B1-B16 · Whole-unit cumulative U3

Original diploma-style practice | Items 1-2

Scope: see the title; not a full diploma examination. Matching, ordering, ranking and selection tasks provide supplementary skill practice.

Use the givens and conditions in each prompt. Enter the requested count, coefficient, oxidation number or potential with the stated unit and precision.

U3-01 · Numerical response

Oxygen is −2 in NO_3^-. What is the oxidation number of the central atom, as a whole number (do not enter the sign)?

Response: _____

U3-02 · Multiple choice

In the cell reaction between Mg(s) and Cu ions, Mg is oxidized. Which particle is the reducing agent?

A. Mg
B. Mg^{2+}
C. Cu^{2+}
D. Cu

Response: _____

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Original diploma-style practice | Items 3-4

U3-03 · Numerical response

Given $NO_3^- + 4H^+ + 3e^- \rightarrow NO + 2H_2O$. How many electrons are gained for each NO_3^-? Enter an integer.

Response: _____

U3-04 · Numerical response

In an acidic titration, 25.00 mL of $Fe^{2+}(aq)$ needs 15.20 mL of 0.0250 mol/L MnO_4^-. The ratio is 5 Fe^{2+} to 1 MnO_4^-. What is $[Fe^{2+}]$, in mol/L to four decimal places?

Response: _____

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Original diploma-style practice | Items 5-6

U3-05 · Numerical response

Use Ecathode − Eanode. Mg: -2.37 V. Cu: +0.34 V (data booklet). What is E°cell for the cell made from these two metals, in volts to two decimal places?

Response: _____

U3-06 · Multiple choice

In a cell made from Mg (-2.37 V) and Cu (+0.34 V), which strip is the anode?

A. Mg
B. Cu
C. Both strips
D. Neither strip

Response: _____

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Original diploma-style practice | Items 7-8

U3-07 · Multiple choice

For the reaction Cu(s) + Mg^{2+}(aq) written as the cell reaction, E°cell = -2.71 V. Which statement is correct?

A. The reaction is spontaneous and runs in a voltaic cell
B. The reaction is not spontaneous, so it needs a power supply (electrolytic cell)
C. The cell has no voltage
D. The reaction runs faster with a salt bridge

Response: _____

U3-08 · Multiple choice

An object is electroplated with Zn from a solution of Zn ions. At which electrode is the object and how is it connected?

A. The anode, connected to the positive terminal
B. The anode, connected to the negative terminal
C. The cathode, connected to the negative terminal
D. The cathode, connected to the positive terminal

Response: _____

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Original diploma-style practice | Items 9-10

U3-09 · Multiple choice

$AgNO_3(aq)$ is electrolyzed with inert electrodes. Use the booklet values (water is reduced at −0.83 V). Which product forms at the cathode?

A. $H_2(g)$
B. $O_2(g)$
C. $NO_2(g)$
D. Ag(s)

Response: _____

U3-10 · Numerical response

A current of 4.00 A runs for 25.0 min. What charge passes, in coulombs? Enter an integer.

Response: _____

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Original diploma-style practice | Items 11-12

U3-11 · Numerical response

The charge 6000 C deposits Zn from $Zn^{2+}(aq)$. M(Zn) = 65.41 g/mol; F = 9.65×10^4 C/mol e^-. What mass is deposited, in grams to two decimal places?

Response: _____

U3-12 · Numerical response

What time is needed to deposit 1.20 g of Zn with a constant current of 3.00 A? M(Zn) = 65.41 g/mol; 2 mol e^- per mol; F = 9.65×10^4 C/mol e^-. Answer in minutes to two decimal places.

Response: _____

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Original diploma-style practice | Items 13-14

U3-13 · Multiple choice

Fe^{2+}/Fe is −0.45 V. Which metal can be attached to an iron pipe as a sacrificial anode (use the booklet reduction table)?

A. Cu
B. Ag
C. Al
D. Pb

Response: _____

U3-14 · Numerical response

A device needs at least 9.0 V. Each cell gives 2.05 V and cells in a row add their voltages. How many cells are needed? Enter an integer.

Response: _____

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Original diploma-style practice | Items 15-16

U3-15 · Multiple choice

A student compares the predicted and the measured voltage of a cell. Which statement is correct?

A. A voltmeter reading is a prediction
B. A value taken from the reduction table is a prediction
C. A colour change is a prediction
D. A mass change is a prediction

Response: _____

U3-16 · Matching

Match each problem to its method.

Items to match:

1. Voltage of a cell
2. Mass deposited from current and time
3. Concentration from a volume of MnO_4^-
4. Protect a pipe

Targets:

A. Redox titration
B. Sacrificial anode
C. Reduction table
D. Faraday’s law

Response: _____