

LAREDO COMMUNITY COLLEGE
Science Department

CHEM 1412

Practice Test ch. 20

Oxidation-Reduction Reactions & Electrochemistry

Newton

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

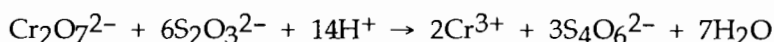
1) The gain of electrons by an element is called _____.

- A) reduction
- B) disproportionation
- C) fractionation
- D) oxidation
- E) sublimation

Page Ref: Sec. 20.1

Topic:

2) _____ is the oxidizing agent in the reaction below.

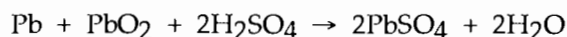


- A) $\text{Cr}_2\text{O}_7^{2-}$ B) Cr^{3+} C) $\text{S}_4\text{O}_6^{2-}$ D) $\text{S}_2\text{O}_3^{2-}$ E) H^+

Page Ref: Sec. 20.1

Topic:

3) Which substance is the reducing agent in the reaction below?



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

Page Ref: Sec. 20.1

Topic:

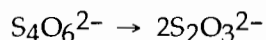
4) What is the oxidation number of manganese in the permanganate ion?

- A) +1 B) +4 C) +7 D) +5 E) +2

Page Ref: Sec. 20.1

Topic:

5) _____ electrons appear in the following half-reaction when it is balanced.

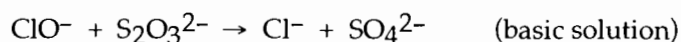


- A) 1 B) 3 C) 2 D) 4 E) 6

Page Ref: Sec. 20.2

Topic:

6) What is the coefficient of the hypochlorite ion when the following equation is balanced?



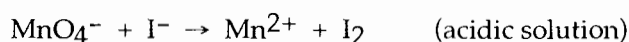
- A) 1 B) 2 C) 3 D) 4 E) 5

Page Ref: Sec. 20.2

Topic:

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7) What is the coefficient of iodine when the following equation is balanced?



- A) 3 B) 5 C) 1 D) 2 E) 4

Page Ref: Sec. 20.2

Topic:

8) The electrode at which oxidation occurs is called the

- A) cathode
B) anode
C) voltaic cell
D) reducing agent
E) oxidizing agent

Page Ref: Sec. 20.3

Topic:

9) The purpose of the salt bridge in an electrochemical cell is to _____.

- A) provide a means for electrons to travel from the cathode to the anode.
B) maintain electrical neutrality in the half-cells via migration of ions.
C) provide a source of ions to react at the anode and cathode.
D) provide a means for electrons to travel from the anode to the cathode.
E) provide oxygen to facilitate oxidation at the anode.

Page Ref: Sec. 20.3

Topic:

10) In a voltaic cell, electrons flow from the _____ to the _____.

- A) anode, salt bridge
B) anode, cathode
C) salt bridge, anode
D) salt bridge, cathode
E) cathode, anode

Page Ref: Sec. 20.3

Topic:

11) The reduction half reaction occurring in the standard hydrogen electrode is _____.

- A) $\text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}(\text{l})$
B) $\text{H}_2(\text{g}, 1 \text{ atm}) \rightarrow 2\text{H}^+(\text{aq}, 1\text{M}) + 2\text{e}^-$
C) $2\text{H}^+(\text{aq}, 1\text{M}) + \text{Cl}_2(\text{aq}) \rightarrow 2\text{HCl}(\text{aq})$
D) $2\text{H}^+(\text{aq}, 1\text{M}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g}, 1 \text{ atm})$
E) $2\text{H}^+(\text{aq}) + 2\text{OH}^- \rightarrow \text{H}_2\text{O}(\text{l})$

Page Ref: Sec. 20.4

Topic:

12) $1\text{V} =$ _____.

- A) $1 \text{ amp} \cdot \text{s}$ B) 96485 C C) 1 J/C D) 1 J/s E) 1 C/J

Page Ref: Sec. 20.4

Topic:

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Table 20.1

Half Reaction	E° (V)
$F_2(g) + 2e^- \rightarrow 2F^-(aq)$	+2.87
$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$	+1.359
$Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$	+1.065
$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$	+1.23
$Ag^+ + e^- \rightarrow Ag(s)$	+0.799
$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$	+0.771
$I_2(s) + 2e^- \rightarrow 2I^-(aq)$	+0/536
$Cu^{2+} + 2e^- \rightarrow Cu(s)$	+0.34
$2H^+ + 2e^- \rightarrow H_2(g)$	0
$Pb^{2+} + 2e^- \rightarrow Pb(s)$	-0.126
$Ni^{2+} + 2e^- \rightarrow Ni(s)$	-0.28
$Li^+ + e^- \rightarrow Li(s)$	-3.05

13) Which of the halogens in Table 20.1 is the strongest oxidizing agent?

- A) Br_2
- B) F_2
- C) I_2
- D) Cl_2
- E) All of the halogens have equal strength as oxidizing agents.

Page Ref: Sec. 20.4

Topic:

14) Using Table 20.1, which substance can be oxidized by $O_2(g)$ in acidic aqueous solution?

- A) $Ag(s)$
- B) $Br_2(l)$
- C) $Br^-(aq)$
- D) $Cu^{2+}(aq)$
- E) $Ni^{2+}(aq)$

Page Ref: Sec. 20.4

Topic:

15) Using Table 20.1, which substance can oxidize $I^-(aq)$ to $I_2(s)$?

- A) $Cu^{2+}(aq)$
- B) $Ni^{2+}(aq)$
- C) $Br^-(aq)$
- D) $Ag(s)$
- E) $Br_2(l)$

Page Ref: Sec. 20.4

Topic:

16) The more _____ the value of E°_{red} , the greater the driving force for reduction.

- A) positive
- B) extensive
- C) exothermic
- D) endothermic
- E) negative

Page Ref: Sec. 20.4

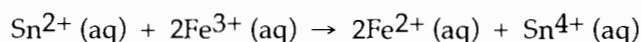
Topic:

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Table 20.2

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

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

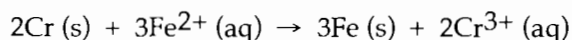


- A) -0.46 B) +1.39 C) +1.21 D) +0.617 E) +0.46

Page Ref: Sec. 20.4

Topic:

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



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

Page Ref: Sec. 20.4

Topic:

19) Which of the following reactions will occur spontaneously as written?

- A) $\text{Sn}^{4+}(\text{aq}) + \text{Fe}^{3+}(\text{aq}) \rightarrow \text{Sn}^{2+}(\text{aq}) + \text{Fe}^{2+}(\text{aq})$
 B) $3\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}(\text{s}) + 2\text{Fe}^{3+}(\text{aq})$
 C) $3\text{Sn}^{4+}(\text{aq}) + 2\text{Cr}(\text{s}) \rightarrow 2\text{Cr}^{3+}(\text{aq}) + 3\text{Sn}^{2+}(\text{aq})$
 D) $\text{Sn}^{4+}(\text{aq}) + \text{Fe}^{2+}(\text{aq}) \rightarrow \text{Sn}^{2+}(\text{aq}) + \text{Fe}(\text{s})$
 E) $3\text{Fe}(\text{s}) + 2\text{Cr}^{3+}(\text{aq}) \rightarrow 2\text{Cr}(\text{s}) + 3\text{Fe}^{2+}(\text{aq})$

Page Ref: Sec. 20.5

Topic:

20) What is the anode in an alkaline battery?

- A) Zn powder B) Pt C) KOH D) Mn_2O_3 E) MnO_2

Page Ref: Sec. 20.7

Topic:

21) The lead-containing reactant(s) consumed during recharging of a lead-acid battery is/are _____.

- A) $\text{PbSO}_4(\text{s})$ only
 B) $\text{Pb}(\text{s})$ only
 C) $\text{PbO}_2(\text{s})$ only
 D) both $\text{PbO}_2(\text{s})$ and $\text{PbSO}_4(\text{s})$
 E) both $\text{Pb}(\text{s})$ and $\text{PbO}_2(\text{s})$

Page Ref: Sec. 20.7

Topic:

22) In a lead-acid battery, the electrodes are consumed. In this battery,

- A) the anode is PbO_2 .
- B) the cathode is PbSO_4 .
- C) the cathode is Pb.
- D) the anode is PbSO_4 .
- E) the anode is Pb.

Page Ref: Sec. 20.7

Topic:

23) Galvanized iron is iron coated with

- A) magnesium.
- B) iron oxide.
- C) zinc.
- D) chromium.
- E) phosphate.

Page Ref: Sec. 20.8

Topic:

24) Cathodic protection of a metal pipe against corrosion usually entails

- A) attaching a dry cell to reduce any metal ions which might be formed.
- B) coating the pipe with a fluoropolymer to act as a source of fluoride ion (since the latter is so hard to oxidize).
- C) coating the pipe with another metal whose standard reduction potential is less negative than that of the pipe.
- D) attaching an active metal to make the pipe the cathode in an electrochemical cell.
- E) attaching an active metal to make the pipe the anode in an electrochemical cell.

Page Ref: Sec. 20.8

Topic:

25) Corrosion of iron is retarded by _____.

- A) high pH conditions
- B) low pH conditions
- C) the presence of salts
- D) both the presence of salts and high pH conditions
- E) both the presence of salts and low pH conditions

Page Ref: Sec. 20.8

Topic:

26) One of the differences between a voltaic cell and an electrolytic cell is that in an electrolytic cell

- _____.
- A) a nonspontaneous reaction is forced to occur
 - B) an electric current is produced by a chemical reaction
 - C) electrons flow toward the anode
 - D) O_2 gas is produced at the cathode
 - E) oxidation occurs at the cathode

Page Ref: Sec. 20.9

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- C) the cathode is Pb .
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