1: Which of the following reactions is **NOT** a redox reaction?
   i. S (s) + O₂ (g) ----> SO₂ (g)
   ii. Fe (s) + Cl₂ (g) ---> FeCl₂(s)
   iii. NaOH (aq) + HCl (aq) ---> NaCl (aq) + H₂O (l)

   A: i only        B: ii only       C: iii only       D: i & ii       E: all are redox

2: Which of the following reactions correctly balances the redox reaction shown, in an acidic solution:
   I₂ (aq) + S₄O₆²⁻ (aq) ---> H₂SO₃ (aq) + I⁻ (aq)
   i. 6 H₂O + S₄O₆²⁻ + I₂ ---> 4 H₂SO₃ + 2 I⁻ + 4 H⁺
   ii. 6 H₂O + S₄O₆²⁻ + 3I₂ ---> 4 H₂SO₃ + 6 I⁻ + 4 H⁺
   iii. 2 H₂O + 4 OH⁻ + S₄O₆²⁻ + 3I₂ ---> 4 H₂SO₃ + 6 I⁻

   A: i only        B: ii only       C: iii only       D: none of these       E: the original

3: Which of the following salts are **not** soluble in water?
   i. Pb(NO₃)₂       ii. K₂CO₃     iii. KMnO₄       iv. CdS

   A: i only        B: i & ii       C: iii only       D: iv only       E: ii & iv

4: The US Navy once proposed a communication system for use with submarines. The system used a radio frequency of 76 Hz. What is the wavelength of this signal through a vacuum?

   A: 3.95 cm        B: 3.95 x 10⁶ m       C: 2.28 x 10¹⁰ m
   D: 0.395 m        E: 2.53 x 10⁻⁷ m

5: Calculate the frequency of light emitted from a hydrogen atom when an electron falls from the n=5 level to the n=2 level.

   A: 435 Hz        B: 6.9 x 10⁵ Hz       C: 1.3 x 10²⁰ Hz
   D: 6.9 x 10¹⁴ Hz       E: 2.3 x 10⁻³ Hz
6: Which of the following is an allowable quantum number set?
   A: \{4,1,2,1/2\}       B: \{3,1,-1,-1/2\}       C: \{1,0,1,1/2\}
   D: \{1,0,0,1\}         E: \{2,2,0,1/2\}

7: If you had a mixture of $K^+$ and $Ag^+$ ions in solution. Which of the following reagents could you use to separate the two ions?
   A: HBr (aq)            B: CH$_3$COOH (aq)          C: HClO$_3$ (aq)
   D: NaNO$_3$ (aq)       E: Pb(NO$_3$)$_2$ (aq)

8: How many electrons could have the the following quantum numbers:
   \(n=2\) and \(m_l = -1\)
   A: 2                   B: 8                   C: 6
   D: 1                   E: 4

9: What is the correct ground state electron configuration for an element with 15 electrons?
   A: 1s$^2$2s$^2$2p$^5$3s$^2$3p$^4$         B: 1s$^2$2s$^2$2p$^6$3s$^2$3d$^3$
   C: 1s$^2$2s$^2$2p$^6$3s$^2$3p$^4$         D: 1s$^2$2s$^2$2p$^6$3s$^2$3p$^3$
   E: 1s$^2$2s$^2$2p$^5$3s$^2$2p$^2$3s$^2$3p$^2$4s$^2$3d$^3$

10: Which of the following sets contain a strong electrolyte, a weak electrolyte, and a non electrolyte (in any order)
   i. HNO$_3$, NH$_3$, CH$_3$COOH
   ii. NH$_3$, C$_2$H$_5$OH, KBr
   iii. HClO$_4$, CH$_3$COOH, C$_2$H$_5$OH
   A: i only     B: ii only    C: i & ii   D: i & iii   E: ii & iii

11: Which quantum number set, \{n, l\}, could describe the drawing below?

\[\text{Diagram of an atom}\]
   A: \{2,2\}              B: \{4,2\}
   C: \{2,1\} and \{2,0\}  D: \{3,-1\} and \{1,0\}
   E: \{1,2\}
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