

CHAPTER 2: ATOMIC STRUCTURE

1. What is the wavelength, λ of the fourth line in the Balmer's series? [Rydberg constant, $R_H = 1.0971 \times 10^7 \text{ m}^{-1}$]
A. 410nm C. 486nm
B. 432nm D. 654nm

2. Calculate the energy required to excite an electron from $n = 2$ to $n = 4$.
A. $4.09 \times 10^{-19} \text{ J}$
B. $5.45 \times 10^{-19} \text{ J}$
C. $2.05 \times 10^6 \text{ J}$
D. $2.74 \times 10^6 \text{ J}$

3. What is the frequency, in s^{-1} , of a radiation with energy of $3.37 \times 10^{-19} \text{ J}$ per photon?
A. $5.08 \times 10^{-54} \text{ s}^{-1}$
B. $5.08 \times 10^{14} \text{ s}^{-1}$
C. $5.08 \times 10^{-15} \text{ s}^{-1}$
D. $5.08 \times 10^{15} \text{ s}^{-1}$

4. Calculate the wavelength of the second line in Lyman series.
A. $1.30 \times 10^{-7} \text{ m}$
B. $1.23 \times 10^{-7} \text{ m}$
C. $5.08 \times 10^{-15} \text{ m}$
D. $1.03 \times 10^{-7} \text{ m}$

5. What is the minimum amount of ionization energy of hydrogen atom at ground state?
A. $1312.36 \text{ kJ mol}^{-1}$
B. $2.18 \times 10^{-18} \text{ J}$
C. $2.18 \times 10^{-18} \text{ J mol}^{-1}$
D. $1312.36 \text{ J mol}^{-1}$

6. Calculate the frequency of the second line in Lyman series.

- A. $1.91 \times 10^{14} \text{ s}^{-1}$
- B. $2.91 \times 10^{15} \text{ s}^{-1}$
- C. $3.23 \times 10^{14} \text{ s}^{-1}$
- D. $1.65 \times 10^{15} \text{ s}^{-1}$

7. Calculate the wavelength of the third line in the Balmer series.

- A. 810 nm C. 434 nm
- B. 343 nm D. 520 nm

8. FIGURE 1 shows the first four lines in the Brackett series of hydrogen emission spectrum.

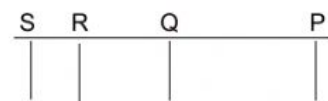


FIGURE 1

Calculate the wavelength of the radiation that produces the fourth line.

- A. $5.56 \times 10^{-6} \text{ m}$
- B. $2.34 \times 10^{-5} \text{ m}$
- C. $1.94 \times 10^{-5} \text{ m}$
- D. $1.94 \times 10^{-6} \text{ m}$

9. In the hydrogen atom, an electron transit from a higher to a lower energy level emits a photon with a wavelength of 1282 nm in Paschen series. Determine the energy level of the excited state for this transition.

- A. $n = 3$ C. $n = 6$
- B. $n = 4$ D. $n = 5$

10. A line with wavelength of 434 nm was observed in the Balmer series of the emission spectrum of hydrogen.

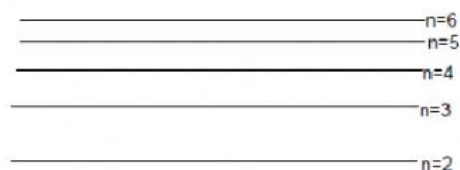
Calculate its frequency.

- A. $5.91 \times 10^{14} \text{ s}^{-1}$
- B. $7.19 \times 10^{14} \text{ s}^{-1}$
- C. $6.19 \times 10^{14} \text{ s}^{-1}$
- D. $6.91 \times 10^{14} \text{ s}^{-1}$

11. Calculate the energy of the photon emitted to produced second line in the Paschen series.

- A. $2.55 \times 10^{-19} \text{ J}$
- B. $1.45 \times 10^{-19} \text{ J}$
- C. $1.51 \times 10^{-19} \text{ J}$
- D. $1.55 \times 10^{-19} \text{ J}$

12. How many electronic transitions between the following energy levels would be expected for Lyman and Paschen



_____ n=1

Lyman Series Paschen Series

- A. 5 3
- B. 5 2
- C. 4 3
- D. 5 4

13. Calculate the wavelength in nm of the second line in Lyman series.

- A. $1.026 \times 10^{-16} \text{ nm}$
- B. $1.026 \times 10^2 \text{ nm}$
- C. $9.75 \times 10^6 \text{ nm}$
- D. $975 \times 10^{-3} \text{ nm}$

14. Q is an element with proton number of 21. Write the electronic configuration of Q.

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$
- C. $1s^2 2s^2 2p^6 3s^2 3p^1$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$

15. Give a set of quantum numbers for the electrons that occupy the fourth shell in Scandium (Sc).

- A. $n=3, l=1, m=0, s=+1$
- B. $n=3, l=1, m=1, s=-\frac{1}{2}$
- C. $n=4, l=0, m=1, s=+\frac{1}{2}$
- D. $n=4, l=0, m=0, s=-\frac{1}{2}$

16. Given the set of quantum number for the highest energy electron in atom X.

$$n=4, l=1, m=0, s=+\frac{1}{2}$$

Write the electronic configuration of X.

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4p^{21}$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^1$

17. Give a set of quantum number of one valence electron in the s orbital of arsenic, As.

- A. $n=4, l=0, m=1, s=-\frac{1}{2}$
- B. $n=4, l=1, m=0, s=+1$
- C. $n=4, l=0, m=0, s=-1$
- D. $n=4, l=0, m=0, s=-\frac{1}{2}$

18. The proton number of copper (Cu) is 29.

Write the valence electronic configuration of the copper atom.

- A. $4s^2 3d^{10}$
- B. $4s^1 3d^{10}$
- C. $4s^2 3d^8$
- D. $3d^{10} 4s^2$

19. Nickel has 28 protons. Give a set of possible quantum number for the electron with the highest energy in Ni^{2+} ion.

- A. $n=3 \quad l=2 \quad m=-1 \quad s=-1/2$
- B. $n=3 \quad l=1 \quad m=-1 \quad s=+1/2$
- C. $n=4 \quad l=0 \quad m=-1 \quad s=+1/2$
- D. $n=4 \quad l=0 \quad m=0 \quad s=-1/2$

20. Ion that have the similar electronic configuration with $_{10}\text{Ne}$ is;

- A. O^{2+}
- C. N^{3-}
- B. Mg^{2+}
- D. Cl^-

21. The charge of an ion P is $2-$, in which it contains 2 inner electrons and eight outermost electrons. The electronic configuration of atom P is;

- A. $1s^2 2s^2 2p^6$
- B. $1s^2 2s^2 2p^4$
- C. $1s^2 2s^2 2p^6 3s^2$
- D. $1s^2 2s^2 2p^6 3s^2$

22. Which of the following electronic configuration represent an element that form ion with a charge of $2-$.

- A. $1s^2 2s^2 2p^6 3s^2$
- B. $1s^2 2s^2 2p^6 3s^2 3p^2$
- C. $1s^2 2s^2 2p^6 3s^2 3p^4$
- D. $1s^2 2s^2 2p^6 3s^2 3p^5$

23. Choose the most suitable reason of the anomaly in electronic configuration of Chromium with the proton number of 24.

- A. Stability of fully filled 3d orbital.
- B. Stability of half-filled orbital.
- C. Stability of half-filled 4s orbital.
- D. Stability of half-filled 3d orbital.

24. Determine the electronic configuration of the most stable ion of element X-25.;

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$

25. Shown below are a set of quantum number of the highest energy electron in P^+ ion. Determine the electronic configuration of P atom.

$$n=4, l=0, m=0, s= +\frac{1}{2}$$

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$