CH40S **Atomic Structure Review – Key**

1. See notes.

2. gamma, x-ray, U.V., Visible Light, I.R., Microwaves, radio waves.

3. Violet, indigo, blue, green, yellow, orange, red.

4. Inverse – as wavelength increases, frequency decreases.

5. Both contain different colours. Continuous has each colour blending into the next (ie. No distinct colour). Line spectra have discreet wavelengths of light that are separate.

6. When burned, copper will emit a specific set of wavlengths of light (a line spectrum). The blending of the colours in the line spectrum will cause the colour produced. Each element produces different line spectra because electrons can only jump between specific energy levels.

7. When an electron absorbs energy, it "jumps" to a higher energy level. As it falls back to the ground state, it releases energy in the form of light, u.v radiation, etc. The wavelength and energy released depends on the distance between energy levels.

8. The amount of energy released when an electron falls from one level to another.

9. See notes.
10. See notes.

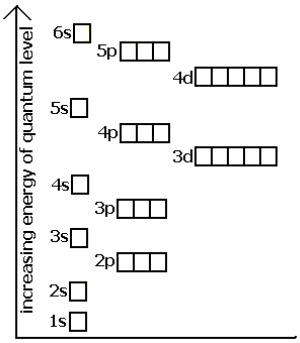
11. Energy levels contain orbitals. Orbitals are regions of space where an electron is likely to be found.

12. See notes for shapes. The shapes represent the probability function – region of space where an electron is likely to be found.

13. n^2 = # of electron orbitals.
    a. n=1 → 1 orbital
    b. n=2 → 4 orbitals
    c. n=3 → 9 orbitals
    d. n=4 → 16 orbitals
    e. n=5 → 25 orbitals

14. See notes

15. Use the template below to draw the configurations. See notes and worksheets for examples.



16. Complete Configurations from #15:
    a. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
    b. $1s^2$
    c. $1s^2 2s^2 2p^3$
    d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$
    e. $1s^2 2s^2 2p^6 3s^2 3p^2$
    f. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^9$
    g. $1s^2 2s^2 2p^6 3s^1$

    Noble Gas Configurations from #15:
    a. $[Ar] 4s^2$
    b. $1s^2$
    c. $[He] 2s^2 2p^3$
    d. $[Ar] 4s^2 3d^6$
    e. $[Ne] 3s^2 3p^2$
    f. $[Kr] 5s^2 4d^9$
    g. $[Ne] 3s^1$

17. Complete configurations:
    a. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
    b. $1s^2 2s^2 2p^6 3s^2 3p^1$
    c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$
    d. $1s^2 2s^2 2p^1 3s^2$
    e. $1s^2 2s^2 2p^1$
    f. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
    g. $1s^2 2s^2$

18. Valence configuration for elements in #15:
    a. $4s^2$
    b. $1s^2$
    c. $2s^2 2p^3$
    d. $4s^2$
    e. $3s^2 3p^2$
    f. $5s^2$
    g. $3s^1$

Valence configurations for elements in #17:
    a. $4s^2$
    b. $3s^2 3p^1$
    c. $4s^2 4p^5$
    d. $3s^2$
    e. $2s^2 2p^1$
    f. $4s^2 4p^1$
    g. $2s^2$

19. Complete configurations…watch out for the ions!!!
    a. $1s^2 2s^2 2p^6$
    b. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$
    c. $1s^2 2s^2 2p^6 3s^2 3p^6$
    d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^9$
    e. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$
    f. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$
    g. $1s^2 2s^2 2p^6$

20. Find the difference between the electronegativities of the two elements…
    a. Polar
    b. Non-polar
    c. Ionic
    d. Ionic
    e. Polar
    f. Ionic
    g. Polar

21. a) Electronegativity:
    - Increases across a row
        - More protons in the nucleus, so more nuclear charge.
        - Electrons are filling the same energy level, so same distance and shielding, so more nuclear force pulling on electrons
        - Therefore atom will attract electrons more.

    - Decreases down a column
        - Every row is filling another energy level. Valence electrons are further away and have more shielding.
        - Even though there are more protons as you go down the column, the increased distance and shielding mean that less force is felt by valence electrons.
        - Therefore the atom will attract electrons less.

    b) Atomic Radius:
    - Decreases across a row
        - More protons in the nucleus, so more nuclear charge.
        - Electrons are filling the same energy level, so same distance and shielding, so more nuclear force pulling on electrons
        - Therefore outer electrons are pulled in tighter, making atom smaller.

    - Increases down a column
        - Every row is filling another energy level. Valence electrons are further away and have more shielding.
        - Even though there are more protons as you go down the column, the increased distance and shielding mean that less force is felt by valence electrons.
        - Therefore outer electrons are allowed to move more freely, and atom gets bigger.

c) Ionic Radius:

- Decreases across a row, then spikes at non-metals, then decreases again
    - More protons in the nucleus, so more nuclear charge.
    - Electrons are filling the same energy level, so same distance and shielding, so more nuclear force pulling on electrons
    - Therefore outer electrons are pulled in tighter, making atom smaller.
    - When the atoms go from losing to gaining electrons, they become much bigger, since there are more electrons than protons and more repulsion between electrons.

- Increases down a column
    - Every row is filling another energy level. Valence electrons are further away and have more shielding.
    - Even though there are more protons as you go down the column, the increased distance and shielding mean that less force is felt by valence electrons.
    - Therefore outer electrons are allowed to move more freely, and atom gets bigger.

d) First Ionization Energy:

- Increases across a row
    - More protons in the nucleus, so more nuclear charge.
    - Electrons are filling the same energy level, so same distance and shielding, so more nuclear force pulling on electrons
    - Therefore atom will attract electrons more, so they are more difficult (need more energy) to remove.

- Decreases down a column
    - Every row is filling another energy level. Valence electrons are further away and have more shielding.
    - Even though there are more protons as you go down the column, the increased distance and shielding mean that less force is felt by valence electrons.
    - Therefore the atom will attract electrons less, and they are easier to remove.

22. See notes.