T True, F False).

A) The gamma decay of a nucleus changes the net number of protons in the nucleus.

B) The net number of quarks minus the net number of antiquarks always remains constant.

C) Neutrons can not decay due to conservation of baryon number.