This print-out should have 15 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

Which of the following is not a correct statement about a popular battery used in our daily lives?

1. Lithium ion batteries, which are used in cell phones, are considered by some to be a safety risk because of explosion or fire.

2. Sulfuric acid is the acid most commonly found in lead acid storage batteries.

3. Calcium oxide is the base most commonly found in alkaline batteries.

4. Nickel cadmium batteries are decreasingly popular because memory effects reduce the lifetime of the battery.

5. "Hybrid" automobiles most often employ a nickel metal hydride battery as their electrical power source.

002 10.0 points

Consider the reaction

$$CrO_2^- + ClO^- \rightarrow CrO_4^{-2} + Cl^-$$

in basic aqueous solution. In the balanced stoichiometric equation, what is the coefficient of Cl^-?

1. 4

2. 2

3. 3

4. 1

003 10.0 points

If the two half reactions below were used to make a battery, what species would be produced at the anode?

Half reaction	E°
$Cu^{2+}(aq) + 2\,e^- \longrightarrow Cu(s)$	+0.34
$Fe^{3+}(aq) + e^- \longrightarrow 2\,Fe^{2+}(aq)$	+0.77

1. $Fe^{3+}(aq)$

2. $Fe^{2+}(aq)$

3. Cu(s)

4. $Cu^{2+}(aq)$

004 10.0 points

Using the standard potential tables, what is the largest approximate E^0 value that can be achieved when two half cell reactions are combined to form a battery?

1. 3 V

2. 6 V

3. −6 V

4. −3 V

005 10.0 points

For an electrolytic cell, which of the following must be negative?

I) E^o_{cell}
II) anode
III) cathode

1. I, II, III

2. II

3. I, II

4. II, III

5. I, III

6. I

7. III

006 10.0 points

How long would a current of 10 mA take to produce 0.096 g of Mo(s) from $Mo^{5+}(aq)$?

1. 964, 850 s

2. 9, 648, 500 s

3. 48, 242.5 s

4. 4, 824, 250 s

5. 9, 648.5 s

6. 48, 242, 500 s

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007 10.0 points

The reaction

$$2\,Ag^{+}(aq) + Fe(s) \rightarrow Fe^{2+}(aq) + 2\,Ag(s)$$

taking place in a battery generates a current of 2 amp. How much Fe(s) is consumed in 1 hour?

1. 1.04 g

2. 3.46 g

3. 8.32 g

4. 4.16 g

5. 2.08 g

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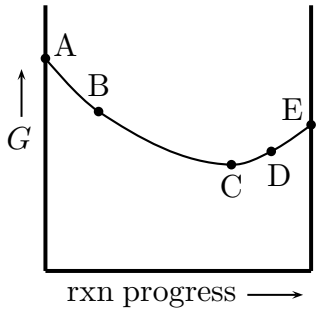
008 10.0 points

The figure represents a reaction at 298 K.



Based on the figure, the standard voltage is

1. positive.

2. negative.

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009 10.0 points

Which type of widely used battery is NOT rechargeable?

1. lead-acid (storage batteries)

2. alkaline

3. nickel-cadmium (NiCad)

4. lithium-ion

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010 10.0 points

When the equation

$$FeCl_3 + Au(s) \rightleftharpoons Fe(s) + AuCl$$

is correctly balanced, what is the coefficient of Fe(s)?

1. 3

2. 4

3. 1

4. 2

5. 5

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011 10.0 points

For a reaction in acid involving the following two half reactions,

$$Fe^{3+} + e^{-} \rightleftharpoons Fe^{2+}$$

$$Cr_2O_7^{2-} + 6\,e^{-} \rightleftharpoons 2\,Cr^{3+}$$

what is the coefficient for H^{+} in the balanced reaction?

1. 1

2. 7

3. 6

4. 36

5. 14

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012 10.0 points

Consider the standard reduction potentials

$Cu^{2+} + 2\,e^- \rightarrow Cu$ $\quad E^0 = 0.337$ V

$Ag^+ + 1\,e^- \rightarrow Ag$ $\quad E^0 = 0.7994$ V

$Au^+ + 1\,e^- \rightarrow Au$ $\quad E^0 = 1.68$ V

Which of the following statements about oxidizing strengths of Group IB metal ions is true?

1. Ag^+ is a stronger oxidizing agent than Au^+.

2. Cu^{2+} is a stronger oxidizing agent than Au^+.

3. Ag^+ is a stronger oxidizing agent than Cu^{2+}.

4. Nothing can be predicted about oxidizing strengths from the data given.

5. Cu^{2+} is a stronger oxidizing agent than Ag^+.

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013 10.0 points

What is the cathode in

$$Ag(s) \mid Ag^+(aq) \,||\, Fe^{2+}(aq) \mid Fe(s)$$

$Ag^+ + e^- \rightarrow Ag$ $\quad \mathcal{E}^\circ_{red} = +0.80$

$Fe^{2+} + 2\,e^- \rightarrow Fe$ $\quad \mathcal{E}^\circ_{red} = -0.44$

and what type cell is it?

1. $Ag(s) \mid Ag^+(aq)$; an electrolytic cell

2. Not enough information is provided.

3. $Fe^{2+}(aq) \mid Fe(s)$; an electrolytic cell

4. $Fe^{2+}(aq) \mid Fe(s)$; a battery

5. $Ag(s) \mid Ag^+(aq)$; a battery

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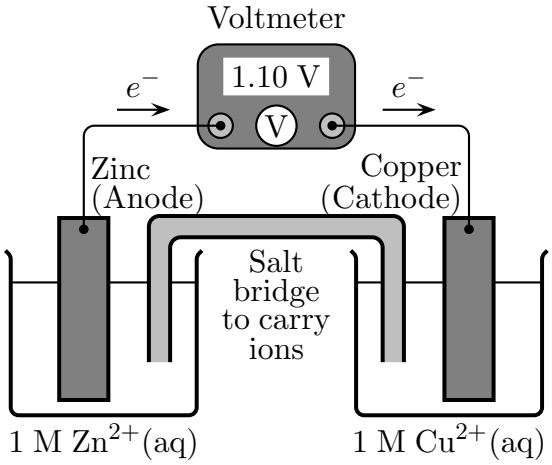
014 10.0 points



In this electrochemical cell, what is the reduction half reaction?

1. $Zn(s) \rightarrow Zn^{2+}(aq) + 2\,e^-$

2. $Cu^{2+}(aq) + 2\,e^- \rightarrow Cu(s)$

3. $Zn^{2+}(aq) + 2\,e^- \rightarrow Zn(s)$

4. $Cu(s) \rightarrow Cu^{2+}(aq) + 2\,e^-$

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015 10.0 points

What is the E°_{cell} of

$$Zn(s) \mid Zn^{2+}(aq) \,||\, Ce^{4+}(aq) \mid Ce^{3+}(aq)$$

$Zn^{2+} + 2\,e^- \rightarrow Zn$ $\quad E^\circ_{red} = -0.76$

$Ce^{4+} + e^- \rightarrow Ce^{3+}$ $\quad E^\circ_{red} = +1.61$

1. +1.61

2. −0.85

3. −2.37

4. +0.85

5. +2.37