U2 – Atomic Theory & Structure TWITTER Review

U2-1: Determine the following for Cl^{-1} with mass # 35:
A) Atomic #
B) # protons
C) # neutrons
D) # electrons

   - Answer: A) Z = 17   B) 17 p^+ C) 18 n^0 D) 18 e^-

U2-2: Determine the following for Sn^{4+} with 69 neutrons:
A) Atomic #
B) # protons
C) mass #
D) # electrons

   - Answer: A) Z = 50   B) 50 p^+ C) X = 119   D) 46 e^-

U2-3: Determine the CHARGE on aluminum (Al) if it has 10 electrons.

   - Answer: Al^{3+}

U2-4: Determine the following for Copper (IV):
A) # protons
B) # electrons

   - Answer: A) 29 p^+ B) 25 e^-

U2-5: Protons & neutrons are responsible for the _____ of an atom.

   - Answer: mass

U2-6: What two (2) things differentiate between two isotopes?

   - Answer: mass # and # neutrons

U2-7: What is the mass (amu) of Uranium-238?

   - Answer: 238 amu

U2-8: Describe C-12 & C-13?
A) ions of same element
B) ions of diff. elements
C) isotopes of same element
D) neutral atoms of diff. elements

   - Answer: C: isotopes of same element

U2-9: Determine the charge AND location of the following subatomic particles:
A) protons
B) neutrons
C) electrons

   - Answer: A) protons = p^+ ; inside nucleus
             B) neutrons = n^0 ; inside nucleus
             C) electrons = e^- ; outside nucleus in electron cloud

U2-10: How would you describe the difference between the nitrogen atom & the N^3- ion?

- Answer: Nitrogen atom is neutral ($7e^-$) & N^{3-} ion has gained $3e^-$ ($10e^-$)

U2-11: Calculate the average atomic mass of silver given the abundances of 51.84% (106.905 amu) and 48.16% (108.905 amu).

- Answer: avg atomic mass Ag = 107.868 amu

U2-12: Gallium has two naturally occurring isotopes. Ga-69 has a mass of 68.9256 amu (60.108%). Determine the atomic mass (amu) of Ga-71.

- Answer: Ga-71 = 70.9170 amu

U2-13:
A) Determine the frequency of photon with energy of 2.93 x 10^-25 Joules (J).
B) What region of electromagnetic spectrum is this in?

- Answer: A) Frequency = $4.42 \times 10^8 \ s^{-1}$
          B) Wavelength = 6.79×10^{-1} m → MICROWAVES

U2-14: What is the energy of one photon of x-ray radiation with a wavelength of 53.7 nm?

- Answer: E = 3.70×10^{-18} J

U2-15: Describe the relationship between:
A) frequency & energy
B) wavelength & frequency

- Answer: A) Direct relationship   B) Indirect/Inverse relationship

U2-16:
A) What happens to the energy of an electron as it moves further away from the nucleus?
B) What is this transitional jump called?

- Answer: A) Energy of e^- INCREASES moving away from nucleus   B) Absorption

U2-17: How were the colored photons able to be observed in the light (flame test) lab? (Think subatomically)

- Answer: e^- returned to ground state becoming more stable, thus <u>emitting</u> photons

U2-18: Write the electron configuration of arsenic.

- Answer: As = $1s^2 \ 2s^2 \ 2p^6 \ 3s^2 \ 3p^6 \ 4s^2 \ 3d^{10} \ 4p^3$

U2-19: Write the electron configuration of barium cation.

- Answer: Ba^{2+} = As = $1s^2 \ 2s^2 \ 2p^6 \ 3s^2 \ 3p^6 \ 4s^2 \ 3d^{10} \ 4p^6 \ 5s^2 \ 4d^{10} \ 5p^6$

U2-20: Zinc cation is isoelectronic with what element?

- Answer: Zn^{2+} = Nickel (Ni)

U2-21: Write the electron configuration of Tungsten (W).

- Answer: W = $1s^2 \ 2s^2 \ 2p^6 \ 3s^2 \ 3p^6 \ 4s^2 \ 3d^{10} \ 4p^6 \ 5s^2 \ 4d^{10} \ 5p^6 \ 6s^2 \ 4f^{14} \ 5d^4$

U2-22: What element is denoted by 1s^2 2s^2 2p^6 3s^2 3p^2

   - Answer: Silicon (Si)

U2-23: How many total orbitals are used in the orbital notation of Vanadium (V)?

   - Answer: 13 orbitals used (filled with at least one electron)

U2-24: How many e- in:
A) filled d-orbital
B) filled p-sublevel
C) full n=3
D) half-filled d-sublevel
E) half-filled s-orbital

   - Answer: A) 2   B) 6   C) 18   D) 5   E) 1

U2-25: What "block" of the periodic table is tin (Sn) located in?

   - Answer: Sn = "p" block

U2-26: What makes 4d orbital different from 2s orbital? (Hint: It's not different energy level or sublevel)

   - Answer: Different SHAPES of sublevels/orbitals

U2-27: What makes 3p(x) orbital different from 5p(x) orbital?

   - Answer: Different # of energy levels indicates SIZE differences in atoms

U2-28: Write the noble gas notation (shorthand) of phosphorus.

   - Answer: P = [Ne] $3s^2$ $3p^3$

U2-29: Write the noble gas notation (shorthand) of manganese.

   - Answer: Mn = [Ar] $4s^2$ $3d^5$

U2-30: Determine the valence electron IDENTITY in the following:
A) Rubidium (Rb)
B) Aluminum (Al)
C) Zirconium (Zr)

   - Answer: Val e- Identity: A) Rb = $5s^1$ B) Al = $3s^2$ $3p^1$ C) Zr = $5s^2$

U2-31: How many valence electrons in the following elements:
A) Selenium (Se)
B) Iron (Fe)
C) Xenon (Xe)

   - Answer: A) Se = 6 ve⁻   B) Fe = 2 ve⁻   C) Xe = 8 ve⁻

U2-32: Order the following particles of beta, gamma, alpha in order from weakest to greatest penetrating power.

   - Answer: Penetrating power (increasing order) → alpha, beta, gamma

U2-33: Determine atom produced (include atomic # & mass #) when Si-35 goes through BETA decay.

   - Answer: Si-35 beta decay → P-35 → (Atomic # = 15 ; Mass # = 35)

U2-34: Determine the atom produced (include atomic # & mass #) when Iodine-110 goes through an ALPHA decay.

   - Answer: I-110 alpha decay → Sb-106 → (Atomic # = 51 ; Mass # = 106)

U2-35: What particle (alpha,beta,gamma) is required to go from Ba-140 --> La-140?

   - Answer: Beta particle

U2-36: Answer the following for bromine:
A) # total orbitals
B) # orbitals used
C) # half-filled orbitals
D) # empty orbitals

   - Answer: Draw orbital notation first →   A) 18   B) 18   C) 1   D) 0

U2-37: Electrons in the outermost "s" and/or "p" orbitals (sublevels) are also referred to as _____.

   - Answer: Valence Electrons

U2-38: A radio broadcasting station has a frequency of 105.1 MHz. Calculate its wavelength (m).

   - Answer: Convert MHz → Hz (s^{-1}) first   Wavelength = 2.854 m

U2-39: A radioactive isotope that has gone through an alpha decay will have a change of _____ in its atomic number.

   - Answer: 2 (decreases)

U2-40: A sample of Ga-67 was ordered by a research laboratory 75.0 hours ago, with a mass of 492g. When it was first received by the lab, the mass was 15.375g. What is Ga-67 half-life?

   - Answer: #H-L = Time/H-L → H-L = 15.0 hours

U2-41: Aluminum cation is isoelectronic with which atom?

   - Answer: Al^{3+} = $10e^-$ = Ne

U2-42: How many neutrons is an atom of platinum likely to have?

   - Answer: Pt → mass # = p^+ + n^0 → mass # = 195 ; #p^+ = 78 → n^0 = 117

U2-43: An electron transitioning from n=5 → n=2 is an example of _____.

   - Answer: Emission

U2-44: What region of electromagnetic spectrum is a photon that is 2.50×10^{-13} m?

   - Answer: Gamma Rays

U2-45: Each orbital within a sublevel must be singly-occupied by an electron before spin pairing within that same orbital is expressed by _____.

   - Answer: Hund's Rule