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

\[
\text{Zn(s) | Zn}^{2+}(\text{aq}) \| \text{Ce}^{4+}(\text{aq}) | \text{Ce}^{3+}(\text{aq}) \]

Assume that the number of electrons transferred in the reaction is \(n = 2\).

\[
\begin{align*}
\text{Zn}^{2+} + 2e^- & \rightarrow \text{Zn} \quad E_{\text{red}}^o = -0.76 \text{ V} \\
\text{Ce}^{4+} + e^- & \rightarrow \text{Ce}^{3+} \quad E_{\text{red}}^o = +1.61 \text{ V}
\end{align*}
\]

1. \(1.33 \times 10^{80}\) correct
2. 2.37
3. \(6.52 \times 10^{79}\)
4. \(1.84 \times 10^2\)
5. \(1.44 \times 10^2\)

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

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

If \(\frac{\Delta [\text{H}^+]}{\Delta t} = 1.2 \times 10^{-3}\) ?

1. \(6 \times 10^{-4}\) correct
2. 4.217 Amp
3. 13.00 Amp
4. \(3 \times 10^{-4}\)
5. \(2 \times 10^{-4}\)
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 → C?

The following data were collected.

<table>
<thead>
<tr>
<th>Exp</th>
<th>[A]₀</th>
<th>[B]₀</th>
<th>Initial Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5</td>
<td>1.2</td>
<td>1.40 × 10⁻³</td>
</tr>
<tr>
<td>2</td>
<td>1.7</td>
<td>1.2</td>
<td>1.40 × 10⁻³</td>
</tr>
<tr>
<td>3</td>
<td>0.5</td>
<td>0.7</td>
<td>4.76 × 10⁻⁴</td>
</tr>
</tbody>
</table>

1. rate = 9.72 × 10⁻⁴ [A]₀ [B]² correct
2. rate = 5.6 × 10⁻³ [A]² [B]₀
3. rate = 1.94 × 10⁻³ [A]₀ [B]²
4. rate = 4.67 × 10⁻³ [A]² [B]¹
5. rate = 2.33 × 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 → B

the initial concentration of [A] is 0.1 M. How much of compound [A] is left after 60 minutes if k = 4.2 × 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

N₂O → N₂ + O

if the reaction occurs at room temperature (T = 25°C) with a pre-exponential factor of 8.0 × 10¹² s⁻¹ and an activation energy of 250 kJ/mol.

1. 1.27 × 10⁻³¹ correct
2. 1.62 × 10⁻³⁰
3. 7.23 × 10¹⁰
4. 9.07 × 10⁹
5. 3.21 × 10⁸

Explanation:

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

008 (part 1 of 1) 5 points
The reaction

NO₂ + CO₂ → CO + NO₃

has a rate law that is second order in NO₂. 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 NO₂ molecules is the rate determining step. correct
2. A single-step reaction mechanism in which a bimolecular collision between NO₂ molecules is the rate determining step.
3. A single-step reaction mechanism in which a bimolecular collision between NO₂ and CO₂ is the rate determining step.
4. A multi-step reaction mechanism in which
a first unimolecular decomposition of $\text{NO}_2$ is the rate determining step.

5. A single-step reaction mechanism in which a first unimolecular decomposition of $\text{NO}_2$ is the rate determining step.

**Explanation:**