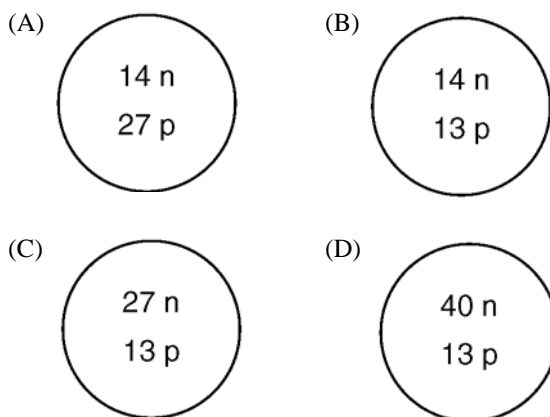


- \_\_\_\_1. Which of these phrases best describes an atom?  
 (A) a positive nucleus surrounded by a hard negative shell  
 (B) a positive nucleus surrounded by a cloud of negative charges  
 (C) a hard sphere with positive particles uniformly embedded  
 (D) a hard sphere with negative particles uniformly embedded
- \_\_\_\_2. The light produced by signs using neon gas results from electrons that are  
 (A) moving from a higher to a lower principal energy level  
 (B) moving from a lower to a higher principal energy level  
 (C) being lost by the Ne(g) atoms  
 (D) being gained by the Ne(g) atoms
- \_\_\_\_3. In the modern wave-mechanical model of the atom, the orbitals are regions of the most probable location of  
 (A) protons (B) neutrons  
 (C) electrons (D) positrons
- \_\_\_\_4. What is the total number of occupied sublevels in the third principal energy level of a zinc atom in the ground state?  
 (A) 1 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_5. What is the total number of sublevels in an atom's fourth principal energy level?  
 (A) 8 (B) 16  
 (C) 3 (D) 4
- \_\_\_\_6. Which sublevel contains a total of 5 orbitals?  
 (A) *s* (B) *p*  
 (C) *d* (D) *f*
- \_\_\_\_7. What is the total number of sublevels in the fourth principal energy level?  
 (A) 1 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_8. What is the total number of electrons needed to completely fill all of the orbitals in an atom's second principal energy level?  
 (A) 16 (B) 2  
 (C) 8 (D) 4
- \_\_\_\_9. What is the total number of sublevels in the third principal energy level?  
 (A) 1 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_10. The maximum number of sublevels in the second principal energy level is  
 (A) 1 (B) 2  
 (C) 3 (D) 4

- \_\_\_\_11. What is the number of orbitals in the first principal energy level?  
 (A) 1 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_12. The maximum number of electrons that a single orbital of the 3*d* sublevel may contain is  
 (A) 5 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_13. Which principal energy level has a maximum of three sublevels?  
 (A) 1 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_14. Which principal energy level can hold a maximum of 18 electrons?  
 (A) 5 (B) 2  
 (C) 3 (D) 4
- \_\_\_\_15. Which principal energy level of an atom contains an electron with the lowest energy?  
 (A)  $n = 1$  (B)  $n = 2$   
 (C)  $n = 3$  (D)  $n = 4$

- \_\_\_\_16. Which diagram represents the nucleus of an atom of  ${}^{27}_{13}\text{Al}$ ?

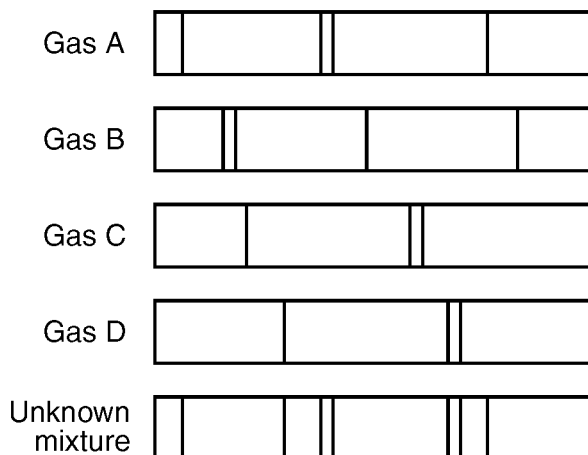


- \_\_\_\_17. The maximum number of electrons that can occupy a principal energy level ( $n$ ) of an atom is equal to  
 (A)  $n$  (B)  $2n$   
 (C)  $n^2$  (D)  $2n^2$
- \_\_\_\_18. What is the maximum number of electrons that can occupy the fourth principal energy level (shell) of an atom?  
 (A) 6 (B) 8  
 (C) 18 (D) 32
- \_\_\_\_19. The modern model of the atom is based on the work of  
 (A) one scientist over a short period of time  
 (B) one scientist over a long period of time  
 (C) many scientists over a short period of time  
 (D) many scientists over a long period of time

## Electron Cloud Structure

20. Base your answer to the following question on the information and the bright-line spectra represented below.

Many advertising signs depend on the production of light emissions from gas-filled glass tubes that are subjected to a high-voltage source. When light emissions are passed through a spectroscope, bright-line spectra are produced.



Identify the *two* gases in the unknown mixture.

\_\_\_\_ 21. Isotopes are atoms that have the same number of protons but a different

- (A) number of electrons      (B) number of neutrons  
(C) atomic number          (D) nuclear charge

\_\_\_\_ 22. Atoms of  $^{16}\text{O}$ ,  $^{17}\text{O}$ , and  $^{18}\text{O}$  have the same number of

- (A) neutrons, but a different number of protons  
(B) protons, but a different number of neutrons  
(C) protons, but a different number of electrons  
(D) electrons, but a different number of protons

\_\_\_\_ 23. The nucleus of an atom of K-42 contains

- (A) 19 protons and 23 neutrons  
(B) 19 protons and 42 neutrons  
(C) 20 protons and 19 neutrons  
(D) 23 protons and 19 neutrons

\_\_\_\_ 24. The nucleus of which atom contains 48 neutrons?

- (A)  $^{32}_{16}\text{S}$   
(B)  $^{48}_{22}\text{Ti}$   
(C)  $^{85}_{37}\text{Rb}$   
(D)  $^{112}_{48}\text{Cd}$

\_\_\_\_ 25. An atom of carbon-14 contains

- (A) 8 protons, 6 neutrons, and 6 electrons  
(B) 6 protons, 6 neutrons, and 8 electrons  
(C) 6 protons, 8 neutrons, and 8 electrons  
(D) 6 protons, 8 neutrons, and 6 electrons

\_\_\_\_ 26. What is the total number of neutrons in an atom of  $^{207}_{82}\text{Pb}$ ?

- (A) 82                                      (B) 125  
(C) 207                                      (D) 289

\_\_\_\_ 27. Compared to an atom of  $^{12}_6\text{C}$ , an atom of  $^{14}_6\text{C}$  has

- (A) more protons                      (B) fewer protons  
(C) more neutrons                      (D) fewer neutrons

**Electron Cloud Structure  
Answer Key**

1.   B  

2.   A  

3.   C  

4.   C  

5.   D  

6.   C  

7.   D  

8.   C  

9.   C  

10.   B  

11.   A  

12.   B  

13.   C  

14.   C  

15.   A  

16.   B  

17.   D  

18.   D  

19.   D  

20. Allow credit for **A** and **D**.

21.   B  

22.   B  

23.   A  

24.   C  

25.   D  

26.   B  

27.   C  

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Question ID's in Numerical Order.

1. 9
  2. 126
  3. 240
  4. 297
  5. 411
  6. 528
  7. 588
  8. 706
  9. 707
  10. 1836
  11. 2744
  12. 2916
  13. 3402
  14. 3406
  15. 3676
  16. 3727
  17. 4024
  18. 4138
  19. 4309
  20. 4311
  21. 4423
  22. 5111
  23. 5292
  24. 5311
  25. 5395
  26. 5567
  27. 5938
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