KEY

Electrons Unit Review

1. *When do you see the color emitted from an atom? When the electrons move up to higher energy levels or when to go back down to their ground state energy level?*
   when electrons fall back to lower energy levels
   move up when gain energy; they fall back when they lose energy
   Why do you see different colors? different wavelengths

2. *What do quantum numbers help tell us about the electrons?* where it is located

3. *Why does the phrase "empty bus seat rule" help describe Hund's rule?* have to have one electron in each orbital before double up. Like on a bus, own seat until all have one person then double up.

4. *In your own words, describe the Pauli Exclusion Principle.*
   No two electrons can be in exact same place (same 4 quantum #s)

5. *Why does the normal sequence change for filling orbitals after the 3p sublevel?*
   Energy requirements are different

In the space below, write the longhand electron configurations of the following elements:

1) sodium $1s^2 2s^2 2p^6 3s^1$
2) iron $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$
3) bromine $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$
4) barium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$
5) neptunium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^5$

In the space below, write the shorthand(noble gas) electron configurations of the following elements:

6) cobalt $[Ar]\ 4s^2 3d^7$
7) silver $[Kr]\ 5s^2 4d^9$
8) tellurium $[Kr]\ 5s^2 4d^{10} 5p^4$
9) radium $[Rn]\ 7s^2$
10) lawrencium $[Rn]\ 7s^2 5f^{14} 6d^1$

Determine what elements are denoted by the following electron configurations:

11) $1s^2 2s^2 2p^6 3s^2 3p^4$ Sulfur
12) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$ Rubidium
13) $[Kr]\ 5s^2 4d^{10} 5p^3$ Antimony
14) $[Xe]\ 6s^2 4f^{14} 5d^6$ Osmium
15) $[Rn]\ 7s^2 5f^{11}$ Einsteinium

Determine which of the following electron configurations are not valid:

16) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ NOT VALID should be $3d^{10}$ not $4d^{10}$

17) $1s^2 2s^2 2p^6 3s^3 3d^5$ NOT VALID 3p before after 3s

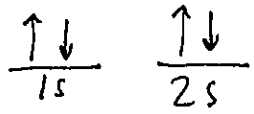
18) [Ra] $7s^2 5f^8$ NOT VALID Ra not noble gas

19) [Kr] $5s^2 4d^{10} 5p^5$ VALID

20) [Xe] NOT VALID an element can't be its own configuration

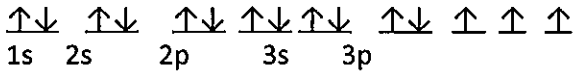
Complete the orbital diagrams for

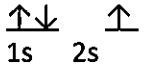
4 21.) Beryllium $1s^2 2s^2$



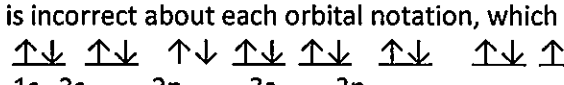
16 22.) Sulfur $1s^2 2s^2 2p^6 3s^2 3p^4$

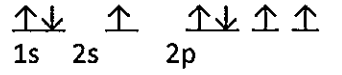
Which element is shown by each orbital notation

23.)  = 15 Phosphorus

24.)  = 3 Lithium

What is incorrect about each orbital notation, which rule does this not obey?

25.)  ← need 1 ↑ in each of last 3 orbital before double up Hund's Rule

26.)  need to fill 2s before start putting in 2p Aufbau

Describe the location of each electron based on the 4 quantum numbers

27.) 3, 1, 0, +1/2 3rd Energy level, p sublevel, 2nd orbital, cw

28.) 5, 3, -1, -1/2 5th Energy level, f sublevel, 3rd orbital, ccw

29. What is the wavelength of light that has a frequency of 3×10^{-4} Hz in a vacuum?

$c = \lambda \nu$ $3.00 \times 10^8 \text{ m/s} = \lambda (3 \times 10^{-4} \text{ Hz})$

$\lambda = 1 \times 10^{12} \text{ m}$

30. What is the energy of a photon that has a frequency of ~~5.0×10^{14}~~ Hz

$E = h\nu$ $E = 6.63 \times 10^{-34} \text{ J·s} \; (5.0 \times 10^{14} \text{ Hz})$

$E = 3.3 \times 10^{-19} \text{ J}$

31. What is the wavelength of a ~~photon with a energy of 7.54×10^{-19}~~ J

$E = h\nu$ $7.54 \times 10^{-19} \text{ J} = 6.63 \times 10^{-34} \text{ J·s} \; (\nu)$ $\nu = 1.13 \times 10^{15} \text{ Hz}$

$c = \lambda \nu$ $3.0 \times 10^8 \text{ m/s} = \lambda \; (1.18 \times 10^{15} \text{ Hz})$ $\lambda = 2.64 \times 10^{-7} \text{ m}$