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Physics\_Questions\_0036

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**Question 1**

2 / 2 points

A photon of wavelength 200 nm is scattered by an electron that is initially at rest. Which one of the following statements concerning the wavelength of the scattered photon is true?

- a) The wavelength is zero nm.
- b) The wavelength is less than 200 nm, but greater than zero.
- c) The wavelength is 100 nm.
- d) The wavelength is 200 nm.
- e) The wavelength is greater than 200 nm.

**Question 2**

2 / 2 points

The work function for a particular metal is 4.0 eV. Which one of the following best describes the wavelength of electromagnetic radiation needed to eject electrons from this metal?

- a) 310 nm or smaller
- b) 620 nm or greater
- c) 800 nm or greater
- d) 620 nm or smaller
- e) 310 nm or greater

**Question 3**

2 / 2 points

Which one of the following statements concerning photons is false?

- a) The rest energy of all photons is zero.
- b) Photons have been brought to rest by applying a very strong magnetic field to them.
- c) Photons travel at the speed of light in a vacuum.
- d) The energy of a photon is proportional to its frequency.
- e) Photons have zero mass.

**Question 4**

2 / 2 points

Which one of the following phrases best describes the term *work function*?

- a) the minimum energy required to remove electrons from a metal surface
- b) the minimum energy required to vaporize a metal surface
- c) the work required to place a charged particle on a metal surface
- d) the work done by electromagnetic radiation when it hits a metal surface
- e) the minimum energy required to remove an atom from a metal surface

**Question 5**

2 / 2 points

Determine the energy of a single photon in a monochromatic beam of light of wavelength 625 nm.

- a) 2.32 eV
- b) 2.08 eV
- c) 1.99 eV
- d) 3.49 eV
- e) 4.77 eV

**Question 6**

2 / 2 points

What is the de Broglie wavelength of an electron ( $m = 9.11 \times 10^{-31}$  kg) in a  $2.5 \times 10^3$ -volt X-ray tube?

- a) 0.0072 nm
- b) 0.031 nm
- c) 0.017 nm
- d) 0.011 nm
- e) 0.025 nm

**Question 7**

2 / 2 points

The x component of the velocity of an electron ( $m = 9.11 \times 10^{-31}$  kg) is known to be between 100 m/s and 300 m/s. Which one of the following is a true statement concerning the uncertainty in the x coordinate of the electron?

- a) The minimum uncertainty is about  $3 \times 10^{-7}$  m.
- b) The maximum uncertainty is about  $6 \times 10^{-9}$  m.
- c) The maximum uncertainty is about  $6 \times 10^{-7}$  m.
- d) The minimum uncertainty is about  $3 \times 10^{-9}$  m.
- e) The maximum uncertainty is about  $10^6$  m.

**Question 8**

2 / 2 points

A physicist wishes to produce electrons by shining light on a metal surface. The light source emits light with a wavelength of 450 nm. The table lists the only available metals and their work functions.

<u>Metal</u>	<u><math>W_0</math> (eV)</u>
barium	2.5
lithium	2.3
tantalum	4.2
tungsten	4.5

Reference: Ref 29-1

Which entry in the table below correctly identifies the metal that will produce the most energetic electrons and their energies?

<i>Metal</i>	<i>Maximum electron energy observed</i>
a) tungsten	2.8 eV
b) tungsten	1.8 eV
c) lithium	0.5 eV
d) lithium	2.3 eV
e) tungsten	4.5 eV

**Question 9**

2 / 2 points

The position of a hydrogen atom ( $m = 1.7 \times 10^{-27}$  kg) is known to within  $2.0 \times 10^{-6}$  m. What is the minimum uncertainty in the atom's velocity?

- a) zero m/s
- b) 0.0085 m/s
- c) 0.031 m/s
- d) 0.016 m/s
- e) 0.011 m/s

**Question 10**

2 / 2 points

For which one of the following problems did Max Planck make contributions that eventually led to the development of the "quantum" hypothesis?

- a) the motion of the earth in the ether
- b) uncertainty principle
- c) the invariance of the speed of light in a vacuum
- d) photoelectric effect
- e) blackbody radiation curves