Science 20

Unit A: Chemical Change

Assignment Booklet A2

Alberta
EDUCATION

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Chapter 2 Assignment	42	

Teacher's Comments

Science 20
Unit A: Chemical Change
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Chapter 2 Assignment

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

ASSIGNMENT BOOKLET A2
SCIENCE 20: UNIT A
CHAPTER 2 ASSIGNMENT

This Assignment Booklet is worth 42 marks out of the total 186 marks for the assignments in Unit A. The value of each assignment and each question is stated in the left margin.

Read all parts of your assignment carefully, and record your answers in the appropriate places. If you have difficulty with an assignment, go back to the textbook and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

42

Chapter 2 Assignment: The Reduction and Oxidation of Metals

For questions 1 to 7, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 1. What happens when a strip of zinc is placed in a silver nitrate solution?

A. Hydrogen bubbles form on the strip of zinc, and zinc ions go into the solution.
B. Zinc ions go into the solution, and silver forms on the strip of zinc.
C. A chemical reaction involving zinc does not take place.
D. Zinc ions go into the solution, and oxygen forms.

(1) _____ 2. What happens when a strip of plastic is placed in a silver nitrate solution?

A. A chemical change involving plastic is not observed.
B. Hydrogen bubbles form on the strip of plastic.
C. The plastic quickly disintegrates.
D. Silver forms on the strip of plastic.

(1) _____ 3. Archaeologists found bracelets and other objects manufactured from copper in a burial ground near Prince Rupert Harbour. Copper buried in rain forest soil tends to quickly deteriorate due to acidic solutions in the soil. What saved these copper artifacts from the damaging effects of acidic solutions?

A. abundant decaying vegetative matter nearby
B. layers of clay impermeable to water
C. abundant snowfall
D. layers of sea shells

(1) _____ 4. Based on the equation $4\ Ag(s) + 2\ H_2S(g) + O_2(g) \rightarrow 2\ Ag_2S(s) + 2\ H_2O(l)$, what is the mole ratio of $H_2S(g)$ to $Ag_2S(s)$?

A. $\frac{2}{1}$

B. $\frac{2}{2}$

C. $\frac{2}{4}$

D. $\frac{4}{2}$

(1) _____ 5. Hydrogen sulfide can be used in aqueous solutions to separate out metal ions. On the other hand, hydrogen sulfide in the air causes considerable damage to silver objects. When a silver goblet tarnished in the presence of hydrogen sulfide (and oxygen), 1.20 mol of silver sulfide formed. What amount of silver was consumed?

A. 4.80 mol
B. 2.40 mol
C. 1.20 mol
D. 0.600 mol

(1) _____ 6. While investigating mole ratios, a group of students collected data for the chemical reaction $2\ NaOH(aq) + CaCl_2(aq) \rightarrow 2\ NaCl(aq) + Ca(OH)_2(s)$. The students wondered what would happen if an excess of NaOH was used. Their teacher approved a procedure in which solutions containing 3.00 g of NaOH and 2.10 g of $CaCl_2$ were combined. Based on the quantities of these reactants, what amount of $Ca(OH)_2(s)$ is produced?

A. 0.0189 mol
B. 0.0375 mol
C. 0.0500 mol
D. 0.1000 mol

(1) _____ 7. In producing pure iron metal from its ore, iron(III) oxide and carbon (coke) must react according to the following balanced chemical equation:

$$Fe_2O_3(s) + 3\ C(s) \rightarrow 2\ Fe(s) + 3\ CO(g)$$

Suppose 5.89×10^3 mol of iron ore are consumed. How many moles of pure iron metal are produced?

A. 1.47×10^3 mol
B. 2.95×10^3 mol
C. 5.89×10^3 mol
D. 1.18×10^4 mol

(3)

8. One essential step in the manufacture of many plant fertilizers is the production of nitrogen monoxide gas, NO(g). This step is represented by the following balanced equation:

$$4\ NH_3(g) + 5\ O_2(g) \rightarrow 4\ NO(g) + 6\ H_2O(l)$$

Determine the amount of oxygen needed to produce 1.2×10^4 mol of nitrogen monoxide gas.

Return to page 11 of the Distance Learning Student Guide, and begin Lesson 2.2.

For questions 9 and 10, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1)

_____ 9. Which is an example of oxidation?

A. $K^+(aq) + e^- \rightarrow K(s)$
B. $Au^{3+}(aq) + 3e^- \rightarrow Au(s)$
C. $Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$
D. $Li(s) \rightarrow Li^+(aq) + e^-$

(1)

_____ 10. Which is an example of reduction?

A. $Ca(s) \rightarrow Ca^{2+}(aq) + 2e^-$
B. $Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$
C. $H_2(g) \rightarrow 2\ H^+(aq) + 2e^-$
D. $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$

11. Decide whether each statement is true (T) or false (F). Place your answer in the blank space given.

½ _____ a. A substance that oxidizes gains electrons.

½ _____ b. When copper is purified from copper sulfide, copper is reduced.

½ _____ c. When tarnished silver becomes shiny, the silver is reduced.

½ _____ d. As an iron object rusts, the iron undergoes reduction.

2 12. Gold ions, $Au^{3+}(aq)$, can easily be made to precipitate out of a solution as gold metal. Simply bring another metal into the solution, and this metal becomes the reducing agent in the chemical change. Write the half-reaction to represent the change in gold as it precipitates out of the solution.

_____

13. When zinc metal is placed into a solution of silver nitrate, silver metal and zinc nitrate are produced according to this reaction:

$$Zn(s) + 2\ AgNO_3(aq) \rightarrow 2\ Ag(s) + Zn(NO_3)_2(aq)$$

1 a. What chemical atom or ion in the reaction is oxidized? Give a reason for your choice.

_____

_____

1 b. What chemical atom or ion in the reaction is reduced? Give a reason for your choice.

_____

_____

1 c. What chemical atom or ion in the reaction is a spectator? Give a reason for your choice.

_____

_____

14. Rewrite each reaction so it is balanced.

(1) a. $Al(s) + I_2(s) \rightarrow AlI_3(s)$

(1) b. $Fe(s) + O_2(g) \rightarrow Fe_2O_3(s)$

(1) c. $Zn(s) + AuCl_3(aq) \rightarrow Au(s) + ZnCl_2(aq)$

Return to page 12 of the Distance Learning Student Guide, and begin Lesson 2.3.

For questions 15 to 18, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 15. Tin does not react with iron(II) oxide, but it does reduce lead(II) oxide to lead. What is the correct arrangement of the metals in order of decreasing reactivity?

A. tin, lead, iron
B. iron, tin, lead
C. lead, iron, tin
D. tin, iron, lead

(1) _____ 16. A student listed the following possible reactants in redox reactions:

I. iron and copper(II) sulfate solution
II. silver and calcium nitrate solution
III. zinc and lead(II) nitrate solution
IV. copper and lead(II) nitrate solution
V. magnesium and zinc nitrate solution

Which combination will spontaneously react in a redox reaction?

A. I and II
B. I, III, and IV
C. I, III, and V
D. V only

(1) _____ 17. Which is least reactive with aqueous solutions of metal ions?

A. tin
B. zinc
C. gold
D. calcium

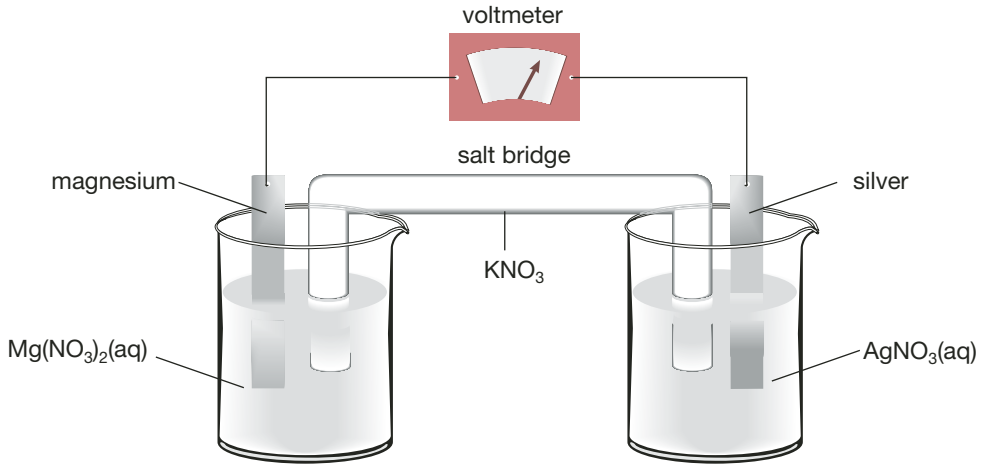
(1) _____ 18. A block of magnesium attached to an iron pipeline running through moist soil may prevent the pipeline from oxidizing and corroding. Magnesium is a very reactive metal. When attached to the pipeline, the magnesium itself will corrode and keep the pipeline a cathode. Based on this form of protection, which of these metals can also protect an iron pipeline from corrosion?

A. zinc
B. lead
C. copper
D. silver

Return to page 13 of the Distance Learning Student Guide, and begin Lesson 2.4.

For questions 19 to 24, read each question carefully. Decide which of the choices BEST completes the statement or answers the question. Place your answer in the blank space given.

Use the following voltaic cell to answer questions 19 to 22.



(1) _____ 19. The reduction-half reaction for the cell is

A. $Ag^+(aq) + e^- \rightarrow Ag(s)$
B. $Ag(s) \rightarrow Ag^+(aq) + e^-$
C. $Mg(s) \rightarrow Mg^{2+}(aq) + 2e^-$
D. $Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$

(1) _____ 20. The oxidation half-reaction for the cell is

A. $Ag^{+}(aq) + e^{-} \rightarrow Ag(s)$
B. $Ag(s) \rightarrow Ag^{+}(aq) + e^{-}$
C. $Mg(s) \rightarrow Mg^{2+}(aq) + 2e^{-}$
D. $Mg^{2+}(aq) + 2e^{-} \rightarrow Mg(s)$

(1) _____ 21. The oxidation half-reaction occurs at

A. the anode
B. the cathode
C. the anode and the cathode
D. neither the anode nor the cathode

(1) _____ 22. The electrode mass will diminish at

A. the anode
B. the cathode
C. the anode and the cathode
D. neither the anode nor the cathode

(1) _____ 23. A scientist is designing a voltaic cell. Which combination of metals, along with their ions, can be used to produce the highest voltage?

A. Mg and Cu
B. Mg and Zn
C. Mg and Pb
D. Mg and Fe

(1) _____ 24. Which are the least likely to be dependent on alkaline batteries?

A. flashlights
B. trucks
C. MP3 players
D. smoke detectors

(2) 25. Describe the role of a salt bridge in a voltaic cell.

_____

_____

_____

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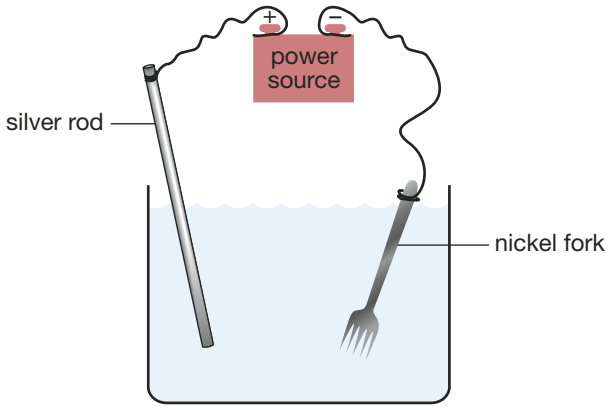
_____

Return to page 15 of the Distance Learning Student Guide, and begin Lesson 2.5.

For questions 26 to 28, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

Use the following information to answer questions 26 to 28.

This diagram shows an electrolytic cell that will plate a fork made of nickel with silver.



(1) _____ 26. Which statement identifies the cathode and correctly describes the electron flow?

A. Electrons flow from the nickel fork to the silver rod, which is the cathode.
B. Electrons flow from the nickel fork, which is the cathode, to the silver rod.
C. Electrons flow from the silver rod to the nickel fork, which is the cathode.
D. Electrons flow from the silver rod, which is the cathode, to the nickel fork.

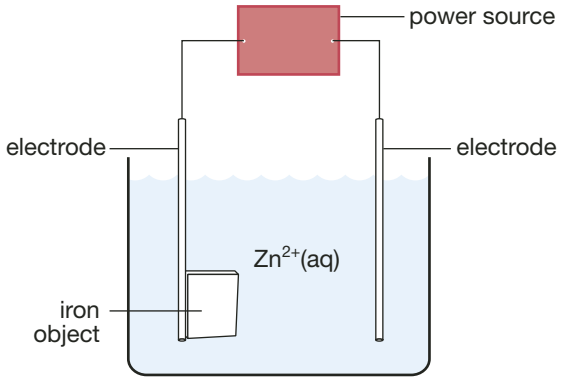
(1) _____ 27. Which solution allows the electrolytic cell to perform the silver plating?

A. nickel nitrate
B. silver nitrate
C. sodium chloride
D. gold(I) chloride

(1) _____ 28. How is the operation of the electrolytic cell explained as a redox reaction?

A. Silver is oxidized at the fork and reduced at the silver rod.
B. Silver is reduced at the fork and oxidized at the silver rod.
C. Nickel is reduced at the fork, and silver is oxidized at the silver rod.
D. Nickel is oxidized at the fork, and silver is reduced at the silver rod.

29. Refer to the diagram showing how to electroplate an iron object.



(1) a. Identify the type of cell depicted in the diagram.

(2) b. Why is an external power source needed for the chemical change to occur in the cell?

(2) c. Write the half-reaction that occurs at the cathode of the cell. Explain your answer.

Submit your completed Assignment Booklet A2 to your teacher for assessment.
Then return to page 17 of the Distance Learning Student Guide,
and begin the Chapter 2 Summary.