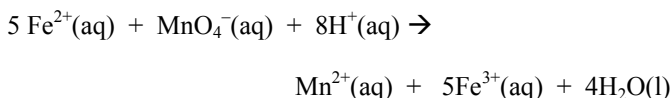


1. What is the oxidation number of chlorine in potassium chlorate, KClO_3 ?
- 1
 - +1
 - +2
 - +5
 - +6

2. The oxidation state of nitrogen given for all of the following species is correct except

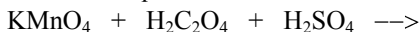
- N_2H_4 -2
- NH_2OH -3
- N_2O +1
- N_2 0
- HNO_2 +3

3. Which substance in the reaction below is the oxidizing agent?



- Fe^{2+}
- MnO_4^{-}
- H^{+}
- Mn^{2+}
- Fe^{3+}

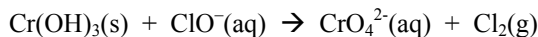
4. In the equation



the oxidizing agent is

- $\text{H}_2\text{C}_2\text{O}_4$
- H_2SO_4
- CO_2
- MnSO_4
- KMnO_4

5. Balance the following oxidation-reduction reaction which occurs in basic solution:



When this equation is balanced using the smallest whole-number coefficients, what is the coefficient on H_2O , and on which side of the reaction is H_2O found, product side or reactant side?

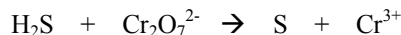
- 2, reactant side
- 8, product side
- 12, reactant side
- 2, product side
- 14, product side

6. The following reaction occurs in acidic solutions. What is the sum of the coefficients in the balanced equation? (Don't forget implied coefficients of "1".)



- 16
- 32
- 43
- 79
- 97

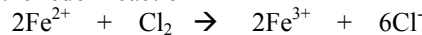
7. The following change occurs in acidic solution:



Complete and balance the foregoing equation. The properly balanced equation shows that for every mole of $\text{Cr}_2\text{O}_7^{2-}$ that reacts, ___ moles of H^{+} are consumed.

- 8
- 7
- 5
- 10
- 14

8. For the redox reaction

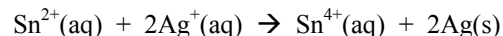


which of the following are the correct half-reactions?

- $\text{Cl}_2 + 2\text{e}^{-} \rightarrow 2\text{Cl}^{-}$
- $\text{Cl} \rightarrow \text{Cl}^{-} + \text{e}^{-}$
- $\text{Cl}_2 \rightarrow 2\text{Cl}^{-} + 2\text{e}^{-}$
- $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^{-}$
- $\text{Fe}^{2+} + \text{e}^{-} \rightarrow \text{Fe}^{3+}$

- I and V
- I and IV
- II and IV
- II and V
- III and IV

9. If the following redox reaction is used for a galvanic cell under standard conditions at 25°C , which of the following reactions occurs at the anode?



- $\text{Sn}^{2+}(\text{aq}) \rightarrow \text{Sn}^{4+}(\text{aq}) + 2\text{e}^{-}$
- $2\text{Ag}^{+}(\text{aq}) + 2\text{e}^{-} \rightarrow 2\text{Ag}(\text{s})$
- $\text{Sn}^{4+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{Sn}^{2+}(\text{aq})$
- $2\text{Ag}(\text{s}) \rightarrow 2\text{Ag}^{+}(\text{aq}) + 2\text{e}^{-}$

10. What is the cell potential for the following galvanic cell at standard conditions and 25°C ?



- 1.89 V
- 2.69 V
- 0.29 V
- 0.51 V
- 0.51 V

11. Which of the following is the best oxidizing agent under standard conditions at 25°C?

- a) $\text{Na}^+(\text{aq})$
- b) $\text{Ag}^+(\text{aq})$
- c) $\text{Pb}^{2+}(\text{aq})$
- d) $\text{Cl}_2(\text{g})$
- e) $\text{I}_2(\text{s})$

12. The Nernst equation is

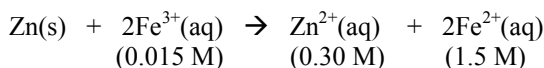
- a) $\Delta G = \Delta G^\circ + RT \ln Q$
- b) $\Delta S_{\text{univ}} = \Delta S_{\text{surr}} + \Delta S_{\text{sys}}$
- c) $\Delta G = \Delta H - T\Delta S$
- d) $E = E^\circ - \frac{RT}{nF} \ln Q$
- e) $\text{pH} = \text{pK}_a + \log \frac{[\text{base}]}{[\text{acid}]}$

13. The following galvanic cell has a standard potential at 25°C of 1.94 V. What is the standard reduction potential for $\text{Ce}^{3+}(\text{aq})$ at 25°C?



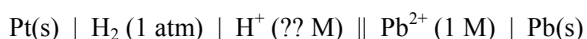
- a) 2.34 V
- b) -2.34 V
- c) 1.57 V
- d) -1.57 V
- e) 1.54 V

14. What is the cell potential of the galvanic cell at 25°C which uses the following reaction?



- a) 1.53 V
- b) 1.63 V
- c) 1.49 V
- d) 0.09V
- e) 1.43 V

15. What is the pH of the solution in the anode half cell of the following galvanic cell if the measured cell potential at 25°C is 0.28 V?

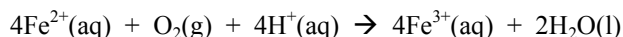


- a) 2.5
- b) 0.14
- c) 6.9
- d) 14
- e) 11.5

16. A galvanic cell is made from a half cell consisting of a $\text{Cu}(\text{s})$ electrode in a 0.30 M solution of $\text{Cu}^{2+}(\text{aq})$ and a half cell consisting of a $\text{Cu}(\text{s})$ electrode in a 0.10 M solution of $\text{Cu}^{2+}(\text{aq})$. What is the cell potential at 25°C and which electrode is the cathode?

- a) 0.014 V, $\text{Cu}(\text{s})$ electrode in the 0.30 M solution of $\text{Cu}^{2+}(\text{aq})$
- b) 0.028 V, $\text{Cu}(\text{s})$ electrode in the 0.30 M solution of $\text{Cu}^{2+}(\text{aq})$
- c) -0.014 V, $\text{Cu}(\text{s})$ electrode in the 0.10 M solution of $\text{Cu}^{2+}(\text{aq})$
- d) -0.028 V, $\text{Cu}(\text{s})$ electrode in the 0.10 M solution of $\text{Cu}^{2+}(\text{aq})$
- e) 0.014 V, $\text{Cu}(\text{s})$ electrode in the 0.10 M solution of $\text{Cu}^{2+}(\text{aq})$

17. Using standard reduction potentials, what is the value of the equilibrium constant at 25°C for the following reaction?



- a) 1.0
- b) 1.2×10^{31}
- c) 69
- d) 2.2
- e) 1×10^{135}

Answer Key

- | | | | |
|------|-------|-------|-------|
| 1. d | 6. e | 11. d | 16. a |
| 2. b | 7. a | 12. d | 17. b |
| 3. b | 8. b | 13. b | |
| 4. e | 9. a | 14. e | |
| 5. d | 10. c | 15. c | |