This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. V1:1, V2:1, V3:1, V4:1, V5:2.

Please make sure you write your version numbers on your scantron. Good luck!

Convert E to K

26:09, general, multiple choice, > 1 min, fixed.

001 (part 1 of 1) 5 points

What is the equilibrium constant for the reaction taking place at room temperature ($T = 25^\circ\text{C}$) in the battery

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

Assume that the number of electrons transferred in the reaction is $n = 2$.

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

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

1. 1.33×10^{80} **correct**

2. 2.37

3. 6.52×10^{79}

4. 1.84×10^{2}

5. 1.44×10^{2}

Explanation:

Cell Current

26:04, general, multiple choice, > 1 min, fixed.

002 (part 1 of 1) 5 points

What is the average current generated in the

$$\text{Cu(s)} \,|\, \text{Cu}^{2+}\text{(aq)} \,||\, \text{Fe}^{3+}\text{(aq)} \,|\, \text{Fe(s)}$$

electrochemical cell if 50 g of Cu(s) are used up in a 24 hour period?

$\text{Cu}^{2+} + 2\,e^- \rightarrow \text{Cu}$ $\quad E^\circ_{\text{red}} = +0.22$ V

$\text{Fe}^{3+} + 3\,e^- \rightarrow \text{Fe}$ $\quad E^\circ_{\text{red}} = -0.04$ V

1. 1.76 Amp **correct**

2. 42.17 Amp

3. 13.00 Amp

4. 111.85 Amp

5. 2.64 Amp

Explanation:

Nernst Calc

26:08, general, multiple choice, > 1 min, fixed.

003 (part 1 of 1) 5 points

What is the E_{cell} for

$\text{Mg(s)} \,|\, \text{Mg}^{2+}\text{(aq)(0.15 M)} \,||\, \text{Au}^{+}\text{(aq)(0.3 M)} \,|\, \text{Au(s)}\,?$

Assume that the number of electrons transferred in the reaction is $n = 2$.

$\text{Mg}^{2+} + 2\,e^- \rightarrow \text{Mg}$ $\quad E^\circ_{\text{red}} = -2.36$ V

$\text{Au}^{+} + e^- \rightarrow \text{Au}$ $\quad E^\circ_{\text{red}} = +1.69$ V

1. 4.04 V **correct**

2. 4.08 V

3. 3.2×10^{-2} V

4. 4.03 V

5. 4.01 V

Explanation:

Rctn Rate

20:01, general, multiple choice, > 1 min, fixed.

004 (part 1 of 1) 5 points

What is the rate for the formation of Cu(s) in the reaction

$$\text{Cu}^{2+}\text{(aq)} + \text{H}_2\text{(g)} \rightleftharpoons \text{Cu(s)} + 2\,\text{H}^{+}\text{(aq)}$$

if $\dfrac{\Delta[\text{H}^+]}{\Delta t} = 1.2 \times 10^{-3}$?

1. 6×10^{-4} **correct**

2. 2.4×10^{-3}

3. 1.2×10^{-3}

4. 3×10^{-4}

5. 2×10^{-4}

Explanation:

Rate Law 01

20:04, general, multiple choice, > 1 min, fixed.

005 (part 1 of 1) 5 points

What is the rate law for the reaction

$$A + B \rightarrow C\,?$$

The following data were collected.

Exp	$[A]_0$	$[B]_0$	Initial Rate
1	0.5	1.2	1.40×10^{-3}
2	1.7	1.2	1.40×10^{-3}
3	0.5	0.7	4.76×10^{-4}

1. rate $= 9.72 \times 10^{-4}\,[A]^0\,[B]^2$ **correct**

2. rate $= 5.6 \times 10^{-3}\,[A]^2\,[B]^0$

3. rate $= 1.94 \times 10^{-3}\,[A]^0\,[B]^2$

4. rate $= 4.67 \times 10^{-3}\,[A]^2\,[B]^1$

5. rate $= 2.33 \times 10^{-3}\,[A]^0\,[B]^2$

Explanation:

Rate Law 02

20:02, general, multiple choice, > 1 min, fixed.

006 (part 1 of 1) 5 points

For the reaction

$$A \rightarrow B$$

the initial concentration of [A] is 0.1 M. How much of compound [A] is left after 60 minutes if $k = 4.2 \times 10^{-6}\ s^{-1}$?

1. 9.8×10^{-2} **correct**

2. 4.1×10^{-1}

3. 8.5×10^{-2}

4. 1.0×10^{-1}

5. 3.2×10^{-2}

Explanation:

Arrhenius Calc

20:07, general, multiple choice, > 1 min, fixed.

007 (part 1 of 1) 5 points

What is the rate constant for the reaction

$$N_2O \rightarrow N_2 + O$$

if the reaction occurs at room temperature ($T = 25^\circ C$) with a pre-exponential factor of $8.0 \times 10^{12}\ s^{-1}$ and an activation energy of 250 kJ/mol.

1. 1.27×10^{-31} **correct**

2. 1.62×10^{-30}

3. 7.23×10^{10}

4. 9.07×10^{9}

5. 3.21×10^{8}

Explanation:

Rctn Mechanism

20:06, general, multiple choice, > 1 min, fixed.

008 (part 1 of 1) 5 points

The reaction

$$NO_2 + CO_2 \rightarrow CO + NO_3$$

has a rate law that is second order in NO_2. Which of these statements describes the mechanism that explains this unexpected rate law?

1. A multi-step reaction mechanism in which a first bimolecular collision between NO_2 molecules is the rate determining step. **correct**

2. A single-step reaction mechanism in which a bimolecular collision between NO_2 molecules is the rate determining step.

3. A single-step reaction mechanism in which a bimolecular collision between NO_2 and CO_2 is the rate determining step.

4. A multi-step reaction mechanism in which

a first unimolecular decomposition of NO_2 is the rate determining step.

5. A single-step reaction mechanism in which a first unimolecular decomposition of NO_2 is the rate determining step.

Explanation: