

1. Name the orbitals described by the following quantum numbers. [3]
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|-------------------|----|---|---|
| a. $n = 3, l = 2$ | 3d | 0 | s |
| b. $n = 3, l = 1$ | 3p | 1 | p |
| c. $n = 5, l = 0$ | 5s | 2 | d |
| | | 3 | f |

2. Give the n and l values for the following orbitals. [3]
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|-------|----------------|
| a. 1s | $n = 1, l = 0$ |
| b. 3d | $n = 3, l = 2$ |
| c. 4f | $n = 4, l = 3$ |

3. Circle all of the following orbital destinations that are theoretically NOT possible. [2]
- | | | | | |
|-------|---|-------|---|-------|
| a. 7s | <input checked="" type="checkbox"/> b. 1p | c. 5d | <input checked="" type="checkbox"/> d. 2d | e. 5g |
|-------|---|-------|---|-------|

4. Circle all of the following electron configurations that are incorrect and then explain why they are not possible. [4]
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|---------------------|--------------------------|--|-------------------------------|
| a. $1s^2 2s^3 2p^7$ | b. $1s^2 2s^2 2p^6 3s^3$ | c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{12}$ | d. $1s^2 2s^2 2p^6 3s^2 3p^6$ |
|---------------------|--------------------------|--|-------------------------------|
- P holds 6 S holds up to 2 d holds up to 10 ✓

5. What are the possible m_l values for the each of the following orbitals? [2]
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|-------|---------------------------------------|
| a. 2s | $n = 2, l = 0, m_l = 0$ |
| b. 5d | $n = 5, l = 2, m_l = -2, -1, 0, 1, 2$ |

6. How many possible orbitals are there for the following energy levels? [2]
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|-------------|-----|-------|
| a. $n = 4$ | 16 | n^2 |
| b. $n = 10$ | 100 | |

7. How many electrons can inhabit all of the $n=5$ orbitals? [1]
- $2n^2 = 2(5^2) = 50$

8. Which sets of quantum numbers are unacceptable? Correct the mistakes in each unacceptable one. [3]
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|---------------------------------|---------------------------|
| a. $n=3, l=-2, m_l=0, m_s=+1/2$ | l not negative |
| b. $n=2, l=2, m_l=-1, m_s=-1/2$ | $l > \text{less than } n$ |
| c. $n=6, l=2, m_l=-2, m_s=+1/2$ | ✓ |

9. Fill in the missing value(s) in each set of quantum numbers. [2]
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|--|------------------|
| a. $n = ?, l = 2, m_l = -1$; name: 4d | $n = 4$ |
| b. $n = 1, l = ?, m_l = ?$; name: 1s | $l = 0, m_l = 0$ |

10. Write the electron configurations for the following elements and ions. [8]
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|--------------|------------------------|
| a. Ni | $[Ar] 4s^2 3d^8$ |
| b. Pb^{4+} | $[Xe] 4f^{14} 5d^{10}$ |
| c. O^{2-} | $[He] 2s^2 2p^6$ |

11. Write the electron configurations and the orbital diagrams for each of the following. [7]
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|-----------|------------------|
| a. Rb^+ | $[Kr]$ |
| b. Mn | $[Ar] 4s^2 3d^5$ |
- Orbital diagrams for Mn: $\uparrow \uparrow \uparrow \uparrow \uparrow$ (5 orbitals)