de Broglie and the Wave Nature of Matter

Multiple Choice

_____ 1. What happens to a high energy photon after it strikes an electron?
   a. decreases frequency
   b. decreases wavelength
   c. increases energy
   d. increases momentum

_____ 2. What is the deBroglie wavelength of a 125 g baseball moving at 28.0 m/s?
   a. 1.89×10^{-34} m
   b. 2.32×10^{-33} m
   c. 3.50×10^{0} m
   d. 5.28×10^{33} m

_____ 3. The deBroglie wavelength of a proton is 5.57×10^{-7} m. What is the speed of the proton?
   a. 1.19×10^{-27} m/s
   b. 3.57×10^{-19} m/s
   c. 1.28×10^{-9} m/s
   d. 7.11×10^{-1} m/s

_____ 4. What speed must a 0.20 kg ball be moving if it has a de Broglie wavelength of 2.2×10^{-34} m?
   a. 0.60 m/s
   b. 15 m/s
   c. 73 m/s
   d. 150 m/s

_____ 5. What is the de Broglie wavelength of a neutron travelling at 5.00 m/s?
   a. 1.58×10^{-8} m
   b. 7.91×10^{-8} m
   c. 3.96×10^{-7} m
   d. 7.92×10^{-7} m

_____ 6. What happens to the deBroglie wavelength of an electron if its momentum is doubled?
   a. decreases by a factor of 2
   b. decreases by a factor of 4
   c. increases by a factor of 2
   d. increases by a factor of 4

_____ 7. What is the wavelength of the matter wave associated with an electron moving at 2.5×10^{7} m/s?
   a. 2.9×10^{-11} m
   b. 4.7×10^{-11} m
   c. 2.9×10^{-7} m
   d. 4.7×10^{-7} m

_____ 8. What is the wavelength of a charged particle, q, which is accelerated from rest through a potential difference, V?

   a. $\dfrac{hc}{Vq}$ c. $\dfrac{hcV}{q}$

   b. $\dfrac{hcq}{V}$ d. $\dfrac{Vq}{hc}$

9. What is the deBroglie wavelength of an electron emitted with a kinetic energy of 2.4 eV?

10. Two subatomic particles with very different masses have the same de Broglie wavelength. Explain how this is possible.

de Broglie and the Wave Nature of Matter
Answer Section

MULTIPLE CHOICE

1.	ANS: A	DIF:	ii	TOP:	photon momentum
2.	ANS: A	DIF:	ii	TOP:	De Broglie Wavelength
3.	ANS: D	DIF:	ii	TOP:	De Broglie Wavelength
4.	ANS: B	DIF:	ii	TOP:	De Broglie wavelength
5.	ANS: B	DIF:	ii	TOP:	De Broglie wavelength
6.	ANS: A	DIF:	ii	TOP:	De Broglie Wavelength
7.	ANS: A	DIF:	ii	TOP:	De Broglie Wavelength
8.	ANS: A	DIF:	iii	TOP:	De Broglie wavelength

PROBLEM

9. ANS:
see key

DIF: ii   TOP: De Broglie wavelength