

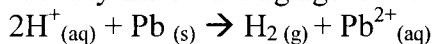
Chemistry 12: Electrochemistry 1
Review Worksheet

Name iKey
Date _____ Block _____

1. When a substance is reduced, it

- a. loses electrons.
- b. causes oxidation.
- c. undergoes oxidation.
- d. increases in oxidation number.

2. Identify the oxidizing agent in the following equation:



- a. $\text{H}_2(\text{g})$
- b. $\text{H}^+(\text{aq})$
- c. $\text{Pb}(\text{s})$
- d. $\text{Pb}^{2+}(\text{aq})$

3. An example of reduction is

- a. $\text{Mn}(\text{s}) \rightarrow \text{Mn}^{2+}(\text{aq})$
- b. $\text{H}^+(\text{aq}) + \text{MnO}_4^-(\text{aq}) + \text{K}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{K}^+(\text{aq}) + \text{MnO}_4^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- c. $\text{Mn}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightarrow \text{MnS}(\text{s})$
- d. $\text{MnO}_2(\text{s}) + 4\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{Mn}^{2+}(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

4. A strip of Zn metal is placed into 0.1M $\text{Ga}(\text{NO}_3)_3$ and its surface darkens. From this observation it may be concluded that Ga^{3+} is a

- a. weaker reducing agent than Zn^{2+}
- b. weaker oxidizing agent than Zn^{2+}
- c. stronger reducing agent than Zn^{2+}
- d. stronger oxidizing agent than Zn^{2+}

5. Which of the following oxidizing agents will react spontaneously with Br^- at standard conditions?

- a. H^+
- b. Li^+
- c. NO_3^- in acid
- d. $\text{Cr}_2\text{O}_7^{2-}$ in acid

6. Which of the following most readily loses electrons?

- a. Ag
- b. Cl^-
- c. Sr
- d. Mg^{2+}

7. Which of the following could be a product of a reaction in which SO_3^{2-} acts as a reducing agent?

- a. SO_4^{2-}
- b. SO_2
- c. S_2O
- d. $\text{S}_2\text{O}_8^{2-}$

8. Given the half-cell reaction $\text{S}_2\text{O}_8^{2-} + 2\text{H}^+ \rightarrow 2\text{HSO}_4^-$, which of the following will balance electric charges?

- a. Add $2e^-$ to the left side
- b. Add $2e^-$ to the right side
- c. Add $3e^-$ to the left side
- d. Add $3e^-$ to the right side

Use the following information to answer question 9.

Cl_2 is pale yellow in CCl_4

Cl^- is colorless in water

Br_2 is red in CCl_4

Br^- is colorless in water

9. Aqueous Cl_2 and aqueous KBr are shaken with CCl_4 in a test tube. The CCl_4 layer is red and the water layer is colorless. What is the best conclusion?

- a. Br^- is oxidized
- b. No reaction occurred.
- c. Cl_2 was oxidized
- d. CCl_4 was oxidized

10. What is the oxidation number of Cr in CrO_4^{2-} ?

- a. -2
- b. +6
- c. +8
- d. +10

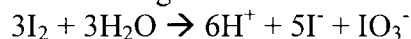
11. The oxidation number for a sulphur atom in $\text{Na}_2\text{S}_2\text{O}_5$ is

- a. -2
- b. +1
- c. +4
- d. +8

12. In which of the following compounds does carbon have an oxidation number of -2?

- a. CO
- b. CO_2
- c. CH_2O
- d. CH_3OH

13. Consider the following reaction:



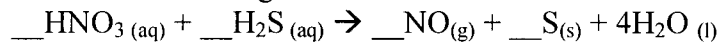
In this reaction atoms in I_2 undergo

- a. oxidation only
 - b. reduction only
 - c. neither oxidation nor reduction
 - d. both oxidation and reduction
14. Which one of the following half-reactions is balanced?
- a. $\text{IO}_3^- (\text{aq}) + 6\text{H}^+ (\text{aq}) + 5\text{e}^- \rightarrow \text{I}_2 (\text{s}) + 2\text{H}_2\text{O} (\text{l})$
 - b. $\text{ClO}^- (\text{aq}) + \text{H}_2\text{O} (\text{l}) + 2\text{e}^- \rightarrow \text{Cl}^- (\text{aq}) + 2\text{OH}^- (\text{aq})$
 - c. $\text{SO}_4^{2-} (\text{aq}) + 8\text{H}^+ (\text{aq}) + 6\text{e}^- \rightarrow \text{H}_2\text{S} (\text{g}) + 4\text{H}_2\text{O} (\text{l})$
 - d. $\text{NO}_2^- (\text{aq}) + \text{H}_2\text{O} (\text{l}) + 2\text{e}^- \rightarrow 2\text{H}^+ (\text{aq}) + \text{NO}_3^- (\text{aq})$
15. Of the following metals, which would be the best one to use to make a container in which to store an aqueous copper(II) sulfate solution?
- a. Ag (s)
 - b. Fe (s)
 - c. Ni (s)
 - d. Pb (s)
16. The correctly balanced half-reaction for $\text{ClO}^- (\text{aq}) \rightarrow \text{Cl}^- (\text{aq})$ in a basic solution is
- a. $2\text{H}^+ (\text{aq}) + \text{ClO}^- (\text{aq}) + 2\text{e}^- \rightarrow \text{Cl}^- (\text{aq}) + \text{H}_2\text{O} (\text{l})$
 - b. $\text{H}_2\text{O} (\text{l}) + \text{ClO}^- (\text{aq}) \rightarrow \text{Cl}^- (\text{aq}) + 2\text{OH}^- (\text{aq}) + 2\text{e}^-$
 - c. $\text{H}_2\text{O} (\text{l}) + \text{ClO}^- (\text{aq}) + 2\text{e}^- \rightarrow \text{Cl}^- (\text{aq}) + 2\text{OH}^- (\text{aq})$
 - d. $2\text{H}^+ (\text{aq}) + \text{ClO}^- (\text{aq}) \rightarrow \text{Cl}^- (\text{aq}) + \text{H}_2\text{O} (\text{l}) + 2\text{e}^-$
17. Experiments were performed with three metal strips, X, Y, and Z, and their corresponding 1.0M nitrate solutions, $\text{X}(\text{NO}_3)_2$, $\text{Y}(\text{NO}_3)_2$ and $\text{Z}(\text{NO}_3)_3$.
- metal Y reacted with X^{2+} but not with Z^{3+} .
 - metal X did not react with any of the solutions

Which of the following gives the metals in order of decreasing strength as reducing agent (strongest reducing agent first)?

- a. Z, Y, X
- b. X, Y, Z
- c. Y, Z, X
- d. X, Z, Y

18. Which of the following sets of coefficients balances the equation



a. 4, 2, 4, 1

b. 4, 1, 4, 1

c. 2, 3, 2, 3

d. 2, 1, 2, 1

19. Which of the following agents would reduce $\text{Sn}^{4+}_{\text{(aq)}}$ to $\text{Sn}^{2+}_{\text{(aq)}}$?

a. Fe (s)

b. $\text{I}^{-}_{\text{(aq)}}$

c. $\text{Fe}^{2+}_{\text{(aq)}}$

d. Ag (s)

20. In a particular redox reaction, the oxidation number of phosphorus changed from -3 to 0 . From this it may be concluded that phosphorus

a. lost 3 electrons and was reduced.

b. lost 3 electrons and was oxidized.

c. gain 3 electrons and was reduced.

d. gain 3 electrons and was oxidized.

SHORT ANSWER QUESTIONS

21. Balance the following half-reaction occurring in acid solution.

