

Short x-ray quiz

- 1) The lifetime of a nuclear isomer is
 - a. typically in the fs range
 - b. in the ns range
 - c. longer than ns

- 2) W. Röntgen first discovered x-rays using
 - a. cathode rays
 - b. a radioactive cobalt source
 - c. oscillating protons

- 3) An oscillating dipole emits electromagnetic radiation
 - a. with a maximum in the direction of oscillation perpendicular to the oscillation direction
 - b. with a maximum in the direction
 - c. isotropically

- 4) The self amplified spontaneous emission happens when
 - a. each electron emits radiation independently
 - b. the electrons in the bunch undergo stimulated emission
 - c. the electrons interact with the emitted light and microbunching occurs

- 5) The XFEL has
 - a. good temporal coherence
 - b. good spatial coherence
 - c. good longitudinal coherence

- 6) The form factor of an atom is
 - a. the Fourier transform of the charge distribution
 - b. the Fourier transform of the scattered electric field
 - c. the Fourier transform of the momentum transfer

- 7) The Compton wavelength of a particle is
 - a. the wavelength of a photon whose energy is the same as the rest energy of that particle
 - b. the wavelength of a photon whose momentum is equal to one atomic unit
 - c. the wavelength of a photon whose energy is one atomic unit

- 8) We use x-rays to study surfaces because
 - a. the x-ray index of refraction is larger than one
 - b. total reflection of x-rays occurs at small angles
 - c. surfaces absorb x-rays very efficiently

- 9) Can we measure the electric and magnetic fields of an electromagnetic wave simultaneously?
 - a. yes
 - b. no
 - c. sometimes

- 10) The so-called vacuum fluctuations occur because
 - a. the expectation value of the electric field in the vacuum state is not zero
 - b. the expectation value of the electric field in the vacuum state is zero
 - c. the expectation value of the squared electric field for the vacuum state is not zero