B1-B4 · Cumulative A

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.

CA-01 · Numerical response

A neutral Mg atom has 12 protons and 12 electrons. It loses 2 electrons and becomes an ion. How many electrons does the ion have? Enter a whole number.

Response: _____

CA-02 · Numerical response

Find nitrogen’s oxidation number in NO_3^-. Enter a signed integer.

Response: _____

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Original diploma-style practice | Items 3-4

CA-03 · Numerical response

Use these reductions from the Alberta Chemistry 30 Data Booklet, Standard Electrode Potentials: $Ag^+ + e^- \rightarrow Ag$, +0.80 V; $Cu^{2+} + 2e^- \rightarrow Cu$, +0.34 V; $Zn^{2+} + 2e^- \rightarrow Zn$, -0.76 V. Use standard table conditions (25 °C, 1.0 mol/L solutions; pure solids). For Cu metal with Ag^+ as the proposed oxidizing agent, calculate E°. Enter volts to two decimal places.

Response: _____

CA-04 · Numerical response

One half-reaction gives off 2 electrons. The other takes in 3 electrons. What is the lowest number of electrons that both can be multiplied up to before you add them? Enter a whole number.

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 5-6

CA-05 · Multiple choice

Given $Zn + 2Ag^{+} \rightarrow Zn^{2+} + 2Ag$, which reactant is the reducing agent?

A. Ag^{+}
B. The oxidation product
C. The reduction product
D. Zn

Response: _____

CA-06 · Numerical response

Find the oxidation number of O in H_2O_2. Enter a signed integer.

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 7-8

CA-07 · Numerical response

In acidic solution, balance MnO_4^- → Mn^{2+}. How many H_2O are needed to balance the oxygen? Enter a whole number.

Response: _____

CA-08 · Ordering / ranking

Tests show that Zn reduces Cu^{2+} and that Cu reduces Ag^+. Put the metals in order from the strongest to the weakest reducing agent.

Strongest to weakest

1. Cu
2. Ag
3. Zn

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 9-10

CA-09 · Multiple choice

An ion made of one atom changes from a charge of +3 to +2. Which statement is correct?

A. It lost an electron, so it was oxidized
B. It gained an electron, so it was reduced
C. It gained an electron, so it was oxidized
D. It is not redox, because both charges are positive

Response: _____

CA-10 · Written response

CH_4 burns in O_2 and forms CO_2 and H_2O. Oxygen in O_2 changes from 0 to -2. Name the oxidizing agent and explain why.

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 11-12

CA-11 · Numerical response

In acidic solution, the atoms are balanced in $MnO_4^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O$. How many electrons must be added on the left? Enter a whole number.

Response: _____

CA-12 · Multiple choice

A simulation gives the same coating or no-coating result four times. Which conclusion follows?

A. A real measurement would have no error
B. Four separate real measurements were made
C. The simulation gives the same result each time
D. All effects of a dirty metal surface were measured

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 13-14

CA-13 · Written response

Given $KCl(s) \rightarrow K^{+}(aq) + Cl^{-}(aq)$. A student says dissolving is redox because the equation shows ions. Explain the mistake. Use what is in the solid.

Response: _____

CA-14 · Numerical response

In a reaction, 2 carbon atom(s) change from an average oxidation number of -3 to +4. How many electrons are lost in total? Enter a whole number.

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 15-16

CA-15 · Select all that apply

Given this half-reaction in basic solution: $OCl^- + H_2O + 2e^- \rightarrow Cl^- + 2OH^-$. Select every correct statement.

A. The Cl, O and H atoms balance
B. The charge is -3 on each side
C. Because OH^- is there, the charge does not have to balance
D. Electrons on the left mean it is a reduction

Response: _____

CA-16 · Select all that apply

An investigation compares different pairs of a metal and an ion. Select every variable that should be kept the same for a fair test.

A. Temperature
B. Ion concentration
C. Exposed metal surface area
D. Which pair is being tested

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 17-18

CA-17 · Written response

One Mg atom becomes Mg^{2+}. 1 Cu^{2+} ion(s) become neutral metal. Draw or describe the arrow that shows the electrons moving. Label the number of electrons, the oxidation and the reduction.

Response: _____

CA-18 · Multiple choice

A student sets the sum of the oxidation numbers in NO_3^- equal to zero. What should the student change?

A. Change every oxygen to zero
B. Set the sum equal to -1, the charge of the ion
C. Change subscripts until the sum works
D. Treat the ion as an element by itself

Response: _____

B1-B4 · Cumulative A

Original diploma-style practice | Items 19-20

CA-19 · Written response

Given two half-reactions: $H_2O_2 \rightarrow O_2 + 2H^+ + 2e^-$ and $H_2O_2 + 2H^+ + 2e^- \rightarrow 2H_2O$. Write the net equation. What kind of redox reaction is it?

Response: _____

CA-20 · Written response

Use these reductions from the Alberta Chemistry 30 Data Booklet, Standard Electrode Potentials: $Ag^+ + e^- \rightarrow Ag$, +0.80 V; $Cu^{2+} + 2e^- \rightarrow Cu$, +0.34 V; $Zn^{2+} + 2e^- \rightarrow Zn$, -0.76 V. Use standard table conditions (25 °C, 1.0 mol/L solutions; pure solids). A student checks the reaction $Cu + Zn^{2+} \rightarrow Cu^{2+} + Zn$ with +0.34 - (-0.76). Give the correct E° for the reaction as written. Explain the student's mistake.

Response: _____