Standards-Based Assessment

Answer the following items on a separate piece of paper.

MULTIPLE CHOICE

1. Which of the following relationships is true?
   - **A.** Higher-energy light has a higher frequency than lower-energy light does.
   - **B.** Higher-energy light has a longer wavelength than lower-energy light does.
   - **C.** Higher-energy light travels at a faster speed than lower-energy light does.
   - **D.** Higher-frequency light travels at a slower speed than lower-energy light does.

2. The energy of a photon is greatest for
   - **A.** visible light.
   - **B.** ultraviolet light.
   - **C.** infrared light.
   - **D.** X-ray radiation.

3. What is the wavelength of radio waves that have a frequency of 88.5 MHz?
   - **A.** 3.4 m
   - **C.** 0.30 m
   - **B.** 8.9 nm
   - **D.** 300 nm

4. Which transition in an excited hydrogen atom will emit the longest wavelength of light?
   - **A.** E_5 to E_1
   - **C.** E_3 to E_1
   - **B.** E_4 to E_1
   - **D.** E_2 to E_1

5. Which of the following quantum numbers is often designated by the letters *s*, *p*, *d*, and *f* instead of by numbers?
   - **A.** n
   - **C.** m
   - **B.** l
   - **D.** s

6. Which quantum number is related to the shape of an orbital?
   - **A.** n
   - **C.** m
   - **B.** l
   - **D.** s

7. What is the maximum number of unpaired electrons that can be placed in a $3p$ sublevel?
   - **A.** 1
   - **C.** 3
   - **B.** 2
   - **D.** 4

8. What is the maximum number of electrons that can occupy a $3s$ orbital?
   - **A.** 1
   - **C.** 6
   - **B.** 2
   - **D.** 10

9. Which element has the noble-gas notation $[Kr]5s^24d^2$?
   - **A.** Se
   - **C.** Zr
   - **B.** Sr
   - **D.** Mo

SHORT ANSWER

10. When a calcium salt is heated in a flame, a photon of light with an energy of 3.2×10^{-19} J is emitted. On the basis of this fact and the table below, what color would be expected for the calcium flame?

Frequency, s^{-1}	7.1×10^{14}	6.4×10^{14}	5.7×10^{14}
Wavelength, nm	422	469	526
Color	violet	blue	green
Frequency, s^{-1}	5.2×10^{14}	4.8×10^{14}	4.3×10^{14}
Wavelength, nm	577	625	698
Color	yellow	orange	red

11. The electron configuration of sulfur is $1s^22s^22p^63s^23p^4$. Write the orbital notation for sulfur.

EXTENDED RESPONSE

12. Explain the reason for the hydrogen line-emission spectrum.

13. When blue light shines on potassium metal in a photocell, electrons are emitted. But when yellow light shines on the metal, no current is observed. Explain.

Test Tip

If time permits, take short mental