Chapter 3 Final Exam Review

1. Average Atomic Mass of Strontium

Naturally occurring strontium consists of four isotopes, Sr-84, Sr-86, Sr-87 and Sr-88.

Isotope	Atomic Mass (amu)	Percent Abundance
Sr-84	83.91 amu	0.56%
Sr-86	85.91 amu	9.86%
Sr-87	86.91 amu	7.00%
Sr-88	87.91 amu	82.58%

Step-by-step:

1. Convert percentages to decimals.
   - 0.56% = 0.0056
   - 9.86% = 0.0986
   - 7.00% = 0.0700
   - 82.58% = 0.8258
2. Multiply each mass by its decimal abundance.
   - (83.91)(0.0056) = 0.470
   - (85.91)(0.0986) = 8.471
   - (86.91)(0.0700) = 6.084
   - (87.91)(0.8258) = 72.623
3. Add the results:

   Average atomic mass = 87.62 amu

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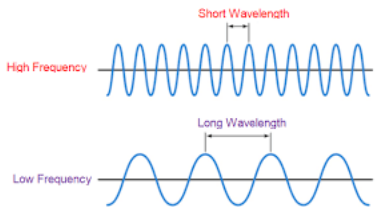
2. Atomic Notation Table

Full Symbol	Atomic Number	Mass Number	Protons	Neutrons	Electrons
$818O^{2-}$	8	16	8	8	10
$4096Zr^{4+}$	40	96	40	56	36
$1224Mg^{2+}$	12	24	12	12	10
$1531P^{3-}$	15	31	15	16	18

3. Wave Diagram

Wavelength (λ) is labeled as the distance between two adjacent crests.



- Wavelength: **short**
- Energy: **high**
- Relationship:
  - Wavelength is **inversely proportional** to frequency

- Wavelength is **inversely proportional** to energy
- Energy is **directly proportional** to frequency

4. Electromagnetic Spectrum Calculations

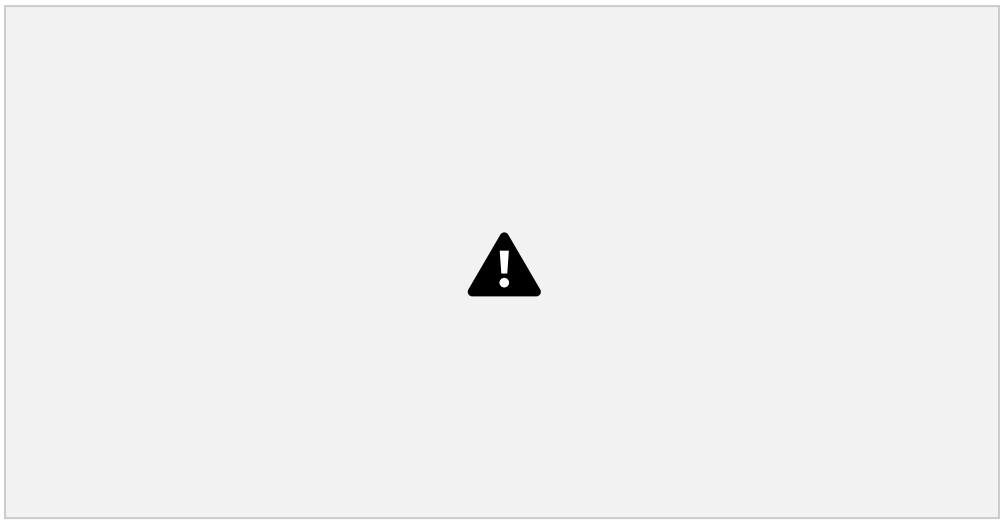
Wavelength (λ)	Frequency (ν)	Energy (E)
705 nm	4.25×10^{14} Hz	2.82×10^{-22} kJ
420. nm	7.131×10^{14} Hz	4.725×10^{-22} kJ
710. nm	4.2×10^{14} Hz	$2.8 \times 10^{-}22$ kJ

(Formulas used: ($c = \lambda\nu$), ($E = h\nu$))

5. Apartment Complex of Electrons (Calcium)

Electron configuration for Ca:

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$



- Orbitals in energy level 3: **9**
- Maximum electrons in energy level 4: **32**
- Sublevels in energy level 2: **2**
- Maximum electrons in f sublevel: **14**
- Electrons per orbital: **2**

6. Quantum Numbers Table

Quantum Number Name	Symbol	Possible Values
Principal	n	1, 2, 3, ...
Angular Momentum	l	$0 \rightarrow n-1$
Magnetic	ml	$-l$ to $+l$
Spin	ms	+1/2 or −1/2

7. Quantum Numbers for the Last Electron in Nickel (Ni)

Ni: [Ar] $4s^2\ 3d^8$

n = **3** l = **2** ml = **0** ms = **−1/2**

8. Valid or Invalid Quantum Numbers

n	l	ml	ms	Valid or Invalid	Reason
2	1	0	+1/2	Valid	—
1	0	0	−1	Invalid	m_s must be ±1/2
3	2	+2	−1/2	Valid	—
3	3	−2	+1/2	Invalid	l can only be 0, 1 or 2

9. Electron Configurations

- N: **$1s^2\ 2s^2\ 2p^3$**
- N^{3-}: **$1s^2\ 2s^2\ 2p^6$**
- Br: **[Ar] $4s^2\ 3d^{10}\ 4p^5$**
- Br^-: **[Ar] $4s^2\ 3d^{10}\ 4p^6$**
- Cu: **[Ar] $4s^1\ 3d^{10}$**
- Fe^{3+}: **[Ar] $3d^5$**

10. Oxygen Electron Configuration

O: **$1s^2\ 2s^2\ 2p^4$**

- Valence electrons: **6**
- Core electrons: **2**

11. Isoelectronic Series for F^-

O^{2-}, F^-, Ne, Na^+, Mg^{2+}, Al^{3+}

12. Valence Electrons and Charges

Element	Valence Electrons	Most Likely Charge
P	5	−3
Ba	2	+2
Zn	2	+2
I	7	−1