

Name: \_\_\_\_\_

Date: \_\_\_\_\_

[3 pt] 1. List the orbitals from lowest to highest energy. Go up to the 7s orbital. In addition, sketch a picture showing the first 5 energy levels.

[3 pt] 2. What is the meaning (give both the quantum number and what it describes about the location of each electron) of each part of the designation  $3d^7$ .

[3 pt] 3. What are the three general rules obeyed by electrons in orbitals (Aufbau Principles).

(a) Rule 1 (Pauli Exclusion Principle):

(b) Rule 2:

(c) Rule 3 (Hunds rule:)

[5 pt] 4. Which elements have the following electron configuration:

(a)  $1s^2, 2s^2, 2p^6, 3s^2, 3p^4$

4(a) \_\_\_\_\_

(b)  $1s^2, 2s^2, 2p^2$

4(b) \_\_\_\_\_

(c)  $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^3$

4(c) \_\_\_\_\_

(d)  $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6, 5s^2, 4d^7$

4(d) \_\_\_\_\_

(e)  $[\text{Ar}] 4s^2$

4(e) \_\_\_\_\_

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[5 pt] 5. Give the electron configuration (using the notation in the previous question) for the following elements:

(a) B

(b) Ti

(c) Cu

(d) Zr

(e) I

[5 pt] 6. Draw orbital diagrams for the following elements. Ignore any extra boxes provided.

(a) N:

(b) V:

(c) Na:

(d) S:

(e) Br:

[5 pt] 7. Using Quantum Mechanics explain:

(a) The shape of the periodic table?

(b) What is the same about each row?

(c) What is the same about each column?

[4 pt] 8. What is a valence electron? Why are they important?

[2 pt] 9. In the periodic table, calcium is surrounded by elements 12, 19, 21, and 38. Which of these have physical and chemical properties most resembling calcium? Explain.

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[5 pt] 10. How many valence electrons do each of the following elements have?

- |        |  |             |
|--------|--|-------------|
| (a) Si |  | 10(a) _____ |
| (b) O  |  | 10(b) _____ |
| (c) K  |  | 10(c) _____ |
| (d) I  |  | 10(d) _____ |
| (e) B  |  | 10(e) _____ |

[5 pt] 11. What outer electron shell configuration do each of the following groups of elements share?

- |  |  |             |
|--|--|-------------|
| (a) Alkali Metals                            |  | 11(a) _____ |
| (b) Alkaline Earth Metals                    |  | 11(b) _____ |
| (c) Halogens                                 |  | 11(c) _____ |
| (d) The column with Co, Rh, Ir, and Mt in it |  | 11(d) _____ |
| (e) The column with B, Al, Ga, In, Tl in it. |  | 11(e) _____ |

[5 pt] 12. Label the following on the periodic table:

- (a) s-block, (b) p-block, (c) d-block, (d) f-block (e) Row numbers (ie 1s, 2s, 2p etc)

