

de Broglie and the Wave Nature of Matter

Multiple Choice

- ____ 1. What happens to a high energy photon after it strikes an electron?
- decreases frequency
 - decreases wavelength
 - increases energy
 - increases momentum
- ____ 2. What is the deBroglie wavelength of a 125 g baseball moving at 28.0 m/s?
- 1.89×10^{-34} m
 - 2.32×10^{-33} m
 - 3.50×10^0 m
 - 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?
- 1.19×10^{-27} m/s
 - 3.57×10^{-19} m/s
 - 1.28×10^{-9} m/s
 - 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?
- 0.60 m/s
 - 15 m/s
 - 73 m/s
 - 150 m/s
- ____ 5. What is the de Broglie wavelength of a neutron travelling at 5.00 m/s?
- 1.58×10^{-8} m
 - 7.91×10^{-8} m
 - 3.96×10^{-7} m
 - 7.92×10^{-7} m
- ____ 6. What happens to the deBroglie wavelength of an electron if its momentum is doubled?
- decreases by a factor of 2
 - decreases by a factor of 4
 - increases by a factor of 2
 - 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?
- 2.9×10^{-11} m
 - 4.7×10^{-11} m
 - 2.9×10^{-7} m
 - 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. $\frac{hc}{Vq}$ | c. $\frac{hcV}{q}$ |
| b. $\frac{hcq}{V}$ | d. $\frac{Vq}{hc}$ |
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.

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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