Chem.11-Q3W5-Electrochamistry-Qs Bank

True/False

Indicate whether the statement is true or false.

- 1. The electrode where oxidation takes place is called the cathode of the cell.
- 2. In a zinc-carbon dry cell, the zinc cell functions as the cathode.
- _____ 3. A storage battery such as a nickel-cadmium battery cannot be recharged.
- 4. A lithium battery is used in cell phones and electric cars since lithium has the highest standard electrode potential of the metallic elements.
- 5. Rusting of iron is an example of reduction of iron.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

 6.	6. The part of the electrolytic cell at which electrons are produced is the				
	a. anode	c.	external circuit		
	b. cathode	d.	salt bridge		
 7.	A Downs cell can be used to prepare				
	a. hydrogen gas	c.	chlorine gas		
	b. oxygen gas	d.	sodium chloride		
 8.	An example of a cation is				
	a. Cl_2	c.	Cl		
	b. Na	d.	Na^+		
 9.	The purpose of adding cryolite (Na ₃ AlF ₆) in the	e pro	pcess of extracting aluminum from bauxite is to		
	a. provide a source of fluorine	c.	provide a source of aluminum		
	b. provide an electrolyte	d.	lower the melting point of bauxite		
 10.	In a galvanic cell, the electrode that is more eas	sily	oxidized is the		
	a. anode	c.	anion		
	b. cathode	d.	cation		
 11.	One of the metals most difficult to oxidize is				
	a. potassium	c.	calcium		
	b. sodium	d.	copper		
 12.	A device used to measure the flow of current in	n a c	ell is the		
	a. salt bridge	c.	voltmeter		
	b. anode	d.	cathode		
 13.	The properties of the makes a dry cell "d	lry.'	,		
	a. anode	c.	electrolyte		
	b. cathode	d.	casing		
 14.	One disadvantage of nickel-cadmium batteries	that	improved technology cannot overcome is the		
	a. cost	c.	power limitations		
	b. toxicity of cadmium	d.	size		
 15.	The flow of electrons in a particular direction is	s cal	lled		
	a. electrolysis	c.	oxidation		
	b. an electrical current	d.	reduction		

 16.	Using an electrical current to break molten bau	ixite	, Al_2O_3 , into aluminum metal and a gas is an example of
		C	alactrolysis
	a. a camode	d.	recycling
17	In the electrolysis of potassium bromide brom	ina (appears at the
 17.	a anode		cathode
	b. anion	d.	cation
18	In the equation $2K^+ \pm 2Cl^- \rightarrow 2K(l) \pm Cl_{2}(q)$	vhat	is the anion?
 10.	in the equation, $2\mathbf{K} + 2\mathbf{C}\mathbf{I} \rightarrow 2\mathbf{K}(\mathbf{I}) + \mathbf{C}\mathbf{I}_2(\mathbf{g})$, \mathbf{V}	C C	K ⁺
	b. Cl ₂	d.	K
19	In the equation $2K^+ + 2Cl^- \rightarrow 2K(l) + Cl_2(\sigma)$	vhat	is the cation?
 17.	a. Cl	C.	K ⁺
	b. Cl ₂	d.	Κ
20.	In the equation, $2K^+ + 2Cl^- \rightarrow 2K(l) + Cl_2(g)$, v	what	is reduced?
	a. Cl	c.	\mathbf{K}^+
	b. Cl ₂	d.	K
 21.	In the equation, $2K^+ + 2Cl^- \rightarrow 2K(l) + Cl_2(g)$, v	what	is oxidized?
	a. Cl	c.	\mathbf{K}^{+}
	b. Cl_2	d.	K
 22.	In the equation, $2K^+ + 2Cl^- \rightarrow 2K(l) + Cl_2(g)$, v	what	is produced at the anode?
	a. Cl	c.	$\hat{K^+}$
	b. Cl_2	d.	K
 23.	In the equation, $2K^+ + 2Cl^- \rightarrow 2K(l) + Cl_2(g)$, w	what	is produced at the cathode?
	a. Cl	c.	$\mathbf{K}^{\overline{+}}$
	b. Cl_2	d.	K
 24.	In electrolysis, which reaction—oxidation or re-	educ	tion—occurs at a faster rate?
	a. oxidation	c.	They occur at the same rate.
	b. reduction	d.	It depends on the reaction.
 25.	Assume an object is to be plated with copper. I	n th	e electroplating process, the anode is made of
	a. an electrolyte	С.	copper the chiest itself
26	D. CATDON	а. 	
 26.	Which process might be used for DNA fingerp	rinti	ng in a criminal case?
	a. anouizing b. electrolytic cleaning	с. d	electrophoresis
77	When two holyes of a groateneous rodey reset	u.	electropiating
 27.	when two harves of a spontaneous redox react $a(n)$ is formed	1011 2	are separated and made to transfer electrons through a wife,
	a anode	с	cathode
	b. battery	d.	half-cell
28	The size of an electrical current depends on		potential difference
 20.	a. the direction of the	с.	the source of the
	b. the size of the	d.	whether there is a
29.	Aluminum is more easily oxidized than tin. In	an a	luminum-tin galvanic cell, electrons flow from the
	electrode to the electrode.		
	a. Al, Sn	c.	Al^{3+} , Al
	b. Sn, Al	d.	Sn ²⁺ , Sn
 30.	A common flashlight battery is not a		
	a. carbon-zinc battery	c.	galvanic cell
	b. dry cell	d.	lead storage battery

- 31. When a lead storage battery operates, _____ is oxidized.
 - c. Pb⁴⁺ a. Pb
 - b. Pb²⁺ d. H₂SO₄
- 32. One type of experimental battery for electric cars uses the active metal _____. c. rubidium
 - a. lithium

b. potassium d. sodium

_ 33. A strip of magnesium is placed in a silver nitrate solution, and a strip of silver is placed in a solution of magnesium chloride. In which case will a reaction take place?

- a. silver in magnesium chloride c. Both will react.
- b. magnesium in silver nitrate
- d. Neither will react.

Completion

Complete each statement.

34. A voltaic cell converts ______ energy to ______ energy.

- 35. A battery that uses a reversible redox reaction is called a ______ battery.
- 36. When the zinc layer on galvanized iron cracks, zinc protects iron from corrosion by functioning as a ______ of the voltaic cell.

Matching

Match each item with the correct statement below.

- a. anion
- b. anode
- c. cathode
- d. cation
- e. electrical current

- f. electrolysis
- g. electrolytic cell
- h. galvanic cell
- i. potential difference
- j. voltage
- _ 37. A system designed to produce electricity from chemical changes is known as a(n) _____.
- 38. In a(n) _____, electrical energy is used to bring about chemical changes.
- _____ 39. A process in which electrical energy is used to decompose a compound into its elements is called _____.
- 40. The flow of electrons through a system is called a(n) _____.
- 41. In an electrochemical cell, electrons travel from the _____, a region of high negative potential.
- _____ 42. _____ is a region of low negative potential.
- _____ 43. If there is no _____ between electrodes, electric current will not flow.
- _____ 44. The difference in electrical potential is called _____.
- _____ 45. An ion with a positive charge is called a(n) _____.
- _____ 46. An ion with a negative charge is called a(n) _____.

Match each item with the correct item below. a. oxidation

b. reduction

- $\underline{\qquad} 47. \quad Zn \rightarrow Zn^{2+} + 2e^{-1}$
- $\underline{\qquad} 48. \quad \mathrm{Ag}^{+} + e^{-} \to \mathrm{Ag}$
- $\underline{\qquad} 49. \quad \mathrm{Ni} \to \mathrm{Ni}^{2+} + 2e^{-1}$
- $\underline{\qquad} 50. \quad \mathrm{Sn}^{2+} + 2e^{-} \to \mathrm{Sn}$

Short Answer

- 51. Define the term primary battery and give two examples of primary batteries.
- 52. Explain how the process of electrolysis is used to purify copper metal.

Explain how the two terms in the following pairs differ from each other.

- 53. oxidation and reduction
- 54. electrons and electrical current
- 55. electrolytic cell and galvanic cell
- 56. dry cell and lead storage battery
- 57. anode and cathode
- 58. anion and cation
- 59. electrical current and voltage
- 60. galvanic cell and battery

In electrorefining, very pure metal is produced from less pure samples. For example, very pure copper can be obtained from bars of impure copper produced in smelting operations. The impure copper contains iron, zinc, silver, gold, and other metallic impurities. The diagram in Figure 17-1 shows how 99.9 percent pure copper can be obtained from impure copper. In this process, ultrapure copper sheets are placed between bars of impure copper and lowered into a solution of copper sulfate. Answer the following questions about this process.



- 61. Write the equation for the half-reaction that takes place at the anode of this cell.
- 62. Iron is more easily oxidized and less easily reduced than is copper. Write an equation that shows what happens to the iron in the impure copper that makes up the anode.
- 63. What happens to the iron oxidized at the anode in this cell?
- 64. Silver is less easily oxidized than is copper. What happens to the silver in the impure copper that makes up the anode?
- 65. Chemical energy is converted into electrical energy in what kind of cell?

Chem.11-Q3W5-Electrochamistry-Qs Bank Answer Section

TRUE/FALSE

1. ANS: F The electrode where oxidation takes place is called the anode of the cell.

PTS: 1 DIF: 1 REF: Page 585 OBJ: 17.1.1 Explain how a nonspontaneous redox reaction can be driven forward during electrolysis. TOP: Explain how a nonspontaneous redox reaction can be driven forward during electrolysis. KEY: Anode MSC: 1 NOT: /T/ An electrochemical cell consists of two parts, anode and cathode, in which the oxidation and reduction reactions take place. The two parts are also called half-cells. /F/ Correct! 2. ANS: F In a zinc-carbon dry cell, the carbon rod functions as the cathode, which is placed at the center of the cell. DIF: 1 PTS: 1 REF: Page 609 OBJ: 17.2.1 Relate the construction of a galvanic cell to how it functions to produce a voltage and an electrical current. TOP: Relate the construction of a galvanic cell to how it functions to produce a voltage and an electrical current. KEY: Dry cell MSC: 1 NOT: /T/ The zinc shell in the zinc-carbon battery serves as an anode. /F/ Correct! 3. ANS: F All types of storage batteries are rechargeable as they depend on reversible redox reactions. PTS: 1 DIF: 1 REF: Page 613 OBJ: 17.2.3 Relate chemistry in a redox reaction to separate reactions occurring at electrodes in a galvanic cell. TOP: Relate chemistry in a redox reaction to separate reactions occurring at electrodes in a galvanic cell. KEY: Secondary battery MSC: 1 NOT: /T/ During the recharging of a nickel-cadmium battery, the reactions of oxidation of cadmium and the reduction of nickel are reversed spontaneously. /F/ Correct! 4. ANS: F Since lithium has the lowest standard electrode potential, it is used in cell phones and electric cars. PTS: 1 DIF: 1 REF: Page 613 | Page 615 OBJ: 17.2.3 Relate chemistry in a redox reaction to separate reactions occurring at electrodes in a galvanic cell. TOP: Relate chemistry in a redox reaction to separate reactions occurring at electrodes in a galvanic cell. KEY: Primary battery | Secondary battery MSC: 2 NOT: /T/ Lithium is the lightest metal, so it has the lowest standard electrode potential. /F/ Correct! 5. ANS: F Rusting of iron is an example of oxidation of iron. In this process iron reacts with moist oxygen available from air and forms rust. DIF: 1 REF: Page 584 PTS: 1

OBJ: 17.1.1 Explain how a nonspontaneous redox reaction can be driven forward during electrolysis.

TOP: Explain how a nonspontaneous redox reaction can be driven forward during electrolysis.KEY: CorrosionMSC: 2NOT: /T/ Rust is hydrated ferric oxide and rusting of iron is a type of corrosion. /F/ Correct!

MULTIPLE CHOICE

6.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-5
7.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-3
8.	ANS:	D	PTS:	1	DIF:	В	OBJ:	17-1
9.	ANS:	D	PTS:	1	DIF:	В	OBJ:	17-2
10.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-6
11.	ANS:	D	PTS:	1	DIF:	В	OBJ:	17-3
12.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-4
13.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-4
14.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-3
15.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-2
16.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-3
17.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-3
18.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-2
19.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-2
20.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-2
21.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-2
22.	ANS:	В	PTS:	1	DIF:	А	OBJ:	17-2
23.	ANS:	D	PTS:	1	DIF:	А	OBJ:	17-2
24.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-1
25.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-3
26.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-3
27.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-4
28.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-5
29.	ANS:	А	PTS:	1	DIF:	А	OBJ:	17-6
30.	ANS:	D	PTS:	1	DIF:	В	OBJ:	17-4
31.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-6
32.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-4
33.	ANS:	В	PTS:	1	DIF:	А	OBJ:	17-2

COMPLETION

34. ANS: chemical, electrical

PTS:1DIF:1REF:Page 602OBJ:17.2.1 Relate the construction of a galvanic cell to how it functions to produce a voltage and an
electrical current.TOP:Relate the construction of a galvanic cell to how it functions to produce a voltage and an electrical
current.KEY:Voltaic cellMSC:

35. ANS: secondary storage

- PTS: 1 DIF: 1 REF: Page 611
- OBJ: 17.2.3 Relate chemistry in a redox reaction to separate reactions occurring at electrodes in a galvanic cell.
- TOP: Relate chemistry in a redox reaction to separate reactions occurring at electrodes in a galvanic cell.
- KEY: Secondary battery MSC: 1
- 36. ANS: anode

PTS:1DIF:1REF:Page 593OBJ:17.1.1 Explain how a nonspontaneous redox reaction can be driven forward during electrolysis.TOP:Explain how a nonspontaneous redox reaction can be driven forward during electrolysis.KEY:GalvanizingMSC:

MATCHING

37.	ANS:	Н	PTS:	1	DIF:	В	OBJ:	17-4
38.	ANS:	G	PTS:	1	DIF:	В	OBJ:	17-1
39.	ANS:	F	PTS:	1	DIF:	В	OBJ:	17-3
40.	ANS:	E	PTS:	1	DIF:	В	OBJ:	17-2
41.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-5
42.	ANS:	С	PTS:	1	DIF:	В	OBJ:	17-5
43.	ANS:	Ι	PTS:	1	DIF:	В	OBJ:	17-5
44.	ANS:	J	PTS:	1	DIF:	В	OBJ:	17-4
45.	ANS:	D	PTS:	1	DIF:	В	OBJ:	17-1
46.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-1
47.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-4
48.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-4
49.	ANS:	А	PTS:	1	DIF:	В	OBJ:	17-4
50.	ANS:	В	PTS:	1	DIF:	В	OBJ:	17-4

SHORT ANSWER

51. ANS:

Primary battery produces electric energy by means of redox reactions that are not easily reversed. Examples of primary batteries include zinc-carbon and mercury cells.

 PTS:
 1
 DIF:
 1
 REF:
 Page 608 | Page 609

 OBJ:
 17.2.1 Relate the construction of a galvanic cell to how it functions to produce a voltage and an electrical current.

TOP: Relate the construction of a galvanic cell to how it functions to produce a voltage and an electrical
current.KEY: Primary batteryMSC: 1

52. ANS:

The anode is made of impure copper in an electrolytic cell, while the cathode is made of a thin sheet of pure copper. When current is passed through the cell, copper atoms in the impure anode are oxidized to copper(II) ions. These copper ions migrate through the solution to the cathode and are reduced to pure copper.

PTS: 1 DIF: 2 REF: Page 588

	OBJ: plating	17.1.3 Apply g, and cleaning.	the prin	ciples of electr	olysis to	b its applications such as chemical synthesis, refining,			
	TOP: cleani	Apply the prir ng.	KEY:	of electrolysis f Electrolysis	MSC:	plications such as chemical synthesis, refining, plating, and 2			
53.	ANS: Oxida	tion is the loss	of elect	rons. Reduction	n is the	gain of electrons.			
54.	PTS: ANS:	1	DIF:	В	OBJ:	17-1			
	Electro from a	Electrons are always transferred during a redox reaction. An electrical current consists of electrons flowing from a region of high electrical pressure to a region of low electrical pressure.							
55	PTS:	1	DIF:	В	OBJ:	17-4			
55.	In an e galvar	In an electrolytic cell, an electrical current is used to bring about a nonspontaneous chemical change. In a galvanic cell, a spontaneous chemical change is used to produce an electrical current.							
56	PTS:	1	DIF:	В	OBJ:	17-1			
50.	The di electro	ANS: The dry cell is a single cell and its electrolyte is a paste. The lead storage battery has several cells and its electrolyte is a solution of sulfuric acid.							
57	PTS:	1	DIF:	В	OBJ:	17-4			
57.	The ar	The anode is the electrode at which oxidation takes place. The cathode is the electrode at which reduction occurs.							
58	PTS: ANS [.]	1	DIF:	В	OBJ:	17-2			
20.	An an	An anion is a negatively charged ion. A cation is a positively charged ion.							
59	PTS: ANS [.]	1	DIF:	В	OBJ:	17-1			
	An ele voltag	An electrical current is a flow of electrons. The size of the electrical current depends on the size of the voltage, or potential difference, between the electrodes.							
60	PTS:	1	DIF:	В	OBJ:	17-4			
00.	The te cell co	rm battery is us onnected in seri	sed to d es.	lescribe portabl	e galvaı	nic cells. Most batteries contain more than one galvanic			
61.	PTS: ANS:	1	DIF:	В	OBJ:	17-4			
	$Cu^0 \rightarrow$	\sim Cu ²⁺ + 2e ⁻							
62.	PTS: ANS:	1	DIF:	В	OBJ:	17-2			
	$Fe^{\vee} \rightarrow$ PTS:	$Fe^{2+} + 2e^{-}$	DIF:	В	OBJ:	17-3			

63. ANS:

The iron remains in solution as Fe^{2+} because copper is more easily reduced than is iron.

PTS: 1 DIF: B OBJ: 17-3

64. ANS:

The silver is unaffected by the electrical current. As copper is removed from the anode, pieces of silver and other less active impurities settle to the bottom of the cell.

65.	PTS: 1 ANS: galvanic	DIF: B	OBJ: 17-1
	PTS: 1	DIF: B	OBJ: 17-4