Honors- Electronic Structure Test Review Name _____

Period _____

In the space below, write the complete 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 $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 6d^1 5f^4$

In the space below, write the noble gas 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 $[Rn] 7s^2 6d^1 5f^{14}$

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

* Einsteinium should really be written as $[Rn] 7s^2 6d^1 5f^{10}$

Determine which of the following electron configurations are not valid. Justify your answer

16) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ not valid

17) $1s^2 2s^2 2p^6 3s^2 3d^5$ not valid

18) $[Ra]\ 7s^2 5f^8$ not valid

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

20) [Xe] not valid (noble gases cannot abbreviate themselves)

Modern Atomic Theory Review

1. Match the definition in Column A with the term in Column B

Answer	Column A	Column B
E	The set of frequencies of the electromagnetic waves emitted by the atoms of an element	A-wavelength
C	The minimum amount of energy that can be lost or gained by an atom	B- photon
G	A form of energy that exhibits wavelike behavior as it travels through space	C- quantum
D	A three dimensional region around the nucleus of an atom that describes an electron's probable location	D-atomic orbital
A	The shortest distance between equivalent points on a continuous wave	E- atomic emission spectrum
F	The lowest allowable energy state of an atom	F- ground state
B	A particle of electromagnetic radiation with no mass that carries a quantum of energy	G- electromagnetic radiation

2. Describe the Bohr model of the atom. How are the electrons arranged? What are energy levels? How are photons produced? Drops to which energy level produce visible light? What are some problems with the Bohr model?

e⁻ are arranged in energy levels with the highest levels being the furthest from the nucleus. Energy levels are quantized, meaning there are no "in-between" levels. When an e⁻ gains energy, it moves to an excited state. When it drops back to ground state, a photon is produced. Drops to level 2 produce visible light. The Bohr model only works for hydrogen.

3. What is the energy of a quantum of light of frequency 4.31×10^{14} Hz?

$E = h\nu$

$E = 6.63E\text{-}34\,(4.31E14)$ $\quad E = \boxed{2.857\ E\text{-}19\ J}$

4. A photon has a wavelength of 662E-9 m. What is the frequency of this light? How much energy does this photon carry?

$E = \frac{hc}{\lambda}$

$E = \frac{(6.63E\text{-}34)(3E8)}{662E\text{-}9}$ $\quad E = \boxed{3.0\ E\text{-}19\ J}$

5. How can spectroscopy be used to identify elements in the stars?

Each element has a unique set of colors or frequencies it emits. Light containing these particular frequencies indicates the presence of that element.