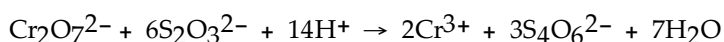


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

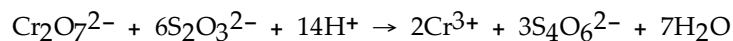
- 1) The gain of electrons by an element is called _____. 1) _____
- A) oxidation
B) reduction
C) sublimation
D) fractionation
E) disproportionation

- 2) _____ is reduced in the following reaction: 2) _____



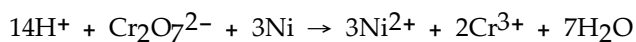
- A) $\text{S}_2\text{O}_3^{2-}$ B) Cr^{3+} C) H^+ D) $\text{Cr}_2\text{O}_7^{2-}$ E) $\text{S}_4\text{O}_6^{2-}$

- 3) _____ is the oxidizing agent in the reaction below. 3) _____



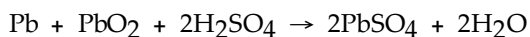
- A) H^+ B) Cr^{3+} C) $\text{S}_2\text{O}_3^{2-}$ D) $\text{S}_4\text{O}_6^{2-}$ E) $\text{Cr}_2\text{O}_7^{2-}$

- 4) Which substance is serving as the reducing agent in the following reaction? 4) _____



- A) H_2O B) Ni C) $\text{Cr}_2\text{O}_7^{2-}$ D) Ni^{2+} E) H^+

- 5) Which substance is the reducing agent in the reaction below? 5) _____



- A) PbSO_4 B) PbO_2 C) H_2SO_4 D) Pb E) H_2O

- 6) What is the oxidation number of chromium in $\text{Cr}_2\text{O}_7^{2-}$ ion? 6) _____

- A) +12 B) +14 C) +6 D) +3 E) +7

- 7) What is the oxidation number of potassium in KMnO_4 ? 7) _____

- A) +3 B) 0 C) +1 D) -1 E) +2

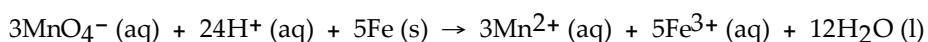
- 8) What is the oxidation number of manganese in the MnO_4^{1-} ion? 8) _____
A) +4 B) +2 C) +7 D) +1 E) +5
- 9) What is the oxidation number of manganese in MnO_2 ? 9) _____
A) +2 B) +7 C) +1 D) +4 E) +3
- 10) _____ electrons appear in the following half-reaction when it is balanced. 10) _____
$$\text{S}_4\text{O}_6^{2-} \rightarrow 2\text{S}_2\text{O}_3^{2-}$$

A) 2 B) 4 C) 6 D) 3 E) 1
- 11) The balanced half-reaction in which chlorine gas is reduced to the aqueous chloride ion is a _____ process. 11) _____
A) two-electron
B) six-electron
C) four-electron
D) one-electron
E) three-electron
- 12) The balanced half-reaction in which dichromate ion is reduced to chromium metal is a _____ process. 12) _____
A) two-electron
B) six-electron
C) twelve-electron
D) four-electron
E) three-electron
- 13) The balanced half-reaction in which dichromate ion is reduced to chromium(III) ion is a _____ process. 13) _____
A) three-electron
B) six-electron
C) twelve-electron
D) two-electron
E) four-electron

- 14) The balanced half-reaction in which sulfate ion is reduced to sulfite ion is a _____ process. 14) _____
- A) six-electron
 - B) one-electron
 - C) four-electron
 - D) two-electron
 - E) three-electron

- 15) The electrode at which oxidation occurs is called the _____. 15) _____
- A) cathode
 - B) oxidizing agent
 - C) reducing agent
 - D) voltaic cell
 - E) anode

- 16) The half-reaction occurring at the anode in the balanced reaction shown below is _____. 16) _____



- A) $2\text{MnO}_4^- (\text{aq}) + 12\text{H}^+ (\text{aq}) + 6\text{e}^- \rightarrow 2\text{Mn}^{2+} (\text{aq}) + 3\text{H}_2\text{O} (\text{l})$
 - B) $\text{MnO}_4^- (\text{aq}) + 8\text{H}^+ (\text{aq}) + 5\text{e}^- \rightarrow \text{Mn}^{2+} (\text{aq}) + 4\text{H}_2\text{O} (\text{l})$
 - C) $\text{Fe} (\text{s}) \rightarrow \text{Fe}^{3+} (\text{aq}) + 3\text{e}^-$
 - D) $\text{Fe}^{2+} (\text{aq}) \rightarrow \text{Fe}^{3+} (\text{aq}) + \text{e}^-$
 - E) $\text{Fe} (\text{s}) \rightarrow \text{Fe}^{2+} (\text{aq}) + 2\text{e}^-$
- 17) In a voltaic cell, electrons flow from the _____ to the _____. 17) _____
- A) cathode, anode
 - B) salt bridge, anode
 - C) anode, cathode
 - D) anode, salt bridge
 - E) salt bridge, cathode

- 18) The reduction half reaction occurring in the standard hydrogen electrode is _____. 18) _____
- A) $2\text{H}^+ (\text{aq}) + 2\text{OH}^- \rightarrow \text{H}_2\text{O} (\text{l})$
 - B) $\text{O}_2 (\text{g}) + 4\text{H}^+ (\text{aq}) + 4\text{e}^- \rightarrow 2\text{H}_2\text{O} (\text{l})$
 - C) $2\text{H}^+ (\text{aq}, 1\text{M}) + \text{Cl}_2 (\text{aq}) \rightarrow 2\text{HCl} (\text{aq})$
 - D) $\text{H}_2 (\text{g}, 1 \text{atm}) \rightarrow 2\text{H}^+ (\text{aq}, 1\text{M}) + 2\text{e}^-$
 - E) $2\text{H}^+ (\text{aq}, 1\text{M}) + 2\text{e}^- \rightarrow \text{H}_2 (\text{g}, 1 \text{atm})$

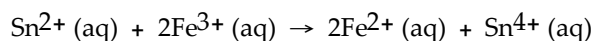
19) $1V =$ _____. 19) _____
A) $1 J/s$ B) $96485 C$ C) $1 J/C$ D) $1 \text{ amp} \cdot s$ E) $1 C/J$

20) The more _____ the value of E°_{red} , the greater the driving force for reduction. 20) _____
A) exothermic
B) extensive
C) endothermic
D) negative
E) positive

Table 20.2

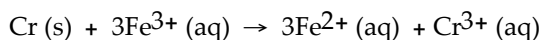
Half-reaction	E° (V)
$\text{Cr}^{3+}(\text{aq}) + 3e^- \rightarrow \text{Cr}(s)$	-0.74
$\text{Fe}^{2+}(\text{aq}) + 2e^- \rightarrow \text{Fe}(s)$	-0.440
$\text{Fe}^{3+}(\text{aq}) + e^- \rightarrow \text{Fe}^{2+}(s)$	+0.771
$\text{Sn}^{4+}(\text{aq}) + 2e^- \rightarrow \text{Sn}^{2+}(\text{aq})$	+0.154

21) The standard cell potential (E°_{cell}) for the voltaic cell based on the reaction below is _____ V. 21) _____



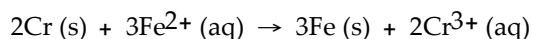
A) +0.617 B) +1.39 C) +1.21 D) -0.46 E) +0.46

22) The standard cell potential (E°_{cell}) for the voltaic cell based on the reaction below is _____ V. 22) _____



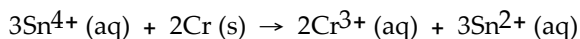
A) +1.57 B) -1.45 C) +1.51 D) +3.05 E) +2.99

23) The standard cell potential (E°_{cell}) for the voltaic cell based on the reaction below is _____ V. 23) _____



A) -0.16 B) +3.10 C) +0.83 D) +2.80 E) +0.30

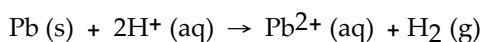
24) The standard cell potential (E°_{cell}) for the voltaic cell based on the reaction below is _____ V. 24) _____



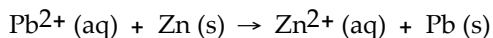
A) +1.94 B) -0.59 C) +0.89 D) -1.02 E) +2.53

- 25) The relationship between the change in Gibbs free energy and the emf of an electrochemical cell is given by _____ 25) _____
- A) $\Delta G = \frac{-nF}{ERT}$
- B) $\Delta G = \frac{-nF}{E}$
- C) $\Delta G = \frac{-E}{nF}$
- D) $\Delta G = -nFE$
- E) $\Delta G = -nRTF$

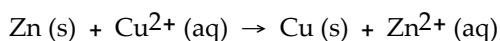
- 26) The standard cell potential (E°_{cell}) of the reaction below is +0.126 V. The value of ΔG° for the reaction is _____ kJ/mol. 26) _____



- A) -24 B) +24 C) -12 D) +12 E) -50
- 27) The standard cell potential (E°_{cell}) for the reaction below is +0.63 V. The cell potential for this reaction is _____ V when $[\text{Zn}^{2+}] = 1.0 \text{ M}$ and $[\text{Pb}^{2+}] = 2.0 \times 10^{-4} \text{ M}$. 27) _____



- A) 0.74 B) 0.41 C) 0.85 D) 0.63 E) 0.52
- 28) The standard cell potential (E°_{cell}) for the reaction below is +1.10 V. The cell potential for this reaction is _____ V when the concentration of $[\text{Cu}^{2+}] = 1.0 \times 10^{-5} \text{ M}$ and $[\text{Zn}^{2+}] = 1.0 \text{ M}$. 28) _____



- A) 0.95 B) 1.25 C) 1.10 D) 0.80 E) 1.40
- 29) The lead-containing reactant(s) consumed during recharging of a lead-acid battery is/are _____ 29) _____
- A) $\text{PbO}_2 (\text{s})$ only
- B) Pb (s) only
- C) $\text{PbSO}_4 (\text{s})$ only
- D) both $\text{PbO}_2 (\text{s})$ and $\text{PbSO}_4 (\text{s})$
- E) both Pb (s) and $\text{PbO}_2 (\text{s})$

- 30) Galvanized iron is iron coated with _____. 30) _____
A) zinc.
B) chromium.
C) phosphate.
D) magnesium.
E) iron oxide.
- 31) Corrosion of iron is retarded by _____. 31) _____
A) the presence of salts
B) low pH conditions
C) high pH conditions
D) both the presence of salts and high pH conditions
E) both the presence of salts and low pH conditions
- 32) How many minutes will it take to plate out 2.19 g of chromium metal from a solution of Cr^{3+} using a current of 35.2 amps in an electrolyte cell _____? 32) _____
A) 17.3 B) 115 C) 346 D) 1.92 E) 5.77
- 33) What current (in A) is required to plate out 1.22 g of nickel from a solution of Ni^{2+} in 1.0 hour _____? 33) _____
A) 65.4 B) 2.34 C) 1.11 D) 12.9 E) 4.01×10^3
- 34) How many grams of Ca metal are produced by the electrolysis of molten CaBr_2 using a current of 30.0 amp for 10.0 hours _____? 34) _____
A) 22.4 B) 448 C) 0.0622 D) 112 E) 224
- 35) How many grams of CuS are obtained by passing a current of 12 A through a solution of CuSO_4 for 15 minutes _____? 35) _____
A) 3.6 B) 7.1 C) 14 D) 1.8 E) 0.016
- 36) How many seconds are required to produce 1.0 g of silver metal by the electrolysis of a AgNO_3 solution using a current of 30 amps _____? 36) _____
A) 3.7×10^{-5} B) 60 C) 3.2×10^3 D) 30 E) 2.7×10^4
- 37) How many grams of copper will be plated out by a current of 2.3 A applied for 25 minutes to a 0.50-M solution of copper(II) sulfate _____? 37) _____
A) 0.019 B) 2.2 C) 0.036 D) 1.1 E) 1.8×10^{-2}

Answer Key

Testname: CHAPTER 20 PRACTICE QUESTIONS

- 1) B
- 2) D
- 3) C
- 4) B
- 5) D
- 6) C
- 7) C
- 8) C
- 9) D
- 10) A
- 11) A
- 12) C
- 13) B
- 14) D
- 15) E
- 16) C
- 17) C
- 18) E
- 19) C
- 20) E
- 21) A
- 22) C
- 23) E
- 24) C
- 25) D
- 26) A
- 27) E
- 28) A
- 29) C
- 30) A
- 31) C
- 32) E
- 33) C
- 34) E
- 35) A
- 36) D
- 37) D